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Practical Wireless

MARCH 1983

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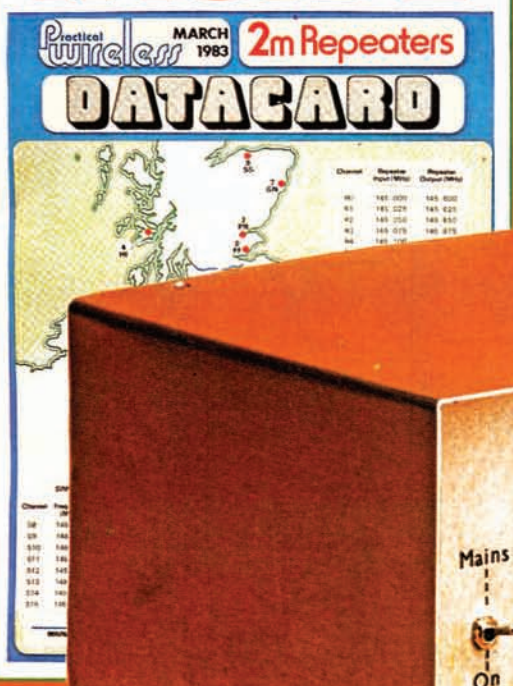

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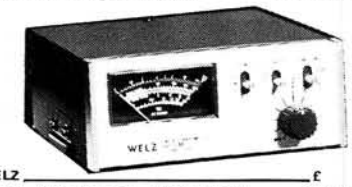
WELZ SP15M £32.00



WELZ		£	c&p
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SP45M	SWR-PWR Meter 2M/70cm 100W	45.00	(1.00)
SP200	SWR-PWR Meter H.F./2M 1KW	61.95	(1.50)
SP300	SWR-PWR Meter H.F./2M/70cm	85.00	(1.50)
SP400	SWR-PWR Meter 2M/70cm 150W	61.95	(1.50)
SP10X	SWR-PWR Meter H.F./2m compact	21.95	(0.75)
SP380	SWR-PWR Meter H.F./2M/70cm compact	49.00	(1.00)
AC38	A.T.U. 3.5 to 30 MHz 400W PEP	59.00	(1.00)
CT15A	15/50W Dummy Load (PL259)	6.95	(0.75)
CT15N	15/50W Dummy Load (N type plug)	11.95	(0.75)
CT300	300/1kW Dummy Load 250MHz (SO239)	45.00	(2.00)

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DAIWA CN630	2M/70 Cross Pointers	75.00	(—)

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WELZ CT 15A	50W MAX PL259	6.95	(0.75)
WELZ CT 15N	50W MAX N type	11.95	(0.75)
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T200	200W MAX 450MHz	34.00	(0.75)
DL600	600W MAX 350MHz	29.95	(1.50)
WELZ CT300	1000W MAX 250MHz	45.00	(2.00)

YAESU			
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FT980	H.F. Transceiver	1115.00	(—)
FT902DM	160-10m 9 Band Transceiver	885.00	(—)
FC902	All Band A.T.U.	135.00	(1.50)
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FT707	8 Band Transceiver 200W Pep	509.50	(—)
FP707	Matching Power Supply	112.50	(5.00)
FC707	Matching A.T.U./Power Meter	85.00	(1.00)
MMB2	Mobile Mounting Bracket for FT707	16.10	(1.00)
FRG7	General Coverage Receiver	199.00	(—)
FRG7700	200KHz-30MHz Gen. Coverage Receiver	335.00	(—)
FRG7700M	As above but with Memories	399.00	(—)
FRT7700	Antenna Tuning Unit	37.00	(1.00)
FRA7700	Active Antenna Unit	36.40	(1.00)
FT208R	2M FM Synthesised Handheld	199.00	(—)
FT708R	70cm FM Synthesised Handheld	229.00	(—)
NC7	Base Trickle Charger	26.80	(1.30)
NC8	Base Fast/Trickle Charger	44.10	(1.50)
NC9C	Compact Trickle Charger	8.00	(0.75)
FBA2	Battery Sleeve for use with NC7/8	3.05	(0.50)
FNB2	Spare Battery Pack	17.25	(0.75)
PA3	12V DC Adaptor	13.40	(0.75)
FT480R	2M Synthesised Multimode	369.00	(—)
FT780R	70cm Synthesised Multimode (1.6MHz Shift)	409.00	(—)
FT290R	2M Portable Multimode	265.00	(—)
FT790R	70cm Portable Multimode	325.00	
MMB11	Mobile Mounting Bracket	22.25	(1.00)
CSC1	Soft Carrying Case	3.45	(0.75)
NC11C	240V AC Trickle Charger	8.00	(0.75)
FL2010	Matching 10W Linear	59.00	(1.20)
Nicads	2.2 AMP HR Nicads Each	2.50	(—)
FF501DX	H.F. Low Pass Filter 1kW	23.00	(1.00)
FSP1	Mobile External Speaker 8 ohm 6W	9.95	(0.75)
YH55	Headphones 8 ohm	9.90	(0.75)
YH77	Lightweight Headphones 8 ohm	9.90	(0.75)
QTR24D	World Clock (Quartz)	28.00	(1.00)
YM24A	Speaker/Mic 207/208/708	16.85	(0.75)
YD148	Stand Microphone Dual IMP 4 Pin Plug	21.10	(1.50)
YM38	As 34 but up/down Scan Buttons	24.90	(1.50)

FDK VHF/UHF EQUIPMENT			
Multi 750E	2M Multimode Mobile	259.00	(—)
Expander	70cm Transverter for M750E	199.00	(—)

DRAE					
Power Supplies					
4 AMP	30.75	(1.50)	12 AMP	74.00	(2.00)
6 AMP	49.00	(2.00)	24 AMP	105.00	(3.00)
VHF Wavemeter 130-450MHz				27.50	(—)

ICOM		£	c&p
IC 740	H.F. 9 Band Transceiver	725.00	(—)
IC 720A	H.F. Tx - Gen. Cov. Rx	949.00	(—)
IC-PS20	P.S.U. for above with Speaker	139.00	(—)
IC-PS15	P.S.U.	119.00	(—)
IC 2KL	H.F. Linear 500 Watts O/P	915.00	(—)
IC 2KLPS	P.S.U. for above	234.00	(—)
IC AT500	1.8-30MHz Auto A.T.U.	339.00	(—)
IC AT100	3.5-30MHz Auto A.T.U.	249.00	(—)
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IC 290E	2M Multimode Mobile	379.00	(—)
IC 25E	2M FM Mobile 25W	269.00	(—)
IC 2E	2M Handheld	169.00	(—)
IC 4E	70cm Handheld	199.00	(—)
IC BC30	Base Charger	45.00	(1.50)
IC HM9	Speaker – Microphone	12.00	(1.00)
IC ML1	10 Watt 2M Booster IC2E	59.00	(1.00)
IC SM5	Desk Mic (8 pin for Icom only)	29.00	(1.00)
IC R70	General Cov. Receiver	469.00	(—)

TV INTERFERENCE AIDS			
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Toroid Filter TV Down Lead		2.50	(0.50)
Trio Low Pass Filter LF30A 1kW		20.00	(1.00)
Yaesu Low Pass Filter FF501DX 1kW		23.00	(1.00)
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ANTENNA BITS			
H1-Q Balun 1:1 5kW pep (PL259 Fitting)		9.95	(0.75)
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Polyprop Strain Insulators		0.40	(0.10)
Small Egg Insulators		0.40	(0.10)
Large Egg Insulators		0.50	(0.10)
4mm Polyester Guy Rope (strength 400kg) per metre		0.18	(0.04)
75 ohm Twin Feeder – Light Duty-Per Metre		0.16	(0.04)
300 ohm Twin Feeder – Per Metre		0.14	(0.04)
URM67 Low Loss 50 ohm Coax-Per Metre		0.60	(0.20)
UR76 50 ohm Coax-Per Metre		0.25	(0.05)

Please send total postage indicated. Any excess will be refunded.

TRIO TS 930S £1154

Amateur band transceiver/General coverage receiver

TRIO			
TS930S	New Transceiver	1154.00	(—)
TS830S	160-10m Transceiver 9 Bands	678.00	(—)
VFO230	Digital V.F.O. with Memories	231.00	(2.00)
AT230	All Band ATU/Power Meter	129.00	(2.00)
SP230	External Speaker Unit	39.00	(1.50)
DFC230	Dig. Frequency Remote Controller	179.00	(1.50)
TS4305	160-10m Transceiver	TBA	(—)
TS130S	8 Band 200W Pep Transceiver	531.00	(—)
TS130V	8 Band 20W Pep Transceiver	433.00	(—)
VFO120	External V.F.O.	93.61	(1.50)
TL120	200W Pep Linear for TS120V	159.00	(1.50)
MB100	Mobile Mount for TS130/120	17.70	(1.50)
SP120	Base Station External Speaker	25.00	(1.50)
AT130	100W Antenna Tuner	88.50	(1.50)
PS20	AC Power Supply – TS130V	54.90	(2.50)
PS30	AC Power Supply – TS130S	96.00	(5.00)
MC50	Dual Impeadance Desk Microphone	29.44	(1.50)
MC35S	Fist Microphone 50K ohm IMP	14.00	(0.75)
MC30S	Fist Microphone 500 ohm IMP	14.00	(0.75)
LF30A	HF Low Pass Filter 1kW	20.00	(1.00)
TR9130	2M Synthesised Multimode	411.00	(—)
BO9A	Base Plinth for TR9130	37.26	(1.50)
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TR7730	2M Synthesised FM Compact Mobile 25W	268.00	(—)
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PS10	Base Station Power Supply for 8400	64.00	2.00)
TR9500	70cm Synthesised Multimode	428.00	(—)
R2000	200KHz-30MHz Receiver	391.00	(—)
R600	Gen. Cov. Receiver	244.00	(—)
SP100	External Speaker Unit	26.90	(1.50)
HC10	Digital Station World Time Clock	64.40	(1.50)
HS5	Deluxe Headphones	21.85	(1.00)
HS4	Economy Headphones	10.80	(1.00)
SP40	Mobile External Speaker	13.57	(1.00)

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TASCO CWR 610		189.00	(—)
TONO 500		299.00	(—)
TONO 9000		669.00	(—)

MORSE EQUIPMENT			
MK704	Squeeze Paddle	10.50	(0.75)
HK708	Up/Down Key	10.50	(0.75)
—	Practise Oscillator	8.75	(0.50)
EK121	Elbug	33.00	(0.75)
EKM12A	Matching Side Tone Monitor	10.95	(0.75)
EK150	Electronic Keyer	78.00	(—)

ROTATORS			
Hirschman	RO250 VHF Rotor	39.95	(2.00)
9502B	Colorotor (Med. VHF)	56.95	(2.00)
KR400RC	Kenpro – inc lower clamps	110.00	(2.50)
KR600RC	Kenpro – inc lower clamps	145.00	(3.00)

DESK MICROPHONES			
SHURE 444D Dual Impeadance		39.00	(1.50)
SHURE 526T Mk II Power Microphone		53.00	(1.50)
ADONIS AM 303 Preamp Mic. Wide Imp.		29.00	(—)
ADONIS AM503 Compression Mic 1		39.00	(—)
ADONIS AM 802 Compression Mic+Meter 3 O/P		59.00	(—)

MOBILE SAFETY MICROPHONES	
ADONIS AM 202S Clip-on	21.00 (—)
ADONIS AM 202H Head Band - Up/Down Buttons	31.00 (—)
ADONIS AM 202F Swan Neck - Up/Down Buttons	33.00 (—)

TEST EQUIPMENT			
Drae VHF Wavemeter	130-450MHz	27.50	(—)
DM81	Trio Dip Meter	67.60	(0.75)
MMD50/500	Dig. Frequency meter (500MHz)	75.00	(—)

Co-AXIAL SWITCH	
2 Way Diecast (V.H.F.) SA450	10.00 (0.75)
2 Way Diecast with N sockets	12.95 (0.75)
2 Way Toggle (V.H.F.)	6.00 (0.50)
WESTERN 5 Way 1KW Switch	13.95 (1.00)

HELIAL ANTENNAS	
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2M Thread for TR2300 or FT290R (state which)	4.50 (0.50)
70cm BNC or Thread	4.50 (0.50)

MICROWAVE MODULES			
MMT144/28	2M Transverter for HF Rig	109.95	(—)
MMT432/28S	70cm Transverter for HF Rig	159.95	(—)
MMT432/144R	70cm Transverter for 2M Rig	184.00	(—)
MMT70/28	4M Transverter for HF Rig	119.95	(—)
MMT70/144	4M Transverter for 2M Rig	119.95	(—)
MMT1296/144	23cm Transverter for 2M Rig	184.00	(—)
MML144/30	2M 30W Linear Amp	69.95	(—)
MML144/100S	2M 100W Linear Amp (10W I/P)	139.00	(—)
MML144/100LS	2M 100W Linear Amp (3W I/P)	159.00	(—)
MML432/30	70cm 30W Linear Amp (3W1/P)	99.00	(—)
MML432/50	70cm/50W Linear Amp	109.95	(—)
MML432/100	70cm 10/100W Linear Amp	228.64	(—)
MM2001	RTTY to TV Converter	189.00	(—)
MM4000	RTTY Transceiver	269.00	(—)
MMC50/28	6M Converter to HF Rig	29.90	(—)
MMC70/28	4M Converter to HF Rig	29.90	(—)
MMC144/28	2M Converter to HF Rig	29.90	(—)
MMC432/28S	70cm Converter to HF Rig	37.90	(—)
MMC432/144S	70cm Converter to 2M Rig	37.90	(—)
MMC435/600	70cm ATV Converter	27.90	(—)
MMK1296/144	23cm Converter to 2M Rig	69.95	(—)
MMD050/500	500MHz Dig. Frequency Meter	75.00	(—)
MMD600P	600MHz Prescaler	29.90	(—)
MMDP1	Frequency Counter Probe	14.90	(—)
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MMA144V	2M RF Switched Preamp	34.90	(—)
MMF144	2M Band Pass Filter	11.90	(—)
MMF432	70cm Band Pass Filter	11.90	(—)
MMS1	The Morse Talker	115.00	(—)

D70 MORSE TUTOR £56.35

DATONG PRODUCTS			
PC1	Gen. Coverage Converter HF on 2M Rig	137.42	(—)
VLF	Very Low Frequency Converter	29.90	(—)
FL1	Frequency Agile Audio Filter	79.35	(—)
FL2	Multi-mode Audio Filter	89.70	(—)
FL3	Audio Filter + Notch	129.00	(—)
ASP/B	Auto RF Speech Clipper (Trio 4p Plug)	82.80	(—)
ASP/A	Auto RF Speech Clippers (Yaesu 4p Plug)	82.80	(—)
D75	Manually controlled RF Speech Clipper	56.35	(—)
RFC/M	RF Speech Clipper Module	29.90	(—)
D70	Morse Tutor	56.35	(—)
AD270	Indoor Active Dipole Antenna	47.15	(—)
AD370	Outdoor Active Dipole Antenna	64.40	(—)
MPU1	Mains Power Unit	6.90	(—)
MK	Keyboard Morse Sender	137.42	(—)
RFA	Broadband Preamplifier	33.92	(—)
Codecall	Selective Calling Device (link prog)	32.20	(—)
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Practical Wireless

MARCH 1983 VOL. 59 NO. 3 ISSUE 912

contents

FREE WITH THIS ISSUE
PW DATACARD "2m Repeaters"

Due to pressure on space, the concluding part of *Basic QSOs in German* has had to be held over

four **new** models from Trio

for the HF man, the **TS 430S**

£698.00 inc vat carriage £5.00

A new HF transceiver, taking into account the outstanding performance of the previous Trio rigs you could be forgiven for thinking that it would be impossible for them to improve on existing models and specifications. Alternatively of course, you might be of the opinion that engineers with the talents as displayed by the designers of such rigs as the TS830S, TS130V and TR2500 etc. would have no trouble in pushing forward the frontiers of transceiver technology s we know it today.

The new HF transceiver from Trio is the TS430S. Those who have seen it and the fortunate ones who have used it on the air are all agreed that here we have a major advance for the enthusiastic operator on todays busy bands. Not only does the transceiver have full amateur band coverage from 160 to 10 metres (including the three new bands) but it also incorporates a general coverage receiver (150 kHz to 30 MHz). The new transceivers features are many; USB, LSB, CW, and AM with FM available (optional FM430 board), compact size 270mm wide/96mm high/275mm deep, continuous tuning over the entire frequency range, two separate VFO's and an up/down scan mode using the optional MC42S microphone. Eight memories, each of which can be used as a separate VFO are provided and frequency scan is programable between the two frequencies held in memory channels six and seven. Not only does the memory remember frequency but also the mode of operation, thus short wave DX and Broadcast stations can be stored alongside a SSB net channel and complete sense made as the frequencies are scanned. The by now normal Trio features are all included, IF shift, notch filter, speech processor and narrow/wide filter selection on CW, SSB and AM modes.

The TS430S, Trio's rig for todays operator.

for the SWL who deserves the best, the **R 2000**

£391.20 inc vat carriage £5.00

Now from Trio, the R2000 general coverage receiver. By taking all the superb features of the R1000 and combining them with the latest in microprocessor control Trio have, in one step, completely revised the standard by which short wave receivers are judged. Among the many features provided for the discerning listener are programmable scan, memory scan, memory retention of the mode set for a particular frequency and last, but not least, Trio have included an FM mode – why FM after all this time and our repeated comment that for a shortwave broadcast receiver FM is not really necessary. Take a look at the rear panel of the R2000: a socket marked VHF converter. Wouldn't it be superb if Trio produced a VHF converter covering from 118 to 174 MHz – then you would require FM, you would also require AM. Study the features and I am sure you will agree the Trio R2000 is the receiver for you.

Continuous Coverage from 150 KHz to 30 MHz
Use of an innovative up conversion digitally controlled PLL circuit provides maximum ease of operation and superb receiver performance. Front panel up/down band switches allow easy selection within the full coverage of the receiver. The VFO is continually tunable throughout the full 150 KHz-30 MHz range.

Ten Memories Store Frequency, Band and Mode Data
Each of the ten memories can be tuned by the VFO, thus operating as ten built in digital VFO's. The original memory frequency can be recalled by simply pressing the appropriate memory channel key. All information on frequency, band, and **mode** is stored in the selected memory. The "auto M" switch allows two types of memory storage: when the "auto M" switch is off, data is memorized by pressing the "M in" switch; when the "auto M" switch is on the frequency being used at that time is automatically memorized.

Memory Scan
Scans all memory channels or may be user programmed to scan specific channels. Frequency, band and mode are automatically selected in accordance with the memory channel being scanned.

Programmable Band Scan
Scans automatically within the programmed bandwidth. Memory channels 9 and 0 establish the scan limit frequencies. The hold switch interrupts the scanning process. However, the frequency may be adjusted using the tuning knob whilst in the scan hold position.

Three Built In Filters with Narrow/Wide Selector
In the AM mode 6 KHz wide or 2.7 KHz narrow may be selected. In the SSB mode 2.7 KHz is automatically selected. In the CW mode 2.7 KHz is again chosen and if the optional YG455C filter is installed then 500 Hz in the narrow position. In the FM mode 15 KHz bandwidth is automatically selected.
Other important features are: squelch on all modes, noise blanker, a large 4 inch front mounted speaker, tone control, RF attenuator, AGC switch, high and low impedance antenna terminals, optional 13.8V DC operation, record jack and, of course, provision for a VHF converter.
All in all, a truly remarkable receiver.

and later in the year for the **R 2000** a 118 to 174 MHz internal vhf converter.

LOWE IN LONDON, Open monday to saturday, six days a week
lower sales floor, Hepworths, Pentonville Rd, London. telephone 01.837.6702
LOWE IN GLASGOW, Open tuesday to saturday
4,5 Queen Margarets Rd, Glasgow. telephone 041.945.2626

for the VHF operator, the **TR7930** mobile transceiver

£289.80 inc vat carr £5.00

Any amateur who has used or owns a Trio TR7800 has had the finest piece of 2 metre mobile technology at his fingertips. The TR7800 had simply everything that the keen mobile operator could ever want. Of course, there were a few points which customers said could be improved on and, I must admit, we, in the majority of cases, agreed. Trio, with the introduction of the new TR7930, have taken note of this feedback of information and the result, I am sure you will agree, is as close to perfection as you will find in a rig.

The improvements are, a green floodlit LCD readout which does not disappear in strong sunlight, additional memory channels, both timed and carrier scan hold on occupied channels, selectable memory channel for the priority frequency and automatically corrected mode selection (simplex or repeater) without having to instruct the rig. The most significant change is the liquid crystal frequency readout on a green illuminated background, but closely following this must be the ability to omit specific memory channels when scanning, and the programmable scan between user designated frequencies. This gives the rig the ability to scan simplex channels only, without holding on repeaters.

The Trio TR7930. The mobile 2 metre FM rig designed with ease of operation coupled to outstanding performance.

for the UHF enthusiast, a handheld transceiver, the **TR3500**

Without a doubt one of life's great mysteries to me is why, when the two metre band is at times so busy, few people are to be found communicating on the wide open spaces of the seventy centimetre band.

I have come to the conclusion that misapprehensions exist about the band. The first being the lack of activity. From my first comments you will have gleaned the fact that seventy centimetres is not a busy band, however there are stations on, myself G8GIY, my colleagues David G4KFN and Roy G8ROR form the nucleus of a UHF group here in Matlock, there are many others like us up and down the country. Seventy centimetre repeaters abound and are a perfect means of communication, their somewhat shorter range serving well their immediate area and, please remember, in the words of that doyen of seventy centimetres Jack G5UM, "Activity breeds activity," simple but true. The second misapprehension is that the equipment is expensive. Not so, the Trio TR3500 costs only slightly more than its matching stable mate, the TR2500, and here again, with the same sensible approach which we have all come to expect from Trio, the accessories which you bought for your TR2500 are compatible with the new TR3500. The appearance, size and weight are similar to the TR2500, output power is 1.5 watts high and 300 milliwatts low, repeater shift is programmable, ten memory channels are provided and frequency scan between operator-defined limits is included. The conventional memory scan and reverse repeater facilities help to make operating a pleasure no matter how difficult the conditions. With the Trio TR3500 handheld as part of your station, you are equipped to expand your operating and begin communicating on the wide open spaces of the seventy centimetre band.

£238.50 inc vat carriage £5.00

and we now stock the superb **vibroplex** range of keys.

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- ★ 30MHz down to 150kHz (and below).
- ★ 12 Channel memory with fine tune.
- ★ SSB (LSB/USB), CW, AM, FM.
- ★ 2.7kHz, 6kHz, 12kHz, 15kHz, @ – 6dB.
- ★ 3 Selectivities on AM, squelch on FM.
- ★ Up conversion, 48MHz first IF.
- ★ 1kHz digital, plus analogue, display.
- ★ Inbuilt quartz clock/timer.
- ★ No preselector, auto selected LPF's.
- ★ Advanced noise blanker fitted.
- ★ Antenna 500Ω to 1.5MHz, 50Ω to 30MHz.
- ★ 20dB pad plus continuous attenuator.
- ★ Switchable A.G.C. Variable tone.

'7700 THE ONE WITH FM!
Non memory version £335

- ★ 110 and 240V ac, 12Vdc option.
- ★ Signal meter calibrated in "S" and SIMPO.
- ★ Acc; Tuners, Converters, LPF, Memory.
- ★ **FRT7700;** 150kHz-30MHz, Switch, etc.
- ★ **FRV7700A;** 118-130, 130-140, 140-150MHz.
- ★ **FRV7700B;** 118-130, 140-150, 50-59MHz.
- ★ **FRV7700C;** 140-150, 150-160, 160-170MHz.
- ★ **FRV7700D;** 118-130, 140-150, 70-80MHz.
- ★ **FRV7700E;** 118-130, 140-150, 150-160MHz.
- ★ **FRV7700F;** 118-130, 150-160, 170-180MHz.
- ★ **FF5;** 500kHz (for improved VLF reception).
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- ★ **FRA7700;** Active Antenna.

COMMUNICATION RECEIVER; NRD 515 £825 Inc. VAT @ 15% + Securicor.

- ★ 30MHz to 100KHz or lower, 100Hz steps.
- ★ PLL digital VFO stability.
- ★ Backlash free, 10KHz rev, 500Hz analogue calib.
- ★ Fast tune up/down switch, dial lockout.
- ★ SSB (USB/LSB), CW, AM, RTTY.
- ★ 6 and 2.4 KHz, 600* and 300* Hz @ –6dB.
- ★ Passband tuning ±2KHz on SSB and CW.
- ★ Variable BFO on CW for preferred tone.
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- ★ High reliability – low power schottky & CMOS.
- ★ Designed for maximum ease of operation.
- ★ Noise blanker. 0-10-20dB attenuator.
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- ★ Up conversion, 70.455 MHz and 455 KHz.
- ★ No R.F. amplifier, balance U310 mixer.
- ★ Crystal filter before first IF amplifier.
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NHD518 96 (4 × 24) channel memory unit.
NCM515 Remote frequency keypad controller, LCD readout. Up/down step tuning, 4 channel memory.
CQE515 Junction unit (NCM515 to NHD518).
NVA515 External 3W speaker 130 × 140 × 200mm.
CFL260 600Hz mechanical filter.
CFL230 300Hz crystal filter.

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- ★ Multimode USB, LSB, FM, CW.
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- ★ Any TX/Rx split with dual VFOs.
- ★ Up/Down tuning from microphone.
- ★ AF output 1W @ 10% THD.
- ★ Bandwidth 2.4kHz and 14kHz @ – 6dB.
- ★ LED's; 'On Air', 'Busy'. m/c meter; S, PO.
- ★ 58(H) × 150(W) × 195(D) (1.3kg).

SMC2.0C	NiCad 2.0A/hr "C"	**2.35**
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6, 2 or 70!

FT290R
£265
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- ★ 144-146MHz (144-148) possible.
- ★ 2.5W PEP, 2.5W RMS/300mW out.
- ★ FM: 25kHz and 12.5kHz steps.
- ★ SSB: 1kHz and 100Hz steps.
- ★ ±600kHz repeater split 1750Hz burst.
- ★ Integral telescopic antenna.
- ★ Rx, 70mA, Tx; 800mA (FM maximum).

FT790R
£325
Inc. VAT @ 15% + Securicor.

- ★ 430-330MHz (440-450 alternative).
- ★ 1W PEP, 1W/250mW FM/CW out.
- ★ FM: 100kHz and 25kHz steps.
- ★ SSB: 1kHz and 100Hz steps.
- ★ 1.6MHz shift with input monitor,
- ★ 1750Hz burst.
- ★ Rx; 100mA/200mA. Tx; 750mA max.
- ★ BNC Mounting ¼λ flexi antenna.

6, 2 or 70!

- ★ USB-LSB-CW-FM (A 3j, A1, F3).
- ★ 30W PIP A3j, 10/1W out A1 F3.
- ★ Any Tx Rx split with dual VFO's.
- ★ Four easy write-in memory channels.
- ★ Memory scanning with slot display.
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- ★ Very bright blue 100Hz digital display.
- ★ Display shows Tx & Rx freq (inc RIT).
- ★ String LED display for "S" and PO.
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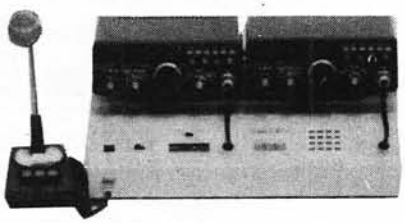
- ★ Size (Case): 8.3" D, 2.3" H, 6.9" W.



Ills. c/w SCI station consol and YD 148 mic.

FT480R £369 Inc. VAT @ 15% + Securicor.

★ LOWER PRICES ★

- ★ 144-146 MHz (143.5-148.5 possible).
- ★ ±600kHz standard repeater split.
- ★ Excellent dynamic range and sensitivity
- ★ FM; 25, 12½, 1kHz steps.
- ★ SSB; 1,000, 100, 10Hz steps.

FT780R £399 Inc. VAT @ 15% + Securicor.

- ★ 430-434MHz (440-445 possible).
- ★ GaAs Fet RF for incredible sensitivity.
- ★ FM; 100kHz, 25kHz, 1kHz, steps.
- ★ SSB; 1,000, 100, 10Hz steps.
- ★ FT780R 1.6 fitted 1.6MHz Shift **£459** inc.

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★ Universal power supply 110-234V AC and 12V DC.

FT902DM, £185 Inc. VAT @ 15% + Securicor.

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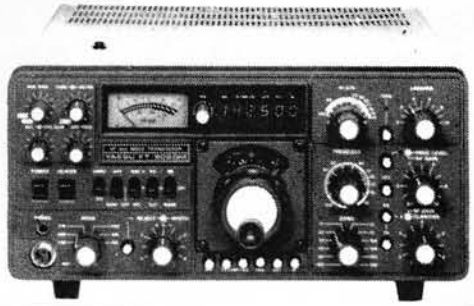

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★ 1.8-3.5-7-10-14-18-21-24.5-28MHz.
★ All modes:- LSB, USB, CW, AM‡, FM‡, (‡Option board).
★ Front end: extra high level, operates on 24V DC.
★ RF stage bypassable boosts dynamic range over 100 dB!
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★ Noise blanker adjustable for pulse *width.* (Woodpecker).
★ External Rx and separate Rx antenna provisions.
★ *Three* 6146B in special configuration – 40 dB IMD!
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★ Mic amp with tunable audio network.
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★ **FV102**:– VFO. 10Hz steps and readout, scanning, QSY.
★ **FC102**:– ATU,1.2KW, 20/200/1200 W FSD PEP, wire.
★ **FAS-1-4R**:– 4 way remote waterproof antenna selector.

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153BA	3 Ele Yagi 15 metres	23.0'LE	12.0'B	£90.85	2.90
155BA	5 Ele Yagi 15 metres	24.5'LE	26.0'B	£217.35	5.90
203BA	3 Ele Yagi 20 metres	35.0'LE	16.0'B	£166.75	4.90
204BA	4 Ele Yagi 20 metres	36.5'LE	26.0'B	£286.35	7.30
205BA	5 Ele Yagi 20 metres	36.5'LE	34.0'B	£362.25	9.40
402BA	2 Ele Yagi 40 metres	43.0'LE	16.0'B	£247.25	6.50
DB10/15A	3 Ele Yagi 10-15M	23.0'LE	13.0'B	£146.05	4.80
TH3JNR	3 Ele Yagi 10-15-20M	24.2'LE	12.0'B	£194.35	3.10
TH2MK3	2 Ele Yagi 10-15-20M	27.3'LE	6.0'B	£169.05	3.20
TH3MK3	3 Ele Yagi 10-15-20M	27.0'LE	14.0'B	£274.85	5.30
TH5DXX	"Thunderbird" 5 Ele	31.0'LE	18.0'B	£378.35	6.70
TH6DXX	"Thunderbird" 6 Ele	31.1'LE	24.0'B	£281.75	8.50
TH7DXX	"Thunderbird" 7 Ele	31.0'LE	20'TR	£458.85	8.75
18TD	Dipole Tape 10-80M		132'	£113.85	2.80
JAYBEAM					
VR3	Vertical 10-15-20M. DC Short 6lb		13.5'H	£46.00	2.30
TB3	3 Ele Yagi 10-15-20M PEP		14.6'TR	14.1'B	£189.75	5.40
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	Mini Beam 10-15-20M			£82.50	4.00
SMC TRAPPED DIPOLE	10-15-20-40-80M				
SMCTD/HP	14SWG, hard drawn Cu, 1000W PEP			£40.83	2.30
SMCTD/P	Portable, Cu/terylene, c/w 75' coax.			£52.33	2.30
SMCHPT	High Power, 1kW, 7MHz		per pair	£13.80	1.10
SMC – HS ANTENNA					
SMCHF5V	Vertical 10-15-20-40-80M		15.7'H	£40.25	2.30
SMCHF5R	Radial kit loaded		6.5'-7.3'	£29.90	2.30
SMCHF3VNB	Vertical 10-18-24MHz 1KW pep		16.0'H	£47.90	2.30
SMC3Y1015D20	3 ele 10-15, Dipole 20M		13.2'B	£134.95	5.00

ANTENNA ROTATORS

KR500	Kenpro, elevation Meter calb ± 90°		£90.85	Free
KR400	Kenpro bell, box as KR500		£90.85	Free
RLD3	SMC, Bell Auto control		£38.53	Free
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Ham IV	CDE 8 × 4cm meter readout		£228.85	Free
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51472	Mast Mount Kit ST CDE HAM4 etc.		£12.08	2.10
51467	Mast Mount Kit HD CDE T2X etc.		£24.15	2.10
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KC038	Lower Mast Clamp KR400, KR600		£10.92	1.70
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RC6W	6 Way KR250/400/500/600RC	p/m	£0.48	
RC8W	8 Way CD45 Ham 4 T2X KR2000RC	p/m	£0.52	

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ANTENNAS VHF FIXED

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PMH2/4M	Harness 2 way			£16.10	1.70
HO/2M	Halo head only	1' sq	ϕdBd	£5.98	0.70
HM/2M	Halo with 24" mast	1' sq	ϕdBd	£6.55	0.95
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5Y/2M	Yagi 5 ele	5.2'	7.8dBd	£12.08	2.20
8Y/2M	Yagi 8 ele	9.2'	9.5dBd	£15.53	2.20
10Y/2M	Long Yagi 10 ele	14.4'	11.4dBd	£33.35	2.20
14Y/2M	Long Yagi 14 ele	17.5'	12.8dBd	£36.23	2.20
D5/2M	Yagi 5 over 5 slot	5.2'	10.6dBd	£21.85	2.20
D8/2M	Yagi 8 over 8 slot	9.2'	12.3dBd	£29.33	2.20
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PMH2/2M	Harness 2 way			£12.65	1.20
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TRIO NEW R2000 £391

The R2000 is Trio's latest communications receiver covering the entire spectrum from 150KHz to 30MHz. It boasts a whole host of features that make it probably one of the best buys radio communications receivers currently available today. Its uncompromising design provides facilities for AM, SSB, CW and FM reception with 3 separate filters automatically switched in. The factory fitted memory module provides for 10 separate frequencies to be programmed in any mode and for automatic scanning of all channels. In addition, pr-programmed segments of the band may also be scanned making it one of the most versatile designs available. As an added feature an internal battery with an estimated life of 5 years retains the memory even when the power is disconnected. The rate of tuning is controlled electronically and has 3 speeds to suit all types of operation. Another novel feature is the squelch control that is effective on all modes for suppressing background noise when no signal is present. Other features include noise blanker, dual AGC, clear digital display down to the nearest 100Hz, dimmer switch, 24 hour quartz clock, front mounted speaker, tone control, RF step attenuator, dual impedance aerial terminals, 230v AC or optional 12v DC operation, built-in timer etc, etc.

YAESU FRG7700

£335 The FRG7700 is for the advanced listener or for the enthusiast who demands the best in short wave reception. The receiver covers the complete spectrum 200kHz to 30mHz with a highly accurate digital display. The receiver offers excellent sensitivity and selectivity and has separate detectors for AM, FM and SSB, plus switched bandwidth on AM. Other controls include automatic gain control, noise blanker, attenuator, squelch, rf gain control and clock with timer. There is also facilities for fitting an optional 12 channel memory unit. The receiver runs from 230v AC mains or 12v DC and there is an optional aerial tuner to go with it. And if you are interested in VHF, there is a complete range of specially designed converters to go with the receiver that covers the amateur, aircraft and marine bands, etc. Why not send today for our coloured brochure and get to know more about what the FRG7700 has to offer.

SONY ICF2001 PORTABLE COMMUNICATIONS RECEIVER

Sony are well known for the innovations and the new ICF2001 is no exception. This receiver covers the full spectrum from 200kHz to 30mHz plus the FM broadcast band. The clear LCD display gives precise frequency readout to 1kHz and the set has six memories for storing popular frequencies. Its diminutive size and complete portability means you can take it anywhere. Powered from internal dry cells it is just as happy on an executive desk as it is in the radio shack. The telescopic aerial gives very creditable performance together with built in aerial tuner. Plug in the external aerial and the World is at your finger tips. It handles both SSB and AM signals and with excellent FM reception can equally double as a domestic receiver. The dual speed electronic tuning and fine tune vernier control make this set a remarkable package at a price that is quite amazing. As the only officially appointed amateur radio Sony dealer in the UK we can give you the kind of after sales service that has made us second to none.

£149

ICOM R70

£469 The R70 is possibly the ultimate in receivers designed for the amateur market. We've tested this thoroughly and are convinced that this receiver offers everything that the enthusiast could ever wish for. If anything can pull the signals in, this one will. Frequency coverage is 100kHz to 30mHz in 30 bands. A 3 stage rate of tuning enables easy tuning for all modes, AM, SSB, CW and FM (the latter requires the optional FM module). The dual VFO enables 2 separate frequencies to be used and the bright digital display gives precise frequency readout down to 100Hz with absolute stability. Great emphasis has been put on selectivity and in addition to independant filters for each mode, there is a separate selectivity control. This enables the bandwidth to be continuously varied down to 500Hz. Another control provides a variable notch filter to prevent hetrodyne interference – now you can really dig deep for those elusive DX signals. Another nice feature on this receiver is its excellent sensitivity even on very modest aerials. This is obtained by the use of a well designed front end incorporating switched pre-amplifier and attenuator. Other features include dual-mode noise blanker, dual AGC action, transmitter monitor, dimmer switch, dial lock, RIT control, squelch control, tone control, FM tuning indicator, forward facing speaker, 230v AC power requirements, etc, etc.

GLOBAL AT1000 ATU

£34.95 p&p £1.75

The Global AT1000 is the answer to top class reception. It's designed to perfectly match the aerial to any short wave receiver. We recommend this an accessory you should not be without.

WELZ SPIOX

£21.95 p&p £1.50

This high grade instrument gives accurate readings of swr and power in the range 1.8 to 150 MHz. No more fiddly adjustments . . . power reading is automatic at the flick of a switch. F.S.D. of 20 watts or 200 watts. Ideal for commercial, amateur of CB operation.

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NEW AIRBAND MONITORS – ATC720/ATC720SP

The ATC720 will revolutionise air band monitoring. At the flick of a switch you can immediately dial up any one of the 720 VHF aircraft channels. In fact, it works just like the receivers built into the pilots cockpit. This means no more wondering whether you are tuned to the right frequency. The clear, white on black thumbwheel digits give instant confirmation of the channel frequency and the drift-free performance of the circuitry ensures that it will stay spot on channel indefinitely.

A new high sensitivity circuit ensures that even the weakest of signals can be copied and there is an external aerial socket so that it can be used indoors as a base station monitor. Extensive fatigue-free monitoring is possible using the squelch control setting and a built-in earphone socket provides for private listening. Included with the set is a flexible rubber antenna, rechargeable batteries and AC mains charger.

Two models are available; the ATC720SP is designed for commercial and professional applications, housed in a metal case and built to a stringent specification to meet all kinds of environments; the model ATC720 uses less sophisticated circuitry and is rated for normal domestic and flying club use.

Whether you're a pilot, engineer or aircraft enthusiast, you'll enjoy the performance of these monitors. Follow the action at air shows and listen to the skills of the air crews as they guide their aircraft through the air lanes and finally down onto the runway.

SPECIFICATION

Frequency range	:118-136mHz
Channel Steps	:25kHz
Mode	:AM
Sensitivity	:0.5uv
Selectivity	:8kHz/6dB & 25kHz 60dB
Antenna	:50 ohms

£129 inc. delivery

SP Model £189 inc. delivery

Both models now available

PRICES INCLUDE RECHARGEABLE BATTERIES & AC MAINS CHARGER

The CD6000 AR is a brand new aircraft monitor incorporating the latest in electronic technology. Designed primarily as a mobile or base station monitor, it covers the complete aircraft band from 110mHz to 140mHz in 5kHz steps. It thus embraces the entire R/T network and beacon bands. The clear digital display enables you to exactly dial up the frequency you require with pin point accuracy and absolute stability. There is absolutely no frequency drift with this unit (that's guaranteed by us!) and you will enjoy the same standard of reception obtainable in many professional aircraft receivers. The unit requires 12v DC at approx. m/a and can easily be powered from a vehicle or standard mains power supply. A special electronic search facility enables the band to be scanned and the receiver will automatically lock on to any signal found. The built-in speaker together with generous audio output power provides clear crisp reception. The addition of the squelch control provides a silent background when no signals are present. The CD6000AR also has excellent sensitivity, matching or beating any other receiver we know of. A special automatic tracking circuit ensures superb sensitivity right across entire frequency range.

NEW CD6000AR

MOBILE/BASE AIRBAND MONITOR
110-140MHz
12v DC
DIGITAL READOUT

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SX200N
26-512MH
£259

The SX200N is an extremely versatile and wide range receiver. This revolutionary design embodies a host of features that makes this unit a completely self-contained monitoring station. The frequency coverage extends from 26mHz to 512mHz and covers every conceivable service that utilises the VHF and UHF spectrum. Both AM and FM reception is provided, giving coverage of the Police, Fire Brigade, Ambulance, Aircraft, Taxis, Public Services, etc! The clear digital display gives instant frequency readout and a comprehensive scanning system makes easy work of hunting out the thousands of stations. The SX200 operates from 12v DC or 230v AC and comes complete with aerial. Simply plug the unit in and whisk yourself away into the wonderful World of radio.

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D70 on its own
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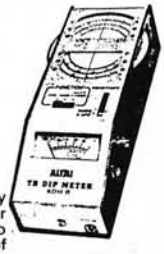

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WELZ SPIOX

£21.95 p&p £1.50

This high grade instrument gives accurate readings of swr and power in the range 1.8 to 150 MHz. No more fiddly adjustments . . . power reading is automatic at the flick of a switch. F.S.D. of 20 watts or 200 watts. Ideal for commercial, amateur of CB operation.

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To you, the customer, cutting out the monopoly middle-man in this way means quite simply lower prices, of which more later. It also means choice—the ability to come to one showroom and try out **all** the rigs on the market side by side, and then select the one that's right for you, rather than having some salesman push a particular make because that's the one he's "authorised" to sell.

Sometimes you may hear doubts expressed about the suitability for UK use of "non-approved" imports, or about after-sales service on them. Well, if you're buying from us... relax. We haven't become London's leading Amateur Radio store by selling **anything** that's not serviceable, or by giving your repair to the first likely lad to walk in clutching a soldering iron!

We think that TRIO for example is great stuff. That's why we've always tried to have as much of it passing through our doors—back or front!—as possible, but at prices that are fair on the customer, like these...

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Fully synthesized AM coverage of 110–139.995MHz in 10kc steps with 5kc option.
Manual control or auto-scan.
Integral speaker, all within super-compact dimensions of 120mm x 222mm x 44mm.
12v operation—ideal for mobile, portable or base station use.

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8 memories with manual selection.
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Built-in digital clock.
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YAESU's evergreen communications receiver giving continuous coverage from 500kc to 30MHz on AM/SSB/CW. Still the best value for money in the market... and even better value from us at

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IC-R70

Presenting the best in today's receiver technology from ICOM, featuring:

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DIGT 101Z	Digital unit	90.00
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FV 101Z	Remote vfo	112.00
FT 902DM	9-Band AM/FM Transceiver	*795.00
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FTV 901R	Transverter fitted 2m module	285.00
430TV	70cm module for above	185.00
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FC 707	Aerial tuner (unbalanced only)	85.00
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MEM 7700	Memory unit for above	90.00

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FRV 7700D	70-80MHz & 118-150MHz	72.45
FRT 7700	Receiver aerial tuner	37.85
FF 5	LF filter for above	9.95
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FP 80A	230V AC power supply	63.00
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CSI-1	Carrying Case	3.45
MMB-11	Mobile mounting bracket	22.25
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FT 708R	70cm hand-held	209.00

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YK 88C	500Hz CW filter	29.60
YK 88CN	270 Hz CW filter	32.60
TS 530S	160-10m trans. 200W pep digital	489.00
TS 130S	8-band 200W pep	499.00
TS 130V	8-band 20W pep	445.00
AT 130	100W antenna tuner	79.00
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TR 2500	2m FM synthesised handheld	207.00
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DM 801	Dip meter	60.00
TR 7730	New 25W FM transceiver	247.00
R 600	Gen. Coverage Receiver	199.00

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KR 600RC	Kenpro – inc. lower clamps	149.00

ICOM

IC 740	Multimode H.F. trans. **NEW**	669.00
ICR 70	New multimode receiver	460.00
IC 730	HF mobile transceiver 8-band	625.00
IC 720A	HF trans. and gen. cov. receiver	849.00
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IC HM9	Speaker/microphone	12.00
IC CP1	Car charging lead	3.20
IC BP2	6V Nicad p-ack for IC 2E	22.00
IC BP3	9V Nicad pack for IC 2E	17.70
IC BP4	Empty case for 6 X AA Nicads	5.80
IC BP5	11.5V Nicad pack for IC 2E	30.50
IC DC1	12V adaptor pack for IC 2E	9.50

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MMT 432/28S	70cm Transverter for HF Rig	159.95
MMT 432/144R	70cm Transverter for 2m Rig	184.00
MMT 70/28	4m Transverter for HF Rig	115.00
MMT 1296/144	23cm Transverter for 2m Rig	184.00
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MML 144/50S	2m 50W lin. Amp (10W1/P)	85.00
MML 144/100S	2m 100W lin. Amp (10W1/P)	139.95
MML 144/100LS	2m 100W linears (1/3W1/P)	159.95
MML 432/20	70cm 20W linear Amp (3W1/P)	85.00
MML 432/50	70cm 50W linear Amp	109.95
MML 432/100	70cm 10/100W linear Amp	228.65
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MM 4000KB	Ditto with Keyboard	299.00
MMC 50/28	6m converter to HF Rig	29.90
MMC 70/28	4m converter to HF Rig	29.90
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MMC 432/28S	7cm converter to HF Rig	37.90
MMC 432/144S	70cm converter to 2m Rig	37.90
MMC 435/600	70cm ATV converter	27.90
MMK 1296/144	23cm converter to 2m Rig	69.95
MMD 050 500	500MHz dig. frequency meter	75.00
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MMA 144V	2m RF switched pre amp	34.90
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PC 1	Gen. Cov. Converter HF on 2m	137.42
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FL 1	Frequency Agile Converter	79.35
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FL 3	FL 2 with Auto Notch	129.37
ASP	Auto R.F. Speech Clipper (Trio or Yaesu plug)	82.80-89.70
D 75	Manually controlled R.F. Speech clipper	56.35
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AD 2700	Indoor Active Filter (inc. PSU)	54.05
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MK	Keyboard morse sender	137.42
PS 1	Programmable Tone Squelch System (2 units)	45.99
RFA	Wideband preamplifier	33.92
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SLNA 144UB	Unboxed version of SLNA 144U	12.41
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TLNA 432UB	Unboxed version of TLNA 432U	18.50
BLNA 432UB	1.3dB NF/13dB gain sub-mini 432MHz pre-amp	12.43

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ZA 1A	Balun 3.5-30MHz for dipoles	12.65
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THETA 9000E	RTTY/CW/ASC11	669.00
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2M-50W	144MHz 30-50W	69.00
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MR 250W	144MHz 250W + preamp	329.00

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TeleReader CWR 685E	RTTY/CW/ASC11 769.00
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MorseMaster CWR 600	As above basic unit 189.00

All units include U.H.F. modulators

WELZ

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DRAE

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NEW! FT-980 ALL MODE HF CAT *

* Computer-Aided Transceiver

This incredible new transceiver incorporates the highest level of microprocessor control ever offered in an HF all solid-state radio. Including a general coverage (0.15-30MHz) receiver with its own, separate front end, this amateur transceiver offers a new dimension in frequency control; whereby frequencies can be entered by either front panel keypad or tuning dial, and then scanned in selectable steps either freely or between any two programmable limits. Twelve memories include four with special protection, and two large digital displays allow full flexibility and control for split frequency operation while two meters allow full transmitter information.

Additional controls include IF Width and Shift on concentric controls, AMGC (Automatic Mic Gain Control) to set microphone input threshold, RF Speech Processor, ALC Meter Hold function, IF Notch and Audio Peak filters, Transmit Monitor, Noise Blanker and CW Full Break-in. Controls are also provided for FM Squelch and CW Keyer Speed when the optional FM and Keyer Units are installed.

The most important feature of the FT-980 is that practically all of the above features can be controlled by the user's separate personal computer, when connected through an optional Interface, also available from Yaesu. Where up to now the few amateur transceivers that offered any kind of computer interfacing at all permitted only frequency control, the FT-980 permits almost total control of all functions from a separate microcomputer, including Mode; IF Width and Shift; Scanner Step, Speed and Limits; and switching of most other functions. (Microcomputers are not available from Yaesu.)

YAESU

FT-77 Thrifty HF Transceiver

UTILIZING THE NEW CAD/CAM* MANUFACTURING TECHNIQUES, YAESU PRESENTS THE FT-77 AS A NEW MILESTONE IN RELIABILITY, SIMPLICITY AND ECONOMY IN HF COMMUNICATIONS.

Thrifty

Featuring efficient, all solid-state, no-tune circuitry, the FT-77 offers a nominal 100 watts of RF output on all amateur bands between 3.5 and 30 MHz, including the WARC bands. New CAD/CAM techniques plus the simple design of the FT-77 add up to one of the smallest, lightest HF transceivers ever; both in your hands, and on your wallet.

Simple

The front panel control layout and operation are actually simpler than some VHF FM transceivers, with only essential operating controls; while the simple circuit design leaves fewer parts that could cause problems. Nevertheless, all of the essential modern operating features for HF SSB and CW are included, along with extras such as dual selectable noise blanker pulse widths (designed to blank woodpecker or common impulse noise), full SWR metering, and capabilities for an optional internal fixed-frequency channel crystal, narrow CW filter and FM Unit.

Reliable

Computer-aided design of the circuit boards in the FT-77 ensures the most efficient component layout possible in the smallest space, while automatic parts insertion and soldering greatly diminish the chance for human error. Reliability and quality control are thus improved and simplified beyond the degree previously attainable in amateur equipment. This means longer equipment life with less chance of breakdown.

Expandable

The extremely compact size and simple control layout make the FT-77 ideal for mobile operation, or as the heart of a complete base station with the optional FP-700 AC Power Supply, FV-700DM Digital Scanning VFO and Memory System, FTV-700 V/UHF Transverter and the FC-700 Antenna Tuner. The competitive price of the FT-77, coupled with the expansion capabilities presented by these accessories, make this transceiver the perfect choice for those new to amateur HF communication, or as a practical second rig for old-timers.

*Computer Aided Design/Computer Aided Manufacture.

FT-726R VHF/UHF Multibander

Combining all of the best features from Yaesu HF and V/UHF transceivers, the FT-726R opens a new world of operating ease and flexibility for FM, SSB and CW on the 50*, 144 and 430/440 MHz amateur bands. The design of the FT-726R integrates the individual operating requirements of each of the three operating modes into one unit, and the user can then select which of the optional plug-in band modules he desires.

The VFO-A/B scheme has ten programmable memories, and can be tuned in 20Hz steps for CW and SSB operation, or in selectable steps for FM. FM tuning is accomplished by an indented tuning knob. IF Width and Shift controls are provided for CW and SSB operation, while both preset standard and user programmable repeater offsets can be selected for all modes. An optional Satellite Unit makes the FT-726R into a full duplex cross-band satellite transceiver.

*144 MHz Unit installed, other Units available as options according to local regulations.

AGENTS

North West - Thanet Electronics Ltd. Gordon, G3LEQ, Knutsford (0565) 4040
Wales & West - Ross Clare, GW3NWS, Gwent (0633) 880 146
East Anglia - Amateur Electronics UK, East Anglia, Dr. T. Thirst (TIM) G4CTT Norwich 0603 667189
North East - North East Amateur Radio, Darlington 0325 55969
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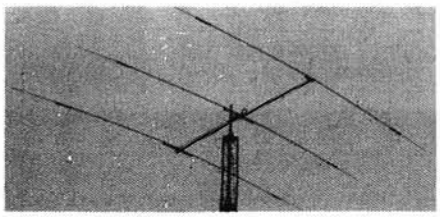

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HB10F2T	2 ele. 10m mono band beam	51.50	(n/c)
HB10F3T	3 ele. 10m mono band beam	74.95	(n/c)
HB15F2T	2 ele. 15m mono band beam	60.66	(n/c)
HB15F3T	3 ele. 15m mono band beam	93.46	(n/c)
HB15M25P	VP mini size 15m 2 ele.	69.50	(n/c)
HB15M35P	VP mini size 15m 3 ele.	102.30	(n/c)
HB34D	4 ele. tri band beam 10/15/20m	222.90	(n/c)
HB33SP	3 ele. tri band beam 10/15/20m	192.50	(n/c)
HB35C	Tri band array 10/15/20m	283.95	(n/c)
HB35T	5 ele. 10/15/20m	278.50	(n/c)
MV3BH	Vertical for 10/15/20m	37.99	(n/c)
MV4BH	Vertical for 10/15/20/40m	48.90	(n/c)
MV5BH	Vertical for 10/15/20/40/80m	63.95	(n/c)
MLA4	Loop antenna 10/15/40/80	105.60	(n/c)
SQ22	Phased 2 ele. swiss quad 2m	58.95	(n/c)
SQY06	6 ele. quagi 2m	45.75	(n/c)
SQY08	8 ele. quagi 2m	52.75	(n/c)
HB210S	10 ele. dual driven yagi 2m	47.99	(n/c)
TE214	14 ele. long yagi 2m	74.40	(n/c)
SSL720	9 x 2 ele. (18) slot fed 70cm	77.20	(n/c)
HB23SP	2 ele. tri band beam 10/15/20m	135.60	(n/c)
SSL218	9 x 2 ele. (18) slot fed 2m	144.79	(n/c)
TPH2	Phasing harness 2m	17.25	(n/c)
QYU10	10 ele. quagi 70cm	67.90	(n/c)
SQ007	70cm 2 ele. phased swiss quad	66.99	(n/c)
SQ10	Swiss quad 10m	97.50	(n/c)
SQ15	Swiss quad 15m	106.90	(n/c)

YAESU ANTENNAS

Base			
RSL145GP	½ wave base ant. 2m	21.20	(1.50)
RSL435GP	½ wave co-linear 70cm	31.60	(1.50)
HF Mobile			
RSL3.5	3.5MHz resonator & whip	12.21	(0.50)
RSL7.0	7.0MHz resonator & whip	11.80	(0.50)
RSL14.0	14.0MHz resonator & whip	11.45	(0.50)
RSL21.0	21.0MHz resonator & whip	11.20	(0.50)
RSL28.0	28.0MHz resonator & whip	11.00	(0.50)
RSL2A	Mast to suit above	5.00	(0.50)
RSM2	Gutter mount/Feeder/PL259 suit above	10.94	(0.75)
VHF Mobile			
RSL145	2m ½ wave fibreglass whip	12.10	(0.50)
RSL145S	2m ½ wave steel whip foldover	9.25	(0.50)
RSL150SS	2m ¼ wave PL259 shock spring	3.90	(0.50)
RSM2	Gutter mount/Feeder/PL259 (RSL145)	10.94	(0.75)
RSM4M	Heavy duty mag/Feeder/PL259	13.25	(1.00)
UHF Mobile			
RSL453S	½ wave antenna	15.50	(0.50)

ANTIFERENCE ANTENNAS

VHF Mobile			
TAP3009	½ wave 3db snap-in hinged whip	11.42	(3.00)
TAP3677	½ wave 3db snap-in shock coil	15.64	(3.00)
TAP3002	¼ wave unity gain snap-in hinged whip	8.81	(3.00)
UHF Mobile			
TAP3462	½ over ½ wave 3db	9.89	(3.00)
TAP3697	½ over ½ wave 5db	18.40	(3.00)
K220	Mag mount/Feeder to suit above	10.73	(2.00)

Antennas Various/Accessories

HQ1	Mini beam 10/15/20m 2 ele. 1kW	TBA	(4.00)
C4	Vertical 10/15/20m	48.50	(3.00)
G4MH	Mini beam 10/15/20	85.00	(4.00)
KTLM-4	Gutter mount/Cable assy. SO239	6.90	(0.50)

DATONG PRODUCTS

PC1	50KHz to 30MHz receive converter	137.42	(0.50)
VLF	Very low freq. converter	29.90	(0.50)
FL1	Frequency agile audio filter	79.35	(0.50)
FL2	Multimode audio filter	89.70	(0.50)
ASP/A	Auto RF speech clipper (YAESU)	82.80	(0.50)
ASP/B	Auto RF speech clipper (TRIO)	89.70	(0.50)
D75	Manual RF speech clipper	56.35	(0.50)
RFC/M	RF speech clipper module	29.90	(0.50)
D70	Morse tutor	56.35	(0.50)
AD270	Active dipole RX ant. (indoor)	47.15	(0.50)
AD370	Active dipole RX ant. (outdoor)	64.40	(0.50)
MK	Morse keyboard	137.42	(0.50)
DC144/28	2m converter	39.67	(0.50)
RFA	Broadband preamplifier	33.92	(0.50)
MPU	Mains power unit	6.90	(0.50)

MICROWAVE MODULES

Transverters			
MMT28/144	10m transverter	109.95	(2.50)
MMT70/144	4m transverter	119.95	(2.50)
MMT432/144R	70cm transverter	184.00	(2.50)
MMT1296/144	23cm transverter	184.00	(3.00)
MMT70/28	4m transverter	119.95	(2.50)
MMT144/28	2m transverter	109.95	(2.50)
MMT432/28S	70cm transverter	159.95	(2.50)
Linear Amplifiers			
MML28/100S	10m 100W linear amp.	129.95	(3.00)
MML70/50S	4m 50W linear amp.	85.00	(2.50)
MML70/100S	4m 100W linear amp.	139.95	(3.00)
MML144/30LS	2m 30W linear amp. 1-3W in	69.95	(2.50)
MML144/50S	2m 50W linear amp.	85.00	(2.50)
MML144/100LS	2m 100W linear 1-3W in	159.95	(3.00)
MML144/100S	2m 100W linear 10W in	139.95	(3.00)
MML432/50	70cm 50W linear amp.	109.95	(3.00)
MML432/100	70cm 100W linear amp.	228.65	(4.00)
MML1296/10	23cm 10W linear amp.	199.00	(2.50)
MML432/30	70cm 30W linear amp. 1-3W in	99.00	(3.00)
Converters			
MM1000KB	ASC11 morse converter with keyboard	99.95	(3.00)
MM4001	RTTY to TV converter	189.00	(2.50)
MM4001KB	RTTY transceiver	269.00	(2.50)
MM4000KB	RTTY transceiver with keyboard	299.00	(4.00)
MMC28/144	10m to 2m converter	29.90	(1.00)
MMC50/28	6m to 10m converter	29.90	(1.00)
MMC70/28	4m to 10m converter	29.90	(1.00)
MMC70/28LO	4m to 10m with LO	32.90	(1.00)
MMC432/28S	70cm to 10m converter	37.90	(1.00)
MMC432/144S	70cm to 2m converter	37.90	(1.00)
MMC435/600	UHF ATV converter	27.90	(1.00)
MMC1296/28	23cm to 10m converter	34.90	(1.00)
MMC1296/144	1296MHz low noise converter	69.95	(1.00)
MMK1691/137.5	1691MHz meteosat converter	129.95	(2.50)
Morse Talkers			
MMS1	Morse tutor 2-20WPM Side tone	115.00	(2.50)
MMS2	Morse tutor (advanced) 6-32WPM + speak back	169.00	(2.50)
Amateur TV			
MTV435	70cm 20W (PSP) transmitter	149.00	(2.50)
MMC435/600	Converter ATV UHF output	27.90	(1.00)
Preamplifiers			
MMA144V	2m preamp RF switched	34.90	(1.00)
MMA28	10m preamp	16.95	(1.00)
MMA1296	23cm preamp	34.90	(1.00)
Frequency Counters			
MMD650/500	500MHz digital meter	75.00	(1.00)
MMD600P	600MHz pre scaler	29.90	(1.00)
MMDP-1	Probe	14.90	(0.50)
Filters			
MMF144	2m band pass 40W max.	11.90	(1.00)
MMF452	70cm band pass 40W max.	11.90	(1.00)
Various			
MMS384	384MHz signal source	29.90	(1.00)
MMR15/10	15db 10W attenuator	11.90	(1.00)

HI-MOUND MORSE KEYS

HK702	Up down keyer marble base	24.50	(0.50)
HK704	Up down keyer	16.68	(0.50)
HK705	Up down keyer	12.50	(0.50)
HK706	Up down keyer	13.75	(0.50)
HK708	Up down keyer	11.96	(0.50)
HK808	Up down keyer marble base	39.57	(0.50)
MK704	Twin paddle keyer	10.95	(0.50)
MK705	Twin paddle keyer marble base	22.00	(0.50)

MOULDINGS

IK	Iambic keyer	19.95	(0.50)

TOKYO HY POWER

HC150	HF ATU SWR/Power meter 200W PEP	62.50	(n/c)
HC2000	HF 2kW ATU SWR/Power meter 6 POS ant. switch. 6 to 1 vernier high Q coils 2kW peak 1kW continuous	276.55	(n/c)

Antenna Rotators & Accessories

SU2000	Light duty rotator	34.95	(3.50)
9502	Channel master med duty up to 8 ele.	57.00	(3.50)
9523	Alignment bearing for 9502	14.38	(1.25)
KR400	Med/Heavy duty 180° meter (inc. lower casting)	90.85	(3.50)
KR400RC	Med/Heavy duty 360° meter Load 200Kg 1½"-2" masts	102.35	(3.50)
CASTING	Lower casting set (400RC)	15.00	(1.25)
KR600RC	Heavy duty 360° meter Load 200Kg Rot600Kg/cm Brake 4000Kg/cm 1½"-2"masts	136.85	(3.50)

Antenna Switches

SA450	SO239 connectors 1 in 2 out	9.75	(0.50)
SA450N	"N" type connectors 1 in 2 out	12.75	(0.50)

Baluns

BL50A	RAK 50 ohm ferrite BALUN 1:1 1.8-38MHz 1kW	12.88	(1.50)
W2AU	1:1 50 ohm 3-40MHz 1kW	14.99	(1.50)

Dummy Loads

T30	30W DC 500MHz PL259	6.61	(0.50)
T100	100W DC 500MHz SO239	20.12	(1.00)
T200	200W DC 500MHz SO239	31.36	(1.50)
T210	Wide band 10W 1.2G-2.4G	24.50	(0.75)
AW05	Pocket RF wattmeter 5W up to 500MHz BNC	19.75	(1.00)

Filters

AKD	Hi-pass blocks 0-200MHz RF interference to UHF above 400MHz	5.50	(0.50)

Linear Amplifiers

YAESU			
FL110	HF 160/80/40/20/15/10m 100W (10W drive)	155.25	(n/c)
FL2100Z	HF WARC 1200w PEP, SSB 1kW CW, 400W AM/FM/FSK	449.00	(n/c)
FL2010	2m VHF 10W linear	54.00	(n/c)
FL2050	2m VHF 50W linear 10W drive	115.00	(n/c)
FL7010	70cm UHF 10W linear	91.00	(n/c)
TOKYO HY POWER			
HL32V	VHF 30W linear 1-5W drive HI-LOW output	53.50	(n/c)
HL82V	VHF linear preamp output meter 2-12W in 35-85+ out	144.50	(n/c)
HL160V	VHF linear preamp output meter 1-10W in 160W+ out	242.40	(n/c)
HL45U	UHF linear preamp 2-15W in 10-45W out	119.75	(n/c)

ADONIS MICROPHONES Mobile/Base

MM202S	Mobile safety mic. (non scanning)	23.00	(1.00)
MM202HD	Mobile safety mic. (scanning)	30.00	(1.00)
AM502	Desk mic. (compressor selectable)	45.94	(1.00)

Miscellaneous

Mutec			
SNL144S	2m preamp RF switched	33.90	(1.00)
RPCB	144UB FT221/225 front end board	64.50	(1.25)
Ni-cads			
AA	AA size Ni-cad	1.00	(0.20)
C	C size Ni-cad	2.40	(0.30)
NC1850	Ni-cad charger (4 x C or 4 x AA)	9.50	(1.00)

DRAE PRODUCTS

DRAE4	4 amp PSU	30.75	(2.00)
DRAE6	6 amp PSU	48.00	(2.50)
DRAE12	12 amp PSU	74.00	(3.00)
DRAE24	24 amp PSU	105.00	(4.00)
DRAE WM	135-450MHz wavemeter	27.50	(1.00)
"N" Connectors (Silver Plated)			
N58	"N" Male connector RG58	2.25	(0.25)
N8	"N" Male connector RG8	2.40	(0.25)
N308	"N" T adaptor (three female)	2.40	(0.25)
N307	"N" L adaptor (1 male 1 female)	2.40	(0.25)
N306	"N" Double female adaptor	1.90	(0.25)
N310	"N" Double male adaptor	2.50	(0.25)
NB304	"N" Female to BNC male adaptor	2.10	(0.25)
N402	"N" Plug to SO239	2.05	(0.25)
N403	"N" Socket to PL259	2.00	(0.25)
N404	"N" Socket to SO239	1.80	(0.25)

Speakers/Headphones

Various			
RT650	4 ohm, 8 ohm 3W nom 6W max	6.50	(0.50)
MS60	3W nom 5W max	7.50	(0.50)
S2	Headphones (cobalt magnets)	5.75	(0.50)
YAESU			
YH55	Headphones Low Z	10.00	(0.50)
YH77	Lightweight headphones Low Z	10.00	(0.50)

SWR/Power Meters

YAESU			
YS200		52.90	(n/c)
YS2000		69.79	(n/c)
Other Makes			
RF2000	Twin meter 3.5-150MHz F/Scale 200/2000W	18.25	(1.00)
YM1X	Twin meter 3.5-150MHz F/Scale 12 or 120W	14.99	(1.00)

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STANDARD – We now have in stock the C58, the C78 and the brand new multi-mode – the superb C5800 (25 watts) only **£359.**

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ANTENNAS – We now have in stock the full range of TONNA and JAYBEAM antennas. We also have some very special bargains such as:–
2m Colinear (3dB) ..... **£17.50** (Base station)
2m Colinear (6dB) ..... **£33.00** (Base station)
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Halo (Sideband Mobile) **£5.75**
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Chimney lashing kits (Heavy duty) **£15.00**
Stand-off brackets – 12" **£11** – 18" **£12** – 24" **£15.50.**

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ROTATORS – Kenpro KR 250 (Light Yagis) – KR 400 (Medium to Heavy) – KR 600 (Heavy) Daiwa DR 7600 (Heavy)–Hirschmann 250 (Heavy).

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METERS – We stock the full range of DAIWA crossed needle SWR/Power meters.

CUE DEE

Specifications:

Antenna	4144A	10144A	15144A
No. Elements	4	10	15
Gain	8dBd	11.4dBd	14dBd
Front/Back	20dB	20dB	26dB
Front/Side	40dB	40dB	40dB
Boom Length	1.1m	4.5m	6.45m
Weight	1Kg	3Kg	5Kg
Boom		3 sections	4 sections

Independent Tests

Model	Boom Length	Gain Annaboda*)	Claimed
15144 (A)	3.1λ	13.0dBd	14.0dBd
C. C. Boomer	3.2λ	12.8dBd	16.2dBd
14 el Parab	2.9λ	12.7dBd	13.7dBd
Tonna	3.1λ	12.2dBd	15.7dBd

*) Gain over dipole under matched condition.

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MR-250W	210 Watt Linear For 2 Metres + switchable pre-amp.	325.00
MR28	100 Watt Linear For 10 Metres + switchable pre-amp	65.00
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comment...

Novices

THE IDEA of a Novice-grade amateur radio licence in the UK has been around for many years. Discussions on the subject have, we understand, been going on between the RSGB and the licensing authorities since 1947.

In 1968 the Postmaster General announced that a "Beginner's Licence" would be introduced: "to encourage interest in radio by people not yet possessing the qualifications needed for a full Amateur Licence." It never happened though, because of "lack of demand"—from whom, wasn't made clear.

In the middle of 1982, the Home Office again agreed to the principle of a novice licence, but said that it could not be introduced in the foreseeable future because there was not the manpower to administer it. The format of such a licence is bound to cause problems. It is difficult to see how it can be framed without making existing "B" Licence holders feel even more strongly that they are considered to be second-class citizens or worse. Had a novice licence been introduced before the "B" Licence, or at the same time, it would have been much easier to achieve a sensible structure for the three licences.

One feature of a novice licence is bound to be some ability in sending and receiving Morse code. Any requirement for competence in Morse code operating means that there must be an organisation for testing candidates. In the past, the Post Office Morse Test for an "A" Licence could be taken at provincial Head Post Offices, at Marine Survey Offices in major ports around our coasts, or at Maritime Coast Radio Stations. Already, the first option has been withdrawn, and in some places at least, dates and times for test appointments at Marine Survey Offices can no longer be arranged for mutual convenience. Instead, a date and time are notified to the applicant, who forfeits his fee if he cannot attend then.

Now comes an announcement from British Telecom of proposals to convert all but two of the UK's Maritime Coast Stations (at Burnham-on-Sea in Somerset and Stonehaven near Aberdeen) to unmanned remote control operation over the next three years. The depression in the UK shipping industry and the development of satellite and telex services has meant a steep decline in the use of terrestrial radio services, which have lost £10m over the last three years.

It would seem that BT is keen to get rid of its commitment to conduct Morse tests for radio amateurs, indeed it is rumoured that this is the true reason behind the Home Office's reluctance to introduce a novice licence at this time. The solution, obviously, is to appoint a number of competent licensed amateurs to conduct Morse tests on behalf of the Home Office, in return for a small fee. Certainly, travelling costs for candidates could be reduced by a better distribution of test centres throughout the UK. I am sure that there would be no shortage of suitable volunteers.

Geoff Arnold

services

QUERIES

While we will always try to assist readers in difficulties with a *Practical Wireless* project, we cannot offer advice on modifications to our designs, nor on commercial radio, TV or electronic equipment. Please address your letters to the **Editor, "Practical Wireless", Westover House, West Quay Road, Poole, Dorset BH15 1JG,** giving a clear description of the problem and enclosing a stamped self-addressed envelope. Only one project per letter please.

Components for our projects are usually available from advertisers. For more difficult items, a source will be suggested in the "Buying Guide" box included in each constructional article.

PROJECT COST

The approximate cost quoted in each constructional article includes the box or case used for the prototype. For some projects the type of case may be critical; if so this will be mentioned in the Buying Guide.

CONSTRUCTION RATING

Each constructional project will in future be given a rating, to guide readers as to its complexity:

Beginner
A project that can be tackled by a beginner who is able to identify components and handle a soldering iron fairly competently. Generally this category will be used for simple projects, but sometimes for more complicated ones of wide appeal. In this case, construction and wiring will be dealt with in some detail.

Intermediate
A project likely to appeal to a wide range of constructors, and requiring only basic test equipment to complete any tests and adjustments. A fair degree of experience in building electronic or radio projects is assumed.

Advanced
A project likely to appeal to an experienced constructor, and often requiring access to workshop facilities and test equipment for construction, testing and alignment. Constructional information will generally be limited to the more critical aspects of the project. Definitely not recommended for a beginner to tackle on his own.

SUBSCRIPTIONS

Subscriptions are available to both home and overseas addresses at £13 per annum, from **"Practical Wireless" Subscription Department, Room 2816, King's Reach Tower, Stamford Street, London SE1 9LS.** Airmail rates for overseas subscriptions can be quoted on request.

BACK NUMBERS AND BINDERS

Limited stocks of some recent issues of *PW* are available at £1 each, including post and packing to addresses at home and overseas.

Binders are available (Price £5.00 to UK addresses, £5.25 overseas, including post and packing) each accommodating one volume of *PW*. Please state the year and volume number for which the binder is required.

Send your orders to **Post Sales Department, IPC Magazines Ltd., Lavington House, 25 Lavington Street, London SE1 0PF.** All prices include VAT where appropriate.

Please make cheques, postal orders, etc., payable to IPC Magazines Limited.

INSURANCE

See page 18, February issue for details of the PW Radio Users Insurance Scheme, exclusive to our readers.

NEWS NEWS NEWS

The 1982 Girl Technician Engineer of the Year

Miss Lauren de Graft Rosenior, age 26, from Tulse Hill, London, is the 1982 Girl Technician Engineer of the Year. At a ceremony in London on the 14 December, HRH The Duke of Kent presented her with the prize of £250 and an inscribed silver rose bowl. Two special £100 awards were also made to the joint runners-up: Miss Jane Wood, 24, a Senior Software Engineer from Maidstone, Kent; and Miss Julie Meakin, 23, a Lighting Engineer from Larkhall, Lanarkshire.

Lauren is employed as a Control Technologist with Mars Ltd., the confectionery manufacturers, at Slough, Berkshire. She acts as the technical authority for maintenance staff and contractors on, at most times, at least two or three long-term projects and many shorter ones. The type of work and size of projects undertaken by Lauren range from MV power distribution schemes to programs for logic controllers, and from designing new systems to commissioning completed plant.

Sponsored by The Caroline Haslett

Memorial Trust and the Institution of Electrical and Electronics Incorporated Engineers, this Award aims to focus attention on electrical and electronic engineering as a worthwhile professional career for women.

For details of nominations for the 1983 award, contact: *The Institution of Electrical and Electronics Incorporated Engineers, 2 Savoy Hill, London WC2R 0BS. Tel.: 01-836 3357.*

West Country Search for New Satellite Station

British Telecom recently announced that it is concentrating the search for a suitable site for the nation's third satellite earth station in the south Wiltshire/north Dorset/south-east Somerset border area. Broadly the area is bounded by East Knoyle, Mere, Wincanton, Milborne Port, Stalbridge and Shaftesbury.

Earth stations send and receive international telephone, television, data and telex communications via satellites in geostationary orbit some 36 000km (22 300 miles) above the equator. As more and more telephones are installed the volume of international communications doubles every four to five years. New techniques which allow existing stations to handle more messages will not be able to keep pace with this increase in demand.

Mr David Withers, chief engineer for British Telecom International (BTI), said: "There is an urgent need for this station if we are to maintain our position as a world leader in international telecommunciations. It is needed because capacity at our two existing stations at Goonhilly in Cornwall and Madley in Herefordshire is limited."

Sites for an earth station need to be free of electrical interference and, ideally, be located in a natural bowl where land contours provide natural screening from interference.

A preliminary survey indicates that some places in the area appear to be sufficiently free from radio interference and would probably be technically suitable for development.

Perhaps, to palliate local apprehension, Mr Withers also said: "There need be no fears that an earth station will spoil the area. Earth stations create no noise, smell, pollution or TV interference.

"The local communities at Goonhilly and Madley have come to view their stations as assets. They bring a degree of prosperity to the area and create jobs."

220MHz e.m.e.

We have recently received a report from Bob Cushman of the Cushcraft Corporation that the first ever single Yagi 220MHz moonbounce contact took place on 6 December, 1982, between Lee Fish K5FF in Edgewood, New Mexico and Dave Olean K1WHS in Lebanon, Maine.

K5FF used her home-built 9·1m parabolic dish with polarity rotation, while K1WHS used a single Cushcraft 220B Boomer Yagi vertically polarised on the side of his tower.

Signals were quite good in both directions and the contact was completed in a minimum length of time.

News from the USA

The total number of radio amateurs in the USA amounted to 404 534 on 30 July 1982. On 1 July the FCC approved the introduction of a "Code Free" licence (similar to the UK Class B licence) which will be introduced after the ratification of WARC 79 and current legislation (licensing). The new class of licence will allow operation above 30MHz and is aimed somewhere between the technician class and the Canadian licence qualifications, with a bias towards technical merit. The ARRL have expressed concern at this relaxation by the authorities, but the issue seems to carry wide support amongst US amateurs, providing the technical standards of the examination are upheld.

Motorola has introduced a range of r.f. devices for operation up to 960MHz, including drivers and final stage elements capable of 30W output. QRO 934MHz CB?

Please Note!

A number of our advertisers have asked us to advise readers that the price of imported products are likely to change from month to month.

The reason behind these changes is fluctuating international exchange rates. So, readers are therefore advised that they would do well to check prices with suppliers prior to sending off orders.

NEWS NEWS NEWS

Oscar News

The 40th edition of *Oscar News* (on sale 6 January 1983) will contain, in addition to the normal wealth of space related information, a free 16-page supplement on the Russian RS series satellites.

The supplement is the first part of what promises to be the most comprehensive set of technical notes for the amateur satellite enthusiast yet published. To be called *The AMSAT-UK Technical Manual, incorporating the best of OSCAR News,* it will reach approximately 300 pages in total, based on a loose-leaf and hardback binder system.

Further details from: *AMSAT-UK, 94 Herongate Road, London E12.*

Phase IIIB: The launch date for the Phase IIIB satellite, the next active transponder in the OSCAR series, is scheduled for either 20 or 21 April 1983.

New Catalogues

South West Aerial Systems announce the availability of their 1983 catalogue, a 20-page publication listing a host of antennas and associated equipment for both domestic and specialised use.

The company, which is staffed by qualified antenna specialists, also provides a customer consultancy service to resolve reception difficulties and problems. Please send an s.a.e. with any query.

The catalogue costs 54p which includes p&p and is available from: *South West Aerial Systems, 10 Old Boundary Road, Shaftesbury, North Dorset. Tel: (0747) 4370.*

The new Maplin catalogue is now available at all branches of W. H. Smith and in Maplin shops for £1.25. The 392-page catalogue is A4 in size and is also available, by post, for £1.50 and for overseas customers £1.90. Orders should be sent to Maplin's Essex address.

The catalogue which lists a huge range of quality electronic components and equipment is divided into 29 sections for easy reference. Two new sections in this edition are Communications and Computers.

The new catalogue, now to be published annually instead of once every two years, is obtainable from: *Maplin Electronic Supplies Ltd., P.O. Box 3, Rayleigh, Essex. Tel: 554155/552911.*

Maplin shops are located at: *159–161 King Street, Hammersmith, London W6, tel: 01-748 0926; Lynton Square, Perry Barr, Birmingham, tel: 021-356 7292 and 282–284 London Road, Westcliff-on-Sea, Essex, tel: (0702) 554000.*

Rallies and Events

Bury Radio Society has organised a rally to be held at the Mosses Community Centre, Cecil Street, Bury, Greater Manchester, on 6 February 1983, starting at 1100hrs.

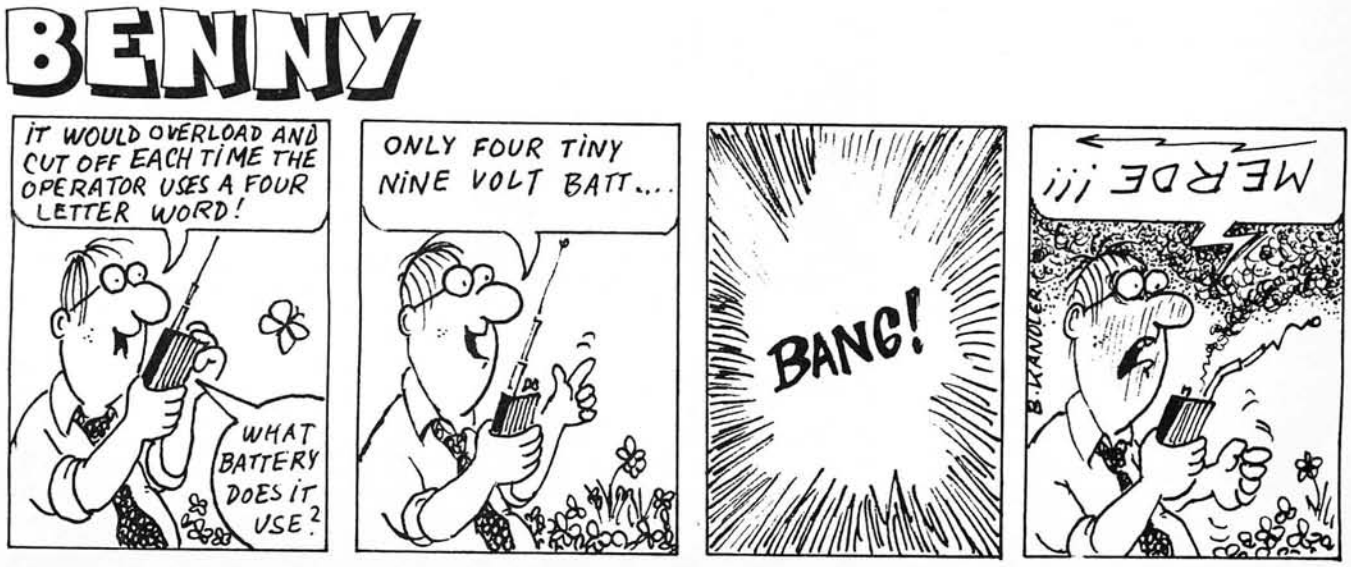
Among the usual rally attractions, the society has arranged for there to be an abundance of secondhand and surplus equipment to be on offer, plus a larger than usual bring-and-buy stall.

The venue has ample car parking facilities and refreshments will be available throughout the day.

The 21st Northern Amateur Radio Societies Association Exhibition (formerly "Belle Vue") will run for two days at Pontins Holiday Village, Ainsdale, Southport on 19 and 20 March 1983.

Admission to the exhibition will be 60p per day or £1.00 for the two days. Parties of 20 or over can obtain a 20 per cent discount by sending, in advance, the appropriate money and an s.a.e. to: *Mike Bainbridge G4GSY, 7 Rothbury Close, Bury, Lancs. BL8 2TT.* Chalet accommodation, at very reasonable rates, has been arranged and can be booked direct from Pontins, tel: (0704) 77165.

In addition to the exhibition, family interests and amusements will be available during the day, while residents will be able to enjoy the entertainment facilities during the evening.



AIR TEST

ANTENNAS IN SMALL GARDENS

Most radio amateurs (and many short wave listeners) would probably like to be able to have a garden big enough to take a full-size dipole for 80m, a large wind-up tower, etc. Unfortunately, the bank manager, the local authority planning department, the neighbours, even the XYL, often have other ideas. Even assuming you're lucky enough to have a house with a garden, the size of the average suburban plot doesn't give too much scope for experimenting with antennas.

For the v.h.f./u.h.f. enthusiast, roof-mounted antenna systems are not too difficult to achieve, though they have several disadvantages. They can be impossible to get at during bad weather; they're close to the house mains wiring, with all sorts of interference-making possibilities; and if you live in a bungalow, they won't be high enough to clear surrounding trees, buildings, etc. The h.f. operator has similar troubles, plus the problem of the varying effect of the roof as the tiles or slates get wetter or drier.

Wooden or metal scaffold poles can provide a fairly unobtrusive alternative to the ideal "sky-hook", but it's still not easy to get at the antennas mounted on top. That's not true, though, of two UK-manufactured "slim-line" masts currently on the market. Both have a maximum operating height of around 10 metres when the head-gear is fitted, and are telescopic, with tilt-over facilities giving ready access to antennas for repair or adjustment in any weather.

Two of *PW*'s technical staff have recently installed and tested samples of these masts, and report on their experiences for you. We also look at an h.f. antenna suitable for limited spaces.

ALTRON SM30 Telescopic Mast

The Altron SM30 is a tilt-over mast with a slim unobtrusive silhouette, designed for single-winch operation. The mast itself is made up of two sections of galvanised steel tube, each 4·57m (15ft) long, the outer being 90mm square, and the inner 76mm o.d. round. The maximum total mast-head weight of antenna plus rotator is 23kg. The length of the extension mast above the rotator should not exceed 1·2m, and the antenna windage surface area should not exceed 0·14m² (1·5ft²) when using the mast unguyed, or 0·46m² (5ft²) when guyed.

There are numerous mounting options available with the SM30. We tested the SM30PM, the post-mounted version. This has a square-section ground-post, to be set in a concrete foundation 600mm square by 900mm deep. If you want to be able to take the ground-post with you when you move house, a ground socket (type GS) can be concreted in instead, and the ground-post dropped into that. Where it is impracticable to dig such a deep hole, a base-post (type BP) mounting is available. This is Rawlbolted at ground level to the top of a concrete foundation 900mm square by 600mm deep. In each case, the cable winch mounts on the post.

The wall-mounted version SM30WM can be pivoted 305mm above ground on a ground-hinge type GH or 915mm above ground (other heights to order) on a post hinge type PH. The wall-bracket which steadies the top of the lower mast section must be mounted at least 3·4m above ground level. The standard wall-bracket is 305mm long, but other sizes up to 533mm are available where you need to clear a larger roof overhang. The standard SM30WM pivots at right-angles to the wall, but where this is not convenient an alternative wall-bracket allows the mast to be lowered alongside the wall. The winch mounts on the wall in each case.

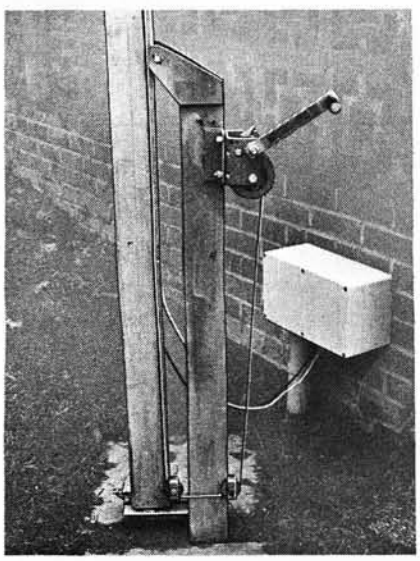
Finally, if you're into /P operation in a big way, a trailer-mounted SM30 is available—you may have seen the one we had at the Electronic Hobbies Fair last November, carrying some of our special event station antennas.

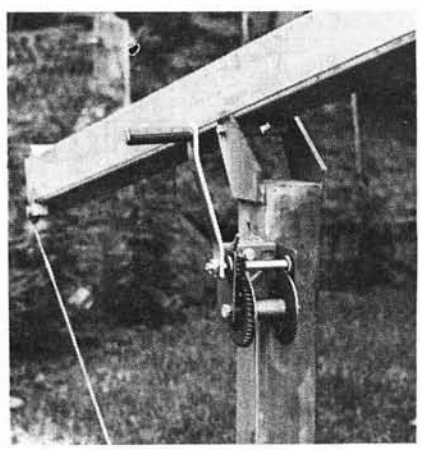
Two head units are available for carrying the antennas atop the mast. Reducer-tube RT1 is a 44·5mm (1¾in) diameter tube with a 460mm extension, suitable for spigot-mounting rotators. Rotator head RH1 (shown in the photographs) takes base-mounting rotators, and has an upper sleeve for 44·5mm o.d. tube 760mm above the mounting face. Both head units incorporate anchor-points for three mast-guys, should you want to fit heavier loads.

Installation

Putting in the ground-post of the SM30PM involved digging a hole approximately 600mm square by 1100mm deep. A 150mm layer of hardcore goes at the bottom of this to give a firm standing for the post, which must be held upright with the hinge plates facing the right way whilst the rest of the hole is filled with concrete.

That's around a third of a cubic yard of concrete, not really enough to call your local Readymix depot for, as small quantities (in their terms) come rather expensive. It might be worth looking through the "Services" ads in your local paper for firms specialising in part loads though. We certainly have some in the Poole/Bournemouth area. If you're making your own, borrowing or hiring a concrete mixer is a good idea. Whether you mix by machine or hand, you've got the option of buying ballast in bulk plus bags of cement, or bags of





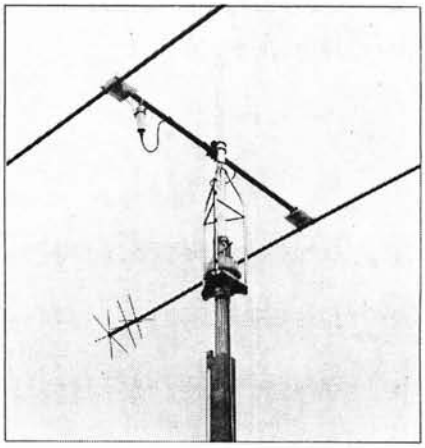
The SM30PM in the tilted position ▲

◀ Ground-post with the mast in the vertical position

dry coarse concrete mix. Which is right for you will depend on where you've got to store the materials between delivery and use, and on the cost of materials and delivery (if necessary) in your locality. You can't get many bags of dry concrete mix in the boot of the average family car!

The foundation block sizes are specified as adequate for "average" UK soil conditions. If the soil in your garden is particularly soft, you may need to increase the size—if in doubt, ask the mast manufacturer. I wanted to put my mast where a substantial beech hedge had been grubbed out with a JCB. The soil there had obviously been loosened in the process, and Allweld recommended that I spread the load to firmer ground by hammering angle-iron stakes downwards at an angle through the sides of the hole before pouring the concrete around them and the post. I used 1·8m fencing stakes as stocked at the local garden centre.

Having got the ground-post concreted in and left to set for at least three days, the mast can be mounted on to it using the hinge pin and split pins provided. The mast should be supported at this stage by a ladder or steps, so that it is roughly horizontal. The only remaining assembly work is to bolt a locating peg, a gravity latch and a pulley to the mast, and the cable winch and another pulley to the post. The lifting cable is supplied attached to the mast, and simply has to be led over the two pulleys just fitted and wound on to the winch. The instructions for installing and using the mast clearly set out all you need to know, with helpful drawings.



The RH1 rotator head, with KR-400 and G4MH Minibeam. The mast is only partly extended

Using the SM30

I've been using the SM30 with a Kenpro KR-400 rotator and the G4MH Minibeam for some months now. It's delightfully quick and easy to operate—so much so that I normally keep the mast down at the 4·7m level so that it's least obtrusive for the neighbours, and just nip out and wind it up to full height when needed.

Tilting the mast down for antenna adjustments is quick too. I've discovered just one snag, that you need three hands: one to pull on the mast to start it tilting, one to hold the winch ratchet off, and one to wind the winch down. I've talked to Allweld about this, asking why they don't weld a lever on to the mast bottom, that you could push on with your foot. They've thought of this, but feel that it's only a matter of time before you'd bark your shins on it in an unguarded moment. Their suggestion is to keep a length of wood by the mast, which you can put between the post and the mast and push with your leg to start the tilting. I've tried it—it works and it's cheap.

When the mast is in the fully-up position, all the weight is taken off the cable by the cord-operated up-lock pin. To lower it again, you winch up slightly to release the pin, pull on the cord to disengage it, then lower away. You can leave the mast at intermediate heights, but then the full weight of the antenna, rotator, and mast top-section are borne by the cord. A steel pin is provided to secure the mast safely in the vertical position, or to lock the telescoping sections together when tilting the mast. It's recommended that the lifting cable should be renewed after three years' average usage, though obviously you should keep an eye on all mechanical parts of the mast for wear at all times.

Availability

The Altron SM30 is manufactured and sold exclusively by **Allweld Engineering, Factory 6, 232 Selsdon Road, South Croydon, Surrey CR2 6PL, telephone 01-680 2995.** See their advertisement in this issue for current prices. They are also happy to quote for special adaptations of the SM30.

Geoff Arnold

WESTERN ELECTRONICS UM1-Ultimast

A low level QTH at or near to sea level, surrounded by high ground and a housing estate, can impose operational restraints for the v.h.f./u.h.f. operator—during 1982 G8MCP moved from such a location to one 60m above sea level and then began to wonder if the antennas had ever been correctly terminated before! The new "ideal" location, however, whilst being on a hilltop, was situated within a residential area of the "low rise" bungalow variety and although a loft mounted Slim Jim did produce results better than previous multi-element beam antennas hung off the end of the old house, something more "practical" was called for.

A 'phone call to the local planning officer resulted in a wealth of helpful information, confirming amongst other things that anything remotely "in the clear" mounted on the bungalow, or a separate free-standing mast structure, would require planning consent. Various schemes were proposed and it would be fair to say that the most favourable response came from the suggestion that I install a mast that would be raised/lowered as required, and thereby attract less attention to the fact that a "Radio Ham" was now in residence. Visual impact is not the only factor governing planning consent, but it is certainly well up the list.

Various mast options were looked at and the Western Electronics UM1 was decided upon as it provided for me the optimum balance between structural rigidity, visual profile and most importantly operational convenience.

The UM1 consists of a tubular two-section telescopic hot dip galvanised mild steel mast with ground-post and winch mechanism. Use has been made of the high strength to weight ratio obtainable from tubular materials and this results in an extremely slim profile. The ground-post is constructed from 100mm square, 5mm thick, rolled hollow section, capped with a welded channel section pivot point. Both mast sections are tubular also—the lower being 90mm square, 4mm thick, and the upper 75mm circular fitted with a guide block to prevent rotation and an extension limiting stop. The complete mast assembly pivots on a single high tensile M12 bolt that passes through lugs, welded to the side of the mast and the ground-post capping.

Included with the mast and fittings is a four-page installation manual which also details aspects of maintenance and use. Section A details the actual installation method and opens with the ground-post foundation requirements—a hole 1·25m square, 500mm deep and filled with concrete. Accomplishing this requirement takes a little longer than the time required to read it! However after some nine hours of pick-axing through layers of compacted clay and flint (without doubt a

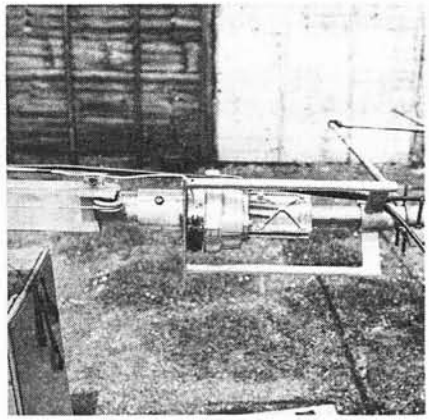
highly durable foundation medium) the hole was ready. I was very grateful for the fact that the foundation dimensions allowed me to stand in the hole as the depth increased and the materials excavated now form a substantial rockery base in the back garden.

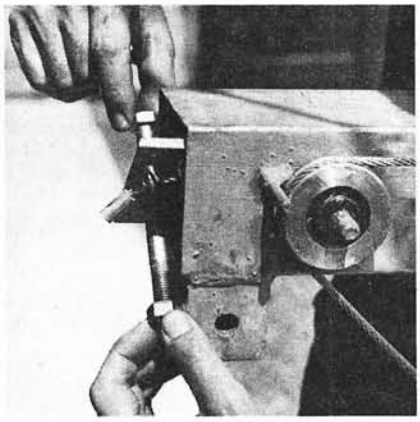
Next step in the installation is the most critical, setting in the ground-post. This must be inserted to the correct depth and firmly supported whilst the concrete in-fill is poured. It goes without saying that accurate vertical alignment is essential unless you want eventual slant polarisation, or enjoy chipping out the odd 2·5 tonnes of concrete. I found that the best technique involved sitting the post on an embedded house brick and clamping timber bracing struts to all four faces. In fact, as a double check, I poured 75mm of concrete into the hole and allowed this to set and the vertical alignment to be verified before the hole was topped off. Three days later the concrete had solidified enough to proceed.

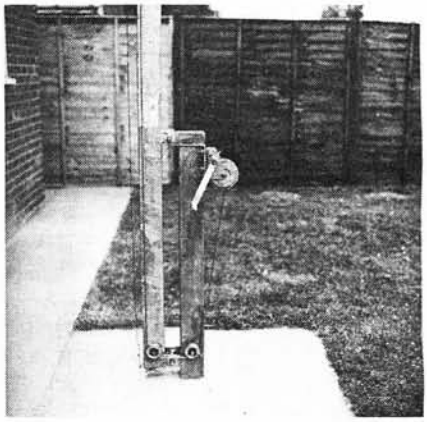
Ideally two people are needed for the next part of the installation—lifting the mast assembly on to the ground-post pivot point. A suitable height support is placed under the outer end of the horizontal mast and the M12 pivot bolt secured at the other. In this position the mast can be easily worked on and the facility to winch the mast and antenna assembly on to the back lawn becomes even more attractive—long gone were the days of waiting for the rain/snow/wind to allow access to roof-top r.f. hardware.

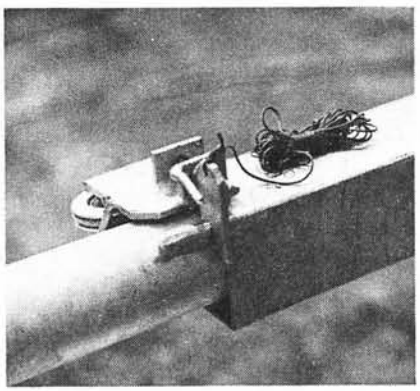
The UM1 is supplied with a 5mm diameter galvanised steel rope already fitted and this only leaves you to feed the free end over three stainless steel pulleys located on the lower mast and ground-post. An American manufactured "trailer" type winch is part of the package and this is the next item to be bolted to the ground-post allowing the lifting rope to be threaded on to it. The instruction manual actually showed the assembly details of a similar winch to the one supplied to me. I puzzled over this for some time before realising that the supplied winch did not use a rope retaining "keeper"—the rope being passed through the side cheeks of the winch drum. This method of securing the rope may appear suspect, but in fact the rope is of sufficient length to have many turns left wrapped around the drum, even when the lifting effort is removed.

The big moment arrives and a trial lift is called for, but first a word of warning: the two mast sections **must** be locked together during all winching over (luffing) operations. If this is not done and the M12 bolt provided for the purpose not installed through the end of the upper mast section, attempts at luffing the mast will result in a very bent antenna system and a sizeable crater in the immediate area of impact. So, sections secured together, the winch handle is fitted and after several turns to take up the tension the mast begins to rise gently from the horizontal. If you want to stop during this operation the winch is automatically locked by a spring loaded pawl engaging the ratchet gearing. When the mast has reached the vertical position the lugs welded to the ground-post engage with mating features on the lower mast and the bolt previously used to lock the mast sections together is removed and used to secure the mast firmly to the ground-post by passing through the lugs. Each subsequent turn on the winch elevates the upper mast by approximately 50mm until the full working height of 9m is attained. For reference the mast when horizontal is 1·1m high and when vertical 4·75m, with the upper section retracted. As a further safety measure, and to remove the loading from the winch, an external toggle catch block is fitted at the top of the lower mast section. This automatically engages with a lug on the upper section when fully extended. When you want to lower the upper mast a nylon cord is pulled to release









Installing the UM1. On the left: plumbing the ground-post (top); the bolt locking the mast sections for tilting (centre); toggle catch with nylon operating cord (bottom). And above: UHD-2, KR-400 and antenna installed (top); job completed—mast upright! (bottom)

the catch, having first taken the load back on to the winch. During lowering operations the standard winch is not braked and must be controlled by the operator.

Omni-directional vertical antennas, floodlights, etc. can be directly bolted to the top of the 75mm diameter upper mast or alternatively Western Electronics can supply mating head adaptor units. The UM1 is a concentric reducer providing a 140mm long, 48mm diameter extension stub and the UHD-2 a fabricated platform and upper alignment bearing assembly. As I already had a Kenpro KR-400RC rotator the UHD-2 was used and was supplied ready drilled to allow the flat base of the rotator to be bolted to it.

I subsequently fitted a 2m long, 50mm diameter stub mast to the rotator and since last August have had permanently installed a 14-element 144MHz Parabeam, 20-element 432MHz quad loop and dual-band omnidirectional vertical antenna. Since its erection the mast has been regularly winched up/down and over during antenna and pre-amplifier tests and has been subjected to most forms of weather available at its hilltop site. Winds of over force 9 are not unusual and to date no problems whatsoever have been encountered with the mast. I now have a system that can be lowered to ground level single handed within two minutes allowing antenna access in all weather conditions, and yet can still hide behind a bungalow.

The UM1 costs £251.85 including carriage and is available ex-stock from **Western Electronics (UK) Ltd., Fairfield Estate, Louth, Lincs LN11 0TH, Tel: 0507 604955,** to whom we offer thanks for the prompt supply of the review mast.

John M. Fell

G4MH Minibeam

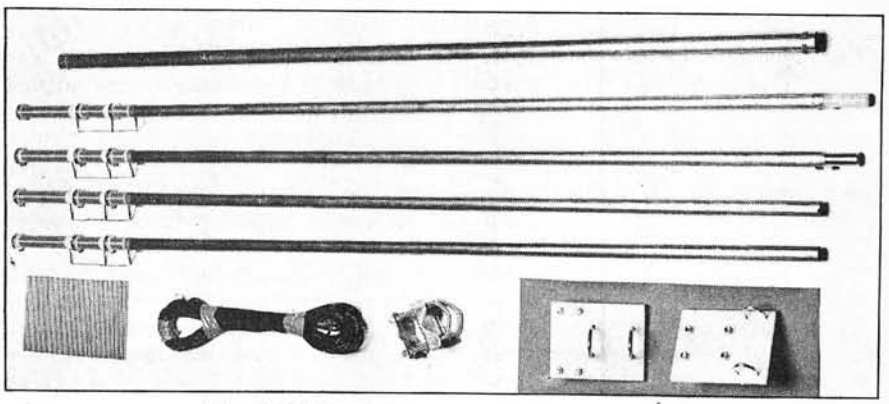
The G4MH Minibeam is a 2-element, 3-band h.f. antenna operating on the 14, 21 and 28MHz amateur bands. Both elements (driven and director) are tuned by inductive and capacitive end-loading to reduce the overall length to 3·4m. With a boom length of 1·5m, the whole antenna has a turning radius of 2m, making it suitable for small garden installations.

The antenna is easily assembled following the instruction leaflet provided. Mounting hardware including mast-clamp and the "U" bolts to attach the elements and boom to the joining nylon plates is all supplied. The element tuning assemblies, each comprising three coils on a threaded nylon rod, come ready-wound, but the 56 brass spokes (6 each for the 14MHz coils, 4 each for the others) have to be screwed into place in the tapped rings provided. Adjustment for minimum v.s.w.r. is by shortening one spoke from each ring (four spokes per band). You can try doing this on a temporary mount, accessible from ground level, but you will find that the minima will have moved when the antenna is raised to its final position.

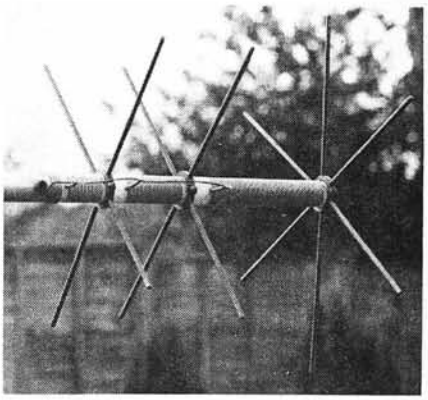
It's far less trouble in the long run to put the antenna up and check its resonant frequency on each band. You'll need a noise bridge for this, because the dip will probably be below the bottom limit of each band, and you won't be able to check v.s.w.r. by transmitting. Then take the antenna down and trim the necessary amount off the spokes for each band using the length-versus-frequency table given in the instructions. Put it back up again and you'll find the resonant frequencies very close to what you wanted.

A good dry day is essential for erecting and adjusting this antenna. In its unprotected state, it is very sensitive to damp, and should you be tempted to carry on the tuning procedure in fine drizzle, as I did, you will be wasting your time, as the resonant frequency shifts downwards quite dramatically. The instructions recommend coating the coils, etc., in polyurethane or yacht varnish. I tried this without much benefit; perhaps it requires more than the two coats I put on. I then wrapped the coils with self-amalgamating rubber tape, which did make quite a difference, cutting the shift in resonant frequency due to rain by more than half. The final figures I got were 30kHz for the 14MHz band, 125kHz for 21MHz and 200kHz for 28MHz. Bandwidths for 2:1 v.s.w.r. were 85kHz, 160kHz and 925kHz respectively. The graphs show v.s.w.r. with the antenna tuned for the c.w. end of each band, and will require some final adjustment for optimum. All measurements were made using a Hansen FS700H automatic s.w.r. and power meter and a Bird Model 43 directional power meter.

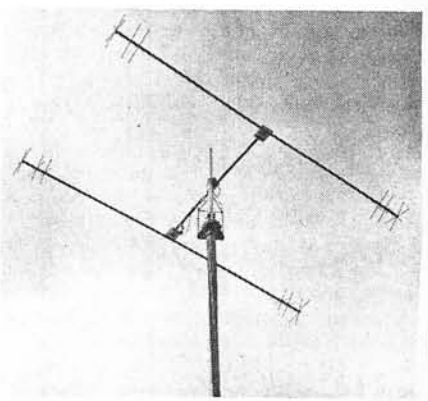
The limited bandwidth and resonance shift when wet are the price one has to pay for compressing a full-size tri-band beam into an antenna of small size, light weight (6·4kg) and low wind resistance. Using an a.t.u. (always good practice with a multi-band antenna, to keep down harmonic radiation) will double these bandwidths with reasonable efficiency of radiation.



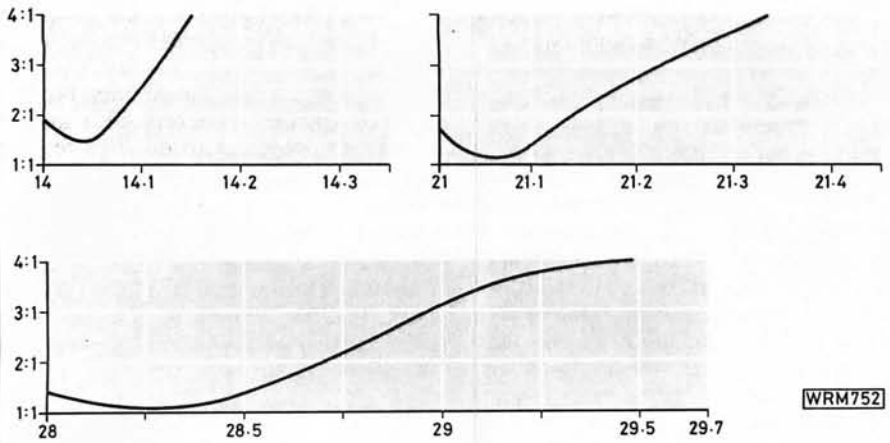
The G4MH Minibeam ready for assembly



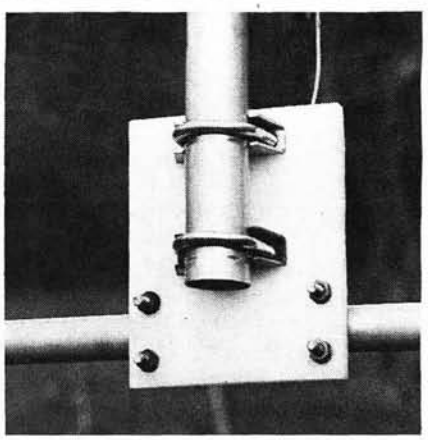
Element tuning assembly



The completed Minibeam aloft



Minibeam v.s.w.r. curves



The exhaust clamp modification

Our Minibeam has survived gales, rain, snow and ice with no damage other than the elements twisting slightly on the ends of the boom, so that they were no longer horizontal. If the boom-end "U" bolts were tightened too much the nylon plates bent, so we got round the problem by fitting motor-car exhaust clamps (38mm/1½in size) in place of the "U" bolts, to provide a flat metal surface to bear against. Four clamps are required. We understand that thicker nylon plates are now being supplied, which should be a help.

The specified back-to-front ratio is 7dB. Without a proper antenna test range, it is impossible to confirm this with any accuracy, but such checks as we could make gave results in that region. There is a sharp null off the end of the antenna on 28MHz, with somewhat broader nulls on the lower bands.

The G4MH Minibeam does not take too kindly to being mounted close to a roof. Our first tests were with it only about 1·5m above the ridge-end of a chalet bungalow, where v.s.w.r. was not good and changed markedly with antenna direction.

The complete G4MH Minibeam in self-assembly form is priced at £82.50 including VAT (UK carriage £2.50) from **Amateur Radio Shop, 4 Cross Church Street, Huddersfield, W. Yorks, telephone 0484 20774,** to whom we offer our thanks for the loan of the review sample, and from their agents in the UK and overseas. Amateur Radio Shop also offer a Minibeam Kit which excludes the mast-clamp and the alloy tubing for the elements (1in o.d.) and boom (1½in o.d.). Any other individual parts can be supplied to order should you damage something, or cut the tuning spokes too short, for example. *Geoff Arnold*

swap spot

Have a pair of "as new" Nikon 9 x 35 binoculars. Would exchange for Yaesu 240V to 12V p.s.u. or similar. B. T. Woodcock, 11 Church Lane, Mirfield, West Yorks. Tel: 0924 493888. *Q042*

Have Grundig Satellit 1400SL professional receiver, one month old. Would exchange for scanning receiver SX200N or 220FB Bearcat. Tel: Lilliesleaf 08357 314. *Q086*

Have a Feinwerkbau mod. 65 177 cal. match air pistol with anatomical grips, in excellent condition with good case. Would exchange for good Trio/FRG-7 type communications receiver in good order. B. Glennon, 25 Cordingley Avenue, Droylsden, Nr Manchester. Tel: 061 301 3750. *Q087*

Have Fidelity 2000 f.m. CB, base and mobile antenna and hardly used slide mount. Would exchange for Vic 20 computer or similar or 144MHz (2m) transceiver or w.h.y. K. Day 0268 558037 (Basildon). Will pay delivery within reason. *Q090*

Set of welding bottles with hose, gauges etc., and trolley and spare welding and brazing fluxwire — rods. Would exchange for 144MHz transceiver, all mode or next best. RAE passed 1982. Tel: 0952 586586 (Telford, Shropshire). *Q099*

Have full set of scuba gear, inc 60 cu. ft cylinder (luxfer) Fenzy A.B.L.J. with cylinder, two wet suits 5ft 9in approx plus. Would exchange for a 144MHz (2m) synthesised multimode unmodified or w.h.y. Steve Carter G6IZB. Tel: Peterborough 0733 78129. *Q116*

Have large Hartley Type 13A, 5in oscilloscope dual beam, 10MHz bandwidth, including alignment, repair manual, circuit diagram etc. Would exchange for accurate d.m.m. or hi-fi, front loading, stereo cassette deck. Kevin. Tel: Hailsham (Sussex) 846904, buyer collects. *Q172*

Have 11 volumes of *Practical Wireless* 1955 (mint), also 11 volumes of *Practical Television* 1954. Would exchange for *Practical Television* books 1975 to 1979 of similar quantity, must collect. M. Dranfield, Denton Villas, 3 Fairfield Road, Buxton, Derbyshire, SK17 7DL. *Q224*

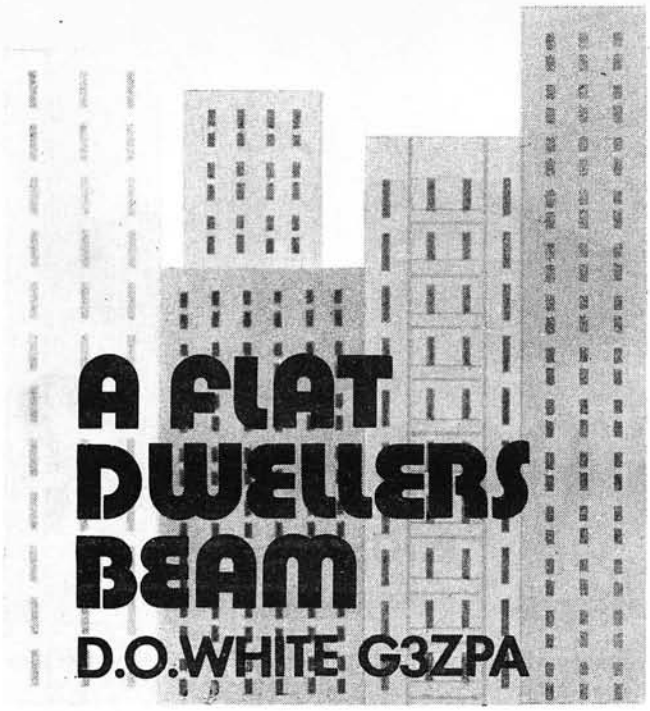
Have National Panasonic DR48 general coverage communications receiver, premix double superheterodyne digital readout, wide/narrow band width, b.f.o., cost over £300. Would exchange for old FT101 or KW2000 or similar w.h.y. s.a.e. please. J. Cavanagu, 190 Liverpool Road, Huyton, Liverpool, Merseyside. *Q225*

Have FTV250 Yaesu transverter. Would exchange for KW supermatch or similar good a.t.u. P. Haughey G3JXR. Tel: 0908 642398 (Bletchley). *Q226*

Have Sansui audio amplifier AU101, plus pair Goodman speakers, very good quality. Would exchange for MM2001 or similar RTTY or c.w. converter/transceiver. Also want AR88 to military specifications. Please state swap required. William Laurie, 7 Rumbleton Law, Greenlaw, Duns, Berwickshire, Scotland. *Q227*

Have FRG-7 general coverage receiver plus 144MHz (2m) converter, very good condition. Would exchange for IC-2E and accessories or h.f. linear. Philip Taylor, 22 Summerhill Drive, Maghull, Liverpool L31 3DW. Tel: 051 526 4777. *Q298*

Have Icom IC-215 144MHz 15 channel f.m. rig, also Mosley TA33 h.f. Tribander. Would exchange either for oscilloscope or general coverage receiver or w.h.y. Brian G4HIY. Tel: Crowmarsh 788. *Q299*



For those of us who are fortunate enough to live in the countryside or in a town with an average suburban size garden, the erection of h.f. antennas of some sort does not usually present too much of a problem. Often a two- or three-element Yagi can be put up without too much difficulty. But what about those unfortunate mortals amongst us (Amateur Radio-wise) who live in high-rise apartment blocks, or a flat without a garden?

For these people the erection of any antenna can become a formidable problem, let alone a directional beam type system. The best that can be hoped for is some sort of omni-directional thin wire hanging dipole or end-fed vertical, running up the side of the building—whilst these can be very effective they do not overcome the problem of interference from other stations in all directions. What is really needed is some sort of directional antenna. The answer to this problem for the flat dweller is the switched directional antenna, described in this article.

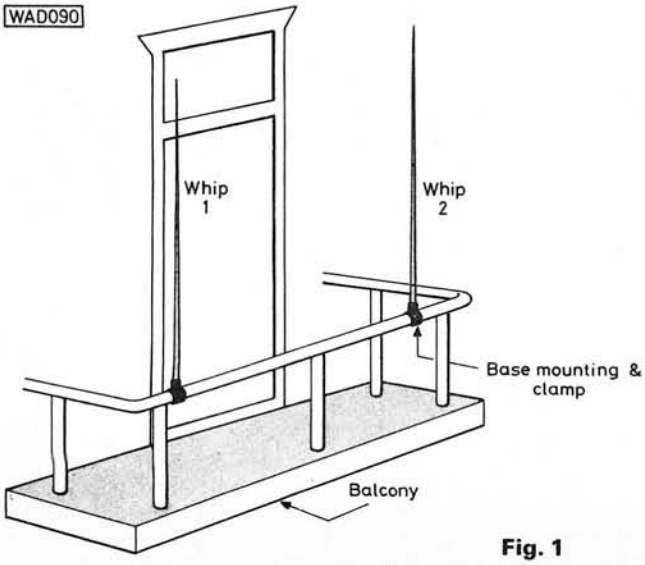


Fig. 1

Two mobile type 14MHz (20m) whip antennas should be clamped to the iron railings which surround the balcony of many flats, as shown in Fig. 1. Then, run two equal lengths of 50 ohm coaxial cable to a metallic junction box, terminated into a pair of UHF SO239 sockets, SK1 and SK2 of Fig. 3. What we are now going to do is to feed these two whip antennas out of phase to obtain an "end fire" directional beam effect.

A cross-connected d.p.d.t. phase reversing switch S1 is mounted inside the box adjacent to the SO239 sockets. A very short piece of 50 ohm coaxial cable should be wired from terminal (a) of this switch to the third SO239 socket, SK3 of Fig. 3. Next select a 2·135m length of identical coaxial cable and wire it between terminal (b) of S1 and SK3.

An antenna tuning unit (a.t.u.) should now be connected as close as possible to SK3 on the junction box and the other end connected to the transceiver to be used. Any type of a.t.u. will do so long as it presents that magic 50 ohms impedance to the transceiver. The spacing of the antenna whip elements is not critical and can vary from one eighth to one quarter of a wavelength, depending on the size of the balcony.

Operation simply consists of setting the a.t.u. for the best received signal and then tuning the transceiver up on low power whilst re-adjusting the a.t.u. until normal power out and minimum standing wave ratio is observed. By choosing the appropriate setting of S1, the phase reversal switch, either of the two principal, 180 degree opposed, directions you wish to transmit your signal in can be selected. The whips can be mounted upright or at an angle of 45 degrees, depending on the situation at your flat.

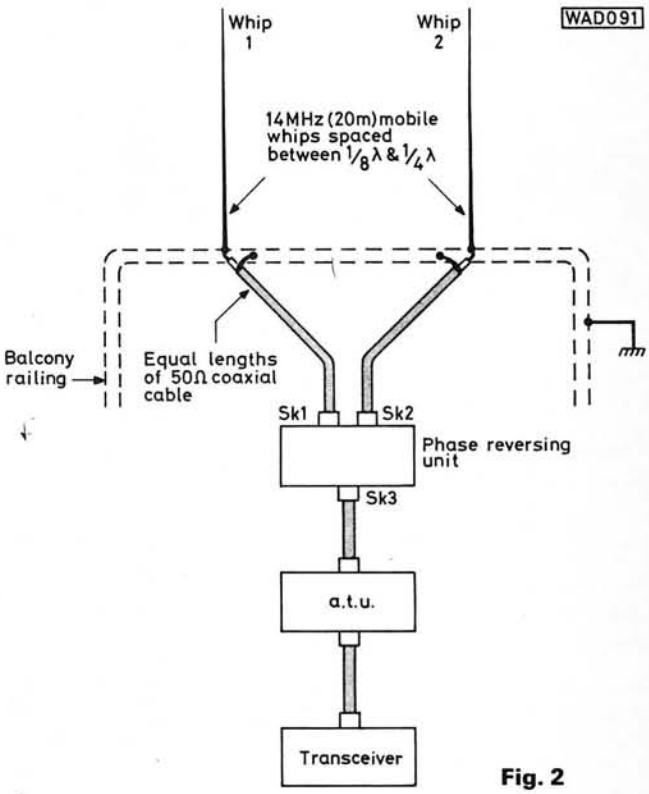
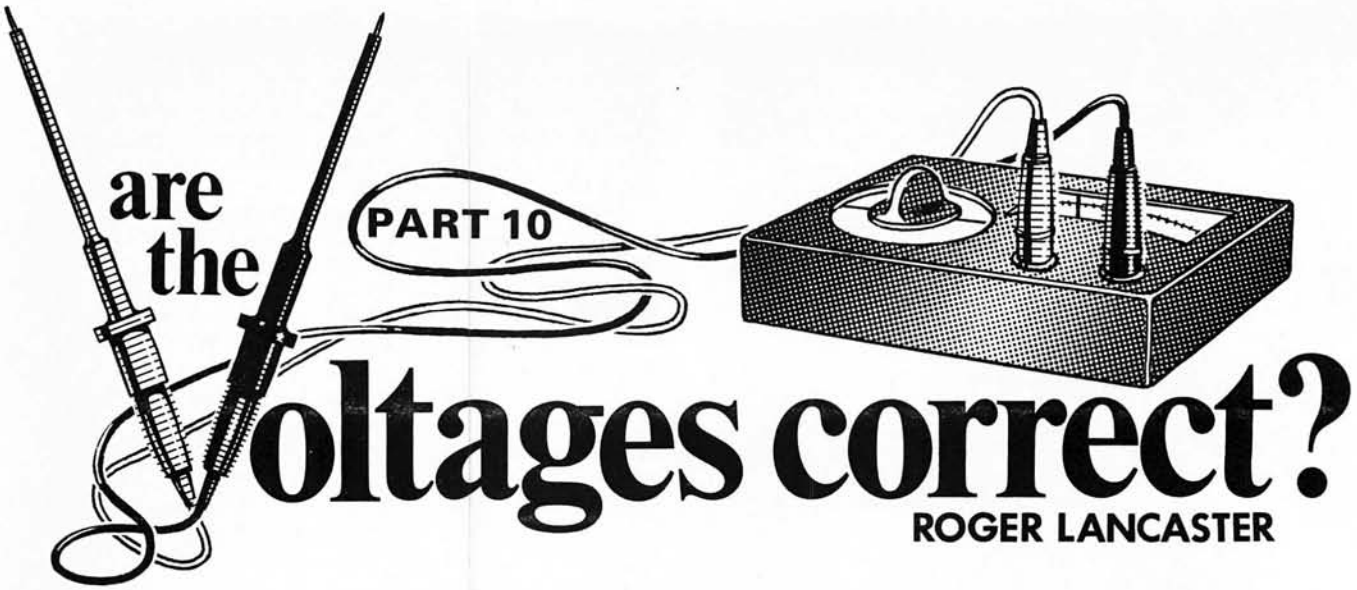


Fig. 2

Try and obtain as good an earth as possible, but you will find that good performance should be obtained just using the iron railings alone. Different lengths of coaxial cable can be tried between S1 (b) and SK3 — the longer you make it, the greater is the degree of phase shift. Do

continued on page 30▶▶▶



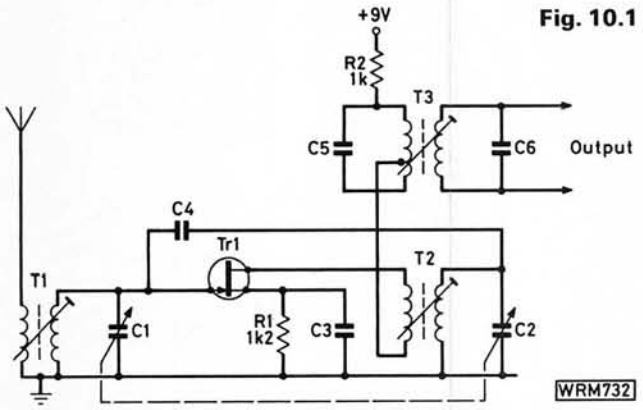
are the voltages correct?

PART 10

ROGER LANCASTER

Solutions to last month's problems: The circuit is reproduced here in Fig. 10.1.

Fig. 10.1



No. 1: Given that the source potential was +2V, and oscillations and signals were suppressed, you were asked to estimate the gate and drain potentials with respect to earth.

The gate will be at **0V** (earthed via T1 secondary). To calculate drain potential:

$$I_s = \frac{V_s}{R1} = \frac{2}{1{\cdot}2} = 1{\cdot}7\text{mA} = I_d$$

$$V_{R2} = I_d R2 = 1{\cdot}7 \times 1 = 1{\cdot}7\text{V}$$

Therefore, drain potential = +9 − 1·7 = **+7·3V.**

No. 2: You were given the following information and asked to decide which component is faulty and what is wrong with it.

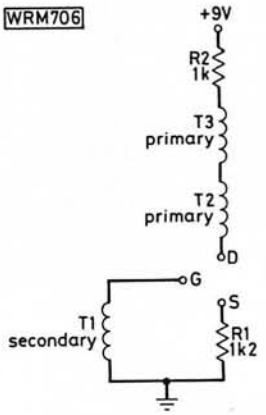
Potentials with respect to earth with Tr1 in circuit: s = +4·5V, g = 0V, d = +5·25V. The f.e.t. is removed, checked by ohmmeter and found to be good. Then, with the f.e.t. still out of circuit, the potentials with respect to earth are: s = 0V, g = 0V, d = +9V; and with respect to the +9V line are: s = −9V, g = 0V, d = 0V.

The potentials with Tr1 in circuit indicate that it is conducting more heavily than it should, because of the larger voltage across R2, yet the bias developed across R1 is higher than normal, which would result in a higher g–s potential and therefore **reduced** conduction—very confusing.

The equivalent d.c. circuit with the f.e.t. removed is shown in Fig. 10.2. From this you should see that the voltages with respect to earth are correct. With respect to the +9V line, however, they should be: s = −9V, g = −9V, d = 0V. The gate potential is incorrect. The further equivalent circuit of Fig. 10.3 shows the situation when the meter is used to measure this potential. If the meter reads 0V, there must be a break in this circuit and the only **component** is T1 secondary, which must therefore be open-circuit. In practice, an ohmmeter check would have to be made to prove the break was in T1 and not in the wiring.

WRM706

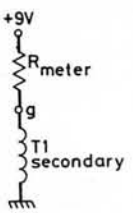
Fig. 10.2



Under these fault conditions, the voltage being developed across R1 could not be applied **between gate and source** because of the break in the circuit. Consequently the channel was a low resistance, high current flowed, and most of the 9V was distributed between R1 and R2.

WRM707

Fig. 10.3



IGFETs

This term stands for insulated gate field effect transistor, the most common example of which is the MOSFET (metal oxide semiconductor f.e.t.)—so called because of its construction.

You can subdivide IGFETs into two groups, depletion-mode and enhancement-mode, and these will be considered separately. Both types are further subdivided into *n*-channel and *p*-channel variations, as with JUGFETs.

The term enhancement-mode refers to the fact that these types are "normally off" devices (i.e. no drain current with zero g–s potential), a suitably applied g–s potential causing them to conduct. A depletion-mode f.e.t. is a "normally on" device (i.e. conductive when g–s potential is zero), this conduction capable of being reduced by the application of a suitable gate voltage. (Consequently, all JUGFETs are depletion-mode devices.)

Enhancement-mode IGFETs

Circuit symbols for *n*-channel and *p*-channel examples are shown in Fig. 10.4 (a) and (b) respectively. The names of the electrodes are not part of the symbols and will not normally appear on circuit diagrams. As with other devices, it is useful to remember that the arrow always points towards *n*-type material (and away from *p*-type).

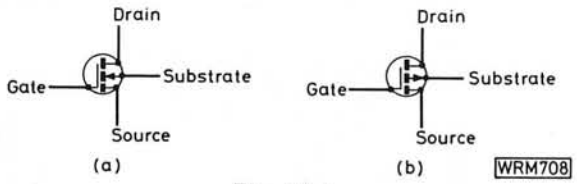


Fig. 10.4

The thick line representing the channel is broken to signify the "normally off" characteristic. The substrate is the bulk of semiconductor material onto which the active parts of the device are built. The f.e.t. is often operated with substrate connected to source and we will consider this to be the case for the time being (see Fig. 10.5).

There is no *p-n* junction between gate and channel this time, instead the gate electrode and the channel act as the plates of a very small value capacitor (e.g. 2pF), hence the term "insulated gate". This also accounts for the high input impedance of the device—even higher than that of the JUGFET.

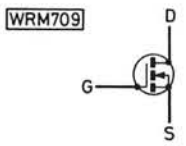


Fig. 10.5

When a g–s potential is applied of correct polarity (gate positive for the *n*-channel, gate negative for the *p*-channel), the field induced by the g–s potential causes the conductive channel to be established and as the g–s potential is increased, so the s–d resistance decreases. Small changes in g–s potential cause large changes in s–d current when a circuit is completed, so enabling the device to operate as an amplifier.

The necessary bias is often obtained by connecting a large value resistor between drain and gate, as shown in the simple amplifier circuit of Fig. 10.6. For a *p*-channel IGFET the circuit is identical but all polarities are reversed.

We are unlikely to have sufficient information to enable us to determine the s–d current or the resistance of the channel under any particular operating conditions, so we cannot calculate drain or source potentials from the information provided. However, we can say that the gate potential will be the same as the drain potential, since there will be no d.c. current through R3 and therefore no p.d. across it. Also, we can check for the correct **relationship** between source and drain potentials, i.e. if we know (or measure) one of them, we can calculate what the other should be, because the same current flows through both (d.c. gate current being negligible because of the insulated gate).

So, if the measured source potential is **+1·5V,** source current $= \frac{1{\cdot}5}{1{\cdot}2} = 1{\cdot}25\text{mA}$.

Then, $V_{R1} = 1{\cdot}25 \times 4{\cdot}7 = 5{\cdot}9\text{V}$. Therefore, drain potential $= +10 - 5{\cdot}9 = \mathbf{+4{\cdot}1V}$, and this will be the gate potential too.

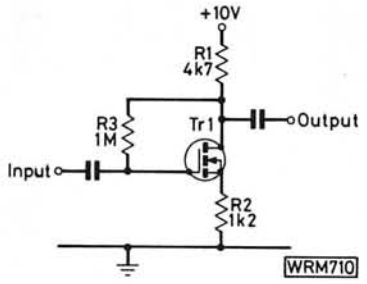


Fig. 10.6

If the voltages are incorrect, you may suspect the IGFET itself of being faulty and wish to remove it for testing by ohmmeter. **DON'T!** Insulated gate devices **must not** be tested by ohmmeter—the test itself would probably destroy them. This is because the g–s capacitance is extremely small and its breakdown voltage is limited.

The voltage and charge on a capacitor are related by the formula $Q = CV$, Q being the charge in coulombs (C). Suppose a small charge of 100pC (10^{-10}C) is somehow imparted to the g–s capacitance of an IGFET (typical value 5pF). The voltage produced across the g–s insulation will be

$$V = \frac{Q}{C} = \frac{10^{-10}}{5 \times 10^{-12}} = 20\text{V}.$$

This may well exceed the insulation breakdown voltage and cause a permanent short-circuit between gate and source. Such a small charge could be acquired from a person's hands or the tip of a soldering iron.

Because of this vulnerability of IGFETs, they are usually supplied with all their electrodes shorted together, by a conductive rubber ring or wire spring, and this protection, which prevents charge accumulating, must be kept in position until **after** the device has been soldered into circuit. Once connected, the circuit resistors should allow any charge to leak away before the danger point is reached.

While the IGFET cannot be tested by ohmmeter, it can be removed to enable further tests on the circuit, provided its leads are securely shorted together (by, say, a tight ring of wire) **before** any attempt to remove it is made **and** that the shorting device is retained until **after** the IGFET has been resoldered into circuit.

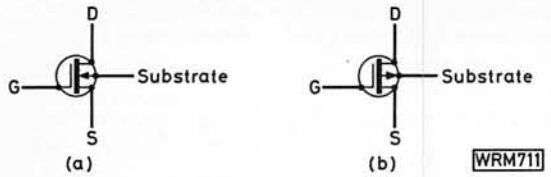
Some IGFETs have built-in diode protection to reduce the dangers described and sometimes protection diodes are incorporated in the circuit if there is any risk to the gate-channel insulation under operating conditions.

Depletion-mode IGFETs

Circuit symbols for *n*-channel and *p*-channel versions are shown in Fig. 10.7 (a) and (b) respectively.

The thick unbroken line of the channel signifies that it is a "normally on" device, just like the JUGFET. Unlike the

JUGFET, however, and despite its name, the depletion-mode IGFET can be used in either depletion-mode or enhancement-mode.



When the g–s potential is zero, the s–d resistance is of a certain value (from a few hundred to a few thousand ohms, depending upon its construction) and this value varies from one type number to another within the depletion-mode IGFET group. If the gate potential is made positive (*n*-channel) with respect to source, s–d resistance decreases and s–d conduction increases, i.e. the device is operating in enhancement-mode. If the gate potential is made negative with respect to source (*n*-channel), s–d resistance increases and s–d conduction decreases, i.e. the device is operating in depletion-mode just like the JUGFET. (Reverse polarities apply to the *p*-channel version.)

The gate voltage can therefore be either positive or negative with respect to source, by a few volts either way, but the same d.c. relationship between source and drain potentials applies as with other types of f.e.t., since source current = drain current.

A simple circuit is shown in Fig. 10.8. Source and gate potentials will both be positive **with respect to earth,** but the gate potential could be more or less positive than source and so can be either positive or negative **with respect to source,** this being determined by the ratio of R1 to R2 and the value of R4 together with the source current flowing through R4.

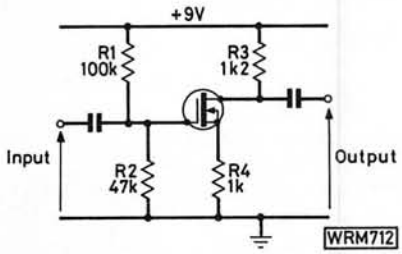


Fig. 10.8

This time we can calculate gate potential by:

$$\frac{R2}{(R1 + R2)} \times 9V = \frac{47}{147} \times 9 = +\mathbf{2{\cdot}9V}$$

However, this gives us no idea of source or drain potentials—they will depend upon source current, which we are not able to calculate since we are unlikely to know the channel resistance under these conditions. We must measure one of them. Suppose we measure the source potential and find it to be **+2V.** This means gate is positive with respect to source and the f.e.t. is operating in enhancement-mode. From it we can estimate drain potential:

$$I_s = \frac{V_s}{R4} = 2mA$$

$$V_{R3} = I_{R3} \times R3 = 2 \times 1{\cdot}2 = 2{\cdot}4V$$

Therefore, drain potential = $+9 - 2{\cdot}4 = +\mathbf{6{\cdot}6V}$.

As IGFETs often have more than one gate, each gate is able to exert its own influence on channel conduction. This is particularly useful in mixer circuits. As with one gate, d.c. voltage estimations are chiefly determined by the assumption that source current = drain current.

Furthermore, the substrate can be used as another control electrode, in JUGFET fashion, since there is a *p-n* **junction** between substrate and channel. This should not alter the $I_s = I_d$ relationship, however (unless the designer has been perverse enough to **forward** bias the junction!).

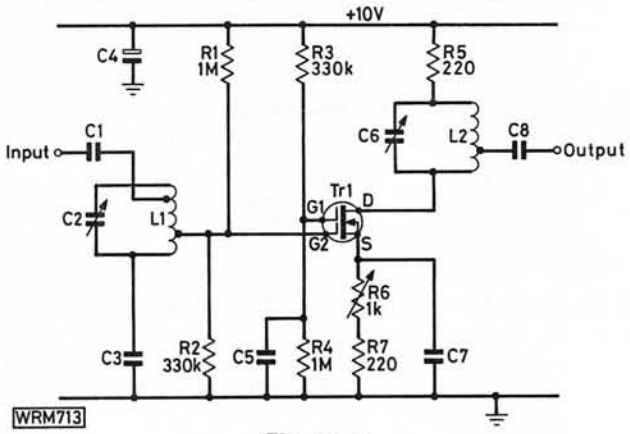


Fig. 10.9

This month's problem is based on the circuit of Fig. 10.9, an r.f. amplifier with gain control (R6). Under no-signal conditions, source potential is measured as +3·1V (R6 at minimum resistance) and +4V (R6 at maximum resistance). Estimate the potentials at g1, g2 and d for both these extreme settings of R6.

Next month we shall be looking at some integrated circuits.

A FLAT DWELLERS BEAM

▶▶▶*continued from page 27*

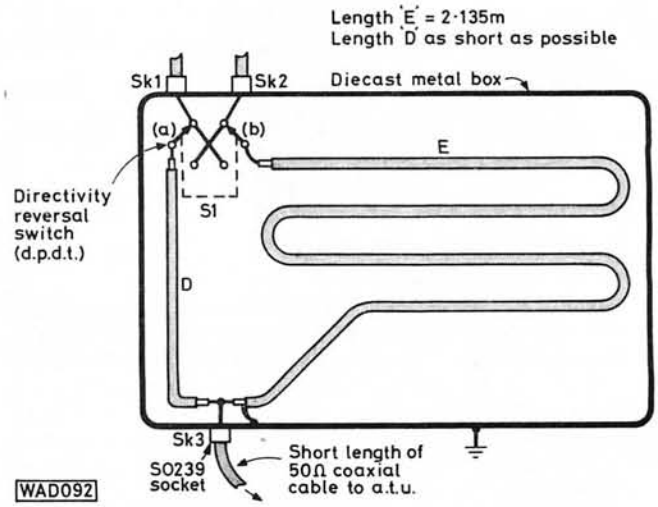


Fig. 3: Internal details of the phase reversing unit

not exceed about 4·5m, as otherwise the phase shift will tend to go towards 180 degrees and then the antenna will radiate equally in two directions at once. The gain is only likely to be about 3 dB but a significant front-to-back ratio should be observed and you will be able to null out the worst of the QRM arriving from the rear of the system. ●

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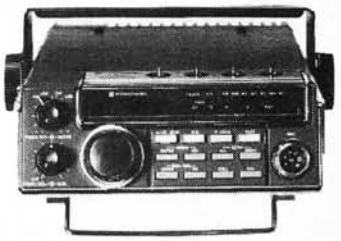

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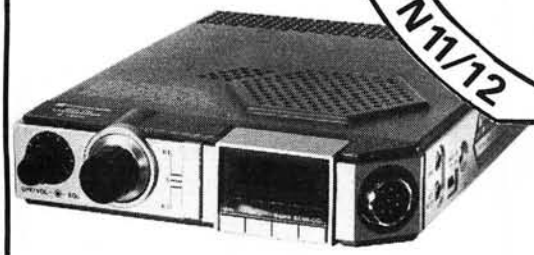

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LMS REGENERATIVE RECEIVER

R.F. HAIGH

PART 2

Having discussed the electronic construction of this simple but highly effective general coverage regenerative receiver, the final part of this article provides details of the mechanical assembly and operating procedures

Mechanical Construction

The whole receiver is assembled on a 5mm plywood front panel and top shelf as shown in Fig. 5. This layout should be maintained for stable results.

When fitting C8 to the front panel particular care must be taken to ensure that the three countersunk 4BA screws used are of the correct length. If they are too long they will foul the vanes of this capacitor and could irreparably damage it; washers should be inserted between the panel and capacitor frame in order to take up any excess length. The bolts which secure the p.c.b. should be countersunk, or their heads will protrude into the coil pack storage well (formed at one end of the top shelf) and may damage the coils.

Quite a bit of pressure has to be applied to open the jaws of the coil holder, and a 6 × 3mm wooden fillet should be glued to the cabinet side to prevent the shelf flexing. A fillet should also be glued to the bottom of the cabinet to form a rebate for the front panel.

A handle can be fixed to the sliding lid and small rubber feet will prevent the cabinet marking polished surfaces. The 9V battery is held in place by means of a thick card strap glued into the corner of the cabinet.

Dial and Calibration

The dial fitted to the prototype receiver is reproduced half full size in Fig. 4. It was marked out on stout, white card and dry transfer Letraset letters and numerals were used to annotate the controls and for the dial calibrations. On completion it was protected with transparent, self-adhesive plastic film.

A blunted darning needle, painted black and glued into a hole drilled in the rim of the BANDSET control knob with epoxy adhesive, makes a good pointer.

A crystal marker was used to calibrate the prototype, but this task could be carried out using a signal generator or by comparison with another receiver with an accurate dial. Listening for transmission frequency announcements and marking the dial accordingly is another method, but this calls for much patient listening. However, it should be possible to identify the various amateur and broadcast bands fairly quickly. As there are no coil cores or trimmers to adjust, the dial shown in Fig. 4 constitutes a rough guide to the calibration of other receivers provided they are constructed **exactly** as described, from the specified components.

Antennas and Earth

On the s.w. bands, the receiver will "pull in" a large number of stations with a five or six metre length of wire for an antenna. As the frequency decreases, a longer antenna must be used or reception of weak signals will prove difficult. Even on the s.w. bands, DX reception calls for at least 10 metres of wire erected as high as possible and well clear of earthed objects.

An earth connection can improve reception, especially on the medium and long waves. A good earth can be formed by connecting a wire to a metal spike driven into damp ground; the length of wire between the set and the earth spike should be as short as possible. If this is not convenient, try making a connection to the cold water main or central heating pipework.

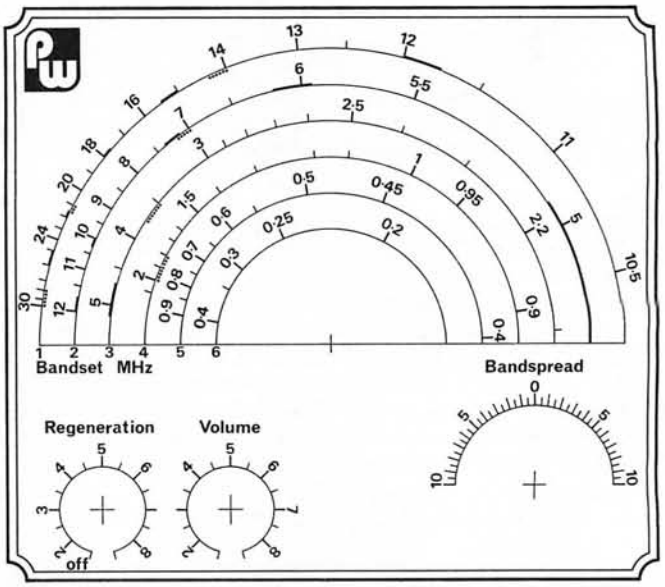

Fig. 4: The front panel dial of the LMS receiver, shown here half full size. Solid lines around the scale are broadcast bands with amateur allocations shown dotted

Setting Up and Operating

Carefully check all wiring, particularly the connections to the transistors and integrated circuit. Set R7 and the volume control to mid travel. Insert the Range 2 s.w. coil, and connect an antenna, earth and 9V battery.

Switch on and advance the reaction control until a hiss is heard in the speaker. Rotation of the BANDSET control, C8, should then result in a number of stations being tuned in; the BANDSPREAD control, C9, acts as a fine tuning control. Maximum sensitivity and selectivity will be obtained when the reaction control is set so that the receiver is on the verge of oscillation. The regeneration control, R2, should be continuously adjusted to maintain the receiver in this condition whilst the tuning capacitors are rotated in search of weak transmissions.

When the receiver is working, R7 should be adjusted until the reaction control is operating as smoothly as possible. Too low a setting will make the control fierce; with too much resistance in circuit, it may not be possible to make the receiver regenerate on some bands. Adjustment of R7 is not critical, but a little time spent on this part of the setting up procedure will be amply rewarded by a reaction control which is extremely smooth and completely free from backlash.

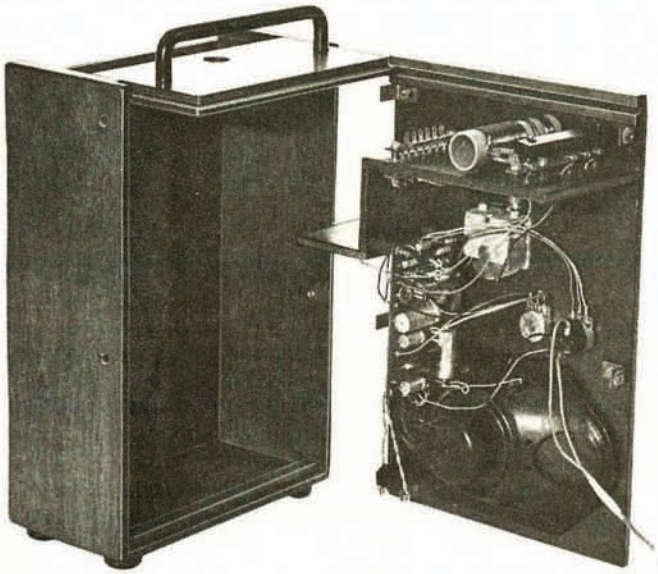

Fig. 5: An exploded view of the author's receiver and its wooden case. The wires disappearing to the right are connected to the 9V battery

Reaction dead spots may be encountered at some settings of the tuning control, especially when long antennas are used. Selecting the appropriate antenna input capacitor will overcome this.

Amateur s.s.b. transmissions, which sound like badly distorted speech, can be resolved by advancing the reaction control until the set is just oscillating. Rendering signals of this kind audible with such a simple receiver calls for a measure of skill and patience. Connecting the antenna via a lower value input capacitor to reduce the amplitude of the signal can help.

There is a delay of two or three seconds after switching on and after coil changing before the receiver becomes operational. This is the time needed for the voltages on Tr1 to reach their normal working levels. Current consumption is approximately 6mA under no signal conditions rising to 100mA with the loud reproduction of music. Power output is generous and audio quality is good. ●

PRODUCTION LINES

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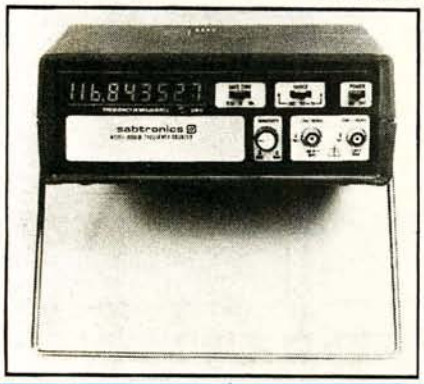
1Hz to 1GHz Frequency Meter

With the coming availability of 934MHz CB transceivers and the increasing amount of amateur activity on frequencies up to 1GHz, Black Star Ltd. recently introduced the Sabtronics Model 8000, a 9-digit, low cost, portable frequency meter. The instrument is powered by either battery or a.c. mains and is capable of measuring frequencies between 1Hz and 1GHz with impressive accuracy.

Frequency is covered in three ranges and three gate times are provided. Input is via two BNC sockets covering 10Hz to 100MHz at 1MΩ impedance, and 10MHz to 1GHz at 50Ω impedance, other front panel controls are power on-off and sensitivity, which ranges from 20mV at 10Hz to 35mV at 1GHz. Maximum resolution, using the ten second gate time, is 0·1Hz (10MHz range), 1Hz (100MHz range) and 10Hz (1GHz range).



The Model 8000 costs £155.00 plus VAT, and the full specification is available from: *Black Star Ltd., 9A Crown Street, St. Ives, Huntingdon, Cambs. PE17 4EB. Tel: (0480) 62440.*

PCB Holder

The OK PCBH-50 printed circuit board and solder station is designed for laboratory, prototype and repair work as well as light production applications with p.c.b.s measuring up to 254 × 305mm.

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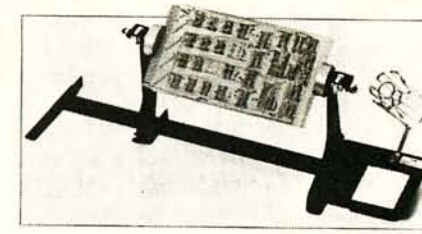
The PCBH-50 costs £24.23 which includes VAT and p&p, and is available from: *OK Machine & Tool (UK) Ltd., Dutton Lane, Eastleigh, Hants SO5 4AA. Tel: (0703) 610944.*



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Versatile RDF System

One of the latest products from Datong Electronics Ltd. is the "Model DF", a Radio Direction Finding (RDF) system which is designed specifically as an add-on accessory for narrow band f.m. communications receivers or transceivers. Two models are available, the DFA1 for base stations and the DFA2 for mobile operation. Both models cover the frequency range 20 to 200MHz, depending on the chosen antennas, and the system accuracy is ±5 degrees.

The system is simple to install, requiring connection only to the receiver's antenna input and the external loudspeaker jack, plus a 10 to 15V d.c. power supply.

In addition to four identical antennas, mounted in a square array, the system comprises two separate units: one contains the control and display electronics and is located at the receiver; the other is a special antenna combining unit containing its own drive electronics and requiring only a single coaxial cable to connect to the control unit.

When a signal is received its bearing relative to the antenna array is indicated via one of the 16 green l.e.d.s arranged in a circle at 22½ degrees. In mobile applications this permits "homing" onto the signal, and at fixed stations when the antenna array has been correctly aligned the compass bearing of the signal is directly indicated. When used with transceivers an r.f. activated relay built into the control unit allows "talk-through" by diverting the transmitter signal to the norm antenna.

The RDF indication is achieved by utilising the so-called Doppler principle in which a single antenna moves rapidly in a horizontal circular path. The cyclic motion towards and then away from the transmitter adds phase modulation to the received signal and after demodulation in the detector of an f.m. receiver followed by filtering, a sinusoidal signal is obtained. The frequency of this signal is equal to the rotation rate of the antenna, and its phase relative to the antenna rotation is related to the direction of arrival of the radio signal.

To avoid the obvious drawbacks of mechanical rotation the Model DF simulates a rotating antenna electronically via four omnidirectional antennas that are mounted at the corners of a square, the separation being between about 0·05 and 0·3 of a wavelength. An electronically controlled attenuator using PIN diodes smoothly transfers the receiver connection from one antenna to the other. The resulting signal is then similar to that obtained from an antenna actually moving in a circle yet without any mechanical complications.

The Model DF is suitable for use with f.m. receivers ranging from pocket scanners to mobile or marine radio telephones, CB transceivers and amateur radio equipment operating within the frequency range covered.

Prices inclusive of VAT and p&p are: £171.35 for the DFA1 base station model; £182.85 for the DFA2 mobile model and £246.10 for a full mobile set-up, which includes the DFA2 and four MA1 ¼λ whip antennas with magnetic mount and four metres of coaxial cable.

For further details contact: *Datong Electronics Ltd., Spence Mills, Mill Lane, Bramley, Leeds LS13 3HE. Tel: (0532) 552461.*

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Modifying The Marconi 'ATALANTA'

W.Titmuss

The "Atalanta" Type 2207C was introduced by Marconi Marine in the late 1950s as a main receiver for shipboard use. It uses 13 valves (B7G and B9A types), and was designed to operate from 110V d.c. mains, though a.c. mains operation is possible using an additional power unit.

Frequency coverage is 15kHz to 28MHz in ten ranges. From 15 – 25 and 100 – 800kHz it functions as a single superhet with an i.f. of 85kHz. From 25 – 100kHz and 800kHz – 28MHz it is a double superhet with i.f.s of 700kHz and 85kHz. Four bandwidths are available, ranging from 8kHz to 100Hz (–6dB points). The narrowest uses a mechanical filter. There is a 700kHz crystal oscillator for scale checking.

Though not as sensitive as today's communications receivers, the "Atalanta" remains a good performer for c.w. and broadcast reception, even in its original form. It dates from an era before the general adoption of s.s.b. for marine h.f. telephony, and its filters and tuning rate, combined with the lack of a product detector, make it less than ideal for sideband reception, though still usable.

Limited supplies of the "Atalanta" are to be found on the second-hand market, at rallies, etc. Copies of the instruction manual are available from Calbresco Ltd., 258 Fratton Road, Portsmouth, telephone 0705 735003, who tell us they can also obtain spares.

The modifications detailed here have not been tried by *PW* staff, but are offered as suggestions to get you experimenting.

G3GSR

Receivers designed in the early postwar years are being used by some amateurs, and these receivers can still be obtained second-hand. The performance of some, perhaps all, can be improved to a worthwhile degree to make them more effective for two quite different operational requirements, namely short-wave broadcast reception and DX Morse reception. In the belief that making modifications to such equipment is part of the amateur scene, an educational hobby, it is hoped that this article will stimulate thinking along these lines and encourage others to try their luck.

One such receiver is the Marconi Marine "Atalanta". This well-made equipment surely must have been designed with ease of preventive maintenance and service in mind. Components and sub-assemblies can be readily removed, modified or substituted. The modifications described are being successfully used, having been made at very little cost and using the most modest of test equipment. Improvements to the s.s.b. performance are also under investigation.

Adding an "S" Meter

This very useful addition was made a first priority. Details are given in Fig. 1. Note that components having circuit references (e.g. R3) but no values shown are existing components. Components with values but no references are new components. The same system has been used for all the modification circuits.

There are two possible positions on the front panel for an "S" meter. One is in place of the loudspeaker grille (an internal loudspeaker is not normally fitted in the "Atalanta"). The other is in place of the Marconi badge, though internal space is limited here. (See also the other modifications.)

RF/IF Gain Controls

Control of the two r.f. (signal frequency) amplifiers and the 85kHz i.f. amplifier is by a twin-gang potentiometer labelled RF GAIN. Separate control of r.f. and i.f. gain is of great benefit to the experienced operator, the main advantages being the ability to prevent or reduce distortion caused by cross-modulation at the first or second mixers from a strong adjacent channel station. This can be achieved by reducing the gain of the r.f. stages, and then restoring the level of the wanted station by increasing the gain of the i.f. and/or audio stages. Use of the FINE TUNING control on the "Atalanta", which is what we would nowadays call "i.f. shift" or "passband tuning", can give additional rejection of the unwanted station.

A further advantage of separate r.f. and i.f. gain controls is the ability to improve the signal to noise ratio, by using the appropriate balance of r.f., i.f. and a.f. gain to reduce the noise contributed by the first r.f. stage.

By removing the right-hand phone jack and fitting a 5kΩ or 4·7kΩ wire-wound potentiometer in its place, the separated controls will be adjacent to each other. Connect one end of the new potentiometer to chassis and the other to the +105V h.t. line via a 4·7kΩ 1W resistor. Remove the lead from the wiper tag of RV2 (front section of the existing RF GAIN control) and connect it to the wiper tag of the new potentiometer.

Antenna Tuning Control

When a separate a.t.u. is not used, it is important to be able to tune the antenna, which might be a long wire or a dipole connected via a length of coaxial cable. A 250pF air-spaced variable capacitor (which must be insulated from the chassis and outer front panel) was mounted on a strip of Paxolin which was attached to the right-hand inner side of the receiver. An extension spindle (6mm wooden dowel) was attached to the capacitor via a flexible coupler. The control knob will be above the FINE TUNING control.

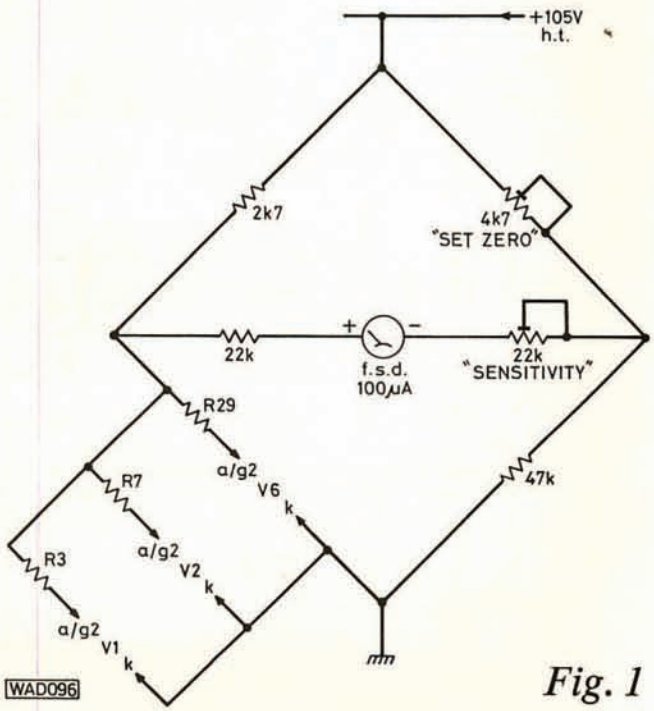


Fig. 1

The capacitor should be enclosed by an aluminium screening can bolted to the inner front panel. Coaxial cable was used to connect the antenna input socket on the receiver case to the new capacitor, and the other side of the capacitor to the coaxial antenna socket on the chassis.

First RF Stage Trimmer

The inclusion of this control may be a case of "gilding the lily", since the correct setting of the antenna tuning control, together with correct trimming and padding of the first r.f. amplifier input circuit, should be all that is necessary. However, the author finds that this control serves a useful purpose in this imperfect world as indicated by the "S" meter readings, but not by ear. This is because the a.g.c. compensates for loss in input due to slight misalignment.

This trimmer is a 50pF variable mounted directly onto the inside of the inner front panel, and connected across C16, the rear section of the main tuning capacitor, by means of a length of low-capacitance coaxial cable. Like the antenna tuning control, this extra capacitor should be enclosed in an aluminium screening can. The control knob will be directly below that for the antenna tuning control.

Reduced IF Bandwidth

The existing 700kHz i.f. stage consists of a switched filter, giving 12kHz or 8kHz bandwidth, coupling the two mixer valves. It would be an advantage in present-day operating conditions to reduce this to about 4·5kHz, and to take the opportunity to introduce some amplification. The two filter assemblies, IF "A" and IF "B", should ideally be replaced by a crystal filter, but the cost of this was considered too high, so the circuit shown in Fig. 2 was adopted. The filter assemblies have been modified to achieve a single narrower bandwidth, and an extra EF85 amplifier added between them.

The first step is to remove switch wafer SWF1/2. It is no longer required, and its removal makes it much easier to get at the soldered connections of the two 700kHz i.f. filters.

Remove 700kHz IF "A", remove its can and disconnect the secondary L41 from its small coupling coil which is tightly coupled to the primary L40. Reconnect the free end of L41 to the earthy tag "D" on the coil former. Replace the can and refit IF "A". Remove 700kHz IF "B" and similarly disconnect the small secondary coupling coil, reconnecting the free end of L43 to tag "1" on the coil former.

The reduction in coupling between coils in each filter assembly increases the Q to give the desired reduction in bandwidth.

The amplifying stage is most easily fitted by building it into a small screening box and mounting it on the top of the two 700kHz filter cans as shown in Fig. 3. The EF85 is upside-down under the box. This method avoids the need to drill the main chassis, or to use long screened leads for the connections. It is necessary to remove the temperature compensating capacitor C101, connected across the first oscillator tuned circuit, to make space for the amplifying stage as shown in Fig. 3.

A separate heater transformer (6·3V secondary) was bolted to the inner front panel immediately above the main tuning capacitor. Screened wiring was used to connect the primary to the receiver's d.p. on/off switch, and from the secondary to the valve holder, pins 4 and 5. The screening was connected to the chassis at the inner front panel.

Tuning this amplifier is simplicity itself. Switch on the calibrator to provide a 700kHz signal, then peak the primary and secondary cores of IF "A" and IF "B" for maximum reading on the "S" meter. There will be a marked improvement in sensitivity and selectivity, but at the cost of some increase in receiver noise, particularly when using maximum r.f. gain.

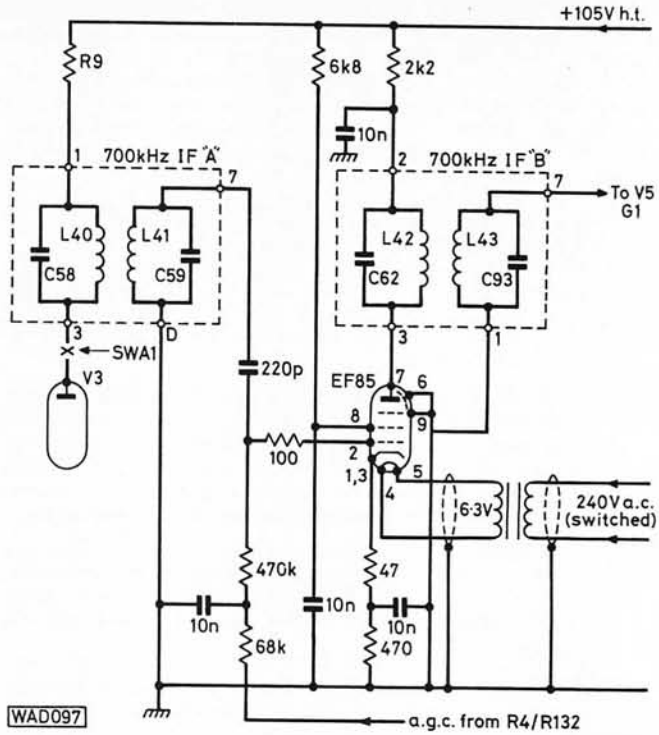


Fig. 2

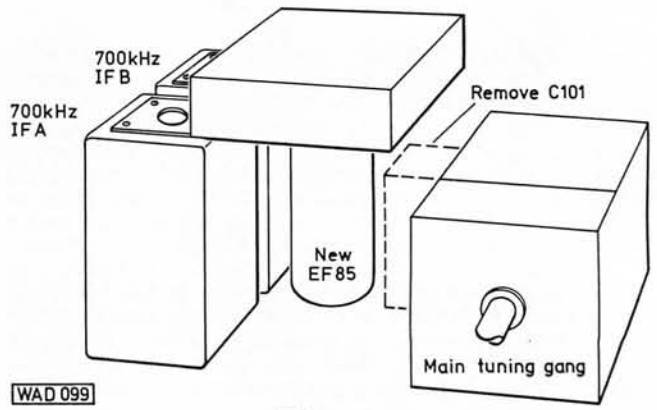


Fig. 3

Calibration Control

Even with temperature compensator C101 fitted, the "Atalanta" can take up to two hours from switch-on to become drift-free. With C101 removed, a manual trimmer across the first oscillator tuned circuit becomes a very useful addition. A 25pF variable was mounted immediately above the a.g.c./noise limiter switch on the inner front panel, and connected across C99, the front section of the main tuning capacitor, by means of a short length of coaxial cable.

Extra 85kHz IF Amplifier

To further improve the selectivity and sensitivity, the amplifier stage shown in Fig. 4 was added between 85kHz IF "1C"

and V6. A new 85kHz IF "2" i.f. transformer was obtained from the manufacturer, and connected in a fixed 3kHz bandwidth mode by using the secondary tap on tag "4". An alternative would have been to use tag "7", but this would have given a bandwidth of 8kHz which was felt to be too wide.

The valve holder used was originally intended for V14, an optional muting stage. Screened leads were used in the anode and control grid circuits. Capacitor C152, a 4µF paper-foil block, was removed to make way for the i.f. transformer. C152 should be replaced by a 4µF electrolytic (minimum 200V d.c. working), mounted under the chassis, where there is ample space.

Care should be taken to ensure the correct wiring of the valve heaters, which are all series-connected in the "Atalanta". The socket of V14 has a 22Ω resistor (R75) wired across heater pins 3 and 4. This must be replaced by a 60Ω 10W wire-wound resistor.

The new i.f. transformer is tuned in a similar manner to that used for the modified 700kHz i.f. stage.

References

All the circuit references quoted are those used in the manufacturer's instruction manual, Ref. R37/58 or R37/66.

If all the modifications described in this article are being included, very careful positioning of the additional controls is required to give adequate clearance both behind the panel and for control knobs.

Comments on modifications from other users of this receiver would be most welcome. ●

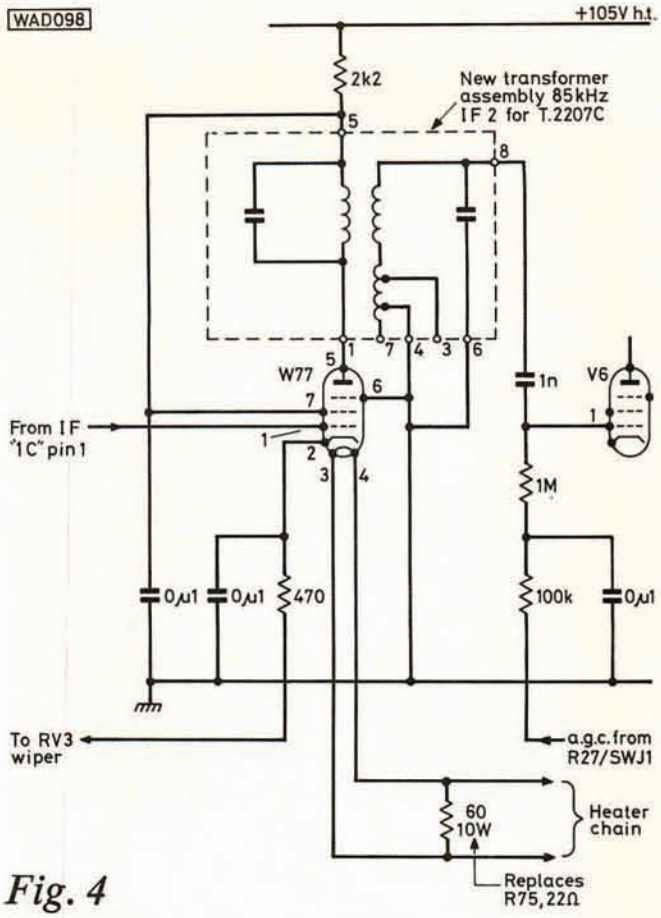


Fig. 4

swap spot

Have Trio stereo rack system, 5 months old, Dolby, twin v.u.s etc., value £320. Would exchange for h.f. gear, transceiver or decent receiver. L. Booth, 60 Pondmoor Road, Bracknell, Berks. *Q300*

Have Collins mechanical filters. Would exchange for Jackson Bros ball drives with rim drive output shaft, single hole mounting. David Burns WA3WHR, 4109 Queen Mary Drive, Olney, MD 20832, USA. *Q302*

Have Binatone 5-star f.m. CB rig, s.w.r. meter, a.t.u., antenna and coaxial cable. Would exchange for Sinclair ZX81 plus 16K RAM and p.s.u., leads, manuals, programs etc. J. G. Bolland, 23 Kingsley Street, Claughton, Birkenhead, Merseyside. *Q400*

Have Realistic PRO 47 v.h.f. and u.h.f. scanner plus 8 crystals, cost £112, also Realistic DX100L general coverage receiver 150kHz–30MHz, cost £79. Would exchange for 144MHz (2m) rig, e.g. IC-2E or similar portable, cash adjustments. S. Tron, 17 Lightfoot Road, Newton Aycliffe, Co. Durham, DL5 4EP. *Q401*

Have Tektronix Type 551 double beam oscilloscope, with differential amplifier and power supply. Would exchange for Eddystone Type 550U receiver or type 550R receiver. Tony Thomson GM3VOX, 108 Tannahill Drive, East Kilbride, Glasgow, G74 3HT. Tel: 035 52 41329. *Q491*

Have pair Cybernet Beta CB transceivers, 1000 and 3000, a.c. power unit, s.w.r. meter, selcall device, Wotpole base and boot-mount antennas. Would exchange for Sinclair ZX81 plus 16K RAM. Jardine, Stornoway. Tel: 0851 2540. *Q535*

Have Radio Amateurs Handbook, 18in colour TV tube. Would exchange for 144MHz converter. Also have Eddystone 840A receiver revalved. Would exchange for s.s.b. short wave QRP transceiver. G4JNW. Scarborough 61191. *Q537*

Have FDK multi U-11 u.h.f. f.m. mobile transceiver with magmount colinear. Would exchange for IC-202, IC-2E or Palm 4. Tel: 0272 692305 (Bristol). *Q536*

Have slow scan monitor and b/w video camera. Would exchange for communications receiver. Tel: Invergordon 853185. *Q574*

Have all issues *PW* January 1960 to July 1982 inclusive. Would exchange for good communications receiver—recent design or w.h.y. Deliver reasonable distance of Surrey. J. W. Topping, 50 Eight Acres, Beacon Hill, Hindhead, Surrey, GU26 6RZ. Tel: 042873-5258. *Q575*

Have C-scope 800 auto-discriminator, cost £170. Golf bag, umbrella, 1, 3, 4 woods, 3, 5, 7, 9, PW irons and putter, transformer output 360V 0·1A, 4·5V 6A, 5V 3A, 6·6V 4A with case. Would exchange for 144MHz f.m. rig, oscilloscope, antenna mast, h.f. equipment or w.h.y. Tel: Chipping Sodbury 318528. *Q576*

Have Lowe TX40 CB transceiver, Harrier CB s.w.r. meter and 13·8V 5 amp power unit, cost £74 April. Would exchange for Codar AT5 TX/RX or RX only or w.h.y. Calvert, 7 Glendale Road, Tadley, Hants. Tel: 07356 2457. *Q577*

Have Marconi high stability h.f. communications receiver model H2301 (similar Eddystone 880/2), 500kHz–30·5MHz in 30 switched bands, manual, in excellent condition. Would exchange for an h.f. transceiver or an FRG-7700 or w.h.y. Tel: Davis 0903 41109 (Worthing). *Q578*

M.J.AXSON B.A.G8WHG

Before considering the equipment required to work through amateur satellites, a few details of a typical satellite would be appropriate. In Part 1 of this series the OSCAR satellites were compared to the f.m. repeaters on 144 and 432MHz, but actually the communication arrangements are considerably more complicated.

Let us examine OSCAR 8 in more detail. This satellite carries two transponders, each of which consists of a receiver tuned to one amateur band, linked to a transmitter on another band. These are not confined to a single channel but can respond to any signal which comes within a passband of 100kHz. Moreover, the design is such that any type of narrow band signal can be handled, be it c.w., s.s.b., RTTY or SSTV. The result is that several different contacts can be carried on at the same time.

The OSCAR 8 mode A transponder receives signals in the range 145·85MHz to 145·95MHz and retransmits them from 29·40MHz to 29·50MHz, whilst the mode J transponder receives on 145·90MHz to 146·00MHz and retransmits on 435·10MHz to 435·20MHz. Both modes are not in use at the same time, usually alternating daily. The actual mode in use on any particular day is given in the orbital predictions. It is very important to note that the satellite **must not be used on a Wednesday,** the day reserved for authorised experimental work.

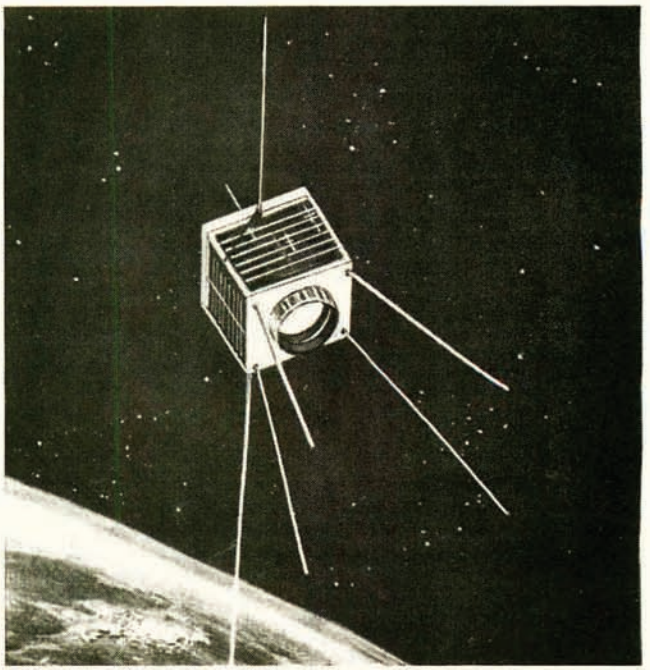
There are also two beacons, one for each mode, that for mode A being on 29·402MHz and that for mode J on 435·095MHz. These beacons transmit telemetry information regarding the state of various sub-systems on board the satellite, such as the temperatures of various parts, voltages, transmitter power, etc. Whilst primarily intended for use by special ground control stations, any amateur station may receive this information which is sent in Morse code. Readings are transmitted in groups of six three-figure codes, each group beginning with "HI".
e.g. HI 166 235 364 437 540 618
The first figure identifies the parameter being measured and the value is given in coded form by the last two figures. For example, channel 3 conveys the battery voltage and 64 indicates that this is 14·65V. Full decoding tables are published by AMSAT-UK.

If things are going awry, as indicated by the telemetry readings, the ground control stations can often correct matters by transmitting a command to the satellite, which also carries a command receiver and control system for this purpose. Power for all these systems is supplied by batteries which are recharged by solar cell arrays whenever the satellite is in sunlight.

Obviously, the satellite must carry antennas for the various transmitters and receivers which are on board and these are required to point at the Earth. Left to its own devices, the satellite would very probably "tumble", that is go end over end as it orbited the Earth, so some form of attitude control or stabilisation must be employed in order to keep the antennas pointing in the right direction. With OSCAR 8 this is effected by carrying a permanent magnet on board which aligns itself, and the spacecraft through thruster vernier jets, with the Earth's magnetic field.

It will be obvious that amateur satellites are very sophisticated devices, embodying advanced technology. That this is so is due to the wide-ranging appeal of amateur radio as a hobby, so that experts in many fields are to be found within its ranks, and AMSAT has been able to draw upon the knowledge and expertise of professionals in the many aspects of communication satellite design, construction and operation in implementing the amateur programme.

Whilst we have so far only mentioned OSCAR 8, there are also several other amateur satellites currently in orbit. OSCAR 7, an earlier AMSAT project, is still there but is now virtually defunct, having been launched on 15.11.74 and given some 7 years of useful service—far in expectation of its design parameters. The Russian space programme has also included amateur satellites, RS1 and



An artist's impression of OSCAR 8

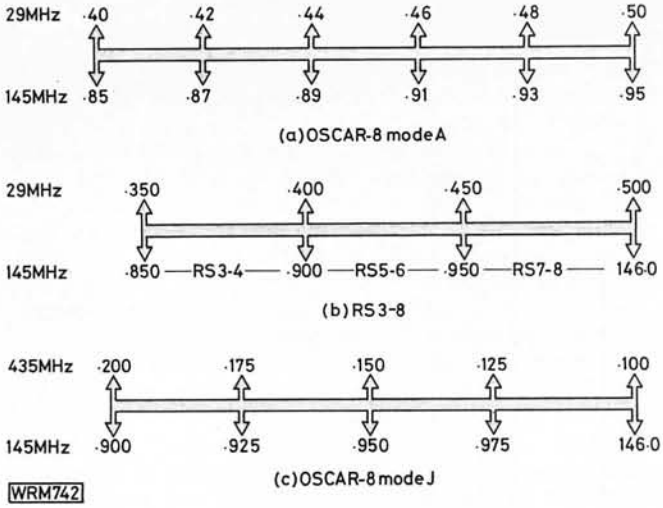
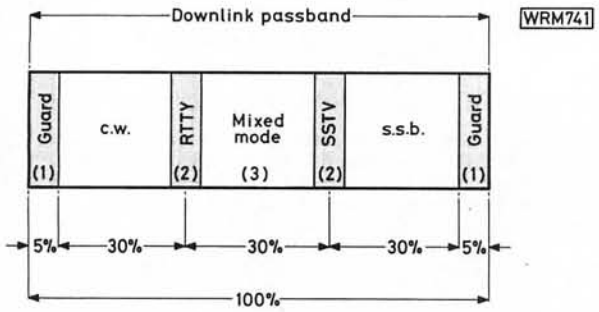


Fig. 2.1: The relationship between uplink and downlink bands for OSCAR 8 and RS3–8

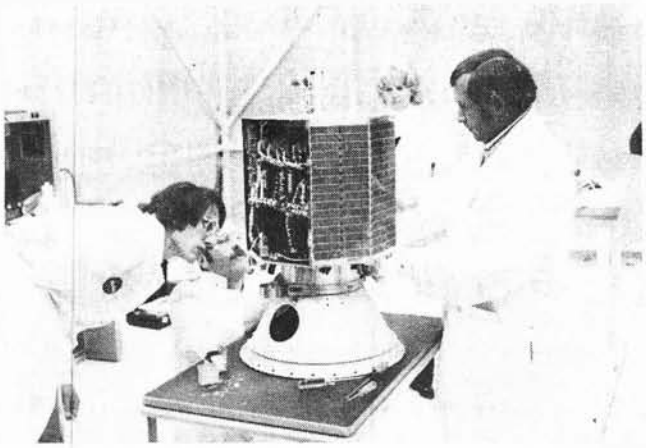
RS2, now gone, but six further satellites RS3 to RS8 are currently in orbit (all launched by the same carrier rocket). Details of these are shown in Table 2.1. Last, but by no means least, is OSCAR 9 or UOSAT—University of Surrey Satellite—of which more details in the third part of this article.

Since the whole object of amateur satellites is that amateurs should be able to use them, the power output of the transponders and the antenna configurations are designed so that signals can be received using simple equipment. For OSCAR 8 the essential requirement is a receiver covering either the 28MHz (10m) or the 430MHz (70cm) band (preferably both) and a transmitter for the 144MHz (2m) band.



(1) Guard area to avoid interference to beacons. These frequencies are available for emergency and bulletin stations.
(2) RTTY and SSTV are placed at the edge of the c.w. and s.s.b. passbands, conforming to their usage at h.f. where RTTY is present within the c.w. space and SSTV is transmitted in the s.s.b. sub-band.
(3) Mixed mode area. This is recommended for crystal controlled stations, or by DXpedition stations, or anyone wishing to work both c.w. and s.s.b. stations.

Fig. 2.2: The AMSAT satellite band plan



AMSAT-OSCAR 7 undergoing pre-flight checks. Faint telemetry signals have recently been received from this vintage transponder

Table 2.1

Satellite	Uplink	Downlink	Beacons
OSCAR 8 mode A	145·85–145·95	29·4–29·5	29·402
OSCAR 8 mode J	145·90–146·00	435·1–435·2	435·095
OSCAR 9 (UOSAT)	Non-transponding, beacons and experiments		7·05, 14·002 21·002, 29·510 145·825, 435·025 2·40GHz, 10·47GHz
RS3	Not activated		29·321 & 29·401
RS4	145·86–145·90	29·36–29·40	29·360 & 29·403
RS5	145·91–145·95	29·41–29·45	29·311 & 29·452
RS6	145·91–145·95	29·41–29·45	29·411 & 29·453
RS7	145·96–146·00	29·46–29·50	29·341 & 29·501
RS8	145·96–146·00	29·46–29·50	29·461–29·502

The performance of many amateur h.f. band receivers is at its worst at frequencies around 29MHz so a preamplifier can provide a very well worthwhile improvement in reception. A simple dipole antenna will be adequate for near overhead passes on this frequency, but for lower angles of elevation some form of simple beam would be preferable. If your present 28MHz capability is limited or even non-existent, it would probably pay you to concentrate on mode J operation—most future developments will almost certainly be concentrated on the u.h.f. spectrum.

On u.h.f. most amateurs already use some form of beam antenna, so there are no special requirements for reception. For transmission the requirements are, perhaps, surprisingly modest. The maximum e.r.p. (effective radiated power) recommended for working through OSCAR 8 is 100W. Since e.r.p. is the combination of the output power of the transmitter and the gain of the antenna, 100W e.r.p. can be obtained from a 10W TX feeding an eight-element quad, even allowing for cable loss. The quad

Table 2.2

Orbital Parameter	OSCAR 8	OSCAR 9	RS3–8
Period (minutes)	103·223	95·3	118·519–119·765
Longitude increment (degrees)	25·807	23·86	29·7566–30·0683
Inclination (degrees)	98·898	97·46	82·9542–82·9629
Mean altitude (km)	910	550	1633–1675

Glossary of frequently used terms and abbreviations

Altitude: The distance of a satellite above the earth
AMSAT: The Radio Amateur Satellite Corp. based in the USA at Washington DC
AMSAT-UK: The Radio Amateur Satellite Organisation of the UK (AMSAT-UK, London, E12 5EQ)
AOS: Acquisition of signal (from a satellite)
Apogee: Point at which the satellite orbit is farthest from earth
Argument of Perigee: The polar angle, measured anti-clockwise from the node line, locating the perigee in the orbital plane
Ascending Node: Point on the satellite orbit where the sub-satellite point crosses from the southern to the northern hemisphere
Code Store: A memory device within a satellite which can be accessed from ground for re-transmission at a given date/time
Descending Node: As ascending node (above) but when the satellite crosses from northern to southern hemisphere
Downlink: Signals from a satellite
Eccentricity: The shape of an orbital ellipse
ESA: European Space Agency, Phase IIIb launch organisation among others
Ground Station: The command station of a satellite system or an amateur satellite system
Inclination: An angle between the orbital plane of a satellite and the equatorial plane of the earth
LOS: Loss of signals, by ground station
NASA: National Aeronautics and Space Administration, USA
OSCAR: Orbital Satellite Carrying Amateur Radio
Perigee: The point of the orbit where the satellite is closest to earth
Reference Orbit: Any orbit from which a progressive set of predictions can be made, given other information
Slant Range: Distance from satellite and ground station
Sub-Satellite Point: Point on earth directly below satellite
TCA: Time of Closest Approach, to any given ground station
TLM: Telemetry-Data or other signals giving information to ground stations on the satellite's "housekeeping"
Transponder: Satellite based transmitter/receiver system that accepts signals received from the earth, translates them to another frequency band where necessary and amplifies them for re-transmission to earth via the satellite antenna system
True Anomaly: The polar angle locating the satellite in the orbital plane, measured anti-clockwise from perigee
Uplink: A signal from ground to a satellite
Mode A: 145MHz up/29MHz down
Mode J: 145MHz up/432MHz down
Mode L: 432MHz up/1296MHz down

is quoted by the manufacturer to have a gain of approximately 12dBd, so 10 watts in should give approximately 160W out. A 2dB loss in the feeder (quite possible with UR67) will reduce the e.r.p. to about 100W. Most problems encountered in working are caused by an excess, rather than lack, of power. As long as nobody else is working on high power much lower than 100W e.r.p. is effective.

The best way to start working the satellites is to get hold of the prediction tables from AMSAT-UK and listen for a few orbits. Then fire up the transmitter and see if you can hear your own signal coming back. If you cannot hear it, do not pile on the power, but simply make sure that your receive capability is good—listen for QRP stations on the satellite. Do remember that the satellite is moving (rapidly) and that at the start of a pass you will hear stations to the south of you which will vanish to be replaced by stations further north. Like all aspects of amateur radio, satellite operation needs practice to become perfect, so have patience!

To be continued

swap spot

Have Panasonic/Technics SX6800 17W r.m.s. x 4-channel receiver also Teac A350 cassette deck. Would exchange for 144MHz handheld or mobile rig or w.h.y. Graham Serenson, 8 Upper Promenade, Colwyn Bay, Clwyd. *P912*

Have legal 40 channel f.m. CB transceiver with mic and s.w.r. meter, all mint condition. Would exchange for any general coverage communications receiver. Hollis, 24 Crown Street, Brandon, Suffolk IP27 0NH. *P913*

Have Bearcat 210F scanning receiver and two professional, "national" back to back walkie talkies. Would exchange for SX200 or SX200N scanning receiver. Peter Killey, 41 Hawarden Avenue, Douglas, Isle of Man. Tel: 0624 5123. *P914*

Have 14 foot GRP hull, wood cabin, less out board. Would exchange for any 144MHz transceiver. G8BSK, 290 Priory Road, St. Denys, Southampton. *P929*

Have pair of Pye Ranger valve v.h.f. mobile set or pair of Ex-WD 88 sets. Would exchange for 144MHz transceiver, communications receiver, a.m./f.m. signal generator, or ZX81. M. Austin, 53 Queen Street, Audley, Stoke on Trent ST7 8HB. *P936*

Have Commodore Pet computer 2001 series updated to 3001 series. Would exchange for FRG7700 general coverage receiver or similar. Tel: Rochdale (Lancs) 50876 after 6pm any evening. *P937*

Have Lowe SRX30D communications receiver in mint condition, also s.s.b. plug in unit for Grundig Satellit 1000 model. Would exchange for Grundig Satellit 1400 model or a Sony ICF2001 receiver or anything like the above considered. Tel: Macclesfield 615076. *P944*

Have 25W Bird Thruline element for 430MHz. Would exchange for 144MHz element 100 or 250W. Have Marconi TF801B/3/S signal generator. Would exchange for IC-2E or similar. Tel: Knockholt 0959 33296. *P946*

Have collection of valves many types, ancient, modern, new and secondhand good tested and listed. Would exchange any for type UL41, ECH81, 4IMP, X148, M5PEN, MU5PEN, EBF89 etc. W. Carr, 4 Tudor Court, Castle Way, Hanworth, Middlesex. Tel: 01 890 2258 evenings and weekends. *P949*

Have UK101 computer, 8K, cased with p.s.u. and leads, 600 baud cassette, new monitor, software and extensive interfacing documentation. Would exchange for FRG–7 or similar. Brian Cutts, 12 Cedar Close, Meopham, Kent. Tel: 0474 812523. *P958*

Have Bearcat 220 scanner with low v.h.f. coverage of 32–50MHz. Would exchange for 220FB with 68–88MHz coverage, possible cash adjustment. Tel: 07912 6801 (Newhaven). *P966*

Have UK101 (cased). Would exchange for a.t.u., 28MHz (10m) beam, h.f. receiver, 144MHz (2m) transceiver, frequency counter, w.h.y. Tel: 0632 514003 (Whitley Bay). *P967*

Have brand new 3-bar electric fire with coal flame effect in wooden cabinet, unwanted with new house, also Labgear TV masthead preamp and power supply group B. Would exchange for 432MHz (70cm) transceiver, Wood and Douglas or similar. G6MEF, 97 Redland Drive, Northampton. *P976*

Have Mamiya 645 camera f2·8 80mm lens pistol grip, CDS prism finder, lots of film — mint condition. Would exchange for good h.f. gear. GW4JOQ, QTHR. Tel: 0558 823301 (Llandeilo). *P977*

Have complete camera kit to professional standard, comprising Minolta XG9 SLR + 50mm, 35mm and 135mm fixed lenses, 80–205mm zoom/macro, two flash guns, pistol grip, three close-up lenses, tripod, five filters, plus many accessories, including aluminium case. Would exchange for complete FT-902 DM with f.m., FTV 901R with 144MHz and 432MHz fitted, FC902 a.t.u. and SP901. Also have two crystalled rigs for 144MHz, old but serviceable and complete. Would exchange for Marconi TF 995/A r.f. signal generator or similar or Marconi TF 8334 convertor for TF2401A counter, or w.h.y. Tel: Hitchin 0462 700178. *P978*

Have Williamson Class A valve amplifier, needs new output valves. Would exchange for oscilloscope, suitable for TV work or TV pattern generator. Tel: 01-368 3931 (Barnet, Herts). *P985*

Have Fluke 8600A digital multi testmeter value £60 also Hansen transistor tester. Would exchange for transistorised multi waveband receiver, FRG-7, Grundig Satellit or similar. Cash adjustment. Phil Jolley. Tel: Fleetwood 5712. *P987*

Have Keithley 600B electrometer, hardly used, complete with manual. Would exchange for CB rig, good micro with peripherals or VHS video. R. G. Rush, 4 The Bury, Shillington, Hitchin, Herts SG5 3PB. Tel: 046277 463. *P988*

Practical Wireless back issues 1962–1981 (232 copies), plus Practical Television back issues 1958–1981 (262 copies). Would exchange for legal CB rig or w.h.y. C. A. Hooley, 28 Clifton Street, Burnley, Lancs. Tel: 0282 26578. *P999*

Have HC25u crystals (FT221) 8·00, 8·025, 8·050, 8·075, 8·225, 8·3MHz. Would exchange for HC25u crystals 8·8, 8·875, 8·9, 8·7, 8·825, 8·975MHz (FT225). G3WEX. Tel: 021 354 4265 (Sutton Coldfield). *Q002*

Have Heath SB300 amateur band receiver with s.s.b. filter. Would exchange for Eddystone 680X receiver. Also have Marconi portable receiver tester TF 888/3. Would exchange for Z-match a.t.u. G4MNB. Tel: Swindon 826325 evenings and weekends. *Q019*

Have JR-310 Trio amateur bands receiver in v.g.c. Would exchange for a.t.u., rotator or any useful accessory (newly licensed). Tel: 0776 5205 evenings (Stranraer). *Q020*

Have Tabur "Yak" 8ft glassfibre dinghy complete with windshield, bottom board, oars, mast and sail, rudder and dagger board. All v.g.c. Would exchange for good 144MHz (2m) rig. Ron Lindsay G4HUX, QTHR. Tel: 0632 372798 (Seaton Delaval). *Q021*

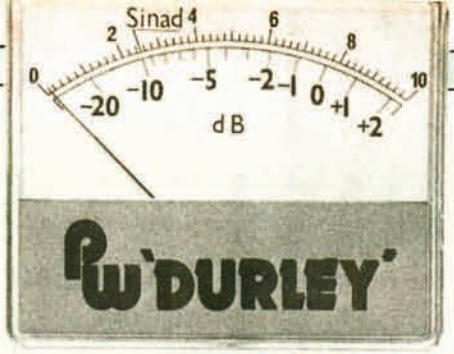
Have a working word processor 64K of memory, includes disc drive, monitor, typewriter styled keyboard (89 keys). Would exchange for VHS video or 144MHz (2m) f.m. mobile or w.h.y. Tel: Redhill 69251. *Q032*

PW "SWAP SPOT"

Got a camera, want a receiver? Got a v.h.f. rig, want some h.f. gear to go with your new G4? In fact, have you got anything to trade radio-wise?

If so, why not advertise it FREE in our new feature SWAP SPOT. Send details, including what equipment you're looking for, to "SWAP SPOT", *Practical Wireless*, Westover House, West Quay Road, Poole, Dorset BH15 1JG, for inclusion in the first available issue of the magazine.

A FEW SIMPLE RULES: Your ad. should follow the format of those appearing above; it must be typed or written in block letters; it must be not more than 40 words long including name and address/telephone number. Swaps only—no items for sale.



by E.A.RULE

Part 1

Distortion and SINAD Meter

The sensitivity of a radio receiver is one of the most important parameters and the measurement of sensitivity is considered to be fairly straightforward to carry out. Regretfully there are a considerable number of errors that can creep into such measurements and the final error can be surprisingly high.

There are two generally accepted standard methods of making sensitivity measurements and these are known by the letters SINAD for communication receivers and IHFM for evaluating the complete performance of hi-fi stereo receivers.

The term SINAD stands for the ratio of signal including noise and distortion to noise and distortion. A receiver's sensitivity is quoted when a set ratio between the signal and the noise and distortion present is achieved. The other sensitivity measurement, IHFM stands for the Institute of High Fidelity Manufacturers and for f.m. receivers their IHF-T-200 1975 refers to a standard method of testing frequency modulated broadcast receivers.

The *PW* Durley SINAD/IHFM meter has been developed to enable both types of test to be made and although developed primarily for determining sensitivity it can also be used for many other types of test on both communications and hi-fi receivers. Tests that can be conducted on hi-fi amplifiers will also be covered. The instrument can also be used to measure voltages from 100V down to less than 20μV over a range of 10Hz to 100kHz.

Both the SINAD and IHFM methods of sensitivity measurement are similar in that they each inject a modulated signal into the receiver and then measure the residual noise and distortion after the modulating signal has been removed from the output. The resulting figures take into account the total design parameters of the receiver under test, i.e. bandwidth, detector linearity, noise and distortion. Because the method used is a standard one the results from one test can be compared with others made elsewhere using the same standard. In order to make full use of the SINAD/IHFM meter a signal generator capable of being modulated will be required and the accuracy of this will set the limits on the overall accuracy obtained.

Basic Circuit

The heart of the meter is the circuit used to remove the modulating signal; Fig. 1 shows the basic circuit and it will be recognised as the familiar twin "T" network.

When a twin "T" network is balanced it is possible to remove completely any single frequency and in practice the amount of rejection obtained is only dependent on the quality of the components and screening used. By arranging switches to change the values of the network capacitors and replacing the resistors with potentiometers, the bridge can be made to cancel out any particular frequency over a wide range. In the *PW* Durley this range covers from below 15Hz to over 20kHz in six overlapping ranges, covering in fact the full audio frequency range. Once a particular frequency has been removed (nulled out) what is left will consist of harmonics of the original signal

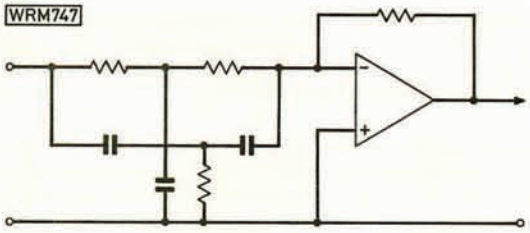
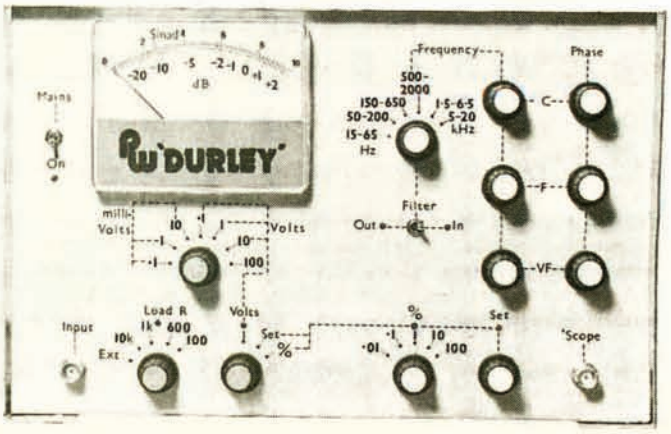


Fig. 1: The basic bridge circuit

and any noise present; by measuring the signal level before and after it has been nulled out, a ratio of the total distortion plus noise, to signal level is obtained. This is the basis of the SINAD and IFHM methods of receiver sensitivity measurement and also the t.h.d. (total harmonic distortion) measurement for hi-fi amplifiers.

The output from the twin "T" bridge can be fed into any suitable meter capable of measuring the range of signal levels involved. The voltmeter used in the *PW* Durley covers from 100V down to approximately 20μV when used as a voltmeter and from 100 per cent down to approximately 0·002 per cent when used to measure distortion, a dynamic range of around 94dB.



★ specification

VOLTMETER SECTION

Voltage ranges:	7 ranges from 100μV f.s.d. to 100V f.s.d.
Frequency response:	0·25dB 10Hz–100kHz (—1dB at 100kHz on 100μV range)
Accuracy:	0·25dB possible depending on calibration source
Input impedance:	1MΩ plus 20pF

DISTORTION BRIDGE SECTION

THD range:	100% down to 0·01% f.s.d. in 5 ranges
Bridge frequency range:	15Hz to 20kHz in 6 overlapping ranges
Harmonics measured to:	100kHz
Accuracy:	0·5dB
Input impedance:	40/100kΩ depending on "SET LEVEL" control

GENERAL

Filter:	"A" weighting
Residual noise level:	15μV or 0·0016%
Output for oscilloscope:	1V (at f.s.d.), 1kΩ impedance
Switched loads:	Ext/10kΩ, 1kΩ, 600Ω, 100Ω

Voltmeter protected against excessive inputs. Usable to 250kHz with decreased accuracy.

As stated earlier, the limit of measurement in practice is most likely to be limited by the signal generator available. The cheaper type of generator will have an inherent distortion of approximately one to two per cent and the better audio ones of 0·1 per cent or slightly lower. Very low distortion generators are expensive and normally only found in professional labs; the author is blessed with having an HP239A which has a distortion of less than 0·001 per cent.

The same thing applies to r.f. generators, the modulation signal often has distortion of approximately one to two per cent and while this is quite suitable for SINAD measurements, a tenfold improvement is required for hi-fi stereo receivers. The *PW* Durley is unlikely in practice to be the limiting factor providing care is taken in its construction and it is in fact capable of a performance equal to very expensive commercial instruments.

Circuit Description

The full circuit diagram of the *PW* Durley is shown in Figs. 2 and 3. The twin "T" bridge section complete with all the switching for the various frequency ranges is shown in Fig. 2.

Input signals go via SK1 to S1, which can be used to select a suitable load resistor; the actual values used for the loads will depend on individual requirements and the ones shown are those used by the author. The lower limit has been set to 100Ω due to power dissipation considerations. For example, if an 8Ω load were used and 100V applied it would dissipate 1·25kW, a bit on the high side for a small instrument case! Even with 100Ω as the lower limit, 100V would result in 10W, so suitably rated resistors must be used. In the author's case the loads are only used when voltages below 25V are applied, above this value external resistors are used.

The input signal also passes to S2a which applies the signal to either the voltmeter section via the switched attenuator S5a and S2e, or direct to the input of the bridge via the "set level" potentiometer R6. From R6 the signal goes to the actual bridge via C1 and R7. Switch elements S3a, b and c select the capacitors for each frequency range; dual-ganged potentiometer R12/15 is the main frequency control (C), with R11 (F) and R8 (VF) providing progressively finer adjustments.

The residual output from the bridge is amplified by IC1(a) and passed to the switched attenuator S4a. Negative feedback is applied to the input of the bridge network to minimise variations in gains as it is adjusted and also to maintain a "flat" frequency response at all other frequencies up to 100kHz.

A typical "notch" response of the bridge is shown in Fig. 4 and as can be seen it is very sharp, in fact being only one or two hertz wide at its maximum rejection point—hence the need for the "fine adjustment" controls; without these it would be impossible to balance the bridge for much beyond 30dB rejection. Even with these fine adjustment controls great care is needed to reject the fundamental signal to 90dB or so.

CONSTRUCTION RATING Advanced

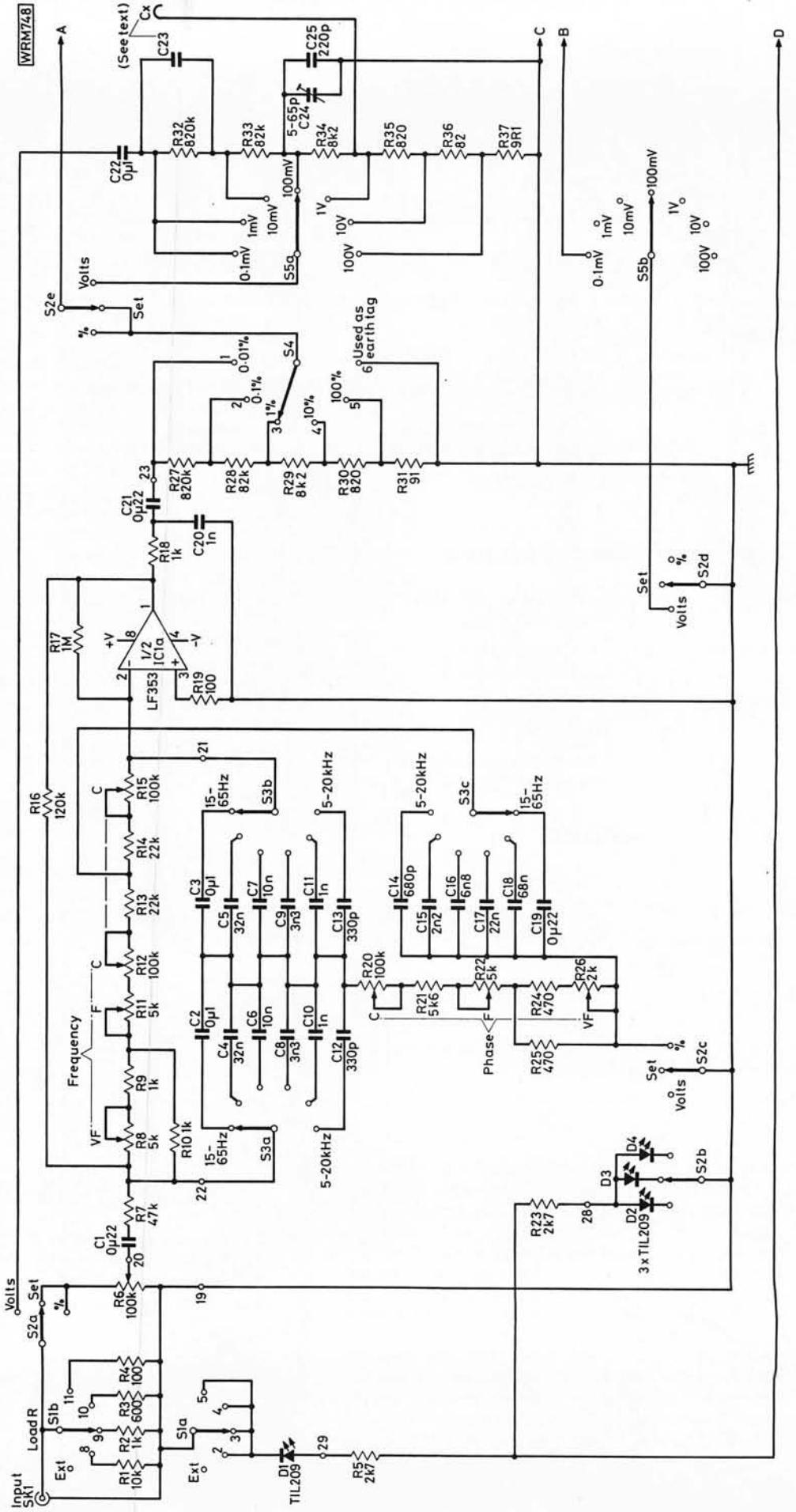
BUYING GUIDE

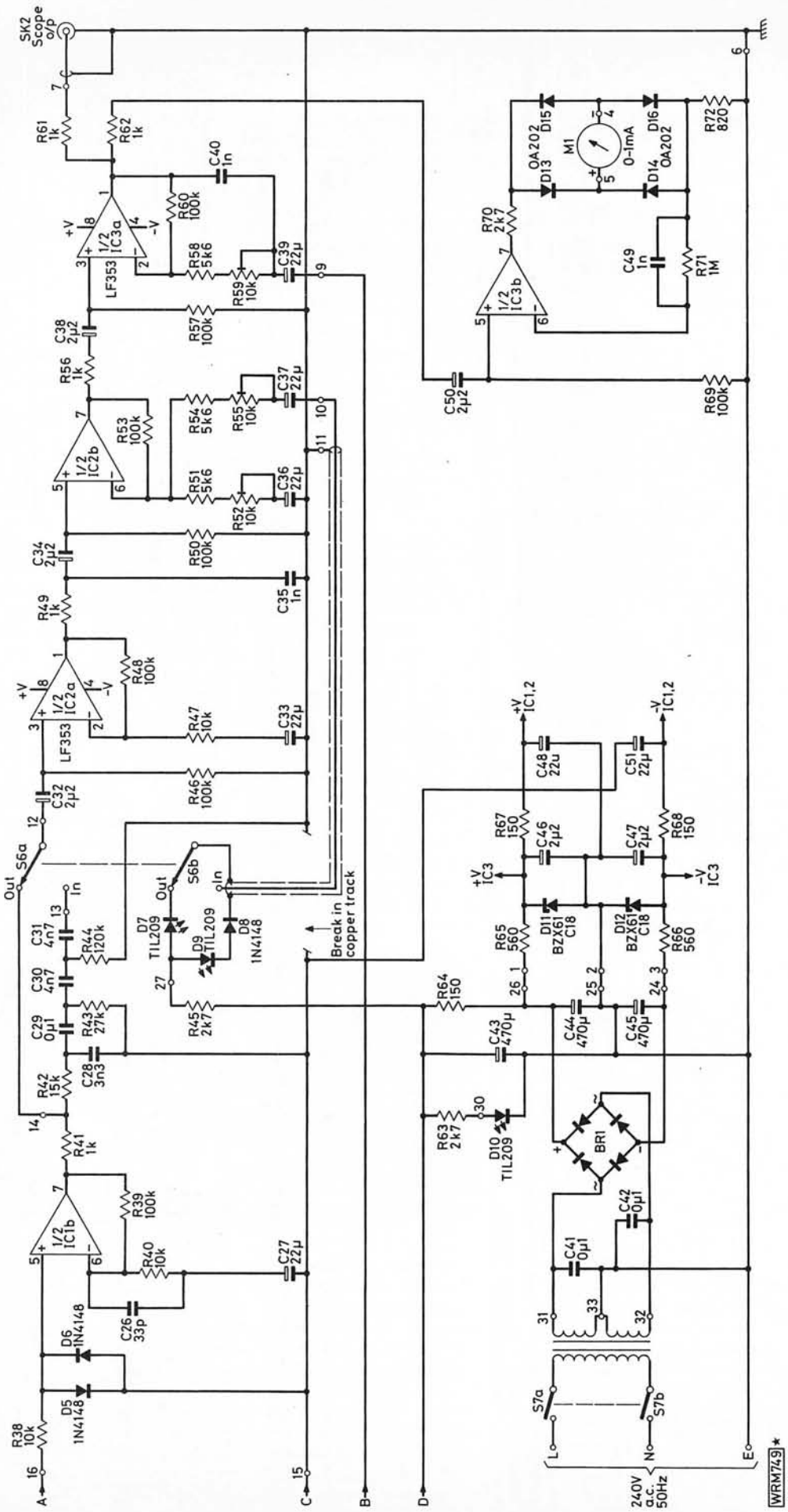
All components needed to construct this project are available from regular advertisers within *PW*. Full details of the case and switching arrangements will be given in subsequent issues

APPROXIMATE COST £38 (excl. case)

The "T" Bridge Section

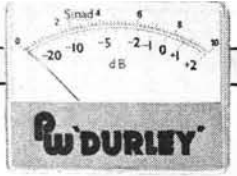
Fig. 2:



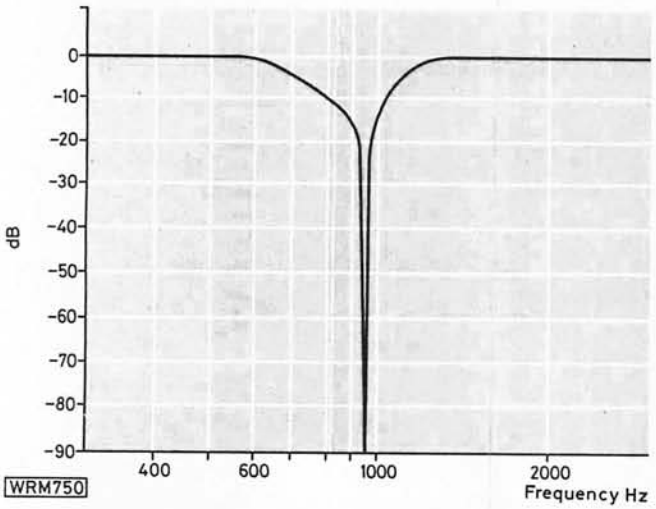


The PSU and Meter Amplifier

Fig. 3:



In order to obtain a reference level (100 per cent) from our signal it is necessary to "unbalance" the bridge and this is done via S2c. Switch S2 has three positions, VOLTS, SET, %; in the SET position the centre arm of the bridge is open circuited and no rejection takes place. The negative feedback supplied via R16 and R17 maintains a flat response and enables the signal to be set to read 100 per cent by adjusting the set level control R6.



Frequency (Hz)	600	920	940	950	960	980	1200	1400
dB down	3	20	30	100	30	20	3	0

Fig. 4

Once the 100 per cent level has been set, S2 is switched to the "%" position and the bridge can be balanced to null out the signal, leaving the residual noise and distortion to be passed onto the voltmeter via the switched attenuator S4a. The 100 per cent position of this switch is equal to around 5V f.s.d. when the set level control is at maximum. This is covered in more detail in the section on operation.

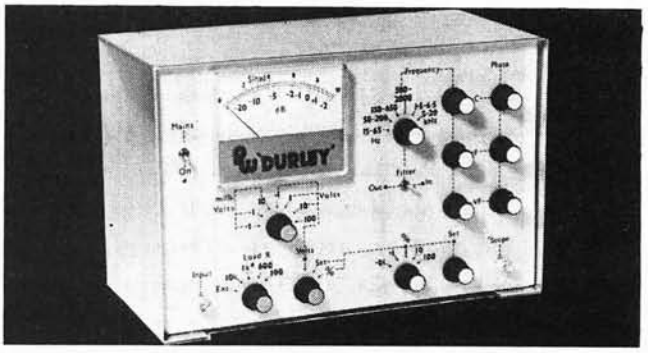
Various l.e.d. indicators are switched via S2b to indicate which section of the meter is in use and as an aid to operation. An l.e.d. is also used to warn that a load resistor has been selected, via S1a. In the VOLTS position of S2, S2d connects C39 to earth via S5b when in the 0·1mV position. This increases the voltmeter gain by a factor of 10 and enables readings from 100μV f.s.d. down to noise (below 20μV) to be carried out.

Coming now to the main voltmeter section, the output selected by S2e may either be via S5a, the voltmeter attenuator, or via S4a, the percentage distortion attenuator. Two separate attenuators are used because this not only makes for convenient operation but also avoids capacitive coupling between the two circuits which can prevent accurate readings at certain settings of the controls.

The signal from S2e feeds via R38 and diodes D5 and 6 to the input of IC1b. Components R38, D5 and D6 form a protective circuit to prevent excess voltages being applied to the input of IC1. The voltage is limited to below 1V even if 100V is applied with the voltmeter set to the 100μV range. Resistor R38 will withstand this type of overload only for short periods of time, but long enough for the operator to correct the attenuator settings before any damage is done.

Two dual op-amps are used to provide the overall gain of the voltmeter and also maintain the bandwidth to greater than 100kHz. Although the gain could be obtained with fewer active devices it would not also be possible to maintain the required bandwidth. Both requirements are met by using more op-amp stages running at lower individual gain, but with greater bandwidths. Each amplifier stage is similar but IC2b is gain switched to compensate for the insertion loss of the "A" weighting filter, consisting of R42–44 and capacitors C29–31. Amplifier IC3a also has a switched gain of either unity or ×10, the extra gain being used for the 100μV f.s.d. range. Potentiometer R52 sets the calibration on the main voltmeter ranges, R55 compensates for the filter and R59 calibrates the 100μV range. Two l.e.d. indicators are used to show the filter IN or OUT positions. The filter is switched by S6 with S6b controlling the gain and l.e.d.s. When set to OUT l.e.d. D7 conducts, leaving the voltage developed across D8 and D9 too low for D9 to conduct. When S6 is set to IN D7 is open circuited and the voltage across D8 and D9 is then enough to cause D9 to indicate. This method of switching the l.e.d.s avoids additional switching complexity and also prevents switching pulses being injected into the circuit via C37, causing the meter to "hit the end stop" when switching the filter in or out. Amplifier IC3b is used to drive the 1mA meter and has negative feedback applied via R71 to maintain a linear scale.

Because the LF353 op-amp has a high common mode rejection the power supply requirements are fairly modest. Mains transformer T1 feeds a bridge rectifier and in conjunction with C44 and C45 forms a split rail supply of approximately ±28V d.c. This voltage is dropped via R65 and R66 to supply Zener diodes D11 and D12 which provide a ±18V supply for the i.c. devices. Resistors R67 and R68 and capacitors C46–49 are used to remove any Zener noise from the supply lines which could otherwise get into the early stages and prevent very low distortion readings.



For the same reason a break was made in the copper earth track of the main p.c.b. between IC3 and the earlier stages. Components R64 and C43 decouple the l.e.d. supply and are necessary because any ripple on the l.e.d. supply line would be capacitively coupled into the inputs due to the close proximity of interconnecting cable runs. (Remember we are dealing with signals as low as 20μV.) Capacitors C35, C40 and C51 are used to reduce noise above 100kHz, which would otherwise increase the residual reading of the meter on the most sensitive ranges, and also to maintain high frequency stability.

The second part of this article will contain full constructional details of this versatile test instrument.

STANDARD C5800E 144MHz MULTI-MODE TRANSCEIVER

In the November 1981 issue of *PW* we tested the Standard C58 portable multi-mode rig. Although Standard make a special mobile bracket to carry the C58 and a 25W linear amplifier, they obviously do not consider it to be a truly mobile rig as they have now introduced the C5800E.

This 144MHz multi-mode rig is styled after the other mobile models in Standard's range—the C7800 and C8800—although it is quite a bit smaller.

The front panel is obviously "Standard" and carries all of the controls most often used. The familiar Standard keypad is fitted under the main "dial" window and to the right of the manual tuning knob. The two dual-concentric knobs to the left of the tuning knob operate VOLUME and SQUELCH with the ON/OFF function by pushing the centre VOL knob. The upper pair are the RIT, brought into play by pushing the centre knob, and the mode selector switch.

The mic socket is on the right of the front panel and is the same 7-pin pattern used on all the other Standard rigs. This means that you can use the same mic for any Standard rig without having to change plugs—why cannot other manufacturers follow suit?

The smoked window running across the top of the front panel and extending back over the top carries the usual Standard green 7-segment display for frequency, with coloured l.e.d.s to indicate memory selected, mode, frequency lock, fast scan and r.i.t. in operation. The "S" meter and power meter is formed by a horizontal row of coloured l.e.d.s. The display is easily read and makes for easy use of the rig when driving.

All five memories can be programmed for either f.m. or s.s.b. and during scanning only those memories programmed for the mode selected are scanned.

The less frequently used controls are positioned along the front edge of the top panel of the display window. These controls are in the form of miniature toggle switches and control the r.f. sensitivity, repeater shifts, tuning control step size and scanning mode. The r.f. sensitivity is interesting as the switch alters the bias on the first r.f. amplifier stage to reduce the sensitivity for working with strong local signals, rather than adding an extra stage.

The back panel carries the heat sink and sockets for d.c. power input, antenna (SO239), external speaker, key for c.w.

★specifications

Frequency range:	144·000 to 147·999MHz
Modes:	FM(F3E); SSB(J3E); CW(A1A)
Antenna impedance:	50Ω
Supply:	13·8V d.c. 3·7A *(4·7A)* Transmit; 450mA (standby)
Dimensions:	149 x 55 x 218mm
Weight:	1·9kg

RECEIVER

Sensitivity:	−10dB 12dB SINAD (f.m.) *(0·28μV e.m.f.)* −12dB 10dB S/N (s.s.b. and c.w.) *(<0·2μV e.m.f.)*
Adjacent channel selectivity:	60dB *(80dB)*
Squelch threshold:	*0·14μV e.m.f.*
Audio output:	2W into 8Ω, 10% t.h.d. *(2·3W)*

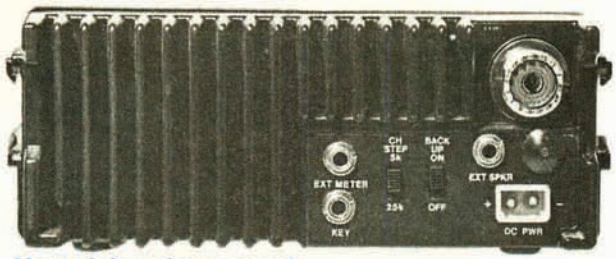
TRANSMITTER

RF output power:	25W into 50Ω *(22·5W)*
Spurious outputs:	−60dB *(49dB worst case 39MHz)*
Stability:	±10p.p.m. x 10^{-6} *(within 20Hz of nominal)*
Carrier suppression:	40dB *(49dB)*
Unwanted sideband:	−40dB *(66dB)*
Modulation:	Reactance mod. (f.m.) Balanced mod. (s.s.b.)

Test equipment

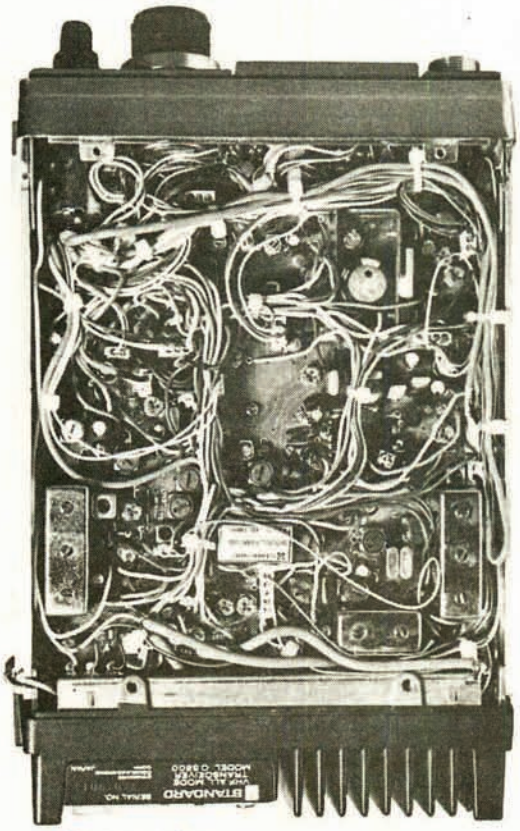
Marconi 2017 sig. gen. Marconi 2019 sig. gen. Marconi TF2371 spectrum analyser; Bird Thruline power meter; Marconi TF2337A distortion meter; Marconi 2435 frequency meter.

Test results are shown in italics.

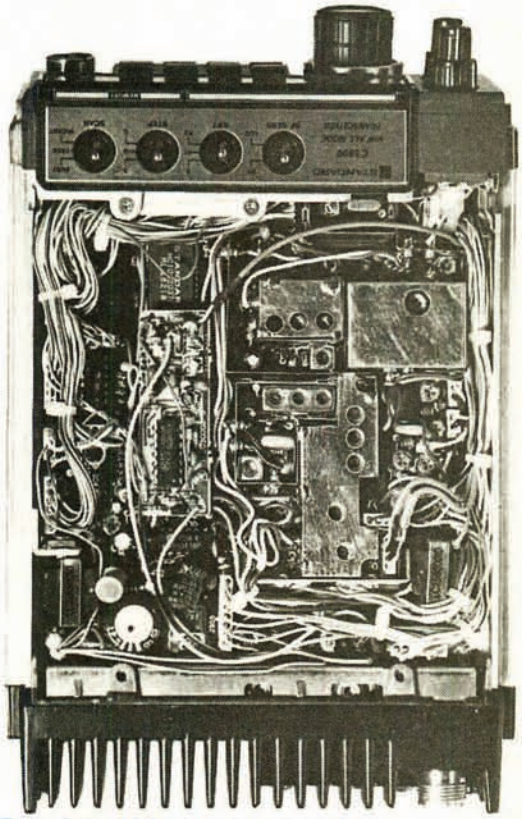


Heat sink and rear panel

Front panel of the C5800E



Bottom view



Top view with cover removed

and an external meter. Two slide switches select 5kHz or 25kHz steps for f.m. only and back-up on/off.

The audio toneburst for repeater operation is selected by a button on the keypad or by pressing the p.t.t. button twice in quick succession. Also selected from the keypad is the noise blanker which functions in all modes.

Nominal r.f. power output is 25W but this can be reduced to 1W by pressing the appropriate locking button on the keypad.

In use the C5800 was a pleasure to use and, like the C58, seems to have just about the right level of complexity without going overboard. The squelch control is functional in all modes, and this proved useful in reducing the level of background noise when working a strong s.s.b. signal.

Construction is to Standard's usual high level but the small size coupled to the increased complexity means that accessibility for maintenance and adjustment is getting difficult. The handbook is excellent, giving all the information for repair work and alignment together with full operating instructions and complete circuit diagrams, parts lists and detailed mechanical drawings.

Performance using a $\frac{7}{8}$ gutter mounted antenna on the car was good with reports of good audio being given. The deviation proved to be a little on the low side for the local repeater's logic—GB3SC doesn't like low deviation signals and lets the person on the other end of your QSO know!

At home (E. Dorset), using a home-made 12-element ZL Special beam, reports were excellent and several 144MHz beacons were heard although conditions were not good during the tests.

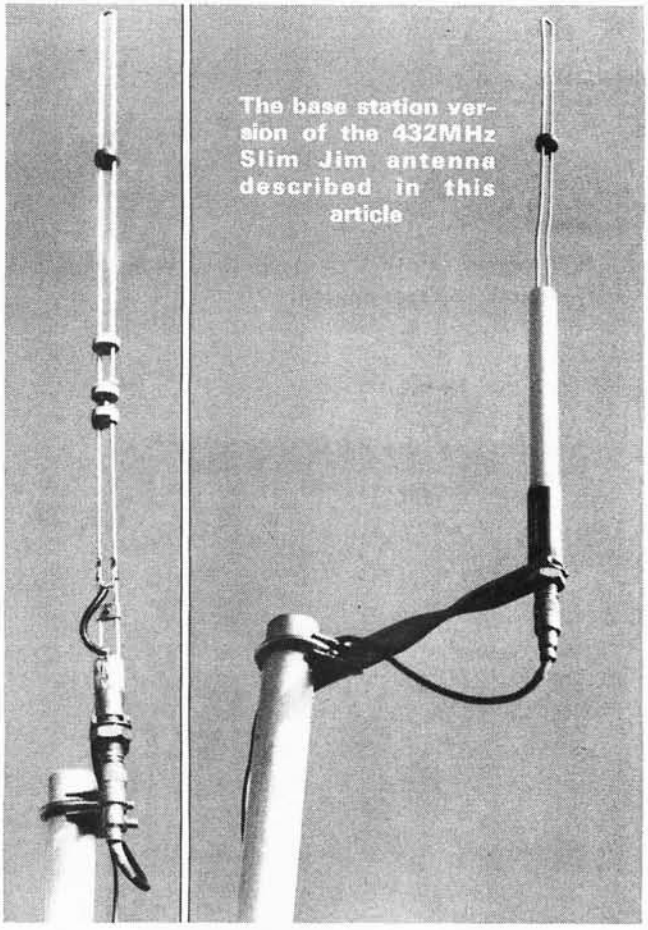
Price

The Standard C5800E costs £359 inc. VAT and the review model was loaned by **Lee Electronics, 400 Edgware Road, London W2, Tel: 01-723 5521** and we would like to thank them for their co-operation.

Dick Ganderton

ANTENNAS PART 2

F.C. JUDD G2BCX


The base station version of the 432MHz Slim Jim antenna described in this article

Part 1 of this series dealt largely with the discone antenna and its ability to function over a frequency bandwidth of about two octaves.

Such antennas can be designed for use in the h.f., v.h.f. and u.h.f. bands and one u.h.f. version known as the SMC-TW435D discone, for operation between 400MHz and 1·2GHz, proved very effective for mobile operation on the 432MHz (70cm) band, Fig. 1.6. As a unity gain antenna its performance compared very favourably with a Slim Jim made for 432MHz operation. Direct mobile to mobile contacts with signals of "S"7 to 8 were exchanged over a distance of 40km with no lift conditions prevailing and using a transmitter power of 10 watts. These tests were carried out over "average" open countryside and aroused considerable interest.

432MHz Slim Jim

Whilst construction of a 432MHz Slim Jim may generally be to a scale of 435/145 or 3 to 1 and based on the original dimensions given for the 145MHz band version, the diagrams and photographs included here may serve to illustrate a more practical format. Fig. 2.1 shows how prototype models were made for both mobile and fixed station operation.

The design shown in Fig. 2.1(a) has a PL259 plug at the base for connection to a standard SO239 socket on a gutter or mag mount. The arrangement shown in Fig. 2.1(b) has an SO239 socket at the base to provide cable entry via a PL259 plug. Ideally N-type connectors should be used, although losses with the PL259/SO239 combination appear to be negligible. Low loss cable should however be used for all base station installations.

If the pvc antenna cover is taken above the upper spacer at the gap then an additional spacer will be needed at the top of the tube and this should be set in with a good adhesive to prevent the entry of water.

The aluminium "v.s.w.r. sleeve" is made from a short length of aluminium tube, slotted accordingly. Initial adjustment of the v.s.w.r. and tuning is carried out by adjusting the position of both the feed cable tapping points L and E and the shorting bar. These operations must be carried out with the cover off. The v.s.w.r. sleeve will almost certainly be needed to compensate for the detuning effect introduced by fitting the pvc sleeve. Final tuning is accomplished by adjusting the position of the v.s.w.r. sleeve between the base of the antenna and the top of the $\lambda/4$ lower matching stub section.

The special base adaptors are similar to those used for the 144MHz Ring Base antenna, described in the October 1982 issue of *PW* (Fig. 6 page 60) and these could be used. Supplies of these items should still be available, ready turned and threaded, from: Blandford Wells Ltd., 2 Station Road, Reedham, nr Gt. Yarmouth, Norfolk. An s.a.e. or telephone call to Gt. Yarmouth (0493) 700245 will provide details of price and availability.

Providing the general dimensions for the 432MHz Slim Jim are maintained alternative methods of mounting may be devised. The photographs above show the base station version without cover and with a half cover fitted. It should be noted that the whole of either form of the antenna may be covered, if desired.

The 432MHz Slim Jim is, like its 144MHz counterpart, a free space antenna and does not require a ground-plane. It will therefore operate on non-metallic vehicles and boats.

For base station operation height is important — the higher the better consistent with the cable used to feed it. For example at 432MHz, with UR43 (M43) or RG5U, the measured loss indicated by a Bird Thru-Line Wattmeter was 4dB for a 7·5m length. An 11·25m length of UR67 (M67) introduced a power loss of 1·2dB.

Whilst the Slim Jim is not a wide-band antenna, like a discone, it does have a better bandwidth v.s.w.r. performance than a single element omni-directional antenna.

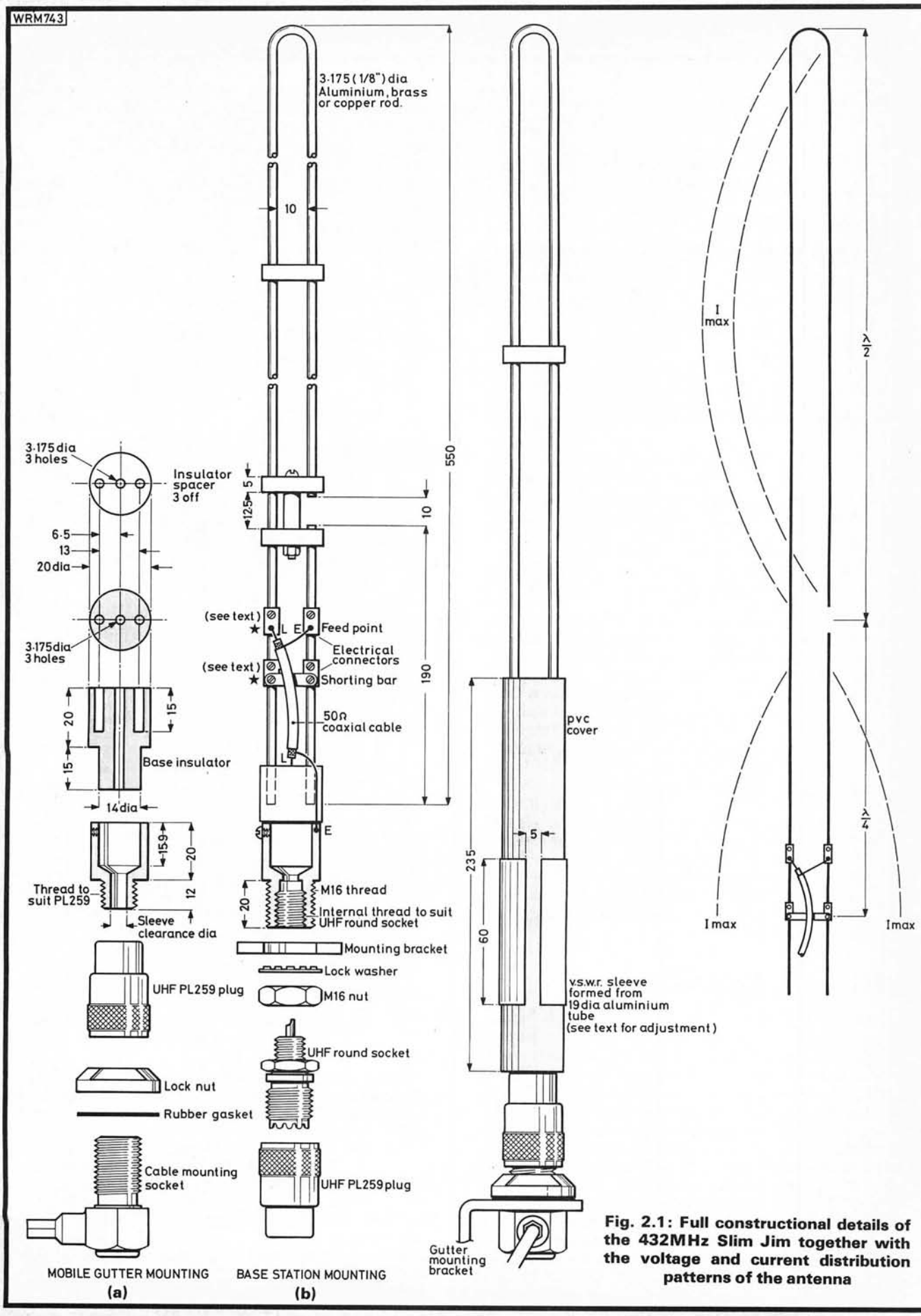


Fig. 2.1: Full constructional details of the 432MHz Slim Jim together with the voltage and current distribution patterns of the antenna

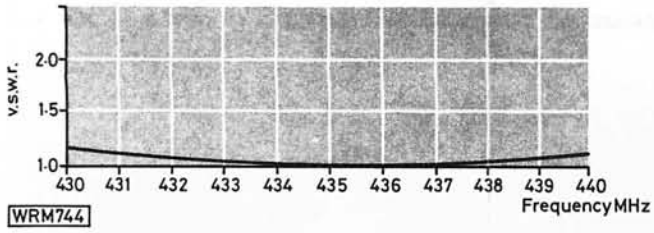


Fig. 2.2: The v.s.w.r. readout obtained from the prototype 432MHz Slim Jim

Other Wide Band Antennas

There is of course within this category the log periodic dipole array which looks rather like a Yagi antenna and can be constructed to cover various bands for h.f., v.h.f. and u.h.f. operation. A well designed l.p.d.a. has a good front-to-back ratio, low v.s.w.r. and a gain factor in the region of 7·4dBd.

Designs vary and some are quite complex so interested readers are referred to sources of information on l.p.d.a.s given at the end of this article. A single log periodic array for v.h.f./u.h.f. can of course be designed with a bandwidth sufficiently wide to encompass both the 144MHz and 432MHz amateur bands. Wide band antennas of this nature should not be confused with "multi-band" antennas which involve entirely different principles of design the function of which will be dealt with later in this series of articles.

Helical Antennas

This description does not refer to so-called helically wound small verticals used for v.h.f./u.h.f. handheld transceivers etc. The helical antenna could be regarded as the link between the linear and loop antenna.

A helix of given diameter can be collapsed into a loop as the spacing between its turn ends approaches zero. A helix of fixed spacing between turns could also be straightened out and would become a long linear conductor as the diameter of each turn approaches zero.

A true helical antenna can be made to radiate in a number of modes but only one will be considered in detail. This is the *axial mode* type in which the field is maximum in the direction of the helix axis and is circularly polarised, or nearly so. The axial mode of radiation occurs when the helix circumference is approximately one wavelength, or has a diameter of λ/π. In this mode high radiation efficiency and a finite forward main lobe is maintained over a relatively wide bandwidth.

Axial Mode Characteristics

The function of axial mode helical antennas is highly complex but the antennas themselves are relatively easy to construct and match to the more or less standard 50Ω coaxial transmission line. These antennas have broadband properties: a desirable forward radiation pattern, constant impedance and polarisation characteristics in the axial mode of radiation over a frequency range of 2:1. For example, these characteristics can easily be maintained for a 14 degree, six turn helix with a circumference of one wavelength, or a diameter of 0·31λ, at a centre frequency of say 400MHz. The diameter of the conductor element may be about 0·02λ.

The radiation patterns shown in Fig. 2.3 are those produced between 275 and 560MHz. The satisfactory patterns of (B), (C), (D), (E) and (F) occur between 300 and 500MHz, at which the circumference of the helical turns assumes dimensions between 0·73λ (300MHz) and 1·22λ (500MHz). The format of the helical antenna in this case is shown as x in Fig. 2.3 and the reflector used has a minimum diameter of λ/2 at the centre frequency.

A bandwidth of 300 to 500MHz provides excellent coverage for the 432MHz band over which the beamwidth and v.s.w.r. remain fairly constant for the relative electrical changes in helix diameter from 0·73λ to1·22λ. This is illustrated in the graphs of Fig. 2.4(A) and (B). As can be seen the beamwidth at half power, or 3dB down from peak, for complete rotation of polarisation, remains very close to 50 degrees. The v.s.w.r. is also fairly constant over the frequency range 300 to 500MHz and more than adequate for the UK amateur band at 430 to 440MHz.

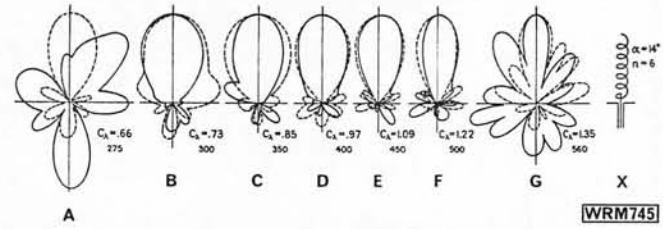


Fig. 2.3: Radiation patterns of a nominal 400-450MHz six turn helical antenna across the range 275-560MHz

Calculated gain for a six turn helix as described is in the region of 11dBi for a half power beamwidth area of 2500 square degrees. A seven turn helix has a gain of approximately 12dBi for the same 2:1 frequency ratio.

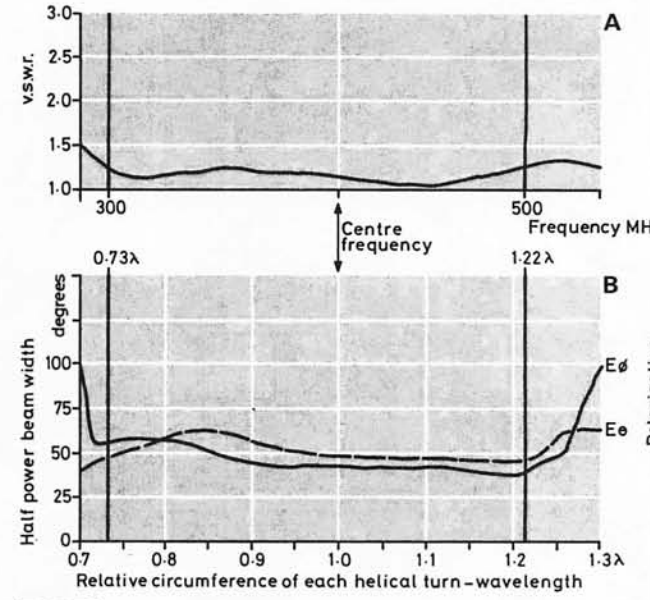


Fig. 2.4

Further details concerned with helical antenna performance and constructional details for a six turn helical with reflector for 432MHz will be dealt with in Part 3 of this series.

Log-periodic Dipole Array Information

The Beam Antenna Handbook. W.I. Orr W6SAI. Radio Publications Inc. USA.
The Radio Amateurs VHF Manual. ARRL Staff.
The ARRL Antenna Handbook. ARRL Staff.
All of these publications are available from the RSGB.

CAN-BAND SCAN-BAND

An Occasional Look At The International Broadcasting Scene by Peter Laughton

At a time when media "experts" are talking about Direct Broadcast Satellites (d.b.s.), gigahertz, dishes, and trying to introduce new words such as "footprint" into the English language, the talk further down the band, below 30MHz, is very different. For despite the acute overcrowding problem and a further significant increase in jamming by the Soviet Union since January 1982, together with higher power levels, governments and even private individuals are willing to invest millions of pounds into the building of new short-wave stations.

Until the start of last year you could categorise any international short-wave broadcaster into one of three groups: government mouthpiece, government financed but editorially independent, or religious.

But now a new group is emerging: the short-wave commercial broadcasters. Adverts on the bands between 3 and 30MHz aren't new. Short-wave listeners can monitor commercial domestic stations in Latin America relatively easily, or follow advertisements on national networks when they are also relayed on short-wave such as Kol, Israel's Hebrew programming. But it's been quite some time since an international broadcaster went knocking on the advertisers' door offering to sell airtime to listeners thousands of miles away. The last attempt at this, WRUL, Radio New York Worldwide, went into liquidation. In January 1982, however, a new commercial voice appeared in the form of WRNO worldwide, based in New Orleans, Louisiana.

Disappointing Results

And it appears to be leading the way for other stations of its kind. The Federal Communications Commission (FCC), based in Washington DC, forbids the use of short-wave by any user for domestic broadcasting in the USA. So Joseph Costello III, owner of WRNO, announces target areas of Europe and Canada instead. Indeed the antenna is fixed with a beam of 20 degrees from true North in the direction of the European continent. But after over a year of beaming rock-music, public service messages (including invitations from the ARRL to take an interest in amateur radio), blocks of religious programmes, and some adverts, the results have been somewhat disappointing: at least in Europe.

For one thing, the angle of the antenna elevation, and the frequencies chosen, would seem to indicate that WRNO is really aimed at the North American listeners after all, including those within the US border.

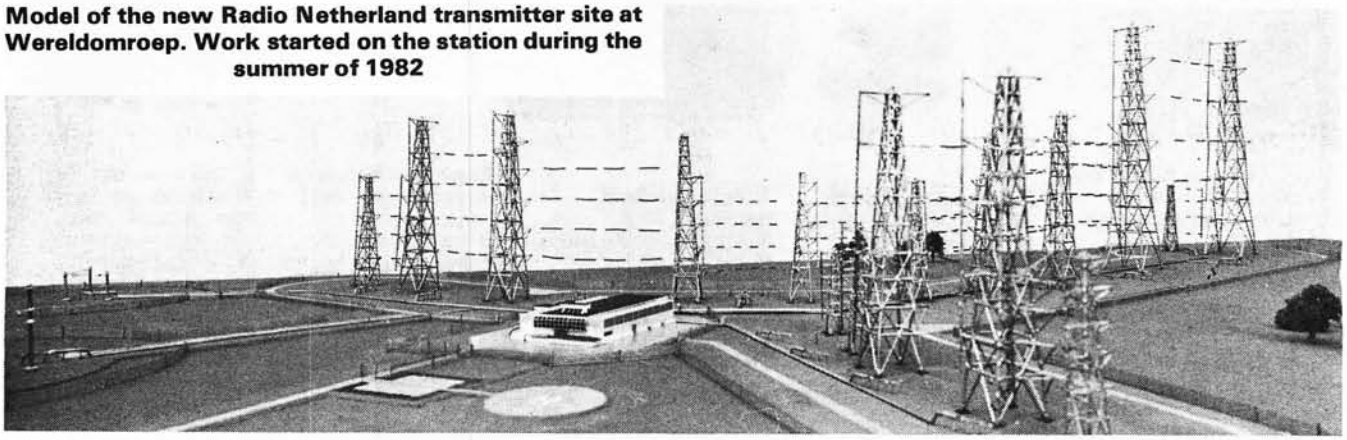
The main income would appear to be from the religious airtime, which is part of the licence requirement set down by the FCC. The station is reported still in the black, and the use of some out-of-band channels may improve reception in Europe. Indeed the recent authorisations of out-of-band channels by the FCC, "when no other in-band channel is available", could make others start a commitment.

Beaming to Japan

New station, KYOI, is the second US commercial short-wave station to hit the air, this time aiming at a closer audience. Owner of Mariana Communications Inc (MARCOM) is Lawrence Berger. Based in Hawaii, he's familiar with Japanese language pop music stations, since many of the broadcasters on the islands use both Japanese and English. Berger argues, however, that despite being an electronically advanced nation, Japan doesn't cater sufficiently for the "young adult". Having completed a station on the US territory of Saipan, KYOI is now beaming a mixture of English and Japanese music programmes on short-wave towards Japan. Ordinary medium-wave wouldn't reach, so the answer chosen was a 100kW short-wave transmitter with a high-gain antenna (23dB) beamed towards Tokyo.

It's early days yet, but even though the path is a short one, this doesn't help the fact that the frequency response of most short-wave receivers gives music fidelity on par with Edison's gramophone. Programmes in fact are not live. They are recorded in California and air-freighted to the automated transmitting site once a week. Berger says that as well as the fidelity craze there are huge sales of short-wave communications receivers. Since they are so much cheaper than in Europe one of the most important markets is students wishing to learn foreign languages. KYOI is after this group of listeners, adding "gossip from Hollywood" to spice things up.

Model of the new Radio Netherland transmitter site at Wereldomroep. Work started on the station during the summer of 1982



BANDSCAN

On continental USA other applications have also been filed with the FCC. WQBA is a medium-wave station in Miami, Florida with a Spanish speaking target audience both within the state, and in Cuba (hence perhaps the call letters). But managing director, Herbert Levin, is also planning a 100kW short-wave commercial outlet. The project however appears to have hit some delays. Construction should have finished by the end of last year, but FCC officials report that the permit has now been extended by 12 months. It also looks uncertain whether the planned call-letters WRMF (Radio Miami Florida) will be the final choice.

Interesting Investment

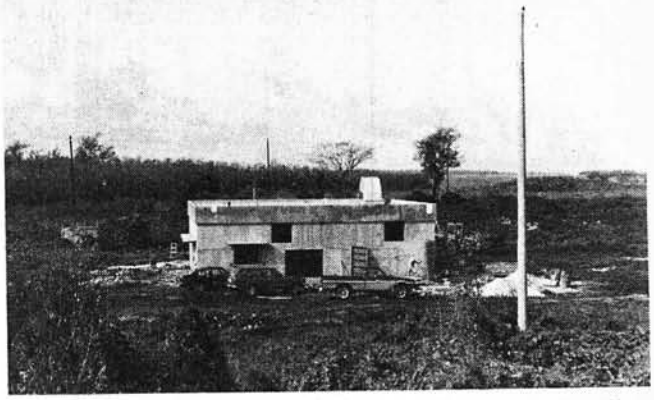
The 1980's however are proving to be very interesting as far as short-wave investment is concerned. With many European transmitter sites now older than their intended life-span, decisions have to be made as to whether or not to replace them. Although satellite broadcasting would appear to be the answer in this case, the political decisions may take several years, and it will only affect the industrial world (a secondary target for most international broadcasters). After over 40 years on the air, the Voice of America is now expanding its relay base in Sri Lanka, and is planning to start a "VOA 2" service primarily aimed at the younger, English speaking audience in Europe. The BBC External Services, with over 50 years' experience behind them, have purchased eight 500 kilowatt transmitters for their Rampisham site. These will replace the ageing 70kW units at Skelton in Cumbria at a cost of £20 million. In October 1982 the Dutch put the first stone on a new transmitter site in Flevoland. This project, again estimated around the £20 million mark, will give Radio Netherlands four 500kW transmitters plus one 100kW in reserve. The days of Lopik, in use at present, are numbered.

Timely

These are "small" projects though, compared with the inauguration last year of 18 s.w. transmitters by the US-funded Radio Free Europe and Radio Liberty based in Munich, West Germany. These proved timely in view of events in Poland. In addition, Radio France Internationale made very large expansion plans public last year. However, it remains to be seen whether all of this will be realised in an economic depression.

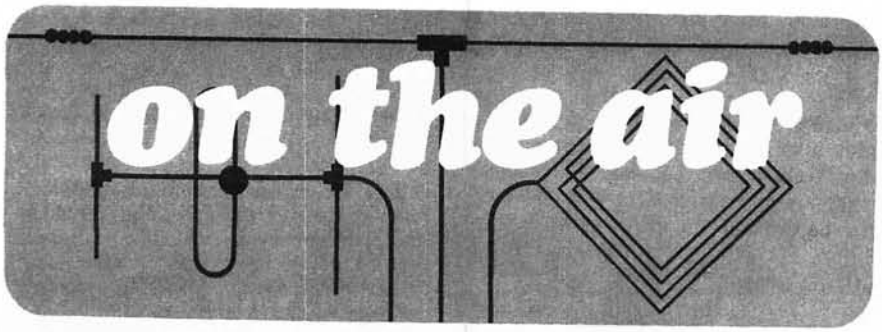
Crisis

It is probably only in times of crisis that the investment is demonstrated to be worth it to those who dismiss such projects as ineffective. The BBC was able to serve the Falkland Islands with very strong signals during the invasion in April 1982. They could effectively counteract the news being given to the islanders by Radio Nacional Islas Malvinas, LRA-60. Had roles been reversed, Argentina, with its single 100kW transmitter, would have had a hard job serving the islanders and the rest of the world at the same time. Perhaps as proof of this, more powerful Argentine s.w. transmitters did go on the air during and after the conflict, and the Ministry of Defence thought it worth their while to use BBC Ascension Island transmitters for their "Radio Atlantico del Sur" service.



KYOI's transmitter building under construction September 1982 on Saipan. The station is now operational

As prices rise however, short-wave stations are looking to other forms of income. France tried, and stopped, its experiment with short-wave commercials on the government station. In November '82 the Dutch second house of parliament raised, yet again, the suggestion that Radio Netherlands should be financed partly by commercials. In fact the more you examine the situation the more it is clear that short-wave broadcasters will need huge investments just to stay on the air. Whereas governments are often willing to find the funds to ensure their audibility, it will be interesting to see if advertisers think it's worth it too! ●



Amateur Bands

by Eric Dowdeswell G4AR

Reports to: Eric Dowdeswell G4AR
Silver Firs, Leatherhead Road,
Ashtead, Surrey KT21 2TW.
Logs by bands in alphabetical order.

It has become quite noticeable lately in the many logs and letters that I get from readers of this column that the "long wire" antenna is apparently enjoying a new lease of life, to the exclusion of dipoles, trapped dipoles, inverted-V's and other definitive designs.

This is a very undesirable trend that seems to be linked with the acquisition of a modern s.w. receiver, the theory being that since it has got everything it doesn't need anything special in the way of an antenna. Nothing could be further from the truth. A well-known advertiser of antennas in *PW* and elsewhere once said to me that using a random length of wire on such a receiver is akin to running a Rolls Royce on paraffin.

In many cases the wire really is an unknown random length, quite unrelated to the frequency in use and very seldom qualifies for the term "long wire" which should be reserved for wires a matter of several wavelengths long, generally an impracticality on the h.f. bands in most locations.

Think of the tuned circuits in the r.f. amplifying stages of the receiver which, hopefully, select the wanted signal and reject all others, all tuned to the same frequency for maximum gain. Every antenna can be shown to be fundamentally a simple tuned circuit but it is not going to be of much use if it is tuned to a frequency different from those in the receiver. It will work, of course, and the listener may be quite happy with the results, but what a difference in the strength of the signals would be experienced with an antenna tuned to the correct frequency, with stations that were down in the noise becoming fully readable.

How often do you hear a G station exchanging reports with a DX station that you can't even hear? His receiving side is probably no better than yours but you can rest assured that he is using an antenna that is very carefully matched to his transmitter, and hence his receiver. So why not do the same for your receiver?

There are two ways in which the random length wire can be tuned or resonated to the desired frequency; by making it physically a half wavelength long or a multiple; by tuning it electrically with an antenna tuning unit (a.t.u.). Until the advent of the three new WARC h.f. bands our bands were related harmonically so that a half wave antenna on, say, 14MHz (20m) becomes a full wave on 28MHz (10m). The general formula for antennas is 143/f (MHz) the answer being in metres. The shortest practical length being 10m, a half wave at 14MHz. The mid-band frequency is quite adequate in this formula.

The centre impedance of such an antenna is low (Fig. 1) and will match coaxial or flat twin feeder of between 50 and 75 ohms impedance. Such an antenna can only be used on the 14MHz band and this restriction applies to any half wave antenna on any h.f. band with the exception of one for 7MHz which will work well enough on its third harmonic, namely 21MHz (15m).

With so many h.f. bands now open to us it is out of the question to erect a half wave dipole for every band. One alternative is to feed the antenna via open tuned feeders using an a.t.u. Such a wire 40·25m long will tune easily to all bands from 1·8 to 30MHz, especially if the feeder length is also a multiple of 10m. Another possibility is a trapped dipole (Fig. 2) which can cover 3·5 to 30MHz with one pair of traps, with a further pair required for extended coverage to 1·8MHz. The feeder should be balanced twin 70/75 ohms which provides a reasonable match on all bands, as well as being physically small, allowing it to be fed easily through window frames and the like. The length of the feeder is more or less unimportant for receiving purposes. Being inherently balanced flat twin feeder is the best to use if interference from TV sets is being experienced.

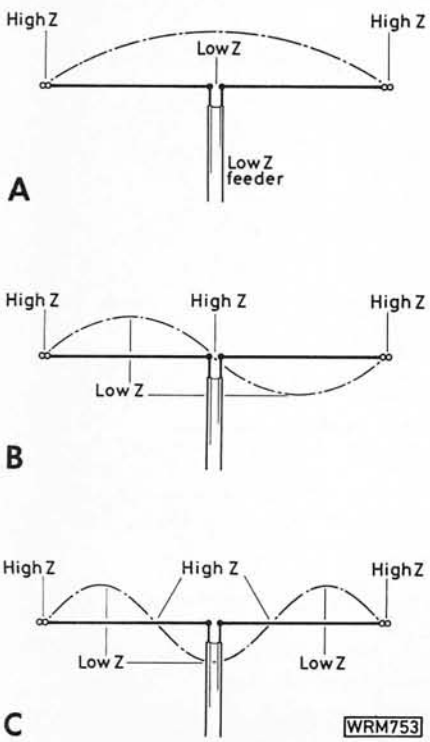


Fig. 1: (A) At its resonant frequency a half wave antenna exhibits low impedance at the centre, a good match for flat twin balanced feeder of around 75 ohms. Coaxial cable is unbalanced and will pick up more interference from, say, a local TV set than twin feeder. (B) The same antenna at twice the frequency is now a full wave long and is a very bad match indeed at the centre. (C) At three times the frequency the centre is again low impedance and a reasonable match to the feeder

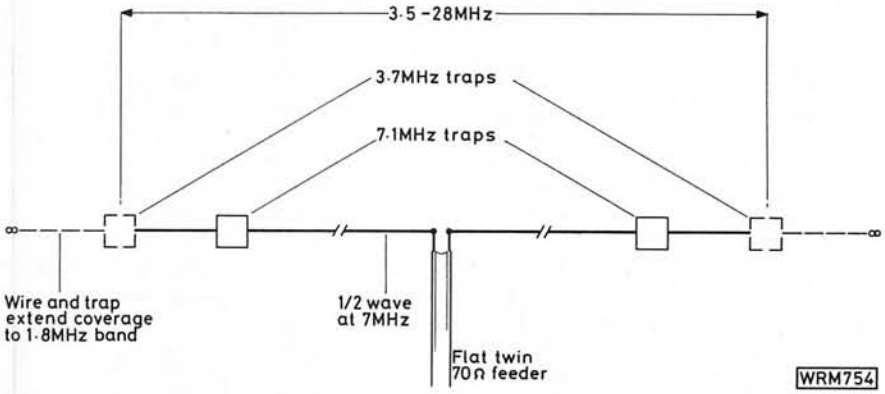


Fig. 2: Simplest trapped dipole has two traps resonant at about 7·1MHz and will cover from 3·5 to 30MHz. Adding two traps resonant at 3·7MHz and end wires will extend coverage to the 1·8MHz band

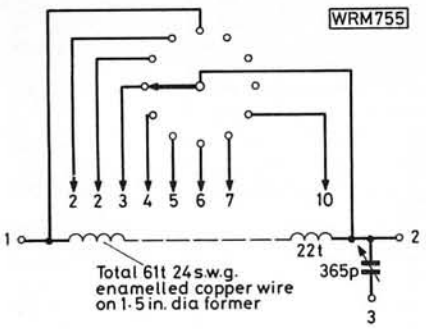


Fig. 3: Circuit of a.t.u., matching wire antenna to receiver on any h.f. band. Cardboard centre of toilet roll makes ideal coil former. Prick small holes at one end to anchor wire, wind on two turns, scrape wire clean and twist small loop. Leave 3mm space, wind on two more turns, make another loop, space, three turns, make loop, and so on. The coil is mounted directly on capacitor and switch. Use insulating panel to isolate capacitor or mount on insulating pillars on aluminium panel

One reason why a random length antenna, indeed any antenna which is half a wavelength long, must not be used straight into the antenna terminals of a receiver is that a complete mismatch of impedance occurs. The ends of such an antenna are high impedance, of the order of several thousand ohms, while the antenna input of the receiver is low, around 50 ohms or so. A worse condition could hardly exist, the result being a much lower signal strength at the receiver than would be obtained with a properly matched system.

The a.t.u. not only resonates the antenna to the correct frequency but also matches the antenna impedance to that of the receiver. An a.t.u. need cost very little to make, especially if one has a junk box, but the returns are out of all proportion to the outlay. Such an a.t.u. is shown in Fig. 3 and it could hardly be simpler. A panel carries the tuning capacitor and coil tap switch, together with the appropriate antenna sockets to take the wander plugs. The possibilities with the a.t.u. are enormous; six are shown in Fig. 4, depending entirely upon the length of wire employed in the antenna. Mark the panel to show the taps on the coil and put a scale on the tuning capacitor so that readings for a particular band can be recorded.

Next month I will enlarge on the various uses to which the six arrangements of Fig. 4 can be put.

General Notes

The crazy RAE and its multiple choice question paper continues to churn out new licensees by the thousand, many with a minimum or no knowledge of practical operating procedures or of the equipment in use. To cite an example, one reader who had been made redundant happened to come across a copy of *PW* and with the help of the *Passport to Amateur Radio* series and the *RAE Manual* learned it all parrot fashion, spending six to seven hours a day at it, even memorised diagrams "although I didn't understand them".

This took about six and a half months, when he sat the RAE and passed with two credits! So now he is allowed to go on the air with 400W p.e.p. output s.s.b. on v.h.f., but here is the payoff. He has never touched any electronic equipment in his life, not even a s.w. receiver! And so knows nothing of operating procedures or the background of amateur radio. What sort of system allows this kind of idiocy to occur? Once again I suggest that suitably approved amateurs in radio clubs should be allowed to certify that a potential licensee has spent a given number of hours using receiving and transmitting equipment under supervision, as an additional requirement of the RAE.

It would cost the Home Office next to nothing in admin costs but it would ensure that similar stupid situations which are no good for amateur radio do not occur again.

John Hayes of Edmonton, London and regular writer to the DX column reports that he is now G6RJA in spite of the fact that he didn't think that he had much chance of passing the RAE and he hopes that any other readers who are hesitating over putting in their application to take the exam will think positive and get cracking. John will be tackling the code next and we wish you every success OM.

In the mail this time is the *News Bulletin* of the VK CW QRP Club, some 16 pages of absorbing interest to any QRP enthusiast. Contact club president Jack Swiney VK6JS, 59 Collova Way, Wattleup 6166, W. Australia for details of membership.

Just to repeat a previous note: that good, clear, black and white photographs of you and your amateur radio activities are always welcome. So far the appeal seems to have fallen on stony ground!

Most of you by now will have heard of the several relaxations in the regulations governing the issue of AR licences, such as evidence of age and the abolition of the C and D licences, so no more G5+3's, just the G4's and 6's.

I am very anxious to answer a letter received from a **Noel Lee** but he did not enclose his address, but the envelope was postmarked "Cleveland" if that is any help. He was awaiting his G6 licence at the time of writing, November 6.

The DX Bands

In Knutsford, Cheshire **Dave Coggins** has been looking at all the bands including the new ones but did not find much of interest with his FRG-7700, a.t.u., two-element delta loop for 28MHz and a 24m wire for the l.f. bands. During an aurora in Mid-November he copied a number of G's with typical aurora roughness on the signals. On 28MHz he copied FR7BT, HL1QY, KH6DQ, VS6CT, ZL3WE, Z21GL, 5Z4FB, 9J2BO and 9X5SL. Not much of interest! Only a few Europeans turned up on 24, 18 and 10MHz c.w. with a solitary American on 10MHz. On 7MHz there were JA4GQK, VK5GT/MM busy fishing, ZL2RS and 9X5SL.

Richard Tomlinson of Hatfield, Herts joins the column for the first time, albeit briefly I suspect as he has passed his RAE with two distinctions but doesn't feel up to having a go at the code just yet. Richard's rig is an FRG-7, AT1000 a.t.u. and just 12m of wire in the loft. On 28MHz he caught EA8ZO, HH7PV,

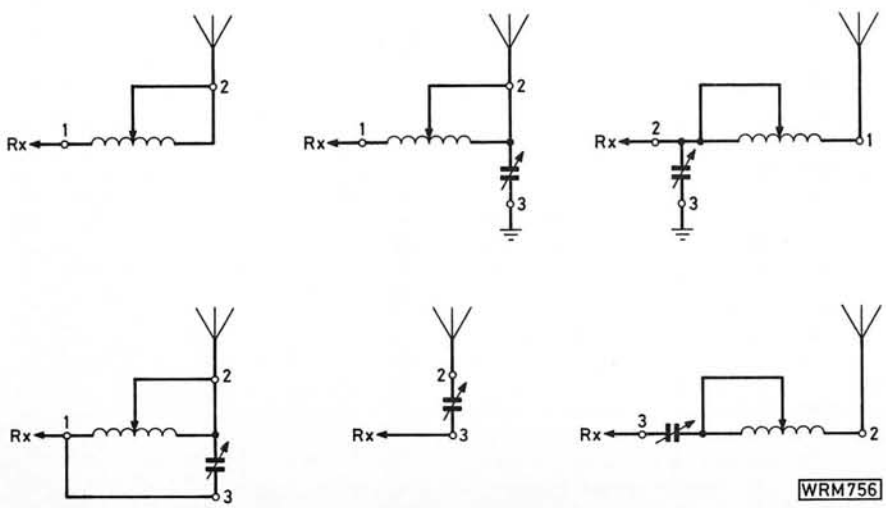


Fig. 4: Six variations of a.t.u. circuit. Antenna, earth and receiver input leads fitted with wander plugs to fit sockets 1, 2 and 3. Optimum circuit depends on frequency and antenna's length

HP1XKZ, S31DH, S6CIY, WA0LMD transmitting colour SSTV, and 8P6JG who wants cards via WA8IMO.

From Reading, Berks, **M. G. Collymore** writes to say that *PW* was a great help in passing the RAE last December when he was only 13 years of age. The code test is over and he is now G4PQK. Congrats OM and we all wish you plenty of DX. Rig to start with is a Heathkit HW100 and 20m of wire which doesn't seem to be doing much of a job so far. However his c.w. log of QSOs looks like EA8AAX, KZ5RR, and lots of W's on 14MHz, with Euros, many W's and PY4ZU on 21MHz.

G. A. Carmichael in Lincoln reports the special calls used in Jordan on the occasion of King Hussein's birthday. If you logged or worked seven JY7's in mid-November send for a certificate via the bureau. Rig is a Realistic DX302 and a.t.u. from a wire antenna but only items of note were OE2TVM/YK on the Golan Heights, and 3C1A. A move to 21MHz for ZS1RA, 6W8EX and A71ED. Later "GA" reported C5BJ, 5N8BRC, 5Z4PR on 14, plus C53DF, EA8ALX, P29WT and S61PT on 21MHz.

Conditions were variable was the verdict of **Viv Doidge** in Callington, Cornwall, with his FRG-7700 plus a.t.u. and a wire some 27m long running east-west, 5m above ground. The QTH is at the bottom of a valley and a 331m hill not too far away. Not too bad OM, but could be plenty bad on v.h.f., unless you move to the top of the hill! Right, on to the log and 21MHz producing J3AA, V2AO, VP5GP, VP8ANT, 5Z4RT, V3PGL, 5T5AP. From the 14MHz band came T30BY, TR8CR, TU2HN, ZF5NZ, V3AS, and 6W8HC. On to 7MHz and CO2AL, HP3AL, ZD7BW, 5N8ARY, 6W8AR, 6Y5IC, FM7WS, PY0FA on Fernando de Noronha, 9X5SL. The 3·5MHz band wasn't too bad either with CO7AM, JA5ANP, KG4W, 6W8AR and 3A2EE.

In spite of now being GW4RGA **Jim Dunnett** up in Prestatyn, Clwyd, still sent on a log of stuff he has heard but it looks like it's the last time! Jim has been busy working the DX on virtually all bands from 3·5 to 144MHz mostly on c.w. Thanks Jim for all the many excellent logs in the past and we wish you every good luck on the bands. So, principal catches were FY7CG on 21MHz, TI2DL, 6Y5SG, 7X4BL on 14MHz, HK3BBK and W's now on 10MHz, plus JR4KGR on 3·5MHz.

Club Events

Acton, Brentford and Chiswick ARC G3IIU Next meeting is on Tuesday Feb 15 at 7.30 at the Chiswick Town Hall, High Road, Chiswick, London W4, with an open discussion on antennas for G3CCD's alternative QTH in France where he is F0UT. (This sounds like a good idea at any club, especially helping newcomers to make the most of the space available.) W. G. Dyer G3GEH, 188 Gunnersbury Avenue, Acton, London W3 is the man to QSO for more info.

Addiscombe ARC Club time is 9pm at the Woolpack, Gloucester Road, Croydon, Surrey (bit late?). Newsletter reveals great interest in contest operation with gear for 1296MHz (23cm) the latest acquisition. More on the club's activities from sec Peter Hart G3SJX, 42 Gravel Hill, Croydon, Surrey, likewise 01-656 9054.

Carlisle & District ARS Every Monday at 7.30, White Quay Inn, Durdar, Carlisle, says Paul Boyd G8RJA, 13 Stackbraes Road, Longtown, Cumbria.

Cheshunt & District ARC G4ECT G6CRC Every Wednesday at 8 in the Church Rooms, Church Lane, Wormley, near Cheshunt, Herts, says new hon sec Roger Frisby G4OAA, 2 Westfield Road, Hoddesdon, Herts, which also answers to (09924) 64795. On Feb 9 it's G8NDR on video recording systems, 16th is natter nite and the 23rd has G4MIU talking on engineering workshop practice.

Crawley ARC Newsletter reports a good year for the club with increased membership, with many CBers receiving a warm welcome, healthy finances, and good results in several contests. Meetings are held either at member's QTH's or at Trinity Church Hall, Ifield, Crawley. Contact hon sec David Hill G4IQM on Crawley 882641 for more info on events.

Derby & District ARS G3ERD G2DJ G8DBY Every Wednesday from 7.30 at 119 Green Lane, Derby, where code classes are also held on Tuesdays and Thursdays. Note for diary:—annual Derby mobile rally on Sunday August 14 at the Lower Bemrose School, Derby. Queries to Jenny Shardlow G4EYM, 19 Portreath Drive, Darley Abbey, Derby. Alternatively Derby 556875.

Glenrothes & District ARC GM4GRC Numbers are limited for the visit to the BBC's medium wave transmitting site at Falkirk on Wednesday Feb 16, so get your name down soon. The Scottish Tourist Board is sponsoring a new amateur award for working certain numbers of Scottish districts. More on this from A. G. Anderson GM3BCL, West Balfour House, Durris, Banchory, Scotland. Detailed info on club activities from GM3YOR on Kirkcaldy 200335, or 203582 on the same exchange will get you GM8ZTV.

Goole Radio & Electronics Society Tuesday pm at 7.30 at the Junior Chamber Premises, 17 Boothferry Road, Goole, with Feb 1 a natter night, the 8th a visit out, but I know not where, a project evening on the 15th and a junk sale on the 22nd. The club boasts a membership secretary, Steve Price G8VHL, 35 Western Road, Goole, or Goole 69130.

Great Yarmouth & District ARC Reminding visitors etc of new QTH at the STC Sports and Social Club, Beevor Road, South Denes, Gt Yarmouth at 7.30 with meetings on Feb 10 and 24th, which seems to be fortnightly on Thursdays. Confirm from A. D. Besford G3NHU, 49 Blake Road, Gt Yarmouth.

Guildford & District RS The club meets in the G'ford Model Engineering Society club house in Stoke Park, G'ford but Helen Mullenger G4OJO, will give you coming dates of events on Aldershot 20384.

Hastings Electronics & Radio Club G6HH Some idea of the size of this club can be judged by the attendance of over 120 people at a recent junk sale when over £700 changed hands with a nice slice going to club funds. Programme is first, second, fourth and fifth Weds devoted to Micro night, the third Wed being the main meeting of the month, with Feb 16 devoted to G4BIA recounting a DXpedition to Andorra. Note that AGM is on March 16. Main meetings at West Hill Community Centre, others at Ashdown Farm where RAE courses and code classes take place on Tuesdays, with Fridays chat nights. In case anything has been missed George North G2LL, 7 Fontwell Avenue, Little Common, Bexhill-on-Sea can fill you in, or try Cooden 4645.

Ipswich RC G4IRC GB2IRC Quite a wealth of talent at this club to produce such a fabulous magazine *QUA* every quarter. Secret, as with almost every publication, is to get some regular advertisers to take space. Meetings second and last Wednesdays at 8pm in the Club Room of the Rose and Crown, 77 Norwich Road, Ipswich, with access possible without going through the public bars, plus plenty of parking space. Meetings programmed in February are the 10th when members will be describing a particular piece of equipment they have constructed. On Feb 24 G4LSP will deal with club motor racing. Advance notice of G4AZR on handling car interference problems, on March 10. Morse classes are held when there is no general meeting scheduled. Let Jack Tootill G4IFF, 76 Fircroft Road, Ipswich, Suffolk, tell you more, or ring him on (0473) 44047.

Jersey ARS GJ3DVC The club meets between 7.30 and 10.30pm every Friday and between 9.45am and 12.30pm on a Sunday. What goes on and where can only be revealed by Phil Taylor GJ6BUK, 1 Don Terrace, Don Road, St Helier, Jersey, CI.

Lincoln SW Club G5FZ G6COL Gatherings at the City Engineers Club, Central Depot, Waterside South, Lincoln, where the main event for March is a lecture on satellites by G4CUO on the 9th. That's the second Wed of the month, which is sometimes devoted to on-the-air activity from the club station. Fourth Weds mean RAE classes and slow Morse practice. Pam Rose G8VRJ, Pinchbeck Farmhouse, Mill Lane, Sturton-by-Stow, Lincoln would like to hear from visitors or potential members, or try Gainsborough 788356.

Maidenhead & District ARC Red Cross Hall, The Crescent, M'head, Berks at 7.30 on Tuesday Feb 15 for Richard

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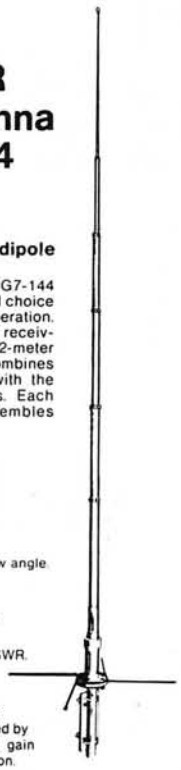
from RADIO SHACK

NEW

TWO METER Vertical Antenna Model G7-144

7 dB GAIN
— compared to ½ wave dipole

The superior performance of the G7-144 Master Gainer II makes it the ideal choice for fixed-station or repeater operation. The gain of 7 dB transmitting and receiving makes it the most powerful 2-meter antenna of its type. The G7-144 combines the latest antenna technology with the best weather-resistant materials. Each precision-built component assembles quickly and easily.



Electrical

7 dB gain over ½ wave dipole.
Omnidirectional radiation pattern, low angle.
50 ohm feed impedance.
Field adjustable: 144-148 MHz.
SWR at resonance: less than 1.1:1 measured at antenna.
Bandwidth: 6 MHz for 2:1 or better SWR.
Power: One kilowatt FM.
Feed: Shunt with dc grounding.
Radiator: collinear shunt-fed. Triple ⅝-wave elements in series, separated by 2 phasing coils to produce maximum gain and extremely low angle of radiation.

Mechanical

Vertical element: 184" long, 1¼" telescopic to ⅜" O.D. Heat-treated high strength aluminum.
Radials: four, 20¼" x ⅜" O.D. aluminum.
Connector: type N.
Wind load: 26 pounds at 100 mph.
Mounting: vertical support up to 1¼" O.D.
Shipping Weight: 10.0 lb.

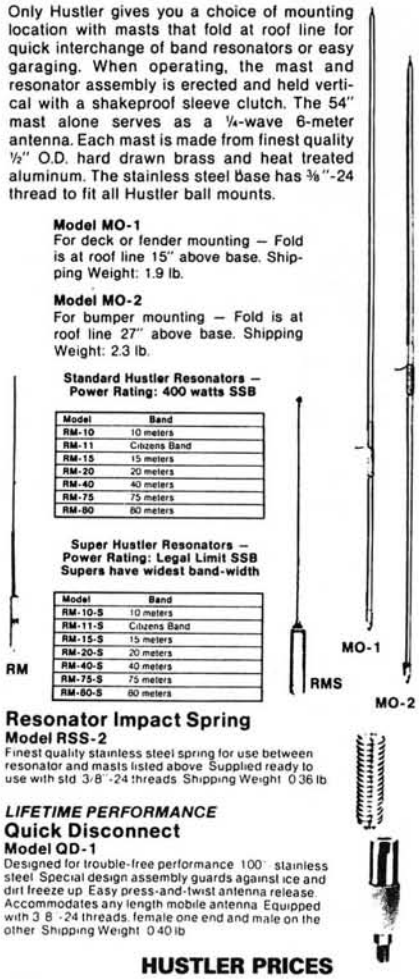
HF Mobile Antennas

FOR 6 - 10 - 15 - 20 - 40 - 75 - 80 METERS

Only Hustler gives you a choice of mounting location with masts that fold at roof line for quick interchange of band resonators or easy garaging. When operating, the mast and resonator assembly is erected and held vertical with a shakeproof sleeve clutch. The 54" mast alone serves as a ¼-wave 6-meter antenna. Each mast is made from finest quality ½" O.D. hard drawn brass and heat treated aluminum. The stainless steel base has ⅜"-24 thread to fit all Hustler ball mounts.

Model MO-1
For deck or fender mounting — Fold is at roof line 15" above base. Shipping Weight: 1.9 lb.

Model MO-2
For bumper mounting — Fold is at roof line 27" above base. Shipping Weight: 2.3 lb.



Standard Hustler Resonators — Power Rating: 400 watts SSB

Model	Band
RM-10	10 meters
RM-11	Citizens Band
RM-15	15 meters
RM-20	20 meters
RM-40	40 meters
RM-75	75 meters
RM-80	80 meters

Super Hustler Resonators — Power Rating: Legal Limit SSB Supers have widest band-width

Model	Band
RM-10-S	10 meters
RM-11-S	Citizens Band
RM-15-S	15 meters
RM-20-S	20 meters
RM-40-S	40 meters
RM-75-S	75 meters
RM-80-S	80 meters

Resonator Impact Spring
Model RSS-2
Finest quality stainless steel spring for use between resonator and masts listed above. Supplied ready to use with std 3/8"-24 threads. Shipping Weight 0.36 lb

LIFETIME PERFORMANCE
Quick Disconnect
Model QD-1
Designed for trouble-free performance. 100% stainless steel. Special design assembly guards against ice and dirt freeze up. Easy press-and-twist antenna release. Accommodates any length mobile antenna. Equipped with 3/8-24 threads, female one end and male on the other. Shipping Weight 0.40 lb

FIXED STATION FIVE BAND Vertical Antenna model 5-BTV

COVERS 10-15-20-40-AND 75 or 80 METERS

Space restricted or space unlimited, the Hustler 5-BTV is the choice of amateurs throughout the world for top signal reports consistent contacts and unmatched dependability.

Fast, easy assembly for permanent or temporary installation and requires only one 50 ohm feedline.

Get the pleasure of multi-band operation and the complete assurance of continued reliable performance with an antenna mechanically and electrically superior to any comparable product.

- Complete coverage on 10 through 40 meters and up to 100 KHz bandwidth on 80 meters.
- Hustler exclusive trap covers. Spritz extruded to extremely close tolerances, assures accurate and permanent trap resonance.
- All sections 1-1/4" heavy wall, high strength aluminum.
- Extra heavy duty aluminum mounting bracket with low loss - high strength insulators, stainless steel mounting hardware included.
- Power capability - full legal limit on SSB.
- Elevated mounting requires radials, not included.

MOUNTING: Ground or tower mount with radials.

SPECIFICATIONS:

Length	25'1"
SWR at resonance	1.15 to 1 or better
Bandwidth	1.6 to 1 at band edges on 10-40 meters; 100 KHz on 75 or 80
Mounting	Vertical support up to 1-3.4" O.D.
Shipping Weight	17 lbs

FIXED STATION FOUR BAND Vertical Antenna model 4-BTV

COVERS 10 - 15 - 20 - 40 METERS

ONLY HUSTLER GIVES ONE SETTING FOR WHOLE BAND COVERAGE. . .

The same quality antenna as above, but for 10-40 meter operation.

- Lowest SWR - plus!
- Bandwidth at its broadest! SWR 1.6 to 1 at band edges.

SPECIFICATIONS:

Length	21'5"
Shipping Weight	15 lbs

HUSTLER PRICES

4-BTV	10-40m Trapped Vertical	98.90	D
5-BTV	10-80m Trapped Vertical	125.00	D
G6-144B	2m Colinear 6db gain	88.55	D
G7-144	2m Colinear 7db gain	129.95	D
BBLM-144A	2m 5 8 whip mag. mt.	37.95	D
BBLT-144A	2m 5 8 whip boot lip mt.	28.35	D
CGT-144	2m Colinear boot mt coax	46.00	D
HT-144	2m 5 8 whip speed mt.	27.60	D
SFM	2m 5 8 whip mag. mt coax	32.95	D
SF-2	2m 5 8 whip only	19.55	D
SPS-144	2m 5 8 whip fast mt coax	21.85	D
DCL	DISCONE coax plug	28.35	D
DCX	DISCONE only (40-700MHz)	18.98	D
UHT-1	140-500MHz whip coax	9.20	D
27-TDX	CB Base Station Ant.	61.50	D
MO-1	Mast (wing mounting)	21.85	D
MO-2	Mast (bumper mtg.)	21.85	D
RM-10	10m Resonator	10.85	D
RM-10S	High Power version	16.10	D
RM-11	27MHz Resonator	10.85	D
RM15	15m Resonator	16.10	D
RM-15S	High Power version	16.80	D
RM-20	20m Resonator	14.72	D
RM-20S	High Power version	20.00	D
RM-40	40m Resonator	16.79	D
RM-40S	High Power version	23.00	D
RM-80	80m Resonator	17.95	D
RM-80S	High Power version	35.65	D
BM-1	Bumper Mount	16.10	D
C-29	St. Steel Spring	12.95	D
C-32	Chrome Ball Mount	8.28	A
HLM	Deluxe Boot mt/coax plug	16.79	A
MM-1	Universal cowl mt.	10.00	B
MM-3	ditto plus 17ft coax	16.79	B
QD-1	Quick-disconnect	13.00	A
RSS-2	Res. Impact Spring	6.30	B
SSM-1	Ball mt st.steel Spring	30.00	B
SSM-2	Ball Mt. only (st.steel)	17.25	B
SSM-3	H.duty Spring st.steel	16.97	B

CARRIAGE: A £1; B £2; D £5.00

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Just around the corner from West Hampstead Station on the Jubilee Line.

BARCLAYCARD VISA

Eaton of BT revealing current developments in satellite communication, not to be missed. Note the AGM on March 15. Ring Roger Hemmings G3VCT on Bourne End 21036 for latest news of club activities.

Maidstone ARC An influx of new members is blamed on *PW*. An RAE class at a local school is sponsored by the club and seemingly a lot of local CBers are going there "for the real gen". On February 11 it's slow Morse time at 7.30 with a technical forum beginning at 8.15. On the 18th slow Morse and RAE class, with G8TCY dealing with amateur TV on the 25th. A club net on 3·5MHz (80m) has had trouble finding a quiet spot, hardly surprising! So, drop a line to J. King G4EMC, 35 Hornbeam Close, Larkfield, Maidstone, Kent, for latest info on club activity.

Midlands ARS Tom Brady G8GAZ "post boy" for the club has had his diligence rewarded, he is now club president. That'll larn him! Feb 15, that's a Tuesday, has G4JBB discoursing on pay phones. With a membership now of over 200 the club is seriously considering closing the books for the time being, the hope being that they never all turn up at once! Seems the major influx is from disillusioned CBers, taking the RAE and Morse classes. Tom lives at 57 Green Lane, Great Barr, Birmingham or 021-357 1924. Alternatively call on S17 most days between 10am and 10pm.

Milton Keynes & District RS A Brains Trust Quiz should entertain members on Monday Feb 14, at 8pm, at Lovat Hall, Silver Street, Newport Pagnell, Bucks. A bit brief so make yourself known to Dave White G3ZPA, Rose Cottage, Shenley Brook End, or try (0908) 501310.

North Bristol ARC G4GCT Fridays at 7pm at the Self-Help Enterprise, 7 Braemar Crescent, Northville, Bristol but no details of February events but you can contact Ted Bidmead, 4 Pine Grove, Northville, Bristol.

North Wakefield RC Meeting at the Carr Gate Working Men's Club, says Steve Thompson G4RCH, 3 Harlington Court, Morley, Yorks (0532) 536633, with info on homebrew gear, not beer, on Thursday February 10, nothing in particular organised for the 17th but on the 24th it will be G3SDY holding forth on mobile operation. From which you may deduce that meetings are held every Thursday.

Radio Club of Thanet G2IC Morse code practice precedes the Friday meetings at 7.30. On Feb 4, a talk on radio test gear, and on the 11th a visit to the police HQ in Maidstone, so get your names down well in advance. VHF operating is the subject for Feb 18. All this at the Birchington Village Centre. Your contact is Ian Gane G4NEF, 17 Penshurst Road, Ramsgate, Kent, likewise (0843) 54154, or there is the new sec Ken Lown, now G4PTE, on 32198.

Rhyl & District ARC Another well-equipped club with rigs for all bands now has a new meeting place at the 1st Rhyl Scout HQ, Tynewydd Road, Rhyl, where they foregather on the second and fourth Thursdays. Second Thursday is on-the-air time, practical projects, and generally informal. All welcome to go along or to contact Paul Frost GW4NLD, 14 Morlan Park, Rhyl, Clwyd, also (0745) 31227.

Rolls Royce ARC G3RR G6RRB A busy club with over 100 members, with RAE and code classes plus slow Morse over S22 at 8 on Fridays. Too late to mention club meeting on Feb 2 but make a note of Wed March 2nd when it's construction contest display and judging time, for the Allan Richards trophies, to be presented at the annual dinner dance on March 4. So, it's Les Logan G4ILG, 19 Fenton Avenue, Barnoldswick, Colne, Lancs, likewise (0282) 812288.

Rossendale Valley ARC Hon Sec Celia Adams G6GZM is delighted to announce that the club has acquired new premises in a small office block at 4 Bacup Road, Rawtenstall with the possibility of some practical construction in future. Celia suggests those going to the club for the first time ring her for guidance, on Rossendale 220935 or a line to 373 Bury Road, Rawtenstall, Lancs will do.

Spalding & District ARS G4DSP Second Friday of the month at 7.30 at the White Hart Hotel, Market Place, Spalding, with new members welcomed. Further details from Ian Buffham G3TMA, 45 Grange Drive, Spalding, Lincs, also Spalding 3845.

Sutton & Cheam RS Annual dinner dance on Sat March 19 at the Woodstock is an item for the diary. Meetings either at the Sutton College of Liberal Arts or Carshalton Sea Cadets HQ TS Puma, Church Path, Beddington which is near to the Carew Manor School. Sec G. Brind G4CMU, 26 Grange Meadow, Banstead, Surrey will gladly give info on events to come.

Thames Valley ARTS Thames Ditton Library, Watts Road, Giggshill, Thames Ditton, Surrey on the first Tuesday of the month around 8pm. Too late to tell you of February meeting so on to March 1 and the club award, the Caernarvon Trophy, for the best QRP transmitter designed for the new 10MHz band. More from Julian Axe G4EHN, 65 Ridgway Place, Wimbledon, London SW19 or 01-946 5669.

Thornton Cleveleys ARS G4ATH G6GMW New meeting place! Make a note of the Scout Hut, 1st Norbreck Scout Group, Carr Lane, Bispham, Blackpool which will be a permanent QTH with active station installed. Every Monday at 7.30, with a film show on Feb 7, satellite working by G8MKQ on the 14th, with a discussion on club matters on the 21st. Hold on tight for a talk on earthquakes by Gerry Vallety on the 28th. With effects? The *TCARS Journal* is another fine publication with plenty of useful ads. They even got a local electronics firm to provide a data card of v.h.f. repeaters with each copy of the mag. So it's George Metcalfe G6VS, Shalom, 4 Partridge Avenue, Thornton Cleveleys, Blackpool, or ring (0253) 823541. Before I forget, you will want to know about a show of Trio equipment which a supplier is organising for March 3rd.

Torbay ARS G3NJA G8NJA Weekly on Fridays at 7.30 at Club HQ, Bath Lane, rear of 94 Belgrave Road, Torquay, plus the last Sat of the month at the same place. The society had no less than 14 new calls in 1982. Main meeting in Feb has G8HHS chatting on teletext matters. Note the annual dinner on Saturday March 12 at the Templestowe Hotel, Torquay. More from Les Mays G2CWR, Atlantis, Clennon Avenue, Paignton, Devon.

University of Kent ARS G3UKC G8KUC Open to both students and others, it's Wednesday nights at 7.30 for half an hour's code practice and then on to the general meeting in the Eliot Seminar, Room 8. If you get lost, call on S15. Facilities include an excellent shack with gear for the h.f., v.h.f. and u.h.f. bands including a TV rig. Who could ask for more? Clive Allen G6FRX, Eliot College, The University, Canterbury, Kent is the lad to contact in the first place.

Wakefield & District RS G3WRS On February 8 it's a visit to the studios of Radio Aire while the 22nd is devoted to a debate on amateur radio. This at Holmfield House, Denby Dale Road, W'field at 8pm which, having been refurbished, is said to have "almost palatial splendour". The club's "cupboard" has become a separate room where on-the-air evenings become a reality. Enthusiastic sec is Dick Sterry G4BLT on W'field 255515.

West Kent ARS G3WKS On Feb 18 Richard Scott of the Open University will talk on Microcomputers. It's "alternate Fridays" so that makes it March 4, 18 etc, at the Adult Education Centre, Monson Road, Tunbridge Wells, Kent. I imagine 8pm would be a good time to trot along. Club nets are Sunday, 28·700MHz at 11am, with c.w. on 3·510MHz at 10am. On Monday it is S23 at 8pm. Excellent nine page club mag *QLF* covers a wide range of club activities, technical and otherwise. Brian Castle G4DYF is on Sevenoaks 456708, awaiting your call.

Wimbledon & District RS February 11, more or less a natter night so go along to St John Ambulance HQ, 124 Kingston Road, London SW19 around 8pm and join in a healthy rag-chew. On Feb 25 the club has a home leg in a quiz contest with the Crystal Palace ARC so support the team if you possibly can. Both dates are Fridays. Geoff Mellett G4MVS, 26 Paget Avenue, Sutton, Surrey, can answer your questions on the club's activities. 01-644 8249 will also get you a QSO.

Wirral ARS G3NWR Club mag *News & Views* says club meets first and third Wednesdays at 7.45, Minto House School, Birkenhead Road, Hoylake but no advanced info on February events, but wait, further on is a programme running

to October next! Well done, that committee. So Feb 16 is film show night, and on March 2 G4EFP will be expounding on the world of amateur TV. Surplus equipment sales have run into a problem with an influx of non-members scooping up the goodies, so a set of rules has been formulated for the future. It's Cedric Cawthorne G4KPY, 40 Westbourne Road, West Kirby or 625 7311 for more details.

Worcester & District ARC Meetings alternate between the Oddfellows Club, New Street, Worcester, and the Old Pheasant, also in New Street, at 8pm. On Feb 7 it's G3PQR dealing with matching problems encountered with antennas, at the Oddfellows spot, while an informal evening (suppose that's really a natter nite?) occurs on the 21st at the other place, again at 8. Members are making a note of the rally on Sunday July 10 at Droitwich High School, Ombersley Road, Droitwich. Hon sec is Alasdair Lindsay G4NRD, 11 Durcott Road, Evesham, Worcs, also Evesham 41508. Advance notice of a talk by a visitor from the Falklands G4GKK ex-VP8QI on March 7th. Bet there won't be a spare seat there!

Reminder that the deadline for copy is the 15th of the month.

Volunteer Wanted!

Bob Salmon G4LJX seems to sail across the Atlantic as if it were a bus route. Next trip is on a 12m steel cutter from the British Virgin Islands to the UK over about five weeks in April-May with a space for another licensed amateur still going spare.

For more details you should contact Bob Salmon Ltd., Marine Consultants, 112 Mewstone Avenue, Wembury, Plymouth, Devon or tel: 0752 862558. Age or lack of experience need not be a bar.

Medium Wave Broadcast Band DX

by Charles Molloy G8BUS

Reports to: Charles Molloy G8BUS
132 Segars Lane, Southport PR8 3JG.

Medium wave DXers in the UK are favourably situated to listen to broadcasts from ITU Region 2. This region comprises North, Central and South America plus the Caribbean. Our location at the western extremity of Europe means that there is a direct sea path to most parts of Region 2, a sea path that favours propagation on the medium waves. There is another, less obvious advantage. Region 2 has a different frequency allocation and different channel spacing to the rest of the world. This means that on some parts of the band DX can be found in between European broadcasters.

Geneva Plan

This plan applies to Regions 1 and 3 which cover Europe, Africa, Asia and Australasia. All share a common frequency plan which starts at 531kHz and finishes at 1602kHz. The channel spacing is 9kHz and each of the 120 channels provided is also a multiple of 9kHz, an arrangement which, it is claimed, will reduce heterodynes. Prior to 1978 when the Geneva Plan came into being, many broadcasters outside Europe could be found 3kHz or 4kHz away from the closest European channel. This no longer is the case and the DXer in search of broadcasts from Africa and Asia now has to rely heavily on the directional properties of his loop to reduce what is called co-channel interference.

Region 2

The lowest channel in Region 2 is 540kHz. Spacing is 10kHz and the highest frequency in use is 1600kHz. There are 107 channels in this system and each is a multiple of 10kHz. This means that broadcasting is to be found on frequencies that end in 0kHz. For example, 930kHz, 940kHz, 950kHz and so on. In the United States the final zero is often omitted, domestic radios being marked 54 to 160.

Photo of the Skalans DX Clubhouse

There are a small number of stations that operate outside of the Region 2 plan. They are found on frequencies ending with the digit 5. These are called "split frequencies" by DXers in North America, the most notable occupant of a split being Radio St Pierre in 1375kHz. This station, which is located on the French islands of St Pierre et Miquelon near Newfoundland, is the only split in North America. There are a few in Latin America and the Caribbean though.

Playing the Systems

As you tune upwards from 531kHz you'll find in some places that Region 2 channels coincide with Geneva channels while in others the two can be as far apart as 4kHz. Coincidence starts at 540kHz and occurs every 90kHz, the sequence being 540, 630, 720 etc. Maximum spacing comes in pairs. There are 580kHz and 590kHz, 670/680, 760/770, 850/860 and so on up to 1570/1580. These are the DX slots in the crowded European medium wave band. It is possible to hear DX on other frequencies and you may not always hear DX in the slots, but it is here that the odds, for once, are in our favour.

DX

What can we hope to hear in those spaces? Try 590kHz for VOCM in St John's in Newfoundland, 770kHz for WABC in New York, 850kHz for WHDH in Boston, 860kHz for Radio Mundial in Rio de Janeiro, 940 for CBM in Montreal or Radio Jornal in Rio, 950kHz for CHER in Sydney, Nova Scotia or Radio Vision in Venezuela, 1030 for WBZ in Boston, 1130 WNEW New York, 1210 WCAU Philadelphia or Radio Coro in Venezuela, 1220 Radio Globo in Rio, 1300 CBAF Moncton New Brunswick, 1570 CKLM Montreal (in French), 1580 The Voice of America in Antigua.

Radio Stations in the United Kingdom

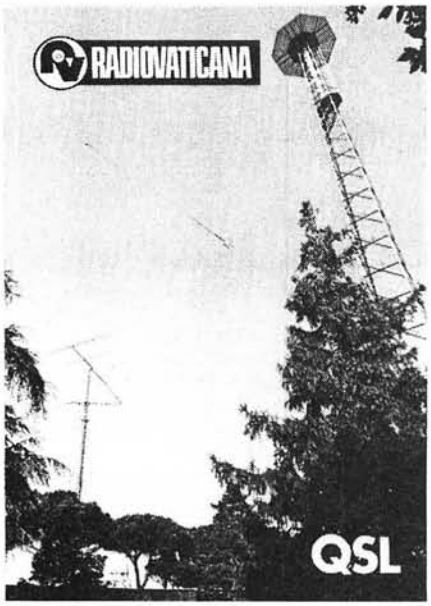
This is the title of a ten page A4 sized publication from the British DX Club. It lists all local, national and regional m.w. and v.h.f. broadcast transmitters in the UK. There is a complete list of station addresses, details of transmission times, QSL policies and a background section which summarises the history of the various broadcasting services and their output. The current issue includes details of most stations scheduled to open during the next twelve months and the club plans to update it annually. The booklet, which is compiled by Dave Kenny is available from the British DX Club, 55 Boundary Road, Worthing, Sussex, BN11 4LL for two International Reply Coupons from abroad or 30 pence in stamps for the UK.

QSL card from Radio Tirana
(Roddy Wishart)

DX Heard

Bolivia is a country seldom logged in the UK due perhaps to the remoteness of the country and the absence of high power transmitters. I was surprised therefore when I opened a letter from **Ian Anderson** of Lerwick in Shetland to learn of his reception of Radio Dieciocho de Mayo in Capinota which is on 1561kHz (nominally on 1560) with a power of 250 watts. This is really an outstanding catch. Ian's receiver is an FRG-7700 connected to an outdoor T antenna and the date was November 20 during the early hours. Ian would like to know if anyone else picked up this station that night when there was a good m.w. opening to South America.

Reception of Latin America, for some inexplicable reason, is often better in Scandinavia than in the UK and it may be that Ian is better placed than most of us for DXing this area. Nonetheless this is the best catch I can remember being reported by a *PW* reader and full marks to Ian for tuning around the top end of the medium waves. It is a part of the band worth exploring.



QSL card from Radio Vatican

(Adrian Butcher)

Vintage Receivers

Reader **T. W. G. Elsenham** writes to say that he was very surprised by "your remarks regarding condensers and wartime receivers in *Practical Wireless*" (December issue). I wasn't knocking these sets. I use one myself, a BRT-400 and I derive a certain satisfaction from keeping it going. It needs some sort of attention though a couple of times a year. It could be a worthwhile project overhauling an old set like the CR100 or the AR88 either of which would provide a first class DX machine for the medium waves. I once replaced the fixed resistors and paper capacitors in an R1155 which then gave excellent service for a number of years. Circuit diagrams and handbooks are available from Brooks, 5 Farrant House, Winstanley Road, London SW1 2EJ, or from The Vintage Wireless Company, 64 Broad St., Staple Hill, Bristol BS16 5NL. The latter can also supply valves not readily obtainable elsewhere and also high voltage decoupling capacitors.

For the non-technical user looking for a secondhand set, these vintage receivers are not a good buy. High voltages, heat, components that do not meet today's standards, all lead to high fault liability. Couple that to difficulties with spares and finding anyone to do repairs and the user could be in trouble. A regular trickle of letters from disappointed readers leads me to emphasize the point. Modern receivers have one great attribute—they are reliable and if you are unlucky then it should not be too difficult to have them repaired.

Readers' Letters

"Once I got my name mentioned on the air by Radio Berlin International but I missed it," writes **Roddy Wishart** who lives at 17 Church St., Lochwinnoch, Renfrewshire, Scotland. The programme our reader missed was *DX-tra* which was broadcast on September 27. If any reader has a tape of the broadcast would they please contact Roddy and let him make a copy of it. Postage and any other expenses will be refunded.

"I would like to tell you that you can hear a lot of British local radio stations here in Sweden, with very good reception," writes *PW* reader **Thomas Mohlin** who lives at Akala about two miles north of Stockholm. "Last week while participating in the Swedish Championship in DXing I heard the following stations: North Sound Aberdeen at 2300 on 1035kHz, Radio Wyvern in Hertfordshire at 0829 on 1530kHz and Radio Tay Perth at 0915 on 1584kHz. Stations heard by other DXers were Saxon Radio, Red Rose Radio, Radio Brighton and Radio Bristol." Thomas, who uses a BRT402 which is a variant of the BRT400, is chairman of the Skalans DX club and he enclosed a photo of the clubhouse which is rented from a church. Welcome on board Thomas, no problem at all with your English.

Short Wave Broadcast Bands

by Charles Molloy G8BUS

Reports: as for medium wave DX, but please keep separate.

Reader **H. Thompson** of St Helens asks how he can earth his receiver separately from the mains earth. He was surprised to find, on checking, that the earth terminal at the rear of his Trio R-1000 is connected internally to the mains earth.

In the UK, where there is three wire mains distribution, it is obligatory to connect the third wire—the mains earth—to exposed metal of an appliance. With a communications receiver, this means the case. Under no circumstances should this mains earth be disconnected; it is there in the interests of safety. The mains voltage in the UK can be lethal! A lower mains voltage together with lower safety standards produces a two-wire mains system in some countries, and in those circumstances the receiver earth terminal would be connected to earth. Otherwise there is little point joining an additional earth to the set unless, of course, it is operating on batteries.

Antennas and Earth

The earth terminal has another use. It enables the antenna input circuits to be connected to earth, if required. A typical arrangement is shown in Fig. 1. If you are using a dipole, then join the two wires from the antennas to A and A1 respectively. If you are using a random (long) wire, join the single wire from the antenna to A1 and connect a strap (piece of wire) between A2 and E. Sometimes better reception will be obtained with the strap omitted.

Short Wave Broadcasting

The short waves have, since the earliest days, provided a convenient way for a country to keep in touch with those of its nationals living abroad. For a number of years I was a regular listener to the BBC Overseas Service (now called the World Service) and even now, from the UK, I eavesdrop occasionally to their programmes. The BBC WS is on 5·975MHz in the 6MHz (49m) band, 24 hours a day. It should be audible in most parts of the UK in daylight and it is supplemented by 647kHz in the medium waves during part of the evening. Listeners abroad can obtain an up-to-date

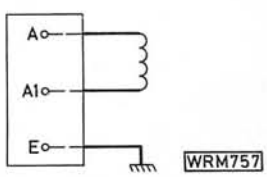


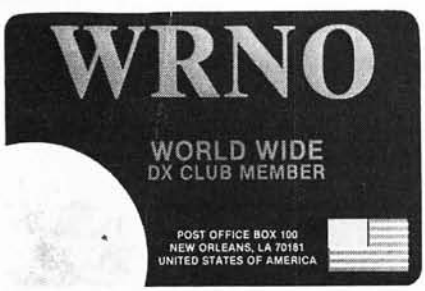
Fig. 1

schedule for their area by writing to the BBC, Bush House, London WC2B 4PH. London Calling, which gives details of the programmes of the WS, is obtainable from the same address.

American Service Personnel throughout the world are catered for by the American Forces Radio and TV Service (AFRTS). At the moment it is beamed to Europe daily on 15·43MHz from 1100 to 0100UTC. The address for further information and for reception reports is AFRTS Programming Center, 1061 N McCadden Place, Los Angeles, CA 90038, USA.

For Canadians Abroad—Pour les Canadiens à l'étranger is the title of the service, in English and French from Montreal to various parts of the world. According to their current schedule, *World at Six* and *As it Happens* are re-broadcast from the domestic service from 2200 to 2300UTC Monday to Friday on 9·76MHz, 11·925MHz and 15·325MHz. *Radio-Journal* and *Présent* can be found on 5·995MHz and 7·32MHz at 2230, again on Mondays to Fridays only. The station address is Radio Canada International, PO Box/CP 6000, Montreal, Canada, H3C 3A8.

This list is by no means exhaustive. Details of broadcasts from other countries and in other languages can usually be obtained from the nearest embassy of the country concerned. Next time we will have a look at broadcasts for a foreign audience, in particular those in English beamed to Europe.

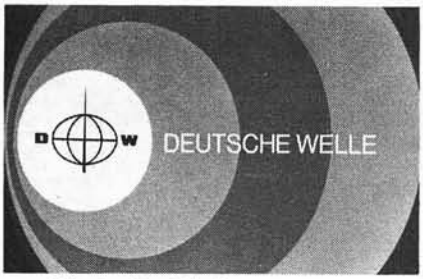


WRNO *(Adrian Butcher)*

Sony ICF2001

Reader **Jim Birkett** (London) has one of these receivers which he uses with a "simple 5m antenna." He has pulled in a number of stations at the h.f. end of the spectrum, including six on the 26MHz (11m) band during the early afternoon. Jim comments on the excessive battery consumption, caused presumably by the electronics associated with the push-button keyboard tuning and digital display. According to the manufacturer, this receiver can also be run from the mains or from a 12-volt car battery, via an adaptor, so perhaps this is the answer to the problem.

It is worth taking account of the power supply required, and the power consumption, when purchasing a receiver. Dry batteries are expensive and can lead to high running costs even if the receiver



Deutsche Welle *(Adrian Butcher)*

power consumption is not excessive. On the other hand a mains-only receiver is liable to mains interference. Personally, I prefer a set that gives a choice of mains or battery operation, and preferably one that will work from a car battery as well. The DX 160 works off the mains or 12 volts.

George Chapman (Gloucester) is another ICF2001 user. He "finds it very good." At 0800 every morning he presses the digits 9570 to obtain Radio Australia (9·57MHz) which he listens to until 0900.

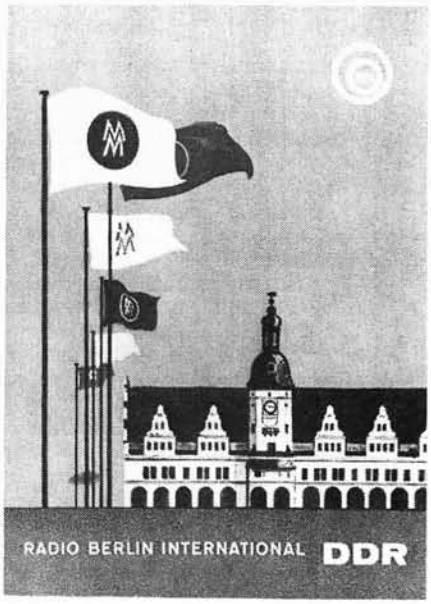
Counting Channels

What do you mean by "Counting Channels," asks **Adrian Butcher,** who, incidentally, has provided the QSL cards this month. Counting channels is a crude but sometimes effective method of using known stations as markers to help in tuning around a band. For example, the BBC WS is on 5·975MHz and Radio Netherlands is on 5·955MHz. The channels between them are 5·97MHz, 5·965MHz, 5·96MHz. On the short wave broadcast bands, stations are allotted channels which are spaced 5kHz apart and it is sometimes possible to count the channels between two known stations in order to set the receiver onto a particular frequency or to find the frequency of an unknown broadcast. The snag with this method is that it is easy to miss a channel either because nothing can be heard on it or because of interference.

If you have a receiver with a logging scale then there is no need to count channels. All you have to do is to take the log scale reading of the two known stations and then work out the log scale reading for the channels in between. Counting channels is probably a technique more suitable for the medium wave DXer, but it does have a use on the short waves as well.

WRNO

This is the callsign of a new broadcaster in the USA which came on the air earlier this year. Located in New Orleans, WRNO transmits around the clock. At the time of writing it can be found on 15·355MHz between 1800 and 2000, on 17·895MHz between 2000 and 2100 and on 9·515MHz between 2315 and 0200. On Sundays there is a programme for DXers at 2330.



Radio Berlin International
(Adrian Butcher)

The address for reports, which are welcomed but should be accompanied by an International Reply Coupon, is WRNO World Wide, PO Box 100, New Orleans, LA 70181, USA. Their QSL card is interesting as it comes from four radio amateurs whose callsigns are WA5HSI, WA5VCF, K5FUT, WA5UUD. The station, though, is not an amateur one. It is commercially owned and obtains its revenue from advertising. The programmes could be classified as music and entertainment.

Readers' Letters

In reply to **Andrew Wallace** of London. Sorry, but I cannot handle reports about pirates either here or in the medium wave section. It is illegal in the UK to listen to these stations.

From Coolaght in Eire comes an enquiry from reader **John Corless** who would like to know the address of Radio Peking. Surprisingly, the answer is Radio Peking, Peking, China. Many stations do have a fuller address, but this is the pattern to follow if you are writing to a major broadcaster and do not know the address. Postal authorities are generally quite efficient in tracking down addressees. I once received a letter which had the address Southport England. I don't know whether to be flattered or not!

An FRG-7700 with Partridge Mini-Multiband antenna is in use at Chorley by **Eddie Gaskell,** who is amazed at the results. He picked up Radio New Zealand in the morning on 15·485 (it signs off at 1115 on this frequency). Reader **Kevin Last** (Newmarket) reports hearing Radio Australia on 9·77MHz at 1700 (details of receiver not mentioned). Finally, thanks to **Dave Fairhurst** (Enfield) for the information on the 1962 short wave car radio converter. Clearly the idea is not new.

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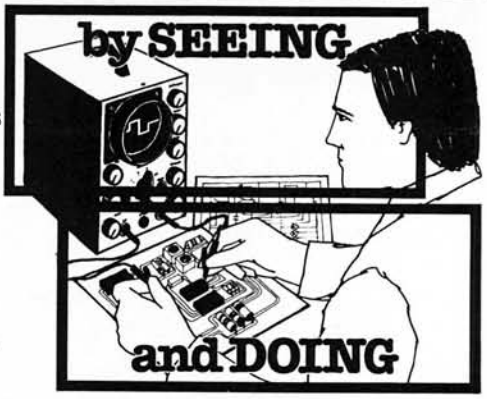

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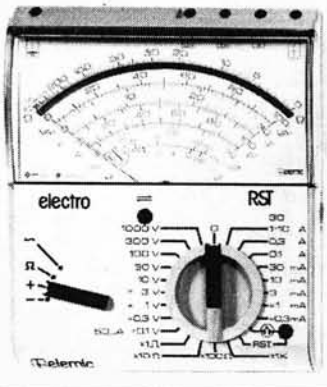

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VHF Bands

by Ron Ham BRS15744

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

We are always pleased to hear from amateur radio enthusiasts overseas and this month's report about a couple of microwave stations in Czechoslovakia, kindly sent by **John Tye**, should fascinate our readers with a similar interest.

Solar

Using his spectrohelioscope on November 22, **Cmdr Henry Hatfield,** Sevenoaks, observed 2 solar flares and as one of these was by a sunspot group half way between the central meridian and the western limb of the sun, there was little surprise when both Henry and I recorded a severe radio noise storm at 136 and 143MHz respectively. At times the radio noise was so strong that bursts were heard in the 28MHz (10m) band with no more than a long wire antenna feeding the receiver. Although overcast skies frequently hamper visual observation of the sun, Henry did get a look around December 9 and counted 7 sunspot groups and an eruptive prominence on the east-limb with a bandwidth of 5 angstroms. Further bursts of radio noise were recorded on November 27, a mild noise storm from the 30th to December 2 and another much stronger radio noise storm began on December 5 and varied in intensity until the 16th. **Ted Waring**, Bristol, counted 14 sunspots on Nov 25, 17 on 29th and 30 on Dec 6.

Aurora

With all the solar activity there was little surprise when a large aurora manifested during the afternoon of November 24. At 1445 I counted 16 radio and television broadcast signals, with the auroral burble, between 48 and 70MHz and by 1719, with my beam north-east, the score was 38 stations between 48 and 70MHz and 46 between 70 and 100MHz, thus playing havoc in Band II. The event was still going well at 1745 when I heard tone-A c.w. and s.s.b. signals, so strongly in the 144MHz (2m) band that I only used a dipole antenna to hear them.

During the event, **Dave Coggins**, Knutsford, received auroral signals from the 28MHz beacons in Germany DF0AAB and DL0IGI, Norway LA5TEN and the UK GB3SX as well as s.s.b. signals from Finland, France, several Gs and Holland. "Auroral reflected signals were heard as low as 3·5MHz (80m) writes Dave, who also logged another small event on December 7.

The alarm was sounded again around 1750 on November 29 by members of Phil Hodson's auroral alert group.

The 50MHz (6m) Band

Between 1158 and 1257 on November 12, **David Newman** G4GLT, Leicester, heard the south-American beacon FY7THF on 50·038MHz and again around a similar time on the 13th. At 1320 on the 13th, **Ken Ellis** G5KW, in a caravan at Lands-End, had a crossband, 50/28MHz contact with WB1FUB which, as David Newman said, "was the first G to W crossband QSO of the 1982 Autumn DX season".

During the late afternoon of December 7, G3WBQ, G4GLT, G4JCC and G5KW had crossband QSOs with VE1YX and **Gordon Pheasant** G4BPY, Walsall, worked crossband with 1 station in Canada and 4 in the USA. "This can certainly be described as a major 50MHz opening with well over 2 hours of propagation at an unexpectedly late time" writes David Newman who was involved in another major event at midday on the 11th, as was **Sam Faulkner,** Burton-on-Trent, who heard the beacon FY7THF, peaking 559 at 1225. "At 1325 things started to happen to the west" said David and c.w. crossband QSOs were had with K1WHS, K2MUB, K8MMM, N0KV/4, W1IMM, W1RJA, WA1TBV and W2IDZ.

Gordon Pheasant worked several of these stations as well as hearing signals, on 50MHz, from KA1PE, W1GCI, WB1DNS and W2IDZ, before the band closed to the States at 1528.

The 28MHz Band

"After the band closed around 1800 on November 21, it re-opened again around 2130" writes Dave Coggins, who, during this later opening logged AJ7Y, K7RJ, K7LXC, N6TR, VE7DXI, W7KE, W7NI and his best catch KH6DQ in the Hawaiian Islands. During the period November 10 to December 8, Dave concentrated his efforts on the 28MHz band and like many of us heard lots of DX including JA, VK and ZL.

Harold Brodribb, St Leonards-on-Sea, reports massive reception of stations from the USA on November 23 when he logged Ws 1,2,3,4,5 and 8 and heard a WA say "Band wide open, every space on the band in use". Harold also received strong signals from Canada on the 28th and north-America in general on December 2 and 10th. Around 1050 on the 10th, I received strong signals from the Hong Kong beacon VS6TEN and a 59 s.s.b. signal from VS6IW and at 0915 on the 14th, the signals from a VK4 were very strong and he was giving 59 reports to a group of Gs that he was working.

28MHz Beacons

Up in Cheshire, Dave Coggins receives a better signal from the Sussex beacon, GB3SX 28·216MHz, when his beam is pointing north-east and suggests that there is some form of reflection in that area. Dave made a study of this frequency, between 2000 and midnight, after the band had closed and has produced the following observation. "If I listen on 28·216MHz for a period, 'pings' and bursts of signal from the Sussex beacon are heard. They are mostly fairly weak and never move the 'S' meter; however, when I hear these bursts of signal, I immediately swing the dial to 28·205MHz where, more often than not, I also hear DL0IGI several seconds later. All this happens when the band is completely dead". A most interesting report Dave, any ideas readers? Dave also reports that the signals from DK0TE, DL0IGI and HG2BHA were extra strong on December 5 and 6.

Reports that signals from the fairly new Spanish beacon, EA6AU, were heard in the UK on November 11, 13, 14, 20 and 21, came from **Susan Beech** RS50969, Dollar, Scotland, Dave Coggins and **W.G. Kelly,** Belfast.

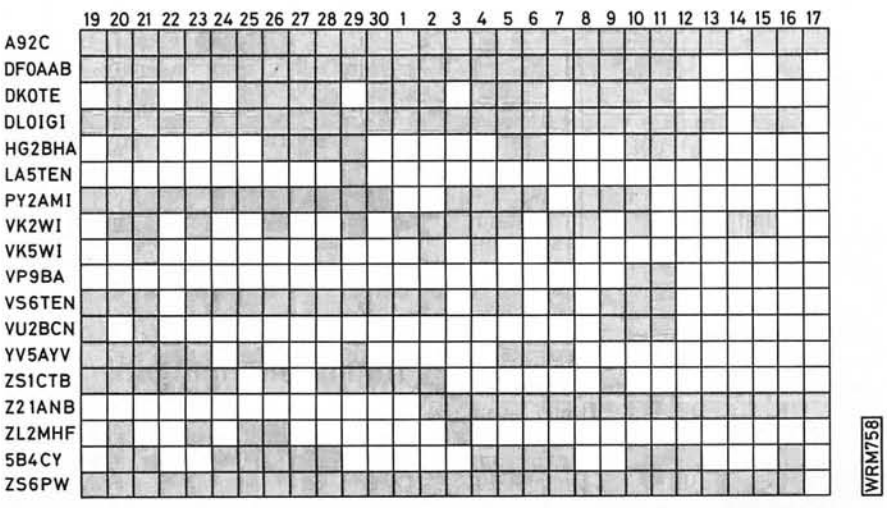

Fig. 1: Distribution of beacon signals

Norman Hyde G2AIH, Epsom Downs, believes that the New Zealand beacon ZL2MHF was heard on several days in November and early December, but was not always sending its callsign. Norman, along with Susan Beech, Dave Coggins, **John Coulter** Winchester, Bert Glass BRS32693, Plymouth, Henry Hatfield, Ted Waring and I, contributed to the list of beacons heard at some time during the days indicated in Fig. 1.

Tropospheric

Apart from most of November 19 and 20th, the atmospheric pressure, measured at my QTH, remained below 30·0in (1015mb) from 1600 on the 21st until 1400 on the 28th when it began to climb rapidly, reaching 30·5 (1032) by midnight on the 29th. It stayed around 30·4 (1029) until 0400 on December 5 when a steady fall began, holding around 30·2 (1022) until midnight on the 6th and then fell sharply to hover around 29·5 (998), sometimes lower and was still low on December 18 when this report closed.

Members of the Flight Refuelling Amateur Radio Society took part in the RSGB's 144MHz Fixed Station contest on December 5 from their club HQ at Merley, 45m a.s.l. Among the operators using the club's call-sign, G4RFR, were G2KV, G4LFM, G4JET, G8MCP, G8MCQ and G8YCA. Using G4MHF's Yaesu FT225R, with muTek front-end board and two 14-element long Yagis, they made almost 200 QSOs which included stations in EI, GD, GW, GJ and PE and their best DX was GI4GVS near Belfast, a distance of 509km.

Band II

Conditions in Band II improved when the pressure went high at the end of November and early December and deteriorated again when it fell. At 1618 on November 29, **Alan Beech,** Dollar, Scotland, received Radio Newcastle and at 0800 on the 30th added Radio Cleveland to his list. Down in Presteigne, **Simon Hamer** heard BBC Radio Northamptonshire and ILR Piccadilly Radio on the 29th and Belgium BRT11 Egem, BBC Radio Solent, ILR Thames Valley and Chiltern Radio and France TDF-Cultur from Brest and Lille on the 30th. DX was also good for Harold Brodribb who counted 12 French stations, between 88-100MHz, on November 30, 8 on December 1, 15 on the 2nd, 9 plus two Dutch on the 3rd, 18 on the 4th and 10 on the 5th. Another Band II enthusiast is **Andrew Wallace** who uses a National Panasonic 110LBE with a telescopic antenna on the top floor of his home in London. Andrew's particular interest is listening for local stations in the Birmingham and Liverpool areas.

I am reminded that reception reports for the French local station RBL on 103·7MHz should go to R.B.L., PO Box 319, Edenbridge, Kent.

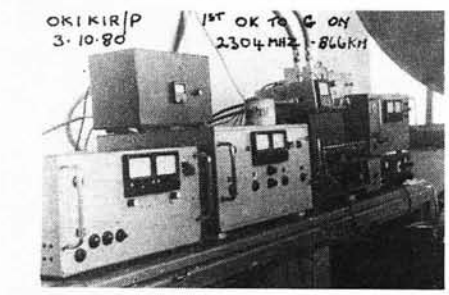

Fig. 2: Equipment used by OK1KIR/P

Fig. 3: UHF and microwave antenna used for field days

RTTY

At 1600 on November 19, **Peter Lincoln** BRS42979, Aldershot, copied ARRL news on 28·095MHz, firstly on 45·5 baud and then at 110 ASCII. Between November 11 and December 8, **Norman Jennings,** Rye, Sussex logged RTTY signals from 29 European countries, including the UK, plus ZB4, on 21MHz and 22 countries on 3·5MHz. His best DX during this period was ST25A and TU2GA on 14MHz, KH6AKW and XT2AU on 21MHz and ZS6 on 28MHz and although Norman copied JAs, VEs and Ws on 14MHz he remarked, "more on 21 than 14 this time". Between November 19 and December 16, I logged RTTY signals from 13 countries, EA, EI, F, HB9, IT9, I, LX, OK, ON, OZ, SM, YU and 3A on 14MHz and 3 countries, G, N7 and OE on 21MHz. Among the interesting QSOs I read were, IK5AAX and N7CPL at 1744 on November 20, EA5COU and OE4TSA at 0959 and DK4KK and HB9AVK at 1330 on the 21st and IT9YHR and OZ1GRF at 0815 on December 13. During November Peter Lincoln received RTTY signals from AG4T/9, KR6I and most of Europe included EA, DJ, I and F.

Those readers wishing to take part in the "BARTG Spring RTTY Contest", which takes place between 0200GMT on March 19 and 0200GMT on the 21st, should send an A4 stamped addressed envelope, for details to Ted Double G8CDW, 89 Linden Gardens, Enfield, Middx, EN1 4DX. The event covers the 3·5, 7, 14, 21 and 28MHz (80, 40, 20, 15 and 10m) bands and should prove interesting to single and multi-operator stations and s.w.l.s who are all eligible to take part.

Microwaves

John Tye G4BYV, Dereham, Norfolk, received a photograph from OK1DAI of the equipment used, Fig. 2, by OK1KIR/P to commemorate their 2·3GHz (13cm) QSO in October 1980. Some time later John worked OK1AIY/P on 2·320GHz, who also sent photographs of the antennas, Fig. 3 and equipment, Fig. 4, for 432MHz, 1296MHz and 2·3GHz, used from a site in HK square, 1411m a.s.l. during the 1982 UHF/SHF field day. "All of the station is home-made by Pavel, the owner of the callsign" writes John who tells me that the "X" in Fig. 3 indicates another site, sometimes used, known as SNEZKA some 1600m a.s.l. in HK29b.

John Williams, Cheltenham, sent me a press cutting dated December 11 about the microwave link that has been set up between Britain and West Germany so that the BBC's *Nine O'Clock News* can be seen live by our troops serving on the Rhine.

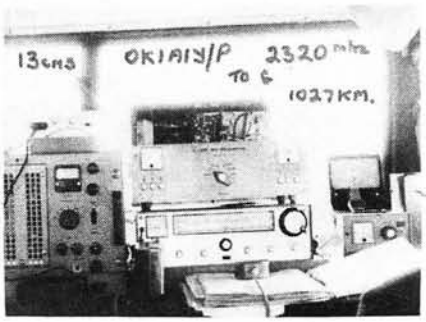

Fig. 4: 2·3GHz gear used for portable work

Station Information

Congratulations to my fellow Mid-Sussex Amateur Radio Club member, **Tony Bailey G3WPO,** on receiving the Ostermeyer Trophy from the RSGB for the second year running. Good luck for the hat-trick Tony, Hi.

"It is hoped to form a Raynet group in central region" writes Susan Beech and says that readers in that area of Scotland who are interested should contact Graham Campbell GM6JEQ, 4 Kippendadavie Lane, Dunblane, Scotland.

Among the members of the newly formed Guernsey Open Channel Association are **Richard Bird** GU6NBS and **Hillary Bridle** GU4IUW. The object of the club is to promote all aspects of radio communication and within this category, many members are active on 934MHz CB and some are in contact with stations in other parts of the UK. Reports about 934MHz activity are welcomed by the GOCA and details of the Association and their award scheme, are available by sending an SAE to P.O. Box 206, Castel, Guernsey, CI.

TV

by Ron Ham BRS15744

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

More amateur television activity in central-Scotland, new equipment for Tim Anderson, 3D colour on SSTV and pictures from around the world by satellite. My post bag is often full of surprises, yet, knowing the ability and resourcefulness of many of my readers, I am not really surprised by anything they achieve.

Amateur Television

"After many years of activity in the shack, I have finally made it on the air as an amateur TV station," writes **Norrie MacDonald** GM4BVU, Hamilton, who, with a Microwave Modules transmitter and MM432/100 linear, running 60W of video, worked GM3HBT, GM3ULP and GM6AOR during his first week of operation. "I am very keen to encourage video in the central Scotland area," says Norrie, and believes that "Amateurs should be seen as well as heard".

"A couple of nights ago," writes **Richard Thurlow** on December 11, "G6OHM, who was working a G4 in Peterborough with 4 watts on 432MHz ATV, heard the G4 say that he was receiving 14MHz SSTV from a station in Bermuda working a W4. He persuaded the G4 to point his ATV camera at the SSTV monitor and thus, G6OHM was able to see perfect SSTV pictures".

From Victoria, Australia, **Wenlock Burton** tells me that he is equipped to receive signals from the ATV repeater VK3RTV and is monitoring this and commercial TV stations when the tropospheric conditions are favourable.

Tropospheric

During the memorable tropospheric opening early in July 1982, **Nicholas Wythe,** Folkestone, received a test card from a French TV station at Dunkerque (Fig. 1) on Ch. 39 and a world cup football announcement (Fig. 2), from RTBF, Anderlues, Belgium, on Ch. 61.

Another useful set which I have added to my station is the Plustron TVR7C which has a variable tuner for the u.h.f. channels 21–69 and a switched turret tuner, with a fine tuning control, for the v.h.f. channels E2 to E12. During the late October opening, this switching arrangement proved very successful for rapid channel changing and for seeing a direct comparison between the signals which were coming up within the Band III channels E5 to E12. This set has a 7in screen, a long and medium wave and v.h.f. radio and a cassette recorder built in, and was on sale for around £100.

In reply to his DXTV report, **Simon Hamer,** Presteigne, received a letter from Dr Joachim Herzer of the International Relations Office of ARD, saying they were pleased to hear about the reception of their pictures outside Germany. Dr Herzer also sent Simon a booklet giving details of the ARD television system.

"On December 1, Band III conditions were quite interesting, with PTT NED 1 test card on Ch. E6 at 1300 and programmes at 1900", writes **Sam Faulkner,** Burton-on-Trent, who also logged pictures from the German station ARD on Ch. E9, Denmark, on E10 and Radio Telefis Eireann on Chs. D, G, H and J. At 1915, Sam logged the ZDF caption on Ch. 35 and later the programme *Heute-Journal* on Chs. 35 and 39.

Band I

At 0825 on November 25, I received a very strong signal from Poland on Ch. R1 with their clock, embossed with the caption TP, showing 0925. This was followed by a test card and at 0830 a YL announcer appeared and then a programme with speakers on a platform and questions coming from members of a large audience. During this short sporadic-E opening I received Ch. R1 sound on 56·25MHz and counted 11 strong signals from east-European broadcast stations within the range 66 to 72MHz. On several days between November 19 and December 17 there were frequent long and short bursts of signals, identified by their test cards, from Austria, Czechoslovakia, Finland, Norway and Poland, along with a variety of unidentifiable captions and pictures.

"Once more it's the sporadic-E season," writes Wenlock Burton on November 24, who has seen pictures from TV1, New Zealand, during several sporadic-E events in mid-September. Wenlock has moved his gear into the garage, because his bedroom was too small and after checking his receivers, says he is very pleased with the performance of his Toshiba C531 colour set on Band I with its own telescopic antenna. **Tim Anderson,** Stroud, has added a Thorn 1500 receiver and Hugh Cocks tuner and a Luxor Skantic with the Bands I, III and u.h.f. tuner to his DXTV station and sent me a picture of the Czechoslovakian PRAHA caption, Fig. 3, which he received during a sporadic-E disturbance on August 12, 1982.

Both Sam Faulkner and I saw the typical blurry images, on Ch. R1, caused by an F2 opening between 1125 and 1400 on December 10. At 1316 I saw a smeary multi-image male announcer and Sam noted that several radiotelephone signals were occupying the lower end of Band I.

For about half an hour around 1300 on the 11th, Sam received pictures from Portugal and Spain via sporadic-E and at 1125 on the 12th, F2 type signals were again present on Ch. R1.

Satellite TV

From his home in Sussex, **Hugh Cocks** is active in the field of satellite television and among the pictures he has received, via the low power 4GHz band Intelsat leased channels, are those from Argentina (Fig. 4), Morocco (Fig. 5), Oman (Fig. 6) and Spain (Fig. 7). The equipment Hugh has developed for the reception of these weak signals includes a 3m dish antenna with a feedhorn feeding a low noise amplifier, a down converter to u.h.f., a 35MHz i.f. and a quadrature f.m. video demodulator with a bandwidth restricted to about 4 or 5MHz. "The sync pulses present a problem because the demodulator with its restricted bandwidth

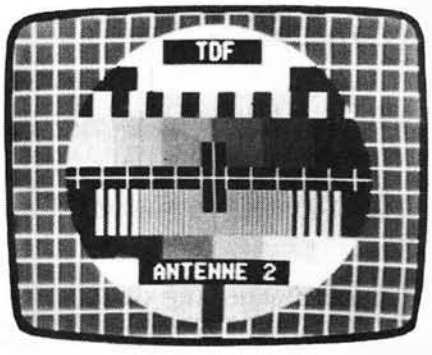

Fig. 1: Test card received by Nicholas Wythe

Fig. 2: World Cup football announcements received by Nicholas Wythe

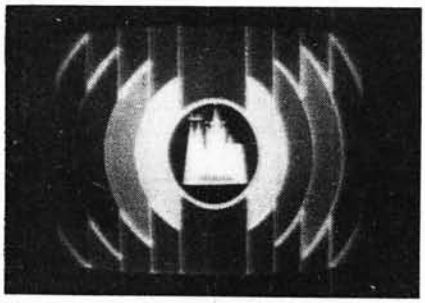

Fig. 3: PRAHA caption received by Tim Anderson

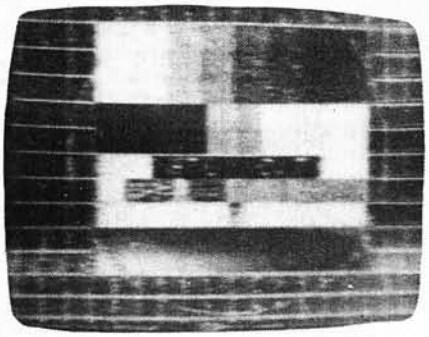

Fig. 4: Test card from Argentina received by Hugh Cocks

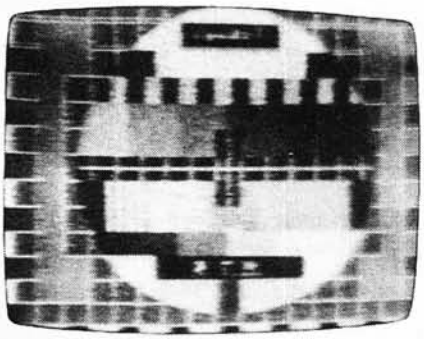

Fig. 5: Test card from Morocco received by Hugh Cocks

Fig. 6: Picture from Oman TV received by Hugh Cocks

Fig. 7: Picture from RTVE Spain received by Hugh Cocks

Fig. 8: ZS6BTD received on SSTV by Peter Lincoln

Fig. 9: Italian SSTV signal received by Peter Lincoln

Fig. 10: SSTV signal from Finland received by Peter Lincoln

cannot 'see' them so a separate sync pulse demodulator is used," writes Hugh, who has also received pictures via the Russian Gorizont system.

SSTV

Congratulations to G3NOX and G3OQD who were awarded the Wortley Talbot Trophy by the RSGB for their outstanding work in the field of colour SSTV. I am told that G3NOX is already transmitting 3D colour SSTV signals on 144MHz and **Richard Thurlow,** who watched the signal with the aid of the coloured glasses from the *TV Times,* was very impressed with the results.

Between October 15 and December 11, Richard worked 26 new first time stations and had several 2-way QSOs in colour. The best SSTV DX for **Peter Lincoln** in Aldershot on 28MHz during November was ZS6BTD, Fig. 8, while in contact with a station in the USA. Peter also logged pictures from several countries, including Italy, Fig. 9; Finland, Fig. 10; Spain and Yugoslavia.

General Information

Fraser Lees, Ringmer, Sussex, returned from a trip to Norway in December and while there he found out that when the word Televerket appears on a Norwegian test card, which many of us have seen, it means that work is being done to that particular transmitter.

Readers wishing to join the British Amateur Television Club, or purchase a copy of their new handbook, should write to Mr B. Summers, 13 Church St, Gainsborough, Lincs.

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Plastic 40mm Travel Mono

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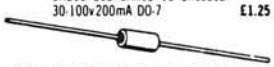

SX44 10 5A SCR's TO64. 3 x 50v, 3 x 100v, 2 x 200v, 2 x 400v. Super value less than ½ price **£1**

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Miniature round nose side cutters — insulated handles 4¼inch length. Order No:Y043.

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4	2½	2	163	83p
3	2	1	164	87p
8	6	3	166	£1.68
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SIZE "L	W	H	Order No	Price
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TO220

Positive +	Negative +
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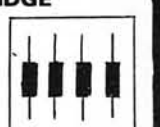

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Dims:- 160 x 110 x 50mm.

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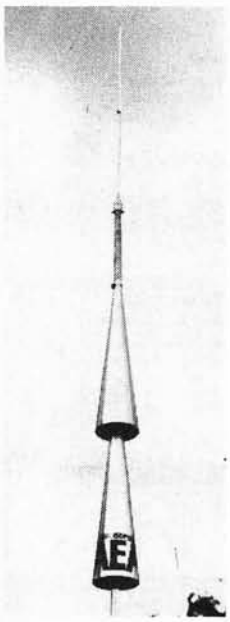

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Isopole 144 (2 metres) **Price: £32.50 plus £2.50 P&P.**
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SD1127	4w	12dB	12	175MHz	£2.80
2N6080	4w	12dB	12	175MHz	£5.97
SD1143	10w	10dB	12	175MHz	£8.85
2N6081	15w	6.3dB	12	175MHz	£8.86
2N6082	25w	5.7dB	12	175MHz	£9.49
2N6084	40w	4.5dB	12	175MHz	£13.90
SD1428	45w	8.5dB	12	175MHz	£25.12
SD1416	70w	6.7dB	12	175MHz	£38.48
SD1477	100w	6.0dB+	12	175MHz	£45.63
2N5590	10w	5.2dB	13.6	175MHz	£7.85
2N5591	25w	4.4dB	13.6	175MHz	£9.15
2N5944	2w	9dB	12	470MHz	£7.47
2N5945	4w	8dB	12	470MHz	£9.85
SD1135	5w	7.5dB	12	470MHz	£7.49
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74LS05	12
74LS08	12
74LS10	12
74LS11	12
74LS14	25
74LS20	13
74LS30	12
74LS32	13
74LS37	14
74LS38	14
74LS42	28
74LS47	36
74LS51	14
74LS73	18
74LS74	18
74LS75	18
74LS76	15
74LS85	40
74LS86	16
74LS90	22
74LS92	30
74LS93	22
74LS107	20
74LS112	20
74LS123	34
74LS125	24
74LS126	25
74LS132	34
74LS136	23
74LS137	90
74LS138	25
74LS139	27
74LS145	70
74LS148	75
74LS151	40
74LS153	40
74LS153	40
74LS155	30
74LS156	36
74LS157	27

74LS161	36
74LS163	36
74LS164	30
74LS165	50
74LS166	60
74LS173	55
74LS174	45
74LS175	40
74LS191	36
74LS193	40
74LS195	39
74LS196	48
74LS197	60
74LS221	48
74LS240	55
74LS241	55
74LS242	55
74LS243	55
74LS244	55
74LS245	70
74LS251	30
74LS253	30
74LS257	30
74LS259	55
74LS266	20
74LS273	55
74LS279	30
74LS299	150
74LS367	30
74LS368	28
74LS373	60
74LS374	55
74LS378	60
74LS393	45

7400

7400	11
7401	11
7402	11
7403	12
7404	13
7405	15
7406	20
7407	20
7408	14
7409	14
7410	14

7413	18
7414	20
7420	15
7430	14
7440	14
7442	32
7443	60
7444	60
7447	36
7448	40
7450	14
7451	14
7453	14
7454	14
7460	14
7470	24
7472	24
7473	26
7474	30
7475	25
7476	25
7480	35
7482	65
7482	65
7483	38
7485	60
7486	18
7489	159
7490	20
7491	35
7492	25
7493	25
7494	35
7495	35
7496	34
74100	80
74104	45
74107	20
74121	24
74123	34
74125	34
74126	33
74141	51
74151	40
74154	60
74155	39
74156	40

74157	30
74190	45
74191	45
74192	45
74193	45
74393	95

CMOS

4000	10
4001	10
4002	12
4006	50
4007	14
4008	32
4009	24
4010	24
4011	11
4012	16
4013	20
4014	46
4015	40
4016	20
4017	32
4018	45
4019	25
4020	42
4021	40
4022	39
4023	14
4024	32
4025	13
4026	80
4027	20
4028	39
4029	45
4030	15
4041	40
4042	40
4043	40
4044	40
4046	46
4049	23
4050	23
4060	45
4069	13
4070	13
4071	13

4072	13
4081	13
4082	13
4093	20
4510	45
4511	45
4514	110
4516	53
4518	40
4520	50
4543	75
4583	90

All above prices are NET and shown in pence

ANALOGUE

709C5	49
709C14	44
723C14	36
741C5	57
741C8	16
741C8/S	56
741C14	47
747C14	65
748C8	35
741S	56
1458C5	62
1458C14	40
7106	450
7107	500N
555	10N
7555	80N
556	45
CA3046	70N
CA3080E	80N
CA3130E	90N
CA3140E	45N
LM301AN	25N
LM308N	60
LM317K	295N
LM324N	32
LM348N	65
LM380N	66
LM380N8	80
LM381N	145

LM382N	115
LM3900N	50
LM3914N	250
LM3915N	200
NE555V	23
NE556A	45
NE567N	104
RC4151NB	80
S041E	290
S041P	121
S042E	364
S042P	138
S89	11.23
S178B	31.00
S187	13.28
S566B	214
S576A	235
S576B	235
S576C	235
S576D	225
S1469	468
SAB0600	302
SAB3209	429
SAB3210	311
SAB3211	168
SAB3271	329
SAB4209	497
SAB8256C	35.40
SAD1024	9.00N
SAJ131	238
SAJ141	278
SAJ205	810
SAS231W	261
SAS251	142
SAS580	198
SAS590	196
SDA5680A	15.55
TAA761	104
TAA761A	49
TAA765A	62
TAA861	103
TAA865A	59
TAA2761A	72
TAA4761A	113
TAA4765A	120

TAB1041K	187
TBA120AS	62
TBA120U	72
TBA800	75
TBA10S	75
TBA820	75
TBB1458	62
TBB1458B	40
TCA105	120
TCA105B	108
TCA105G	140
TCA250A	185
TCA205K	200
TCA335A	66
TCA345A	109
TCA345W	177
TCA671	131
TCA780	211
TCA871	114
TCA955	228
TCA965	136
TCA965K	170
TCA971	92
TCA991	80
TCA991K	100
TDA2002	120
TDA2003	126
TDA2030	150
TDA4050B	144
TDA4290	169
TDA4600	184
TDA4700A	546
TDA4713A	435
TFA1001W	252
TL071CP	45
TL072CP	75
TL074CN	120
TL081CP	46
UAA170	165
UAA170L	152
UAA180	165
UAA190	141
XR2206	520
ZN414	85
ZN424P	99
ZN425E	350

CRYSTALS

(in MHz)			
0.032768	102	4.433	128
0.100000	453	5.000	157
1.000	453	5.026	128
1.8432	320	6.000	157
2.000	268	6.144	157
2.4576	268	6.5536	128
3.2768	188	8.000	1.88
3.579	128	8.867	128
4.000	102	10.000	157
4.194	128	18.432	188

ZENER DIODES

400mW/2.7-30V	7p
1-3W/3.3-100V	15p
20W/7.5-75V	£1.98

CONNECTORS

DIN AUDIO

Pins	plug	skt
2	8p	8p
3	14p	8p
4	17p	14p
5 (180°)	17p	11p
5 (240°)	20p	8p
6	18p	20p
7	19p	30p

JACK PLUGS SKTS

MONO ¼"
chrome P1 53p 34p 42p
plastic P2 32p 14p 20p

STEREO ¼"
chrome P3 81p 52p
plastic P4 60p 15p 20p

MONO

3.5mm	18p	14p
Stereo	23p	42p

0 – SERIES

	Plug	skt	hood
9	78p	104p	92p
15	106p	140p	96p
25	141p	205p	110p
37	199p	298p	122p

IDC Connectors

DIL

14 way	103p
16 way	117p
24 way	170p
40 way	265p

PARALLEL TYPE

	plug	skt
16 way	1.10	1.30
20 way	1.25	1.45
26 way	1.50	1.70
34 way	1.65	1.95
40 way	1.85	2.10

Plugs have retainers
Sockets have strain relief

IC SOCKETS

Pins	Each	25 for
8	6	120N
14	8	160N
16	9	180N
18	11	220N
20	12	240N
22	14	280N
24	15	300N
28	18	360N
40	25	500N

CAPACITORS

Polystyrene, Siemens
5% Tolerance 160V
5, 7, 10, 12, 15, 18, 22, 27, 33, 39pF **15p**; 47, 56, 68, 82, 100, 120, 150, 180, 220, 270, 330, 390, 470, 560, 680, 820pF, 1n, 1n2, 1n5, 1n8, 2n2, 2n7, 3n3, 3n9, 4n7, **10p**; 5n6, 6n8, 8n2, 10n, **13p**

Ceramic Very small 1.8, 2.2, 2.7 etc, up to 1n **5p each**. 1n5, 2n2, 3n3, 4n7, 6n8, **5p**; 10n, 22n, **6p**; 33n, 47, **7p**; 100n, **8p**

Polyester, Siemens Layer Type 7.5mm lead spacing 100V
1n, 1n5, 2n2, 3n3m **6p**; 4n7, 6n8, 8n2, 10n 12n, 15n, 18n, 22n, 33n, 47n, **7p** 56n, 68n, **7p**; 82n, 100n, **9p** 120n, 150n, **15p**; 180n, 220n, **12p**; 270n, 330n, 330n, 390n, 470n, **15p**; 560n, 680n, **24p**; 10mm spacing 1uF **25p**; 15mm spacing 2u2 **35p**; 22.5mm, spacing 1uF 400V **50p**; 3.33uF 100V **69p**; In depth stocks.

ELECTROLYTICS

1/63	9	1000/10	19
2.2/25	13	1000/16	26
2.2/63	9	1000/25	36
4.7/63	9	1000/40	44
4.7/100	14	1000/63	76
6.8/40	9	2200/6	9
10/6	13	2200/16	44
10/25	10	2200/25	60
10/40	11	2200/40	73
10/63	12	4700/16	72
10/100	15	4700/25	90
22/10	10		
22/25	11	**TANTALUM BEADS**	
22/40	14		
22/63	15	0.1/35	13
22/100	16	0.22/35	13
47/3	3	0.47/35	13
47/10	11	1.0/35	13
47/25	10	2.2/16	13
47/40	15	2.2/35	16
47/63	15	4.7/16	16
47/100	18	4.7/35	18
100/3	3	6.8/16	18
100/10	12	6.8/25	24
100/16	12	10/6.3	16
100/25	12	10/16	18
100/40	15	10/25	18
100/63	20	22/6.3	18
100/100	27	22/16	30
220/10	16	22/25	30
220/16	16	33/6.3	24
220/25	16	33/10	30
220/40	20	47/6.3	30
220/28	28	100/10	66
220/100	42	For full ranges	
470/10	19	of very many	
470/16	19	other types	
470/25	19	please see	
470/40	27	Cat 82 and/or	
470/63	45	current price	
470/100	73	list.	

BOXES

High quality Black ABS plastic or die-cast plain or stove grey.

L	W	D	ABS		Plain		Stove Gr	
50	50	25	–		5001P	90p	5001	123p
100	60	25	2002	96p	5002P	117p	5002	154p
113	63	31	2003	109p	5003P	143p	5003	184p
121	66	40	2004	115p	5004P	162p	5004	210p
152	82	50	2005	134p	5005P	216p	5005	268p
192	113	61	2006	235p	5006P	314p	5006	401p

VERO RANGE plastic boxes

L	W	D		
72	47	25	21024	54p
120	50	35	21390	87p
180	110	55	21391	160p

G RANGE professional instrument Cases

134	90	44	21089	£7.68
224	140	64	21090	£11.62
302	170	84	21091	£15.78

VEROBOX CASES

to give a completely professional finish to a much valued project.
ABS, light grey top; dark grey bottom + 2 anodised panels

L	D	H	TYPE	PRICE
205	140	40	21034	£4.52
205	140	75	21035	£5.02
205	140	110	21036	£6.54
180	120	39	21037	£4.11
180	120	65	21038	£4.40
180	120	90	21039	£4.69
155	85	39	21040	£3.31
155	85	60	21041	£3.31
155	85	80	21042	£4.30
125	65	30	21047	£2.48
125	65	39	21048	£3.15
125	65	50	21049	£3.56

METERS

Large range of types in stock; also probes, leads, accessories, etc.
PANEL MOUNTING in 50, 100, 500μA; 1, 5, 10, 50, 100, 500mA; 1A either model.

MU Range 50 × 45mm £2.68

T Range 60 × 45mm £5.95

MULTIMETERS

NH56A NEW – 20KΩ/V AC/DC/-RES/dB in 23 ranges: 130 × 88 × 37mm **£11.20N**

YN360TR 20KΩ/V: AC/DC/R/dB/Transistor Test: in 21 ranges: 145 × 96 × 45mm **£16.45N**

RF CHOKES

1, 1.5, 2.2 etc to 33μH ea. 30p
47, 68, 100 etc to 680μH ea. 33p
1000, 1500 etc to 4700μH ea. 35p

PANEL LAMPS

LED chrome, red 54
LED yellow or green 70
(high efficiency)
Filament in red, amber, green or clear.
6V 60 mA 48
14V 40 mA 54

LED's
5mm red 10
yellow 19
green 16
Mountings, B65 3

DISPLAYS
7-segment
Common anode
MAN72A red 75
MAN82A yellow 110
MAN52A green 110
Common cathode
MAN74A red 85
MAN84A yellow 110
MAN54A green 110
5V filament
3015F 8 mA 255
3015F 15 mA 256

KNOBS

black plastic K1 skirted with spot **16**
K2 as K1, 35mm **21**
K3 pointer **15**
K7 19mm knurled **23**
K8 as K7 + skirt **23**

RECHARGEABLE CELLS

AA **104p** C **249p**
D (4AH) **414p**
PP3 cell (7-2V) **410p**
PP3 charger **410p**

CHARGERS

NC756 **£5.59N**
For any two pairs AA, C or D No
NC1230 **£9.92N**

POTENTIOMETERS

Carbon Rotary (P20) 100ohms – 4M7 lin. 220ohms – 2M2 log. **32p each** w.switch **87p**. Dual gang (JP20) 4K7 – 1M2 lin, or log **95p** w.switch **£1.50**

SLIDERS
58mm, low cost 10K 1M log only **29p**. Std 58mm mono 4K7 – 1M lin. or log **74p** stereo matched **£1.25**. Graduated bezels **34p each**.
PRESET
Min. 10mm dia. Hrix. or Vert. 100ohms – 1M **13p**
Preset Cermet rectilinear type 89P 100ohm – 1m **£1.06 each**
Preset Cermet 10mm dia. Horiz. or Vert. 100ohm – **29p**
Plessey MPW T moulded carbon 47ohms – 2M2 **59p each**.

SOLDERING IRONS

Also large stocks of bits, desoldering devices, accessories, etc.
ANTEX C 240V **£4.60N**; X.25-240V **£4.70N**; CSBP **£5.45N**; XSBP **£5.56N**; ST4 Stand **£1.70N**
ORYX 50 watt temp. controlled **£15.50N**
SOLDER 500gm/18SWG **£7.60N**; Desolder braid 1.5m **54p**

SWITCHES

Type CK – 1P/12 way, 2P/6 way, 3P/4 way, 4P/3 way **48p**; Min Toggles – S7101 SPDT **57p**; S7201 DPDT **80p**; S7301 3PDT **£1.64**; S7203 DPDT **96p**; Push Button min. 8531 make/8533 break **62p**; 8225 DPDT **£1.34**.
DUAL IN LINE ERG colour coded 0.3" × 0.1" format. On/Off single throw 2P SDS2 **54p**; 4P SDS4 **96**; 6P SDS6 **£1.38**; 8P SDS8 **£1.87**; 10P SDSO **£2.10**. *Low cost* D-I-L 4P DNS04 **66p**; DNS08 **£1.00**

LATEST PRICE LIST
includes many new additions to items in our catalogue. Large S.A.E. brings price list FREE.
CATALOGUE incl 70p refundable voucher, 70p post free U.K. with price list.

RESISTORS

1/4, 1/3, 1/2, 3/4 watt – **all 2p each**, 10 of one value **15p**
2% Mullard metal film 5.1 ohms – 300K **5p each**, 10 of one value **40p**
5% wire wound 3W or 7W, most E12 values 1.2ohms to 8K2 **9p each** 10 for **70pN**

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SEMICONDUCTORS

1N914	03	2N3819	22	AA118	14
1N914B	10	2N3820	40	AA119	13
1N916	52N	3823	60	AC126	25
1N4007	06	2N3904	15	AC127	25
1N4148	03	2N3906	15	AC128	25
1N5402	14	2N4036	46	AC151R	55
1N5407	18	2N4058-62	09	AC153K	20
2N697	23	2N4124	25	AC176	25
2N706	18	2N4126	25	ACY17	155
2N930	20	2N4284	30	ACY18	120
2N1132	23	2N4286	18	ACY19	99
2N1302	110	2N4289	23	ACY20	90
2N1303	58	2N4291	24	ACY21	85
2N1304	62	2N4292	21	ACY39	170
2N1305	62	2N4991	62	ACY41	10
2N1306	90	2N5062	32	AD136	530
2N1307	67	2N5192	110	AD142	90
2N1308	147	2N5195	106	AD149	88
2N1309	99	2N5457	32	AD161	35
2N1599	100	2N5458	32	AD162	35
2N1613	25	2N5459	38	AF114	37
2N1711	25	2N6050	380	AF115	37
2N1893	32	2N6057	375	AF116	57
2N2218A	31	6F40	152	AF117	110
2N2219A	25	16F40	165	AF124 AF125	37
2N2222A	25	40HF40	225	AF126	37
2N2369A	21	40361DIS		AF127	37
2N2484	25	40362	65	AF200	10
2N2646	45	40406	71	AF239	114
2N2904	26	40408	95	AF279	30
2N2904A	25	40412	108	AFY12	204N
2N2905A	25	40430	100	AFY16	327N
2N3053	23	40594	123	AFY180	310N
2N3054	55	40595	123	AFY18E615N	
2N3055	48	40636	147	AFY42	461N
2N3405	64	40673	146	AU106	240
2N3663	15	A9903	16	AU111	(use
3702-11	09	AA113	13	AU116)	
2N3771	180	AA116	9	AUY22	10.95
2N3794	21	AA117	13	BO140	25N

BO146	30N				
BO226	45N				
B1906	38	BC214	09	BFR39-41	23
BA379	25	BC214L	09	BFR79-81	23
BAS40-03	36	BC238C	09	BFT65	119
BAS70-03	41	BC238D	09	BFT66	192
BAT14-036	11.75	BC258B	09	BFX29	24
BB409	33	BC267B	16	BFX84	24
BC107A,B	16	BC300	32	BFX85	24
BC108A,B,C	16	BC301	24	BFX87	28
BC109B,C	18	BC303	30	BFX88	26
BC121W	30N	BC327	16	BFY50	24
BC122Y	100	BC328	11	BFY51	24
BC125	20	BC337	14	BFY52	24
BC125	20	BC338	11	BFY90	143
BC140	25	BC413	09	BR34	70
BC141	30	BC414	09	BR64	110
BC147A	10	BC477	24	BRY39	45
BC148	10	BC546	10	BSX20	22
BC149	10	BC547	09	BSX26	22
BC154	25	BC548	09	BSX63	769N
BC160	25	BC549	09	BT106	147
BC161	30	BC550	10	BT108	136
BC167A	09	BC556	10	BU105	170
BC167B	09	BC557	09	BU124	85
BC168A	09	BC558	09	BU208	180
BC168B	09	BC559	09	BUX26	350N
BC169B	09	BC560	10	BUX28	545
BC169C	09	BC879	38	BUX81	744
BC177B	16	BC880	43	BUX85	249
BC178B	16	BCY31A	157	BUZ10A	478
BC179B	18	BCY58	18	BUZ15	12.27
BC182	09	BCY70	18	BUZ20	523
BC182L	09	BCY71	18	BUZ23	787
BC183	09	BCY72	18	BUZ24	12.50
BC183L	09	BD130	45N	BUZ32	625
BC184	09	BD131	48	BUZ33	844
BC184L	09	BD132	48	BUZ41A	637
BC202Y	120	BD135	27	BUZ44A	9.67
BC212	09	BD136	27	BUZ45	12.76
BC212L	09	BD139	30	BUZ48	18.94
BC213	09	BD140	32	BUZ50A	763
BC213L	09	BD644	42N	BUZ54A	21.43
		BD679	62	BUZ80	739
		BD680	64	BUZ83	11.29
				BUZ83A	11.95
		BF115	36	BUZ84A	12.75
		BF167	25	BY164	48
		BF173	25	C106D1	45
		BF177	25	C0326	460N4
		BF178	25	C0340	490N4
		BF244B	40	C407	17
		BF254	14	C0546	126N1
		BF255	14	C762	40
		BF420	31	C1406	77
		BF421	34	D4 clip	for
		BF457	35	C1406	and
		BF458	35	E2506	10
		BF459	35	D1046	88
		BF597	12N	E1110	78
		BFR34A	84		

E1210	76				
E2506	154				
EB383	20				
MJ2955	90				
MJE340	55				
MJE2955	95				
MJE3055	70				
MPF102	40				
MPS6531	40				
MPS6534	42				
MPSA12	36				
MPSA63	38				
NAS206S5	81				
OA47	12				
OA90	10				
OA91	10				
OA95	DIS				
OA202	14				
OC28	75				
OC29	75				
OC35	75				
OC36	90				
OC84	25				
PM7A2	373				
PN70	10				
PN72	05				
Q4006LT	104				
Q4010LT	115				
Q4025H	450				
T2700D	189				
T2800D	104				
TAG3-400	100				
TAG209-400	85				
TAG209-600	130				
TIC106D	48				
TIC106M	55				
TIC126D	64				
TIC206D	54				
TIC226D	61				
TIC236D	96				
TIC246D	105				
TIP31A	36				
TIP32A	36				
TIP41A	45				
TIP41C	60				
TIP42A	45				
TIP42C	60				
TIP150	75				
TIP2955	55				
TIP3055	55				
TIS43	50				
U763	50				
VN10KM	55				
VN46AF	93				
VN66AF	105				
VN88AF	123				
W02	25				

REGULATORS						
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7808	40	7908	50	78L05	32	79L05	50
7812	40	7912	50	78L12	32	79L12	50
7815	40	7915	50	78L15	32	79L15	50
				78L24	32	79L24	50

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Northern Amateur Radio Societies Association

The Society is holding its 21st Exhibition at Pontins Holiday Village, Southport on Saturday 19th March 1983. This was formerly the Belle Vue exhibition. The Exhibition will open at 11.00 a.m. each day.

It will include an inter club quiz, construction contest, grand raffle, R.S.G.B. bookstall, amateur computers, N.A.R.S.A. stands and trophy. Trade Stands featuring all types of Radio/Electronic equipment; Demonstration Station.

The following traders will be present:- J. Birkett; Radiotronics, Amateur Radio Exchange; John's Radio; New Cross Radio; Wilson Valves; C.B. Electronics; S.O.T.A.; The Computer Junk Shop; W. H. Westlake; D. S. Electronics; Arrow Electronics; Greens Telecom; Royal Electronics; Newton Engravers; Leeds Amateur Radio; Marco Trading; R.A.I.B.C.; Microprint Ltd.; 2 J Sound; Gemini Communications; Radio Surplus; B.N.O.S. Electronics; D. Currie (Printer); G. Jackson; W. E. Griffiths; Waters & Stanton; Ham Radio Today; Garex Electronics; P.L.M. Communication Supplies; Tricon Supply Co.; Electro-Supplies.

Admission to the Exhibition will be 60p per day or £1 for the two days. Lots of 20 tickets or more booked in advance from Mike Bainbridge G4GSY 7 Rothburg Close, Bury BL8 2TT Lancs, can be obtained at a 20% discount by sending the appropriate cash and s.a.e.

Chalets are available if booked direct from Pontins. Tel. (0704) 77165 and can be equipped for self-catering if you so wish. Charges vary from £10 + VAT (for 2 person chalet) to £26 + VAT (for a 6 person chalet). Larger family chalets are available.

Family entertainment will be available during the day while 'Residents' will be able to enjoy evening entertainment.

Talk in will be on S22 and other available simpler channels.

Car parking is free but please follow the parking attendants instruction and the notices to prevent congestion.

Enjoy yourself at this family Week-End Exhibition.

MAIL ORDER ADVERTISING

British Code of Advertising Practice

Advertisements in this publication are required to conform to the British Code of Advertising Practice. In respect of mail order advertisments where money is paid in advance, the code requires advertisers to fulfil orders within 28 days, unless a longer delivery period is stated. Where goods are returned undamaged within seven days, the purchaser's money must be refunded. Please retain proof of postage/despatch, as this may be needed.

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If you order goods from Mail Order advertisements in this magazine and pay by post in advance of delivery, PRACTICAL ELECTRONICS will consider you for compensation if the Advertiser should become insolvent or bankrupt, provided:

(1) You have not received the goods or had your money returned; and
(2) You write to the Publisher of PRACTICAL ELECTRONICS summarising the situation not earlier than 28 days from the day you sent your order and not later than two months from that day.

Please do not wait until the last moment to inform us. When you write, we will tell you how to make your claim and what evidence of payment is required.

We guarantee to meet claims from readers made in accordance with the above procedure as soon as possible after the Advertiser has been declared bankrupt or insolvent.

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A GOOD START is essential to short wave listening and expert advice is important in achieving this. Firstly, a receiver is only as good as the antenna it sees. The old adage regarding wire antennas "as long and as high as you can" is still good, but at best is only good for PEAK PERFORMANCE on one or two frequencies, or at worst none.

For PEAK PERFORMANCE on all frequencies you need good matching between your Receiver and Antenna. If you plan to listen on the high frequency bands up to 30MHz then you know you can't have an antenna for every frequency! BUT we can offer you MUCH IMPROVED PERFORMANCE from your receiver by using an antenna tuning unit that will electrically change the length of your antenna to match the frequency you select. In other words – A MATCH FOR ALL FREQUENCIES.

You'll see many antennas being advertised under gimmicky names, but when it comes down to it they're only random wires or odd configurations, but at the end of the day, if you're expecting the performance the manufacturers specified, then you'll have to buy an antenna tuning unit. DON'T! We'll give you one ABSOLUTELY FREE when you buy your receiver from Amcomm, as well as complete advice on an antenna to suit your available space.

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1 ICOM ICR7 + FRT 7700	£469.00 inc. VAT
1 TRIO R1000 + FRT 7700	£297.00 inc VAT
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A2293	8.80	1L4	0.50	6AX4GT	1.30	6KG6A	2.70	19G3	11.50
QQV03-25A	36.50	1R5	0.60	6AX5GT	1.30	6Q7G	1.30	19G6	8.50
QQV06/40A	16.10	1S4	0.45	6BA6	0.55	6SA7	1.00	19H5	39.55
QV03-12	4.20	1S5	0.45	6BE6	0.60	6SG7	1.15	20D1	0.80
SP61	1.80	1T4	0.45	6BG6G	1.60	6SJ7	1.05	20F2	0.85
TT21	23.00	1U4	0.80	6BJ6	1.30	6SK7	0.95	20E1	1.30
TT22	18.50	1X2B	1.40	6BQ7A	0.85	6SL7GT	0.85	20P1	0.65
U25	1.15	2D21	1.10	6BR7	4.80	6SN7GT	0.80	20P3	0.75
U26	1.15	2K25	1.85*	6BW6	6.20	6SR7	1.10	20P4	1.25
U27	1.15	2X2	16.95	6BW7	1.80	6SQ7	0.95	20P5	1.35
U191	0.85	3A4	1.15	6C4	0.50	6V6G	1.50	25L6GT	0.95
U281	0.70	3AT2	0.70	6C6	0.55	6V6GT	0.95	25Z4G	0.75
U301	0.65	3D6	2.40	6CH6	8.20	6X4	0.95	30C15	0.50
U600	11.50	3D22	0.50	6CL6	2.75	6X4WA	2.10	30C17	0.50
U801	0.90	3E29	23.00	6CW4	8.50	6X5GT	0.65	30C18	2.45
UBC41	1.20	3S4	19.00	6CX8	3.80	6Y6G	0.90	30F5	1.15
UABC80	0.75	4B32	0.60	6D6	0.70	6Z4	0.70	30FL2	1.40
UAF42	1.20	5B/254M	18.25	6F6	1.60	7B7	1.75	30FL12	1.25
UBF80	0.70	5B/255M	16.90	6F6GB	1.10	8BN8	2.95	30FL14	2.15
UBF89	0.70	5B/258M	14.50	6F7	2.80	9D2	0.70	30L15	1.10
UCC84	0.85	5C22	12.50	6CY5	1.15	9D6	2.90	30L17	1.10
UCC85	0.70	5R4GY	29.90	6F8G	0.85	10C2	0.85	30P12	1.15
UCF80	1.30	5U4G	1.20	6F12	1.50	10F18	0.70	30PL13	1.25
UCH42	1.65	5V4G	0.75	6F14	1.15	10P13	1.50	30PL14	2.45
UCH81	0.75	5Y3GT	0.75	6F15	1.30	11E2	19.50	35L6GT	1.40
UCL82	0.95	5Z3	0.95	6F17	3.20	12A6	0.70	35W4	0.80
UF41	1.35	5Z4G	1.50	6F23	0.75	12AT6	0.70	35Z4GT	0.80
UF80	0.95	5Z4GT	0.75	6F24	1.75	12AT7	0.65	50C5	1.15
UF85	0.95	6/30L2	1.05	6F33	10.50	12AU7	0.60	50CD6G	1.35
UL84	0.95	6AB7	0.90	6FH8	4.20	12AV6	0.95	75B1	1.25
UM80	0.90	6AC7	0.70	6GA8	1.95	12AX7	0.65	75C1	1.70
UM84	0.70	6AG5	1.15	6GH8A	0.95	12BA6	0.90	76	0.95
UY82	0.70	6AH6	0.60	6H6	1.60	12BE6	1.25	78	0.95
UY85	0.85	6AK5	1.15	6J4	1.35	12BH7	1.95	80	1.70
VR105/30	1.25	6AK8	0.65	6J4WA	2.00	12BY7A	2.30	85A2	1.40
VR150/30	1.35	6AL5	0.60	6J5	2.30	12C8	0.65		2.55*
X66	0.95	6AL5W	0.60	6J5GT	0.90	12E1	18.95	807	1.25
X61M	1.70	6AM5	0.85	6J6	0.65	12J5GT	0.55		1.90*
XR1-6400A	125.00	6AM6	4.20	6J6W	0.90	12K7GT	0.70	813	19.32
Z759	19.00	6ANBA	1.50	6JE6C	2.95	12K8GT	0.80		88.50*
Z749	0.75	6AQ4	2.50	6JS6C	2.95	12Q7GT	0.60	829B	14.00
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Z801U	3.75	6AQ5W	1.00	6K7	0.80	12SH7	0.65	866A	3.80
Z803U	16.00	6AS6	1.80	6KD6	4.50	12SJ7	0.70	866E	6.25
Z900T	2.45	6AT6	1.15	6L6M	2.80	12SQ7	1.45	931A	13.80
		6AU6	0.90	6L6G	2.50	12SQ7GT	0.85	954	0.60
			0.60	6L6GC	2.65	12Y4	0.70	955	1.20
				6L6GT	1.25	13D3	0.70	956	0.60
				6L7G	0.65	13D5	0.90	957	1.05
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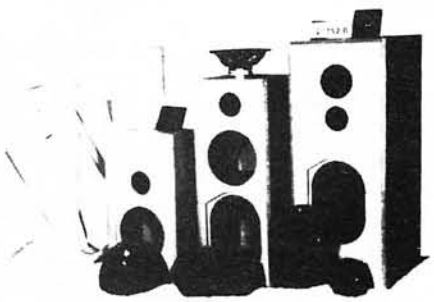

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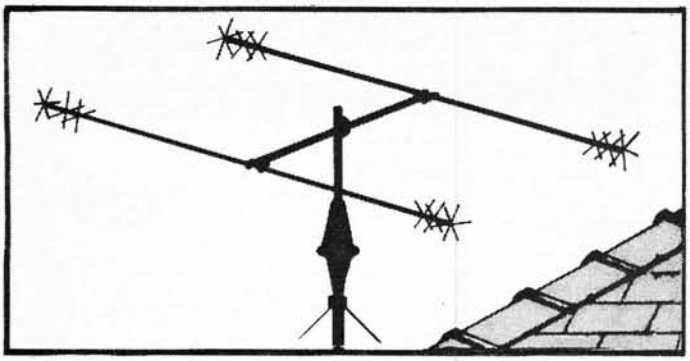

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(Carriage UK mainland £2.50 – kit £1.50)

SPECIFICATION:

Element length	11 feet	SWR at resonance	1·5 to 1:00 max
Boom length	60 inches	Power rating	1400 watts PEP
Turning radius	7 feet	Input impedance	50 ohms
Operating frequencies	10m, 15m, 20m	Wind resistance	80 mph
Forward gain (ref D pole = 1:00)	3·6 dB	Weight	14 lbs
		Rotator requirements	AR40

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	HC6/U 30pF TX	HC6/U 30pF TX	HC25/U 30pF and 40pF TX	HC25/U 20pF and 30pF RX	HC25/U 25pF and 20pF TX	HC6 & 25/U SR RX
R0	4.0277	8.0555	12.0833	14.9888	18.1250	44.9666
R1	4.0284	8.0569	12.0854	14.9916	18.1281	44.9750
R2	4.0291	8.0583	12.0875	14.9944	18.1312	44.9833
R3	4.0298	8.0597	12.0895	14.9972	18.1343	44.9916
R4	4.0305	8.0611	12.0916	15.0000	18.1375	45.0000
R5	4.0312	8.0625	12.0937	15.0027	18.1406	45.0083
R6	4.0319	8.0638	12.0958	15.0055	18.1437	45.0166
R7	4.0326	8.0652	12.0979	15.0083	18.1468	45.0250
S8	—	—	12.1000	14.9444	18.1500	44.8333*
S9	—	—	12.1020	14.9472	18.1531	44.8416*
S10	—	—	12.1041	14.9500	18.1562	44.8500*
S11	4.0354	8.0708	12.1062	14.9572	18.1593	44.8583*
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S20	4.0416	8.0833	12.1250	14.9777	18.1875	44.9333
S21	4.0423	8.0847	12.1270	14.9805	18.1906	44.9416
S22	4.0430	8.0861	12.1291	14.9833	18.1937	44.9500
S23	4.0437	8.0875	12.1312	14.9861	18.1968	44.9583

SR Series Resonance *HC25 only

Also in stock: R0 to R7 and S8 to S23 for following: Belcom FS1007, FDK TM56, Multi 11 Quartz 16 and Multi 7, Icom IC2F, 21, 22A and 215, Trio Kenwood 2200, 7200, Uniden 2030 and Yaesu FT2FB, FT2 Auto, FT224, FT223 and FT202.

Also in stock: 4 and 8MHz TX in HC6/U for 145·8MHz. Icom crystals TX for 145·6MHz (RRO). 44MHz RX crystals in HC6 for 145·8 and 145 (RRO). All at above price.

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CONVERTER CRYSTALS in HC18/U at **£2.85**. In stock 38.666, 42.000, 70.000, 96.000, 101.000, 101.500, 105.666 and 116.000MHz. 26·000 HC6 **£2.00**

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MADE TO ORDER CRYSTALS SINGLE UNIT PRICING

	Price Group	Adjustment Tolerance ppm	Frequency Ranges	Price and Delivery A	B
Fundamentals	1	200 (total)	10 to 19.999 kHz	—	£23.00
	2	200 (total)	20 to 29.999 kHz	—	£16.50
	3	200 (total)	30 to 159.999 kHz	—	£10.50
	4	200 (total)	160 to 999.999 kHz	—	£6.00
	5	50	1.00 to 1.499 MHz		£6.00
	6	10	1.50 to 1.999 MHz	£4.75	£4.40
	7	10	2.00 to 2.599 MHz	£4.75	£4.40
	8	10	2.60 to 3.999 MHz	£4.55	£4.10
	9	10	4.00 to 20.999 MHz	£4.55	£4.00
	10	10	21.00 to 25.000MHz	£6.00	£4.00
	10A	10	25.00 to 30.000MHz	£8.50	
3rd OVT	11	10	21.00 to 59.999 MHz	£4.55	£4.50
5th OVT	12	10	60.00 to 99.999 MHz	£5.00	£5.50
	13	10	100.00 to 124.999 MHz	£6.15	£5.20
5th, 7th & 9th OVT	14	20	125.00 to 149.999 MHz	—	£6.00
	15	20	150.00 to 225.00 MHz	—	£7.50

Unless otherwise requested fundamentals will be supplied with 30pF load capacity and overtones for series resonance operation.

HOLDERS – Please specify when ordering – 10 to 200kHz HC13/U, 170kHz to 170MHz HC6 or HC33/U, 4 to 225MHz, HC18 and HC25.

Where holders are not specified crystals above 4 MHz will be supplied in HC25/U.

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DISCOUNTS. 5% mixed frequency discount for 5 or more crystals at B delivery. Price on application for 10 or more crystals to same frequency specification. Special rates for bulk purchase schemes including **FREE** supply of crystals used in UK repeaters.

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All quad antennas have glass fibre booms and supports for strength and less corrosion and less effect on performance.

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	1x011	9 + 9	1.66	
	1x012	12 + 12	1.25	
	1x013	15 + 15	1.00	
	1x014	18 + 18	0.83	
	1x015	22 + 22	0.68	
	1x016	25 + 25	0.60	
	1x017	30 + 30	0.50	
50 VA 80 × 35mm 0.9 Kg Regulation 13%	2x010	6 + 6	4.16	**£5.70** + p&p £1.30 + VAT £1.05 TOTAL £8.05
	2x011	9 + 9	2.77	
	2x012	12 + 12	2.08	
	2x013	15 + 15	1.66	
	2x014	18 + 18	1.38	
	2x015	22 + 22	1.13	
	2x016	25 + 25	1.00	
	2x017	30 + 30	0.83	
	2x028	110	0.45	
	2x029	220	0.22	
	2x030	240	0.20	
80 VA 90 × 30mm 1 Kg Regulation 12%	3x010	6 + 6	6.64	**£6.08** + p&p £1.67 + VAT £1.16 TOTAL £8.91
	3x011	9 + 9	4.44	
	3x012	12 + 12	3.33	
	3x013	15 + 15	2.66	
	3x014	18 + 18	2.22	
	3x015	22 + 22	1.81	
	3x016	25 + 25	1.60	
	3x017	30 + 30	1.33	
	3x028	110	0.72	
	3x029	220	0.36	
	3x030	240	0.33	
120 VA 90 × 40mm 1.2 Kg Regulation 11%	4x010	6 + 6	10.00	**£6.90** + p&p £1.67 + VAT £1.29 TOTAL £9.86
	4x011	9 + 9	6.66	
	4x012	12 + 12	5.00	
	4x013	15 + 15	4.00	
	4x014	18 + 18	3.33	
	4x015	22 + 22	2.72	
	4x016	25 + 25	2.40	
	4x017	30 + 30	2.00	
	4x018	35 + 35	1.71	
	4x028	110	1.09	
	4x029	220	0.54	
	4x030	240	0.50	
160 VA 110 × 40mm 1.8 Kg Regulation 8%	5x011	9 + 9	8.89	**£7.91** + p&p £1.67 + VAT £1.44 TOTAL £11.02
	5x012	12 + 12	6.66	
	5x013	15 + 15	5.33	
	5x014	18 + 18	4.44	
	5x015	22 + 22	3.63	
	5x016	25 + 25	3.20	
	5x017	30 + 30	2.66	
	5x018	35 + 35	2.28	
	5x026	40 + 40	2.00	
	5x028	110	1.45	
	5x029	220	0.72	
	5x030	240	0.66	

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TYPE	SERIES No	SECONDARY Volts	RMS Current	PRICE
225 VA 110 × 45mm 2.2 Kg Regulation 7%	6x012	12 + 12	9.38	**£9.20** + p&p £2.00 + VAT £1.68 TOTAL £12.88
	6x013	15 + 15	7.50	
	6x014	18 + 18	6.25	
	6x015	22 + 22	5.11	
	6x016	25 + 25	4.50	
	6x017	30 + 30	3.75	
	6x018	35 + 35	3.21	
	6x026	40 + 40	2.81	
	6x025	45 + 45	2.50	
	6x033	50 + 50	2.25	
	6x028	110	2.04	
	6x029	220	1.02	
	6x030	240	0.93	
300 VA 110 × 50mm 2.6 Kg Regulation 6%	7x013	15 + 15	10.00	**£10.17** + p&p £2.00 + VAT £1.83 TOTAL £14.00
	7x014	18 + 18	8.33	
	7x015	22 + 22	6.82	
	7x016	25 + 25	6.00	
	7x017	30 + 30	5.00	
	7x018	35 + 35	4.28	
	7x026	40 + 40	3.75	
	7x025	45 + 45	3.33	
	7x033	50 + 50	3.00	
	7x028	110	2.72	
	7x029	220	1.36	
	7x030	240	1.25	
500 VA 140 × 60mm 4 Kg Regulation 4%	8x016	25 + 25	10.00	**£13.53** + p&p £2.00 + VAT £1.88 TOTAL £18.26
	8x017	30 + 30	8.33	
	8x018	35 + 35	7.14	
	8x026	40 + 40	6.25	
	8x025	45 + 45	5.55	
	8x033	50 + 50	5.00	
	8x042	55 + 55	4.54	
	8x028	110	4.54	
	8x029	220	2.27	
	8x030	240	2.08	
625 VA 140 × 75mm 5 Kg Regulation 4%	9x017	30 + 30	10.41	**£16.13** + p&p £2.00 + VAT £2.26 TOTAL £20.39
	9x018	35 + 35	8.92	
	9x026	40 + 40	7.81	
	9x025	45 + 45	6.94	
	9x033	50 + 50	6.25	
	9x042	55 + 55	5.68	
	9x028	110	5.68	
	9x029	220	2.84	
	9x030	240	2.60	

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E12 22pf. to 1000pf. & E6 1K5pf. to 47Kpf.—**2p**
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10/50	5p	47/50	6p	220/50	10p	1000/40	35p
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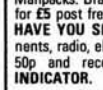

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35 to 39	3.52	2.10	1.15	0.85
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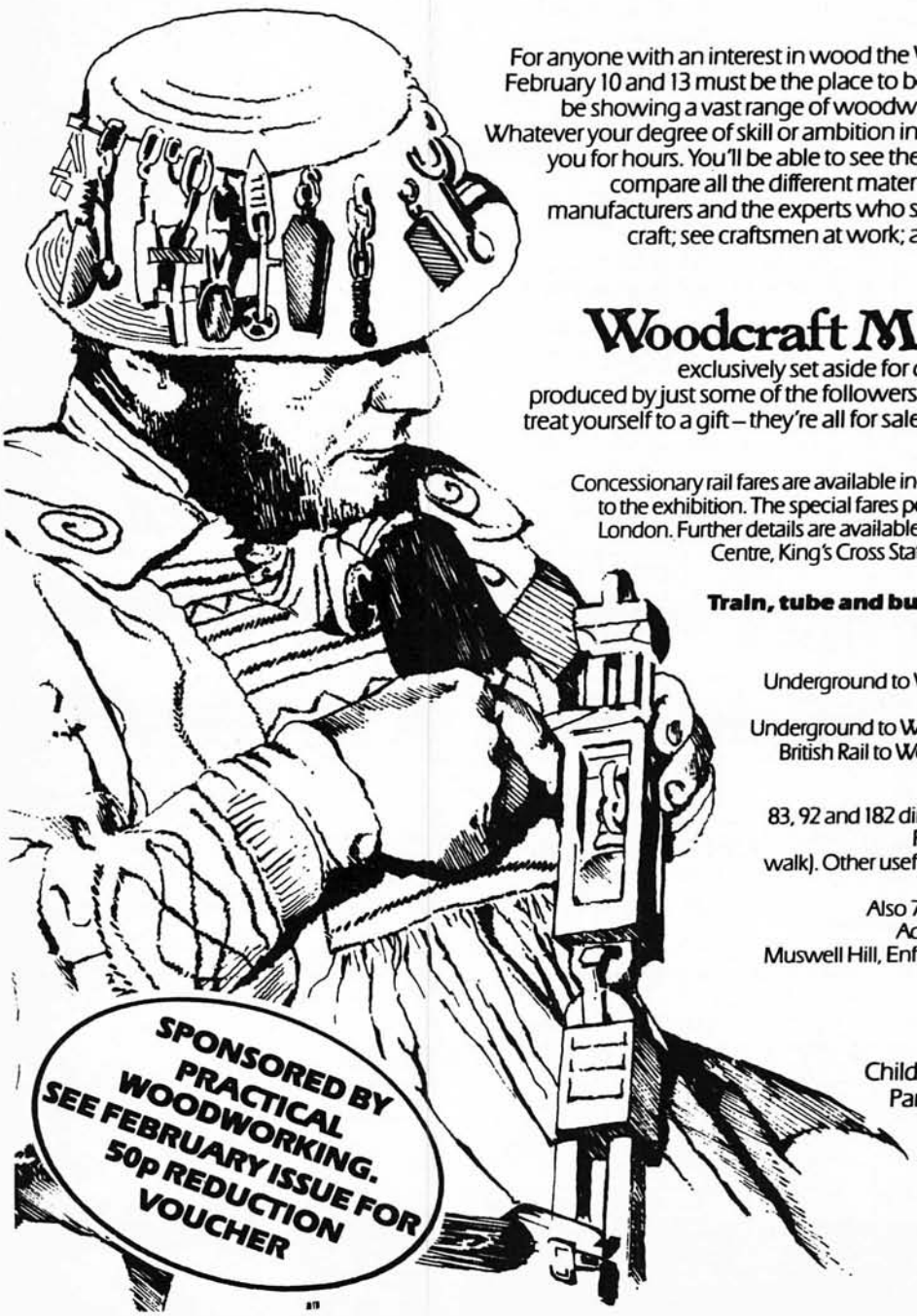
Wembley Conference Centre February 10-13, 1983

February 10-12, 10am-7pm
February 13 (Sunday) 10am-6pm.



For anyone with an interest in wood the Wembley Conference Centre between February 10 and 13 must be the place to be. More exhibitors than ever before will be showing a vast range of woodworking materials, tools and accessories. Whatever your degree of skill or ambition in the craft, you will find plenty to absorb you for hours. You'll be able to see the tools and machinery in use; study and compare all the different materials and accessories available; meet the manufacturers and the experts who specialise in producing the tools of your craft; see craftsmen at work; and displays from colleges and schools.

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Train, tube and bus services to Wembley Conference Centre are as follows:–

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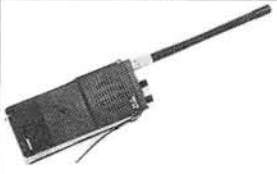

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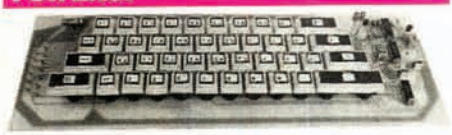

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