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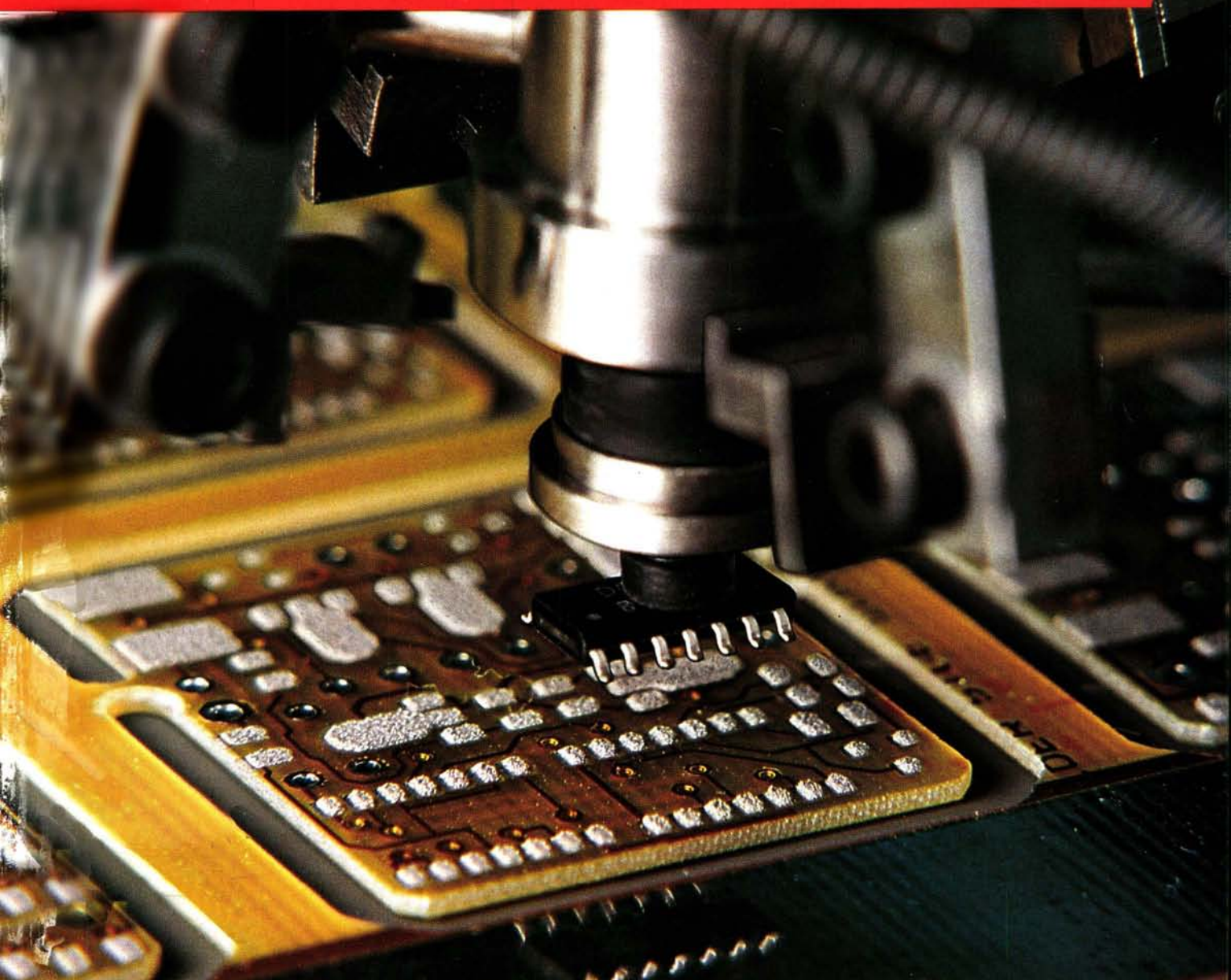
# Practical Wireless

The Radio Magazine



- Build our RTTY/Morse Modem
- Braille Circuit Diagrams
- Valved Communications Receivers - The R107

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## 1 WESTERN PARADE, WEST STREET, AXMINSTER, DEVON, EX13 5NY.

THE SOUTH-WEST'S LARGEST AMATEUR RADIO STOCKIST

## Trio

| | | | |
|---|---|---|---|
| TS940S | 9 Band TX General Cov RX | 1695.00 | |
| TS930S | 9 Band TX General Cov RX | 1295.00 | (—) |
| TS830S | 160-10m Transceiver 9 Bands | 832.75 | (—) |
| AT230 | All Band ATU/Power Meter | 157.99 | (2.00) |
| SP230 | External Speaker Unit | 47.73 | (1.50) |
| TS530S | 160m-10m Transceiver | 698.00 | (—) |
| TS430S | 160m-10m Transceiver | 720.00 | (—) |
| PS430 | Matching Power Supply | 138.00 | (3.00) |
| SP430 | Matching Speaker | 39.50 | (1.50) |
| MB430 | Mobile Mounting Bracket | 13.17 | (1.50) |
| FM430 | FM Board for TS430 | 45.00 | (1.50) |
| TS130S | 8 Band 200W Pep Transceiver | 633.06 | (—) |
| SP120 | Base Station External Speaker | 30.74 | (1.50) |
| AT130 | 100W Antenna Tuner | 108.62 | (1.50) |
| MC50 | Dual Impedance Desk Microphone | 36.19 | (1.50) |
| MC35S | Fist Microphone 50K ohm IMP | 17.01 | (1.00) |
| LF30A | HF Low Pass Filter 1kW | 24.68 | (1.00) |
| TR7930 | 2M FM Mobile | 329.00 | (—) |
| TR9130 | 2M Multimode | 499.00 | (—) |
| TW4000A | 2M/70cm mobile | 522.00 | (—) |
| TM201A | 2M 25W mobile | 296.00 | (—) |
| TM401A | 7cms FM 12W | 316.00 | (—) |
| TH21E | 2M Mini-Handhelds | 170.00 | (—) |
| TH41E | 70cm Mini-Handhelds | 199.00 | (—) |
| TM211E | 2M FM Mobiles | 365.00 | (—) |
| TM411E | 70cm FM Mobiles | 399.00 | (—) |
| TS711E | 2M Base Stations | 768.00 | (—) |
| TS811E | 70cm Base Stations | 895.00 | (—) |
| TR3600 | 70cm Handheld | 292.00 | (—) |
| TR2500 | 2M FM Synthesised Handheld | 258.00 | (—) |
| TR3500 | 70cm Handheld | 270.00 | (—) |
| TR2600 | New 2M FM Synthesised Handheld | 275.00 | (—) |
| ST2 | Base Stand | 60.36 | (1.50) |
| SC4 | Soft Case | 15.92 | (1.00) |
| SMC25 | Speaker Mike | 18.66 | (1.00) |
| PB25 | Spare Battery Pack | 29.10 | (1.00) |
| MS1 | Mobile Stand | 37.31 | (1.00) |
| R600 | Gen. Cov. Receiver | 299.52 | (—) |
| R2000 | Synthesiser 200KHz-30MHz Receiver | 479.47 | (—) |
| HC10 | Digital Station World Time Clock | 78.99 | (1.50) |
| HS5 | Deluxe Headphones | 26.88 | (1.00) |
| SP40 | Mobile External Speaker | 16.46 | (1.00) |

## Linear Amps

**TONO (G series)**

| | | | |
|---|---|---|---|
| 2M40G | 2m, 1-3W in, 20-35W out, preamp | 101.81 | (2.00) |
| 2M90G | 2m, 10-15W in, 70-90W out, preamp | 161.20 | (2.00) |
| 2M130G | 2m, 10-15W in, 110-130W out, preamp | 159.00 | (2.50) |
| 4M70G | 70cms, 10-15W in, 40-60W out, preamp | 219.74 | (2.00) |

**TOKYO HIPOWER AMPS. NOW BACK IN STOCK**

**MICROWAVE MODULES**

| | | | |
|---|---|---|---|
| MML144/30-LS | inc preamp (1/3 w i/p) | 82.90 | (2.00) |
| MML144/50-S | inc preamp, switchable | 92.00 | (2.00) |
| ML144/100-S | inc preamp (10w i/p) | 149.95 | (2.50) |
| MML144/100-HS | inc preamp (25w i/p) | 149.95 | (2.50) |
| MML144/100-LS | inc preamp (1/3w i/p) | 169.95 | (2.50) |
| MML144/200S | inc preamp (3/10/25 i/p) | 299.00 | (2.50) |
| MML432/30L | inc preamp (1/3w i/p) | 145.00 | (2.00) |
| MML432/50 | inc preamp (10w i/p) | 129.95 | (2.00) |
| MML432/100 | linear (10w i/p) | 299.00 | (2.50) |

**B.N.O.S.**

| | | | |
|---|---|---|---|
| LPM 144-1-100 | 2m, 1W in, 100W out, preamp | 181.00 | (2.50) |
| LPM 144-3-100 | 2m, 3W in, 100W out, preamp | 181.00 | (2.50) |
| LPM 144-10-100 | 2m, 10W in, 100W out, preamp | 157.00 | (2.50) |
| LPM 144-25-160 | 2m, 25W in, 160W out, preamp | 217.00 | (2.50) |
| LPM 144-3-180 | 2m, 3W in, 180W out, preamp | 247.00 | (2.50) |
| LPM 144-10-180 | 2m, 10W in, 180W out, preamp | 247.00 | (2.50) |
| LP 144-3-50 | 2MN 50W out, preamp | 108.00 | (2.50) |
| LP 144-10-50 | 2M 10W in, preamp | 108.00 | (2.50) |
| LPM 432-1-50 | 70cm, 1W in, 50W out, preamp | 235.00 | (2.50) |
| LPM 432-3-50 | 70cm, 3W in, 50W out, preamp | 235.00 | (2.50) |
| LPM 432-10-50 | 70cm, 10W in, 50W out, preamp | 195.00 | (2.50) |
| LPM 432-10-100 | 70cm, 10W in, 100W out, preamp | 335.00 | (2.50) |

## SWR/PWR Meters

**HANSEN**

| | | | |
|---|---|---|---|
| FS50VP | 50-150MHz 20/200 Interval PEP/SWR | 106.70 | (1.50) |
| FS300V | 50-150MHz 20/200 PWR/SWR | 53.50 | (1.50) |
| FS300H | 1.8-60MHz 20/200/10W | 53.50 | (1.50) |
| FS210 | 1.8-150MHz 20/200 Auto SWR | 63.50 | (1.50) |
| W720 | 140-430MHz 20/200W | 41.50 | (1.50) |

**WELZ**

| | | | |
|---|---|---|---|
| SP45 | 130-470MHz PWR/SWR | 69.00 | (1.50) |
| SP10X | 1.8-150MHz PWR/SWR | 34.00 | (1.50) |
| SP200 | 1.8-160MHz PWR/SWR | 89.00 | (1.50) |
| SP250 | 1.8-60MHz PWR/SWR | 65.00 | (1.50) |
| SP300 | 1.8-500MHz PWR/SWR | 129.00 | (1.50) |
| SP350 | 1.8-500MHz PWR/SWR | 79.00 | (1.50) |
| SP400 | 130-500MHz PWR/SWR | 89.00 | (1.50) |

**NEW RANGE OF WELZ METERS NOW AVAILABLE**

**TOYO**

| | | | |
|---|---|---|---|
| T430 | 144/432 120 W | 44.65 | (1.00) |
| T435 | 144/432 200 W | 49.35 | (1.50) |

## Scanning Receivers

| | | | |
|---|---|---|---|
| SMC8400 | VHF/UHF Scanner | 249.00 | (2.50) |
| SX200 | VHF/UHF Scanner | 325.00 | (2.50) |
| SX400 | VHF/UHF Continuous Coverage | 625.00 | (2.50) |
| AOR2001 | VHF/UHF Continuous Coverage | 345.00 | (2.50) |
| FDK RX40 | 141.00-180.000 MHz | 159.00 | (2.00) |

## Icom Products

| | | | |
|---|---|---|---|
| IC751 | HF Transceiver | 1299.00 | (—) |
| IC745 | HF Transceiver | 899.00 | (—) |
| IC735 | New HF Transceiver | 849.00 | (—) |
| PS15 | P.S. Unit | 145.00 | (4.00) |
| PS30 | Systems p.s.u. 25A | 297.85 | (—) |
| SM6 | Base microphone for 751/745 | 40.25 | (1.00) |
| IC290D | 2m 25w M/Mode | 479.00 | (—) |
| IC290E | 10w Multi-Mode Mobile | 449.00 | (—) |
| IC271E | 2m 25w M/Mode Base Stn. | 729.00 | (—) |
| IC271H | 100W version of above | 899.00 | (—) |
| IC25H | 2m 45w FM | 359.00 | (—) |
| IC27E | 25W FM mobile | 379.00 | (—) |
| IC45E | 70c 10w FM | 345.00 | (—) |
| IC47E | 25w 70cm FM mobile | 469.00 | (—) |
| ICBU1 | B/U Supply for 25/45/290 | 29.90 | (1.00) |
| ICR70 | General Coverage Receiver | 629.00 | (—) |
| ICR71 | General Coverage Receiver | 729.00 | (—) |
| IC02E | 2m H/Held | 269.00 | (—) |
| IC2E | 2m H/Held | 199.00 | (—) |
| ML1 | 2m 10w Linear | 79.35 | (2.00) |
| IC4E | 70cm H/Held | 259.00 | (—) |
| IC04E | 70cm handheld | 279.00 | (—) |
| BC35 | Base Charger | 62.10 | (1.00) |
| HM9 | Speaker mic | 18.56 | (1.00) |
| IC3 | Carry Case | 5.50 | (1.00) |
| ICBP3 | Std Battery Pack | 27.50 | (1.00) |
| BP5 | High Power Battery Pack | 52.80 | (1.00) |
| CP1 | Car Charging Lead | 5.50 | (1.00) |
| DC1 | 12v Adaptor | 13.75 | (1.00) |

## Mutek Products

| | | | |
|---|---|---|---|
| SLNA 50 | 50MHz Switched preamp | 44.90 | (1.50) |
| SLNA 144s | 144MHz Low noise switched preamp | 39.95 | (1.50) |
| SLNA 145sb | Preamp intended for 290 | 29.90 | (1.50) |
| GLNA 432e | 70cm Mast head preamp | 149.90 | (2.50) |
| RPCB 144ub | Front end FT221/225 | 79.90 | (1.50) |
| RPCB 251ub | Front end IC251/211 | 84.90 | (1.50) |
| BBBA 500u | 20-500MHz Preamp | 34.90 | (1.50) |
| GFBA 144e | 2m Mast head preamp | 149.90 | (2.50) |
| SBLA 144e | 2m Mast head preamp | 89.90 | (2.50) |
| RPCB 271ub | Front end for IC271 | 89.90 | (1.50) |
| TVHF 230c | 2M-FM Transverter | 334.90 | (5.00) |
| LBPF 144v | Bandpass Filter | 22.40 | (1.50) |
| LBPF 432u | Bandpass Filter | 22.40 | (1.50) |
| TVVF 50c | 6M Transverter | 199.90 | (2.50) |
| GLNA 433e | 70cm Pre-amp | 79.90 | (2.50) |
| TVVF 144a | 2M Transverter | 239.90 | (2.50) |

## Datong Products

| | | | |
|---|---|---|---|
| PC1 | Gen. Cov. Con. | 137.40 | (1.50) |
| VLF | Very low frequency conv. | 29.90 | (1.50) |
| FL2 | Multi-mode audio filter | 89.70 | (1.50) |
| FL3 | Audio filter for receivers | 129.00 | (1.50) |
| ASP/B | r.f. speech clipper for Trio | 82.80 | (1.50) |
| ASP/A | r.f. speech clipper for Yaesu | 82.80 | (1.50) |
| ASP | As above with 8 pin conn | 89.70 | (1.50) |
| D75 | Manual RF speech clipper | 56.35 | (1.50) |
| D70 | Morse Tutor | 56.35 | (1.50) |
| MK | Keyboard morse sender | 137.40 | (1.50) |
| RFA | RF switched pre-amp | 33.90 | (1.50) |
| AD270-MPU | Active dipole with mains p.s.u. | 51.75 | (1.50) |
| AD370-MPU | Active dipole with mains p.s.u. | 69.00 | (1.50) |
| MPU | Mains power unit | 6.90 | (1.50) |
| DC144/28 | 2m converter | 39.67 | (1.50) |
| PTS1 | Tone squelch unit | 46.00 | (1.50) |
| ANF | Automatic notch filter | 67.85 | (1.50) |
| SRB2 | Auto Woodpecker blanker | 86.25 | (1.50) |

## CW/RTTY Equipment

| | | | |
|---|---|---|---|
| Tono 9000E | Reader/Sender | P.O.A. | (—) |
| Tono 550 | Reader | 329.00 | (2.50) |

**MICROWAVE MODULES**

| | | | |
|---|---|---|---|
| MM2001 | RTTY to TV converter | 189.00 | (2.00) |
| MM4001 | RTTY terminal | 269.00 | (2.00) |
| MM4001KB | RTTY term with keyboard | 299.00 | (2.00) |

**BENCHER**

| | | | |
|---|---|---|---|
| BY1 | Squeeze Key, Black base | 53.95 | (1.50) |
| BY2 | Squeeze Key, Chrome base | 69.95 | (1.50) |

**HI-MOUND MORSE KEYS**

| | | | |
|---|---|---|---|
| HK702 | Up down keyer marble base | 30.95 | (1.50) |
| HK703 | Up down keyer | 29.35 | (1.50) |
| HK704 | Up down keyer | 19.95 | (1.50) |
| HK705 | Up down keyer | 15.49 | (1.50) |
| HK706 | Up down keyer | 16.96 | (1.50) |
| HK708 | Up down keyer | 14.95 | (1.50) |
| HK802 | Up down solid brass | 86.30 | (2.00) |
| HK808 | Up down keyer | 39.95 | (1.50) |
| MK704 | Twin paddle keyer | 13.50 | (1.50) |
| MK705 | Twin paddle keyer marble base | 25.65 | (1.50) |

**KENPRO**

| | | | |
|---|---|---|---|
| KP100 | Squeeze CMOS 230/13.8v | 82.50 | (2.50) |
| KP200 | Memory 4096 Multi Channel | 169.50 | (2.50) |

## Yaesu

| | | | |
|---|---|---|---|
| FT1 | HF Transceiver | P.O.A. | (—) |
| FT980 | HF Transceiver | 1450.00 | (—) |
| SP980 | Speaker | 78.95 | (2.00) |
| FC700 | Tuner | 105.00 | (2.00) |
| FT757GX | HF Transceiver | 739.00 | (—) |
| FC757 | Auto A.T.U. | 255.00 | (2.00) |
| FP757HD | Heavy Duty PSU | 175.00 | (2.00) |
| FP757GX | Switched Mode PSU | 160.00 | (2.00) |
| FL2050 | Linear Amplifier | 115.00 | (2.00) |
| FT290 | 2m M/Mode Port/Transceiver | 315.00 | (—) |
| FT290 | With Mutek front end fitted | 345.00 | (—) |
| FL2010 | Linear Amplifier | 69.00 | (1.00) |
| MMB11 | Mobile Bracket | 30.00 | (1.00) |
| NC11 | Charger | 11.50 | (1.00) |
| CSC1 | Carrying Case | 5.00 | (1.00) |
| YHA15 | 2m Helical | 7.65 | (1.00) |
| YHA44D | 70cm ½wave | 9.95 | (1.00) |
| YM49 | Speaker Mike | 20.20 | (1.00) |
| MMB15 | Mobile Bracket | 14.55 | (1.00) |
| FT203R | NEW 2m H/Held/C/W FNB3 | 195.00 | (—) |
| FT209R | NEW 2m H/Held/C/W FNB3 | 239.00 | (—) |
| FT703R | 70cm H/Held | 235.00 | (—) |
| FT709R | 70cm H/Held | 259.00 | (—) |
| FT270R | 2m 25W F.M. | 315.00 | (—) |
| FT270RH | 2m 45W F.M. | 365.00 | (—) |
| FT2700R | 2m/70cm/25W/25W | 499.00 | (—) |
| FRG 9600 | 60-905MHz Scanning RX | 449.00 | (—) |
| MMB10 | Mobile Bracket | 8.80 | (1.00) |
| NC9C | Charger | 9.60 | (1.00) |
| NC8 | Base/station Charger | 64.80 | (2.00) |
| PA3 | Car Adaptor/Charger | 18.00 | (1.00) |
| FNB2 | Spare Battery Pack | 27.02 | (1.00) |
| YM24A | Speaker Mike | 23.75 | (1.00) |
| FT726R | 2m Base Station | 775.00 | (—) |
| 430/726 | 70cm Module for above | 255.00 | (2.50) |
| FRG8800 | HF Receiver | 475.00 | (—) |
| FRV8800 | Convertor 118-175 for above | 80.00 | (1.50) |
| FRT7700RX | A.T.U. | 49.85 | (1.50) |
| MH1B8 | Hand 600 8pin mic | 15.70 | (1.00) |
| MD1B8 | Desk 600 8pin mic | 64.80 | (1.00) |
| MF1A3B | Boom mobile mic | 18.00 | (1.00) |
| YH77 | Lightweight phones | 14.95 | (1.00) |
| YH55 | Padded phones | 15.35 | (1.00) |
| YH1 | L/weight Mobile H/set-Boom mic | 14.95 | (1.00) |
| SB1 | PTT Switch Box 208/708 | 15.70 | (1.00) |
| SB2 | PTT Switch Box 290/790 | 13.80 | (1.00) |
| SB10 | PTT Switch Box 270/2700 | 14.95 | (1.00) |
| QTR24D | World Time Clock | 33.35 | (1.00) |
| FF501DX | Low Pass Filter | 29.90 | (1.00) |

## Power Supplies

| DRAE | | | BNOS | | |
|---|---|---|---|---|---|
| 4 amp | 40.50 | (2.00) | 6 amp | 58.00 | (2.50) |
| 6 amp | 63.00 | (2.50) | 12 amp | 99.00 | (3.00) |
| 12 amp | 86.50 | (3.00) | 25 amp | 148.00 | (4.00) |
| 24 amp | 125.00 | (4.00) | 40 amp | 296.00 | (4.00) |

## Aerial Rotators

| | | | |
|---|---|---|---|
| FU200 | Light Duty | 49.95 | (2.00) |
| AR40 | 5 core Medium Duty | 115.00 | (2.00) |
| KR400 | Med/H Duty | 109.95 | (2.50) |
| KR500 | 6 core Elevation | 139.95 | (2.50) |
| KR400RC | 6 core Medium Duty | 132.50 | (2.50) |
| CD45 | 8 core Heavy Duty | 189.95 | (2.50) |
| KR600RC | 8 core Heavy Duty | 189.50 | (2.50) |
| HAM1V | 8 core Heavier Duty | 299.00 | (4.00) |
| T2X | 8 core Very Heavy Duty | 365.00 | (4.00) |

## Switches

| | | | |
|---|---|---|---|
| Sigma | 2 way SO239 | 14.49 | (1.00) |
| Sigma | 2 way 'n' Skts | 19.95 | (1.00) |
| Welz | 2 way SO239 | 22.95 | (1.00) |
| Welz | 2 way 'n' Skts | 41.90 | (1.00) |
| Drae | 3 way SO239 | 15.40 | (1.00) |
| Drae | 3 way 'n' Skts | 19.90 | (1.00) |

## Miscellaneous

| | | | |
|---|---|---|---|
| DRAE | Wavemeter | 27.50 | (1.00) |
| T30 | 30W Dummy load | 8.05 | (1.00) |
| T100 | 100W Dummy load | 35.20 | (1.00) |
| T200 | 200W Dummy load | 42.55 | (1.50) |
| CT300 | 300W Dummy load | 69.00 | (2.00) |
| DRAE | 2m Pre-set A.T.U. | 14.50 | (1.50) |
| ALTAI | KDM6 Dip Meter | 68.60 | (1.50) |

**TOKYO HI-POWER**

| | | | |
|---|---|---|---|
| HC200 | 10-80 HF Tuner | 82.50 | (2.00) |
| HC400 | 10-160 HF Tuner | 176.00 | (3.00) |

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The Radio Magazine

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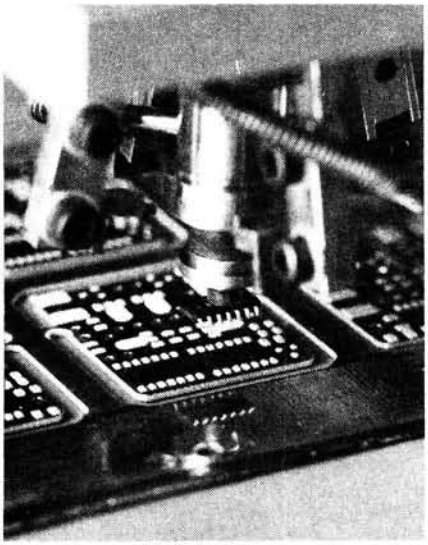
THIS MONTH





## THIS MONTH'S COVER

This month's cover shows an automatic pick-and-place surface-mounting p.c.b. assembly head. Surface-mounting techniques such as this, featuring pre-printed solder paste and robust miniature components, permit the location of some 5000 components per hour. Accurate control of board/component stress, soldering and improved high frequency performance are just some of the advantages of this, soon to be widespread, technology—which does not exclude home construction. Our thanks go to **Surface Electronics Ltd, Patrick House, West Quay Road, Poole, Dorset,** for their invaluable assistance.



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# LOWE SHOPS

**In Glasgow the LOWE ELECTRONICS' shop** (the telephone number is 041-945 2626) is managed by Sim GM3SAN. Its address is 4/5 Queen Margaret Road, off Queen Margaret Drive. That's the right turn off Great Western Road at the Botanical Gardens' traffic lights. Street parking is available outside the shop and afterwards the Botanical gardens are well worth a visit.

**In the North East the LOWE ELECTRONICS' shop** is found in the delightful market town of Darlington (the telephone number is 0325 486121) and is managed by Don G3GEA. The shop's address is 56 North Road, Darlington. That is on the A167 Durham Road out of town. A huge free car park across the road, a large supermarket and bistro restaurant combine to make a visit to Darlington a pleasure for the whole family.

**Cambridge, not only a University town but the location of a LOWE ELECTRONICS' shop** managed by Tony G4NBS. The address is 162 High Street, Chesterton, Cambridge (the telephone number is 0223 311230). Easy and free street parking is available outside the shop.

**For South Wales, the LOWE ELECTRONICS' shop is located in Cardiff.** Managed by Carl GW0CAB, the shop (the telephone number is 0222 464154) is within the premises (on the first floor) of South Wales Carpets, Clifton Street, Cardiff. Enter the shop, follow the arrows past the carpets, up the stairs and the "Emporium" awaits you. Free street parking is available outside the shop.

**For South Coast radio amateurs there's a LOWE ELECTRONICS' shop in Bournemouth.** It's manager is Colin G3XAS. The shop's address is 27 Gillam Road, Northbourne, Bournemouth, that's the north side of town, just off Wimborne Road (the telephone number is 0202 577760). Easy to find, the shop has free street parking immediately outside.

**LOWE ELECTRONICS' London shop** is located at 223/225 Field End Road, Eastcote, Middlesex (the telephone number is 01-429 3256). The shop, managed by Andy G4DHQ is easily found, being part of Eastcote tube station buildings. For the motorist, we are only about 10 minutes' driving time from the M40, A40, North Circular Road (at Hanger Lane) and the new M25 junction at Denham. Immediately behind the shop is a large car park where you can currently park for the day for 10p. There is also free street parking outside the shop.

**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 (telephone 0323 848077). An evening or weekend telephone call will put you in touch with John.

**Finally, here in Matlock**, Richard G4NAD is in charge. Located in an area of scenic beauty a visit to the shop can combine amateur radio with an outing for the whole family. May I suggest a meal in one of the town's inexpensive restaurants or a picnic on the hill tops followed by a spell of portable operation.

# TRIO
# TS830S

## hf transceiver

**The TRIO TS830S is for the operator who wants a dedicated amateur bands only transceiver,** who is used to and wants a pair of rugged 6146B valves in the PA stage and who wants a compact rig which has its own in-built power supply. The TS830S is for the radio amateur who requires a rig capable of rising above today's crowded band conditions, a rig that has, as standard, the necessary features that will produce consistently good contacts where other lesser equipment would fail. The TRIO TS830S, a proven rig with an impeccable pedigree.

**The TS830S covers** on USB, LSB and CW the full amateur bands from 160 through to 10 metres.

**Convenient to use,** the transceiver has its own in-built power supply.

**VBT (variable bandwidth tuning)** enables the operator to, at will, vary the IF filter passband width and establish optimum IF bandwidth relative to the interference being experienced.

**The IF shift control** allows the IF passband to be moved up or down in frequency without having to retune the receiver. Hence, an unwanted signal, present in the IF passband, may be attenuated significantly by moving the passband in the appropriate direction.

**As the IF shift and VBT are independently** adjustable they can, to advantage, be used together.

**The tunable notch filter** in the TS830S is a high-Q active circuit in the 455KHz second IF. Sharp, deep notch characteristics will eliminate a strong interfering carrier within the passband of the receiver section.

**The RF speech processor** in the TS830S provides added audio punch and increases the average SSB output power whilst suppressing sideband splatter. Compression levels can be monitored and controlled from the front panel.

**To cope with pulse type (such as ignition) noise,** the transceiver has an in-built noise blanker.

**For perfect listening,** a tone control adjusts receiver audio frequency response to suit operating conditions.

**Both RIT and XIT,** transmitter as well as receiver incremental tuning are included to aid operating. XIT being a distinct advantage when calling a station that is listening 'off frequency'.

**It is possible** to monitor the transmitted audio in order to assess the effects of the speech processor: a most useful feature ensuring perfect signal reports.

**TS830S** amateur band transceiver.....**£832.75 inc VAT, carr £7.00**

# LOWE ELECTRONICS LTD.

**Chesterfield Road, Matlock, Derbyshire DE4 5LE**
**Telephone 0629 2817, 2430, 4057, 4995.**

send £1 for complete mail order catalogue.

# the TRIO two metre base station, the TS711E.

**Several weeks have passed** since I took delivery of my own TRIO TS711E. The Japanese home market model has returned whence it came and I am using the version designed specifically for the UK market. The rig is perfection epitomised. For todays two metre operator any base station with less facilities and performance than the TS711E would be far from acceptable. The TS711E's receiver performance in sensitivity and in its ability to reject unwanted adjacent signals is outstanding. I'm not talking about test equipment figures though undoubtedly these will soon be published. My own on air operating with the rig has enabled me to hear what I previously couldn't.

**The transceiver** covers the 2 metre band from 144 to 146 MHz in FM, USB, LSB and CW modes. When switched to the auto position the rig correctly selects mode according to frequency, a great advantage to the blind operator. Simple up/down frequency shift is provided both on the transceiver front panel and microphone.

**IF shift** is available, an essential when considering todays crowded 2 metre band. For more penetrating transmitted audio when working DX speech processing can also be switched in.

**The TS711E has two separate VFO's and forty channels of memory.** Each memory remembers frequency, operating mode, simplex or repeater shift and whether or not a tone burst is to be included. Frequencies stored in memory can be readily transferred to either VFO A or B. The VFO can be either free running as for SSB or CW operation or electrically switched to a "click" stop where it changes frequency in 12.5 or 5 kHz steps. The two VFO's can quickly be put on the same frequency, an aid when checking the position of a strong adjacent signal with one VFO whilst remaining on your operating frequency with the other.

**Frequency scan** on VFO can be either between or outside user set limits. On memory the transceiver can either scan the entire memory contents or be instructed to look at those frequencies of a particular mode. The TS711E has a timed hold on an occupied channel. Both priority channel and the immediate recall of your local net frequency are possible with the TS711E.

**For those with failing sight or a blind operator** the TS711E is a dream come true, not only is the operating mode identified by the appropriate CW letter sent in tone (F for FM, U for upper side band etc.), other rigs just bleep but, when fitted with the VS1 optional board, a digitally encoded girls voice will announce both frequency and where applicable, whether the rig is switched to repeater shift.

**TS711E 2 metres £695.00 carr £7.00**

# also on seventy, the TS811E.

**TS811E 70 centimetres £795.00 inc. VAT carr £7.00**

# not even a mouse, could hide behind a TRIO TH21E.....

**I am not for one moment suggesting that current hand-helds should be photographed with an elephant** but I have heard many amateurs refer to their existing hand-helds as "bricks". That the TH21E could not be called. In fact I am tempted to say it is the rig that not even a mouse could hide behind. Over the past fourteen years I have watched amateur radio equipment develop from cumbersome to perfection. I remember John, G3PCY, showing me the first TR2400 and our mutual amazement at how TRIO could put so much radio in such a small package. Later developments produced the TR2500 and its 70 centimetre version, the TR3500 and left me in no doubt that TRIO would soon produce a compact inside pocket transceiver. At the same time it became apparent that a simpler rig with performance would have great appeal. That transceiver is the TH21E and being typically TRIO is right first time. Size is not the most important feature, it's just the way the transceiver feels when picked up, impossible to put down. I am not going to give its dimensions, I will just say that it is hand sized, the true inside pocket transceiver. As an owner and with the rig always on your person the hobby of amateur radio expands to an all day event. **Never miss a contact, never miss a friend.**


A similar transceiver is available for 70 centimetres, the TH41E. Having the same features including reverse repeater the TH41E is just the rig that newcomers to the hobby have been looking for. Around the country are many 70 centimetre repeaters and what has been needed for some time has been a low cost FM rig that everyone could afford. The TH41E from TRIO is that transceiver and many amateurs are discovering the 70 centimetre band with one.

**First of all the Pocketfone, now the TH41E.**

1 watt output in high power position, 150mW in low position.

Full coverage of the 2 metre amateur band from 144 to 146MHz. (TH41E covers from 430 to 440MHz.)

Frequency selection by simple thumb-wheel switches.

Full repeater facilities including reverse repeater.

The rig comes complete with nicad pack and charger.

**TH21E ..... £170.00 inc VAT**
**TH41E ..... £199.00 inc VAT**

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| SMC (Chesterfield) | 25th Dec-2nd Jan |
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| SMC (TMP) | 28th-31st Dec-1st-4th Jan |
| SMC (Scotcomm) | 25th Dec-7th Jan |
| Dartcoms | 25th & 26th Dec-1st-5th Jan |
| Transworld Comms | 25th Dec-30th Dec |
| SMC (Jersey) | 25th & 26th Dec & 1st Jan |
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## FT-290R £315 inc VAT

**MULTIMODE OPERATION**
Never before possible from such a compact package, true multimode operation is yours to enjoy. With CW and SSB activity at an all-time high, you will not be left out of the satellite or DX action and you can still ragchew on FM simplex or even via a repeater.

**ADVANCED MICRO CONTROL**
Advances in microprocessor circuitry allows selectable synthesizer steps, up/down scanning from the microphone, priority channel operation, and ten memories (with memory scan), all called up with fingertip ease.

**LCD DISPLAY**
A large Liquid Crystal Display provides readout of the operating frequency. It is highly readable under conditions of bright sunlight and is backed up by a lamp for night-time operation.

**PROGRAMMABLE SYNTHESIZER**
The optimum synthesizer steps for SSB/CW/AM or FM operation are very different. That's why Yaesu gives you the flexibility of two synthesizer steps per mode: 100Hz or 1kHz per step on SSB, AM & CW, and 12½/25kHz on FM.

### FT 290R

**Frequency coverage (MHz):**
144-146 or 144-148
**Modes of operation:**
SSB (USB, LSB) CW & FM
**Synthesizer steps:**
SSB/CW: 100Hz/1kHz
FM: 12.5/25kHz
**Sensitivity (better than):**
SSB/CW: 0.5µV for 20dB S/N
FM: 0.25µ for 12dB SINAD
**Selectivity:**
SSB/CW: 2.4kHz @ −6dB
4.1kHz @ −60dB
FM: 14kHz @ −6dB
25kHz @ −60dB
**Repeater Split:**
600kHz (+ and −)
**Tone burst frequency:**
1,750Hz

### GENERAL

**Power Output:**
2.5 Watts at 12VDC
**Frequency response:**
300-2,700Hz @ −6dB
**Carrier Suppression:**
Better than −40dB
**Sideband Suppression:**
Better than −40dB
**FM Deviation:**
+5kHz (max)
**Spurious radiation:**
Better than −60dB
**Intermediate frequencies**
1st IF 10.81MHz
2nd IF 455kHz (FM)
**Image rejection:**
Better than −60dB
**Audio output:**
1 Watt @ 10% THD
**Audio output impedance**
8 Ohms
**Antenna:**
SO239 on rear
**Dimensions:**
58H × 150W × 195D m
1.3kg (without cells)

## OSCAR 2/10M

The SMC Oscar was designed to satisfy the stringent specifications of MPT1320. It is a solid state, compact, transceiver built to withstand the shock and vibrations experienced in the mobile environment for years to come. It also makes an ideal base station when used in conjunction with an external 12V P.S.U. and optional amplifier such as our type PA10L/25. A high level of frequency stability over a wide temperature range is achieved by the use of low tolerance quartz crystal and the latest in CMOS integrated circuits. The receiver provides good sensitivity allowing excellent reception of even the weakest stations, good selectivity and signal handling allows perfect reception of local signals with minimum interference from adjacent channels. The power output is 5W giving a good range. This coupled with highly controlled modulation and high spurious rejection gives maximum readability with minimum interference to other users.

**ONLY £65 inc**

## FT726R(2) £775 inc VAT

The Yaesu FT726R has been designed and built for the discerning VHF and UHF operator. Up to three modules can be simultaneously installed giving pushbutton band selection. Choose between 6M, 2M, 70cms and 10, 12, 15M.

SSB (with fully adjustable speech processor), FM and CW (optional 600Hz CW filter available) are standard. The CW filter combined with Yaesu's excellent IF shift/width system enables optimum receive performance despite today's crowded bands.

An 8 bit NMOS microprocessor offers a level of control hither to unsurpassed, dual VFO's – 20Hz step tuning, standard repeater shifts including reverse, push button band selection and 25/12.5KHz FM channel tuning knob.

The eleven memory channels store mode as well as frequency and can be scanned for busy or clear, stop or pause, even on different bands. Programmable limited band scan between memories is provided as well as priority channel checking. All the memories and both VFO's are protected against power failure by a lithium cell.

With the optional "plug-in" satellite IF unit installed, full crossband duplex capability is available with independent tuning and mode selection, as well as full metering of both transmit and receive parameters (power O/P and signal strength).

An LED display plus two digit clarifier display are provided with large digits for easy reading at any angle. Standard features also include selectable AGC and noise blanker, all mode squelch and RF gain and continuously adjustable transmitter output power.

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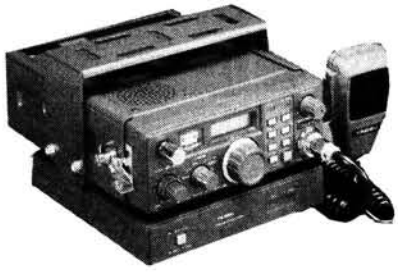
When changing modes from SSB/CW to FM, your transceiver is automatically set to the nearest standard channel when you start scanning or tuning.

**TEN MEMORY CHANNELS**
As many as ten frequencies may be stored into memory, for instant recall. The priority feature allows you to check a favourite frequency every few seconds, with automatic halting (FM mode) when the channel is clear or busy, as desired. Memory backup is provided by a built-in lithium cell.

**DUAL VFO SYSTEM**
These transceivers feature a digitally synthesized dual VFO system which provides tremendous flexibility in day to day operation. For example, one VFO may be set in the SSB portion of the band, and the other in the FM sub-band, for immediate QSY when changing modes.

**CONVENIENT FEATURES**
Among the many features adding to the convenience of the transceiver is a supplied portable antenna, a high-performance noise blanker, a high/low power switch. A clarifier allows you to follow unstable or Doppler-shifted signals.

## FT-690R £289 inc VAT



### FEATURES

**Current consumption:**
70mA receive
800mA Tx (2.5 W RF FM)

**Power requirements:**
8 × C size dry cells
8 × C size Nicad cells
External 8.5-15.2VDC
Memory backup: Lithium cell

**Microphone:**
(YM47 supplied)
600 ohms ppt with scan

### FT 690R

**Frequency coverage (MHz):**
50-54
**Modes of Operation:**
USB, CW, AM & FM
**Synthesizer Steps:**
SSB/CW/AM: 100Hz/1kHz
FM: 10/20kHz
**Sensitivity (better than):**
SSB/CW/AM: 0.5μV for 20dB S/N
FM: 0.25μV for 12dB S/NAD
**Selectivity:**
SSB/CW: 2.4kHz (−6dB)
4.1kHz (−60dB)
AM: 4kHz (−6dB)
15kHz (−60dB)
FM: 14kHz (−6dB)
25kHz (−60dB)
**Repeater Shift:**
1MHz (+&−)

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| F90F2.4, SSB 2.4kHz | **£10.00** |
| F90H12, FM 12kHz | **£12.50** |
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| DC Kit FRG7700 | p&p 50p |
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## FT757GX £739 inc VAT

The FT757GX is the latest in a long line of superb HF transceivers from Yaesu. The transceiver covers all the amateur bands with a full 0.5-30MHz continuous coverage receiver. Dual VFO's and eight memories all controlled by three microprocessors allow quick and accurate control of all the main functions.

All modes SSB, CW, AM and FM are included as standard along with a 600Hz CW filter, iambic keyer with dot-dash memory, 25KHz marker, noise blanker, AF speech processor and IF shift/width filters. Top panel switch selectable semi-break in or QSK is available for CW operation.

The Yaesu CAT (computer aided transceiver) system is fitted to enable external control of VFO frequency and memory functions from a personal computer via an interface unit for customised band scanning and control of the memories and VFO's.

The remarkable new heatsink design includes a quiet cooling fan with a new duct-flow cooling system incorporating the heatsink into the body of the radio. This gives forced air circulation allowing 100W PEP continuous output at 100% duty cycle in all modes.

The high performance general coverage receiver with Yaesu's unsurpassed IF shift/width system, switchable AGC and 20dB attenuator, combined with the switchable, RF preamp provides the FT757GX with a dynamic range in excess of 100dB in CW narrow.

The optional FC757AT is a fully microprocessor controlled antenna tuner which gives fast, reliable automatic tuning of a broad range of SWR's, with manual override for that particularly 'difficult' aerial. Also included is a dummy load, automatic SWR calculating system and meter and a dual range RF wattmeter.

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| **LINEAR AMPLIFIERS:** | | | |
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| | MML 144/50-S | 2m 50 watt linear/preamp, 10w input switchable | 92.00 |
| | MML 144/100-S | - 2m 100 watt linear/preamp, 10w input switchable | 149.95 |
| | MML 144/100-HS | - 2m 100 watt linear/preamp, 25w input, switchable | 149.95 |
| | MML 144/100-LS | - 2m 100 watt linear/preamp, 1 or 3w input, switchable | 169.95 |
| | MML 144/200-S | - 2m 200 watt linear/preamp, 3, 10, 25w input, switchable | 299.00 |
| | MML 432/50 | - 70cm 50 watt linear/preamp, 10w input | 129.95 |
| | MML 432/100 | - 70cm 100 watt linear, 10w input | 299.00 |
| **TRANSVERTERS** | MMT 144/28 | 2m Linear transverter, 10m input, 10w output | 129.95 |
| | MMT144/28-R | - 2m linear transverter, 10m input, 25w output | 215.00 |
| | MMT 1296/144 | - 23cm linear transverter, 2m input, 2w output | 235.00 |
| **RECEIVE CONVERTERS** | MMC50/28-S | - 6m to 10m down converter | 34.90 |
| | MMC144/28 | - 2m to 10m down converter | 32.90 |
| | MMC144/28HP | - 2m to 10m high performance down converter | 47.90 |
| | MMC432/28-S | - 70cm to 10m down converter | 39.90 |
| | MMC432/144-S | - 70cm to 2m down converter | 39.90 |
| | MMK1296/144 | - 23cm to 2m down converter, GaAsFET preamp | 129.95 |
| | MMK1691/137-5 | - 1691 MHz Metostat converter | 145.00 |
| **RECEIVE PREAMPS** | MMG144V | - 2m RF switched GaAsFET preamp. 100w capacity | 37.90 |
| | MMG1296 | - 23cm GaAsFET low noise preamp | 75.00 |
| | MMG1691 | - 1691 MHz Meteosat GaAsFET preamp | 113.00 |
| **MICROPROCESSOR CONTROLLED PRODUCTS** | MM2001 | - RTTY to TV converter | 189.00 |
| | MM4001KB | - RTTY transceiver with keyboard | 299.00 |
| | MMS1 | - THE MORSETALKER - Speaking Morse Tutor | 115.00 |
| | MMS2 | - Advanced Morse Trainer | 169.00 |
| **FREQUENCY COUNTER** | MMD050/500 | - 500 MHz digital frequency meter | 89.00 |
| | MMD1500P | - 1500 MHz+ 10 prescaler | 95.75 |
| **AMATEUR TELEVISION** | MMC435/600 | - 70cm ATV converter, UHF Output | 29.90 |
| | MTV435 | - 70cm ATV 20 watt transmitter | 179.95 |

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| RECEIVE PREAMP RF switched, variable gain 0-20dB RP2S & masthead version, RP2M | PCB | £10.25 | £14.25 |
| | BOXED | £18.75 | £24.75 |
| RECEIVE CONVERTER, 10 metre IF, 26dB gain, low noise with OSC out, RC2-10 | PCB | £16.00 | £22.00 |
| | BOXED | £22.75 | £31.00 |
| TRANSMIT CONVERTER, matches RC2-10, 0.5W out. TC2-10 | PCB | £15.50 | £24.50 |
| TRANSCEIVE CONVERTER, 10 metre IF, 26dB RX gain 0.5W out, 10mW to 0.5W in TRC2-10 | PCB | £39.00 | £54.00 |
| | BOXED | £53.00 | £83.00 |
| TRANSMIT AMPLIFIER, matches TC2-10 & TRC2-10 0.5W in, 20W min. out, TA2U-2 | PCB | £38.75 | £45.25 |
| | BOXED | £42.00 | £51.00 |
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| | BOXED | £39.00 | £48.00 |
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| RECEIVE CONVERTER, 2 metre IF, 26dB gain low noise, with osc out RC4-2 | PCB | £16.00 | £22.00 |
| | BOXED | £22.25 | £31.00 |
| **6 METRE EQUIPMENT** | | | |
| As 2 metre, substitute 6 in place of 2 in type numbers of 2 metre equipment, also | | | |
| RECEIVE CONVERTER, 2 metre IF, 26dB gain low noise, with osc out RC6-2 | PCB | £16.00 | £22.00 |
| | BOXED | £22.25 | £31.00 |
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| RECEIVE PREAMP, unswitched, 14dB gain RP10 | PCB | £5.50 | £7.00 |
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| RECEIVE CONVERTER, 2 metre IF, 26dB gain low noise, with osc out RC10-2 | PCB | £16.00 | £22.00 |
| | BOXED | £22.25 | £31.00 |
| SYNTHESIZER CONVERSION, add 10KHz steps up to PLL02A or MC145106 rigs, SC02A or SC106 | PCB | £10.50 | £11.00 |
| SYNTHESIZER CONVERSION, 10FM from UK FM rigs, suits LC7136/7 & TC9119P synth rigs SC29 | PCB | | £15.00 |
| | FITTED | | £28.00 |
| **MISCELLANEOUS EQUIPMENT** | | | |
| RECEIVE CONVERTER, 20 metre in, 2 metre IF low noise, with osc out RC20-2 | PCB | £16.00 | £22.00 |
| | BOXED | £22.95 | £31.00 |
| SPEECH PROCESSOR, level & frequency limiting SP1000 | PCB | £11.75 | £16.75 |
| SPECTRA FILTER, 10.7MHz filter & matching SF10.7 | PCB | £6.50 | £7.50 |
| FM BOARD, 455KHZ for AM transceivers FM455 | PCB | £6.50 | £9.50 |

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Clean up the bands, increase your P.A. life by many times, by tuning up without transmitting.

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Feature either POWER AMP alone or PRE-AMP alone or both POWER AND PRE-AMP or STRAIGHT THROU when OFF. Plus a gain control on the PRE-AMP from 0 to 20dB. N.F. around 1dB with a neutralised strip line BF981. Top performance on transmit and receive.

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**3/36.** 12 times power gain, e.g. 3W in, 36W out. **£70**
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**VISA 80M.** SSB/CW receiver **£60**. Ex. stock.

**SENTINEL AUTO 2 METRE or 4 METRE PRE-AMPLIFIER** (R.F. Switched)
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The most versatile filter available. Gives "passband" tuning, "variable selectivity" and one or two notches. Switched Hi-pass, Lo-pass, peak or notch. Selectivity from 2.5KHz to **20Hz.** Tunable from 2.5KHz to 250Hz. PLUS another notch available in any of the four switch positions which covers 10KHz to 100Hz. 12V supply. Sizes: 6" × 2½" front panel, 3½" deep, all for only **£65 Ex stock.**

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## AUDIO FILTERS MODELS FL2, FL3, FL2/A

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| WR168 | PW Seven | £2.80 | July 1983 |
| WR172A | PW Prescaler | £2.90 | July 1983 |
| WR171 | PW Prescaler | £1.65 | July 1983 |
| WR174 | PW Capacitance meter | £3.60 | Oct 1983 |
| WR173 | PW Digital calibrator | £3.40 | Oct 1983 |
| WR176/177/178 | PW Dart | £3.65 | (each) |
| WR182 | Bridport | £2.65 | |
| WR179 | Transceiver Box Unit | £3.90 | |
| WR175 | PW IF Signal Generator | £4.90 | |
| WR183 | Top Direction Receiver | £3.90 | May 1984 |
| WR184 | Top Band Receiver | £4.20 | May 1984 |
| WR185 | Auto Notch Filter | £3.50 | June 1984 |
| WR187 | Morse Sending Trainer | £2.40 | |
| WR188 | Microphone Pre-amp | £2.40 | |
| WR189 | Bug Key with memory | £4.35 | |
| WR190 | Modifying FRG7 | £3.15 | |
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| WR195/A/B | Stable Tone Burst | £3.40 | |
| WR196 | PW Teme | £4.90 | |
| WR197 | PW Colne | £3.60 | June 1985 |
| WR198 | PW Colne | £5.20 | May 1985 |
| A005 | PW Colne | £2.90 | April 1985 |
| A006 | PW Colne | £3.00 | April 1985 |
| WAD302 | Battery Charger Controller | £2.60 | June 1985 |
| WR199A | | £8.20 | |
| WA002 | | £4.80 | |
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**5-10-12½Kc steps**

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50-650MHz up to 950MHz
Gain 17dB Typical

**TECHNICAL SPECIFICATIONS FOR ARA 500**

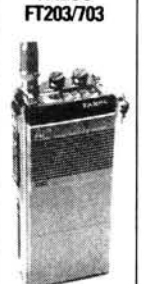
| | |
|---|---|
| Gain | 17dB Typical (14-17dB) |
| Frequency Range | 50-650MHz** |
| Noise Figure | 1dB at 50-180MHz<br>1.5dB below 300MHz<br>2.0dB below 350MHz<br>2.7dB below 400MHz<br>3.0dB below 500MHz<br>3.8dB below 650MHz |

Operation is possible up to 950MHz with gain of 10dB
Noise 4-6dB
Intercept Point 3rd Order: +18dbm at Input

## TRIO KENWOOD TH-21/TH-41

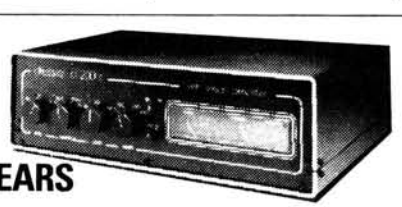
## YAESU FT209/709

## YAESU FT203/703



## ICOM IC2E/IC02E

## ICOM IC4E/IC04E



## LINEARS

| | | |
|---|---|---|
| D200 | 2 MTR 500W SSB | **£699** |
| D200S | 2 MTR 750W SSB | **£799** |
| D70 | 70 CMS 550W SSB | **£799** |

## PRE-AMPS – NEW MODELS

| MODEL | FREQ. | NOISE | GAIN | POWER | PRICE |
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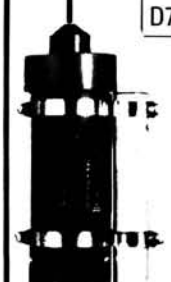
| EVV1296S | 1.25-1.3GHz | 0.7-0.9 | 16-19dB | 100W | **£139** |
| EVV1296C | 1.25-1.3GHz | 0.9-1.2 | 16-18dB | 100W | **£119** |
| EVV1296 | 1.25-1.3GHz | 1.9-2.1 | 14-17dB | 100W | **£100** |
| EVV700 | 430-440MHz | 0.5-0.9 | 15-18dB | 500W PEP | **£90** |
| EVV2000FB | 144-146 | 0.6-0.9 | 16-18dB | 1000KW PEP | **£90** |
| EVV200FB | 144-146 | 0.6-0.9 | 16-18dB | 700W PEP | **£80** |
| EVV2000GAAS | 144-146 | 0.6-0.8 | 16-18dB | 1KW PEP | **£90** |
| EVV200GAAS | 144-146 | 0.6-1 | 16-18dB | 700W PEP | **£80** |
| EV2GAAS | 144-146 | 0.6-0.9 | 15-18dB | 100W PEP | **£60** |

VV INTERFACE FOR ABOVE PRE-AMPS **£20**



**dressler – ara 30 – active antenna**

## 200 kHz . . . 40 MHz

Professional electronic circuitry with very wide dynamic range. Meets professional demands both in electronics and mechanical ruggedness. 120 cm long glass fibre rod. Circuit is built into waterproof 2,5 mm thick aluminium tube. Ideal for commercial and swl-receiving systems. £90 + £4 p&p. See Review in August Issue p.15

## RECEIVE PRE-AMPS

| MODEL | FREQUENCY | NOISE | GAIN | PRICE |
|---|---|---|---|---|
| EWPA 560 | 50-600-1GHz | | 16.5dB-1dB | **£60** |
| IP3 order | +18dBM | | | |
| ERPA 1296 | 1.25-1.30 | 0.8 | 17-18dB | **£70** |
| ERPA 435 | 430-440 | 0.5 | 15-18dB | **£60** |
| ERPA 144 | 144-146 | 0.7 | 16-18dB | **£60** |

**MUTEK SPECIALISTS**

# WRITE ON . . . *the page where you have your say*


## Practical?

**Sir:** As one of the dwindling number of readers who have taken *PW* right from No. 1, I view with some concern the growing tendency to turn away from the "practical" aspect of our hobby in favour of "blackboxology"; the only practical requirement of this being to have the necessary cash to buy the latest all-singing, all-dancing model.

With the arrival of the November issue insult was added to injury when you have thought fit to postpone the article on "Use of FET DIP Meter" in favour of a five-and-a-bit page glorified advert concerning the Trio TS–940S talking box, the only real point of interest to me being the price, £1695, basic model, gets worse doesn't it?

Now, I venture to suggest that in the present climate of increasing unemployment and rising cost of essentials, not many readers will be in the position to rush out and buy it.

As the holder of an Amateur Licence I constantly hear fellow hams complaining, "got to count the pennies"; in other words we're all getting hard-up and just cannot afford to go in for these super-duper transceivers.

In any case if one really wanted to know all about the latest offering I am sure the dealers would not be slow in providing the glossy brochure, so why waste space which would be better used "practically"?

Finally should you consider (I doubt it!) this letter for publication, I will start with the £10 prize saving up for a second-hand TS–940S blackbox, I may be lucky at a Bring-and-Buy in 25 years time!

***L. Silvester GW6GLL***
***Narbeth***

## EMP

**Sir:** Who is Michael A. Lacey? In his letter in *PW* Nov. 85 he expresses opinions and beliefs which are anathema to the world of amateur radio. His opinionated views can be summed up in one word, POLITICS. A word which if accepted in our hobby would render it unworkable. He puts forward the "Greenham Common philosophy" that there is no point in any form of preparation for a nuclear holocaust, simply because no-one would survive such an exchange. That may well be true. It is, however, no reason for not hedging our bets and preparing for the very real probability that many of us would in fact survive. Any other attitude is fatalism.

I have made many contacts in the Eastern Bloc countries and they are nice people, just as human as us, but if you were to suggest to them that they should dismantle their national defence systems in the hope that everyone else would respond in a like manner, they would simply consider it part of the inimitable British sense of humour.

However, we would never discuss such a thing on the air in the first place. It would not be in the true spirit of amateur radio to do so, not to mention our respective licensing conditions.

Mr Lacey should perhaps write to his MP to express his views, but amateurs in general and RAYNET in particular should treat his over-excited letter in its true context and that is that his opinions are simply not relevant to us or our hobby.

I would like to have expressed my own point of view in much stronger words but how can you argue with people so blinkered?

***Derek J. Wrathall G4XQU***
***Bradford***

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**Sir:** I enjoyed the article *Communications and Nuclear Explosions* by M. J. Darby (*Practical Wireless*, August 1985).

Amateur radio operators can prepare for a EMP event by building a transceiver

# PW COMMENT

FIRST OF ALL, SINCERE APOLOGIES to all those readers who were disappointed to find out that the article on using the FET–DIP Oscillator was not, as promised, in our November issue. As announced at the foot of the Contents list that month, this was due to pressure on editorial space, but perhaps a little explanation of that may help.

When planning what articles are going to make up a future issue of *PW*, I have to make assumptions on how many pages of advertisements will be booked, how much in the way of news items will have to be included in that issue if they are not to become out of date, how long the topical articles will be, etc. Even when I have to put my neck on the block and state in an issue, what's coming next month, some of these variables are still to be decided.

Usually, things turn out alright, and none of the continuing series, regular features or promised articles has to be left out. Occasionally though, as with component tolerances in electronic circuit design, all the variables combine in the wrong way, making it impossible to get everything that I promised into the number of editorial pages available in a particular issue. Then I have to make the decision on what must be left out, based not only on the effect on readers, authors, and other interested parties in that month, but also on the "knock-on" effect on plans for future issues.

On the question of whether we are right to give space to reviews of expensive radio equipment, there are several points to be made. Our recent readership survey showed that our equipment reviews rate almost as highly as constructional articles in popularity. To confine reviews to "inexpensive" equipment would be very limiting. Taking a parallel from the motor industry, magazines and newspapers will review "executive" or "luxury" models as well as family saloons. Even when money is tight, people still like to read about goodies they may not be able to afford, just to dream a little. Anyway, it's not as if the more exotic rigs were never bought—one has only to look at NFD results in *RadCom* to realise that.

Incidentally, the sort of information that was included in the TS–940S review will not appear in a manufacturer's glossy brochure. It's the outcome of separate independent evaluations in the lab and on the air.

Finally, it's good to see the current revival of interest in home construction, despite the frustrations so often experienced in getting hold of the necessary components on the retail market. I am always pleased to receive articles on small, useful projects for radio hobbyists, but they must be properly proved and fully described and documented, **and** use components that are generally available.

If you think you might have a design that would interest other enthusiasts, I'll be glad to hear about it and to send you a copy of our guidance notes for authors.

★★★★★★★★★★★★

One of the most frequent complaints which we get from our readers is how difficult it is to find components to build projects nowadays. Stockists such as Cirkit, CPL, Electrovalue and Maplin who advertise in our pages, offer a mail-order service on a wide range of components, but it is convenient to be able to get at least some items locally.

Although the days have passed when there was a radio shop dealing in components in every town, and often one in each suburb of a city or large town, we know there are such shops still tucked away in side-streets in many parts of the UK. Most of them are not geared up to handle mail order, and therefore do not usually advertise in magazines such as ours.

Local inhabitants will probably know about them, but it would be helpful to others if these shops were publicised. If you know of any in your town, please let me know their names, addresses and telephone numbers, so that we can invite them to join in our new small-box advertisement feature (see the back of this issue). Thank you, on behalf of all frustrated component-seekers.

**Geoff Arnold**

with the following specifications:

A. High frequency (h.f.) low-power operation
B. CW capability
C. Vacuum-tube technology for all stages
D. Shielding (as close to "tempest" quality as possible)
E. Built-in nanosecond transient-protective devices
F. Over-rated circuit components (to accommodate excess current and voltage)
G. Heavy point-to-point wiring instead of a circuit board
H. Circuit layout that can be serviced with a fire-heated soldering iron
I. Integration of carbon block r.f. absorbers into the shielding
J. Battery power station
K. Rapidly deployable antenna system (this would be stored in a shielded container when not in use)
L. Shielded fire-resistant container for storing the transceiver
M. Shielded stock of spare parts

I originally published these specifications in a letter to QEX the ARRL experimenters' exchange (September 1985). This letter was then reprinted in the ARRL Field Forum (October 1985).

Amateur radio operators should also consider the possibility of a pure-case EMP attack where a nation's economy would be ruined without the firestorms, fallout, and low altitude explosions of "conventional" nuclear war. An EMP war may be more likely to occur than would a regular nuclear war.

***Nickolaus Leggett N3NL***
***Washington DC, USA***

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Send your letters to our Editorial Office in Poole, the address is on our contents page. We will pay £10 for the Star Letter each month, £5 for any others published. letters must be original and not duplicated to other magazines. The Editor reserves the right to shorten or modify any letter. We regret that we cannot answer letters by post unless accompanied by an s.a.e. Brief letters may be filed via our Prestel Mailbox number 202671191. The views expressed in letters are not necessarily those of Practical Wireless.

**Sir:** Heaven forbid that the fascinating and peaceful pages of *PW* should become a forum for political argument. Nonetheless, I cannot let Michael Lacey's letter in your November issue pass without comment.

Anger gets one nowhere Mr. Lacey and neither does complacency. As one who survived WW2 (it was a nuclear war) I am very fortunate. I believe that radio amateurs did and can play a vital role in both peace and war and I am sure the authorities recognise this. After the war I had the responsibility of setting up communication centres for regional seats of government and although all involved were servicemen, many were also radio amateurs and it was their specialised knowledge which contributed significantly to the technical efficiency of the system.

What stops war Mr. Lacey are not those who are angry and incensed. It is fear. Fear of the inevitable consequences. Maybe one day it will be this fear which will develop within us all a commitment to peace. But we are not there yet. In the meantime we must be prepared. If we as a nation become involved again I would like to think that the members of RAYNET who unselfishly devote a considerable part of their spare time to the service will be there to help co-ordinate the rescue services in an attempt to save lives, whatever the future holds for them. Their activities have nothing to do with politics or the rights and wrongs of nuclear armament.

***V. J. Copley-May G3AAG***
***Petersfield, Hants***

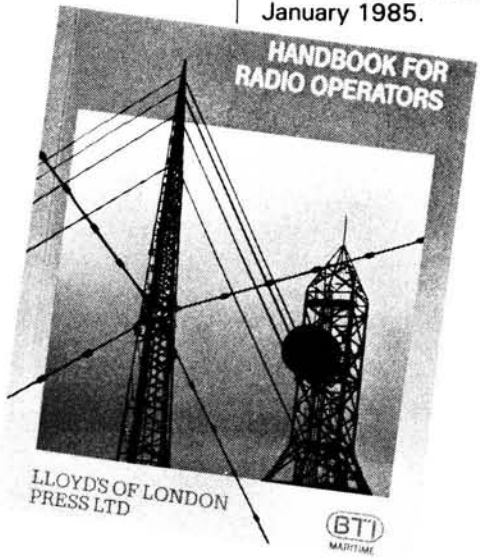
*This correspondence is now closed—Ed.*

# BOOKSHELF *. . . available from book stockists*

**HANDBOOK FOR RADIO OPERATORS**
**Published by Lloyd's of London Press Ltd. for British Telecom International**
**283 pages, 210 x 148mm (paperback).**
**Price £9.95.** **ISBN 1 85044 050 6**

This latest version of a publication known to generations of seagoing radio officers as the "PMG Handbook", forms a practical working handbook for those who use radio at sea, and replaces the 1975 HMSO edition, now out of print.

There is a totally new section dealing with maritime satellite communications services, and the remainder of the book has been revised and updated to take account of the ITU Radio Regulations which became effective in January 1985.

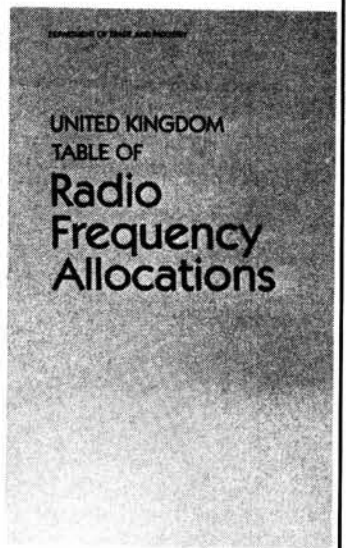



**UNITED KINGDOM TABLE OF RADIO FREQUENCY ALLOCATIONS**
**Published by HMSO for the Department of Trade and Industry**
**308 pages, 209 x 146mm (paperback).**
**Price £12.00** **ISBN 0 11 513819 6**

One of the recommendations of the Merriman Report was that the UK Frequency Allocation Table, which until now has been a classified document, should be published. This book is the result of that recommendation.

It is divided into four chapters. The first two reproduce related terms and definitions from the international Radio Regulations, and explain the footnote reference system. The third chapter contains the international table of frequency allocations, with the UK national table printed on the facing pages.

Finally, chapter four contains more detailed information on the internal arrangement of certain bands and sub-bands for some of the more widely used radio services. These include the Amateur and Amateur-satellite services, Land mobile services, Private fixed services, Low-power systems and the UK Radio astronomy observatories.



## GW Repeaters

In order to provide improved 144MHz repeater coverage in the urban areas of South Wales around Swansea, Llanelli, Neath and Port Talbot, the Swansea Repeater Group are currently constructing GB3SA. Tests made from the proposed site at Clase, Swansea, have given excellent results and it is hoped to be operational by the summer of 1986.

The group do not intend to ask for yearly subscriptions but donations towards the construction and on-going maintenance will be very welcome. As with all UK repeaters their existence depends on an enormous amount of totally voluntary work. The very least that we as users of such facilities can do is to make a financial gesture of appreciation. Nobody can "listen through" a QRT "box".

Offers of help, donations and requests for further details should be sent to: ***The Swansea Repeater Group, c/o Peter Alexander, GW4RXO, 80 Yr Aran, Dunvant, Swansea SA2 7PX.***

For the u.h.f. minded GW stations GB3SG should be QRV by the time you read this. Operating on RB15 this South Glamorgan based repeater will cover Cardiff, Newport and surrounding areas. The group hope to construct and commission the 1·3GHz repeater GB3VG during 1986. Membership enquiries and donations to the South East Wales Repeater Group should be addressed to: ***Steve Williams GW6CUR, 301 Newport Road, Roath, Cardiff CF2 1BS.***

## More Meon

It seems clear from the feedback received direct on the air, over the counter at our rally exhibition stands and from your letters that the *PW* Meon transverter has proved popular.

Versions for 50, 70 and 144MHz are now in use and the demand for some of the more specialised components had created temporary supply problems. Electrovalue were reported to be receiving telephone orders for the Siemens SO42P mixer every 10 minutes—fortunately they do have a large stockholding capability.

Due to popular demand the authors have produced a modified version of the Meon which will allow use of a 144MHz i.f. This should be very useful for Class B licence holders and will also leave the h.f. transceiver available for crossband operation. Look out for this article which is coming soon, together with p.a. design options.

Meanwhile a complete kit of parts including the specified case, is available at £51 inc. P&P from ***C.P.L. Electronics, 8 Southdean Close, Hemlington, Middlesbrough, Cleveland TS8 9HE or Tel: 0642 591157.*** A comprehensive stock of components and tools is also maintained—CPL will undertake to supply non-stock or difficult to obtain items for *PW* projects. An s.a.e. will bring you the details.

## Repeater News

Chris Young, G4CCC, the Publicity Officer of the Repeater Management Group has supplied the following information. The second batch of 430MHz band u.h.f. repeater submissions to the DTI for 1985 included: GB3HL, West London (RB3); GB3BV, Hemel Hempstead (RB1); GB3GH, Gloucester (RB5); GB3DD, Dundee (RB10); GB3WJ, Scunthorpe (RB5); GB3RE, Chatham (RB11); GB3GM West Glasgow (RB12-RTTY/DATA). Franchises for repeaters on RB1, 3 and 5 will not be released until the completion of mutual non-interference/co-existence negotiations with the Scandinavian groups operating on the reverse of these channels.

A batch of 1·3GHz band (24cm) ATV repeater licence applications will be submitted for the following: GB3HV, High Wycombe (RMT3); GB3PV Cambridge (RMT2); GB3SX, Hastings (RMT1-using a.m.); GB3GT Glasgow (RMT2); GB3AF, Durham (RMT2).

The Potteries ATV repeater GB3UD was scheduled to start up on 19 October on RMT2 (1249MHz input/1318·5MHz output), using f.m. The site is on Mow Cop at approximately 300m a.s.l. and reports will be gratefully received by G6UKP.

Financial constraints have caused the postponement of the RMG open meeting in S. Wales and the RMG technical conference. A proposed u.h.f. repeater coverage booklet has also had to be dropped due to heavy workload.

## TV and Radio Reception Guide

During October the DTI published the 28 page booklet *How to Improve Television and Radio Reception*, which is available free from main post offices. Its two principal parts cover advice for the householder and the TV and Radio dealer. A step-by-step procedure for verifying the installation is performing efficiently, together with an explanation of anomalous (tropospheric) interference is given, before detailing the potential sources and reasons for interference.

Amongst other radio services identified the guide clearly states that the mere existence of a local radio amateur station does not imply that his/her installation is at fault. Further details catalogue the items of equipment protected under the various Wireless Telegraphy Acts and indicate the preventative measures that can be undertaken by the householder.


The second part is for the benefit of the servicing trade and goes into some detail in respect of equipment electromagnetic compatibility (EMC). In fact the filtering and de-coupling arrangements will be of use to most radio enthusiasts.

A series of appendix notes provide frequency bandplans (almost correct—but when did the UK amateur enjoy bands at 425 and 450MHz?), filter analysis and commercial sources of same, together with a resume of Regulations/British Standards and address details of principal broadcasting services.

The concluding pages detail the procedure for requesting help from the RIS, including the appropriate form and where to send it.

## Licence Changes

Just in time for JOTA 85 the DTI announced a relaxation of the regulations governing messages passed via the amateur service by non-licensed persons.

In future amateur special event stations (normally GB series prefixes) in the UK will be permitted to carry third party traffic to and from

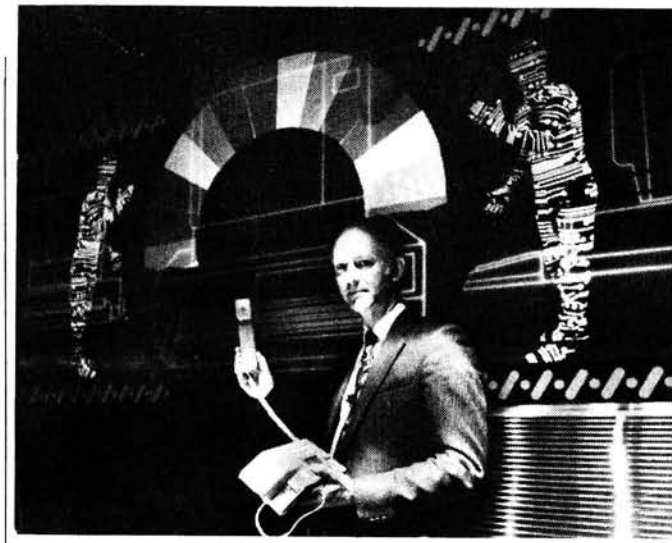
Canada, the USA and the Falklands in addition to inter-UK contacts. Messages of a technical or purely personal nature may be passed between non-licensed operators whilst the station is under the control of the licensed amateur permitted to operate it—initial contact having been previously established with a licensed amateur station at the far end of the link. Messages are limited to two minutes, with one contact per non-licensee allowed. No payment must change hands.

This relaxation of the rules is a concession to radio amateurs to promote goodwill towards the amateur service and demonstrate the effectiveness of amateur communication. Applications for special event callsigns should be made via the RSGB who act on behalf of the DTI. This facility is not limited to RSGB members.

## Possible US Band

Proposals made by the ARRL seeking expansion of the current 28MHz band section used by US Novice licence holders could, if adopted, create worldwide problems. The international beacon system mainly operates within the agreed sub-band 28·2–28·3MHz—the ARRL proposal is to allow multi-mode Novice operation down to 28·1MHz (the current US lower phone limit is 28·3MHz). The use of c.w., s.s.b. and RTTY within this sub-band will obviously affect the beacon system and it should be remembered that if the Novice allocation goes through US General and higher licence classes will automatically be allowed use of the same frequencies, with up to full legal power.

It is further understood that ARRL, in recognition of this fact, would initiate proposals to reorganise and move the beacon network . . .



## BT Faraday Lecture

British Telecom commenced the 1985/6 series of Faraday Lectures, on behalf of the Institution of Electrical Engineers, during October. Entitled "Beyond the Telephone: the Intelligent Network" the lecture will tour 16 towns and cities playing to an estimated audience of more than 70 000 people. The lecture explains to the layman how microchip technology is changing telecommunications. In the words of BT's Chief Executive of Technology and Senior Faraday Lecturer "As we move into the information age it is becoming increasingly important that people understand the technology that is changing our lives"—"Our presentation is planned to stimulate a lasting interest in electronics and telecommunications". Remaining venues include: Harrogate, Conference Centre—11 December; Portsmouth, Guildhall—22 January; Liverpool, Philharmonic Hall—30 January; London, Logan Hall—4/5/6 February; Birmingham, Town Hall—12 February; Belfast, Sir William Whitla Hall—26 February; Exeter, University Great Hall—5 March; Bristol, Colston Hall—12 March; Derby, Assembly Rooms—19 March.

## WAB Islands Award

From 1 January 1986 the Worked All Britain Awards organisation will be operating the Worked All Britain Islands Award. A certificate will be awarded for contacts with 25 qualifying islands with further endorsements for 40, 50, 60, 70, 80, 90 and 100 islands. This should be an enlightening exercise if nothing else!

An island for WAB purposes is defined as a naturally formed piece of land lying off-shore from the mainland of Great Britain and Northern Ireland and includes the Channel Islands, all of which are at some time surrounded by the sea. Man-made bridges/causeways do not negate this status but the island must be named on the 1:50 000 OS map. Where a group of islands is named on the map and the individuals are not, then only one of the group counts towards the award.

Claims for the award certificates (cost £2) and record sheets for the purpose can be obtained from: ***Brian Morris G4KSQ, 22 Burdell Avenue, Sandhills Estate, Headington, Oxford, OX8 8ED.*** Please include an s.a.e. (sufficient IRCs for non-UK).

## EUROCAST 86

The European World Trade and Convention Centre, Basel, Switzerland will be the venue for EUROCAST 86, the focal point for European Cable and Satellite TV exponents. Due to a date clash with the Swiss Industries Fair, EUROCAST 86 will now be open on 11–13 February providing a comprehensive exhibition and conference facility. Further details: ***Cable and Satellite Television Exhibitions Ltd., 3 Barratt Way, Tudor Road, Harrow, Middx. HA3 5QG. Tel: 01-861 4877.***

## New US Band

From 28 September 1985 the majority of the United States had access to a new amateur band. Technician and higher licence classes are allowed all-mode operation within the frequency range 902–928MHz (33cm), subject to non-interference to industrial, scientific and medical services. Stations within 240km of the White Sands Missile range in New Mexico are **limited** to 150W p.e.p. Initial use will probably centre on f.m. using equipment developed for the Japanese Personal Radio Service—currently understood to be struggling for existence in the land of the rising sun. On the same day US amateurs within 80km of the Canadian borders **lost** use of the 420–430MHz section of the u.h.f. band. Canadian land mobiles will use the vacated spectrum—a familiar story?

## HF NFD–EI Style

The South Dublin Radio Club are hopeful that their efforts during HF NFD will match the tenth place worldwide obtained in the CQWPX contest last March. Using the callsign EI7H/P during NFD and operating from the Dublin Mountains, the group clocked-up over 1000 contacts and some 114 possible multipliers. An 18m mast accommodated a TH-5 beam, 3·5MHz V dipole and slopers for 7 and 14MHz. FB one and all.

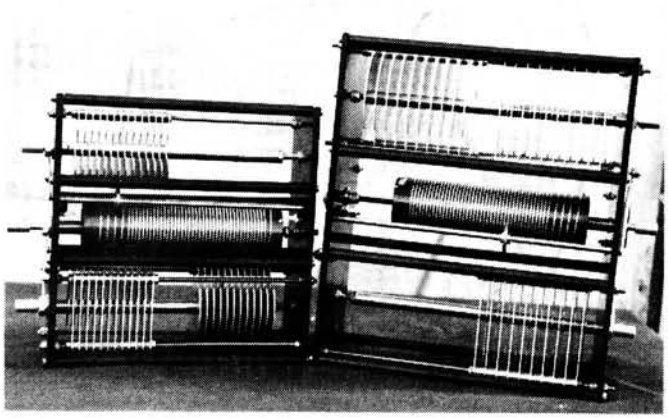
## Antenna Tuning Units

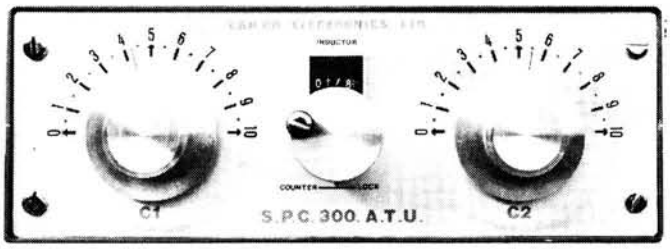
The latest developments in h.f. antenna tuning units have resulted in the SPC-300 and SPC-3000 modules from ATUs UK of Cap. Co. Electronics.

Both models are available in module form or installed in a cabinet and have had several improvements made to the original basic design which dates back some three years. These improvements are claimed to allow the units to tune the h.f. bands up to 28MHz over an impedance range of half an ohm to several thousand ohms.

The 300 is capable of running 1kW while the 3000 can handle 5kW. By altering links on the front and rear panels the unit can be altered into a Transmatch, PI, LC, T, C or L match.

Prices for the cabinet versions are £164 for the SPC-300C and £214 for the SPC-3000C, both incl. VAT. For further details contact ***ATUs UK of Cap. Co. Electronics Ltd., 63 Hallcroft, Birch Green, Skelmersdale, Lancs WN8 6QB. Tel: (0695) 27948.***






## Catalogue

We have just received the latest edition of Marco Trading's catalogue which lists a wide range of electronic components. Each month Marco will be offering customers a special low price on a selected item and there is also a special offer supplementary list and a 50p voucher. For your copy of the 1985–6 Marco Catalogue, send £1 to ***Marco Trading, The Maltings, High Street, Wem, Shropshire SY4 5EN.***


## DMM

A new hand-held digital multimeter has been introduced by Harris Electronics. The G44 is housed in a high-impact plastics case with integral tilt stand and safety sockets. Both range and function are selected by a single rotary switch and the display is a 0·5in l.c.d. unit.

Full overload protection is given by a low-capacitance spark gap for voltage, surge current limiter for resistance, fast switching high-current diodes plus fuse for current and the a.c. converter is voltage protected by a resistor diode network.

The basic ranges cover 1000V d.c., 750V a.c., 20A d.c. and a.c. and 20MΩ resistance.

The G44 costs £49 from ***Harris Electronics (London) Ltd., 138 Gray's Inn Road, London WC1X 8AX. Tel: 01-837 7937.***

## VHF Contest Logging Program

The computer is very useful for contest logging and scoring and GM4SZA has produced a disk-based package for v.h.f. contest operators. Written for the BBC-B, this program can deal with up to 1500 contacts during each contest. This is reduced to 1000 if the location is added to the stored information on each contact.

Duplicate checking is performed by machine code and takes typically 0·1 seconds for 1000 callsigns. If the program is used in real-time during the contest, a clock is always displayed on the screen. However, if the program is used after the contest to produce a neat log and calculate scores the time for each contact has to be entered manually. Locators can be either the old five-character European or the new six-character universal system or a mixture of both, with the program automatically sensing which is being used for each contact. Three different scoring systems are catered for—Radial Ring, *Practical Wireless* QRP and X points per km.

The program is supplied on a dual format 40/80 track disk formatted to Acorn standard with a set of comprehensive instructions. Available direct from ***GM4SZA, 7 Ashgrove Road West, Aberdeen AB2 5BB,*** the program costs £6.50, incl. p. & p.

## UHF Converter

Do you want to increase the frequency coverage of your scanner into the u.h.f. bands? If you do, then ARE Communications have a converter which will add 800MHz to the frequency range of any scanner. This means that if your scanner covers the range 25 to 550MHz then using the converter will enable it to cover 825MHz to 1·35GHz.

The converter requires a 12 to 14V d.c. supply at 80mA and is simply connected between the scanner's ANTENNA socket

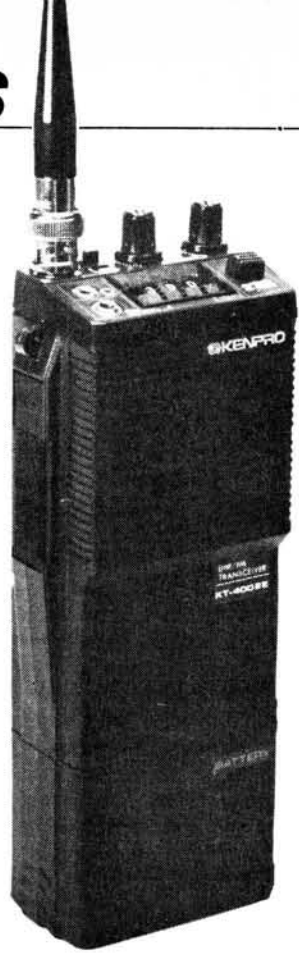
and a suitable antenna.

A double balanced mixer is used to reduce reception problems, although the use of the scanner's RF GAIN control should reduce any breakthough effects. Some reduction in performance may be evident above 1GHz, but it is claimed that good results have been obtained at frequencies as high as 1·47GHz.

The converter costs £89 from ***ARE Communications Ltd., 28 Bridge Street, Earlestown, Newton-le-Willows, Merseyside. Tel: (09252) 29881.***

## Handhelds

A new range of v.h.f. and u.h.f. f.m./handheld transceivers has been introduced into the UK under the Kenpro name by Hi-Tech Worldwide. The two models at present available cover the 144 and 430MHz bands and feature re-chargeable NiCad battery packs and a mains charger as an introductory offer. The 144MHz model, designated KT200EE is priced at £169 while the KY400EE for the




430MHz band costs £189 incl. VAT. Further technical details are available from ***Hi-Tech Worldwide Ltd., 584 Hagley Road West, Oldbury, Warley B68 0BS. Tel: (021-421) 6001.***

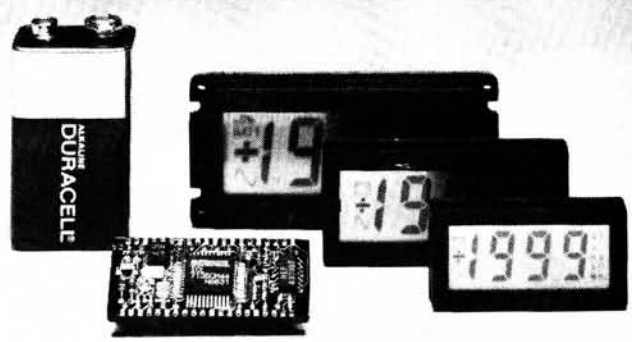
## Computer Control

G3LIV has entered the market for software written specifically for the new generation of receivers and transceivers. The first package is for the Yaesu 757GX transceiver and allows complete control of the rig from the computer keyboard. The computer chosen is the popular BBC-B, and it can be interfaced to the rig using either the Yaesu supplied interface unit or G3LIV's own design unit.

The keyboard controls the frequency of the A and B v.f.o.s in steps of 10Hz, 100Hz, 1kHz, 10kHz and 1MHz, as well as allowing direct keyboard frequency entry. A storage capacity of 300 frequencies has been allocated for allowing that number of stations to be checked in seconds.

The program is available on disc at £9.50 and ROM at £12.00, incl. p. & p., direct from ***G3LIV, 2 Salters Court, Gosforth, Newcastle, Tyne & Wear NE3 5BH. Tel: (091) 2843028.***

Other programs in the pipeline are for the FT-9600, FRG-8800, FT-980 and for some of the Trio range. Readers are asked for their interest so that the most popular can be catered for.




## The Smallest DPM

Lascar Electronics have just introduced a range of digital panel meters which they claim will be easy to use by both low or high volume users.

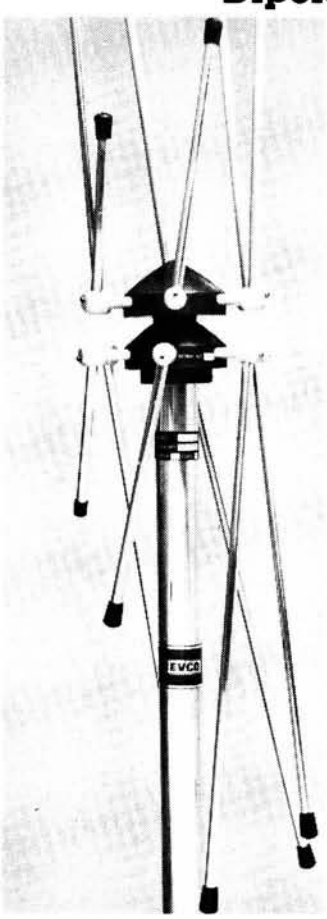
All the models in the range are designed and made in the UK and utilise the latest surface mounting techniques to greatly reduce the overall size.

Standard features include auto-zero, auto-polarity, 200mV f.s.d., programmable decimal point and "low battery" indication.

The l.c.d. incorporates a range of useful engineering symbols and three different character heights are available—10, 12·5 and 15mm and the version with the 10mm high digits is claimed to be the smallest off-the-shelf d.p.m. in the world. At a one-off price of £16.95 Lascar reckon that it is also probably the cheapest.

Further details from ***Lascar Electronics Ltd., Module House, Whiteparish, Salisbury, Wilts SP5 2SJ. Tel: (07948) 567.***

## Dipole Nest



The demands by scanner users for suitable antennas to cover the ever-increasing range of their sets has been met by a new British made wide-band v.h.f./u.h.f. antenna from Revco.

Produced after concentrated development, the new designs are based on a modified "nest of dipoles" concept. Of interest to the radio amateur is the fact that up to six specific bands may be specified as transmit frequencies, thus allowing the amateur to use the antenna on all the available amateur bands from 28MHz to 430MHz.

At present the frequency range of the antenna is 25 to 500MHz and the elements are arranged in a radial configuration, offering a compact antenna with low wind resistance. The antennas are distributed by ***Garex Electronics, 7 Norvic Road, Marsworth, Tring, Herts HP23 4LS. Tel: (0296) 668684,*** and are priced at around £30.

## Scanning Information

*Antennas for Scanners, Choosing a Shortwave Receiver,* and *What Kind of Antenna do I Need for Shortwave?* are free information sheets available from Grove Enterprises, PO Box 98A, Brasstown, NC 28902, USA, for an s.a.s.e. from USA readers or $1.50 equivalent IRCs for airmail to non-US readers. Also just released is their latest free catalogue of products for the serious listener. Grove also publish *Monitoring Times,* a monthly tabloid on all aspects of monitoring the radio spectrum.

# A Cautionary Tale

*My pen is poised and I shall write*
*A story that's not meant to fright—*
*—en you who read this sad story*
*Of one ill-fated licensee.*
*For niceness sake I will not mention*
*His callsign, name or his location*
*But to make the story run*
*We'll call him Mr. N. E. One.*

*Now Mr. One had always been*
*Keen on the amateur radio scene.*
*When playing cops and robbers he*
*Was the one who called "emergency!"*
*On a lump of wood he called his 'mike'*
*Mounted on his sister's trike.*
*He and some pals as they grew older*
*Made things that worked with wire and solder*
*And I've heard it said, 'though quietly,*
*They even took to . . . piracy . . .*
*Then work and YLs played their part*
*But the airwaves still retained his heart.*
*So, at the earliest opportunity*
*He took and passed the RAE.*
*He sold his camera, bike and stamps,*
*Even his antique railway lamps.*
*Then he borrowed some more from sister Sally*
*And rushed along to the nearest rally.*

*He bought himself a lovely rig*
*Complete with microphone and 'twig'.*
*(For those of you who are concerned*
*You'll like to know he quickly learned*
*The accepted terminology*
*Of the amateur fraternity!)*

*An age it seemed to him passed by*
*'Till his licence came from the DTI*
*"At last!" he cried, "I can transmit!—*
*—If I can decipher it!"*
*(Of course he managed eventually*
*To read his call sign) and then he*
*Jumped in his car, put her in gear*
*And took to the road with a full-throated cheer.*


by Derry Parker G1MBC

*Now most of you I am sure will have known*
*How he felt as he first used the microphone—*
*The nervous dry mouth, the intense concentration,*
*The strained shaky voice and the sense of elation*
*When from nowhere an answer comes back to your call*
*And you know you're an amateur, once and for all.*
*(How ironic the words that I've chosen appear,*
*For from now on my story gets grimmer I fear!!)*

*So, back to our 'hero' now 'feeling his feet'*
*With a helpful G4 on the local repeat—*
*—er. He found it quite awkward whilst driving along*
*And holding his fist mike to concentrate on*
*His gears or his speedo, his wipers or brake*
*But his QSO progressed without a mistake.*
*A few other contacts came in with congrats.*
*And he lit up a cigarette, much more relaxed.*

*He waved to a friend with the mike in his hand,*
*Reached for a packet of Polo-mints and*
*The last thing he said—or the last that was heard—*
*Was, "the price that he asked was quite franky absurd*
*So I'll go to a rally and pick one up there . . ."*
*Then it all went quite quiet—at least, on the air!*

*He avoided the oncoming coach and the tractor*
*But immovable trees were a different matter.*

*He lay there half in and half out of the wreck*
*With the lead from his microphone wrapped round his neck.*
*"You've dropped out of the box." Said a voice from afar.*
*But then, with a thud, he dropped out of the car!*

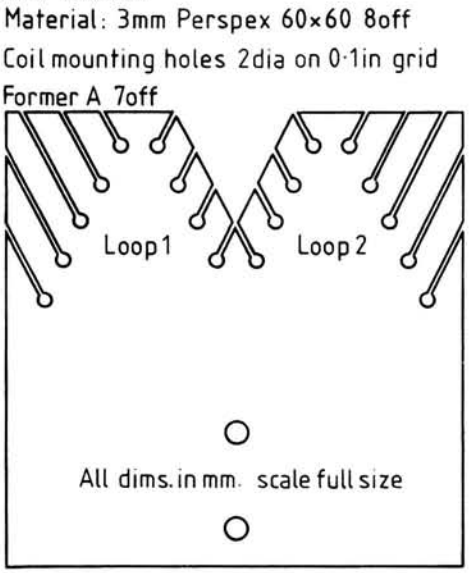
*He's still lying prone in his hospital bed,*
*With plaster and bandages wrapped round his head*
*And 'though he can't talk yet he thinks quite a lot*
*Of what he will do and of what he will not.*
*'If only's' and 'What if's' spin round in his brain—*
*But with luck he may take to the air once again—*
*And of course if he does I'm quite sure he won't fail*
*To tell new licensees of his caution'ry tale.* ***PW***

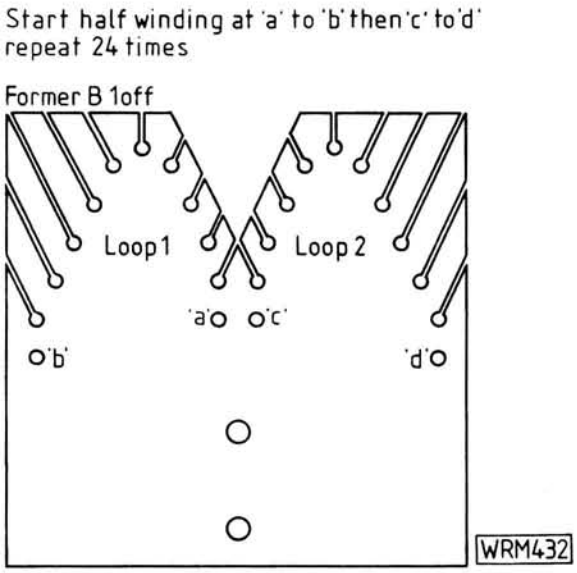
# ERRORS & UPDATES

## The W-Q MW Loop Antenna, November 1985

We are sorry that, in trying to simplify the drawings for this project, the details given in Fig. 1 did not make sense. The Perspex plates are of two types, drilled and slotted as shown here.

Also in Fig. 6, C10 and C11 should have been connected across the right-hand half of bridge D1 as C8 and C9 are connected across the left-hand side. Capacitors C7 and C12 should be 1000µF in Fig. 6 and the components list. The output of Fig. 6 is 18V 125mA.



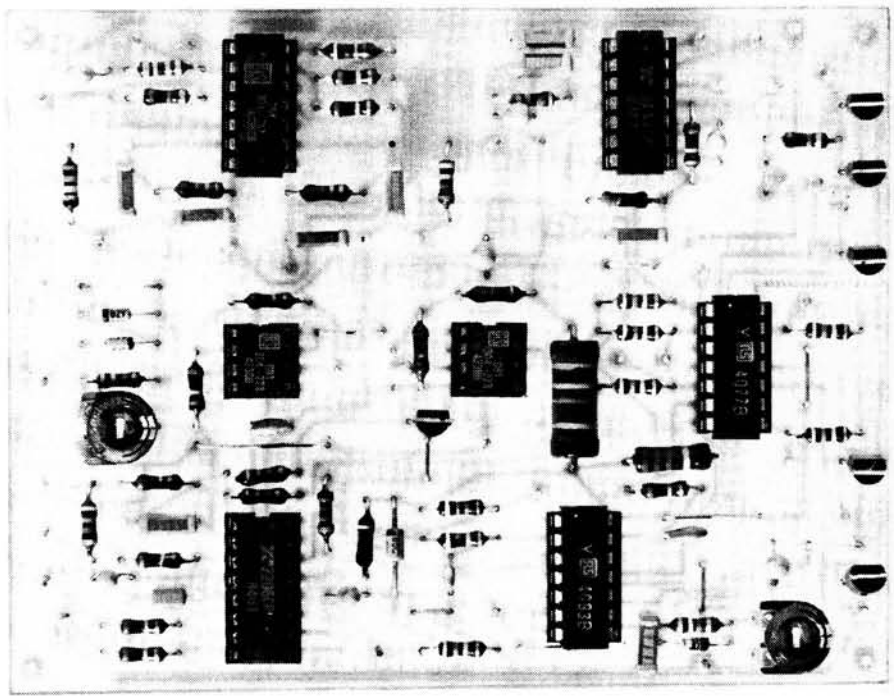




## PW Meon, October 1985

Trimmer padder capacitors C31/39 shown dotted on the circuit diagram are only required on the 50MHz version. Increased i.f. output and improved stability of the post-mixer stage, if found to be necessary, can be obtained by adding a 1nF ceramic capacitor across the source resistor R43. Inductor L7 is tapped at one turn from the "cold" end. The Cirkit OM1 relay (Stock No. 46-70060) is a direct replacement for RLA.

# RTTY/Morse modem

How Much? & How Difficult? £30 Advanced



*Radio amateurs with computers will find this modem, designed by N. Allen-Rowlandson G4JET, a very useful piece of equipment. It can handle Morse and RTTY transmissions as well as computer data.*

Although several designs for modems have been published for the amateur builder, none has so far offered the flexibility to cope with the wide variety of data transmission formats. This modem has been designed to cope with a wide range of data rates and tones by the use of plug-in modules, each one set up for a particular mode of operation. As a spin off from using the Exar i.c.s, it is possible to obtain clean Morse data from the relatively noisy signals expected on the h.f. bands.

The inputs and outputs are provided to interface with any home computer so that operation of the transceiver can be done from the keyboard. The prototype has been used by several amateurs with Commodore 64 and VIC 20 computers mainly because of the availability of the RS232 facility on the user port. If your computer does not have RS232 or similar, then you will have to write your own.

Program listings for the Commodore 64 and VIC 20 have been included, in which the information on connecting to the user port is given. The listing for the RTTY program is available from the *PW* Editorial Offices on receipt of a large s.a.e.

## Description

First, a quick look at the i.c.s used. The Exar XR2211 and XR2206 have been designed specifically for this type of application and have proved to give superior performance to any of the alternative methods tried by the author, albeit some of them were crude!

The XR2211 consists of the usual phase-locked loop with two separate signal conditioning sections, one for data and the other for carrier detection. The component values for various data rates and tones can be calculated from the design rules (taken from the manufacturers application notes*), but with some compromises, the values given in this design seem to cover the majority of formats used on the air.

The XR2206 generates low-distortion sinewaves whose frequency is dependent on the values of R12, 16 and the logic level on pin 9. The two potentiometers are completely independent which makes the frequencies very easy to set up. The i.c. is also capable of driving a line isolation transformer without buffering.

The output amplitude is determined by the value of R10 and is given to obtain the correct level of output to suit a standard audio line. For the transceiver microphone input, an attenuator is required. In practice, most transceivers have good audio signal handling (a.g.c. and filtering) and will tolerate gross input overload but it is worth experimenting with the value of R6 to get the best results.

The modem circuit (Fig. 1) itself is very straightforward. Tones are applied to the buffer amplifier and then to the active filters whose values are calculated to give a $Q$ of 10 around 1·5kHz, the outputs of the filters are summed before being applied to the XR2211.

Two outputs are taken from the XR2211. The first is the decoded data which is taken through an exclusive NOR gate to allow data inversion by operating switch. The data is sent to the computer by an open collector transistor. If you prefer, the base resistor and capacitor can be replaced by a link and the output transistor can be a v.m.o.s. device like the VN10LM.

The second output, carrier detect, goes through another filter before going to the computer. This output is primarily for Morse decoding but if Link 1 is made then data is inhibited if a tone is not detected. Remember that if you wish to look at the data at the output without being connected to a load, add a pull-up resistor of about 10kΩ from the collector to +5V.

Data from the computer is first filtered, then fed to the exclusive NOR gates and then either operates driver transistors or modulates the tone generated by the XR2206. Transistor Tr3 is used to turn the transmitter on via the p.t.t. line and Tr1 is used to operate the key input. On the prototype, the p.t.t. and key lines were driven directly using v.m.o.s. switches, but if interfacing is required then reed relays could be used.

**The data from the application notes has been used in the program listing "XR2211 DESIGN PROGRAM" written again for the Commodore, but should be easily transferred to any other machine.*

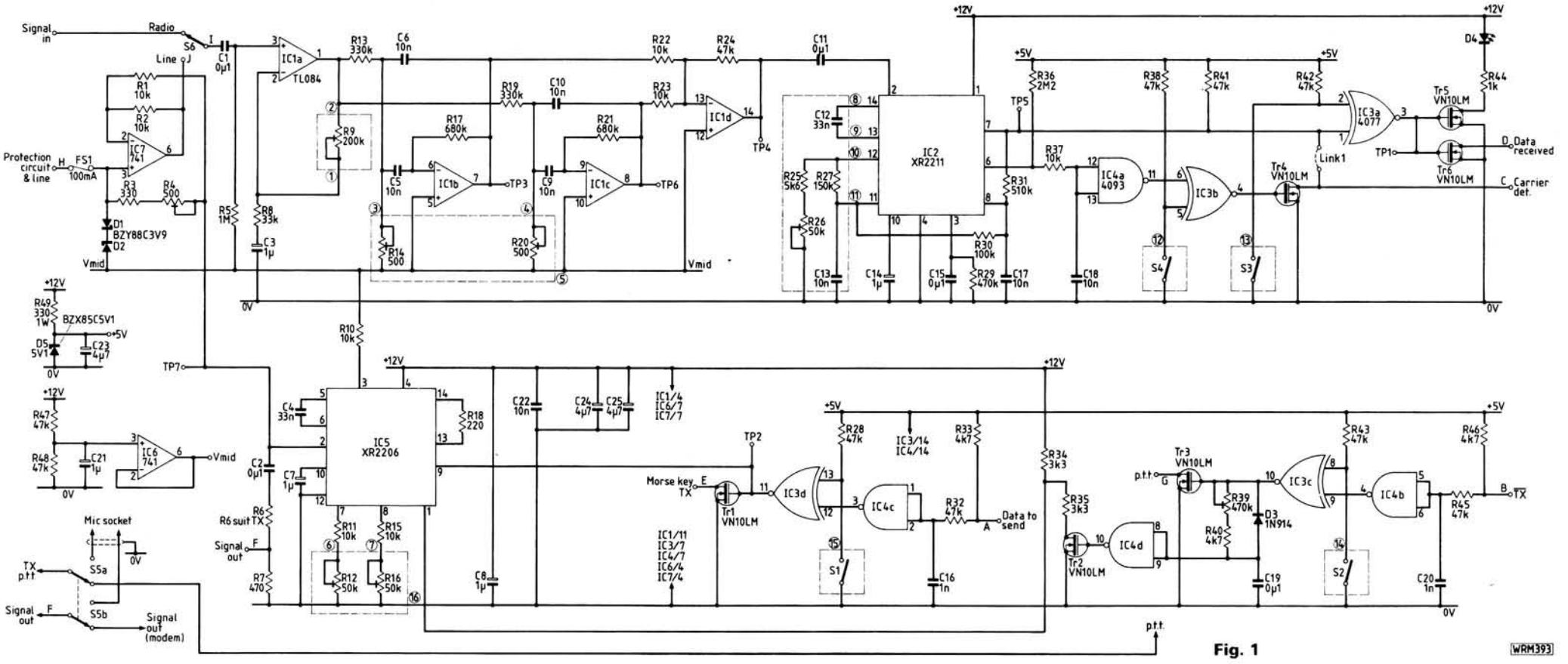



**Fig. 1** WRM393

# ★ COMPONENTS

## Resistors

*¼W 5% Carbon Film*

| | | |
|---|---|---|
| 220Ω | 1 | R18 |
| 330Ω | 1 | R3 |
| 470Ω | 1 | R7 |
| 1kΩ | 1 | R44 |
| 3·3kΩ | 2 | R34,35 |
| 4·7kΩ | 3 | R33,40,46 |
| 5·6kΩ | 1 | R25* |
| 10kΩ | 9 | R1,2,6,10,11,15, 22,23,37 |
| 33kΩ | 1 | R8 |
| 47kΩ | 10 | R24,28,32,38,41, 42,43,45,47,48 |
| 100kΩ | 1 | R30 |
| 150kΩ | 1 | R27* |
| 330kΩ | 2 | R13,19 |
| 470kΩ | 1 | R29 |
| 510kΩ | 1 | R31 |
| 680kΩ | 2 | R17,21 |
| 1MΩ | 1 | R5 |
| 2·2MΩ | 1 | R36 |

*1W 5% Carbon Film*

| | | |
|---|---|---|
| 330Ω | 1 | R49 |

## Potentiometers

*Min. Horizontal Presets*

| | | |
|---|---|---|
| 500Ω | 1 | R4 |
| 470kΩ | 1 | R39 |
| 500Ω | 2 | R14*,20* |
| 50kΩ | 3 | R12*,16*,26* |
| 200kΩ | 1 | R9* |

*Multiturn Cermet ¾inch*

## Capacitors

*Polyester Min. Layer*

| | | |
|---|---|---|
| 10nF | 6 | C5,6,9,10,13*,17 |
| 0·1µF | 5 | C1,2,11,15,19 |

*Polyester sub-min.*

| | | |
|---|---|---|
| 33nF | 2 | C4,12* |

*Disc Ceramic*

| | | |
|---|---|---|
| 1nF | 2 | C16,20 |
| 10nF | 2 | C18,22 |

*Tantalum Bead*

| | | |
|---|---|---|
| 1µF 35V | 5 | C3,7,8,14,21 |
| 4·7µF 16V | 3 | C23,24,25 |

## Semiconductors

*Diodes*

| | | |
|---|---|---|
| BZX85C5V1 | 1 | D5 |
| BZY88C3V9 | 2 | D1,2 |
| l.e.d. | 1 | D4 |
| 1N914 | 1 | D3 |

*Transistors*

| | | |
|---|---|---|
| VN10LM | 6 | Tr1,2,3,4,5,6 |

*Integrated Circuits*

| | | |
|---|---|---|
| TL084 | 1 | IC1 |
| XR2206 | 1 | IC5 |
| XR2211 | 1 | IC2 |
| 741 | 2 | IC6,7 |
| 4077B | 1 | IC3 |
| 4093B | 1 | IC4 |

## Switches

*Dual-in-line Lever*

| | | |
|---|---|---|
| 4 × s.p.s.t. | 1 | S1,2,3,4 |

*Min. Toggle*

| | | |
|---|---|---|
| s.p.d.t. | 1 | S6 |
| d.p.d.t. | 1 | S5 |

## Miscellaneous

Printed circuit boards (2); Fuse 100mA (FS1); IC sockets 8 pin d.i.l. (2), 14 pin d.i.l. (4), 16 pin d.i.l. (1); Veropins; 16 way single edge connector; 2 way p.c.b. jumper links (Link 1).

Components marked * are on the plug-in p.c.b.

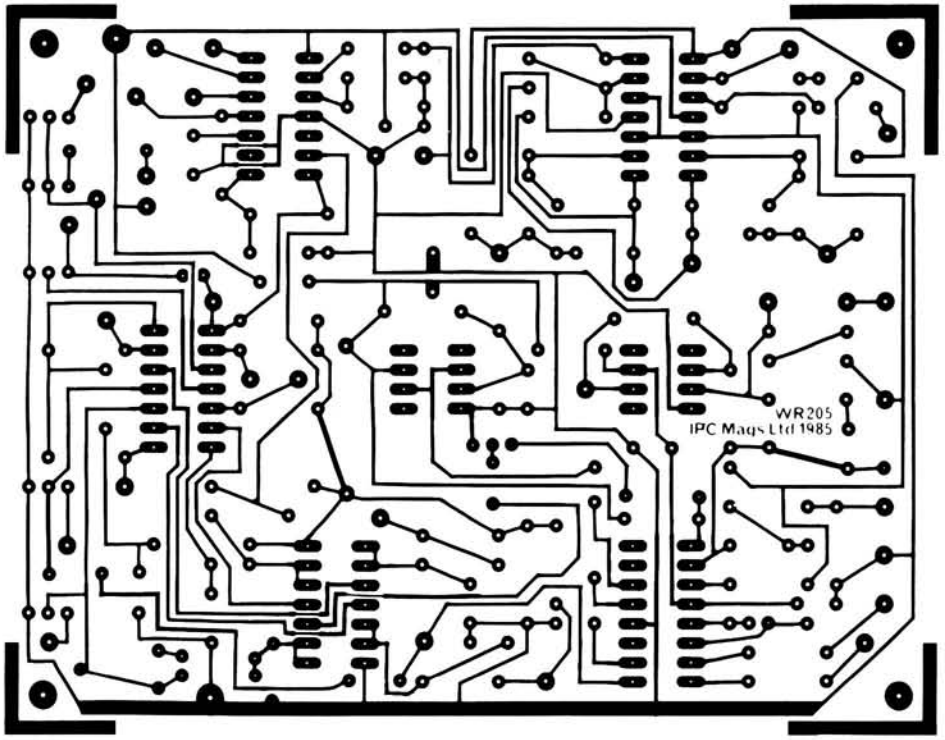



Fig. 2 ▲

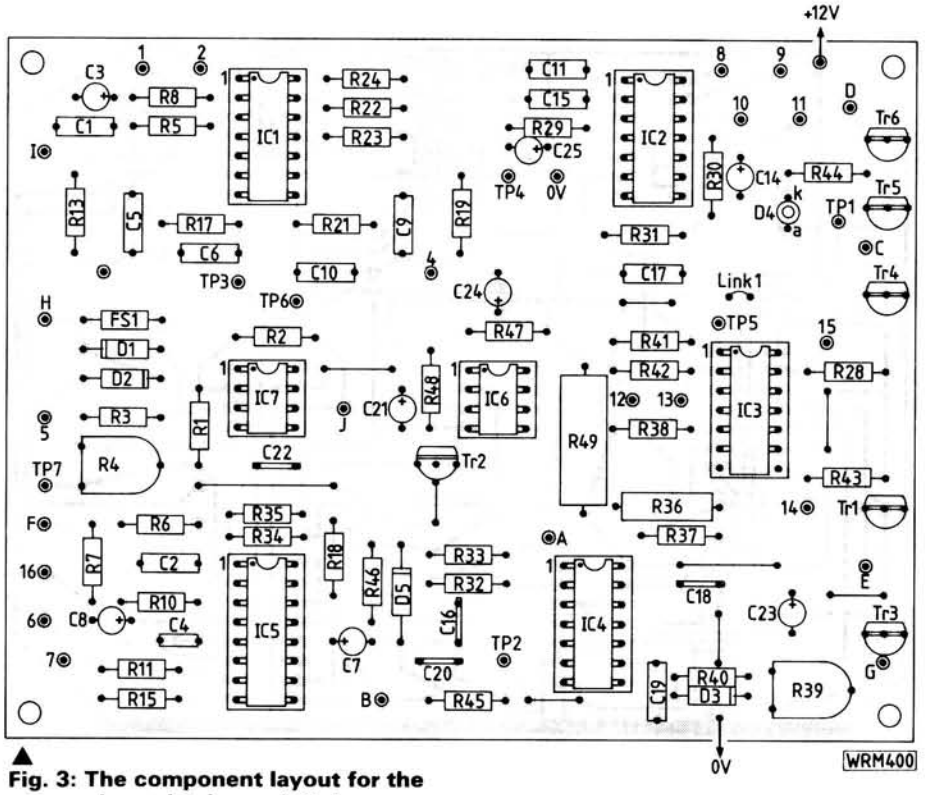
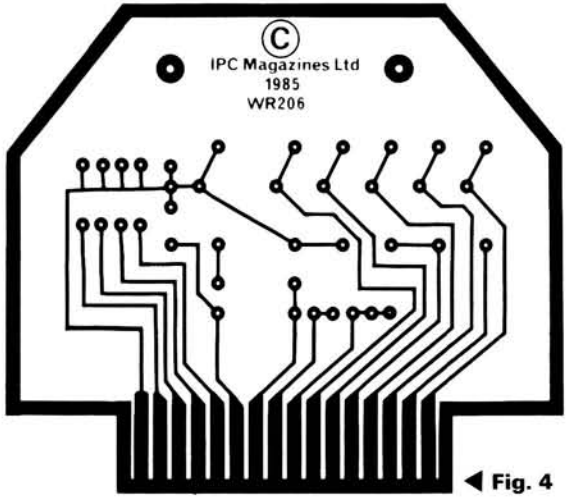
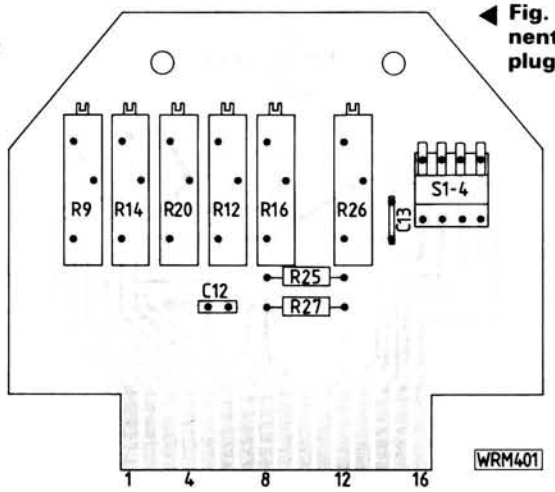


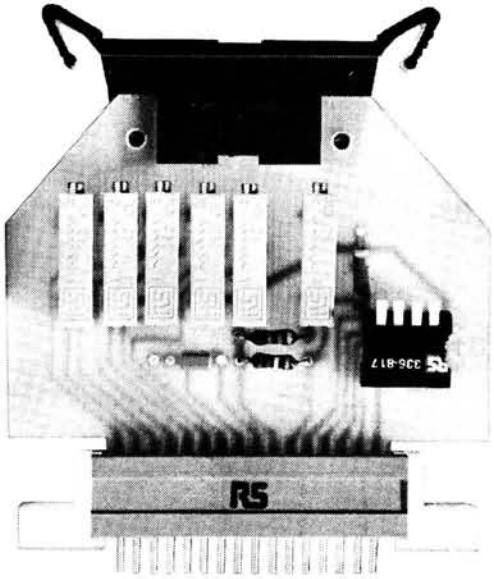

Fig. 3: The component layout for the main p.c.b. shown full size




◀ Fig. 4


◀ Fig. 5: The component layout for the plug-in p.c.b. shown full size



The isolation amplifier (IC7) is only used with a wire data link and is adjusted to prevent the transmitted frequency swamping out the received frequency and is best set up on the actual line where the modem will be used. *N.B. This modem is not BT approved, and it is illegal to connect the modem to a BT telephone line under any circumstances.* It is worth making the line isolation transformer an approved type even so, first to provide the required electrical isolation and secondly because an inferior transformer stands a good chance of saturating due to any d.c. flowing through it when on line. This will not cause any great embarrassment, it just won't work!

A switch (S5) is also provided to switch between the modem and the transceiver microphone. This saves a great deal of time plugging in and out the microphone which seems to be done endlessly in the early days of using the modem!

## Construction

There is nothing special to watch out for when constructing the modem other than the usual anti-static precautions that should be followed when assembling semiconductor devices. The main p.c.b. (Figs. 2 and 3) has been laid out to allow all connections to be made to it including all the inputs, outputs and transceiver lines.

## Setting up

The best way of setting up the modem is with a frequency counter and an oscilloscope, but just an oscilloscope is adequate. The general principle is to set up the transmitted tones, feed them into the demodulator, set that up to decode the data and then reset the transmitted tones if they are different.

Monitor pin 2 of the XR2206. The sinewave amplitude should be 1V peak-to-peak and its frequency set by R12 or R16 depending on the state of S1. Make a temporary connection between TP7 and I and adjust R4 to obtain 3V p-p at the output of IC1a.

Monitoring the output of IC1b, adjust R14 to obtain a maximum output, change S1 and repeat for IC1c adjusting R20. Next connect the computer to D and adjust R26 so that the demodulated signal on A is the same as the data in from the computer.

Remove the temporary connection and reset R12 and R18 to the required transmit frequencies. The modem is now ready for use.

## In Use

One of the problems encountered using any radio in close proximity to a computer is interference. As already mentioned, the prototypes have been used with Commodore 64s and VIC 20s. Both of these machines have a screen inside them and have a filter on the supply lead, but it was found that a great deal of noise still escaped from the computer down the supply lead and the cure for this is to wrap the whole of the supply lead round a ferrite rod or if possible, a large toroid as near to the computer as possible.

When using the modem off-air, it is sometimes difficult to tune the receiver in on the tones without some sort of tuning aid. The l.e.d. (D4) on the data line can be monitored for clean data, but if an oscilloscope is available, the outputs of the filters can be monitored. If the oscilloscope is set up with one input on the X axis and the other on the Y axis, the display gives a clear view of what is going on. If the receiver is correctly tuned, the display is as Fig. 6a. As the signal becomes detuned, the display rotates and reduces in amplitude as shown in Fig. 6b. The nice thing about this display is that the direction in which the display rotates indicates whether the frequency has increased or decreased. **PW**

**MODEM PROGRAM**

```
10 PRINT"{CLR}{CUR DN}{CUR DN}{CUR DN}{CUR RT}{CUR RT}{CUR RT}{CUR RT}GENERAL PU
RPOSE MODEM PROGRAM{CUR DN}{CUR DN}{CUR DN}"
20 PRINT"{CUR RT}{CUR RT}{CUR RT}{CUR RT}OPTION MENU"
30 PRINT"     1......50 BAUD"
40 PRINT"     2......75"
50 PRINT"     3......110"
60 PRINT"     4......134.5"
70 PRINT"     5......150"
80 PRINT"     6......300"
90 PRINT"     7......600"
100 PRINT"    8......1200"
110 PRINT"    9......1800?"
120 PRINT"    10.....2400"
130 INPUT"    ENTER OPTION";A
140 A=INT(A)
150 IFA<1ORA>10THENPRINT"{CUR UP}        ( 31 spaces )              ";:GOTO130
160 PRINT"    1......NO PARITY BIT"
170 PRINT"    2......ODD PARITY"
180 PRINT"    3......EVEN PARITY"
190 INPUT"    ENTER OPTION";P
200 P=INT(P)-1
210 IFP<0ORP>2THENPRINT"{CUR UP}         ( 25 spaces )      ";:GOTO190
220 INPUT"1 OR 2 STOP BITS?";B
230 B=INT(B)-1
240 IFB<0ORB>1THENPRINT"{CUR UP}         ( 22 spaces )  ";:GOTO220
270 S$=CHR$(B*128+(32+A))+CHR$(32*P)
280 OPEN2,2,0,S$
290 PRINT"{CLR}"
300 PRINT""
305 PRINT"{CUR DN}{CUR DN}{CUR RT}{CUR RT}MODEM RX{CUR DN}{CUR DN}"
310 GETA$
315 IFA$=""THENA$="A"
320 IFASC(A$)=133THEN600
325 IFASC(A$)=134THENCLOSE2:GOTO10
330 GET#2,B$
335 IFB$=""THENB$="{*^}"
340 IFASC(B$)<32ORASC(B$)>90THEN310
350 PRINTB$;
360 GOTO310
600 PRINT""
605 PRINT"{CUR DN}{CUR DN}{CUR RT}{CUR RT}MODEM TX{CUR DN}{CUR DN}"
610 POKE56579,64:POKE56577,(255-64)
620 FORT=1TO200:NEXT
630 GETA$:IFA$=""THEN630
640 IFASC(A$)=136THEN700
650 PRINTA$;
660 PRINT#2,A$;
670 GOTO630
700 IFPEEK(669)<>PEEK(670)THEN700
710 POKE56577,255
720 FORT=1TO500:NEXT
730 GOTO300
```

**XR2211 DESIGN PROGRAM**

```
10 PRINT"{CLR}"
20 PRINT"{HOME}{CUR DN}{CUR DN}{CUR DN}{CUR DN}{CUR RT}{CUR RT}{CUR RT}XR2211 DE
SIGN PROGRAM"
40 INPUT"{CUR DN}FREQ OF HI TONE HZ";F1
50 INPUT"{CUR DN}FREQ OF LO TONE HZ";F2
60 INPUT"{CUR DN}BAUD RATE          ";BR
70 F0=(F1+F2)/2
80 C0=INT(1/20000/F0*10^12)/1000
90 R1=INT(20*(F0/(F1-F2))*1000)/1000
100 C1=INT(C0/4*1000)/1000
110 CF=INT(3/BR*10^6)/1000
120 PRINT"{CUR DN}{CUR DN}C0=                {CUR L}{CUR L}{CUR L}{CUR L}{CUR L}{C
UR L}{CUR L}{CUR L}{CUR L}";C0"NF"
130 PRINT"{CUR DN}R1=                {CUR L}{CUR L}{CUR L}{CUR L}{CUR L}{CUR L}{CU
R L}{CUR L}{CUR L}{CUR L}";R1;"K"
140 PRINT"{CUR DN}C1=                {CUR L}{CUR L}{CUR L}{CUR L}{CUR L}{CUR L}{CU
R L}{CUR L}{CUR L}{CUR L}";C1;"NF"
150 PRINT"{CUR DN}CF=                {CUR L}{CUR L}{CUR L}{CUR L}{CUR L}{CUR L}{CU
R L}{CUR L}{CUR L}{CUR L}";CF;"NF APROX"
200 GOTO20
```

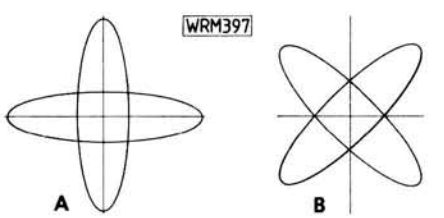



**Fig. 6: The displays to be expected when an oscilloscope is used for tuning purposes. Fig. 6a shows the display when the receiver is properly tuned while Fig. 6b is typical of an out-of-tune receiver**

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# Valved Communications Receivers

*In Part 4 Chas Miller looks at the R107 Communications Receiver*

In reviewing the R107 in August 1945, *Wireless World* described it as being one of the Army's best communications receivers. Nearly 40 years on the claim still appears to have been valid. It might be said that the R107 was to the Army what the R1155 was to the RAF and the B28 to the Royal Navy.

Its frequency coverage was not as great, admittedly, but this is explained by the different conditions of service. Generally speaking, land forces required relatively short distance two-way communication for battle orders in the field and fairly long-distance reception facilities for messages from base, whilst direction-finding and very long range working were not an essential. Thus the extremely low and high frequency coverage needed by the other two services could be dispensed with by the Army. The coverage of the R107, 1·2MHz–17·5MHz was perfectly adequate for its job and made it complementary to such transmitters as the WS12 and WS33. It still offers a satisfying performance to the short-wave listener who does not wish to tune below the 16m band, or who has an alternative receiver for the higher frequencies.

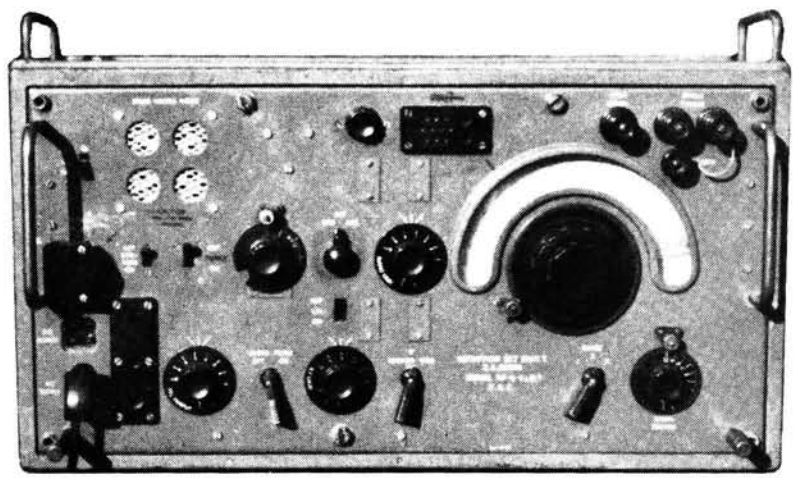
Externally the R107 is most impressive. Its cabinet is of rugged design and the front panel carries an array of no fewer than 14 controls, plus a number of sockets for connection of antenna, earth, power supplies, headphones, etc. Within, it is an eight valve plus rectifier superhet with many interesting features. It is built up of three separate chassis interconnected by tag-panels and leads. On the right of the cabinet, behind the semi-circular dial, is the r.f. and frequency-changer unit; in the centre is the i.f./a.f. chassis, and to the left is the power supply. A preliminary examination of the circuit diagram reveals two immediate points of interest: an extensive use of twin-coupled tuning circuits in both r.f. and i.f. amplifiers, and the fact that, apart from the h.t. rectifier, only two different valve types are used for all functions. The two types are the r.f. pentode ARP34 and the double-diode-triode AR21. The commercial (Mullard) equivalents of these are the EF39 and EBC33 respectively. Inevitably one speculates as to the reason for this—was it to simplify the spares requirement? If so, was the designer asked to work around those two particular types, or did he decide upon them for himself? Certainly the use of the AR21/EBC33 in r.f. oscillator positions was innovative and has possibly never been repeated. One useful aspect of the two types is that their heater rating of 6·3V at 0·2A each lends itself to a simple series/parallel arrangement drawing a very moderate total of only 0·8A at 12·6V. Economy of this kind was highly desirable when the R107 was used on 12V battery supplies. The alternative a.c. mains input could be from 100V–250V, a somewhat unusual versatility.

## Circuit description

**Preliminary notes:** Although the official workshop manual for the set has been drawn on for much information, it has been felt advisable to change the valve/component numbering to a certain extent to avoid possible confusion. Originally the valves were designated V1A, V2A, V1B, V2B, etc., the premise being that the prefix V1 would always indicate the ARP34/EF39, and V2 the AR21/EBC33, with the suffix denoting the circuit location. For some odd reason C was not used, being replaced by an acute accent on B. For this article, the normal numbering V1, V2, V3, etc., has been adopted. A similar original component numbering has been retained because it does in this case aid the reader. The system is that all components marked, say, R1A, B, C, etc., will be of the same value. The same applies to C3A, B, C, etc. The components lists are therefore simplified and the recognition of values aided. Transformers, however, have been re-numbered in order of location, starting at the first i.f. transformer as T1. The same has been applied to the tuning coils, as L1, L2, and so on.

The frequency coverage of the receiver is split into three bands as follows: Band 1, 17·5MHz–7MHz; Band 2, 7·25MHz–2·9MHz and Band 3, 3MHz–1·2MHz. Antenna input is to tuned transformers L1, L2 and L3, via primary windings for dipoles and to tappings on the secondaries for open-wire types. Signals are fed to V1 (ARP34/EF39) operating as r.f. amplifier. This valve is controlled by a.g.c. and by the manual gain control VR1, which also acts on the two i.f. amplifiers. Amplified r.f. signals are passed on via the band-pass coils L4/L5, L6/L7, and L8/L9, tuned by the second and third sections of the ganged capacitor. This arrangement ensures good pre-frequency-changer selectivity and effectively protects against second-channel interference (images).

An ARP34/EF39 is used for V2,



**The Army R107 communications receiver**

operating as a mixer with suppressor grid injection. It operates at two levels of fixed bias, with no a.g.c. or manual adjustment. The control grid receives −1·5V and the suppressor grid −20V. The Local oscillator is provided by V3, an AR21/EBC33 triode section in a Hartley configuration, a rather unusual choice for the job in both respects. The cathode of the valve here is live as regards r.f., rather than the anode, which is decoupled to earth by C10A, 0·01µF. Oscillations are fed from the cathode via C13D (200pF) to V2 suppressor grid. With the cathode/heater capacity in mind, the two electrodes are strapped on the earthy side of the heater, and thus the heater current flows through the oscillator coils. To prevent r.f. losses on the other side of the heater, it receives its voltage via an r.f. choke. The anode of V3 is supplied via R4B (25kΩ) and R8B (80kΩ), the latter being shorted out on Band 1. The i.f. is 465kHz.

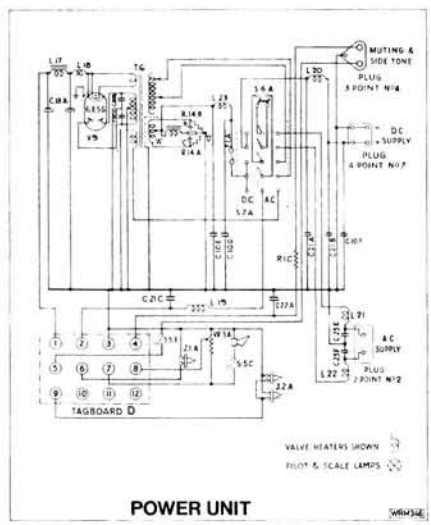
A band-pass transformer T1 passes the i.f. signals from V2 to the first i.f. amplifier V4 (ARP34/EF39) operating in conventional manner. They are then transferred to the second i.f. amplifier (ARP34/EF39) V5 by a dual band-pass system consisting of T2 and T3. All i.f. transformers up to this point have two levels of selectivity available at the turn of a switch. In the WIDE position the passband is 7·5kHz, and in NARROW 3kHz.

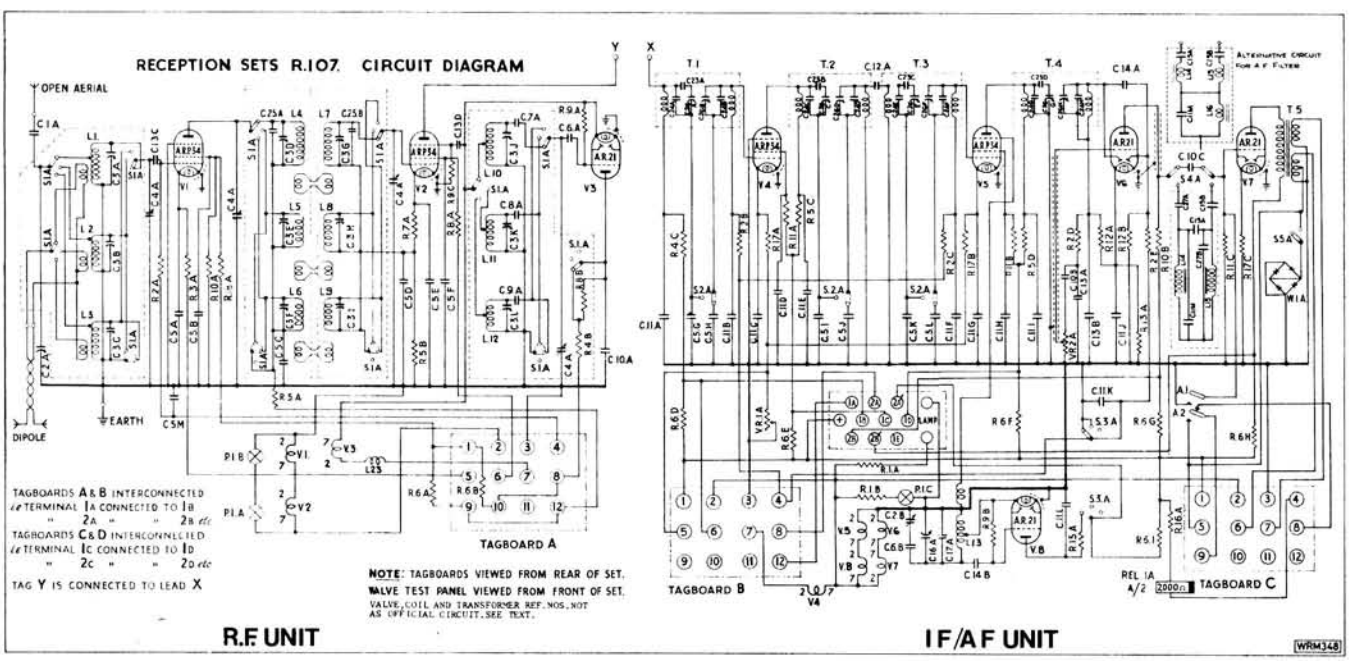
The final i.f. transformer, T4, has fixed selectivity. Its secondary feeds the demodulator diode section of V6 (AR21/EBC33) directly, whilst C14A (100pF) couples it to the a.g.c. diode. This arrangement is unusual in this class of receiver since there is likely to be severe shunting of the demodulator diode load, and a reduction in a.g.c. voltage. (The preferred system is to have the a.g.c. diode fed via a small capacitor from the anode of the final i.f. amplifier. It should also be noted that informed opinion suggests that the final i.f. amplifier should be operated at fixed bias, which makes it function as a virtual a.g.c. amplifier. In ignoring these precepts, the designer of the R107 may have been justified by special considerations brought about by the unusual tuning system and valve complement).

Audio signals are filtered by R2D (250kΩ) and C13A/C13B (200pF) before going to the volume control VR2A (500kΩ) and thence to the control grid of V6. This latter receives a bias of −3V due to the cathode resistor R13A (1kΩ). This also provides a 3V delay for the a.g.c. system. A selector switch allows the a.g.c. to be disabled at will and automatically when the b.f.o. is switched into use. A fairly low value of load resistor (R10B, 20kΩ) feeds the anode of V6 and the amplified a.f. is then coupled to the grid of V7 (AR21/EBC33) via an optional a.f. bandpass filter switched into circuit for difficult c.w. reception. It passes 900Hz, ±150Hz and with the b.f.o. adjusted to provide this frequency it alone will be heard in the headphones/LS—all other frequencies being suppressed. When not used it is by-passed by C10C (0·01µF). Valve V7 operates as a low-power a.f. output valve, the diodes again being unused. It is transformer-coupled to either the built-in loudspeaker or up to three sets of headphones, or to a telephone/intercom line. A separate low-impedance volume control is provided for the last function. Provision is also made for the introduction of a side-tone (monitoring facility) from an associated transmitter. This is at a.f. and taken directly to the loudspeaker or headphones via relay contacts which are made when the transmitter is keyed or its microphone switch depressed. At the same time another set of contacts shorts the grid of V7 to earth to mute the receiver. A "crash" (noise) limiter consisting of metal rectifiers connected back to back may be shunted across part of the output transformer secondary if required.

The b.f.o., V8, is another AR21/EBC33 again operating in a Hartley circuit with the same cathode-live-to-r.f. mode as with V3. This time a small secondary winding on the oscillator coil couples the b.f.o. to the suppressor grid of V5. No extra bias is provided for the electrode in this case. The b.f.o. may be continuously tuned around its centre frequency of 465kHz by a front-panel mounted control.

**Power Supply Unit.** Only one power transformer is employed for both mains and 12V d.c. operation. In the first mode a normal tapped primary accepts the input voltages of between 100V and 250V. An h.t. secondary provides 250–0–250V for the full-wave rectifier V8 (6X5G) anodes, and an l.t. winding supplies its 6·3V heaters. A second l.t. winding supplies 12·6V for the receiver valve heaters. For d.c. operation a selector switch S7 disconnects the 12·6V winding and takes the heaters directly to the 12·6V input. At the same time a second primary winding is brought into use. Its centre tap is connected to battery positive line and the outer ends to the




**Circuit diagrams of the three principle modules of the R107 receiver**

fixed contacts of the Mallory G650 vibrator. Each is therefore taken to battery negative line alternately via the moving contact as it vibrates at around 100Hz, inducing the same secondary voltages as on a.c. operation. The rectifier works in the same manner as on a.c. mains but, as mentioned before, the 12·6V winding is not used. Blocking r.f. filters are fitted in both a.c. and battery input circuits, and in the l.t. and h.t. outputs from the power pack.

## Testing and Servicing

Provision is made in the R107 for initial voltage and valve testing without the necessity of dismantling. Just above the left hand side of the main tuning dial is a small panel having three large sockets and nine small ones. The large socket on the left carries the full 250V h.t., which may be checked with a meter from this point to chassis. The other two large sockets carry the 12·6V l.t. (via a 100Ω resistor to enable a 6·3V operator's lamp to be plugged in and powered) and its presence or otherwise may also be checked. With no lamp in use the full 12·6V will be registered on a high-resistance test meter.

Eight of the smaller sockets (the exception being the one marked 1E, which is blank) are for testing the h.t. feeds to the valves. For this purpose an extra 3kΩ resistor has been fitted in each feed so that when the valve is drawing its correct h.t. current a certain voltage will be developed across it. The lower end of each resistor is brought out to a socket on the test panel, and the voltage is checked with a meter connected between it and the h.t.+ socket. Although the maximum voltage that will be recorded is around 20V, it is important to remember that both meter leads will be at h.t.+ with respect to chassis. The expected test voltages as given in the official manual are shown in Table 1. These were taken with the aid of the once ubiquitous AVO Model 7, which had a sensitivity of 500 ohms per volt and, as the book says, other meters may produce different readings. The AVO 7 was to be used on its 100V range, which would have the effect of placing a 50kΩ resistor in parallel with each 3kΩ in turn. This would result in an effective resistance of 2·83kΩ. The same result may be obtained with a modern 20kΩ per volt meter (such as the AVO 8) on a 25V range by shunting it with a 56kΩ resistor. The readings quoted in the manual should then be obtained, subject to normal tolerances. Bear in mind that the shunt resistor too will be at h.t.+ with respect to chassis.

**TABLE 1**

| Valve | Function | Test Panel No. | Voltage |
|---|---|---|---|
| V1 | r.f. amplifier | V1A | 15V |
| V2 | Mixer | V1B | 11·5V |
| V3 | Local osc | V2A | 11V (Band 1)<br>5V (Bands 2 & 3) |
| V4 | 1st i.f. amp | V1C | 16·5V |
| V5 | 2nd i.f. amp | V1D | 16·5V |
| V6 | 1st a.f. amp | V2B | 9·5V |
| V7 | 2nd a.f.. amp | V2B′ | 20V |
| V8 | b.f.o. | V2A′ | 9·5V |

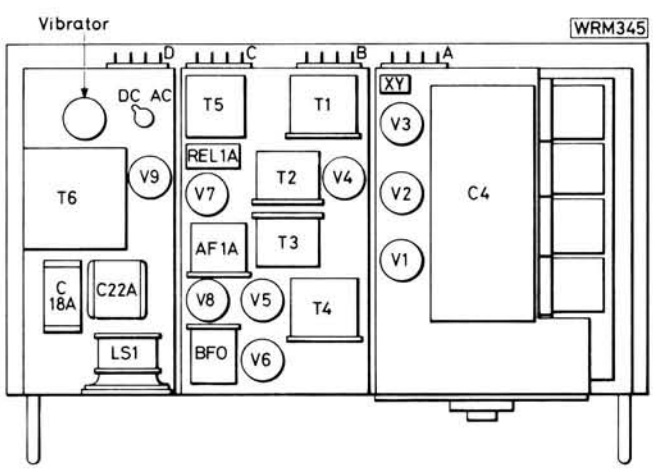
The test voltage readings shown in Table 1 should be taken with the antenna terminals shorted to chassis to prevent any signal input, with the r.f. gain control at maximum and with the b.f.o. switched on. Low readings point to valve(s) having low emission. A cross-check can be made by interchanging two of the same type. High readings could mean a leaky decoupling capacitor.

No reading at all on one socket probably indicates a valve having no emission at all, but it might just be a break in the h.t. supply. Substitution should clear up this point. If zero is still obtained with the substitute the voltages at the actual valve socket will have to be investigated. Note that all the valves must be plugged in for tests at all times due to the series/parallel heater wiring. This also means that should one valve heater go open-circuit, its companion in the chain will be extinguished. The valves are paired as follows: V1/V2, V3/V4, V5/V8, V6/V7. If zero readings are obtained on any pair of valves there is a distinct possibility of one of them having an open circuit heater.

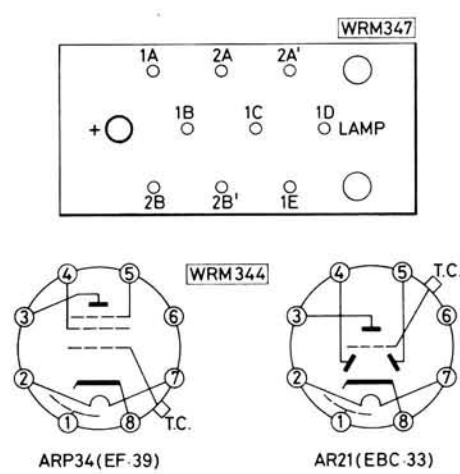
If all voltages appear to be in order but the set remains completely silent, it is worth checking that the muting switch is operating correctly. It may seem an obvious point, but one that could be overlooked.

## Alignment and Calibration

The specialised nature of the bandpass tuning circuits calls for a great deal of skill in re-alignment and, as in the case of some other sets, it is suggested that this work should not be attempted on the R107 unless the operator possesses the necessary knowledge and equipment. It would be folly to disturb any of the i.f. adjustments, or that of the r.f. intervalve coupling, without these essentials. It will therefore be assumed that if these are available no further information will be required. It is permissible to make small adjustments to the local oscillator trimmers, and of the antenna coils if the dial calibration is slightly out, using either a good signal generator or known broadcasting stations as frequency standards. Band 1 trimmers C3A and C3J should be adjusted for maximum at approximately 17MHz; Band 2 trimmers C3B and C3K at 7MHz and Band 3 trimmers C3C and




**The internal plan view of the R107 indicating locations of principle components**




**The valve test panel layout and valve base diagrams (viewed from the pin end)**

C3L at 2·5MHz. Should any range have its calibration wildly out the padder capacitors C7A, C8A and C9A for Bands 1, 2 and 3 respectively should be suspected. Their values are, in order, 5000pF, 1630pF and 750pF. The second will almost certainly have to be made up of two new capacitors in parallel (e.g., 1500pF and 130pF). Note that close tolerance components are required. With the padder capacity correct the oscillator trimmer should be capable of bringing the dial into line. If there is still inaccuracy it may be possible to eliminate it by using a slightly smaller padder value, and shunting it with a trimmer so that the total capacity may be varied about the quoted value.

Check the antenna coil trimmers after the oscillators have been trimmed, first setting the main antenna trimmer to its half-way mark.

## Suggested Modifications

One of the stated aims of this series is to assist in the restoration of receivers to as near as possible original condition and not to encourage unnecessary or inappropriate modification. In certain cases, however, some alteration to the original specification of an ex-Government set may be needed to make it suitable for civilian use. The R107 is a case in point as regards its output stage. It is fine if the user wishes to use headphones only, but it is felt that many owners will require reasonable loudspeaker volume, necessitating a more powerful output valve. The problem here is to find one that will not be incongruous in the set, will suit the existing heater circuitry, will not be too heavy on h.t. current (since the R107 power pack is limited in this respect) and will not need a lot of modification to the set mechanically. Fortunately a valve exists that fulfills these requirements admirably. It is the Mullard EL32, also known in the Services as the VT52 or CV1052. It is very similar in shape to the AR21/EBC33 it is to replace, but just a little larger. It has exactly the same heater rating, draws only 37mA maximum and is virtually a plug-in replacement—only slight alterations to the wiring being necessary, plus the provision of a new output transformer to match it to the loudspeaker. It is of course long obsolete, but little difficulty should be experienced in obtaining one from a dealer in vintage valves.

**Fitting the EL32.** The heater, cathode and anode pins on the base are the same as the AR21/EBC33, so these are used as before, except that the existing lead to the anode pin (3) must be removed and insulated, being replaced by a connection to the new output transformer. Pin 4 is the g2 (screen grid) connection of the EL32 and needs to be taken to h.t.+. It is suggested that the existing 3kΩ resistor R6H should be used as it will not now be needed to feed the old output transformer. It can still continue in its role as a test resistor, but now for the EL32 g2. The voltage dropped across it will be 14·15V using the 20kΩ/volt meter and 56kΩ shunt as mentioned earlier. The recommended anode load for the EL32 is 8kΩ, and the transformer ratio must be calculated with the aid of the well-known formula which states that the turns ratio equals the square root of the anode load divided by the speaker impedance. As a guide the old type of loudspeaker with a 2–3Ω impedance needs a 55 : 1 ratio, and an 8Ω speaker approximately 30 : 1.

The cathode bias resistor for the EL32 is 500Ω, the same as the valve it replaces. The grid connection is also by top cap, so no change is required for these two electrodes. It is a remarkably efficient valve, delivering no less than 3·6W at a maximum distortion of 10 per cent. The output could conveniently be connected to a good external speaker via one of the three standard jack sockets on the front panel.

**Improving the valve test system.** The existing test system in the R107 lends itself admirably to modification to the constant voltage arrangement described in an article entitled *A Versatile Valve Monitor and S-Meter*, by the present author. If this method is adopted the test meter has no need of accurate voltage calibration, a simple 0–1mA scale being sufficient. This will indicate at a glance if each valve is drawing its correct current or not, no reference to the manual being necessary. The S-meter facility would also become available.

## Component References

The Army numbering system is intended to simplify the recognition of component values. Instead of each resistor or capacitor having its own individual number, they have a figure which identifies them as being of a certain value, plus a suffix letter locating them on the diagram. For instance, all resistors having the type no. 9 (R9A, R9B, etc.) will be 50kΩ. Likewise all capacitors numbered C10, A, B, C, etc., will be 0·01μF. In a few cases two figures are allocated to one value where there is a difference in the type of capacitor, e.g., mica or paper. All resistors are 0·5W unless otherwise annotated. ***PW***

### COMPONENT NUMBERING SYSTEM

**Resistors**

**1** 100Ω
**2** 250kΩ
**3** 300Ω
**4** 25kΩ
**5** 5kΩ
**6** 3kΩ
**7** 400Ω
**8** 80kΩ
**9** 50kΩ
**10** 20kΩ
**11** 100kΩ
**12** 500kΩ
**13** 1kΩ
**14** 150Ω
**15** 30kΩ
**16** 15kΩ, 3W
**17** 500Ω
**18** 25kΩ, 1W

VR1 4kΩ r.f. Gain
VR2 500kΩ a.f. Gain
VR3 500Ω headphone vol

**Transformers**

**1** 1st i.f.
**2** 2nd i.f.
**3** 3rd i.f.
**4** 4th i.f.
**5** Audio output
**6** Power (mains/12V d.c.)

**Capacitors**

**1** 20pF
**2** 50pF variable
**3** 25pF trimmer
**4** 4×300pF tuning gang
**5** 0·05μF
**6** 80pF
**7** 5000pF, 5%
**8** 1630pF, 2%
**9** 750pF, 2%
**10** 0·01μF, mica
**11** 0·01μF, paper
**12** 2·2pF
**13** 200pF
**14** 100pF
**15** 5000pF
**16** 100pF trimmer
**17** 1000pF 2%
**18** 8+8μF electrolytic
**19** 50pF variable
**20** 0·01μF buffer, 800V a.c. wkg
**21** 1μF
**22** 4μF
**23** 1000pF, 300V a.c. wkg
**24** *
**25** 10pF
**26** *

*Fixed and trimmer capacitors fitted in i.f. transformers, no values stated.

**Switches**

**1** BAND selector
**2** SELECTIVITY
**3** AGC/BFO on-off
**4** AF FILTER in/out
**5** CRASH LIMITER in/out/L s on/off/ SIDE TONE on/off
**6** MAIN POWER on/off
**7** AC mains/12V d.c. power switch

# Braille Circuit Diagrams

*Although initially devised to help blind students follow circuit diagrams, George Day describes a new method of reading theoretical circuits in the hope of better understanding and co-operation between the sighted and non-sighted.*

At first, the details outlined may appear so foreign to normal practice that a short preliminary explanation of the underlying reasoning may prove to be worthwhile.

Although the blind can, as they must, master suitably modified embossed versions of normal diagrams, there are a number of reasons which prevent this approach from becoming the ideal method for everyday use by advanced students. Amongst these reasons is the need to use modified versions of particular Braille writing machines. A real benefit would, therefore, ensue if the required information could be prepared on any Braille machine. This has been achieved by modifying the presentation of normal diagrams in such a way as to make the use of graphical symbols unnecessary whilst, at the same time, avoiding the drawbacks inherent in longhand word-only descriptions. The advantages normally provided by the graphical symbols have been retained to a marked degree in the new style diagrams. This makes it comparatively easy when reading either the traditional or new style circuits to envisage the details as presented in the alternative arrangement.

This latter point has an important bearing on the possible success of the scheme, for it means that sighted technicians will find it easier to discuss circuitry with a blind person.

This is a very important aspect as far as the blind are concerned, but before such discussions can be really meaningful, it is obviously necessary for a typescript version of the scheme to be available for the benefit of any sighted helper.

Meeting the original requirements for this new style diagram was found to be a quite straightforward task, for the necessary language was already in common use. Before describing the new diagrams it is necessary to mention a required alteration to diagram layout.

The normal theoretical diagram is built up from a number of comparatively simple sub-circuits which are mainly presented vertically. However, since the blind have to use a machine to assist them when compiling any sort of diagram, their task would be simplified considerably if such details were given horizontally. Fortunately one has only to turn a normal diagram through ninety degrees and the required layout results. Clockwise turning of the diagram is the obvious choice as it not only provides a datum line, the chassis or ground line, but it places the input at the top of the arrangement—as is generally preferred.

If a suitable shorthand could be devised to enable each horizontal sub-circuit to be individually described in one line of writing, then these individual sequences could be placed under one another to agree with the layout of a normal diagram. Then if each sequence is identified, one could gain the ability to move around a circuit as in a normal symbol type diagram.

Consequently, not only is the overall size of the symbol-less diagram quite small but the general layout resembles that of its equivalent symbol type reasonably well.

The language necessary to change these pleasant anticipations into practical arrangements has been in common use for many a year. It needs only a little augmentation and regimentation to convert it into the required shorthand, as will soon become evident.

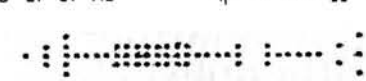
Not only are the identification groups now in regular use ideal for present purposes but, in shorthand sequences, the wiring between components can be indicated by the relative positioning of the identification groups.

For example, the information normally given by a symbol-type diagram for a series-tuned circuit consisting of a capacitor (C1), an inductor (L1) and a resistor (R1) is given fully by the following simple sequence:

C1 L1 R1

Similarly, the details for a fixed series-tuned circuit fitted between ground and an antenna can be written as:

GD L1 C1 AE



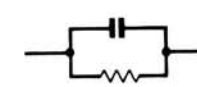
Although no information regarding the wiring has actually been written into the sequence, no major mental effort is needed in order to picture a lead emanating from the right-hand side of the first group to connect it to the left-hand side of the second group, which is similarly connected to the third group and so on.

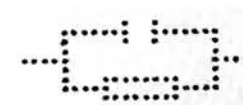
However, the details can only relate to a maximum of two terminals per component, and normally to only one connection per terminal in any given sequence. Description of circuits which include either components with more than two terminals, or having more than one lead attached to any given terminal, will normally require more than one sequence, as will be shown later.

Although a similar approach to that given previously is appropriate for describing parallel circuits, the necessary procedure cannot help but be a little more complicated. Not only has one to show where the circuit divides and eventually recombines, but it is necessary to have a distinct sign to mark the end of one branch and the start of another. So, three shorthand signs become necessary.

For the first two requirements, the signs for "less than" and "greater than", doubled for emphasis, are appropriate. For the third requirement the oblique stroke makes a reasonable sign for separating the branches. So, the common arrangement of a capacitor (C1) and a resistor (R1) in parallel can be detailed by:

« C1 / R1 »

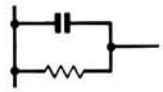


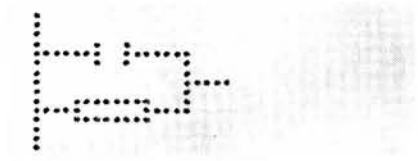


In practice so many circuits are connected to chassis or ground that it is worthwhile to have another special sign to indicate this—and the left-hand squared bracket sign was adopted.

So, to indicate a parallel circuit, the left-hand junction sign is modified. When the previous circuit is grounded it can be shown as:

[( C1 / R1 )]





Similarly, series-parallel circuits can be detailed by combining the previously mentioned procedures.

Consideration so far has only been given to fixed, non-polarised, components. It is a simple matter to modify an identification group to provide extra information when necessary.

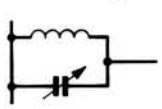
Polarisation can be indicated by writing the normal sign for either "plus" or "minus" immediately before the group concerned. Such a modified group can then not only indicate a type of component and how it is connected, but where polarised supplies are concerned, just a specific terminal.

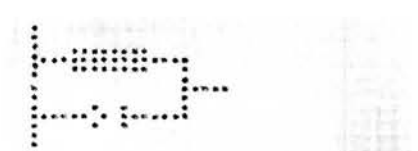
For example, the group +B1, when used in the midst of a sequence would indicate a battery with its positive terminal on its left-hand side. Alternatively, the same group when used as the first or final group of a sequence would then indicate just the positive terminal of the battery.

Additionally one has only to keep to long established practice in order to provide extra information, by adding an amplifying letter immediately after an identification group.

To show that a component is adjustable, one just adds either the letter "V" for variable or "T" for trimmer. Hence a normal grounded, parallel circuit can now be described by:

[( L1 / C1V )]





On the other hand a variable capacitor which is actually a section of a ganged component can be indicated by replacing the amplifying letter by one from a series commencing with the letter "a" for the whole ganged component, whilst at the same time retaining a common identifying number appropriate to the whole. The three sections of a three-ganged variable capacitor would be referred to individually by groups in the form C1a, C1b and C1c.

Another useful piece of information can be gained in a similar manner to enable one to differentiate between different types of semiconducting devices. The amplifying letters "P" and "N" can help where transistors are concerned. For example, a *pnp* transistor can be specified by the group Tr1P. Similarly a tunnel or Zener diode can be clearly specified by groups of the form D1T and D1Z respectively.

The next type of component to consider is the one with named or numbered terminals. A named terminal is identified by using a self evident abbreviation of the name concerned. This is then placed before or after the identification group of the component concerned. So, a semiconductor diode with cathode to the left can be fully described by the group K-D1AN. The relationship between a group and a name is shown by coupling them together by a hyphen which prevents mis-reading.

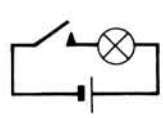
Components having numbered terminals are dealt with in a similar manner, the numbers replacing the terminal naming groups. Thus a "through" circuit going in at terminal 4 and coming out at terminal 13 of IC1 can be specified by the group 4IC1–13.

When concerned with only one terminal per component, the specification is written on the appropriate side of the component's identification group.

The stage has now been reached when it is desirable to consider another aspect of the scheme. Although the main object has been to develop a shorthand method for describing electronic circuits it is equally important for it to be possible to detail general electrical circuitry in a similar manner.

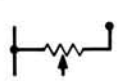
Let us consider a battery driven lighting circuit. By starting at the negative terminal the complete details for a hand torch can be given:

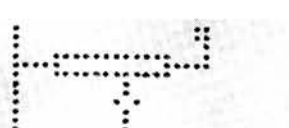
-B1 S1 LP +B1



The input circuit to a potentiometer controlled a.f. amplifier can be detailed in a like manner, though a preferred alternative way is shown here. It is quite common for the input to be shown connected only to the live side of the potentiometer and, by reading in the normal way from left to right, such as arrangement can be readily described by:

[ P1 IN

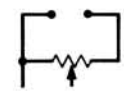


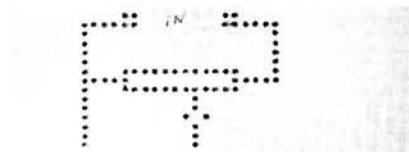


On those occasions when the input is shown strapped across the potentiometer the similarity of the whole to a grounded parallel circuit becomes quite obvious—with the exception that no output occurs at the live side of the circuit. The arrangement could therefore be treated as though it was an actual parallel circuit if only the right-hand junction sign was modified to indicate that the normal output has been sealed off.

This can be achieved by changing the sign. So a circuit can then be detailed by a sequence in the form:

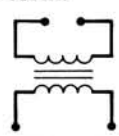
!( IN / P1 )!





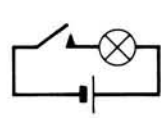
Another similar arrangement is met when considering the input circuit to a power transformer, though on this occasion neither side of the arrangement would either be earthed or connected elsewhere. Such an arrangement can be treated in a similar manner provided the left-hand junction sign is now changed to become a mirrored version of that used at the right-hand side. Thus a circuit showing an a.c. supply strapped across the primary winding of a transformer can now be given in the form:

!( AC / T1a )!



It should be noted that the shape of the torch circuit discussed previously can now be shown in an alternative description by:

!( S1 LP / -B1 )!



As the circuits described become more complex the need to identify each sequence in a circuit becomes more obvious.

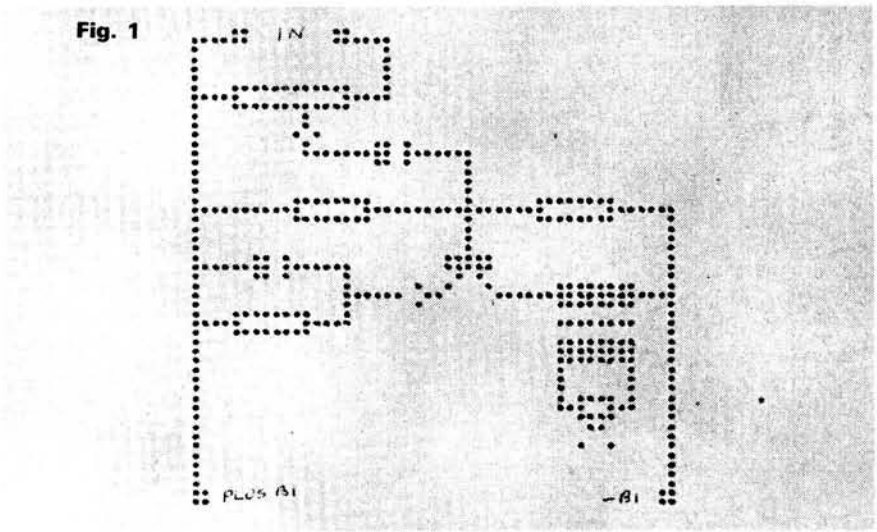
The details for an a.f. output stage consisting of a *pnp* transistor driving a transformer coupled loudspeaker can now be given as shown in Fig. 1 overleaf.

Note that whereas sequence (c) leads to the base of the transistor, sequence (d) leads away from the same terminal. So, they can be combined to give the sequence:

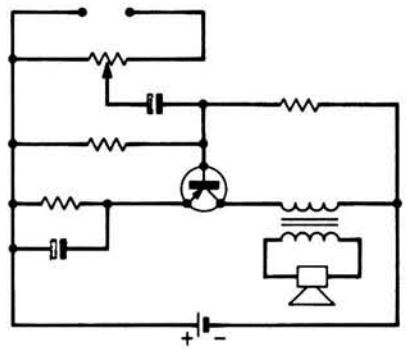
(c) [ R1 BA-Tr1P-BA R2 -B1

It should also be noted that one is now not restricted even to circuits which consist of just one stage, provided the coupling between them is by means of a transformer. As the use of such components is now becoming so

Fig. 1




```
(a) [< IN / P1 >!
(b) P1AR +C1 BA-Tr1P
(c) [ R1 BA-Tr1P
(d) Tr1P-BA R2 -B1
(e) [< +C2 / R3 >> EM-Tr1P-CO T1a -B1
(f) !< T1b / LS >!
(g) [ +B1
```




rare this aspect will not be discussed further here.

In transformerless circuits the provision of a passage for the control signal from input to output necessitates a linking circuit from each main sub-circuit to its following neighbour. Circuits such as feedback or stabilisation ones shouldn't be forgotten as they often emanate from sub-circuits.

If the symbol-less diagram is to compare realistically with its normal equivalent it must be possible to ascertain the details of an individual sub-circuit and to be able to find a specific section of a complex diagram with comparative ease and speed. Hence it is not adequate just to indicate where the branch circuits come from a parent sequence.

It is necessary for the descriptions of all the interlinking circuits to show clearly not only from where they start but also where they end.

The first step towards meeting this requirement has already been introduced by identifying individual sequences.

Since sequences are read from left to right the start of a linking circuit can be detailed by commencing its description with the identifying letter of the sequence from which it originated, coupled by a hyphen to the item immediately to the left of that junction.

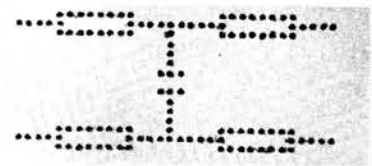
Similarly, the end can be shown in a corresponding manner, but on this occasion one uses the item immediately to the right of the junction. Although this approach is exact, it is not always possible to forecast the sequence where the linking circuit will actually end and so diagram compilation can be simplified by attaching the identification letter after the item.

A linking circuit which consists of a capacitor, C1, and which comes from a sequence (a), from between resistors R1 and R2, and ends at sequence (f) between resistors R3 and R4 would be described as:

(b) a-R1 C1 f-R4

This could be modified to:

(b) a-R1 C1 R4-f



Although this procedure is quite satisfactory when junctions are situated between items which do not have named terminals, whenever a junction is adjacent to such a terminal then this name should be used as the reference in the sequence concerned.

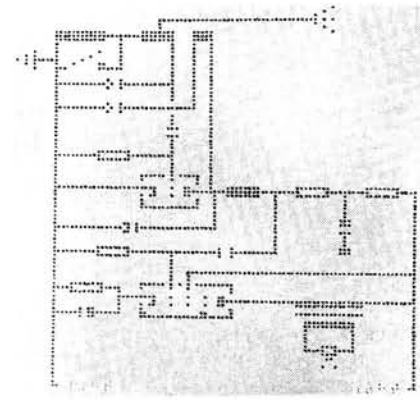
Although this approach enables the position of any junction to be detailed accurately, it is only suitable for linking or branch circuits. A different sort of indicator is required for use in sequences for parent circuits.

Junctions in the latter sequences could be indicated by using a series of isolated numbers per sequence, but this does not meet requirements fully. Since branch circuits may spread out on either side of a parent circuit, two types of indicator are really required in order to show whether a branch exists above or below the parent sequence. This is because the details of a branch circuit which spreads out above the sequence concerned will normally have been given already in an earlier sequence, whereas those for branches which spread out downwards will naturally have to be given in later sequences.

Hence it pays to indicate a junction caused by one of the former branches from whence it originated, and to reserve the series of numbers to mark the places from where branches emanate downwards. The latter description can then be given in numerical order immediately after the sequence concerned.

All this is much more easily explained with an example. An old-fashioned, two waveband, two-valve receiver has been chosen and can be detailed as follows:

```
(a) L1a-TP AE
(b) GD [< L1b 1 L1a / C1V >> C1 G-V1T
(c) [ S1 b-L1a
(d) [ C2V L1c AN-V1T-f
(e) [ R1 G-V1T
(f) [ K-V1T-AN d 1 CH1 2 R2 3 R3 +HT
(g) [ C1T f-CH1
(h) [ R4 G1V2P-G1 C2 f-R2
(i) [ -C1 f-R3
(j) V2P-G2 +HT
(k) [< R5 / -C2 >> K-V2P-AN T1a +HT
(l) !< T1b / LS >!
(m) [-HT
```



Finally the author wishes to express his sincere thanks to two young acquaintances, Paul Dickinson and David Whitby for making it possible for the article to be typed by preparing the necessary computer program required for speech output. **PW**

# Crystal Calibrator

by R. H. Pearson G4FHU

*For those of you who do not own a calibrated signal generator this simple device, based on a crystal controlled oscillator, will provide accurate marker points throughout the h.f. bands. To allow easy identification the output signal can be modulated.*

## SHOPPING LIST

**Resistors**

*¼W 5% Carbon film*

| | | |
|---|---|---|
| 180Ω | 1 | R1 |
| 820Ω | 1 | R4 |
| 22kΩ | 1 | R2 |
| 33kΩ | 1 | R3 |

**Capacitors**

*Electrolytic, miniature radial*

| | | |
|---|---|---|
| 3·3µF | 2 | C2,3 |

*Ceramic Disc*

| | | |
|---|---|---|
| 1nF | 1 | C4 |
| 10nF | 3 | C5–7 |

*Compression Trimmer, mica dielectric*

| | | |
|---|---|---|
| 250pF | 1 | C1 |

**Semiconductors**

*Integrated circuits*

| | | |
|---|---|---|
| 555 | 1 | IC2 |
| 7400 | 1 | IC1 |
| 7490 | 2 | IC3,4 |

**Miscellaneous**

Miniature toggle switches: d.p.d.t., S1–4; s.p.d.t., S5; 1mH inductor, L1, Toko 187LY-102; 1MHz HC6/U crystal and socket; 14-pin d.i.l. sockets (3); 8-pin d.i.l. socket (1); diecast aluminium box 114 × 64 × 30mm; p.c.b.

How Much? & How Difficult? £15 Intermediate

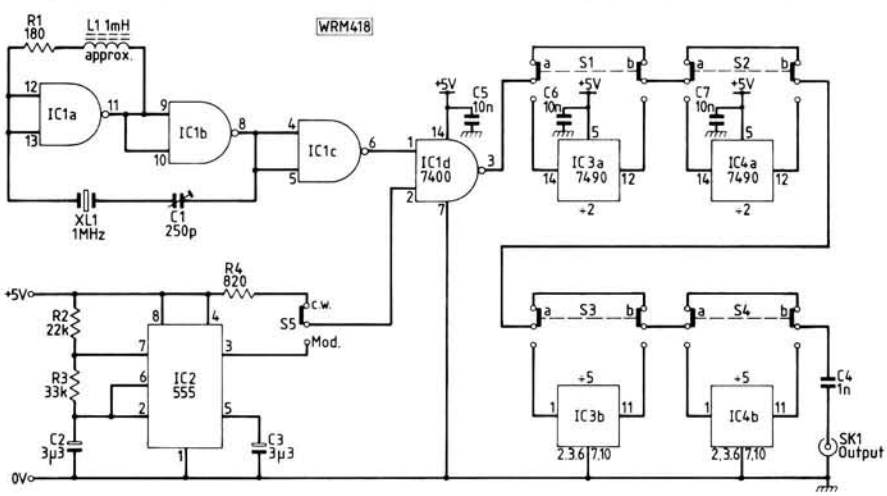
## Circuit Description

The heart of the crystal calibrator is the master oscillator, formed around gates (a) and (b) of IC1. Gate (c) buffers the 1MHz oscillator and gate (d) can be pulsed at about five times a second by the timing circuit formed around IC2. When S5 is set to MOD the output signal from the calibrator can be easily identified amongst the many other whistles normally picked up by the receiver.

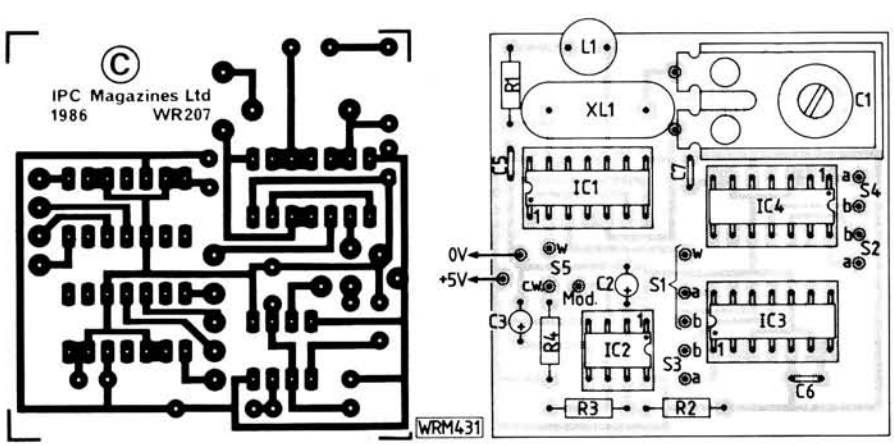
Sub-divisions of the 1MHz oscillator are provided by divider circuits, IC3, 4. By the appropriate selection of toggle switches S1–4, divide-by-two and divide-by-five functions are brought into operation. Resulting outputs occur at 10, 20, 40, 50, 100, 200, 250, 500 and 1000kHz. For example, by depressing S1, S2 and S3, the output frequency will be:

1MHz ÷ 2 ÷ 2 ÷ 5
= 1MHz ÷ 20
= 50kHz.

For ease of construction a p.c.b. layout is shown in Fig. 2. The output is taken from the wiper of S4b via C4 which is mounted between S4 and SK1. **PW**




◀ **Fig. 1: Circuit diagram of the crystal calibrator. Inductor L1 is non-critical and could be based on a toroid core. With S5 set to MOD the output carrier is pulsed to allow easy identification. Useful outputs can be obtained well into the v.h.f. region**




◀ **Fig. 2: Full p.c.b. track pattern and component location details. The 5V d.c. supply should be well regulated to within ±0·25V—current consumption will be approximately 100mA. Setting of the master oscillator is accomplished by adjusting C1 for "zero beat" with a receiver calibrated against a standard frequency transmission. In practice with C1 at half-value the oscillator should be within a few hundred Hz of nominal**

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# Broadside and Endfire Antenna Systems–2

*by F. C. Judd G2BCX*

The function of broadside and endfire antennas is perhaps a little difficult to understand mainly because of the number of variables e.g. the phase relationship of the currents in the radiators, the spacing between them, the height of the system above ground and whether it is horizontal or vertical.

Part 1 dealt with the general principles of such arrays using as an example a simple arrangement of two λ/4 vertical radiators with different spacing between them and the phase relationship of the r.f. current in one radiator with respect to the other. Both determine the radiation pattern and gain of the system relative to a single radiator or dipole.

Broadside and endfire systems are by no means confined to the use of vertical radiators and there are numerous combinations using λ/2 radiators or elements each being directly driven with r.f.

## Endfire Systems with Two λ/2 Elements

Two commonly used endfire systems are illustrated in Fig. 2.1 in horizontal mode, although they can be used vertically. The elements in both are λ/2 and *driven out of phase* with each other i.e., the phase difference between the currents in each element is 180 degrees. The instantaneous direction of the currents is indicated by the arrows. Spacing between the elements may be up to 5λ/8 although maximum gain is obtained when the spacing is λ/8 (refer to Fig. 1.2). As the spacing between the elements is increased the bi-directional patterns begin to break up. Indeed it will be seen from the G. H. Brown patterns that with element spacings greater than λ/2 the radiation patterns become more complex, with up to as many as five separate lobes.

Broadside or endfire systems for amateur radio applications rarely have element spacing in excess of λ/2. For endfire systems the gain over a single radiator is directly related to element spacing, as shown in the graph Fig. 2.2.

With spacing of λ/8 between the elements the gain in each main lobe is a little over 4dB relative to that from a single radiator or dipole. The comparatively high gain obtainable with close spaced driven radiators offers a number of possibilities in antenna design and are even used very effectively in certain types of parasitic arrays with doubled driving elements, such as the ZL special and the G2BCX 16-element v.h.f. antennas[1].

## Endfire Array Radiation Patterns

The radiation patterns illustrated in Fig. 2.3 have been included to further clarify the similarity of the bi-directional radiation with close-spaced endfire arrays regardless of whether they are operated vertically as (a) or horizontally as (b). Note: *These are "free-space" patterns as would be obtained without the presence of ground beneath the antenna.* With all antennas at low height, which is the norm with amateur radio antennas, the presence of ground effects the vertical angle of radiation as a whole which, were it not for the ground beneath, would be maximum in two directions along a line at 90 degrees to the antenna as indicated in Fig. 2.3.

We must therefore, regard the ground as the reference for the vertical angle of radiation. This reference is zero degrees i.e., an angle parallel to ground. Ground beneath the antenna may also modify the radiation pattern by causing additional lobes of radiation to be formed.

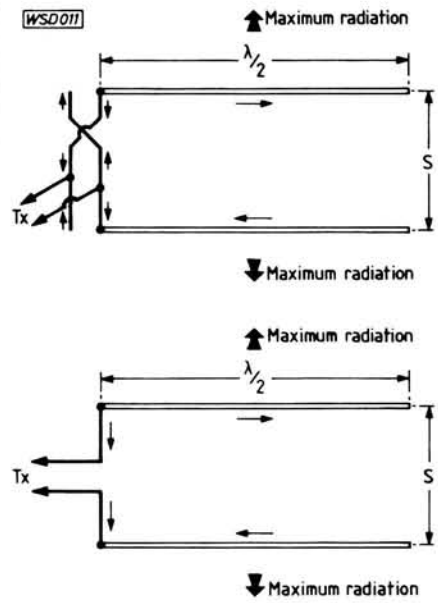



**Fig. 2.1: Two alternative two-element horizontal endfire arrays with element currents in phase-opposition (plan views)**

## Broadside Arrays

Whilst there is some similarity between the functioning of endfire and broadside antenna arrays, the most common spacing between elements for

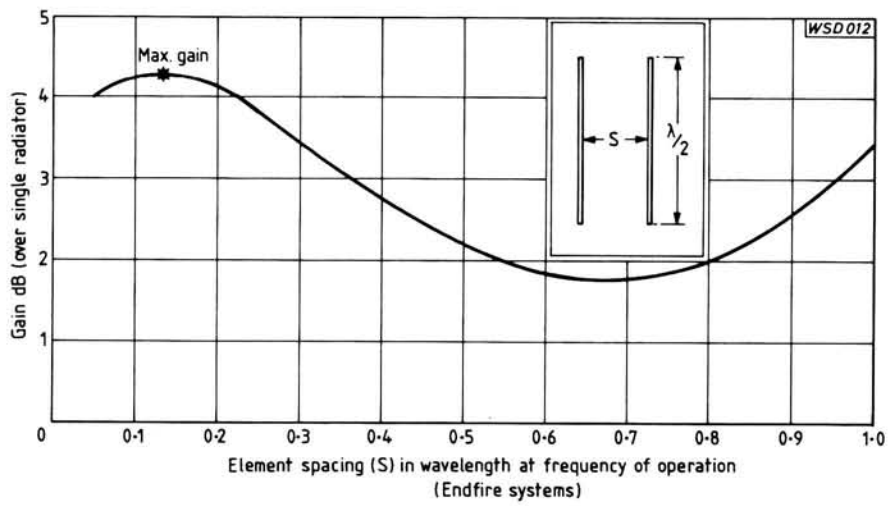
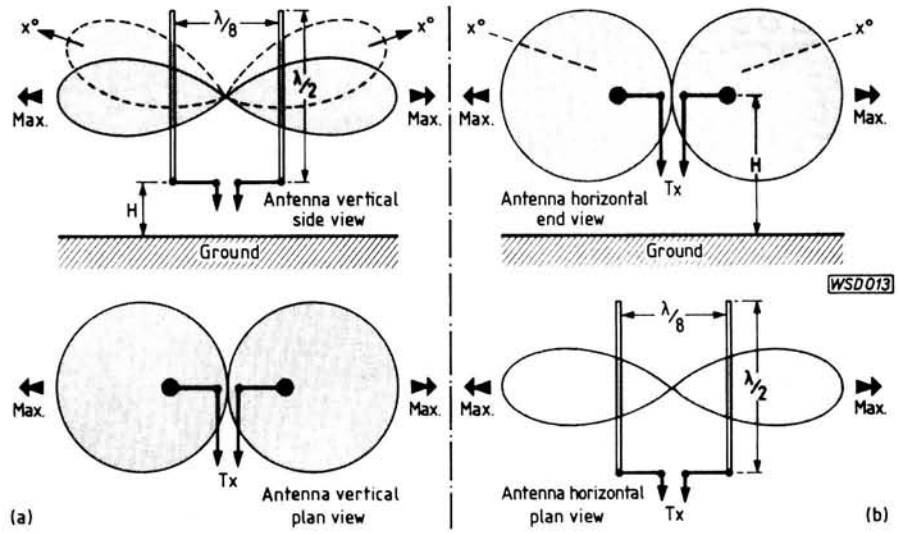


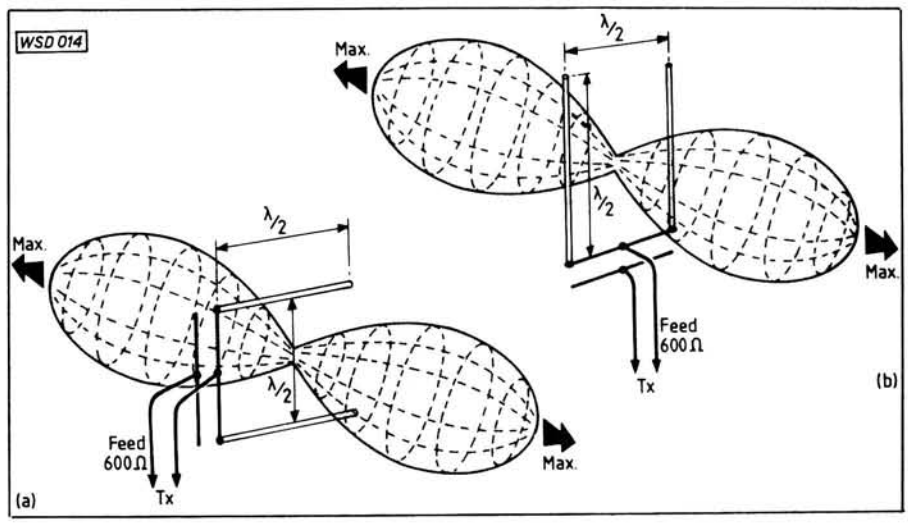

**Fig. 2.2: Spacing versus gain, two-element endfire**

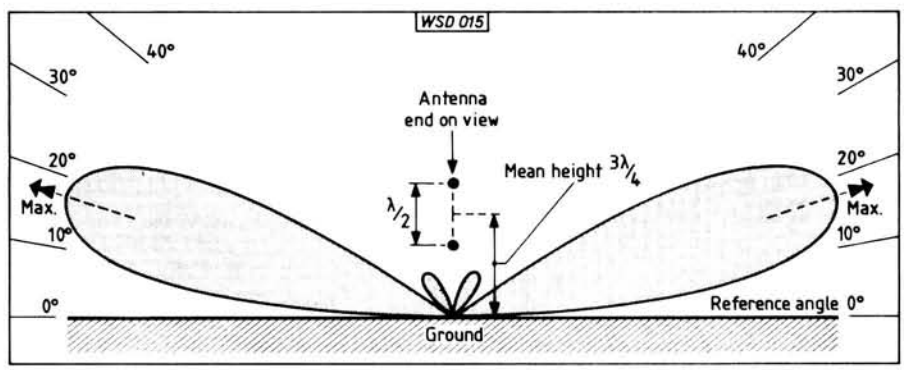
**Fig. 2.3 (Right): two-element free-space radiation patterns, (a) vertical, (b) horizontal. Angle X denotes approx. vertical angle of maximum radiation when operated above ground**

**Fig. 2.4 (Centre): Free-space radiation patterns, (a) horizontally polarised broadside, (b) vertical broadside. Note patterns are identical for either polarisation**

**Fig. 2.5 (Bottom): Radiation pattern of two λ/2 element broadside at 3λ/4 above ground**




broadside arrays is λ/2 and 5λ/8 and with the current in each radiator or element *in phase* (zero degrees). A simple two-element system is illustrated in Fig. 2.4 with (a) being a horizontally polarised system and (b) vertically polarised; each has two λ/2 elements spaced λ/2 apart. The radiation pattern is bi-directional with a gain of 4dB from each main lobe over a single radiator or dipole. The twin lobe shape is the same for either mode of polarisation. A gain approaching 5dB can be obtained with the elements spaced 0·625 to 0·7λ apart as shown by the graph of Fig. 1.3. With this spacing however, two minor lobes are produced at right angles to the main lobes. As the spacing between the elements is increased, toward λ, what were the major lobes of radiation now become very narrow and maximum radiation is in line with the elements i.e., the system becomes endfire (Fig. 1.2).

Under "free space" conditions maximum radiation, from both endfire and broadside antennas, is either in line with the array or at 90 degrees to it. However, the vertical angle of maximum radiation from the main lobes for both vertical and horizontal antennas at various heights above ground is changed. With ground of average conductivity the vertical angle for a horizontal antenna can be derived from arcsin $\frac{A}{4H}$ where $A = 1$ and $H$ = antenna height in λ. A typical example of the vertical angle of radiation from a horizontal two-element broadside array at a mean height of 0·75λ is shown in Fig. 2.5. The equation gives a close approximation to this: arcsin $\frac{1}{4 \times 0{\cdot}75}$ = 19 degrees. In practice the angle may vary slightly e.g., around 18 to 20 degrees, depending on ground conductivity, but is reasonably low enough for DX operation.

## Uni-directional Endfire Arrays

We have seen that with two element close-spaced arrays with the current in the elements in *phase opposition*, bi-directional radiation is obtained and the system is "endfire" as in Fig. 2.1. With two elements suitably spaced, but fed with equal currents 90 or 135 degrees out of phase, the radiation pattern will be in one direction only, at right angles to the plane of the array. In the opposite direction the fields from the two radiating elements cancel.

Radiation pattern is cardioid (heart-shaped) as shown in Fig. 2.6 and may be obtained with an element spacing of λ/8 and with a current phasing of 135 degrees or, with a spacing of λ/4 and a current phase difference of 90 degrees. The former close-spaced element method provides the greatest gain and is the basis of the popular HB9CV and ZL Special two-element 144MHz antennas.

## Array Feed Impedance-Broadside Systems

The elements of a broadside array must be connected by a transmission line system that supplies power in the correct phase to each element. Two methods of interconnection are shown in Fig. 1.4 (a).

The main transmission line is connected to the phasing line at its centre which brings the array element currents in phase. Although no specific data is available with regard to feed impedance, it will in most cases be below 100 ohms at the point where the transmission line joins the phasing line, assuming this has a self-impedance of about 600 ohms. The array ▶

# Working with the Ethodyne Receiver

*John D. Heys G3BDQ could not have written this article without the invaluable help of Mr. J. L. Beech who was formerly an employee of the Burndept Wireless Company. His photographs and reminiscences have allowed the description of a time when there was great competition in the wireless manufacturing industry. J. L. (Jack) Beech has for many years been a personal friend of the writer and it has been a privilege to set to paper a little of what went on in the mid-20's.*

In 1926 there were 120 manufacturers of radio receivers in Great Britain, but only seven of these made sets using the superhet principal. An American, Major E. H. Armstrong invented the superhet whilst serving in France during the First World War, and his patent application was filed in December 1918.

From the birth of broadcasting in the early 1920's and right up to the mid-30's straight receivers were in general use and it was only later that the superhets superseded them. Although they exhibited their usual characteristics of great sensitivity and good selectivity, superhet receivers were not popular because they were expensive and difficult to operate. The oscillator and first detector tuned circuits were not ganged which made tuning a two handed operation. In addition their oscillator radiation could give rise to strong heterodyne interference and was a serious problem. The large number of valves employed in most designs, usually between six and eight, greatly raised production costs, for until 1928 very high Royalties had to be paid for each valve holder used in commercially made receivers.

In 1921 a firm called Burnham and Co. was manufacturing high quality coils and other wireless components in their Deptford factory. The company prospered, changed its name to Burndept, and soon became one of the leading British receiver manufacturers. In 1926 they were producing ten different models. These included a simple crystal set, a special short wave receiver and various other models of t.r.f. or "straight" design. The model at the top of the range however was a magnificent 7-valve superhet called the "Ethodyne". Much of this narrative concerns the "Ethodyne" and its promotion.

## The Ethodyne Receiver

The chief engineer at the Burndept Blackheath works was Mr. Frank Phillips. He worked closely with Ralph Bloxam, a licenced amateur holding the call G5LS. (This call has since been re-issued). The Ethodyne was very much the "brainchild" of Phillips, and it first appeared on the market in 1924. At this time it was far ahead of most available receivers and had few serious rivals in this country or in the USA. Triode valves were used in every stage and a rotatable frame antenna was mounted on to the top of its solid mahogany cabinet. The oscillator coils were within a screened compartment only very very loosely inductively coupled to the first detector (mixer) which had an adjustable regeneration control. This was a novel feature which really enhanced receiver sensitivity and selectivity and did much to put the Ethodyne head and shoulders above its rivals. There were two stages of i.f. amplification at about 125kHz and then a second detector which was in turn followed by an a.f. amplifier. This a.f. stage was *RC* coupled to the power output valve, a DE5A. The valve filaments were run from a 6 volt lead-acid accumulator and there were individual dropper resistors which allowed 5 volts on the filaments of the first six stages. The valves used were not manufactured by Burndept but were sold under their name. An h.t. battery supplied 120 volts for the anodes, and the receiver had two tuning ranges; 545 to 1200kHz (520 to 250m) and approximately 150 to 300kHz (2000 to 1000m). Coils had to be changed when changing waveband and they were of the "plug-in" type. Burndept i.f. trans-

**Jack Beech at the controls of the Ethodyne aboard a GWR train somewhere between Bristol and Cardiff. Colleague Lomax is looking on. The heterodyne wavemeter standing on the receiver cabinet was essential and was used to locate the exact wavelength of wanted and perhaps very weak stations**


**Burning the midnight oil at CNR London Headquarters when tuning for the station CNRA in Canada. Jack is at the controls with other Burndept representatives and a number of CNR officials having their first taste of DX**

formers in circular metal screening cans were a special feature and their excellence contributed much to the overall receiver performance.

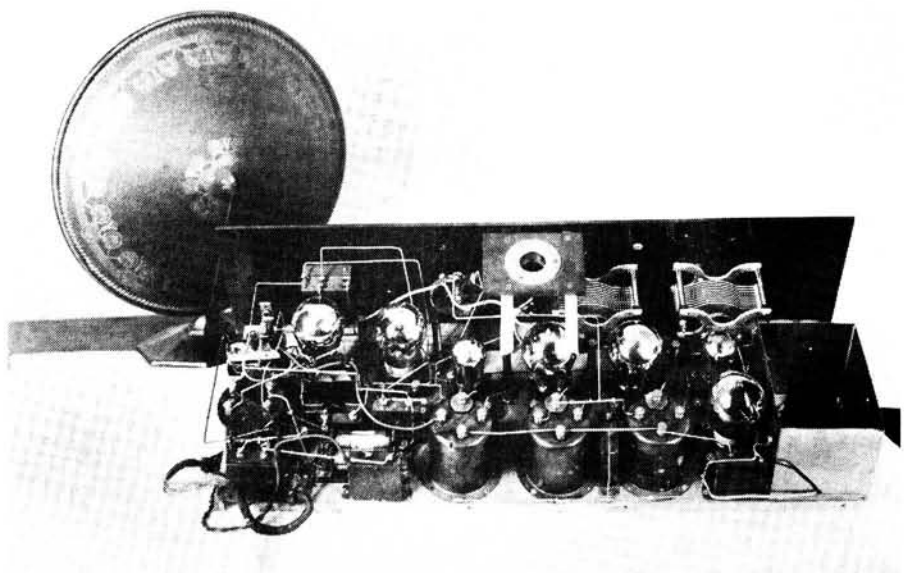
A separate loudspeaker could be supplied as an "extra" and it was named the "Ethovox". The basic price of an Ethodyne receiver was £80 in 1926. Batteries and loudspeaker, if obtained from Burndept added another £15 or so to the total. Almost £100 for a wireless receiver at that time was a staggering price and only the well-to-do could afford such superb apparatus. Most "straight" receivers then cost between £10 and £20 which was far from cheap at that time when such amounts represented one month's wages or salary.

## Working for Burndept

Mr. J. L. (Jack) Beech was about 22 years old when he joined the Burndept Company and his first position was concerned with Showroom Sales and Customer Information. Jack worked at the London HQ of the firm in Aldine House, Bedford Street, Strand, and he does not remember ever visiting their parent factory at Blackheath. His considerable abilities and energy soon caught the eye of the chief of the sales Department, Colonel Ball, and he was quickly promoted up to the Publicity and Demonstration section of the company. This new work took him away from the London premises on numerous occasions and he demonstrated the Ethodyne to many very famous personages. Perhaps the most notable of these was H.R.H. The Prince of Wales, later to be King Edward VIII, who had an Ethodyne set up in St. James Palace. Jack Beech also still treasures a signed photograph and a personal letter from Sir Seymour Hicks, then one of our most outstanding and respected actors. On one occasion when Jack and chief engineer Phillips were in Paris to demonstrate the Ethodyne there was some misunderstanding of identity and Phillips was arrested as a suspected "spy". Jack Beech was warned in time and fled back to the UK on the first available ferry! There was even a question asked in the House of Commons regarding the short arrest of engineer Phillips and the affair was taken most seriously.

We regard in-car radio as a fairly recent development, but Burndept were successfully demonstrating the technique in 1925. By arrangement, the Editor of *Motor* magazine, Jack Beech, a colleague Mr. Lomax and a chauffeur all set off in a large saloon car from central London. Inside the car was an Ethodyne superhet, its loudspeaker, the frame antenna and the sets of batteries! Heavy London traffic gave much motor ignition interference and reception was noisy, but once the vehicle was out in the more open countryside eveything became perfect. The car used for the experiment had been fitted with a supressor on each of its spark plugs and the background noise was minimal. As might have been expected, when the frame antenna was used outside the car the reception improved enormously; but of course this was only possible when stationary.

The tests received an enthusiastic "write-up" in *Motor* and they came to the notice of the Canadian National Railways. This company approached Burndept and asked if good reception was possible from a moving railway train, so another notable experiment was set up by the Sales and Demonstration section. A normal production sample of the Ethodyne was installed in a GWR carriage with the full co-operation of that progressive Railway Company, and it was arranged that the carriage should be part of a train travelling from Bristol to Cardiff. The trip would take the train and the Ethodyne through the Severn Tunnel. Jack Beech and Mr. Lomax were again involved and their task was to impress two officials from the CNR. Good loudspeaker reception was achieved when the frame antenna was alongside the largely wooden wall of the carriage, but results were nil when deep under the Severn! This now seems hardly surprising, but at that time it was a major experiment which proved that reception on the broadcast bands was impossible when the receiver and its antenna were under sea water. This is a problem which still besets the submarine flotillas of all navies.



**A rear view of the "Chinese Copy" of the Ethodyne which was built by Jack Beech, used successfully on board ship. The three cylindrical components are special Burndept i.f. transformers and the circular metal object mounted behind the panel at its centre is the connector for the frame antenna**

## Canadian National Railways

The success of the railway tests had impressed the CNR officials and led to further dealings with their organisation. The Canadian National Railways operated ten private broadcast stations in Canada. These stations were strung along in a chain astride the transcontinental railway route from Halifax in the east to Vancouver in the west. The intention was to provide a radio programme service to the train passengers as they journeyed across Canada and also to serve their local communities. The CNR Company contacted Burndept and asked for another demonstration of the Ethodyne. This time it was to be a stern test, for the intention was to receive the Moncton station CNRA on the first anniversary of its opening with a receiver situated in the Company's London HQ in Cockspur Street. Early in November 1925 the test took place. Although the receiver was within a large London office building fine reception was achieved in the early hours of the morning, and the bevy of CNR officials were very impressed. Jack Beech was Burdept's chief agent in this demonstration and he once told me (whilst a wry smile flickered across his face) that he expected reception problems that night, so on the way to Cockspur Street he purchased a small bottle of beer. He then drank the beer and slipped the empty bottle into his raincoat pocket. On arrival at the CNR office he tied one end of about 18 metres of wire to the neck of the bottle and slid it carefully out of a convenient window high up in the building where the test was to take place. The free end of the wire was connected to the Ethodyne and this extra bit of antenna ensured really solid signals from New Brunswick!

**Fig. 1. The circuit of Jack Beech's superhet which is very similar to that of the Ethodyne. This diagram was used to illustrate an article in the American magazine *Popular Radio* for May 1927. "A" batteries were for the filaments, "B" batteries supplied h.t. and the "C" batteries were for bias**

So impressed were the CNR by the way that Jack Beech had so efficiently set up the receiving demonstration that he was invited to join their organisation and go to work for them in Canada. His task would be to install and supervise the operation of receivers on the transcontinental trains. These receivers would be able to pick up programmes from the ten NCR broadcast stations along the route, and it was hoped that passengers in the rear observation cars would so be helped to pass away the time on a rather long and tiring trip. Jack accepted the offer and prepared to leave.

## A Chinese Copy

For some unknown reason the Canadian National Railways did not buy any Ethodynes for use in Canada. Jack sought for, and received permission to build his own superhet similar in design to the Ethodyne and containing many of the specialised Burndept parts. This receiver was physically rather smaller than the Ethodyne but it used a seven valve circuit with the Burndept frame antenna, valves, coils and i.f. transformers etc.

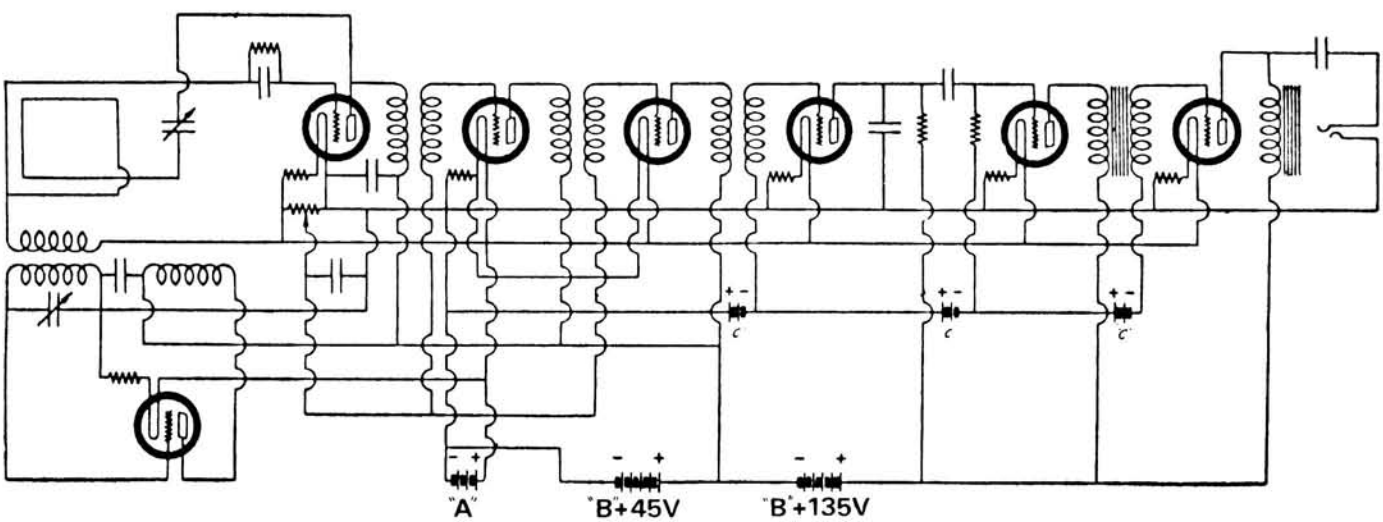
On Saturday November the 6th, 1926, Jack left Southampton Docks in the RMS *Ascania* bound for Canada. He had with him the homemade superhet, and surprisingly the Canadian National Railways had arranged that this receiver could be used on board during the trip. At first Jack tried it from his cabin but found that the metal plating and fixtures limited the effectiveness of the frame antenna. The "bottle-on-the-end-of-a-wire" technique was again used and helped greatly with reception. After a few days the receiver was removed to a more advantageous position on an upper deck and immediately reception became very good. On November 10 when some 1000km out the first American broadcast stations on the medium waveband came through strongly. The next day Jack became quite cross when the Manchester BBC station 2ZY heterodyned and spoiled reception from the American WGY in Schenectady, New York. On this occasion the path to Britain was in full daylight. Other stations in Europe and especially Spain seemed to be "beating their heads" against the many American transmissions. In all thirteen European and twenty four USA and Canadian stations were logged during the voyage, all being received at distances exceeding 625km. The enormous advantages of the superhet as against the then usual "straight" receiver had been amply demonstrated.

The full details of Jack's operations on board the *Ascania* were written up in the May 1927 issue of *Popular Radio*, an American publication, and in the March 1927 issue of the CNR house magazine.

## Conclusion

Jack Beech worked for the Canadian National Railways for about two years, and then he went to the United States to take up employment with General Motors. He remained with that company until his retirement in 1963 when he returned to live in England again. Photography had long been another of Jack's "passions" and for many years both before and after the last War he broadcast on that topic each Saturday from WKAR, the station run by the Michigan State College.

Perhaps the Ethodyne receivers were too good and too expensive for their time, for they failed to ensure the success of Burndept. The company was in great financial difficulty a few years later and they eventually found themselves in the hands of the Official Receiver. A report in *Wireless World* dated August 1928 states that the company had been reconstructed under a new management and directorship. From that time Burndept stopped production of complete receivers and became component specialists once more. The only serious rivals to the Ethodyne were the superhets made by the American RCA and Western Electric companies. Its performance put it years ahead of its time. ***PW***



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| TVHF 230c | 2M-FM Transverter | 334.90 |
| LBPF 144v | Bandpass Filter | 22.40 |
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| 432-17X | 17 Ele Crossed | 49.17 |
| 432-17T | 17 Ele Long | 39.20 |
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| CN630 | 140-450 Mhz cross pointer. Up to 200W | 66.21 |
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| CNW419 | 1.8-30 Mhz 200W tuning unit | 129.50 |
| CNW919 | 2M Power meter and antenna tuning-unit | 159.64 |
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| L200 | 200W Dummy load | 42.55 |
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## YAESU FRG-7700

George G4RNI has sent in a selection of interesting mods for this very popular receiver. He is on his second one and has found that both suffered from various image and cross-modulation problems. However, he has managed to greatly reduce these problems on all but the 1–2MHz range and all for a total cost of approximately 50p.

To carry out the mods it is necessary to completely remove the main p.c.b.—but this is quite a simple job. Start by disconnecting the mains supply and then remove the six screws securing the top cover. Loosen the screws that hold the handle and take off the top cover.

Now take off all the flying leads from the main board and from the f.m. board. These should all be marked with code numbers, which match the numbers on the boards, so it should not be too difficult to replace them later. Undo the two screws that hold the screen behind the digital display and remove this screen.

Next, remove the nine screws that hold in the main p.c.b. and take the board out, taking care not to damage the digital display. Locate the bandpass filter section, which is near to the antenna terminals, and then cut the tracks as described in the following section.

**16–30MHz Filter:** Find R04 and L04, cut the copper track that connects them and then solder a miniature 27pF capacitor across this cut on the p.c.b. Carefully remove capacitor C10 (12pF) and replace it with a 4·7pF one.

**8–16MHz Filter:** Cut the track between C17 and L09 and solder a 39pF capacitor across the cut.

**4–8MHz Filter:** Cut the track between C26 and L14 and solder a 68pF capacitor across the cut.

**2–4MHz Filter:** Cut the track between C35 and L19 and solder a 100pF capacitor across the cut.

**0·15–1MHz Filter:** Remove the two 120pF capacitors C51 and C54 and replace them with 1000pF ones. Solder two more 1000pF capacitors onto the underside of the board, one in parallel with C52 and the other in parallel with C53.

These mods help to prevent cross-modulation. George says that he lives just 3km from a BBC medium wave station and even with his long wire antenna he experiences no break-through at all now.

### Improved FM Selectivity

Start by removing the two plastic pins holding the f.m. board metal cover to the back panel of the set and then withdraw the panel and the board. Remove the two screws that hold the panel to the board and then unsolder and take out the CFU455E ceramic filter. Replace it with a CFU455H (for 6kHz bandwidth) or a CFU455G (for 8kHz bandwidth).

### Brighter FM Audio

While the f.m. board is out of the set, remove capacitor C13 (0·22µF) and replace it with 0·1µF or 0·01µF, depending on the quality of audio that you prefer.

### Improved Bandwidth (AM WIDE)

George thinks that the manufacturer has made this setting too wide for serious use on the broadcast bands so he suggests the following change.

With the main board out of the set, remove CF04 (LFH12) and replace it with an LFH8, which is available from Cirkit. A CFW455G could be used instead but if it is, it will have to have its third earth lead bent over and soldered to the second one before installation.

After modification the bandwidths will be: NARROW <3kHz @ −6dB, 8kHz @ −50dB; MEDIUM 6kHz @ −6dB, 15kHz @ >−50dB; WIDE 8kHz @ −6dB, 18kHz @ <−50dB.

I have not yet tried out these mods on my own FRG-7700 but I certainly intend to and I'll pass on my comments when I do. Meanwhile, thanks for sending them in George.

## ICOM

David G6MOE, has written in with a very simple mod that will convert any Icom pre-amplified microphone into a switchable "noise cancelling" one. He has modified his Icom HM-11 mic and has been using it in the cab of his noisy lorry with good results.

All that is involved is the insertion of a single-pole switch in the negative leg of the 4·7µF capacitor, as shown in Fig. 1. When the capacitor is switched in, the microphone works normally but when it is switched out of circuit, negative feedback is increased and the gain of the pre-amplifier is reduced enough to cut out most background noise. David says

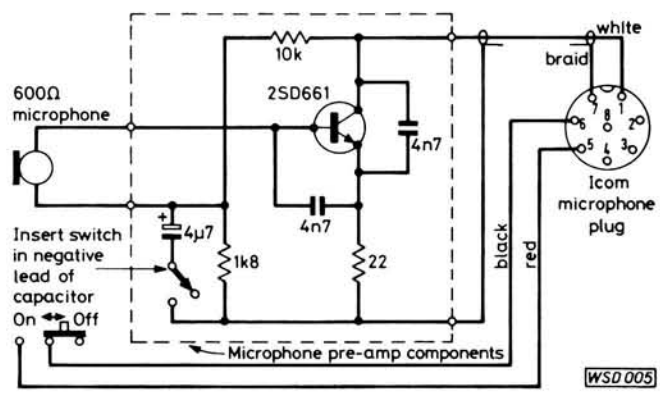



Fig. 1

that there is no need to adjust the deviation inside the rig and the microphone will not need to be "talked up".

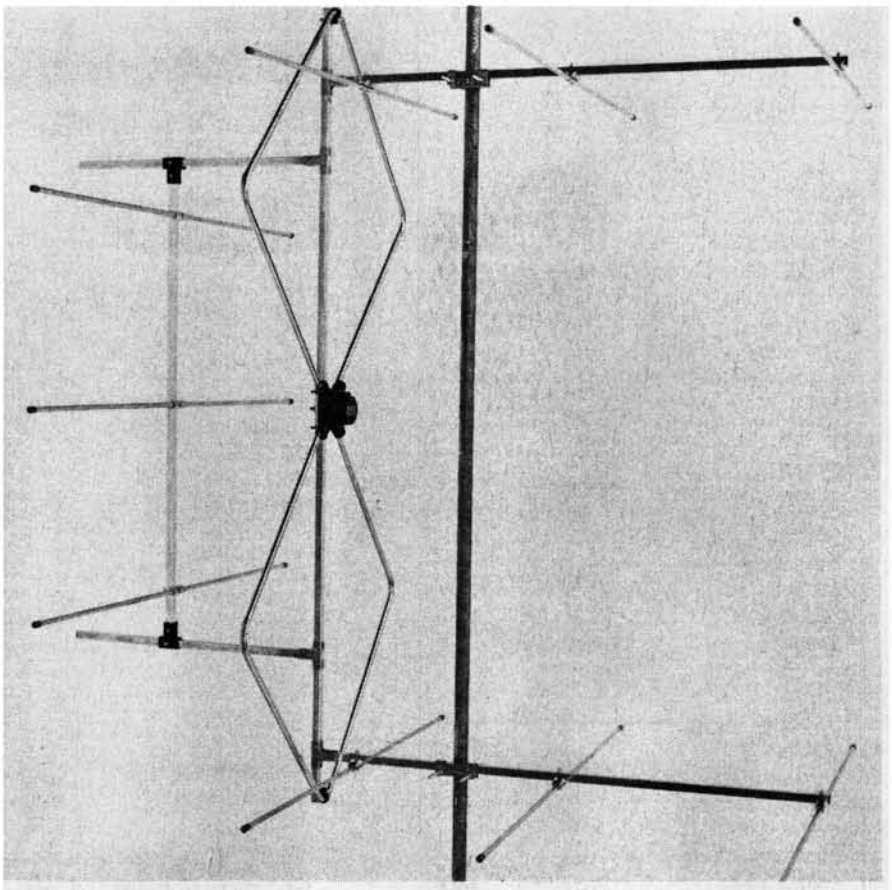
The HM-11 microphone has a slide switch that is used for defeating the SCAN buttons but as this can be done by flicking the p.t.t., it can be used for this mod. Other microphones may not have a spare switch so one will have to be added. If long lengths of wire are used to connect the switch into the circuit, it may be a good idea to run them through ferrite beads.

This method of reducing the gain of Icom pre-amplified microphones makes them more versatile as they can now be used wherever there is background noise. Thanks for sending in the mod David and thanks for the clear diagram.

# PW REVIEW

## Halbar QDX 144MHz Double Quad Yagi

*Need a compact 144MHz band array? PW's antenna constructor extraordinaire John M. Fell G0API evaluates a likely contender*



Regular readers of *PW* may well have read about the results of past antenna exploits and gather that I place a very strong emphasis on the "fundamental transducer". As an old timer once said to me "the more metalwork—the more signal".

Over the years I have endeavoured to follow this basic concept with the largest constructed array currently standing at 400 elements on 1·3GHz (for contest operation/e.m.e.). So it was not without some second thoughts that I was persuaded to remove all the normal metalwork from the top of my Western Ultimast. This action was necessary in order to both accommodate and evaluate the Halbar QDX —the results obtained surprised me.

Those who have read the often excellent DJ9HO *UHF Compendium* will recognise the QDX as a developed version of the Twin-quad—seemingly much loved by our German friends. Sound British engineering has resulted in a compact and sturdy array which can be seen to comprise a double-quad driven element and twin-boom director/reflector assembly.

The distance between the Yagi director booms and the overall length of the array is virtually equal at 1·27m (0·64λ) which may lead you to conclude that such a short structure will be low gain. My measurements indicate that the 14dBi (approx. 12dB over λ/2 dipole) quoted by the manufacturer is realistic and is equivalent in forward gain terms to a 10-element (2·2λ or 4·4m long) NBS Yagi.

Nothing is really for free so where does the gain of the antenna come from? Well go back to the "max metalwork" theory and it becomes clear that the QDX could be thought of as a 13-element system—four λ/4 components in the double-quad driven element, three in the stacked reflector and six directors.

Further measurements taken also confirm the quoted front-to-back ratio of 23dB, which also coincides with the NBS value for a triagonal reflector. Horizontal beamwidth is quoted as 40 degrees, but does not state the reference. Assuming this to be at the 3dB points (the beamheading either side of the peak forward gain at which the signal level has dropped by 3dB i.e. to half its peak value), my measurements indicate the actual figure to be at approximately 50°. The fall-off in forward response is very smooth with the first real nulls (−27dB) occurring at ±70 degrees, rising again before a further −33dB null at ±140 degrees.

In practical terms these figures indicate the directional "selectivity" to be somewhat less than the equivalent Yagi and with current 144MHz activity levels system selectivity at whatever point in the receiving (and transmitting) system is of importance. Conversely the vertical beamwidth (not measured) of the stacked system should be narrower than the Yagi, which will lead to reduced noise pick-up from ground based QRM and an enhanced system noise figure.

Construction of the QDX as mentioned previously is sturdy and should allow survival even on the west coast of GM—the boom is of 15mm × 1·5 wall square section, parasitic elements 10mm diameter and the driven element 12mm diameter.

Setting-up was accomplished on the tilted-over mast at 2m above ground. The reflector stack is adjustable over a horizontal distance of 520mm and was optimised at 270mm behind the driven element on the review sample. A plot of the resulting v.s.w.r. shows 1·15:1 at 145MHz, rising to 1·2:1 at 144 and 146MHz—no problems here. The QDX is quoted at 50Ω impedance—as the system is inherently balanced a 1:1 λ/4 balun should be used with an unbalanced coaxial feeder. However in practice direct connection can be made and will result in an approximately six degree skew of the polar pattern.

So to conclude this review the QDX can be recommended for those with neighbour/planning sensitive locations, will provide very respectable forward gain but does occupy more vertical space on the mast than a conventional Yagi. You could fit rear mounting antennas for higher frequencies between the booms—but may impair the performance to a degree. At an all-up weight of 2·3kg this antenna could be the answer to a lot of peoples problems.

Thanks for the loan of the review QDX go to ***Halbar Aerials, Unit 1, Bury Walk, Bedford, MK41 0DU, Tel: (0234) 44720.*** The QDX currently costs £26 inc. p&p. **PW**

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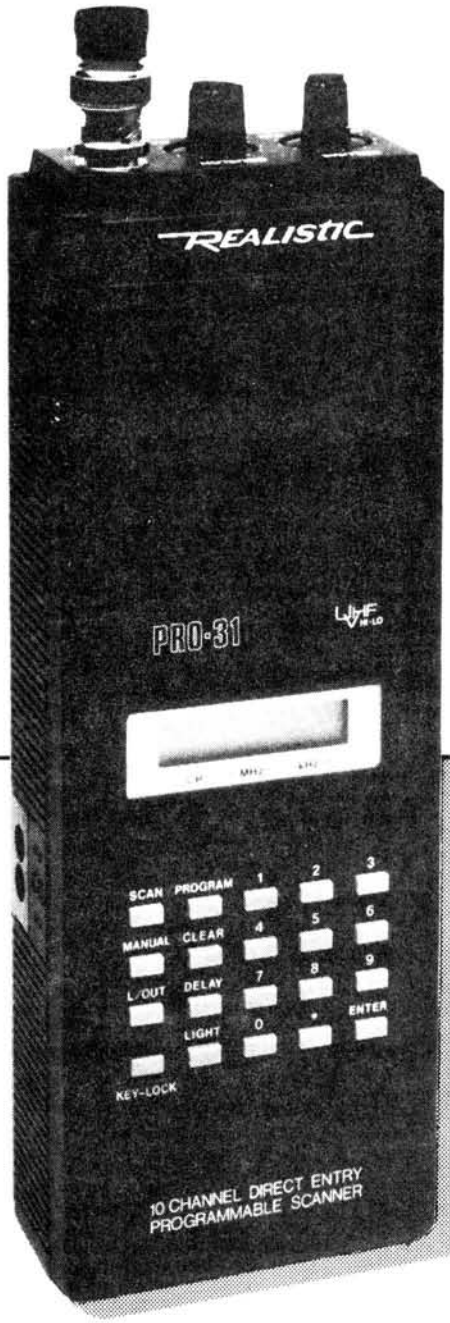


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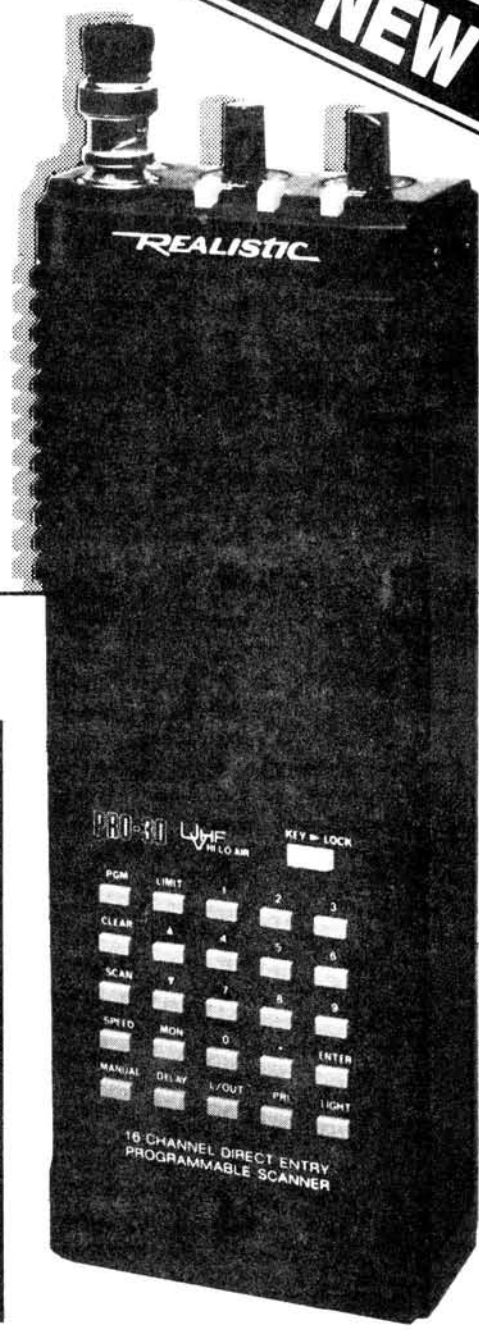


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# Simple Continuity Tester

**by R. H. Pearson G4FHU**

How many times have you needed to do a simple check for electrical continuity (below a few hundred ohms), reached for a multimeter and found the battery exhausted?

This simple indicator needs only a single cell for its d.c. supply and consumes 0·6mA on standby and less than 4mA on "bleep". The circuit works happily with cells that are too tired for most other uses and forms a convenient last resting place for such items!

In operation the item under test is subjected to less than 150mV potential difference, leaving transistor and diode junctions inoperative during tests.

Inspection of the circuit diagram, Fig. 1, will show that the indicator is based on a CA3046 i.c. transistor array, IC1. The left-hand device IC1(a) produces a voltage reference of about 0·6V, whilst IC1(b) is biased about 100mV higher so that it saturates and holds IC1(c) "off" disabling the astable multivibrator formed around IC1(d)/(e).

When a sufficiently low resistance is connected across the test terminals, between the first two bases, IC1(b) comes out of saturation and allows the multivibrator to function. A 10nF capacitor, C1, is included to prevent any tendency to spurious oscillation.

Construction of the indicator is non-critical and a suggested layout based on Veroboard is shown in Fig. 2. **PW**

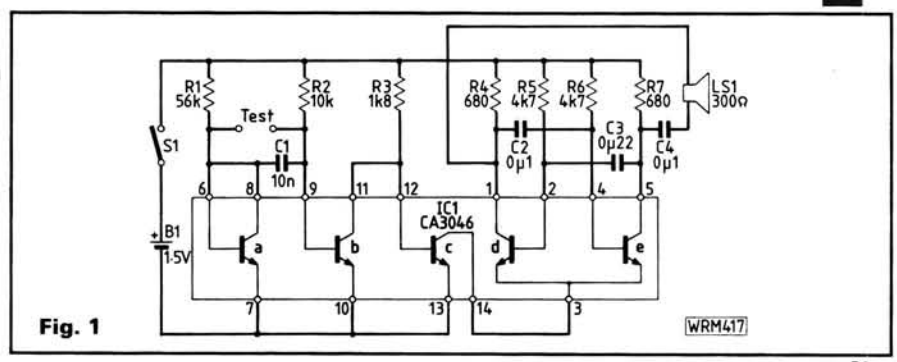



Fig. 1

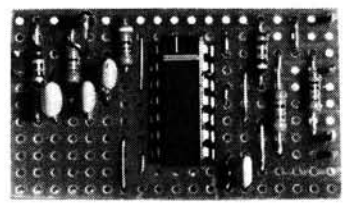
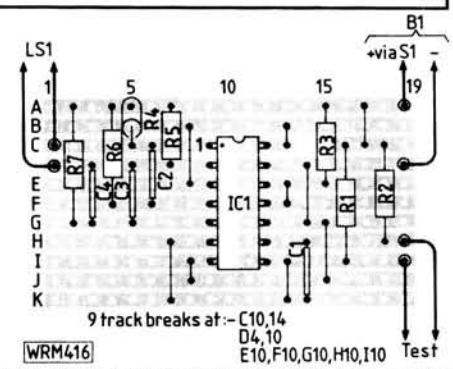


Fig. 2




## SHOPPING LIST

**Resistors**

*¼W 5% Carbon Film*

| | | |
|---|---|---|
| 680Ω | 2 | R4,7 |
| 1·8kΩ | 1 | R3 |
| 4·7kΩ | 2 | R5,6 |
| 10kΩ | 1 | R2 |
| 56kΩ | 1 | R1 |

**Capacitors**

*Monolithic ceramic*

| | | |
|---|---|---|
| 10nF | 1 | C1 |
| 0·1µF | 2 | C2,4 |
| 0·22µF | 1 | C3 |

**Semiconductors**

*Integrated Circuits*

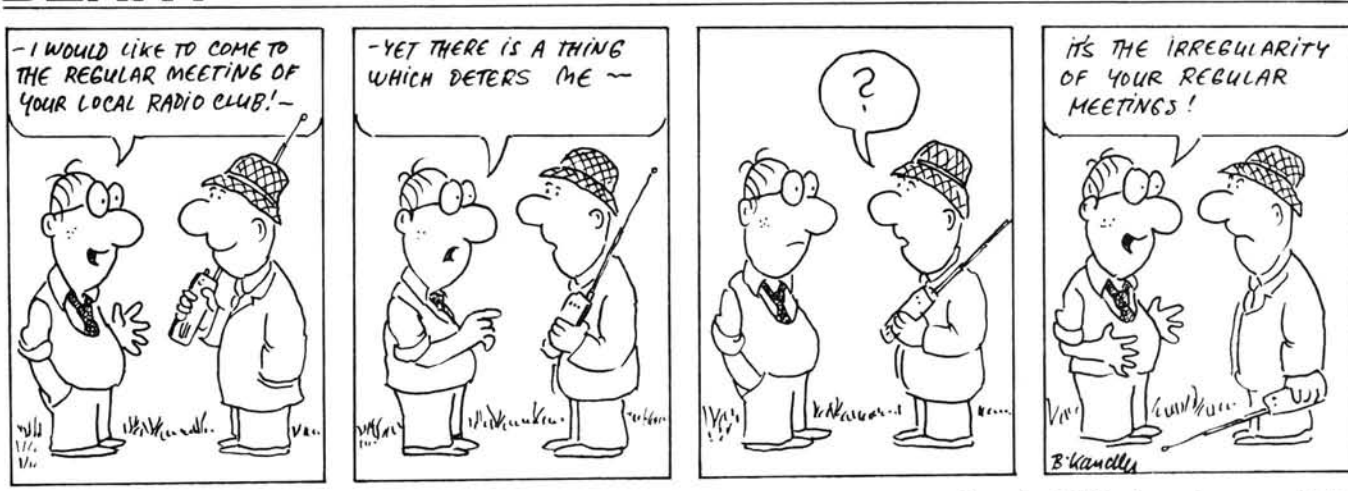
| | | |
|---|---|---|
| CA 3046 | 1 | IC1 |

**Miscellaneous**

14 pin d.i.l. socket; 300Ω Telephone earpiece, LS1; Test terminals (2); s.p.s.t. miniature toggle switch; 0·1in Veroboard; Plastics case.



## BENNY



# CLUB NEWS

**Compiled by Eric Dowdeswell G4AR**
Reports to: Eric Dowdeswell,
57 The Kingsway, Ewell Village,
Epsom, Surrey KT17 1NA
**PLEASE MARK "CLUB NEWS"**

## Avon

**City of Bristol RSGB Group: C. R. Hollister G4SQQ (Bristol 508451).** Meets 7.30pm in the Small Lecture Theatre, University Walk, University of Bristol, Clifton. Dec 16—Xmas Celebrations.

**North Bristol ARC: Ted Bidmead G4EUV, 4 Pine Grove, Northville, Bristol.** Meets Fridays, 7pm at the SHE Centre, 7 Braemar Crescent, Northville. Dec 27—Xmas Party.

**South Bristol ARC: Len Baker G4RZY (Whitchurch 834282).** Meets Wednesdays, 7.30pm in the Whitchurch Folk House, East Dundry Road, Whitchurch. Dec 11—h.f. Activity; 18th—Families Xmas Evening.

## Bedfordshire

**Dunstable Downs RC: Phil Morris G6EES (Dunstable 607623).** Meets Fridays, 8pm in Room 3, Chews House, High Street South, Dunstable. Dec 6—Constructors' Competition; 13th—"A Backwards Look at '85"; 21st—Xmas Party; Jan 3—"Idiots" Construction Competition.

**Leighton Linslade RC: Ian Jardine G1ACQ (Leighton Buzzard 376741).** Meets 1st and 3rd Mondays, 7.30pm in Room A64, Vandyke CC, Vandyke Road, Leighton Buzzard.

**Shefford & District ARS: Alan Little G4SPO (Hitchin 57946).** Meets Thurdays, 8pm in the Church Hall, Ampthill Road, Shefford. Dec 12—Constructors' Contest; 19th—Chairman's Social Evening.

## Berkshire

**Reading & District ARC: Chris Young G4CCC, 18 Wincroft Road, Caversham, Reading.** Meets alternate Tuesdays, 8pm at the White Horse, Emmer Green, Reading. Dec 10—AGM; 17th—Xmas Social.

## Buckinghamshire

**Maidenhead & District RC: Bob Fowler G3IQF (Marlow 6421).** Meets 1st Thursdays and 3rd Tuesdays, 7.30pm at the Red Cross Hall, The Crescent, Maidenhead.

## Cambridgeshire

**Greater Peterborough ARC: Frank Brisley G4NRJ (Peterborough 231848).** Meets 4th Thursdays, 7.30pm in Southfields Junior School, Stanground, Peterborough. Dec 12—Social.

## Central

**Falkirk & District ARC: Brian Waddell GM4XQJ (Falkirk 31258).** Meets 1st and 3rd Wednesdays, 7.30pm in the Grange Centre, Brightons, nr Falkirk. RAE and c.w. on Tuesdays.

## Cheshire

**Chester & District RS: Alan Warne G4EZO (Chester 40055).** Meets 2nd, 3rd, 4th and 5th Tuesdays, 8pm at Chester RUFC, Hare Land, Vicars Cross, Chester. CW from 7.15pm. Dec 11—Construction Contest; 17th—Xmas Buffet.

## Clywd

**Alyn & Deeside ARS: G. C. Cook GW4RKX (Deeside 660066).** Meets alternate Mondays, 8pm in Shotton Social Club, Shotton Lane, Shotton. Dec 16—Xmas Party.

**Conwy ARC: Nigel Vicars-Harris (Conwy 636376).** Meets 2nd and 4th Thursdays, 8pm at Green Lawns Hotel, Bay View Road, Colwyn Bay. Dec 12—Talk by N. Wales Police Crime Prevention Officer.

## Cornwall

**Cornish RAC: Tony Bevington G4ZUI (Stithians 860572).** Meets 1st Thurdays, 7.30pm in the Church Hall, Treleigh. 1st Thursdays—General Meeting; 2nd Mondays—Computer Club; 3rd Mondays—Constructors' Workshop; January 2—"Beetling around Africa" by G3WKP.

**Plymouth ARS: John Veale G4SCA (Plymouth 337980).** Meets alternate Mondays, 7.30pm at the Plymouth Albion RFC, Beacon Park, Peverell, Plymouth.

## Cumbria

**Carlisle & District ARS: Tony Leach G4WOQ (Scotsby 500).** Meets Mondays, 7pm in the Scout Hut to the rear of Trinity School, Carlisle.

**Eden Valley RS: Alison Telford G4XPO, Ivy House, Culgaith, Penrith.** Meets 3rd Thursdays, 7.30pm in the Kings Arms, Temple Sowerby, on the A66. Dec 19—Buffet/Dance.

**Westmorland RS: Gordon Chapman G1IIE, 61 Rusland Park, Kendal.** Meets 2nd Tuesdays, 8pm at the Strickland Arms, Sizergh, nr Kendal.

## Derbyshire

**Bolsover ARS: David Fleetwood G1GNC (Chesterfield 824061).** Meets Wednesdays, 7.30pm in the Black Bull, Bolsover.

**Glossop & District ARG: G. Sims G4GNQ, 85 Surrey Street, Glossop.** Meets last Thursdays, 8pm in the Nags Head Hotel, Charlestown Road, Glossop.

## Devon

**Axe Vale ARC: Bob Newland G3VW (Lyme Regis 5282).** Meets 1st Fridays, 7.30pm in the Cavalier, West Street, Axminster. Dec 6—Annual Dinner; January 3—Construction Contest.

**Exmouth ARC: Des Thompson, Four Winds, 131 St John's Road, Exmouth.** Meets alternate Wednesdays, 7.30pm in the Scout Hut, Marpool Hill, Exmouth. Dec 18—Next Meeting.

**Tiverton (SW) RC: G. W. Draper G4ZNV (Crediton 235).** Meets Tuesdays, 7.30pm in the Half Moon Inn, Fore Street, Tiverton.

**Torbay ARS: Brian Wall G1EUA, 48 Pennyacre Road, Teignmouth.** Meets Fridays and last Saturdays, 7.30pm in the ECC Social Club, Ringslade Road, Highweek, Newton Abbot. Dec 21—Xmas Party.

## Dyfed

**Aberporth RAC: Frank Thomas GW6RDR (Cardigan 87274).** Meets Thursdays, 7pm in Building 17, Royal Aircraft Establishment, Aberporth.

## Essex

**Braintree & District ARS: David Willicombe G6CJA (Braintree 45058).** Meets 1st & 3rd Mondays in Room 1, Braintree CC, Victoria Street, Braintree. Dec 16—Xmas Party.

**Havering & District ARC: D. St. J. Gray G0BOI (Hornchurch 41532).** Meets Wednesdays, 8pm at Fairkytes Art Centre, Billet Road, Hornchurch.

## Gloucestershire

**Cheltenham ARA: Tim Kirby G4VXE (Cheltenham 36723).** Meets 1st and 3rd Fridays, 7.30pm in the Stanton Room, Charlton Kings Library, Cheltenham. Dec 6—AGM.

**Smiths Industries RS: Roger Hawkins G8UJG (Cheltenham 673333 ext 2557).** Meets alternate Thursdays, 8pm in the S&SC, Evesham Road, Bishops Cleeve, Cheltenham. Dec 12—Xmas Fayre.

## Gwent

**Abergavenny & Nevill Hall ARC: J. B. Davies GW4XQH, 109 Croesonen Parc, Abergavenny.** Meets Thursdays, 7.30pm in Pen-Y-Fal Hospital, above Male Ward 2. The club is a registered centre for the RAE.

**Pontypool ARS: Ivor Wilkinson GW4RJA (Cwmbran 72110).** Meets Tuesdays, 7pm at The Settlement, Rockhill Road, Pontypool.

## Hampshire

**Amateur Radio & Computer Club: Trevor Tugwell G8KMV (Fareham 43031 ext 2591).** Meets every 4th Friday, 8pm in the Crown, Bishops Waltham. Dec 13—Xmas Social.

**Binstead ARS: A. F. Knight G4RTT (IoW 295951).** Meets Wednesdays, 7.30pm at the 1st Ryde/1st Binstead Scout HQ, Binstead.

**Fareham & District ARC: Brian Davey G4ITG (Fareham 234904).** Meets Wednesdays, 7.30pm at the Porchester CC, Westlands Grove, Porchester. CW at 7pm. Dec 18—The g.d.o. by G4ITF.

**Three Counties ARC: Keith Tupman G0BTU (Petersfield 66489).** Meets alternate Wednesdays, 8pm in the Railway Hotel, Liphook. Dec 11—Quiz.

## Hereford & Worcester

**Droitwich ARC: Gordon Taylor G4HFP (Stourport-on-Severn 3818).** Meets 2nd and 4th Mondays, 8pm in the Scout HQ, Union Lane, Droitwich.

**Hereford ARS: F. E. G. Cox G3WRQ, 35 Thompson Place, Hereford.** Meets 1st and 3rd Fridays, 7.30pm in the County Council CD HQ, Gaol Street, Hereford. Dec 30—Annual Quiz; Jan 3—Audio/Visual Show.

## Hertfordshire

**Cheshunt & District ARC: Roger Frisby G4OAA (Hoddesdon 464795).** Meets Wednesdays, 8pm in the Church Room, Church Lane, Wormley. Dec 6—Xmas Dinner; 11th—Video by G4OAA; 18th—Social Evening.

**Verulam ARC: Hilary Claytonsmith G4JKS (St Albans 59318).** Meets 2nd & 4th Tuesdays, 7.30pm at the RAFA HQ, New Kent Road, off Marlborough Road, St Albans. Dec 17—AGM and Social.

**Welwyn Hatfield ARC: Dave Fairbanks G0AII (Welwyn Garden 326138).** Meets 1st & 3rd Mondays, 8pm at the Knightsfield Scout HQ, Welwyn Garden City. CW on Thursdays. Dec 16—Workshop Evening.

## Humberside

**Grimsby ARS: G. J. Smith (Grimsby 887720).** Meets Thursdays, 8pm at the Cromwell SC, Cromwell Road, Grimsby.

**Hornsea ARC: N. A. Bedford G4NJP, 39 Hamilton Road, Bridlington.** Meets Wednesdays, 8pm in the Mill, Atwick Road, Hornsea.

## Kent

**Bredhurst R&TS: A. S. White G4EGH (Medway 388760).** Meets Thursdays, 8.15pm at the Parkwood CC, Parkwood, Rainham. Dec 12—Construction Contest.

**Dartford Heath DF Club: Peter Sharman G8DYF (Greenhithe 844467).** Normally meets at the Horse & Groom, Leyton Cross, Dartford Heath, prior to hunt. Dec 17—EGM (9pm).

**Hilderstone RS: Annette Penfold GOBEX (Canterbury 812723).** Meets Fridays, 7.30pm at the Hilderstone AEC, St. Peters, Broadstairs.

**SE Kent (YMCA) ARC: John Dobson (Dover 211638).** Meets Wednesdays, 7.45pm at the Dover YMCA, Godwynehurst, Leyburne Road, Dover. Dec 11—Microwaves by G8FEZ; 18th—Xmas Social.

**West Kent ARS: Nigel Peacock G4KIU (Tunbridge Wells 33586).** Meets Fridays, 8pm in the AC Annex, Quarry Road, Tunbridge Wells. Dec 6—Annual Dinner at the Star & Eagle, Goudhurst.

**Maidstone ARS: Peter Pickering G3ORP (Maidstone 29462).** Meets Fridays, 7.30pm at the YMCA Sports Centre, Crip le Street, Maidstone.

## Lancashire

**Bury RS: Miss C. J. Ashworth G1PKO (061-764 5018).** Meets Tuesdays, 8pm at the Mosses CC, Cecil Street, Bury. Dec 10—AGM.

**Fylde ARS: H. M. Fenton G8GG (Lytham 725717).** Meets 1st & 3rd Tuesdays, 7.45pm in the Kite Club, Blackpool Airport. Dec 17—Hot-pot Supper and Xmas Party; Jan 7—AGM.

**Morecambe Bay ARS: W. E. Delamere G3PER (Heysham 52659).** Meets Mondays, 7.30pm in the canteen, Luneside Eng. Co., Mill Lane, Halton. Dec 9—Police Wireless Workshops Visit; 16th—Hot-pot Supper for all the family; 23rd & 30th—no meeting.

**Rossendale Valley ARC: Lee Standley G1EIU (Rossendale 214411).** Meets Thursdays, 8pm at the Bishop Blaize Hotel, on A56, Rawtenstall.

**Skelmersdale & District ARC: Gordon Crowhurst G4PZY (Ormskirk 894299).** Meets Thursdays, 8pm at the Beacon Park Centre, Dalton Lane, Skelmersdale. Dec 12—SSTV; 19th—Xmas Social and Quiz.

**Thornton Cleveleys ARS: E. E. Milne G4WIC (Blackpool 821827).** Meets Mondays, 7.45pm at the 1st Norbreck Scout HQ, Carr Road, Bispham, Blackpool.

## Lincolnshire

**Lincoln SWC: Pam Rose G4STO c/o Club Address.** Meets 3rd Wednesdays, 8pm at the City Engineers Club, Central Depot, Waterside South, Lincoln. Dec 11—Xmas Buffet.

**Sleaford & District ARC: Dave Beilby G2HHK (Sleaford 304454).** Meets 3rd Sundays, 7.45pm at the Hale Magna Village Hall, Great Hale. A new club looking for members.

## London

**Acton, Brentford & Chiswick ARC: Bill Dyer G3GEH, 188 Gunnersbury Avenue, Acton, W3.** Meets 3rd Tuesdays, 7.30pm at the Chiswick Town Hall, High Road, Chiswick, W4. Dec 17—50MHz Band by G1ARQ.

**Grafton RS: John Kaine G4RPK, 74 Camden Mews, NW1.** Meets 2nd and 4th Fridays, 8pm at the Five Bells, East End Road, East Finchley.

**Wimbledon & District ARC: George Cripps G3DWW (01-540 2180).** Meets 2nd and last Fridays, 8pm at the St John Ambulance HQ, 124 Kingston Road, SW19. Dec 13—Xmas Social.

## Merseyside

**Wirral ARS: Cedric Cawthorne G4KPY (051-625 7311).** Meets 1st and 3rd Wednesdays, 7.45pm in the Parish Hall, Heswell.

## Middlesex

**Edgware & District RS: John Cobley G4RMD (Hatfield 64342).** Meets 2nd and 4th Thursdays, 8pm in the Watling CC, 145 Orange Hill Road, Burnt Oak, Edgware. Dec 12—Junk Sale.

## Nottinghamshire

**Mansfield ARS: Angela Fisher G1DZH (Mansfield 652812).** Meets 1st Fridays & 3rd Tuesdays at the Victoria Social Club, Mansfield. Dec 6—Buffet and Disco; 17th—Club Projects.

**ARC of Nottingham: Ian Miller G4JAE (Nottingham 232604).** Meets Thursdays, 7.30pm at Sherwood CC, Woodthorpe House, Mansfield Road, Sherwood. Dec 19—Xmas Party.

**Oldham ARC: Kath Catlow G4ZEP (061-624 7354).** Meets Thursdays, 8.30pm at the Moorside Conservative Club, Ripponden Road, Moorside, Oldham. Jan 26—1st Mobile Rally at Birch Hall Hotel.

**Worksop ARS: Carole Gee G4ZUN (Worksop 486614).** Meets Tuesdays, 7.30pm at the Sub-Aqua Club, The Maltkins, Gateford Road, Worksop. Dec 10—Quiz; 20th—Xmas Buffet and Disco at the Worksop Miners Welfare, Gateford Road.

## Shropshire

**Salop ARS: Simon Price G6OMJ (Shrewsbury 67799).** Meets Thursdays, 8pm in the Olde Bucks Head, Frankwell. Dec 19—Xmas Social.

**Telford & District ARS: Tom Crosbie G6PZZ (Telford 597506).** Meets Wednesdays, 8pm at the Dawley Bank CC, Bank Road, Dawley. Dec 11/18—Club Project a g.d.o.; 20th—Xmas Social at the Station Inn, Horsehay, Telford.

## Somerset

**Yeovil ARC: Eric Godfrey G3GC (Yeovil 75533).** Meets Thursdays, 7.30pm at the Recreation Centre, Chilton Grove, Yeovil. Dec 12—Thick Film Hybrid Circuit by G3ETA; 19th—AFS Contest by G3GC; Jan 2—Tuned Circuits G3MYM.

## Staffordshire

**Cannock Chase ARS: B. Robinson G1FEC (Cannock 74521).** Meets Thursdays, 8pm at the Bridgtown War Memorial Club, Bridgtown.

**Stafford & District ARS: Tony Bairstow G4RSW (Stafford 46306).** Meets Tuesdays, 8pm in the Coach and Horses Motel, Weston (A51).

## Strathclyde

**Ayr ARG: R. D. Harkness GM3THI (Ayr 42313).** Meets alternate Fridays, 7.30pm on the Wellington Leisure Centre, Wellington Square, Ayr. Dec 13—RSGB Video.

## Suffolk

**Ipswich RC: Jack Toothill G4IFF (Ipswich 44047).** Meets 2nd and last Wednesdays, 8pm in the Rose and Crown, 77 Norwich Road, Ipswich. Dec 11—"Guess What" by G4HMF.

## Surrey

**Coulsdon ATS: Alan Bartle (01-684 0610). Meets 2nd Mondays and last Thursdays, 7.45pm in St Swithin's Church Hall, Grovelands Road, Purley. Dec 9—AGM.**

**Dorking & District RS: J. Greenwell G3AEZ (Newdigate 236).** Meets 2nd and 4th Tuesdays, 8pm in the Star and Garter Hotel, Dorking, for informal meetings, others at Ashcombe School. Jan 28—AGM.

**Sutton & Cheam RS: Alan Keech G4BOX, 26 St Albans Road, Cheam.** Meets 3rd Fridays, 7.30pm at the Downs LT Club, Holland Avenue, Cheam. Dec 20—Xmas Get-together.

**Thames Valley ARTS: John Pegler G3ENI (East Horsley 4279).** Meets 1st Tuesdays, 8pm in Thames Ditton Library, Watts Road, Thames Ditton.

## Sussex

**Chichester & District ARC: C. Bryan G4EHG (Chichester 789587).** Meets 1st Tuesdays and 3rd Thursdays, 7.30pm in the Fernleigh Centre, 40 North Street, Chichester. Dec 19—Xmas Social.

**Crawley ARC: Dave Hill (Crawley 882641).** Meets 2nd and 4th Wednesdays, 8pm at the United Reform Church, Ifield Drive, Ifield. Dec 11—Xmas Supper G4TVC on Crawley 28612 for details.

**Hastings Electronic & RC: Dave Shirley G4NVQ (Hastings 420608).** Meets 3rd Wednesdays, 7.45pm in West Hill CC, Croft Road, Hastings, and Fridays, 8pm in the Club Room, Ashdown Farm CC, Downey Close, St Leonards-on-Sea. Dec 18—Xmas Social at Ashdown Farm CC.

## Warwickshire

**Atherstone ARC: Roy Fuller G6YQU (Chapel End 393518).** Meets 2nd and 4th Mondays, 7.30pm in the Physics Lab, Atherstone Upper School, Long Street, Atherstone. Dec 9—Social Buffet with entertainment for members and guests at the Bull, Witherley.

**Rugby ATS: Kevin Marriott G8TWH, 41 Foxon's Barn Road, Brownsover, Rugby.** Meets Tuesdays, 7.30pm in the Cricket Pavillion, BTI Radio Station, "B" Building Entrance, Hillmorton on the A5. Dec 17—Xmas Party.

**Stratford upon Avon & District ARC, David Boocock G8OVC (S-u-A 750584).** Meets 2nd and 4th Mondays, 7.30pm in the Baptist Church, Payton Street, S-u-A. Dec 9—Severn Trent Telemetry System by G8TWH; 23rd—Xmas Get-together.

## West Midlands

**South Birmingham RS: Tim Scrimshaw G8RGQ (021-459 8312).** Meets 7.45pm in the West Heath CC, Hamstead House, Fairfax Road, West Heath. Dec 11—Xmas Party and Construction Contest.

**Midland ARS: Norman Gutteridge G8BHE, 68 Max Road, Quinton, Birmingham.** Meets every week night in Unit 5, Henstead House, Henstead Street, off Bromsgrove Street, Birmingham 5. Note the new venue.

**Mirfield RC: C. Marks G4ZPJ, 63 Alvis Walk, Chelmsley Wood, Birmingham.** Meets Mondays, Tuesdays, Wednesdays and Thursdays, 7.30pm at the Mirfield CC, Yockelton Road, Lea Village, Birmingham. Club 'phone number is 021-783 5898.

**Willenhall & District ARS: John Phillips G4UPF (Wombourne 782076).** Meets Wednesdays, 8pm at the Cross Keys, Prouds Lane, Willenhall.

**Wolverhampton ARS: Keith Jenkinson G1OIA (Wolverhampton 24870).** Meets Tuesdays, 8pm at Wolverhampton Electricity S & SC, Chapel Ash, Wolverhampton. Dec 17—Xmas Social.

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# ON THE AIR

## AMATEUR BANDS

by Eric Dowdeswell G4AR

*Reports to: Eric Dowdeswell G4AR, 57 The Kingsway, Ewell Village, Epsom, Surrey KT17 1NA.*
*Logs by bands in alphabetical order.*

Common complaint of readers is the continuing decrease of activity on the h.f. bands, but with the sunspot count down to almost zero it is hardly surprising! This state of affairs could last well into 1986 before any upturn manifests itself. I'm afraid the odd sunspot that does appear now and again will have little effect on the general trend. The 14MHz and 3·5MHz bands are about the only bands with much traffic on them at the moment.

### DX Bands

A first letter from **A. Topping** of Selby, North Yorks, aged 15, who runs an FRDX-400 with a CB antenna. Hope he can put up a decent antenna 'ere long! So far mainly European stations with the odd W on 14MHz.

Another newcomer is **Bruce Milburn** of Alfreton, Derbys, also aged 15, who has been doing quite well with the DX on his Realistic DX-200 receiver and a 40m-long wire and home-brew a.t.u. On the 3·5MHz band he caught CT2CB, EA8ANR, EA9NW, JR6YAH, JW0A, VK2AEA, VO1FG, 4X4VE and 9H1ED. On 7MHz it was just TF6JZ and VK2APK among the QRM. The 14MHz band produced DU9RG, LU5DKI, T77V, and a stack of W's.

**Melvyn Dunn BRS86500** of Grimsby runs a Yaesu FRG-7700 with a 40m-long antenna. Among interesting QSLs received lately are ZD7CW, CN2AQ and HB0CFD. The 3·5MHz area produced just JW0A with cards to SP2HMT, while 7MHz came up with CN8ES (QSL WA3NCP), HH7PV and TZ6WC (QSL D44BC). Up to 14MHz and PZ5ES, TZ6FS, KP4BZ, ZB2EO and VP5WE plus 8P9AB with cards to POB 1213 Bridgetown, Barbados.

In New Malden, Surrey, **Robert Parsey BRS85875** has an FRG-7700 with matching a.t.u. fed from a 20m-long inverted Vee or a 60m-long horizontal wire. Good ones logged around 3·8MHz were CT2CB, EA9NW, HK5ISX, TI2KD, VP2MLD V3CQ (QSL WA6VNR), and 4U1ITU. Just two on 7MHz were A71AD and J5WAD but on 21MHz he found KH0AC (QSL K7ZA), 7Q7LW (QSL POB 24 Mtakataka), and 4U1VIC in Austria.

**Marcus Walden** of Harrogate, using a DX-302 and 30m-long antenna copped HB0/DL1GBM and JW0A on 3·5MHz, HP1BGV and 9K2EK (QSL POB 533, Safat, Kuwait) on 7MHz and then KP2AM, PJ2HB, TR8DR, TU4BR (QSL KN4F), XE3RT and 8P6JQ, all on 14MHz band. Only logging on 21MHz was TL8CK.

In Bolton, Lancs, **Michael Sargeant** stuck to listening on the 14MHz band with his DR49 and active antenna AO370 from Datong. He logged JW5E, TF5TP, VK2QK, VQ9YR on Diego Garcia, VS6CT, VU2CDP, YB0BNB and 9M2RT.

**Andy Durrant** of Aldershot, Hants, reveals that one of his uncles used to be G8PL and wonders if he could take over his callsign when he gets his RAE. Stranger things have happened, and no harm in trying, OM, but of course you'll need the c.w.! Andy is delighted with his new FRG-8800 and FRT-7700 a.t.u. fed from an inverted Vee designed for the 7MHz band. Right, on to 3·5MHz or thereabouts and A71AD, AK9PR in Alaska, AP1Q, C31UA, FG6AOJ, HB0BJQ/P, HW4PA on Wallis & Fortuna Islands, HK5ISX, KP2AD, OY5J, and VK6IR around 2330Z, plus VK6LK, YV4DKP, ZL1BMU, ZL1VV, ZL3FM and 9Y4KB. Not bad for 3·5MHz band, eh? Anyway, on to 7MHz and CE1HBI, HC5EA, HK3MAE, LU1KHB, PY8AHA,TK/DL4FF, TK/G3KFT and VK2AJK, all in the neighbourhood of 7·050MHz and between about 0630Z and 0900Z. Still on 7MHz and VK2, 3, 5 and 7, VK9NM/LH on Lord Howe Island, VR3JR on East Kiribati islands, YC2LK, ZL0AKS, ZL1, 2 and 3, and ZL4AW, plus ZP5JCY and 9H1GY. Still with Andy on to 14MHz and EL7BA, FE5RV/TK, JW0A, JW5E, VK5YM, YI1BGD and 5X5GK a Father Jerry who, it seems, is building his own church brick by brick!

**Dick Stanbridge** of Leiston, Suffolk, finds the 1·8MHz band coming to life with the darker mornings. He has a Trio R-2000, AT1000 a.t.u., a half-size G5RV and Datong AD370 active antenna, and that band came up with EA6NB, IY90FGM, K5NA, UB5MVS, ZB2EO and 4U1ITU all on c.w. On 3·5MHz s.s.b. he logged HK5ISX, HP1XXO, and 9Y4NP with ZL2OM on c.w. around 0600Z. The 7MHz section produced KL7Y, JA6BSM, VK2ZC and VU2TEC all on c.w.

**Brian Fields G4XDJ** in Billingham, Cleveland, continues to make good use of his QRP 3W input c.w. from his *PW* Severn rig, plus a home-brew a.t.u. fed from a half-size delta loop on 7MHz. Brian would be glad to hear from any readers who have built the *PW* Severn, particularly on initial de-bugging problems. His full QTH is 122 Weardale Crescent, Billingham, Cleveland. So, to his log of stations worked with DK3GR/P, HB0/DJ1XP, RZ3AM, HA6VO, VN7NS(?), UA3SBD, EA2SG, UR2RFG and two choice bits of DX in YC2CIA and W2KF.

Also active on QRP on 7MHz was **Phil Dykes G4XYX** running around 2/3W output from a modified SB102 rig to a loaded vertical 8m long with a quarter wave horizontal radial to make up the half wave antenna. As one would expect with a single radial, the antenna is quite directional, so Phil moves the radial around as required! Phil needs only Australasia to complete his QRP WAC. Good luck, OM! The catches on 7MHz c.w. included KB1DA for first QSO with new vertical, N2BOG, N4MVX, UA6ADJ, W9TKV and YV1AD for a new country. With his modified CB rig and 10W p.e.p. s.s.b. and dipole, Phil worked GB4LIE on Lundy Island at a range of about 160km which seems strange for 28MHz.

Some odd prefixes reported include 8A0PPI in YB-land, JY5O for King Hussein's 50th birthday, V85HG with cards to Box 228, BSB, Brunei, CG for Canada, T47 for Cuba and 4N for YU. For the island-chasers there were I4ALU/ID9 on the Lipari Islands and I2KGM/IG9 in the Lampedusa group.

Activity by **Mike Willgoss G4XRR** of Weymouth, Dorset, has been on 28MHz; he worked PY7ZZ, PT7ZD and CX6BBY but 4X6FK and 3XHAB were called but not worked. All this was an FT-902 and FL-2100 linear running between 100 and 400W on s.s.b, with two-element delta quad. Mike has now finished converting a Cobra 148GT CB rig to the 29MHz band, providing both f.m. and s.s.b. facilities and one QSO was with SP9DO. Mike has also been working through the Russian RS7 satellite using the FT-902 plus FTV-9OR transverter on the uplink and the Cobra rig on the downlink. He wonders why many more Class B licensees don't latch on to this mode of communication using the Russian satellites.

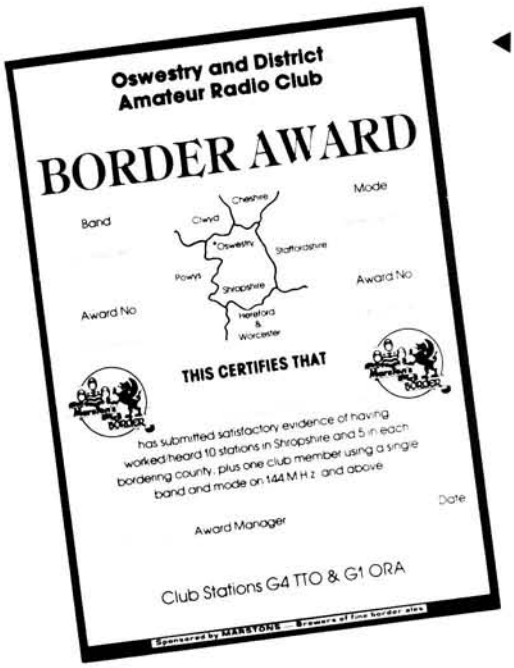
For those readers who want some practice in copying Morse code, why not listen in to the TOPS CW Club contest running from 1800Z Saturday, December 7 for 24 hours, between 3500 and 3585kHz, with stations calling CQ TAC or CQ QMF (QMF "Where fists make friends")? Participating stations must use only the bottom 12kHz for contacts with DX stations. Classes are single-op, multi-op and QRP up to 5W input, single-op.

### General

It has become very noticeable lately that certain special event stations have been soliciting donations over the air for specific charities and I have been wondering what the legal position may be. So it was with interest that I came across this following statement in the RSGB's *News Bulletin* recently. "A quick reminder for the organisers and operators of special-event stations—there's an increasing trend for special-event stations to be associated with events held in good causes for which sponsorship in one form or another is featured. It's important to stress that requests for money in the form of donations must NOT be passed over the air under ANY circumstances". It is often implied, albeit innocently, that a QSL card would follow for any donation made. Let's stamp on this practice before it becomes a habit.

A letter from Ean Retief ZS6UD points out that both South Africa and Zimbabwe have had amateur band allocations over the range 50–54MHz "for a few decades"—a rare thing for IARU Region 1 countries. However, they do not have 70MHz.

The Newport ARS expedition to Lundy Island, GB4LIE, made over 2100 QSOs on all bands from 1·8MHz to 430MHz and special QSLs were sent out by the end of October. Several messages concerning the Mexican earthquake were handled, and 85 countries were worked. Trouble was experienced with the 430MHz rig and the Top Band rig "blew up" towards the end of the time on the island. An article on the expedi-




**◀ The attractive Border Award introduced by the Oswestry & District ARC. Club stations are G1ORA and G4TTO. Details of the award are given in the text**

tion plus photographs is promised for the near future.

I have on several occasions in the past suggested that potential amateurs should, if inexperienced, undertake a short course at a local radio club under the supervision of an experienced amateur in order to become familiar with amateur equipment and procedures, before being issued with a licence. The *PW* item *Eavesdroppings* may seem amusing but it highlights the inexperience of many new operators of today.

Two typical incidents are highlighted in the Radio Society of Harrow's magazine *QZZ* for October/November. A licensed amateur bought a 2m-long Yagi antenna to improve his signal on f.m. but complained to the dealer that it was no better than the colinear. It turned out that the Yagi had been installed horizontally and it was suggested that it would be better if used vertically. It was worse than ever, came the complaint, until the dealer discovered that the Yagi had been installed pointing skywards on it's end! Another licensed amateur is reputed to have bought a straight Morse key from mail order, only for the dealer to get a letter asking for instructions on how to use it!

The Border Award has been introduced by the Oswestry & District ARC for working, or hearing, 10 Shropshire stations and five in each of the bordering counties of Clywd, Cheshire, Staffs, Hereford, Worcs and Powys, plus one club member. Contacts on one single band and one mode excluding repeaters. Details of the award, which costs £1.75, from T. Parsons G6XPO, 90 Castle Street, Oswestry, Salop.

## VHF Forum

Since 1982 the RSGB's Propagation Studies Committee has been running an international project "aimed at providing sufficient raw data in the form of reliable signal reports to establish the extent and movement of the areas of ionisation responsible for long-range ionospheric propagation at v.h.f.". Amateurs refer to this mode as "Sporadic-E" but the professionals, it seems, have pointed out that the currently accepted theories cannot apply at frequencies such as 144MHz and beyond. "It is possible, then, that what we have been observing and reporting for well over a quarter of a century is evidence of a different propagation process from that which leads to Sporadic-E at h.f.".

The Committee says that the results of the amateur studies will be of use to the planners of commercial and broadcasting services for whom long-range v.h.f. propagation is a source of annoyance by the QRM caused to these services. The information is also welcomed by such bodies as the CCIR. Observations are needed of the duration of long-range Sporadic-E type signals from distance stations that are very close together, within about 100km of each other.

The project is being carried out in close co-operation with the IARU and all reports go eventually to F8SH, the Region 1 IARU Spor-E Co-ordinator. Reports on transmissions above 50MHz will be welcomed provided that positive locations can be given. Report forms are available from R. G. Flavell G3LTP, 174 Finchampstead Road, Wokingham, Berks, to whom completed forms should be sent.

To show what can be done with QRP on the 144MHz band, **Doug Warner** (Swansea) GW1DTX sent a log showing 11 French stations worked plus I4NYN in a recent contest, using 2·5W output from his FT-290R into a five-element Yagi. From his remarks it seems he is very interested in meteor shower communication.

**A shot of one of the several tents at the Wimbledon & District ARC's summer camp near Chessington, Surrey. The main rig is a Heathkit SB101, but the smaller rig in front is a war-time suitcase transceiver running 25W. At the far end is white stick operator G3ILU, with G3DWW in the centre and G3ESH nearest the camera**

**Mike Newall** of Kenilworth, Glos, used to report on h.f. matters but now that he is G1HGO he has concentrated on 144MHz. He also has the FT-290R, plus a 30W linear feeding an HB9CV antenna in the loft space with a pre-amplifier. So far he has worked 51 counties, 10 countries including OZ and HB, and 31 squares, but now awaits the avalanche of QSL cards before he can claim any awards.

I often get requests for information on the four Russian satellites and OSCAR-10 as well as the two University of Surrey satellites UOSAT 1 and 2, also know as OSCAR-9 and 11. The idea of communicating around the world by means of, say, OSCAR-10, at a maximum range of some 36 000km is very intriguing and it can be done with quite simple equipment. The source of all knowledge, as far as we are concerned, is AMSAT-UK, the radio satellite organisation of the UK, and there are similar organisations in other countries around the world. Applications to join AMSAT-UK should be sent to the secretary, Ron Broadbent G3AAJ at 94 Herongate Road, Wanstead Park, London E12 5EQ. Don't forget to read Pat Gowen's column *Space and Satellites* in *On The Air* every month for news, too.

This is the point at which I offer my sincere Christmas greetings to one and all and to your families. Don't forget to keep the reports and photographs coming once you have got over the Christmas binge!

Don't forget the 15th of the month is the copy deadline with more details of this to be found at the end of Club News.

## RTTY

*Reports: as for VHF Bands, but please keep separate.*

*by Ron Ham BRS15744*

Writing about his RTTY log covering September 12 to October 10, **Norman Jennings** in Rye says, "The only call of note seems to be HK, Colombia, most of the others are the good old faithfuls." He copied two countries on 3·5MHz, 5 on 7MHz, 29 on 144MHz and 2 on 21MHz. The monthly chart, Fig. 1, was compiled using Norman's computer-produced log, **Len Fennelow's** and my own.

Len G4ODH in Wisbech managed to log 7 counties on 3·5MHz, 5 on 7MHz and 44 on 14MHz. He also copied plenty of AMTOR signals as can be seen by Fig. 2. With 50 prefixes in his data communications log Len has chalked-up a new record for himself. He received new countries with Bangladesh, The Ivory Coast and Philippines on RTTY with Sudan and West Malaysia on AMTOR. "The distribution of these stations all over the world shows just how universal the 14MHz band can be, despite the low level of solar activity," writes Len.

A count up on our RTTY chart shows a total of 55 countries heard on 14MHz covering 5 of the world's continents. **George Haylock G2DHV** in Sidcup is building terminal units for RTTY on v.h.f. using a ZX81 computer, so I look forward to his reports in the future. **Dave Coggins** has now entered the world of RTTY using his Spectrum computer and Trio R-2000 communications receiver. He finds the results very interesting.

While operating at the Chalk Pits Museum station GB2CPM at Amberley in Sussex on September 29, **Gerry Brownlow G3WMU** made his first ever RTTY QSO with HA2VB in Budapest. Gerry was testing his Spectrum computer with Scarab software and a Mike Rowe terminal unit with his TS-430S on 14MHz and is pleased with the result. I think that the museum visitors were fascinated, first by the incoming words on the upper half of the screen and secondly to see Gerry's reply being prepared for transmission on the lower half.

Among the interesting signals I received during the month prior to October 14 was a QSO between IK8EEY and G4PDF at 2034 on September 19. The Italian station sent a five-figure tall "73" to send best wishes to the G station. Later that evening there was an opening to South America

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Access

BARCLAYCARD VISA

| Country (Prefix | Band (MHz) 3·5 | 7 | 14 | 21 |
|---|---|---|---|---|
| Andorra (C31) | | | X | |
| Argentina (LU) | | | X | |
| Austria (OE) | X | X | X | |
| Balearic Is (EA6) | | X | X | |
| Bangladesh (S2) | | | X | |
| Belgium (ON) | X | | X | |
| Brazil (PP7, PY2) | | | X | |
| Burundi (9U) | | | X | |
| Canada (VE) | | | X | |
| Canary Is (EA8) | | | X | |
| Ceuta & Melilla | | | X | |
| Colombia (HK5) | | | X | |
| Costa Rica (TI) | | | X | |
| Cyprus (5B4) | | | X | |
| Denmark (OZ) | X | | X | |
| England (G) | X | | X | |
| Finland (OH) | | | X | |
| France (F) | | X | X | X |
| Gabon (TR) | | | X | |
| Germany (DF, DJ, DK, DL, DM) | X | X | X | |
| Gozo & Comino (9H4) | | | X | |
| Greece (SV) | | | X | |
| Guadeloupe (FG) | | | X | |
| Hungary (HA) | | | X | |
| Ireland (EI) | | | X | |
| India (VU) | | | X | |
| Israel (4X4, 4Z4) | | | X | |
| Italy (I) | | X | X | |

| Country (Prefix | Band (MHz) 3·5 | 7 | 14 | 21 |
|---|---|---|---|---|
| Ivory Coast (TU) | | | X | |
| Japan (1CA, JA, JR) | | | X | |
| Kuwait (9K) | | | X | |
| W. Malaysia (9M2) | | | X | |
| Malta (9H) | | | X | |
| Maranhao (PR8) | | | X | |
| Netherlands (PA) | X | | | |
| Nigeria (5N) | | | X | |
| Northern Ireland (G1) | | | X | |
| Norway (LA) | | | X | |
| Oman (A4) | | | X | |
| Panama (HP1) | | | X | |
| Philippines (DU) | | | X | |
| Poland (SP) | | | X | |
| Portugal (CT1) | | | X | |
| Puerto Rico (KP4) | | | X | |
| Rumania (YO) | | | X | |
| Sardinia (ISO) | | | X | |
| Scotland (GM) | | X | X | |
| Sicily (IT9) | | | X | |
| South Africa (ZS6) | | | X | |
| Spain (EA) | | X | X | |
| Sweden (SM) | X | | X | X |
| Switzerland (HB9) | X | X | X | |
| USA (K, N, W) | | | X | |
| USSR (UA, UB, UK, UT, UZ) | | | X | |
| Venezuela (YV) | | | X | |
| Yugoslavia (YU) | | | X | |

◀ Fig. 1

Fig. 2 ▼

| Country (Prefix) | Band (MHz) 3·5 | 7 | 14 |
|---|---|---|---|
| Canary Is (EA8) | | | X |
| Costa Rica (TI) | | | X |
| England (G) | | | X |
| France (F) | X | | X |
| Germany (DJ–DL) | X | X | X |
| Italy (I) | | | X |
| Kuwait (9K) | | | X |
| W. Malaysia (9M2) | | | X |
| Netherlands (PA) | X | | |
| Nigeria (5M) | | | X |
| South Africa (ZS6) | | | X |
| Spain (EA) | | | X |
| Sudan (ST) | | | X |
| Sweden (SM) | X | | X |
| Switzerland (HB9) | X | | |
| USA (K, N, W) | | | X |
| Venezuela (YV) | | | X |
| Wales (GW) | X | | |

and I copied strong RTTY signals from Argentina, Brazil, Panama and Venezuela. At 1619 on the 21st I logged SW2NU, the special callsign for the 2300 years of Thessaloniki. Then at 0815 on October 4 I copied, "My name is XYL Mila, QTH north YU-land," from a YU2 to an F6. The tropospheric opening on October 12 gave me the chance to look for some v.h.f. RTTY and during the evening I received signals from G0BRP in Sussex, G8IKF in Surrey, G6XRG in Gloucestershire, G4DIE in Wiltshire, G1LAF in Derbyshire and ON5EX in Belgium.

One way of keepng up to date is by listening to the BARTG news, it is transmitted on RTTY on the first and third Sundays of each month using the callsign GB2ATG. These bulletins are transmitted on 45 baud on 3·590MHz from Leicester by G4MMQ at 1200GMT, Preston by G3VYV at 1230 and Fleetwood by G4RSA at 1900. Reception reports and items for inclusion in the RTTY news should be sent to Ken Young G3ZCG, 12 The Grange, Cubbington, Warks CV32 7LE. The Autumn 1985 issue of *DATACOM*, BARTG's quarterly journal, has around 100 pages of info packed with articles about RTTY, using computers, technical and constructional items, AMTOR, FAX and packet radio to mention only a few.

As usual there are details about BARTG and its activities, in my view it's well worth the membership fee of £7 (£10 for Europe). More details can be obtained from Pat Beedie GW6MOJ, "Ffynnonlas", Salem, Llandeilo, Wales SA19 7NP.

# SPACE & SATELLITES

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

by Pat Gowen G3IOR

## Phase IIIc

The loss of the ARIANE carrying two major satellites on September 12 was a further set-back to the space programme, following the total failure of the u.h.f. transponder of SYNCOM-4 launched by the 51-I shuttle mission only the week before. A problem exists for Phase IIIc, as the insurance premiums have escalated to enormous proportions, probably well beyond that which can be found by non-commercial funding. AMSAT was unable to afford to insure Phase IIIa, and its loss was almost the loss of AMSAT itself. Had it not been for the generosity of the world community of radio-amateurs, OSCAR-10 would never have flown.

On the happier side, work is progressing at great speed on the Phase IIIc with AMSAT-DL. The prototype of the "RUDAK" processor (see *PW* July issue, page 61) built by DF8CA, worked perfectly. DL2MDL and DG2CV developed a simple initial operating system that tested the RAMs of both transponder interfaces and the on-board computer. Using the AMSAT command station of DK1YQ, a successful command dialogue was established, similar to that of OSCAR-10. Using "IPS" (Interpreter of Processing Structures) DJ4ZC developed and installed the main RUDAK operating system to successful completion by 0300 on September 7. The engineering model of the Mode "L" transponder built by DJ5KQ already contains the RUDAK receiver and downlink beacon, so now effort will be concentrated on the electrical and environmental testing as well as on the two flight versions. Ground stations will now be simultaneously developed with RUDAK interfaces and 145/1269MHz up converters with b.p.s.k. modulators. Schematics suitable for home-brew constructors will be provided well in advance so that all enthusiasts can be ready before the launch, and detailed information on the entire experiment with required equipment will be released soon.

## STS-61A

Despite rumours of further delays the STS-61a/D1 Space Lab mission carrying the three European Radio Amateur Astronauts lifted off only 7s after their 1700UTC launch window on Oct 30. The propagation experiment run by PE1LFO and VERON came up for one orbit only transmiting a three-letter code group, sent every fifteen seconds. The letter group related to the spacecraft position, and the observer should have recorded the maximum number of different code status points heard, the RST, the exact frequency and the precise time when heard. This should be sent to VERON, P.O. Box 1166, Arnhem, Holland, marked "VERON Jubilee experiment". You must include your Universal Locator, antenna and station equipment details, as these will be correlated to indicate any propagational abnormalities, and prizes and awards are offered for the best entries received.

In the 1 watt level auto-QSO mode, the call "CQ DP0SL record on tape K" was made, and to help to avoid blocking no uplink frequency was given. Stations should have given their callsign only, as any call heard more than three times in the course of a pass was **NOT** be QSLed.

On the normal 10 watt two-way QSO mode, full conversations were encouraged, but few took place except with the command station DF0VR. Again, to reduce QRM, no uplink frequency was notified.

Yet a further "ham-in-space" possibility is to arise on shuttle flight 61-K, scheduled for a September 1986 lift-off, as Dr. Owen Garriott W5LFL is one of the crew members of that mission.

## Shuttle Frequencies

In a letter to keen space watcher **Martin Ehrenfried** of South Wales, Robert Overmyer, commander of the 51-B mission, confirms Martin's findings that the frequencies 259·7 (not 259·4 as earlier listed) and 296·8MHz a.m. are used for communications during launch and final stages of landing, although their basic use is for "EVA" (Extra-Vehicular Activities) in duplex mode. "By the way," adds Robert, "we often just leave the u.h.f. on in orbit so even when we are talking to Houston via the "S" band TDRS (Tracking Data and Relay Satellite) we are still going out on u.h.f.". Martin found that the u.h.f. transmissions were detectable long before any 145MHz transmissions were evident from the 51-F flight carrying W5LFL. He

**Signed photograph of the STS–51–B shuttle mission, sent by Commander Robert Overmyer to Martin Ehrenfried**

has been copying good signals from SALYUT-7 on 142·420 f.m., although with slightly muffled speech, which he feels to be due to a different pre-emphasis characteristic.

## Weather and NAVSATS

**Graham Smith G1JVZ** telephoned to say that he has been studying the satellites for some time, and lists the weathersats on 137·620, with 136·77 and 137·77 for direct broadcasting satellites and vertical profile temperatures. He finds all the Russian NAVSATS audible from 149·910 to 150·030 when in range, but has never yet heard the SALYUT supply automatic docking PROGRESS rocket on 166·0MHz. He further reports the Ocean Reconnaissance sats on 466MHz, and locates the navigation sats on u.h.f. by multiplying the v.h.f. frequency by 8 and then dividing by 3, e.g. 149·910 × 8/3 = 399·760MHz. **John Branegan GM4IHJ** reports the very useful set of 5 American Transit and 9 Russian CosNav satellites that provide navigational data to ships and submarines, which transmit simultaneously on two frequencies. He finds those in regualr use are on:

| Chan. 1 | Chan. 2 | Chan. 3 | Chan. 4 | Chan. 5 |
|---|---|---|---|---|
| 149·910 | 149·940 | 149·970 | 150·000 | 150·030MHz |
| 399·762 | 399·842 | 399·922 | 400·002 | 400·082MHz |

John finds them superb for simultaneous Doppler experiments, but points out that some care is needed, as the Doppler shift on 399MHz (where only the continuous carrier is sent) is ±9kHz and very fast indeed! On 149MHz the signals consist of continuous carrier plus RTTY giving orbital data. Each satellite has an orbital period close to 104 minutes. John has heard four separate satellites on channel 4, and tells us that there are other satellite signals on 399MHz, in particular a very noisy family on 399·968 sending out a very rough 400Hz pulsed note sounding like a continuous mobile aurora, about which he promises us more information later.

## AMPTE now Empty

Because of poor official results in the early tests of this series in December '84 and January '85 (see *PW* April '85 page 63 and May '85 page 75), the mission controllers decided to shoot the lot in the recent July test. This was done by simultaneously exploding two cans of Barium to produce an eight minute duration artificial comet. This could be seen by telescopes, and the results were felt to be "moderate", invisible to the naked eye despite excellent viewing conditions.

## OSCAR-DX

8Q7EV, 4S7EA and 4S7AG are looking for OSCAR-10 QSOs, and KL7JIZ, UD6DE and UI9IWA were worked on RS-5 by your scribe. **Bill Kelly** monitored RS-5 and 7 to hear JN0ADP, RA1AAX/3, UR5ZN, UL7RAV, KO5I, LZ1NA, and a host of European stations. He is still copying the "55" and "5015" sent by the venerable RS-1.

| EQX °W | AOS mins | Bearing ° | TCA mins | Bearing ° | Elevation ° | LOS mins | Bearing ° | Optimum DX AOS | Optimum DX LOS |
|---|---|---|---|---|---|---|---|---|---|
| 300 | +17 | 60 | +20 | 30 | 1 | +23 | 30 | VU,BY | UA0,JA |
| 310 | +13 | 90 | +19 | 50 | 5 | +26 | 25 | VU,AP,BY | UA0,JA |
| 320 | +10 | 110 | +18 | 60 | 10 | +27 | 20 | ET,A7 | UA0,JA |
| 330 | +7 | 130 | +19 | 60 | 20 | +28 | 20 | 5Z,5X | JA,UA0,KL7 |
| 340 | +5 | 150 | +18 | 80 | 30 | +29 | 18 | Z2,5X | JA,KL7,UA0 |
| 350 | +4·5 | 165 | +17 | 80 | 45 | +29·5 | 15 | 9J2,5H3 | JA,UA0,KL7 |
| 0 | +4 | 180 | +17 | 90 | 70 | +30 | 15 | ZD7,ZD8 | JA,UA0,KL7 |
| 10 | +4·5 | 195 | +17 | 270 | 85 | +30·5 | 15 | ZD7,ZD8, TR | JA,UA0 |
| 20 | +5 | 210 | +17 | 280 | 50 | +31 | 15 | 9G1,PY,FY | JA,UA0,BY |
| 30 | +7 | 225 | +18 | 290 | 40 | +32 | 20 | PY,FY,8R | JA,UA0,BY |
| 40 | +9 | 240 | +19 | 300 | 25 | +33 | 20 | PY,YV,KP4 | JA,UA0,BY |
| 50 | +11 | 260 | +22 | 325 | 20 | +34 | 25 | HI8,CO,HK | UA0,JT,BY |
| 60 | +14 | 280 | +23 | 330 | 15 | +35 | 30 | XE,W5,VP2 | UA0,JT,BY |
| 70 | +16 | 290 | +27 | 340 | 10 | +37 | 35 | W5,W0,W7 | AP,EP |
| 80 | +20 | 310 | +29 | 355 | 10 | +39 | 45 | W5,W0,W7, VE7 | UI8,UL7,UM |
| 90 | +21 | 320 | +31 | 10 | 10 | +42 | 60 | W7,W0,VE7 | UA0,JT |
| 100 | +24 | 330 | +35 | 25 | 10 | +45 | 75 | KL7,VE7, VE8 | VU,BY |
| 110 | +26 | 340 | +37 | 30 | 15 | +48 | 90 | KL7,W0 | VU,HZ |
| 120 | +27 | 340 | +39 | 40 | 20 | +51 | 110 | KL7,VE8 | 8O,ET |
| 130 | +27 | 340 | +40 | 45 | 30 | +52 | 125 | KL7,VE8 | 5Z4,5X5 |
| 140 | +28 | 345 | +42 | 70 | 45 | +54·5 | 145 | KL7,VE8 | 9X,9J2 |
| 150 | +28·5 | 345 | +42·5 | 80 | 70 | +55·5 | 160 | KL7,UA0 | 9U,CR6 |
| 160 | +29 | 345 | +44 | 240 | 85 | +56 | 175 | KL7,UA0 | TR8,CR6 |
| 170 | +30 | 345 | +44 | 270 | 55 | +56 | 185 | KL7,UA0 | 9J2,TU |
| 180 | +30 | 345 | +43 | 270 | 40 | +55 | 205 | KL7,UA0 | ZD7,ZD8 |
| 190 | +31 | 345 | +42 | 290 | 25 | +54 | 220 | VE7,W7, KL7 | PY |
| 200 | +32 | 340 | +42 | 290 | 15 | +52 | 240 | KL7,VE7, VE8 | PY,YV,8R |
| 210 | +33 | 335 | +41 | 300 | 7 | +48 | 260 | W1–0,VE1–8 | XE,W5 |
| 220 | +36 | 330 | +41 | 310 | 1 | +45 | 290 | KL7,W7,W5 | XE,W5 |

**Table 1**

**Optimum DX is the furthest land areas available in line at mutual horizon. All areas en route are also mutually accessible. Orbits emanating between 220° and 297° EQX are sub-horizon and not normally accessible from Eastern G**

## Our Series for the Beginner

Last month we covered the basic circular satellite orbit, and the terms that are used in reference to orbits such as those performed by the Phase II RS and UoSAT spacecraft. This month we shall pursue the means of interpreting the orbital path to the means of finding those times when the satellite is within range and tracking the path.

Most satellite followers now use computers for tracking, especially for the more complex elliptical orbits such as OSCAR-10 (more on this topic later). However, it is quite simple to calculate an approximate position, to determine the azimuth (bearing of the spacecraft in degrees relative to North) and to determine the elevation (angle of the satellite above the horizon) by tabular means.

First we start with the reference orbits, that give the first orbit of the UTC (Universal Time Co-ordinated, alias GMT) day by the time that the northbound spacecraft crosses earth's equator called "EQX" (Equator Crossing) and the longitude in degrees west of the Greenwich meridian at the equator. These are given out on the AMSAT International net each Sunday at 1900 on 14·282MHz, each Saturday on 14·280/290MHz at 1015 and 1100 on the AMSAT and SPUTNIK nets, and at 1015 each Sunday via the AMSAT-UK Net on 3·780MHz. They are also sent via the bulletin board of the RS Satellites themselves each Saturday and Sunday on 29·330MHz (RS-5) or on 29·340MHz via RS-7, and on the UoSAT bulletin board.

We have picked for our references Sunday, 15 December 1985, as the satellites are then out of eclipse, there should be lots of week-end activity, and UK readers at least should all have their *PW* by then.

| Satellite | Time as hours/mins UTC | EQX in degrees west at EQR |
|---|---|---|
| RS-5 | 0000·00 | 236 |
| RS-7 | 0008·00 | 244 |

The period (between northbound equator crossings) of RS-5 is 119·55530925 minutes, and the increment (degrees west longitude added each equator crossing) is 30·01573185. For RS-7 it is 119·19617095 minutes and 29·92588942 degrees, respectively. If we take RS-5, and round up the figures, we can say that this satellite takes roughly two hours less half a minute between EQXs, and each EQX is some 30 degrees further west, giving us a table of times and positions of equator crossings. By adding these to our original RS-5 reference orbit we get Table 2.

Note that when we get to greater than 360°, we start again by subtracting 360, as 360 is the Greenwich line, equal to 0° W. Further note that after twelve orbits, our time for the next day is only six minutes earlier, and the EQX longitude almost the same. Had we used all the figures precisely, and said 24 hours × 60 minutes minus 119·55530925 × 12, e.g. 1440 – 1434·6637 = 5·33628 minutes, we actually have the satellite crossing the equator 5 minutes 20·1768 seconds earlier the following day. The exact crossing longitude would be (30·01573185 × 12) – 360, giving us 0·1886772 degrees that

Fig. 1

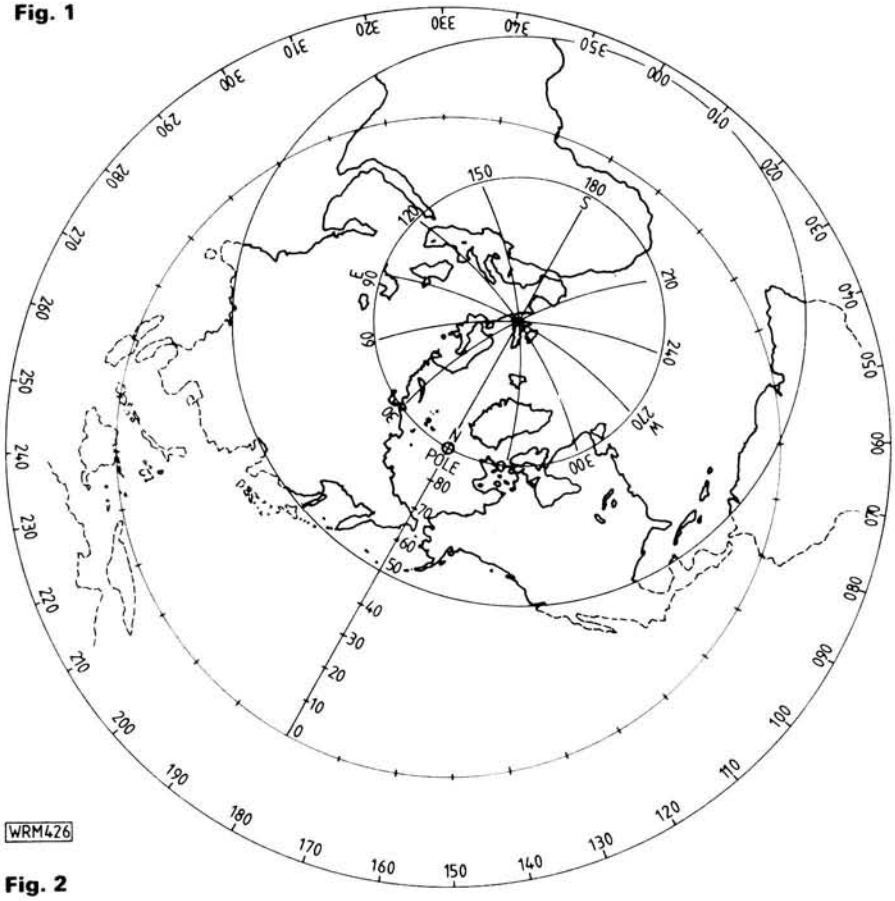
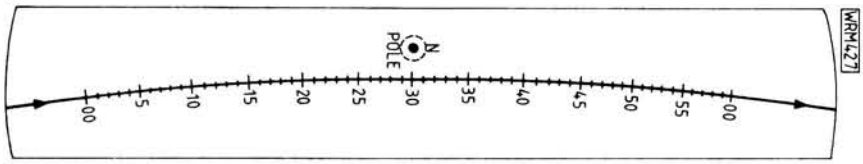



Fig. 2




the satellite is further west the next day, all this giving us a new reference rounded up to 2355UTC at 235·8 degrees west.

If we look at Fig. 1 we see the earth as the inner circle, and the satellite path around it. Our observer is at point "O", and his horizon takes his line of sight from "O" outward into space. When our satellite gets to point "A", it comes above his horizon circle and he has "AOS" (Acquisition Of Signal). The spacecraft is gaining elevation to the time of closest approach (TCA) in the middle of the period, then going down to go below the horizon at "L" to give "LOS" (Loss Of Signal). The lines from "A" to "C" and "L" to "C", where "C" is the earth centre, give us the Sub-Satellite Point (SSP) on earth, so we are able to draw a circle around our QTH to indicate where and when we shall have satellite access, and transpose this to a flat earth in Fig. 2, forming an equidistant polar projection.

The circle immediately around the UK is the capture area, and any sub-satellite point that bisects this will be above our horizon, hence audible. The circle outside this is double the radius, and shows the theoretical limits of DX stations who have common access, i.e. the maximum mutual DX possible. The inner circle centered on the north pole is the equator line, and the outermost circle of all indicates the degrees west line of the equator.

If we transpose our satellite track (curved, because the earth turns as the satellite traverses) to a piece of clear plastics sheet, and then pivot this through the points marked "N.POLE" we have a ready calculator based on the original design by Bill Browning G2AOX, to give us the satellite position from our QTH and when in range of us. We merely set the arrow below the "00" mark to the "EQX" and count up the minutes to be added to the EQX time from the scale. When the satellite track intersects our horizon circle we have "AOS" at a given azimuth, and can follow it across our area of capture until it leaves the circle at "LOS".

This method gives accuracy enough for the limits of any average beam, and can be used at any QTH on the proviso that the centre of the capture circle is centred on the observer's position. It will mean a southern hemisphere polar projection for those south of the equator. The actual shape of the capture circle (and the azimuth degrees) tends to be elliptical as we approach the equator, due to the distortion introduced by "flattening" the hemisphere, and it is only truly circular at the poles, but a true circle will give a good guide. Anyone needing a well-produced northern hemisphere tracker that covers the RS satellites, the UoSAT pair, as well as the NOAA weathersats, is invited to send £1 (UK) to cover p + p to G3AAJ of AMSAT-UK and ask for an OSCARLOCATOR. Please add extra postage if overseas. For those who prefer tabular plotting, Table 1 relates the EQX degrees west to the time lag which will occur until the satellite appears to the observer in the UK. Just add the time in minutes shown to the equator crossing time for the nearest EQX W, and you have AOS and the azimuth bearing. The next column gives the added time to the time of closest approach (TCA) with the azimuth and elevation above your horizon at this time, whilst the third gives the LOS and the bearing. The final column shows the furthest DXCC countries that are within range at AOS and LOS.

**Nick Laub WOCA is a highly active satellite enthusiast and accomplished the world's first Satellite Worked All Continents. His tower supports the h.f. tri-bander and a double ten skeleton slot for 435MHz, whilst the tree is surmounted by a double four slot for 145MHz. Literally an antenna farm!**

Fig. 3

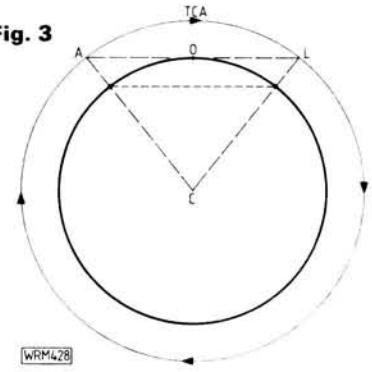



**Table 2**

| Orbit of day | EQX in UTC | Longitude of EQX in °W |
|---|---|---|
| 1 | 0000 | 236 |
| 2 | 0159·5 | 266 |
| 3 | 0359 | 296 |
| 4 | 0558·5 | 326 |
| 5 | 0758 | 356 |
| 6 | 0957·5 | 386 (386–360 = 26) |
| 7 | 1157 | 56 |
| 8 | 1356·5 | 86 |
| 9 | 1556 | 116 |
| 10 | 1755·5 | 146 |
| 11 | 1955 | 176 |
| 12 | 2154·5 | 206 |
| 13 | 2354 | 236 |

This table is based on Norwich, 52° 40′ N, 1° 16′ E, and will be less accurate for other parts of the UK. For Scotland, some two minutes needs to be added to both AOS and LOS times for orbits emanating from 300 through 0 to 50° W, and some two minutes subtracted from those originating from 70 to 220° W longitude. For Ireland and the West Country, add up to 6° to the EQX degrees west column to correct for geographic position.

For now, have a listen to the RS-5 beacon on 29·451MHz, or the codestore and ROBOT on 29·330MHz, and occasionally the command transponder on 29·350MHz. The downlink passband for the general communications transponder runs from 29·410 (the c.w. end) to 29·450MHz (for s.s.b.) where you will hear lots of transponded signals from the users. The RS-7 equivalent frequencies are 29·501, 29·340, 29·350 and 29·460 to 29·500MHz. If you have a high vertical, a low-angle beam or a cubical quad, you will hear signals from the start to the end of the pass, whilst if you have a simple low dipole or long wire, you may miss the lower angle parts of the pass. In the next part, we shall cover the meaning and interpretation of the signals that you hear, and then how to optimise your downlink and uplink systems to communicate.

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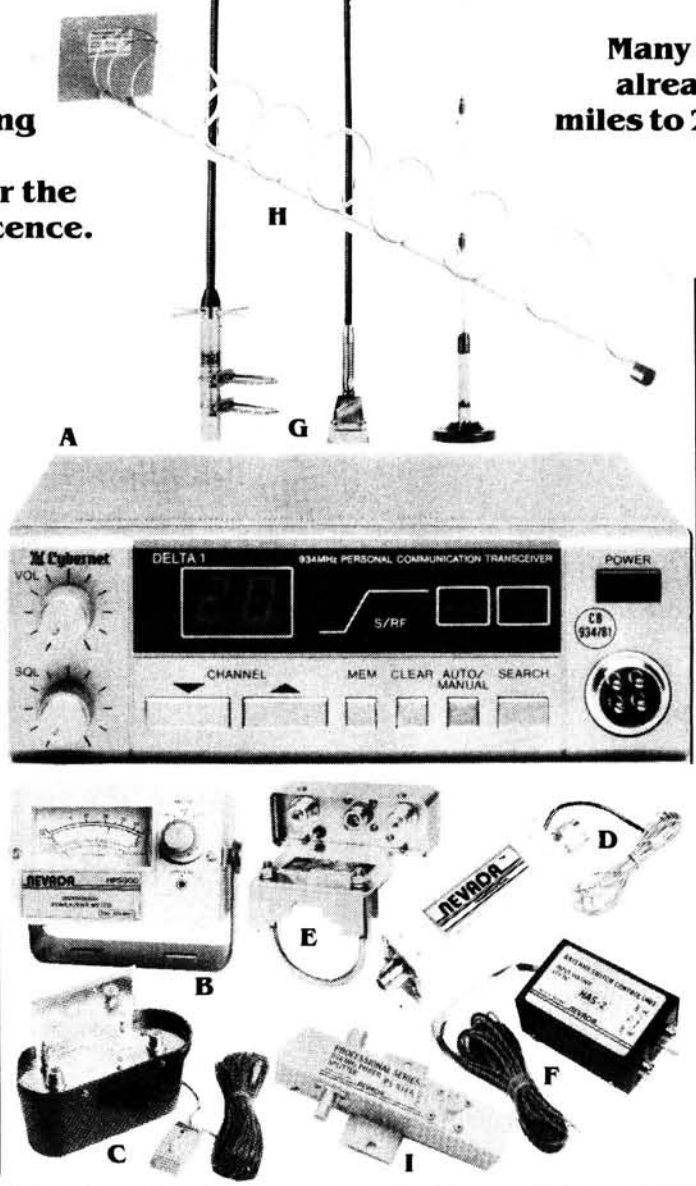


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# VHF BANDS

Reports to: Ron Ham BRS15744, Faraday, Greyfriars, Storrington, West Sussex RH20 4HE.

by Ron Ham BRS15744

Although at this time of year sporadic-E is sparse and the sun as well as the 28MHz band is generally quiet, readers still note each disturbance. It all goes to prove that the sun and the earth's complex atmosphere are never totally at rest.

## Solar

"Things can only get better, but it will be a while yet I suppose," writes **Ted Waring,** Bristol. He recorded no sunspots in his log for the period September 15 to October 14. In Malden, **Ted Owen** checks the sun with image projection equipment and reports, "no sunspots visible for some weeks." From his observatory in Sevenoaks, **Cmdr Henry Hatfield** says, "Sorry I can't give you something more interesting." However, while using his spectrohelioscope at 1330 on September 11 and 1050 on the 26th he did see 7 and 6 filaments, respectively, on the sun's disc. **Filip Rogister ON1BRL,** Overijise, has been told that the minimum sunspot activity is between September 85 and February 86, which indicates that my radio telescope on 143MHz will continue recording receiver noise for a while yet. **Patrick Moore,** Selsey, found one sunspot during his observations on September 15 and a clear disc during later checks.

Enough of the gloom, something has been happening especially on the auroral front. "In spite of frightful cloud cover and monsoon rain in mid-Scotland, there have been some aurora sightings reported," writes **Ron Livesey,** Glasgow. He is auroral co-ordinator for the British Astronomical Association and his magnetometer showed smaller storm activity on September 14, 15, 17, 18 and 28 and larger storm conditions on days 19, 21, 24 and 26. The Wick Met office told Ron that they observed auroral glows and rays on the night of September 17/18 and glows on the nights of 19/20, 21/22 and 22/23. The observatory at Boulder Colorado, reported a major storm on the 16th and 19th and the Weathership *Starella,* at Station Lima (west of Scotland) observed auroral glows on the nights of 14/15 and 19/20. "The weathership's report for 14/15 ties up with a glow reported on the same day by Bob Evans and other observers in Invercargill, South Island, New Zealand," said Ron. After studying the July-September report from his Canadian observers, he found details of an active aurora on the night of 20/21 following the eastern Atlantic aurora on 19/20. "Both of these Canadian aurorae included active rayed structures and reported in Winnipeg, Fort McMurry further to the north and west in Alberta by Todd Lohvinenko and Peter Brown." Michael Boschat also saw an auroral glow on 29/30 at Halifax, Nova Scotia. From Cornwall **Karl Lewis,** using a recording magnetometer, told Ron about active magnetic field conditions on September 15, 16, 20, 21, 25 and 26 and disturbances on days 16, 20, 21, 22 and 27. A final word from Ron, "My magnetometer picked up a big magnetic storm on the evening of October 5, but unfortunately the skies were cloudy at Glasgow and Edinburgh, so no confirmation of auroral light was possible."

Around 2300GMT on October 5, **Dave Coggins** in Knutsford noted auroral type signals from a Band I TV station on Ch. E2 48·25MHz and from GM4IPK and several other c.w. stations that were not easy to read.

## The 50MHz Band

Up to the end of September **Gordon Grigg G3PRX** from Rainham had received signals from 66 of the 100 British stations licensed for 50MHz and is looking forward to operating himself when the band becomes fully available. In Walsall **Gordon Pheasant G4BPY** heard the Gibraltar beacon ZB2VHF, 50·035MHz, at 2041 on October 11. **Norman Hyde G2AIH** from Epsom logged signals daily, via meteor scatter, between September 15 and October 12 from the UK beacons GB3RMK (located at Mount Eagle, 13km west of Rosemarkie) and GB3SIX. He noted that during the period October 4 to 8 inclusive the bursts from GB3RMK were very strong. Before the 50MHz operators departed, as the permit requires, at 0730GMT on October 12, Norman had crossband QSOs (50/144MHz) with G4OXY in Portishead and G4BAO near Cambridge. "Unfortunately when G4BAO and I were in contact the close-down time arrived and we had to complete our QSO on 144MHz," said Norman. He uses an 8-element Yagi at about 5m a.g.l. and a 2-element beam at 13m a.g.l. for the 144MHz and 50MHz bands respectively. "I have changed my main antenna tower and now have an Altron AT32, with which I am very pleased," remarks Norman.

**John Fell G0API** has also been logging activity on 50MHz and has now heard 47 of the UK permit holders, using a *PW* Meon transverter and home-brew 5-element NBS Yagi. Dave Powis G4HUP, who designed the Meon, was contacted via 144MHz crossband—the QSO between Suffolk and Dorset involved 50MHz (28MHz i.f.), 144MHz (28MHz i.f.) and 50MHz (144MHz i.f.) versions of the transverter!

At 0815 on October 8 I noted a very large number of strong, "ping" type bursts of television pictures, presumably via m.s., from Czechoslovakia, Finland, Poland and the Hungarian TV clock, on Ch. R1 49·75MHz. I also received bursts of signal from several east-European broadcast stations, between 66 and 70MHz. No doubt something to do with the Draconid meteor shower.

## The 28MHz Band

"Most of my logs were made during a two week period that started on September 20 when the S. American skip was good," writes Filip Rogister. Within that time he logged c.w. signals from EA7FEB, EA8RL, PP5OV, PU2NPO, PY7DT and ZP5LOB in Asuncion, Paraguay and, EA8AMT, Tenerife, CX1ABK in Montevideo, Uruguay, LU2CC and PT7WZ on phone.

"Very little DX on the band, but have been listening to the RSGB 28MHz Activity Contests, which take place between 2000 and 2200GMT on selected days," writes Dave Coggins, having logged 8 "G" stations mainly from the Midlands, on September 16, 10 "Gs" on the 24th including Cumbria, Hereford and Suffolk, 4 "Gs" from the Midlands on October 2 and 2 "Gs" on the 10th. "It was interesting to note the effect that propagation had on these contest signals. Some were heard with slow and deep QSB while others were subject to rapid flutter and bursts of meteor scatter," said Dave, who also logged HB9CEY at 1211 and IK5FKF at 1620, during a bit of short-skip on September 20.

## Propagation Beacons

"Very quiet again on 28MHz this month, with the notable exception of September 19, when an opening started around 1300UTC with good signals from the Cyprus beacon 5B4CY," writes Gordon Pheasant. He also heard a new beacon EA6VQ, in Majorca, on 28·223MHz, on September 20 and 22 giving its location as JM19HO. "At 1428 on the 19th, I received strong signals from ZS1LA and weaker ones from DL0IGI (possibly backscatter), ZS6PW and Z21ANB. At 1435, I found PY2AMI competing with ZS1LA whilst my beam was still at 160 degrees and later, when I turned it toward South America I found that the beam appeared to have lost its directional properties! I also logged ZD9GI for the first time in years," said Gordon. He adds, "This opening ended rapidly around 1525 with the last signals coming from ZS1LA."

Alan Taylor G3DME from Crowborough is the International Beacon Project co-ordinator for the RSGB and has news of a new beacon. It was built by Tony Baldwin G6CAR and has been sent to the Solomon Islands, under the care of Peter Taylor H44PT, for installation on the site of a broadcast station. Readers can listen out for its signals on 28·287MHz using the callsign H44SI.

"I logged a new beacon on September 29, EA3VHF on 28·247MHz, indentifying itself every few seconds by transmitting its callsign and QTH in Morse code," writes Filip Rogister. He continues, "There

Fig. 1 ▼

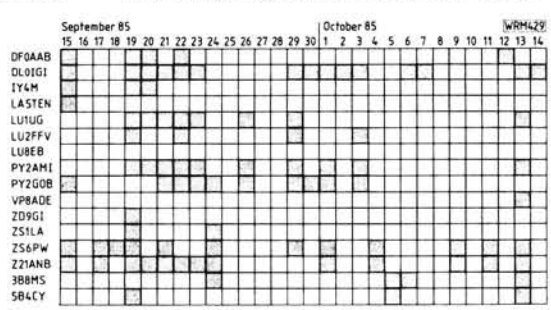
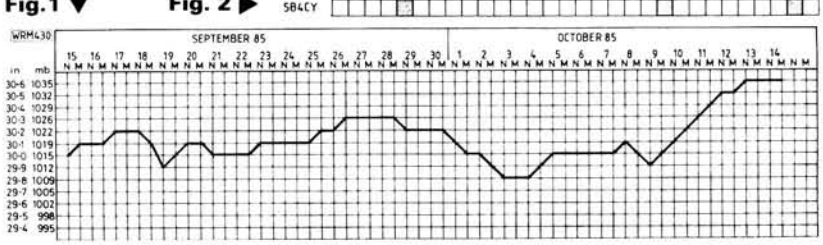



Fig. 2 ▶



was a sporadic-E opening to the south on October 2, when I heard the South African beacons ZS6PW and Z21ANB coming in strong for about half an hour."

**John Coulter** in Winchester reports that G4VPS in Taunton managed to get his callsign stored in the memory of IY4M on September 20. **Bill Kelly** in Belfast headed his log on October 4 with the remark, "Very poor offering this month". However, my thanks are due to all those mentioned in this section, Dave Coggins, Len Fennelow G4ODH, Wisbech, Henry Hatfield, Norman Hyde, Fred Pallant G3RNM, Storrington, Ted Owen and Ted Waring for their logs which enabled me to compile the monthly beacons chart, Fig. 2. "Could hardly believe my ears! when at 1415 on October 4, I logged ZS6PW and Z21ANB at good strength," writes **Chris van den Berg** from The Hague. He also reported hearing 3B8MS and 5B4CY at similar strength at 1030 on the 5th and of some cheer to us all comes the report, "First real sign of winter conditions today, with a good opening to ZS6PW, Z21ANB and 3B8MS during the morning and VP8ADE in the late afternoon," from Gordon Pheasant on October 13.

John Coulter received signals daily from the 14MHz beacons (14·100MHz), CT3B, OH2B, ZS6DN, 4U1UN and 4X6TU between September 15 and 28 inclusive and W6WX on days 17, 18 and 22. Len Fennelow observed the band from September 15 to October 12 and logged W6WX on days 27 and 29 and 1 and 2, LU4AA on October 3, 7 and 8 and the others almost daily.

"A v.h.f. beacon on 144·830MHz is installed in Malta and its locator is JM75FV," writes **Walter Gatt 9H1DU.** Len Fennelow reports hearing the Wrotham beacon GB3VHF on 144·925MHz and the RSGB HQ beacon GB3NHQ, on 50·050MHz daily throughout this period. Both Chris van den Berg and I at distances of 381km and 67km, respectively, also received these beacons on a daily basis. Chris also logged signals from the Belgian beacon ON4VHF on 144·985MHz and the Norfolk repeater GB3NB on R1 145·625MHz, on most days between September 10 and October 9. During the lift on the 13th, Dave Coggins received signals from the beacons in Angus GB3ANG 144·975MHz, Cornwall GB3CTC 144·915MHz, GB3VHF, France FX0THF 144·895MHz and Switzerland HB9HB 144·865MHz.

## Tropospheric

Depending on the time of year high atmospheric pressure (above 30·1in or 1019mb) usually means cold or warm fine weather and a period of improved v.h.f./u.h.f. conditions, with a good chance of a tropospheric opening when the pressure begins to fall. The readings for this month's chart, Fig. 1, were taken at noon and midnight from the continuously recording barograph at my QTH although the figures are slightly rounded for convenience. The pressure throughout this period, September 15 to October 14, was mainly above 30·0 (1015), falling just below for a relatively short time on the 19th and October 2 to 4 and on the 9th, with highs of 30·3 (1026) and above during the last few days of September and of this reporting period. In Essex, Ted Owen's barometer was high for most of the period ranging from a low of 1008mb on October 3, through 1030 at the end of September to 1036mb on October 12.

I noted several repeaters on Ch.R0 at 0913 on September 22, northern G stations working through the Kent repeater GB3KN, R4, at 1155 on the 27th, GWs on R0 and French through KN at 0825 on the 29th, EIs on R2 and GWs on R6 at 1955 on October 13 and EA and PA stations through R4 and R0 repeaters, respectively, around 0140 on the 14th. At 1958 on the 13th, I copied both sides of a s.s.b. QSO between EI2CLB and DL4EBX, on 144·3MHz, without altering my beam direction. With his barometer well up at 30·6 on the 13th, Dave Coggins checked the 144MHz band and logged 2 Dutch and 4 French stations at good strength.

"A v.h.f repeater on Ch. R1 (145·625/145·025MHz) with an output of 5W has been installed by members of the Amateur Radio League of Attard, Malta. It is in a temporary location, on an experimental basis," writes Walter Gatt. He adds, "It is also hoped to put another repeater on Ch. R7, with the hope of preparing for the forthcoming permission of the use of mobile operated equipment." Walter says that any amateur who intends to visit Malta and operate on a reciprocal basis should get in touch with the Chief Inspector of W/T Branch, Auberge de Castille, Valletta. Readers who need other radio information about Malta, should write to, The Secretary, M.A.R.L., P.O. Box 575, Valletta.

During the sporadic-E opening at 1440 on June 6 that was reported in our October issue Walter, who is the 9H-VHF Manager, worked into north-west Europe on 144MHz using his callsign 9H1DU. He was using 10W to a 9-element beam, pointing NNE.

## Band II

During the month prior to October 14, Band II was reasonably DXy, among some very positive peaks. With the pressure at 30·2 and beginning to fall on September 18, **Harold Brodribb,** St Leonards-on-Sea, received signals from French stations at Abbeville, Caen, Lille, Paris and Rouen. Between the 20th and 30th, he heard the occasional and rare signals such as Musique from Amiens and Paris and Culture from Caen. On October 1, a peak day, he logged 6 transmissions of Culture, 7 of Inter and 6 of Musique, as well as Frequence Nord and a Belgian station at Egem. At midday on the 24th, I used the v.h.f. radio section of my Plustron TVR5D from a site in Ashdown Forest and with its telescopic antenna, I heard several French stations between 98 and 101MHz. From the home QTH during the evening, I found Band II in chaos. I counted at least a dozen foreign voices between 87 and 103MHz, plus inter-station "warbles" and some of the music may well have come from continental transmitters. Between the 27th and 30th Bill Kelly, trying out a friends JVC receiver, heard BBC Radios Cleveland, Clywd, Cumbria, Derby, Lancaster, Merseyside and Manchester and ILR Clyde in Glasgow, Radio City Liverpool, West Sound Ayr, Red Rose Preston, Piccadilly Radio Manchester, Radio Nova Dublin and RTE 1 and 2, all between 88 and 104MHz. In Gloucestershire, **John Williams,** using a Fidelity portable and telescopic antenna on the 28th, received strong French stations around 98MHz and a stronger than usual transmission from Signal Radio in Stoke. On October 1 **Simon Ball** in Ryde, using a Toshiba receiver, heard Arabian or Indian type voices around 104MHz. I logged strong French stations between 98 and 102MHz while portable, with the Plustron, near Alfriston in Sussex. Another big peak came toward the end of this period and on October 12, **Simon Hamer,** New Radnor, listened to programmes from BBC1 in the Channel Islands, BRT-11 and RTBF-1 from Belgium, British Forces Broadcasting Service with *John Morten with Jazz* and WDR 11 from Germany and NOS-1 from Holland, between 87 and 102MHz. At 1900 on the 13th, John Williams, using a Deccasound with rod antenna logged 6 French stations at amazing strength.

# TELEVISION

*Reports, as for VHF Bands, but please keep separate.*

*by Ron Ham BRS15744*

At this time of year Band I may well appear to be dead, but do not despair, keep a watch for DX pictures via "F1" meteor scatter and brief periods of sporadic-E, during the early mornings and around midday. Tropospheric openings during the winter can be more frequent, so watch your barometer and when it is high, take a tune through Bands III, IV and V, the results are often surprising.

## Band I

Although sporadic-E is rare at this time of year the consistent band watching by **Harold Brodribb** in St. Leonards-on-Sea, **Dave Coggins** in Knutsford, **Simon Hamer** in Radnor and **Gordon Pheasant** in Walsall found short lived disturbances periodically on September 15, 18, 20, 26 and 30 and October 2, 3, 4 and 8. During these events they identified pictures, and/or test cards, from Czechoslovakia, Finland, Germany, Italy, Spain, Sweden, USSR and Yugoslavia. These were identified by catching a glimpse of such captions as ARD, CST-01, GRUNTEN, RAI, RS-KH, TVE, TV1-SVERIGE and YLE-TV1. Harold heard words from the USSR on the Ch. R1 sound frequency 56·25MHz, Dave saw an educational type programme on Ch. E2 48·25MHz, Gordon watched netball on Ch. R1 49·75MHz and Simon caught a political discussion on TSS. I saw a few bursts of picture on Ch. R1 at 0909 on the 22nd and a strong burst of test card from Poland at 1310 on the 30th.

## Tropospheric

"The weather conditions between September 14 and 17 provided plenty of good DX," writes **George Garden,** Edinburgh. After seeing signals from the Black Hill transmitter at his father's home in Laurencekirk on the 17th George promptly took his JVC CX610GB receiver to Cairn O'-Mounth, a local high spot. Between 1400 and 1630, using a stacked 4X antenna outside of his car, he found many signals throughout Bands IV and V. By carefully checking adverts, captions and channel numbers, he identified pictures from Ch. 4,

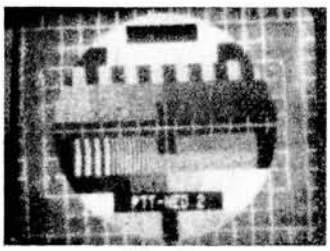


Fig. 1

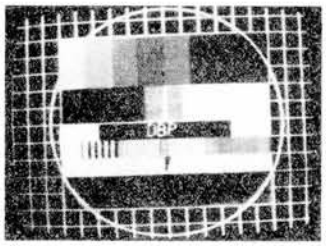



Fig. 2


Fig. 3

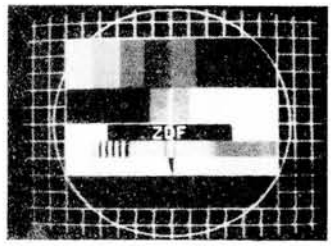



Fig. 4

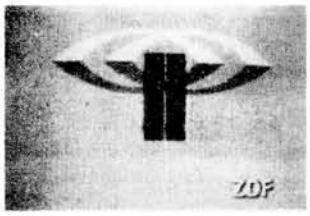



Fig. 5


Fig. 6


Fig. 7

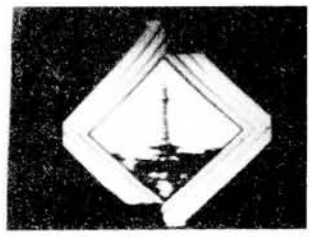


Fig. 8


Fig. 9

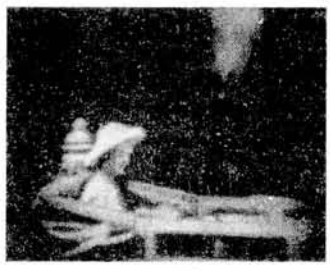


Fig. 10

Fig. 11

Fig. 12

Selkirk on Ch. 65 and BBC 1 from Darvel in Ayrshire on Ch. 33.

During the afternoon of October 5, George made another trip to Cairn O'Mounth with his JVC and received strong colour pictures from Tyne Tees, Chatton on Ch. 49, BBC 1 from Darvel on Ch. 33 and Grampian TV from their Taybridge satellite at Dundee on Ch. 41. George stressed the importance of varying the antenna polarity between horizontal and vertical and reports some co-channel interference on several stations in the u.h.f. band. **Adrian Butcher,** Washington, using a Plustron TVRC5D and dipole antenna received test cards from Holand PTT-NED-2, Fig. 1, on Ch. 50 and news and test card from Belgium RTBF-1, Leglise, on Ch. 11 in Band III on the 24th.

Harold Brodribb received a test card from Belgium, Wavre on Ch. 8 at 1805 on the 25th and both Liege on Ch. E3 and Wavre and negative pictures from France, Abbeville and Neufchatel on several u.h.f. channels on the 28th. He also received test cards from Belgium RTBF-1, Germany ARD/ZDF and Luxembourg RTL in Band III and negative pictures on about 5 u.h.f. channels on October 1.

While using my TVR5D, portable at Ightom Mote in Kent on September 20, I logged negative pictures from France in Band III and some co-channel interference on u.h.f. signals was seen from the home QTH during the evening. Around 2000 on the 24th, I tuned through Band III and found a travel film in colour on Ch. E8, a picture of a post card with "IQ BRT" on it, a YL announcer before what looked like a science programme with a "LAB YRI" caption and the word "BELGICA" in front of a warship. At 0958 on October 10, I saw the Schools TV "PAUSE" caption, with analogue clock, from Holland on Ch. 4 and a Belgian test card on Ch. E10.

The big event came on the 13th, when, at 1944, I received strong colour pictures from Radio Telefis Eireann and watched part of *Murphy's Micro Quiz-In* on RTE-1 and many adverts on RTE-2 in Band III. This was still open at midday on the 14th, because test cards from Belgium BRT TV1 and Holland PTT-NED 1 and a couple of negative pics from France were still coming in. During the evening of the 13th, **Peter Lincoln,** Aldershot, noted the heavy co-channel interference on his local station, so, into the shack, on with the Panasonic receiver-cum-video monitor and after close-down at 2330, he received u.h.f. colour test cards form the German stations DBP, Fig. 2, DBP WDR 3, Fig. 3 and ZDF, Fig. 4 and a fine ZDF logo, Fig. 5. Around 0820 on the 14th, Peter tuned around Bands I and III, using his Datong dipole, and received test cards from Holland PTT-NED-1 on Ch. E4 and from Germany NDR-1 on Ch. E7. The latter was his first ever DX in Band III and he also logged the East German test card DDR-F2 in Band V.

At 1000 on the 13th, Gordon Pheasant received CEEFAX type information from RTBF-1 on Ch. E11, a full colour test card from Luxembourg RTL PLUS (a new one for him) on Ch. E7. During the evening, he saw a religious programme from DDR-1 and good colour pictures from ARD-1 in Band III. Simon Hamer did very well on October 12 and 13 when he received pictures in Band III from Belgium, Denmark, Eire, France, east and west Germany, Holland, Luxembourg and Switzerland and saw the respective captions, BRT-1, RTBF-1, DR, RTE-2, TDF, CANAL PLUS, DFF-1, ARD/WDR-1, ARD/SWF-1, NOS-1, and PTT-NED-1, RTL PLUS and +PTT/SRG-1. He also saw pictures from France on over a dozen u.h.f. channels and although negative, Simon identified the captions, A2, FR3, TDF and TF1 and watched a subtitled film from BRT-2 on Ch. E46 and a test card from ZDF on Ch. E37. Among the programmes he saw in Band III were, *Akuelle Kamera* from East Germany, *Rendezvous* from France, *Paganini on Violin* and *Elections* from Belgium. Although the majority of Simon's DX was received at his home QTH, he took a trip to Penyfforest Hill on the 13th and with a rod antenna, received excellent pictures from Denmark on Ch. E7 and RTE 2 on Ch. J. In Bristol, **Len Eastman,** found Band III very good and after logging strong pictures from Belgium, France, Holland, Ireland and Luxembourg remarked, "We don't often get the results like this, as they do on the east coast."

## SSTV

During the month prior to October 13, **Richard Thurlow G3WW,** March, had 2-way, 8-seconds, QSOs with G4ENA and G4ENB on 1·960MHz. He also joined in the 0815 to 0835BST daily net on 3·730MHz with stations in Sheffield. During this net, Richard had frequent 2-way, 24- and 48-seconds SC2-K colour exchanges with Bert Croker G4NJI in Rotherham. On October 13, both Bert and Richard exchanged 2-way, 8-seconds pictures with G3KDD in Helston. After their QSOs Bert transmitted a 24-seconds, single frame colour picture of himself, using his colour camera and a Volker Wrasse interface board. "G4NJI can now supply all Volker-Wrasse SSTV/FAX equipment from his TV shop in Sheffield," said Richard. After seeing the 36 second colour tape made by Ron Clews G3CDK, through his Robot 1200C Luminance, SSTV converter of the pictures from *Challenger,* Richard remarked, "Simply magnificent." The contact with G3KDD gave Richard his 2093rd, first time worked, 2-way SSTV QSO and his first new one since the end of August.

In Bude, **Lester Curno** received signals from CT1WW, DK9KW, IY4MO, K1QBZ,

OZ4EDR, SP6BNG and YU5OZ within this period. During the evenings of September 23 and 25 he logged the caption, "ZS6BKK DE I1CEL" and on the 23rd, saw EA5FIN experimenting with colour. Like Lester, I copied strong signals, with some QSB, from OZ4DER (Fig. 6) calling CQ followed by "K" at 1530 on September 21. During the GARTG SSTV contest on October 5, I received pictures on 14·230MHz from IK3BPN (Fig. 7) and YU1NR, as well as partial captions from CT1, EA and SP, which were spoilt by both QRM from s.s.b. stations and QSB. During the afternoon of October 12, Peter Lincoln, received pictures from EA9NP working a GJ4 on 14·230MHz and adding Ceuta and Melilla to his new countries list. Dave Coggins recently added the Scarab SSTV software to his Spectrum computer and has already copied pictures from Italy, Hungary, Poland and the USA.

## News from India

Sporadic-E disturbances during the morning of August 4 and the evenings of July 30 and August 6 were observed by **Major Rana Roy**. He saw cartoon and feature films and a high ranking Russian naval officer, in another programme, from the USSR on Ch. 2 in Band 1. "This year we hardly saw an Arabic station via sporadic-E. They are normally very strong and are available like local stations for 2–3 hours, but, whatever we saw this year was for a very short duration," writes Rana on October 1. During the tropospheric openings on August 8, 10, 16 and 21 and September 4, 5 and 19, Rana received pictures in Band III from Lahore TV on Ch. 5 (Figs. 8 and 9), Jalandhar TV on Ch. 9, Mussoorie and Pakistan TVs on Ch. 10 (Figs. 10 and 11) and Rawalpindi TV on Ch. 8 (Fig. 12). While these events were in progress, Rana saw a variety of adverts (Fig. 9), news, (Fig. 12) a play in Urdu, a programme about Yoga, an American TV serial and a documentary about the ex-President of india, Dr Radhakrishanan, as well as test cards. Some of these transmissions were received in colour.

My thanks to Bill Stewart, Lossiemouth, for the translation of the Russian text in our November issue, Fig. 7 is "CANADA TODAY" and Fig. 8 is "LOOK".

# MW BROADCAST BAND DX

Reports to: Brian Oddy G3FEX, Three Corners, Merryfield Way, Storrington, W. Sussex RH20 4NS

by Brian Oddy G3FEX

The little two-transistor, double-reflex receiver mentioned in the October '85 *PW* "On the Air", as used by **John Ratcliff** of Southport, Queensland, Australia, created considerable interest. John has now kindly sent along the basic circuit of this design together with a few contructional notes and I shall be pleased to send a copy of these to interested *PW* readers. (Please enclose a suitable s.a.e. or IRCs with your request.)

## DX Report

*Note: Frequencies in kHz: Times UTC = GMT.*

**Transatlantic DX: Paul Logan** of Co. Fermanagh was busy on October 13 late into the night looking for transatlantic DX. Newfoundland's CJYQ 930, with much fading, was noted first at 0100 from St. John's; and later at 0205 CKYQ appeared at good strength from Grandbank on 610. To his surprise he found a very strong signal from WHN 1050 at 0400, with a programme of country music called *Memory Machine*.

From South America, Paul heard Radio Globo 1220 at 0105 broadcasting from Rio de Janeiro and quite a strong signal from Radio Visión 950, located in Caracas.

"Not exactly the best month for DX," says **Graham Powell** of Pontypridd, but some good DX was heard, including most of the stations he reported last month. In addition, WNBC 660 and WABC 770 from New York were received around 0330 by Graham on his new Trio R-2000 receiver. From Boston, WBZ 1030 put in an appearance at 0355. Canada's CBGY 750 from Bonavista Bay, Newfoundland, was logged at 0307 and CKLM from Montreal was noted at 0331.

**Simo Soininen** of Kauniainin, Finland, says that the majority of the North American stations detailed in *PW* are also being heard in Lapland, North Finland. He has sent along a comprehensive list of m.w. DX heard by s.w.l.s in Finland during 1984/85 which makes very interesting reading.

At his listening post in Belfast, **Bill Kelly** has been hearing Newfoundland's CJYQ 930 on four nights around 0100—often a good signal by 0230—and CBGY 750 at 2330. WHN 1050 was received on three nights from New York at 0230 with talks about baseball (and adverts for fertilisers!). Another good signal was WCAU 1210 at 0220 from Philadelphia. WGAR 1220 with news and weather from Cleveland made interesting listening at 0530. WTOP 1500 was logged on three nights from Washington between 0130 and 0230. On October 2 Bill heard a three-station link up, between 0130 and 0300, relaying a football match from the USA between Detroit and New York Tigers. The stations involved were CJYQ 930 St. John's, CIYQ 680 Grand Falls and CKYQ 610 Grandbank—they all used a common callsign CIYQ. Bill says it was an exciting match and the referee was involved in an argument with a Tiger player!

## News from "Down Under"

John Ratcliff has sent along more details about DXing m.w. in Australia. He says: "There are about 130 Australian, 50 New Zealand and a couple of dozen Pacific Island transmitters operating on the m.w. band. About 75 per cent are commercials and operate 24 hours a day. Each and every one has a heterodyne present, unless it is a local. With enough time and patience I could log every one of them but I confine my activities to the small hours. It is now mid-summer in Southport and by the end of December sunrise is at 0445 and sunset at 1830, the temperature is 35–37°C. In January, tropical cyclones and lots of static occur so when to listen is all important—0100–0500 is best." John offers a good tip to m.w. DXers: "Antenna height is more important than length (20 metres is long enough if it is high enough)."


## Other DX

A very interesting log from **Philip Rambaut** of Macclesfield details DX heard between 1700 and 1800UTC: on l.w.—Minsk (USSR) 281, Prague 272 and Tipaza, Algeria 254; on m.w.—Innsbruck 520, Cuna di Dentro (Swiss) 558, Vienna 585, Prague 639, RTE 1 (Cork) 729, Algiers 891, Turku (Finland) 963, Katowice (Poland) 1080, Bratislava (Czech) 1098, Belgrade (Yugoslav) 1134, Solvesborg (Sweden) 1179, VOA Munich 1197, Warsaw 1206, RTE 2 (Dublin) 1278, Litomysl (Czech) 1287, Kvitsoy (Norway) 1314, Kaliningrad (USSR) 1386, Leningrad 1494 and Kosice (Czech) 1521.

Programmes from Radio Polonia 1503 were received on a Vega B210 with ferrite rod antenna by **Keith Fernie** of Ossett, W. Yorks, during eight days of enjoyable listening. Other stations included BRT Brussels 1512, Radio Prague 1287 and Radio Vilnius (USSR) 666. On l.w., Tipaza, Algeria 254 was logged.

**Martyn White** of Edinburgh lives on the 5th floor of a 15-storey block. This is a common situation which presents antenna problems when there is no balcony. My advice is to use a m.w. loop antenna for DXing. His log includes Radio Yugoslavia 1008 and AFRTS 1080.

Bill Kelly noted SER Madrid 810 and Radio COPE Canary Is. 837. Paul Logan's log included RNE1 (Spain) on 585 and 684, Portugal 660, Marseille (France) 674, Bayerischer Rundfunk (Germany) 801, BRT 1 (Belgium) 927, Hilversum 1008, Denmark 1062 and Stavanger (Norway) 1314.

An attractive QSL showing the 135m-tall antenna masts of Radio Sweden's new Solvesborg transmitter 1179 was sent in by **Chris Hughes** of Helston, Cornwall (Fig. 2). He says, "Their programme matches the signal—very good". A free Radio Sweden poster is available for reception reports (see QSL addresses)." **Alan Merritt** of Abingdon has been enjoying their "phone-in" programme on acid rain.

**Alan Williams**, also of Helston, has logged Manx Radio 1368; he and **Darren Taplin** of Tunbridge Wells both enjoy Radio Finland's *Compass North* programme on 254 and 963kHz.

An amusing letter from **Phil Englehard G8UFU**, of Macclesfield describes how Radio Sevilla (Spain) 792 had a football commentary recently and each time a goal was scored the Morse letters G O L were sent! "Just imagine that on BBC Radio 1 at 20 w.p.m.," he says!

**Fig. 1: An ILR Red Rose Radio sticker sent in by Paul Logan of Co. Fermanagh**

| Heard by ▶ | | Keith Fernie, Ossett | Dave Jackson, Goole | Graham Johnson, Nuneaton | Paul Logan, Co. Fermanagh | Alan Merritt, Abingdon | Graham Powell, Pontypridd | Darren Taplin, Tunbridge Wells | Derek Thornley, Birmingham | Alan Williams, Helston | Stephen Woods, Nottingham |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Freq (kHz)** | **Station** | | | | | | | | | | |
| 603 | Invicta Sound | | | | | | | | | | X |
| 630 | Radio Cornwall | | | | X | | | | | | |
| 630 | Radio Bedfordshire | | X | | | | | | | | |
| 666 | Radio York | X | | | X | | | | | | X |
| 666 | Devon Air Radio | | | | X | | | | | | |
| 756 | Radio Cumbria | | | | X | | | | | | |
| 756 | Radio Shropshire | X | | X | | X | | | | | |
| 774 | Radio Leeds | | | | | | | | | | X |
| 792 | Chiltern Radio | | | X | | | | | | | X |
| 801 | Radio Devon | | | | X | | | | | | |
| 837 | Radio Leicester | | X | X | | | | | | | |
| 837 | Radio Furness | | X | | | | | | | | |
| 855 | Radio Lancashire | X | X | | X | | | | | | |
| 855 | Radio Norfolk | | X | | | | | | | | |
| 855 | Radio Devon | | | | | | | | | X | |
| 873 | Radio Norfolk | | X | X | | | | | | | X |
| 954 | Radio Wyvern | | | | X | | | | | | |
| 990 | Beacon Radio | | | X | | | | | | | |
| 999 | Red Rose Radio | | | | X | | | | X | | |
| 1026 | Radio Cambridgeshire | X | X | X | | X | | | | | X |
| 1035 | Radio Sheffield | X | | | | | | | | | X |
| 1107 | Radio Northampton | | X | X | | X | | | | | |
| 1116 | Radio Derby | X | X | X | | | | | | | |
| 1116 | Radio Guernsey | | | | | X | | | | | |
| 1152 | Radio Clyde | | | | X | | | | | | |
| 1152 | BRMB Radio | | | X | | | | | | | |
| 1152 | LBC | | | | | X | | | | | |

| Heard by ▶ | | Keith Fernie, Ossett | Dave Jackson, Goole | Graham Johnson, Nuneaton | Paul Logan, Co. Fermanagh | Alan Merritt, Abingdon | Graham Powell, Pontypridd | Darren Taplin, Tunbridge Wells | Derek Thornley, Birmingham | Alan Williams, Helston | Stephen Woods, Nottingham |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Freq (kHz)** | **Station** | | | | | | | | | | |
| 1152 | Piccadilly Radio | X | | | | | | | | | |
| 1161 | Viking Radio | | | | | | | | | | X |
| 1161 | Radio Bedfordshire | | | X | | X | | | | | |
| 1161 | Radio Sussex | | | | | | | X | | | |
| 1170 | Signal Radio | | | X | | | | | | | |
| 1251 | Saxon Radio | | | X | | | | | | | |
| 1260 | Leicester Sound | | | X | | | | | | | |
| 1260 | Radio GWR | | | | | | X | | | | |
| 1278 | Pennine Radio | | | | | | | | | | X |
| 1323 | Southern Sound | | | | | | | X | | | |
| 1332 | Hereward Radio | | X | | | | | | | | |
| 1359 | Mercia Sound | | | X | | | | | | | X |
| 1359 | Essex Radio | | | | | | | X | | | |
| 1368 | Radio Lincolnshire | X | | | | | | | | | |
| 1431 | Essex Radio | | | | | | | X | | | |
| 1458 | Radio WM | | | | | | X | | | | |
| 1458 | Radio Manchester | | | | X | | | | | | |
| 1458 | Radio Cumbria | | | | X | | | | | | |
| 1458 | Radio Devon | | | | | | | | | X | |
| 1485 | Radio Humberside | | | | | | | | | | X |
| 1485 | Radio Merseyside | | | | X | | X | | | | |
| 1485 | Radio Sussex | | | | | | | X | | | |
| 1503 | Radio Stoke-on-Trent | | | | | | X | | | | |
| 1530 | Pennine Radio | X | | | | | | | | | |
| 1557 | Hereward Radio | | | X | | | | | | | X |
| 1584 | Radio Shropshire | | | | | | X | | | | |

**Fig. 3**

Early this year Phil "dug" out of the corner of his room an old m.w. loop antenna, connected it to his FRG-7 receiver and was amazed at the results, hearing the BBC Masirah station 1413 at 1900. Recent reception of Radio Cadena (Canary Is.) 1215 has amazed him, too—this signal is heard between 2300 and 0540 ("when Radio 3 is put to bed," he says) and is often stronger than the BBC Radio 3 transmitters when they are powered in turn, until his local one comes on!

## Local Radio DX

**Steven Woods** does his local radio DXing during daylight hours, and quite successfully as can be seen in Fig. 3.

**Bert Trickey** of Bristol informs me that, from October 1, ILR Radio West amalgamated with Wiltshire Radio to become the new ILR Radio GWR.

**Derek Thornley** of Birmingham received Red Rose Radio 999 when in Stoke-on-Trent, some 110km away. **Paul Logan** has received their car sticker, and he is another who does his DXing during the day, Fig. 1.

Daylight DXing is obviously popular, as Dave Jackson also finds signals better then. After two years of s.w.l.ing **Graham Johnson** has decided to explore m.w. local radio DXing, again Fig. 3 shows the results.

**Alan Merritt,** who uses a Vega receiver, heard a live report on a helicopter crash at Silverstone Race Track via BBC Local Radio Northampton 1107 on October 8. **Darren Taplin** uses a DX-150A receiver and a 25m-long wire. The chart in Fig. 3 shows how all the DXers have fared this month.

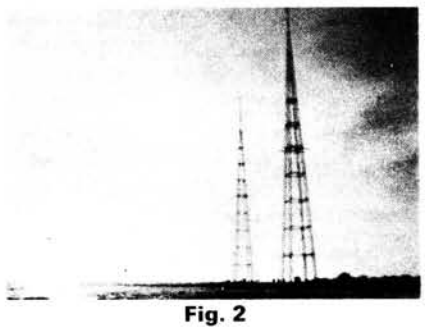


**Fig. 2**

## QSL Addresses

Radio Sweden: S-105 10 Stockholm, Sweden.
BBC Radio Bristol: 3 Tyndall's Park Road, Bristol BS8 1PP.
BBC Radio Derby: 56 St. Helen's Street, Derby DE1 3HY.

# SW BROADCAST BANDS

*Reports: as for Medium Wave DX, but please keep separate*

*by Brian Oddy G3FEX*

## For the Newcomer SWL

One of the many interesting things about short wave radio is that it brings together the peoples of the world, hopefully to bring about a common understanding of many subjects. One of the basic essentials for this to happen—apart from overcoming the problems of different languages—is that there should be a common understanding of the **language of time,** for it is necessary for broadcasters to use a time system for their transmission schedules which is meaningful in every country of the world.

The thousands of tiny signals from short wave transmitters located around the world arrive at a receiving antenna and by simply adjusting the receiver tuning it is possible to select signals from different countries. The world is literally at one's finger tips! Ponder a moment upon the implications of this.

When it is nine o'clock in the evening in the UK it is afternoon tea time in New York, lunch time in Los Angeles and breakfast time tomorrow morning in Australia! These differences are not just restricted to the time of day, either, for different seasons exist, too—summer in one country and winter in another! Also, because large countries have to take into account the differences in the time of day between their eastern and western shores (or boundaries) **time zones** have to be introduced. The USA has four such zones, Canada has six, Australia has four, whereas New Zealand has only one.

The legal civil time in the British Isles is called **Greenwich Mean Time** (GMT). However, during periods laid down by the Government, **British Summer Time** (BST) is introduced and this is one hour ahead of GMT.

Greenwich Mean Time is derived from observations of the sun's transit over the Greenwich Meridian, located at longtitude measured East and West as 0°. Because the earth's rotation is somewhat irregular, many such observations over a period of years are necessary. These are collected and then corrected and correlated to produce a dynamic time scale, based on a variable unit. Although there are always 60 seconds in a minute of GMT, the length of a second varies gradually. Clocks are, in effect, adjusted to keep in step with the rotation of the earth on its axis.


**Fig. 1**

Some idea of the relevant time of day in other countries in relation to GMT is given in Fig. 2.

Because of the problems in trying to convert from one time to another, the International Telecommunications Union established a universal time system called **Universal Time Co-ordinated** (UTC). This is, for most practical purposes, similar to the long used Greenwich Mean Time but is derived from an Atomic Standard. This Atomic Standard uses the Caesium 133 atom which has a frequency of radiation taken to be, by definition, 9192·631770MHz. The seconds of the UTC system are always the same length but there are not always 60 seconds in a minute for it is occasionally necessary to introduce **leap seconds** in order to keep UTC in step with astronomical time because of the irregular nature of the earth's rotation. Time in UTC makes use of a 24-hour clock system. This UTC 24-hour clock system is used throughout the world by broadcasters when drawing up their transmission schedules. How, then, may s.w.l.s use the system?

Irrespective of where a s.w.l. lives in the world, it is a good idea to place a small clock near to their receiver permanently so that this can be set always to display UTC, independently of any other clocks about the house which may well display a local time. (Some receivers have such clocks built into them.) This little clock can have a 12-hour dial and be used in conjunction with a conversion table but it is better to purchase a 24-hour clock—these are now available in some shops and such clocks make a nice birthday or Christmas present! Once this clock is set to UTC it is **never** altered throughout the year. So, how do we set it to UTC?

In the UK, s.w.l.s may, **during the winter months,** make use of the Greenwich time signals radiated on the domestic BBC services, or use the telephone "speaking clock" to set their 24-hour clock. For although the legal winter time is GMT all these time signals are now derived from Atomic standards using UTC. No-one actually has convenient access to GMT any longer—so perhaps we should persuade our Government to call it UTC instead! During the summer months when we are using BST, clocks everywhere in the UK will be one hour ahead of UTC, so don't forget to allow for this if setting up initially the 24-hour clock.

Overseas listeners must ignore their local clock times and set the 24-hour clock to UTC using, for example, the BBC World Service time announcements. Alternatively, they may make use of the very accurate time signals transmitted from special stations around the world to provide standards against which clocks and other devices can be compared. (Incidentally, because these stations transmit on highly accurate r.f. frequencies, these, too, can provide a means of calibrating a secondary frequency standard—see August *PW* page 55.) Where to find some of these special stations is detailed in Fig. 3.

| UTC | Travelling Eastwards from UK |
|---|---|
| 0001 | UK |
| 0100 | C. Europe, Berlin, Geneva, Stockholm |
| 0200 | E. Europe, Cape Town, Cairo, Moscow |
| 0300 | Arabia, Ethiopia, Madagascar |
| 0400 | Mauritius, Iran, Reunion Island |
| 0500 | Central Russia, Bombay, India |
| 0600 | Calcutta, Tibet |
| 0700 | Sumatra, Thailand, Laos |
| 0800 | Philippines, Perth |
| 0900 | Japan |
| 1000 | E. Australia, Melbourne, Sydney |
| 1100 | New Caledonia, New Zealand |
| 1200 | International Date Line, Fiji |

| UTC | Travelling Westwards from UK |
|---|---|
| 1200 | International Date Line, Fiji |
| 1300 | Nome, Alaska, Samoa |
| 1400 | Hawaii, Midway Islands |
| 1500 | Eastern Alaska, Dawson |
| 1600 | Los Angeles, Seattle, Juneau |
| 1700 | Calgary, Denver, Phoenix |
| 1800 | Chicago, Costa Rica |
| 1900 | Montreal, New York, Peru |
| 2000 | Argentina, Nova Scotia |
| 2100 | Greenland, Rio de Janeiro, Brazil |
| 2200 | Azores |
| 2300 | Iceland, Canary Islands |
| 2359 | UK |

**Fig. 2 ▲**

**▼ Fig. 3**

| Frequency | Standard Time Station |
|---|---|
| 60kHz, 2·5MHz, 5·0MHz, 10MHz | MSF—Rugby—England |
| 2·5MHz, 5·0MHz, 10·0MHz, 15·0MHz, 20·0MHz | WWV—Fort Collins—USA |
| 3·33MHz, 7·335MHz, 14·670MHz | CHU—Ottawa—Canada |
| 4·5MHz, 7·5MHz, 12·0MHz | VNG—Lyndhurst—Australia |

Because all broadcasters use UTC for their schedules they expect to receive s.w.l. reports and comments about their broadcasts in terms of UTC, in return. So, remember to state the time of reception in all reports—including those to "On the Air" in *PW*!—in UTC. Make all entries in your log book in UTC, too—it's the "Universal Time Language".

## Conditions on the HF Bands

Note: Frequencies in MHz; Times UTC = GMT.

**The 26MHz (11m) and 21MHz (13m) Bands:** The 11-year solar sunspot cycle has now reached a probable minimum for there are no visible spots on the sun's surface at the time of writing (mid-October). Conditions on the higher frequency bands can therefore be expected to be poor.

The 26MHz band is very empty now, for the BBC signal on 25·650 ceased from the end of their summer schedules in late September. **Chris Hughes** of Helston, Cornwall, carried out regular checks on the band and confirms that no signals were heard. **Bill Kelly** of Belfast also monitored 26MHz and, apart from an out of band Russian programme heard on 9 September on 25·467 at 1830, found the band to be dead.

The 21MHz band is still producing some interesting signals. Radio Japan's trans-

mission via Moyabi, Gabon, on 21·550 was heard by **Darren Taplin** of Tunbridge Wells at 1500, using a DX 150-A receiver plus 25m long wire antenna. "Newcomer s.w.l." **Bob Taylor** also heard these signals in Edinburgh, on his new Toshiba F11/L receiver and just the set's whip antenna!

The signals from UAE Dubai are very strong in the UK. **Graham Powell** of Pontypridd, along with **Bert Trickey** of Bristol and Bob Taylor, have all logged them as "excellent". They beam to Europe on 21·605 between 1330 and 1400 with English News.

Radio Moscow broadcasts are targeted to Australia and Asia in the early morning and around midday to Africa and the Middle East on this band: their frequencies include 21·450, 21·545, 21·590, 21·670, 21·715 and 21·740.

Radio Berlin International's transmission to Asia was noted by Bob Taylor on 21·540: look for this between 1330 and 1415. Another one logged by Bob was Vatican Radio on 21·485—this transmits to Africa at 1200.

The BBC use a number of frequencies in this band. Their transmitters in the UK radiate on 21·470, 21·550 and 21·710, while their overseas stations in Limassol, Cyprus and Ascension Island use 21·660MHz. The signals are targeted mainly to Australia, Asia, Africa and the Middle East during the day.

**The 17MHz (16m) and 15MHz (19m) Bands:** All India Radio from Delhi is just one of the many signals to be heard on the 16m band and was logged by **Edward Stone** of Kingston upon Thames on 17·705, using his FRG-7700 receiver. Listen between 0830 and 0840.

Radio Australia, 17·715, is a good signal most mornings and one for which "Newcomer s.w.l.s" should listen. **Michael Sargeant** of Bolton, Lancs, has been hearing it well at 0805. He uses a Panasonic DR-49 receiver with Datong AD-370 Active Antenna.

In an extensive log from **Keith Fernie** of Ossett, Yorks, the 17MHz stations detailed include Radio Japan (via Gabon relay) 17·855 at 0700, Radio Cairo, Egypt, 17·675 at 1215 and the UAE Dubai 17·775 at 1330, which is a strong signal.

"Newcomer s.w.l." **Kevin Plunkett** of Wembley also heard UAE Dubai but earlier, at 1045. He has a Sony 7600D receiver. His first log mentions The Voice of the Andes from Quito, Ecuador—HCJB 17·790 at 1930. This is always a popular station and their excellent *DX-Party Line* s.w.l. programme, hosted by John Beck, is a "must" for s.w.l.s on Mondays and Wednesdays. My thanks to **Stephen Roberts** of Urmston, Manchester, for his comprehensive s.w.l. DX programme notes. He says: "A special edition of *DX-Party Line* is broadcast live on Saturday mornings. Any s.w.l.s can ring the station in Ecuador to ask a panel of experts questions about DXing".

Radio Canada International 17·820 at 1900 was logged by Michael Sargeant. This station has a special *Short Wave Listeners' Digest* programme, hosted by Ian McFarlane, which is broadcast on Saturdays.

A Yaesu FRG-8800 plus FRV-8800 is the receiving equipment used in Edinburgh by **Martyn Whyte** to listen to excellent signals from Radio Bangladesh, 17·670 at 0815.

**Peter Mills** of Sherborne, Dorset, noted good signals from The Voice of Turkey, 17·885 at 1330, using his Selena portable.

Radio RSA, Johannesburg, 17·780 transmits to Europe and the Middle East between 1400 and 1556—newcomers should look out for their excellent signal and listen, too, for their *Mail Bag* programme conducted by Shirley Veal and Kathy Fitch. They answer listeners' letters and have a personally signed QSL waiting.

Although you may not understand the language, FEBA Radio Seychelles 17·875 broadcast in Arabic and is a good signal in the UK at 1100 according to Graham Powell, who also heard Radio Pakistan 17·660 at 1100 and, earlier, Radio Afghanistan (via USSR) 17·655 at 0952.

Signals from all continents can be heard on 15MHz; the level of illegal jamming has considerably increased, however, which makes reception difficult at times.

A station located in one of the rarer DX spots—Saipan, North Mariana Islands—is KYOI 15·190. **Derek Thomley** of Birmingham has been hearing it from 0840 and has sent along their QSL, Fig. 1. He says: "It takes a bit of finding on the map!"

**Margaret Sadler** of Leeds listens to *News around Asia* in English, beamed to Europe from Radio Japan at 0700 on 15·235, and later logged RNB Brasilia, Brazil 15·155 at 1800 and RAE Buenos Aires, Argentina 15·345 at 2120, using just a whip antenna on her Grundig 1400SL receiver.

Africa No. 1, Gabon 15·475 has been received by **Philip Rambaut** of Macclesfield at 1730 and, later, by **Simon Hamer** of New Radnor at 2014 with "pop" music. Simon logged an s.s.b. signal from Radio Sweden 15·420 at 2030, AFRTS Greenville, USA 15·430 at 2036 and WYFR 15·440 at 2040 from Oakland, California, USA.

Radio Tirana, Albania 15·430 was heard by **John Parry G4AKX** of Northwich, Cheshire, at 1730 and Darren Taplin noted Radio Bucharest, Rumania 15·380 at 1747 in his log. Programmes from UAE Dubai 15·320 at 1630 and Radio RSA Johannesburg 15·185 (in German) at 1730 were enjoyed by **Bill Stewart** of Lossiemouth.

**Albert Fisher G4VBH** of Heston, Hounslow, has listened to RCI Montreal, Canada 15·325 from 1900, Radio HCJB Quito, Ecuador 15·270 at 1900 and BBC Ascension Island 15·260 at 2000. The Voice of Nigeria 15·120—"a strong signal with poor modulation"—was received by Peter Mills at 1800. **Alan Williams** of Helston, Cornwall, logged Radio Jamahiriyah, Tripoli 15·450 at 1818 and Radio Budapest, Hungary 15·160 at 1600.

During the Mexico earthquake, Bill Kelly kept a listening watch between 2000 and 0330 for signals from their 50kW transmitter on 15·430, but heard nothing.

**The 13MHz (22m) Band:** Radio Nederlands are now operating in this band on 13·770 with a programme in English at 1430.

**The 11MHz (25m), 9MHz (31m), 7MHz (41m) and 6MHz (49m) Bands:** These bands are becoming more and more congested; nevertheless Radio Australia can usually be heard well on all of them! Two newcomers—**Clive Powell** of Southport and Kevin Plunkett—have been enjoying the thrill of hearing signals from "down under" for the first time. Clive has heard their programmes on 6·035 at 2000. Kevin listened much earlier, at 0600, to their 11·910 signal. Keith Fernie has sent along a QSL confirming his reception of their 7·205 transmission from 1530—this depicts a "chopping competition".

Another newcomer, **Leighton Smart** of Trelewis, Mid. Glam, received Radio Aus-

tria Int 12·015 at 1525, Radio Bucharest, Rumania 11·775 at 1520, Radio Polonia, Warsaw 7·285 at 1415 and Radio Sweden Int 9·630 from 1100. This station has an s.w.l. programme called *Sweden Calling DXers* on Tuesdays.

All India Radio's programmes 9·910 received by **John Sadler** of Bishop's Stortford, Herts, were heard at 2230. Other entries in his log included Radio Afghanistan (via USSR) 7·310 at 1900, Radio Kiev, Ukraine 7·175 at 1900 and The Voice of Israel 9·435 at 2230. Bert Trickey also enjoys All India Radio programmes but listens to them on 11·620 at the earlier time of 1940. Both he and Bill Stewart tune in to the Voice of Vietnam 10·040 at 1825 and 2030, which at 2045 broadcasts answers to listeners' letters, according to Margaret Sadler. Her log mentions World News from Radio RSA, Johannesburg 11·900 at 2100 and a programme called *The Land of Music* from RHC Havana, Cuba 7·150 (via USSR) at 2223. At 2230, Margaret enjoys a religious programme from WYFR Oakland, California, USA, on 9·852.

**Alan Merritt** of Abingdon, using his new Vega receiver, has also listened to WYFR for the first time on 9·535 at 2115. Another new one for Alan was The Voice of Turkey 7·215 at 2140.

Philip Rambaut concentrated on the 7MHz band and sent along an extensive log which included TWR Monte Carlo 7·160 at 0755, Radio Austria Int 7·170 at 0900, All India Radio 7·412 at 1440 and Radio Beijing 7·055 at 1745—this station continues to operate in an international amateur band.

**The 5MHz (60m), 4MHz (75m), 3MHz (90m) and 2MHz (120m) Bands:** There is plenty of interest for the keen DXer on these bands. "Old Timer" **Harold Buggins** of Witney heard RRI Sibolga, Indonesia 5·257 at 1600. **Fred Pallant G3RNM** of Storrington listened to Ghana 4·915, Chad 4·904, Cameroon 4·795 and Nigeria 4·770 on a "vintage" Dynatron B129 receiver between 200 and 2100.

Margaret Sadler logged Radio Uganda 5·027 at 2050, Ecos del Torbes, Venezuela 4·980 at 0220 and SWABC Namibia 3·270 at 2300. Philip Rambaut heard Madagascar 3·288 at 1740 and Michael Sargeant received AIR Delhi 3·905 at 2250. Gabon 4·810 at 2130 featured in Bill Stewart's log and others.

Sounds of a tribal dance were heard by Bill Kelly from Radio Cameroon 5·010 at 0240. Later, Radio RSA 3·230 at 0400 and Albanian Radio 5·020 at 0450 were received.

Xinjiang, China 4·220 & 5·060 and Radio Moscow 4·045 & 4·060 were logged by Edward Stone. Martyn Whyte heard Mozambique 4·855 at 1730, The Voice of Kenya 4·885 at 1855 and John Parry's log included ZBC Zimbabwe 3·396 at 1925.

Graham Powell listened to Radio Atlantida, Peru 4·790 at 2315, Radio Rumbos, Venezuela at 0215 and Radio Brasil Central at 0541.

Using a DX400 receiver, **Tim Shirley** of Bristol included in his logs SABC South Africa 4835, Radio Nacional Manus, Brazil 4·845 at 0154, Havana, Cuba (via Moscow?) 4·765 at 0240 and Paramaribo Suriname 5·005 at 0222.

**Please note:** Many broadcasters will have changed their frequencies in November to account for seasonal changes in Ionospheric conditions.

**Reports by the 13th Please**

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shown in Fig. 1.4 (b) has the transmission line connected at the junction of the phasing line at mid-point. The impedance at the point of feed will however, be about 6000 ohms. Such a system could be matched to a low impedance transmission line via a λ/4 stub. Otherwise open line wire transmission line (600 ohms) from transmitter to antenna can be used and the requisite low s.w.r. obtained by tuning the transmission line.

## Endfire Systems

There are various methods of feeding an endfire array with λ/2 elements and two are shown in Fig. 2.1. In (a) a section of the phasing line is transposed above the feed point to ensure that the element currents are correctly phased. The method shown in (b) is suitable for close spaced arrays i.e., λ/8 as each half of the connecting lines are only λ/16 in length and carry very little current. With λ/4 spacing, the radiation resistance increases and the array can be fed via a tuned 600 ohm transmission line, although the array itself becomes sharply tuned. An alternative is to use folded elements (folded dipoles) in order to obtain an increase in feed impedance. Twin 600 ohm transmission lines can be used but impedance transformation via a balun will be necessary to match to a 50 ohm transmitter output.

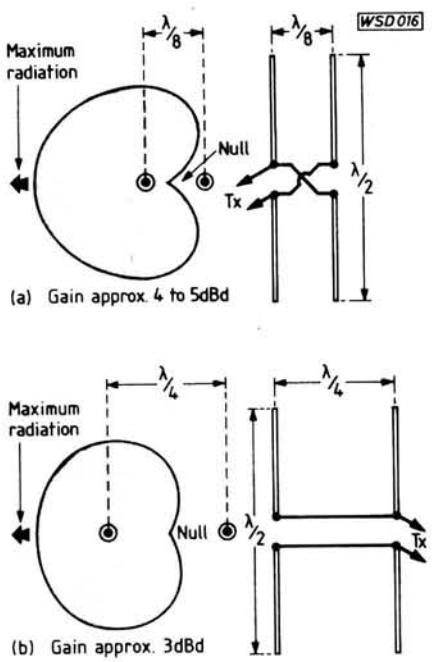


**Fig. 2.6: Uni-directional endfire arrays, (a) λ/8 spacing, 135° current phasing, (b) λ/4 and 90° phasing**

Since parts 1 and 2 of this series of articles have been intended solely for explanation of the basic function of endfire and broadside arrays, it has not been possible to include full details of the numerous methods of matching and types of transmission lines that could be used. The reader is therefore, respectfully referred to the references given. However, following articles will contain practical details of broadside and endfire systems together with methods of matching to the now commonly used 50 ohm coaxial transmission cable.

## References


1: *Out of Thin Air* IPC Magazines. (A *Practical Wireless* publication.)
2: *ARRL Antenna Handbook* ARRL. Transmission line section chapter 3.


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## Wigtownshire

**Wigtownshire ARC: Gerry Maxwell GM4BAE (Stranraer 2876).** Meets Thursdays, 7.30pm in the Stranraer CC, Lewis Street, Stranraer.

## Wiltshire

**Blackmore Vale ARS: M. R. Bailey, 11 Brines Orchard, Templecombe.** Meets 2nd and 4th Tuesdays in The Bell and Crown Inn, Zeals. Dec 10—Xmas Entertainment.

**Devizes & District ARC: Peter Greed G3MQD, 18 Nursteed Park, Devizes.** Meets Fridays, 8pm in the Devizes Town FC, Devizes.

**Trowbridge & District ARS: Gerry Callaghan G4SPE (Trowbridge 4532).** Meets 4th Tuesdays, 8pm in the Southwick Village Hall, Nr Trowbridge.

## Yorkshire

**Denby Dale & District ARS: G. Edinburgh G3SDY (Huddersfield 602905).** Meets 2nd Wednesdays, 8pm in the Pie Hall, Denby Dale. Dec 11—Xmas Party; Jan 8—AGM.

**Maltby ARS: Ian Abel G3ZHI (Rotherham 814911).** Meets Fridays, 7pm in the Church Buildings, Church Lane, Maltby. Dec 6—Computer Night; 13th—Xmas Junk Sale; 20th—Social.

**Pontefract & District ARS: Colin Mills (Pontefract 43101).** Meets Thursdays, 8pm at the Carlton CC, top floor, Pontefract. Dec 19—Xmas Party; Jan 2—AGM.

**Spen Valley ARS: Tim Clough G4PHR (Mirfield 499397).** Meets Thursdays, 8pm in the Old Bank WMC, Mirfield. Dec 19—Xmas Gathering.

**Todmorden & District ARS: J. Gamble G6MDB (Todmorden 2494).** Meets 1st and 3rd Mondays, 8pm in the Queen Hotel, Todmorden.

**Wakefield & District RS: Walter Parkin G8PBE (Wakefield 379727).** Meets alternate Tuesdays, 8pm in the Ossett CC, Prospect Road, Ossett. Dec 10—Xmas Social.

| Cover Date | Deadline | For events from early |
|---|---|---|
| March 86 | Dec 15 | February 86 |
| April | Jan 15 | March |
| May | Feb 12 | April |

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| TL922 2kw linear | £1149.00 |
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| TH41E 70cm H'held | £199.00 |
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| ICOM | |
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| 70cm 10/50 | £195.00 |
| 70cm 10/100 | £335.00 |

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|---|---|
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|---|---|
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| SP10X Budget HF/VHF | £34.00 |
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| SP420 PEP VHF/UHF | £69.00 |
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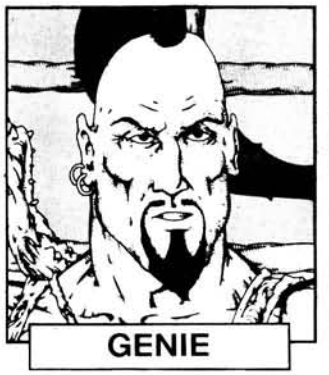
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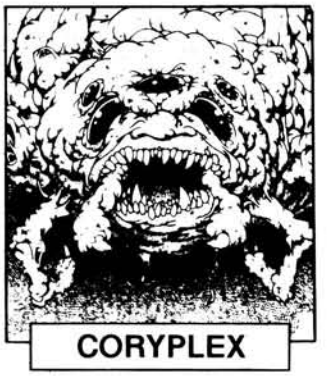
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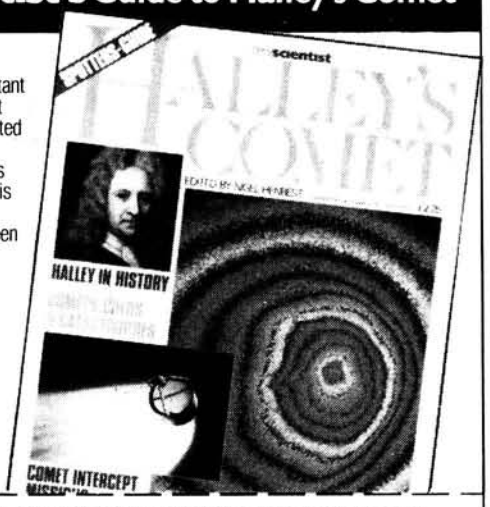


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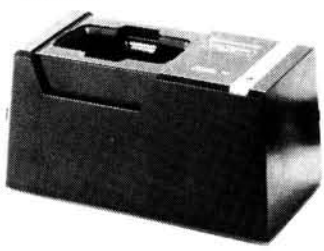

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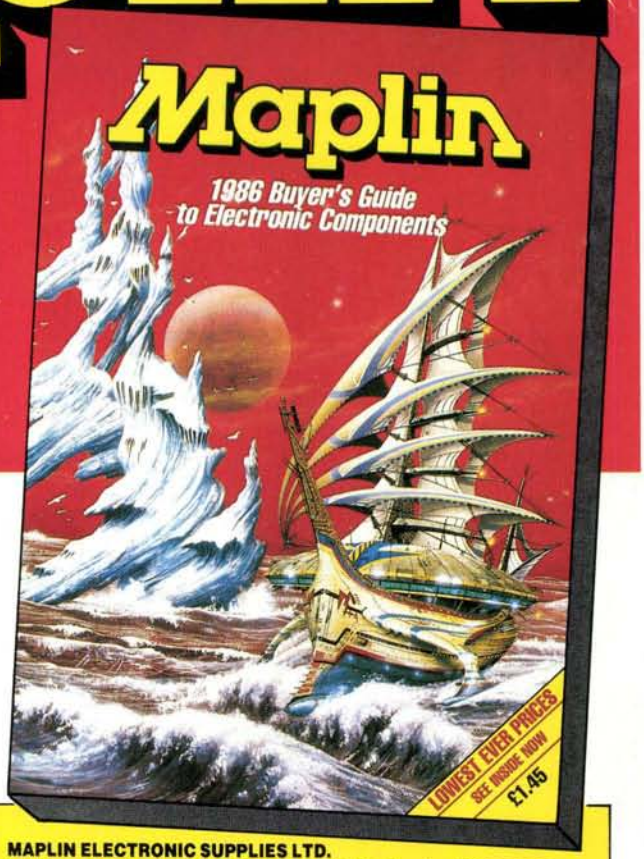


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