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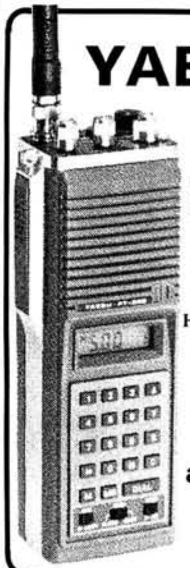

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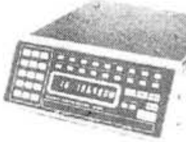

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Practical Wireless

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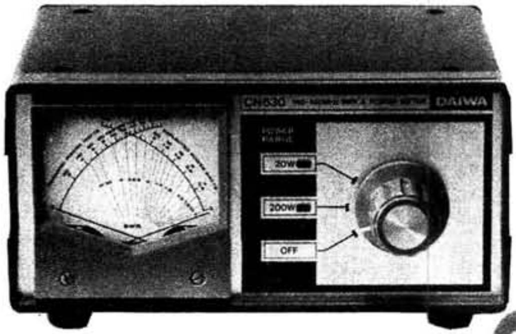

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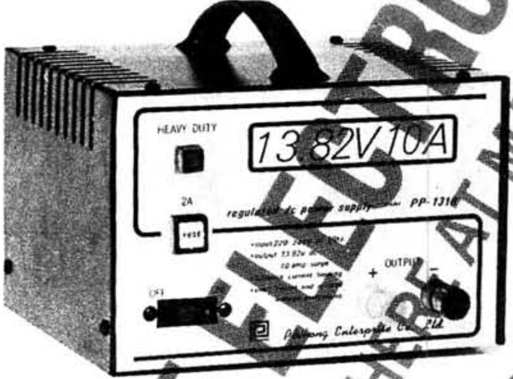

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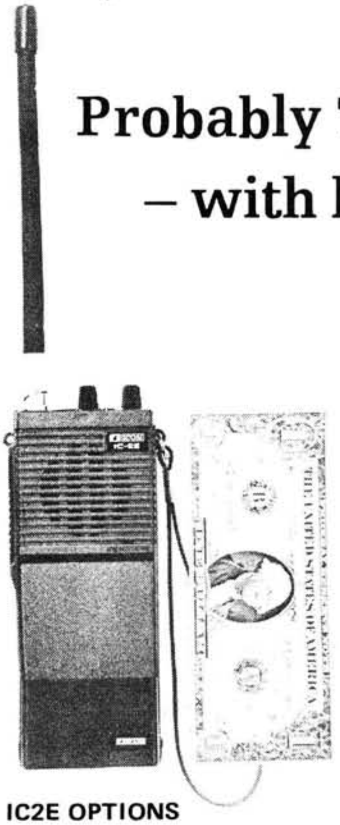

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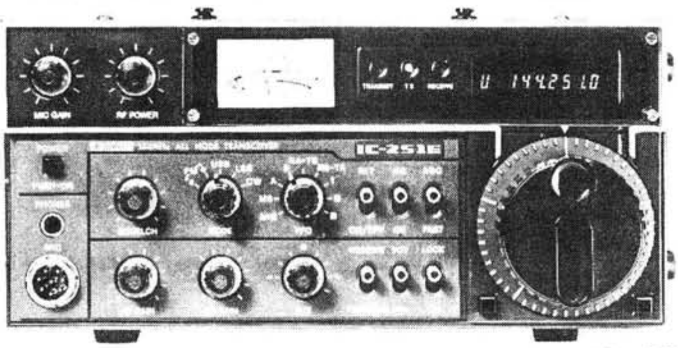

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25 The Strait, Lincoln. LN2 1JF

EDDYSTONE TRANSMITTING VARIABLES 30+30pf (60pf) - **£2.20.**
FERRANTI WIRE ENDED DIODES 800 PIV 750mA 12 for **£1.**
500 METRE REEL OF PVC CABLE 13 Strands .019 at **£10** carriage paid.
80M CRYSTALS 10X Type,3642.5KHz or 3750KHz. Both **40p** each.
MINIATURE CERAMIC TRIMMERS 2.5 to 6pf, 3 to 10pf, 4.7 to 20pf, 7 to 35pf, 10 to 40pf, 10 to 60pf, All at **15p** each.
MAINS TRANSFORMERS 240 Volt input, Output 24 volt Tapped at 14 volt 1 amp - **£1.30** (P&P 30p).
JUMBO ORP12 CADMIUM SULPHIDE PHOTOCONDUCTIVE CELL Type RPY18 - **£1.65** each.
LEAD SULPHIDE PHOTOCONDUCTIVE CELL RPY 75 with data - **3.50.**
RPY75A WITH GERMANIUM FILTER - **£4.50.**
ORP62 CELL with data - **£1.30.**
SUB-MINIATURE AXIAL RED LEDS– CQY60 - **20p** each.
MULLARD PHOTO TRANSISTORS BPX 70 - **50p.**
SLOTTED OPTO INFRA RED SOURCE SWITCH - **£1.50.**
X BAND GUNN DIODES with data - **£1.65.**
SOLDER-IN FEED THRUS 6.8pf, 27pf, 300pf, 1000pf. **20p** doz.
4500 PIV 2 AMP DIODES at **£1.50** each.
VARIABLE CAPACITORS 10+10+10pf - **75p** each.
6.2 VOLT WIRE ENDED 2 WATT ZENERS - **15p, 5 for 60p.**
HEWLETT PACKARD HOT CARRIER DIODES 5082-2800 - **40p.**
VHF FETS J304 - **30p,** BF 256C - **4 for 75p.**
FERRITE BEADS FX1115 - **15p** doz. ½" Long Type 6 for **10p.**
MULLARD SUB-MINIATURE DISCS 1000pf 63v.w., **25p** doz.
DISC CERAMICS .1uf 18v.w., .22uf 7v.w., .5uf 12v.w., All **5p** each.
VERNITRON FM4 10.7MHz FILTERS - 3 for **£1.**
MINIATURE CERAMIC TAG STRIPS 12 way Opp15p, 21 way - **20p.**
3/16" COIL FORMERS with core at 6 for **25p.**
TORROIDAL TRANSFORMERS 240 Volt Input, Output 30 Volt 500mA - **£2.30.**
H.F–VHF POWER TRANSISTOR 587BLY 40 watts, 26 to 70 MHz - **£3** each.
2 CHANNEL HIGH SPEED DRIVER WITH SPST J FET SWITCHES Type DG182 with data - **£1.15** each.
POWER TRANSISTORS 2N4348 140 Volt 10 amp - **65p.,** 2N6212 PNP 350 volt 2 amp - **65p,** SDT 96306 300 Volt 50 amp at **£1.65,** OC 36 - **50p.**
GENERAL PURPOSE NPN TRANSISTORS BSY95A - **6 for 50p.**
TRW UHF POWER TRANSISTORS useful up to 980MHz FT 1200MHz 12 Volt 2 watt out Type PT 4642 - **£2.50.**
VARIABLE CAPACITORS 5pf - **75p,** 10+10+10pf - **75p,** 250+250pf - **85p,** 200+200+20+20pf - **75p,** 250+250+20+20+20pf - **75p.**
R. F. CHOKES 10U.H., 33U.H., 330U.H., All at **7p,** 1000U.H. - **12p.**
MULLARD BLY55 175MHz 13 Volt 4 watt 400mW Drive - **£4.**
MULLARD 175MHz 40 watt 5 watt Drive. 570BLY 28 volt - **£8.30.**
MULLARD 1000pf 63v.w., DISC CERAMICS at **25p** doz.
MULLARD UHF POWER MODULE BGY22C, 380-412MHz, 2.5 watt - **£12.50.**

Please add 30p for post and packing. Orders over £3 post free.

BI-PAK NEW EXTENDED 1981 RANGE

AERIALS

105	Adjustable Aerial Gutter Mount	3.00
106	C.B. Mobile Antenna	9.50
107	FM Indoor Ribbon Aerial	0.50
108	4 Section Car Aerial (Stainless)	2.16
109	4 Section Car Aerial (Chrome)	1.80
110	8 Section 1200mm Telescopic Aerial	2.00
111	8 Section 750mm Telescopic Aerial	2.60
112	5 Section 570mm Telescopic Aerial	2.64
113	Roof Mounting Aerial (Car)	3.80

AUDIO LEADS

114	5 pin – 3.5mm 3 & 5 connected	0.65
115	5 pin – 3.5mm 1 & 4 connected	0.65
116	Car Aerial Ext Lead	1.00
117	Mains Cassette Lead	0.48
119	2×2 pin Plug in In Line Stereo Jack Socket	0.74
120	Universal Car Adaptor Plug	0.52
123	20ft. Coiled Guitar Lead	1.50
125	5 pin to 5 pin DIN	0.65
126	5 pin to DIN to open ends	0.65
127	5 pin to DIN to 4 Phono Plugs	1.00
128	5 pin Plug to 5 pin socket	0.75
129	5 pin to 5 pin Plug (Mirror image)	0.72
130	2 pin Plug to 2 pin Line Socket 5 mtrs	0.55
132	2 pin Plug to 2 pin Line Socket 10 mtrs	0.85
133	5 pin Plug to 2 Phono Plug	0.65
136	Headphone ext lead 6 mtrs	1.50

A.B.S. PLASTIC BOXES

141	4"×1"×2"	1.08
142	4.4"×1.22"×2.44"	1.24
143	4.75"×1.56"×2.56"	1.30
144	6.00"×2.00"×3.15"	1.50
145	7.5"×2.38"×4.33"	2.64
146	2.8"×4.37"×1.63"	1.40
147	3.78"×6.33"×2.06"	1.92
148	5.63"×4.14"×2.19"	2.14
149	5.63"×6.7"×2.19"	2.62
150	6.65"×4.98"×2.76"	3.84
151	9.57"×7.36"×4.06"	5.82

VERO CASES

152	1"×213/16"×115/16" Black	0.47
153	1"×213/16"×115/16" White	0.47
154	Vero 3"×5½"×8" box	4.82

INSTRUMENT CASES

155	8"×5¼"×2"	1.70
156	11"×6"×3"	2.63
157	6"×4¾"×1¾"	1.64
158	9"×5¼"×2½"	2.20

ALUM BOXES

159	5¼"×2¼"×1½"	0.83
160	4"×4"×1½"	0.83
161	4"×2¼"×1½"	0.83
162	5¼"×4"×1½"	0.93
163	4"×2½"×2"	0.83
164	3"×2"×1"	0.57
165	7"×5"×2½"	1.30
166	8"×6"×3"	1.68
167	6"×4"×2"	1.12
168	Sloping Box – Large	6.97
169	Sloping Box – Small	4.63

CASSETTES

301	Low Cost C60	0.36
302	Low Cost C90	0.45
303	Low Cost C120	0.65
304	30 Min Letter Tape	0.38
305	Empty Library Case	0.12

CAPS, CHOKES, TRIMMERS

327	Jackson Coupling	0.74
328	Jackson Slow Motion Drive	1.38
329	Jackson 300PF Dilecon	2.64
330	Jackson 500PF Dilecon	3.10
331	Jackson 01-365PF	2.86
332	Jackson 02-365PF Dual	4.34
333	Jackson 804 10PF	2.62
334	Jackson 804 25PF	2.88
335	Jackson 804 50PF	2.88
336	Jackson 804 100PF	3.42
337	Trimmer Cap 40PF	0.20
338	Trimmer Cap 250PF	0.25
339	Trimmer Cap 450PF	0.30
340	Trimmer Cap 750PF	0.34
357	Repanco CH1 2.5MH	0.44
358	Repanco CH2 5.0MH	0.50
359	Repanco CH3 7.5MH	0.50
360	Repanco CH4 10.0MH	0.56
361	Repanco CH5 1.5MH	0.44
362	Repanco CH6 5UH	0.38
363	Repanco DRX1 Coil	0.60
364	Repanco DRR2 Coil	1.00

ELECTROLYTIC CAPACITORS

430	470uF 50v	0.30
431	1000uF 25v	0.40
432	1000uF 63v	1.00
433	1000uF 100v	1.25
435	2200uF 25v	0.70
436	2200uF 40v	1.20
437	2200uF 100v	2.00
438	3300uF 100v	2.40
439	4700uF 25v	0.90
440	4700uF 63v	2.30

BATTERY HOLDERS

200	Batt Holder 2×HP7 short	0.18
201	Batt Holder 4×HP7 short	0.19
202	Batt Holder 6×HP7 short	0.20
203	Batt Holder 4×HP7 long	0.19
204	PP3 Battery Clips	0.07
205	PP9 Battery Clips	0.12
206	Batt Holder 4×HP11 long	0.25
207	Batt Holder 4×HP11 short	0.25
208	Batt Holder 4×HP2 long	0.30

ETCHANT AND PENS

1610	Dalo Etch Resist Pen	0.90
1611	Ferric Chloride ½lb pack	0.95
1612	Pentel Etch Resist Pen	0.65

ENAM. COPPER WIRE 2oz

365	40 swg	1.00
366	38 swg	0.88
367	36 swg	0.90
368	34 swg	0.82
369	32 swg	0.80
370	30 swg	0.80
371	28 swg	0.76
372	26 swg	0.74
373	24 swg	0.66
374	22 swg	0.62
375	20 swg	0.60
376	18 swg	0.60
377	16 swg	0.52
378	14 swg	0.52

TINNED COP. WIRE 4oz

379	24 swg	0.94
380	22 swg	0.83
381	20 swg	0.86
382	18 swg	0.90
383	16 swg	0.78

HARDWARE IN PACKS OF 25

839	OBA 1" Bolt	0.70
840	OBA ½" Bolt	0.40
842	2BA 1" Bolt	0.35
843	2BA ½" Bolt	0.30
844	2BA ¼" Bolt	0.32
845	4BA 1" Bolt	0.28
846	4BA ½" Bolt	0.20
847	4BA ¼" Bolt	0.18
848	6BA 1" Bolt	0.24
849	6BA ½" Bolt	0.18
850	6BA ¼" Bolt	0.20
851	OBA Solder Tags	0.20
852	2BA Solder Tags	0.16
853	4BA Solder Tags	0.14
854	6BA Solder Tags	0.12
855	OBA Full Nut	0.42
856	2BA Full Nut	0.26
857	4BA Full Nut	0.18
858	6BA Full Nut	0.18
859	OBA Washer	0.12
860	2BA Washer	0.09
861	4BA Washer	0.09
862	6BA Washer	0.09

FUSE HOLDERS

506	20mm Chassis Fuse Holder	0.14
507	1¼" Chassis Fuse Holder	0.14
508	1¼" Car in line Fuse Holder	0.12
509	20mm Panel Fuse Holder	0.26
510	1¼" Panel Fuse Holder	0.32

FUSES:

Quick Blow 20mm:

611	150mA	0.06
612	250MA	0.06
613	500MA	0.06
614	800MA	0.07
615	1 Amp	0.06
616	1.5 Amp	0.07
617	2.0 Amp	0.06
618	2.5 Amp	0.06
619	3.0 Amp	0.06
620	3.15 Amp	0.07
621	5.0 Amp	0.06

Semi Delay: 20mm

622	100MA	0.08
623	250MA	0.08
624	500MA	0.08
625	1 Amp	0.07
626	1.6 Amp	0.07
627	2 Amp	0.07
628	2.5 Amp	0.07
629	3.15 Amp	0.07
630	5.0 Amp	0.07

Quick Blow: 1¼":

631	250MA	0.06
632	500MA	0.06
634	800MA	0.06
635	1 Amp	0.06
636	1.5 Amp	0.06
637	2.0 Amp	0.06
638	2.5 Amp	0.06
369	3 Amp	0.06
641	4 Amp	0.06
642	5 Amp	0.06

KNOBS

1101	Black/Silver Knob	0.28
1102	Large Calibrated Knob	0.30
1103	Alli PA100 Knob	0.46
1104	Heavy Brushed Alli Knob 15mm	0.32
1105	Heavy Brushed Alli Knob 22mm	0.40
1106	Heavy Brushed Alli Knob 28mm	0.52
1107	Matt Black Knob 17mm	0.40
1108	Matt Black Knob 24mm	0.46
1109	Matt Black Knob 28mm	0.56
1110	All Metal Serated Edge Knob 15mm	0.34
1111	All Metal Serated Edge Knob 24mm	0.48
1112	All Metal Serated Edge Knob 30mm	0.60
1113	Black Plastic Metal Skirt	0.24
1114	Black Pointer Knob	0.22
1115	Black/Chrome Instrument Knob 22mm	0.32
1116	Alli Push Button Knob 11mm	0.14
1117	Black Plastic Slider Knob	0.12
1118	Chrome Slider Knob	0.14
1119	Chrome/Black Slider Knob	0.22

MICROPHONES etc.

1325	Crystal Desk Mike	3.30
1326	Cassette Mike 2.4mm + 3.5mm Plugs	1.46
1327	Dynamic Cassette Mike	1.86
1328	Dual Imp Dynamic Mike	10.50
1329	Dual Imp Condenser Mike	13.20
1330	Plastic Mike Holder	0.66
1331	Windshield Medium (Pair)	1.38
1332	Windshield Large (Pair)	1.92
1333	Gooseneck 320mm (Chrome)	2.60
1334	Gooseneck 515mm (Chrome)	3.50
1335	Mike Floor Stand	10.70
1336	Cassette Deck Mike 5K ohm	5.30
1337	Mike Boom Arm	8.80
1338	Crystal Mike Insert	0.52
1339	Two-Station Intercom	6.60
1340	Mobile or CB Mike 600 ohms	5.98
1341	Mobile or CB Mike 250 ohms	6.00

SEMICONDUCTOR HARDWARE

867	T0220		0.20
868	T03		0.20
869	S055	Insulating kits	0.20
870	T066	in packs of 5	0.20
871	T064		0.20
872	T048		0.20
873	T03 Single Heat Sink		0.26
874	T03 Double Heat Sink		1.35
875	Double Sided Heat Sink		2.65
876	T05/39 Heat Sink		0.15
877	T018 Heat Sink		0.15
878	T01 Heat Sink		0.10
879	T0220 Heat Sink		0.15
880	T066 Transistor Cover		0.14
881	T03 Transistor Cover		0.14

METERS

1305	2" Meter 2 Amps	2.88
1307	2" Meter 50UA	2.88
1308	2" Meter 100UA	2.88
1309	2" Meter 500UA	2.88
1310	2" Meter 1MA	2.88
1311	2" Meter 50 volts	2.88
1312	SWR and FS Meter	9.50
1313	SWR and Power Meter	11.90
1315	Test Meter 20,000 OPV	24.75
1316	Multi Tester RE185M	40.00
1317	Double VU Meter	3.25
1319	100-0-100 UA Meter 45mm	1.90
1320	Min Level Meter 23mm	0.95
1321	VU Meter 40mm	1.96
1322	Test Meter 1000PV	6.50
1323	Test Meter 20,000 OPV	12.40
1324	Test Meter 50,000 OPV	19.75

SWITCHES

1958	Min SPST Toggle Switch	0.70
1959	Min SPDT Toggle Switch	0.75
1960	Min DPDT Toggle Switch	0.80
1961	Min DPDT Centre Off Switch	0.95
1962	Push Button SPST	0.90
1963	Push Button SPDT	0.95
1964	Push Button DPDT	0.98
1965	1P 12W Rotary Switch	0.60
1966	2P 6W Rotary Switch	0.60
1967	3P 4W Rotary Switch	0.60
1968	4P 3W Rotary Switch	0.60
1973	Min DPDT Slide Switch	0.15
1974	Std Slide Switch	0.16
1975	SPST Toggle Switch	0.33
1976	DPDT Toggle Switch	0.46
1977	Rotary On-Off Switch	0.56
1978	Push to Make Switch	0.15
1979	Push to Break Switch	0.19
1981	SPST Rocker Switch (Black)	0.32
1982	SPST Rocker Switch (White)	0.32
1983	SPST Rocker Switch (Blue)	0.32
1984	SPST Rocker Switch (Yellow)	0.32
1985	SPST Rocker Switch (Luminous)	0.32
1986	Sub min SPST Toggle Switch	0.54
1987	Sub min SPDT Toggle Switch	0.58
1988	Sub min DPDT Toggle Switch	0.62
1989	Keyboard 24 way	1.50
1990	Keyboard 40 way	1.60
1991	Keyboard Switch	0.20
1992	Push to Make Switch (metal body)	0.32

TOOLS CROC CLIPS ETC

2001	Insulated croc clips (Red)	0.06
2002	Insulated croc clips (Black)	0.06
2003	1¼ insulated croc clips (Red)	0.07
2004	1¼ insulated croc clips (Black)	0.07
2005	30 Amp croc clips 100mm **per pair**	0.74
2006	Test Leads	0.55
2007	Test Lead Kit	1.70
2008	4mm Test Lead Set	1.36
2009	4mm Test Prods Set	0.52
2010	Pincer Action Prod Set	1.40
2011	Cutters	5.50
2012	Pliers	5.20
2013	Croc clip test set	1.00
2014	Resistance sub box	4.30
2015	IC Extraction Tool	0.64
2016	Neon Mains Tester/Screwdriver	0.52

SOLDERING EQUIPMENT

1925	12 volt soldering iron MLX	5.46
1927	Multicore solder 22 swg tube	1.00
1928	Multicore solder 22 swg reel	3.50
1929	Multicore solder 18 swg reel	3.50
1930	Desolder braid	0.75
1931	X25 Soldering Iron	4.20
1932	X25 ⅛" replacement Bit	0.50
1933	X25 3/16" replacement Bit	0.50
1934	X25 3/32" replacement Bit	0.50
1935	X25 Replacement Element	1.80
1936	Desolder Pump	5.56
1937	Desolder Pump Nozzles	0.64
1938	SK1 Soldering Kit	7.00
1939	ST3 Iron Stand	1.60
1940	Horizontal IC Desoldering Bit	1.95
1941	Vertical IC Desoldering Bit	1.95
1942	Antex Heat Shunt	0.15
1943	CCN240 Soldering Iron	4.20
1944	CCN240 3/32" Replacement Bit	0.50
1945	CCN240 ⅛" Replacement Bit	0.50
1946	CCN240 3/16" Replacement Bit	0.50
1947	CCN240 Replacement Element	1.90
1948	C240 Soldering Iron	4.20
1949	C240 3/32" Replacement Bit	0.50
1950	C240 ⅛" Replacement Bit	0.50
1951	C240 3/16" Replacement Bit	0.50
1952	C240 Replacement Element	1.70
1953	G Soldering Iron	4.20
1954	Model G 3/32" Replacement Bit	0.50
1955	Model G ⅛" Replacement Bit	0.50
1956	Model G 3/16" Replacement Bit	0.50
1957	Model G Replacement Element	1.90

MAINS PLUGS AND SOCKETS

1618	13 Amp Rubber Plug	0.52
1619	13 Amp Plastic Plug	0.46
1620	13 Amp Free Socket	0.50
1621	13 Amp 2 way Free Socket	1.50
1622	13 Amp 4 way Free Socket	4.20
2019	2 Amp Terminal Block 12 way	0.24
2020	5 Amp Terminal Block 12 way	0.24

POTS

1831	1K	Lin Single Pots	32
1832	2K2	Lin Single Pots	32
1833	4K7	Lin Single Pots	32
1834	10K	Lin Single Pots	32
1835	22K	Lin Single Pots	32
1836	47K	Lin Single Pots	32
1837	100K	Lin Single Pots	32
1838	220K	Lin Single Pots	32
1839	470K	Lin Single Pots	32
1840	1M	Lin Single Pots	32
1841	2M2	Lin Single Pots	32
1842	4K7	Log Single Pots	32
1843	10K	Log Single Pots	32
1844	22K	Log Single Pots	32
1845	47K	Log Single Pots	32
1846	100K	Log Single Pots	32
1847	220K	Log Single Pots	32
1848	470K	Log Single Pots	32
1849	1M	Log Single Pots	32
1850	2M2	Log Single Pots	32
1851	4K7	Lin Dual Pots	89
1852	10K	Lin Dual Pots	89
1853	22K	Lin Dual Pots	89
1854	47K	Lin Dual Pots	89
1855	100K	Lin Dual Pots	89
1856	220K	Lin Dual Pots	89
1857	470K	Lin Dual Pots	89
1858	1M	Lin Dual Pots	89
1859	2M2	Lin Dual Pots	89
1860	4K7	Log Dual Pots	89
1861	10K	Log Dual Pots	89
1862	22K	Log Dual Pots	89
1863	47K	Log Dual Pots	89
1864	100K	Log Dual Pots	89
1865	220K	Log Dual Pots	89
1866	470K	Log Dual Pots	89
1867	1M	Log Dual Pots	89
1868	2M2	Log Dual Pots	89
1869			
1870	4K7	Lin switched pots	76
1871	10K	Lin switched pots	76
1872	22K	Lin switched pots	76
1873	47K	Lin switched pots	76
1874	100K	Lin switched pots	76
1875	220K	Lin switched pots	76
1876	470K	Lin switched pots	76
1877	1M	Lin switched pots	76
1878	2M2	Lin switched pots	76
1879	4K7	Log switched pots	76
1880	10K	Log switched pots	76
1881	22K	Log switched pots	76
1882	47K	Log switched pots	76
1883	100K	Log switched pots	76
1884	220K	Log switched pots	76
1885	470K	Log switched pots	76
1886	1M	Log switched pots	76
1887	2M2	Log switched pots	76
1888	100K	Log-Anti Log Dual Pot	89
1889	5K	Log pot 16mm switched	36
1890	5K	Log pot 17mm switched	48
1891		10 ohm wire wound pots	85
1892		22 ohm wire wound pots	85
1893		47 ohm wire wound pots	85
1894		100 ohm wire wound pots	85
1895		220 ohm wire wound pots	85
1896		470 ohm wire wound pots	85
1897		1K ohm wire wound pots	85
1898		2K ohm wire wound pots	85
1899		4K7 ohm wire wound pots	85

CABLE per metre

390	Light Mic Cable	0.10
391	Twin Mic Cable	0.19
392	Fig. 8 Stereo Cable	0.12
393	4 Way SCR Cable	0.35
394	4 Way Ind. Screened Cable	0.18
395	Heavy Mic Cable	0.25
396	3 Amp 3 Core Mains Cable	0.16
397	Twin Oval Mains	0.10
398	Fig. 8 Speaker Cable	0.07
399	Low Loss Coax. 75 ohms	0.20
400	Uniradio 76-50ohms coax.	0.30

MIN PRESETS 9p EACH

1801	100 ohm	Horizontal
1802	220 ohm	Horizontal
1803	470 ohm	Horizontal
1804	1K	Horizontal
1805	2K2	Horizontal
1806	4K7	Horizontal
1807	10K	Horizontal
1808	22K	Horizontal
1809	47K	Horizontal
1810	100K	Horizontal
1811	220K	Horizontal
1812	470K	Horizontal
1813	1M	Horizontal
1814	2M2	Horizontal
1815	4M7	Horizontal
1816	100 ohm	vertical
1817	220 ohm	vertical
1818	470 ohm	vertical
1819	1K	vertical
1820	2K2	vertical
1821	4K7	vertical
1822	10K	vertical
1823	22K	vertical
1824	47K	vertical
1825	100K	vertical
1826	220K	vertical
1827	470K	vertical
1828	1M	vertical
1829	2M2	vertical
1830	4M7	vertical

TRANSFORMERS

2021	6-0-6v 100mA	0.90
2022	9-0-9v 75mA	0.90
2023	12-0-12v 100mA	1.15
2024	0-6v 0-6v 280mA	1.60
2025	0-12v 0-12v 150mA	1.60
2026	6-0-6v 1 Amp	2.40
2027	9-0-9v 1 Amp	2.00
2028	12-0-12v 1 Amp	2.50
2029	15-0-15v 1 Amp	2.75
2031	Multi tap ½ Amp	3.40
2032	Multi tap 1 Amp	4.80
2033	Multi tap 2 Amp	6.40
2034	0-35v 1.7 Amp	4.90
2035	0-55v 2 Amp	6.65
2036	0-17v 750mA	2.85
2037	Min audio output	0.25
2038	min audio driver	0.36
2039	0-20v 1 Amp	3.60
2040	0-45-55v 1.5 Amps	6.45
2041	0-55-65v 1 Amps	8.46
2042	0-25v 2 Amps	4.50
2043	15-0-15 150mA	2.40

2017
PICK UP FOR
ACOUSTIC GUITAR
£5.50

2018
TELEPHONE
PICK UP COIL
£0.66

170
QUICK TEST BLOCK 'KEYNECTOR'
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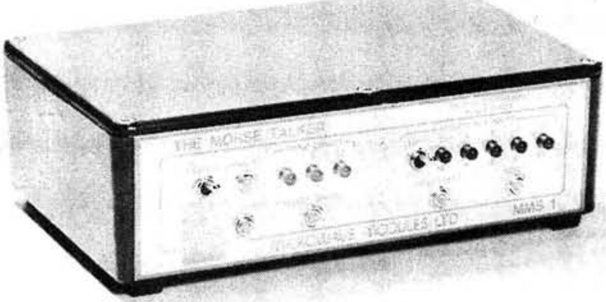

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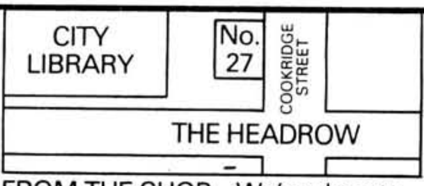

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Who's Kidding Who?

THIS MONTH, we begin "Passport to Amateur Radio", a revised and updated version of our very popular "So You Want to Pass the RAE?", and written by one of the co-authors of that series. Alongside the "Passport" will appear several articles dealing with other aspects of amateur radio.

The licensed amateur holds a unique position, with more freedom than enjoyed by most research and development labs. By passing a fairly elementary examination showing that he has an interest in radio techniques, and a basic knowledge of radio interference and how to avoid causing it, he is allowed to experiment with a wide range of communication methods on several frequency bands set aside for him, and with a minimum of official control.

Citizens Band, on the other hand, is a service intended for use by people with no knowledge or interest in the techniques of radio, but who want to talk to others within a fairly limited range. Because the service is going to be used by large numbers of unskilled operators, the transceivers must be "fool-proof" in operation, and meet a tight technical specification. It is surprising that the draft UK CB specifications do not lay down that samples of any transceiver must undergo Government Type Approval tests before it is put on sale, as is the case for every other service (taxis, ambulances, radiophones, etc.) where non-technical users are involved.

It appears that "home construction" of a CB transceiver will not be specifically prohibited, but a "manufacturer or assembler" **will** be responsible for ensuring that the equipment he produces conforms to the specification. In a factory, the test and quality control departments will take care of that, but how is a home constructor to make the necessary measurements? He would need access to many thousands of pounds-worth of instruments, or have to pay a considerable fee to a suitably-equipped laboratory to check his rig for him. And since he is testing only one sample, the specification says that all limits have to be bettered by a margin of 2dB!

Several magazines have proudly announced that they will be publishing CB transceiver designs for the home constructor, but it seems to me that they are badly misleading their readers by suggesting that this will be practicable, even if it is legally allowed.

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 £11.80 per annum, from **"Practical Wireless" Subscription Department, Room 2613, King's Reach Tower, Stamford Street, London SE1 9LS.** Airmail rates for overseas subscriptions can be quoted on request.

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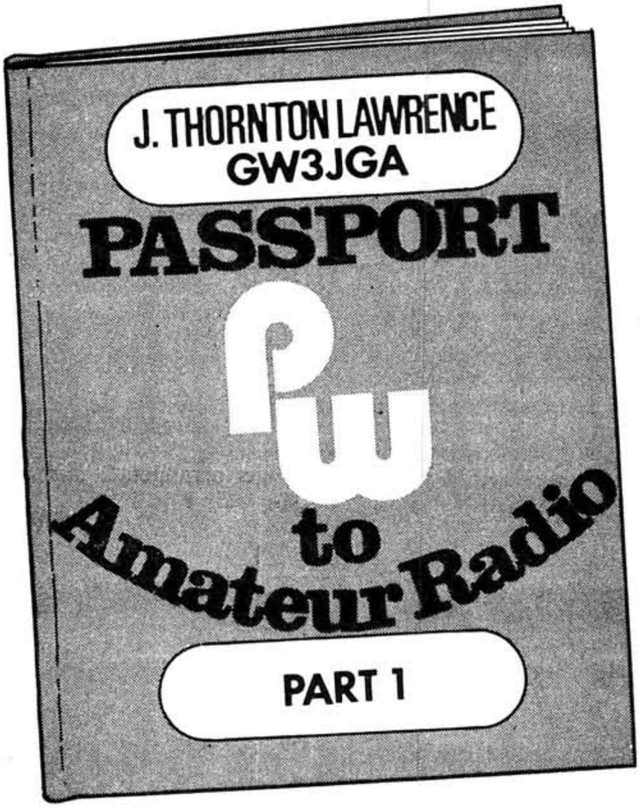


Communication by radio is now very commonplace and we are no longer amazed by the policeman or woman talking to HQ over a hand-held radiophone. Mobile radios are standard equipment for taxis, public service vehicles and many others. All these users are licensed to **operate** commercially made communication equipment which is of a type tested and approved by the licensing authority, the Home Office. The user does not need to have any technical knowledge.

In contrast, the radio amateur is licensed to "use his Station for the purpose of sending to and receiving from, other licensed amateur stations, as part of the self-training of the Licensee in communication by wireless telegraphy/telephony".

Although the Licence infers that amateur radio is a strictly male preserve, there are in fact many YL operators too, some sharing their husband's equipment, some having their own.

As the amateur's equipment may be home built and experimental, it is essential that he (or she) has an understanding of how it works.

Before the Home Office will issue an Amateur Licence, one of the conditions to be satisfied is proof of the would-be amateur's technical competence and knowledge of the licensing conditions, in short, a "pass" in the Radio Amateur's Examination (RAE).

The Old . . .

There have been wireless (radio) amateurs since the very beginning of wireless communication, but it was in 1905 that the first printed "licence to use Wireless Telegraphy for Experimental Purposes" was issued to a wireless amateur in this country.

It is interesting to note that one of the first licensees was Professor J. A. Fleming, the inventor of the thermionic diode which was used extensively in the very first valved radio receivers.

In 1910 the Post-Master General decided that all holders of experimental licences should be given a distinctive call sign (consisting of 3 letters, one of which was always an X) and that this should be sent at the end of each transmission.

The London Wireless Club (the forerunner to the Radio Society of Great Britain) was formed in 1913 and by 1914, the start of the First World War, there were about 2150 wireless licences in force, approximately 1600 of these being for experimental transmitting stations.

The period between the wars was a very exciting time for radio amateurs, pioneering as they did, the *spanning of* the Atlantic on the so-called "useless short waves", below 200 metres.

In 1922 the London Wireless Society (formerly Club) became the Radio Society of Great Britain (RSGB) which today is still our national society, representing and protecting the interests of the British radio amateur on the national and international scene.

The year 1929 saw the first six internationally agreed short-wave bands allocated specifically for amateur radio use. Five of these bands have remained substantially unchanged to the present day.

The Oxford Dictionary states that an amateur is "one who cultivates a thing as a pastime", but it was at the International Telecommunications Convention, in the USA in 1947, that amateur radio was defined as "A series of self-training, intercommunication and technical investigations, carried on by duly authorised persons, interested in radio technique solely with a personal aim and without pecuniary interest". Although it is a bit of a mouthful, I think you will agree that amateur radio must surely be the only hobby ever, to have been defined by an international treaty, drawn up by 90 nations.

And the New . . .

Let us now move to the present day and look at the 14 frequency bands available to the British radio amateur.

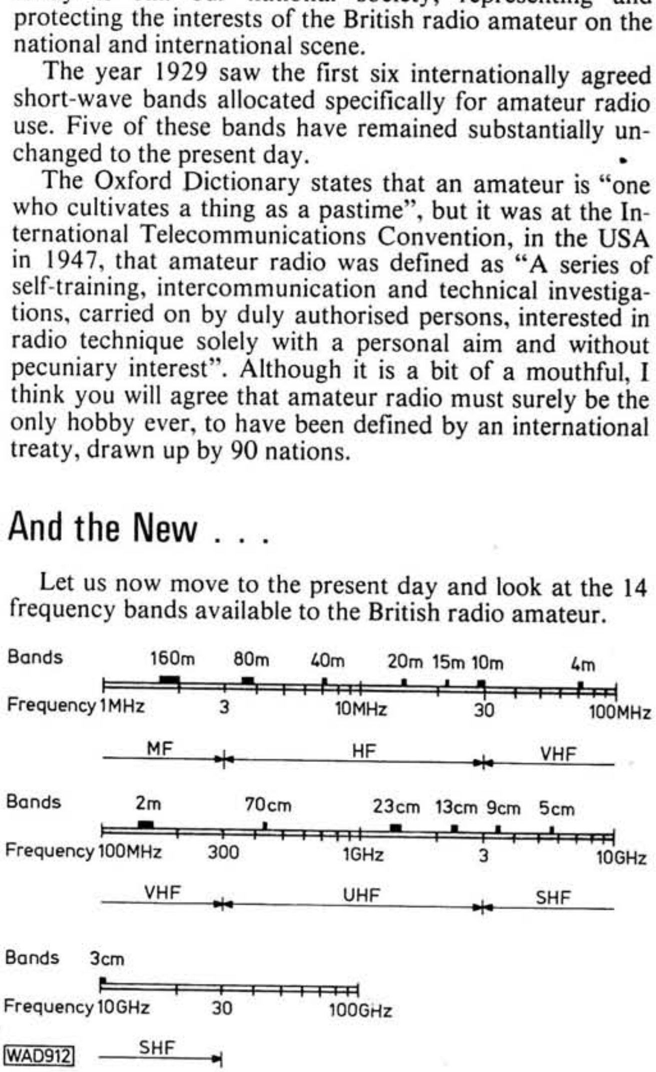


Fig. 1

It is in these bands that the radio amateur is able to communicate with fellow amateurs in the UK and all over the world.

You may think that a radio amateur must be a professional technician or engineer; not at all, radio amateurs have all kinds of jobs and backgrounds, but they do have something in common in that they are interested in one or more aspects of amateur radio communication or experimentation.

Our thanks to Mike Joy G8HBQ, for the use of his amateur station in our cover photograph.

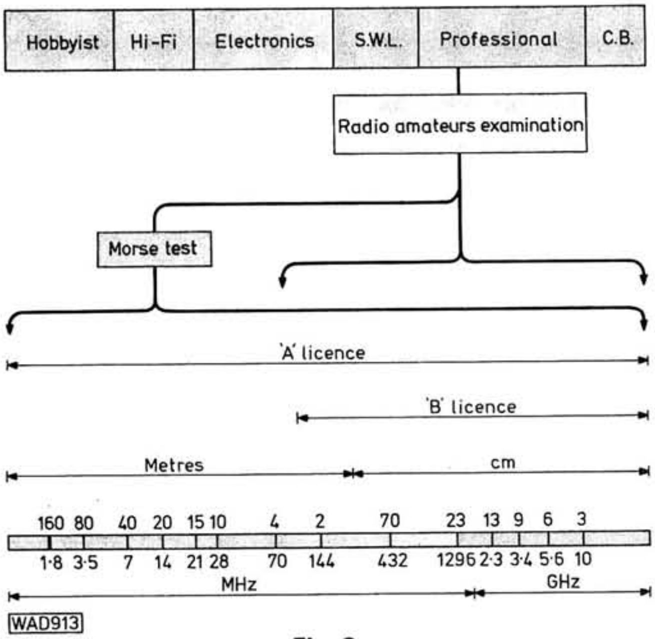


Fig. 2

The prospective radio amateur is probably keen on a practical hobby, interested in hi-fi or electronics, he may be in electronics professionally, a keen short wave listener or CB enthusiast. At this point the amateur radio bug usually bites, which means that the enthusiast must study for, sit and pass the RAE in order to obtain his licence.

After passing the RAE he can immediately apply for the Amateur Class B licence, which allows him to transmit on amateur bands above 100MHz. Alternatively, he may wait and pass the Morse test and then apply for the full Amateur Class A licence.

Many radio amateurs obtain their Class B licence first and then, after gaining some operating experience, pass the Morse Test and re-apply for a Class A licence in place of their Class B licence.

Often radio amateurs have first spent some time as a short wave listener (s.w.l.) or, if they have joined the RSGB (as I hope you will be doing), as a British Receiving Station (BRS).

You will learn a lot about short wave conditions and amateur radio operating by listening on the amateur bands, but to do this you will, of course, need a receiver.

You can purchase a new communications receiver for £100 – £200. For example the Lowe SRX-30 (reviewed in *PW* August 1980) or the Yaesu FRG-7 (reviewed in *PW* July 1980).

The main features of a suitable receiver are shown in Fig. 3.

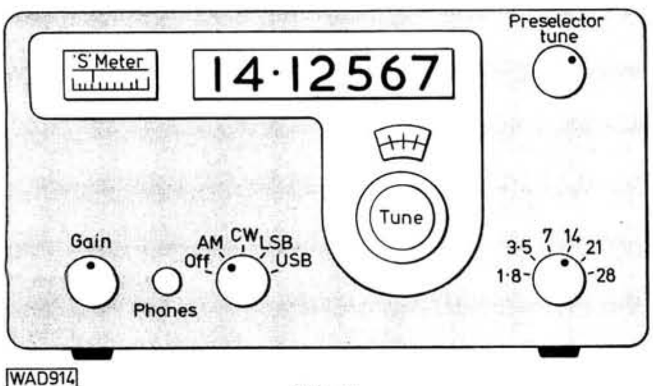


Fig. 3

The portable multiband receivers sold by hi-fi shops are not usually suitable for serious listening on the amateur bands, mainly because they do not have a beat frequency oscillator (b.f.o.) and the dial accuracy and frequency stability are inadequate.

You can sometimes find an old wartime h.f. communications receiver such as the British CR100 or American AR88 or BC348 etc., for £10 – £30, or one of the Eddystone range of receivers such as the 640 (1947 vintage) up to the 880 (1956) at £15 – £50.

These receivers usually cover several of the amateur bands in the range 1·8 to 30MHz (160 to 10 metres). If you are interested in listening on the v.h.f. or u.h.f. bands, then a frequency converter (usually just called a "converter") can be used in conjunction with your h.f. receiver to tune the band required. A separate converter is required for each band.

For example, a converter-receiver arrangement for the 2 metre band 144–146MHz, is shown in Fig. 4.

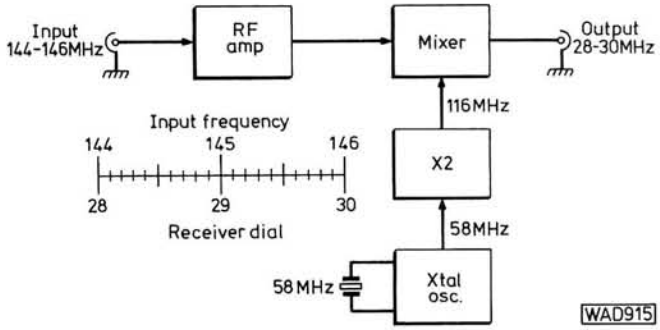


Fig. 4

If you decide to build a 2 metre converter then designs and printed circuit boards are available (2m MOSFET converter *PW* October 1978) or there is plenty of choice at around £20 if you wish to purchase one.

Amateur radio transmissions can use different types of modulation to convey the information, some of the types you may come across are shown in Fig. 5.

WAD916 ★

				Receiver demodulation	
Emission class	Modulation	Description	Popular terms	Beat-frequency oscillator	Discriminator
A1-A1A	Telegraphy	On-off keying	Morse c.w.	Yes	No
A3J-J3E	Telephony	Amplitude modulation single sideband suppressed carrier	Phone s.s.b.	Yes	No
F3-F3E	Telephony	Frequency (or phase) modulation	f.m.–n.b.f.m.	No	Yes

Fig. 5

Amateur radio is a hobby which is pursued mainly at home and naturally it affects the rest of the family. On a more personal note now, I obtained my licence in 1953. I was single and living with my parents at the time and my radio "shack" was a corner of my bedroom.

I think it is very important to encourage your young lady (YL) or wife (XYL) to take part in your amateur radio hobby and not exclude her from it. She may become sufficiently interested to pass the RAE and obtain a licence herself.

My XYL and I married in 1954 and for the first three years my shack was in the second bedroom, it was warm and comfortable and I could work late into the night with the minimum of disturbance.

continued on page 61 ▶▶▶

PW 'EXE' MICROWAVE TRANSCEIVER Part 3

Dick GANDERTON G8VFH & John M. FELL G8MCP

The mechanical engineering involved in the *PW* Exe project should now be complete and we can turn to the more conventional electronic engineering. However we will be giving details of simple modifications for other types of doppler burglar alarm heads later in the series.

The various circuits comprising the i.f. strip and audio processing sections were described in the first part of the series and the majority of this circuitry is built on one p.c.b. The remaining part of the i.f. is an Ambit EF5803 module which is used as purchased. This module is, in effect, a very high performance v.h.f. Band II tunerhead covering the frequency range 88 to 108MHz.

The p.c.b. carrying the components for the 10·7MHz i.f. section together with the audio processing, modulator and 9V stabilised supply should present little difficulty to the constructor. It may be necessary to open up the holes to accept the two tags of the quadrature coil L2. Integrated circuit holders can be used if the constructor is averse to applying heat to the pins of his i.c.s.

Veropins are inserted in the holes shown in Fig. 10 to allow the leads to the various controls to be easily attached to the p.c.b.

One or two components were omitted from the circuit diagram (Fig. 4). C32, 0·1μF is fitted between the microphone socket and R51; C33, 22nF provides a means of removing ringing on the microphone amplifier and C9 has been reduced in value to 0·1μF. S2 and S3 can be combined into a s.p.d.t. switch with a centre off position.

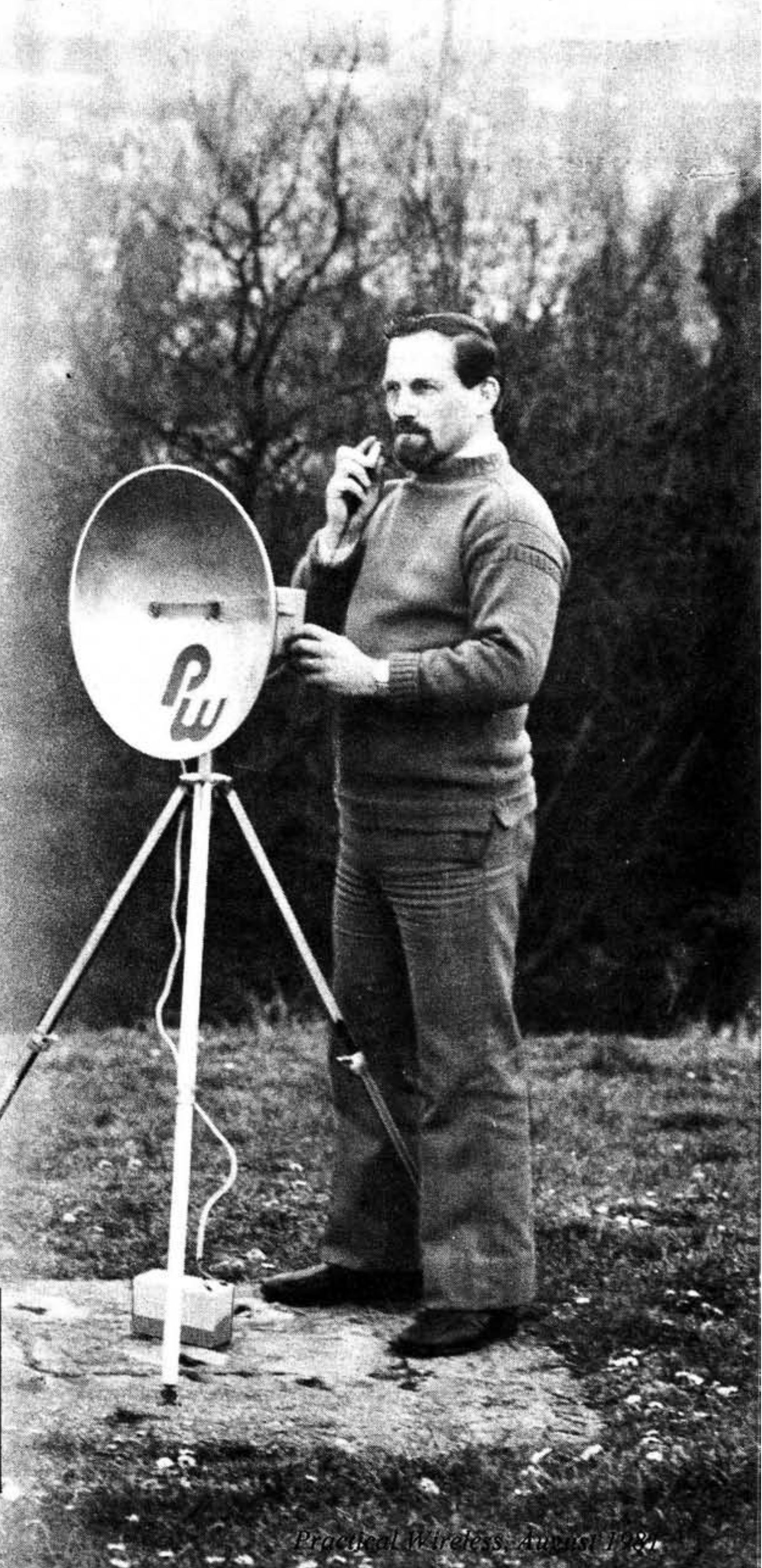
It is suggested that the resistors and diodes are inserted into the appropriate holes first followed by the i.c. sockets, Veropins and presets. The last components to be fitted should be the electrolytic capacitors. Do not forget the two wire links.

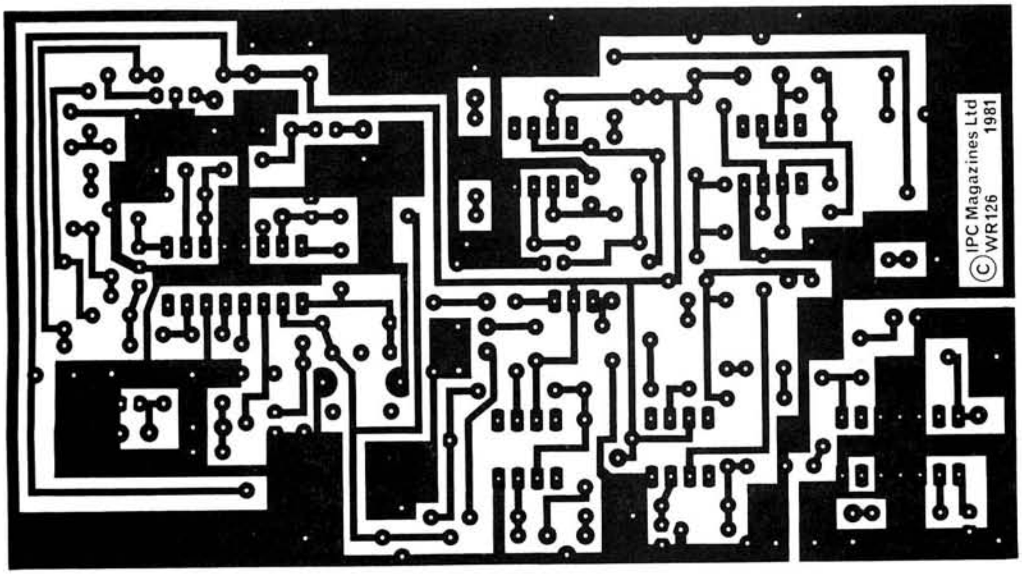
The diecast box was described last month and the controls, meter and sockets should now be fitted into place. The EF5803 module is held in position on edge at the front of the box by its edge connector and a clip at the other end. The edge connector is bolted to the end of the box using two brackets which fit into the connector moulding. Full details of the connections to the EF5803 are given in the instruction provided with each module.

Earthing arrangements are very important if the full potential of this tunerhead is to be realised and to achieve this a 16 s.w.g. tinned copper wire earthing bar is soldered alongside the edge connector. All earths to the module are made to this bar.

To cut down on pick-up problems all the internal wiring is made using a small size screened lead. For some of the leads the screened twin version can be used.

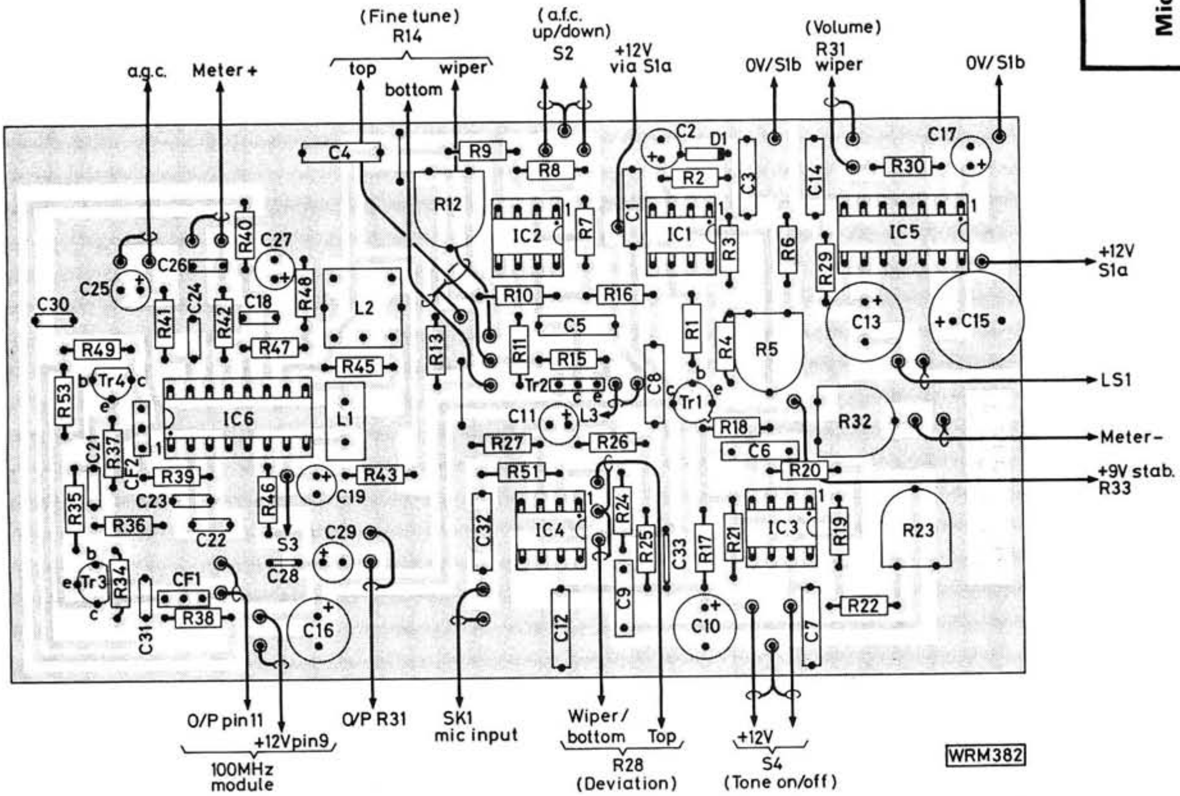
The specially designed parabolic dish used in the *PW* Exe is available by post from the Editorial Offices as detailed in last month's issue. M & B Radio (Leeds), 86 Bishopgate Street, Leeds LS1 4BB will be selling these dishes at their shop and also at rallies.





WARNING

Microwave energy can cause damage to the tissues of the eye. Whilst there is no risk during normal working of the *PW* Exe *under no circumstances* should you look down the waveguide or into the microwave head cavity during operation.



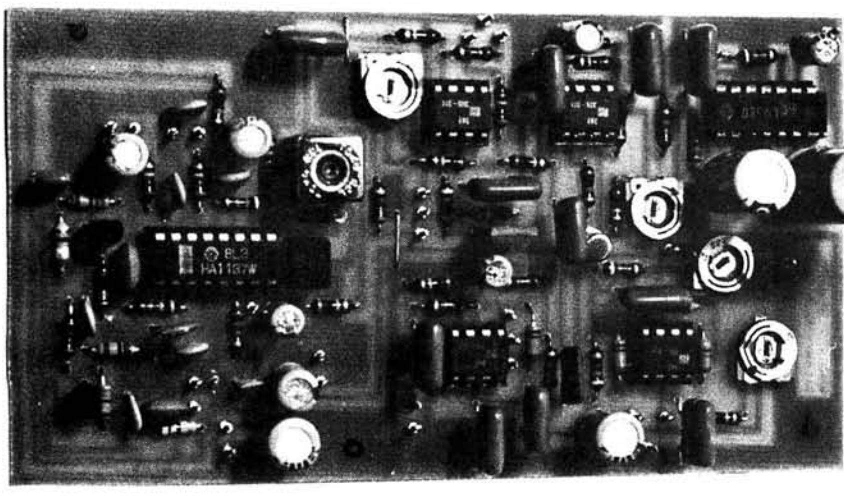
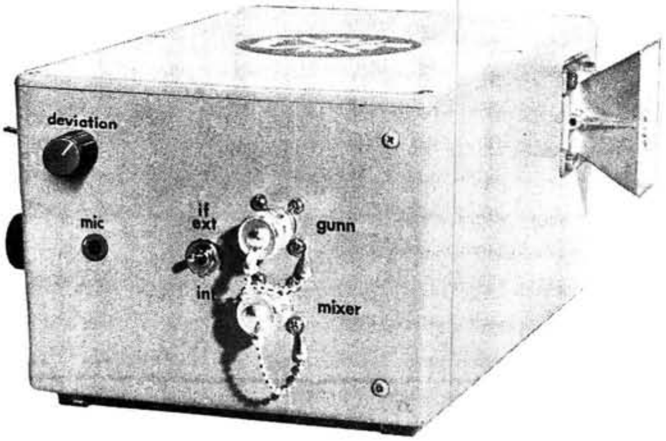
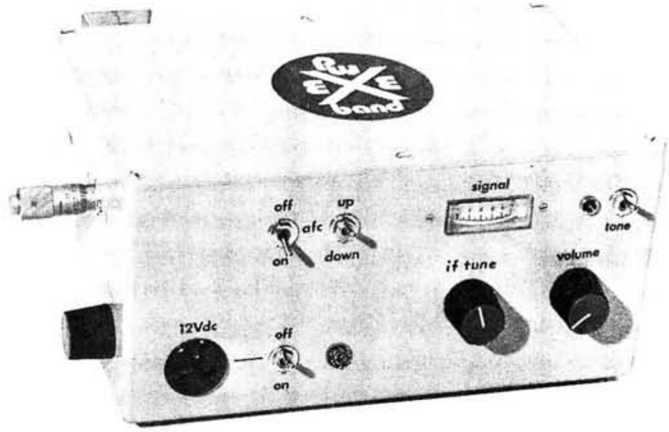


Fig. 9: (Top) the p.c.b. copper track pattern shown full size. Fig. 10: (Above) the component placement drawing for the *PW* Exe. Note that most of the leads from this board are in screened cable

(Left) The completed p.c.b. before attaching the flying leads



Readers who intend to operate the *PW* Exe should be in possession of the appropriate licence issued by the Home Office to those who have passed the City and Guilds Radio Amateurs' Examination. Details may be obtained from: The Home Office, Radio Regulatory Department, Amateur Licensing Section, Waterloo Bridge House, Waterloo Road, London SE1 8UA.



These two pictures show the relative positioning of the controls on the front and end of the diecast box. Used in conjunction with the dimensioned drawing Fig. 8 the controls can be correctly placed. The TUNE control (R14) is positioned in the end of the box below the micrometer head

★ components

Resistors

$\frac{1}{4}$W carbon film 5%

2·7Ω	1	R29
10Ω	1	R36
56Ω	1	R38
100Ω	2	R37,40
330Ω	3	R34,39,49
470Ω	2	R11,47
1kΩ	3	R1,3,35
1·2kΩ	1	R8
1·5kΩ	1	R52
1·8kΩ	2	R25,50
2·2kΩ	1	R46
3·3kΩ	1	R45
3·9kΩ	2	R15,53
4·7kΩ	4	R17,18,30,51
5·6kΩ	1	R6
8·2kΩ	2	R13,26
10kΩ	10	R2,4,7,10,16,22,27,41,42,43
33kΩ	1	R48
47kΩ	1	R19
56kΩ	1	R9
100kΩ	3	R20,21,24

Semiconductors

Diodes

1N5401	1	D2
Red l.e.d.	1	D3
BZY88C3V3	1	D1

Transistors

BC108	1	Tr1
BD135	1	Tr2
BF224	2	Tr3,4

Integrated circuits

741	4	IC1,2,3,4
LM380	1	IC5
CA3089	1	IC6

Potentiometers

Min. horizontal trimmers

1kΩ	2	R5,23
22kΩ	1	R32
500kΩ	1	R12

Carbon track

10kΩ log.	1	R31
10kΩ	1	R14
100kΩ	1	R33
1MΩ	1	R28

Capacitors

Ceramic disc

10nF	7	C6,18,21,22,24,26,31
22nF	1	C23
0·1μF	11	C1,3,4,5,7,8,9,12,14,30,32

Ceramic plate

47pF	1	C28
220pF	1	C20

Electrolytic, p.c.b. mounting

1μF 63V	1	C27
4·7μF 50V	2	C25,29
10μF 16V	3	C2,11,19
22μF 16V	1	C17
100μF 16V	2	C10,16
470μF 16V	1	C13
1000μF 16V	1	C15

Miscellaneous

Ambit EF5803 tunerhead module; 100μA edge meter; 5 × 3inch speaker 8Ω; p.c.b.; 10μH choke; Toko KACSK586HM; Toko 7BA144LY220, 22μH choke; Toko CFS/SFE filters (2); s.p.s.t. min. toggle switch, d.p.d.t. min. toggle switch; s.p.d.t. centre off min. toggle switch; Veropins; Screened cable; Knobs; 3·5mm jack; Min. 3p. non-reversible connector; 1·6A fuse and holder.

The screens are soldered at one end only, to the appropriate Veropin on the p.c.b., keeping the unscreened part of the lead as short as is possible.

The wiring from the power supply socket to the fuse holder switch should be made in heavy gauge insulated wire to minimise voltage drop problems. Screening these wires is not necessary. Note that the audio amplifier has its own separate 12V and 0V feeds taken directly from the ON-OFF switch. D2 is connected from the fuse holder to the 0V side of S1b. R52 and D3 are mounted on the front panel of the diecast box and connected to the nearest source of +12V. The prototype used S4 for this.

Two b.n.c. sockets are fitted to the side of the box together with a d.p.d.t. switch to enable the electronics to be used with an external microwave head. The switch is connected so as to change the i.f. input and modulator outputs between either the internal head or the sockets. A separate earthing tag must be used at each b.n.c. socket.

The modulator output is wired up using screened lead throughout with the r.f.c. (L3) soldered directly onto the Gunn diode post. Wiring for the Schottky mixer diode is carried out in a good quality 50Ω coaxial cable of as small a diameter as possible. Remember the warning given in Part 2 about the earthing strap across the Schottky.

When the p.c.b. has been completed and all the leads fitted the board can be fastened to the floor of the box using either suitable p.c.b. mounting pillars or Sticky Fixers.

Setting Up

The p.c.b. can be checked out before mounting in the box and the 9V regulated output set to between 9 and 9·5V using R5. The actual voltage is not critical but the EF5803 module requires up to 9·5V to enable it to tune up to 108MHz.

The Gunn voltage should be capable of being varied using the FINE TUNE control R14 and should be set initially at about +7·5V with a.f.c. switched out.

With a meter set to read about 3V connected across R43 adjust the core of L2 for zero volts on the meter.

It should be possible to tune in several v.h.f. radio stations using R33 so select a weak signal and carefully adjust the final i.f. transformer for maximum output. Note the instructions given with the module as to carrying out this operation.

The meter reading can be adjusted with R32 to give a suitable deflection with a really strong input signal.

If an oscilloscope is available then the modulator can be set together with the microphone amplifier output and tone generator output. Measured at the Gunn diode the modulation level should be 200mV. If a scope is not available then the modulation will have to be set up in conjunction with another working system. In this case R23 must be set to give minimum tone output and R28 set for minimum gain (zero resistance) to start with.

When you are satisfied that the system is working properly you can try out the a.f.c loop. The gain of the loop is set by R12 which also sets the modulator gain. With a.f.c. switched in and set to either position there should be no change in Gunn diode voltage. If there is, then the quadrature coil L2 will have to be re-adjusted. The modulator gain is set by R12 and should be adjusted to give the desired a.f.c. action.

Next Part

Final setting up of such things as modulator gain and i.f. tuning will be covered in the next part along with a general guide to operation on the 10GHz band.

A1A J3E

All change! – the new emission codes

F3E G3E

Although the most talked-about changes resulting from the deliberations of the 1979 World Administrative Radio Conference in Geneva (WARC '79) are in frequency allocations, there are others which will have some effect on radio amateurs and those studying for the RAE. Among these is a new set of codes for specifying radio emissions, which will come into use officially on 1 January 1982.

Most amateurs talk about emission types using abbreviations such as c.w. (continuous wave) for Morse code signals; s.s.b. for single-sideband, suppressed-carrier signals; and f.m. for narrow-band frequency-modulated (or phase-modulated) signals. The licence, however, uses the codes A1, A3J and F3 respectively to refer to these, and lists several other emission modes available for amateur use as well. Now, all these codes are to be changed, presumably on the grounds that they were not detailed enough to describe the many new types and variations of modulation which have come into use. Under the new codes, A1 becomes A1A (assuming it is to be received by human (non-automatic) means), A3J becomes J3E, and F3 becomes F3E for frequency-modulated telephony, or G3E if it's phase modulated.

The complete table of codes, extracted in slightly modified form from the new *Radio Regulations,* is shown in Table 1. A conversion table for the codes mentioned in the UK Amateur Licence will be published in a future issue of *PW*.

Bandwidth

Associated with the emission code is another code which designates the r.f. bandwidth of the emission. In the amateur service, the licence merely says that the radiated energy shall be kept within the narrowest possible frequency band, having regard to the class of emission in use, although certain standards have come to be accepted to ensure that transmitters and receivers are broadly compatible. It is very important to keep bandwidth in mind when operating near the band edges. For example, an upper-sideband telephony signal based on a carrier frequency of 29·699MHz would go well beyond the upper limit of the 10m amateur band at 29·700MHz, and could invite the attention of one of the international frequency monitoring stations.

In all types of professional radio communications the bandwidth allowed to be used is closely defined in the relevant equipment specification issued by the Home Office. For the benefit of readers involved in such communications, the new bandwidth code is as follows:

> The necessary bandwidth shall be expressed by three numerals and one letter. The letter occupies the position of the decimal point and represents the unit of bandwidth. The first character shall be neither zero nor K, M or G.
>
> Necessary bandwidths:
> between 0·001 and 999Hz shall be expressed in Hz (letter H);
> between 1·00 and 999kHz shall be expressed in kHz (letter K);
> between 1·00 and 999MHz shall be expressed in MHz (letter M);
> between 1·00 and 999GHz shall be expressed in GHz (letter G).

Examples:

0·1Hz = H100	2·4kHz = 2K40	180·7kHz = 181K
25·3Hz = 25H3	6kHz = 6K00	4·5MHz = 4M50
100Hz = 100H	180·4kHz = 180K	5·65GHz = 5G65

Breaking You In Gently

To get everyone used to the new emission codes, the Home Office has asked the technical press to use the existing and new codes in parallel during the remainder of 1981, so that the examples given at the beginning of this article become:

A1 — A1A
A3J — J3E
F3 — F3E or F3 — G3E as appropriate.

J 3 E

FIRST SYMBOL

TYPE OF MODULATION OF THE MAIN CARRIER

N Emission of an unmodulated carrier

Emission in which the main carrier is amplitude-modulated (including cases where sub-carriers are angle-modulated):

A Double-sideband
H Single-sideband, full carrier
R Single-sideband, reduced or variable level carrier
J Single-sideband, suppressed carrier
B Independent sideband
C Vestigial sideband

Emission in which the main carrier is angle-modulated:

F Frequency modulation
G Phase modulation
D Emission in which the main carrier is amplitude- and angle-modulated either simultaneously or in a pre-established sequence

Emission of pulses:*

P Unmodulated sequence of pulses
K A sequence of pulses modulated in amplitude
L A sequence of pulses modulated in width/duration
M A sequence of pulses modulated in position/phase
Q A sequence of pulses in which the carrier is angle-modulated during the period of the pulse
V A sequence of pulses which is a combination of the foregoing or is produced by other means
W Cases not covered above, in which an emission consists of the main carrier modulated, either simultaneously or in a pre-established sequence, in a combination of two or more of the following modes: amplitude, angle, pulse
X Cases not otherwise covered

*Emissions, where the main carrier is directly modulated by a signal which has been coded into quantised form (e.g. pulse code modulation), should be designated under amplitude- or angle-modulation as appropriate.

SECOND SYMBOL

NATURE OF SIGNAL(S) MODULATING THE MAIN CARRIER

0 No modulating signal
1 A single channel containing quantised or digital information without the use of a modulating sub-carrier*
2 A single channel containing quantised or digital information with the use of a modulating sub-carrier*
3 A single channel containing analogue information
7 Two or more channels containing quantised or digital information
8 Two or more channels containing analogue information
9 Composite system with one or more channels containing quantised or digital information, together with one or more channels containing analogue information
X Cases not otherwise covered

*This excludes time-division multiplex.

THIRD SYMBOL

TYPE OF INFORMATION TO BE TRANSMITTED*

N No information transmitted
A Telegraphy—for aural reception
B Telegraphy—for automatic reception
C Facsimile
D Data transmission, telemetry, telecommand
E Telephony (including sound broadcasting)
F Television (video)
W Combination of the above
X Cases not otherwise covered

*In this context the word "information" does not include information of a constant, unvarying nature such as provided by standard frequency emissions, continuous wave and pulse radars, etc.

Modulation used only for short periods and for incidental purposes (such as, in many cases, for identification or calling) may be ignored provided that the necessary bandwidth is not thereby increased.

Table 1—Emission Code

air test

USER REPORTS ON SETS AND SUNDRIES

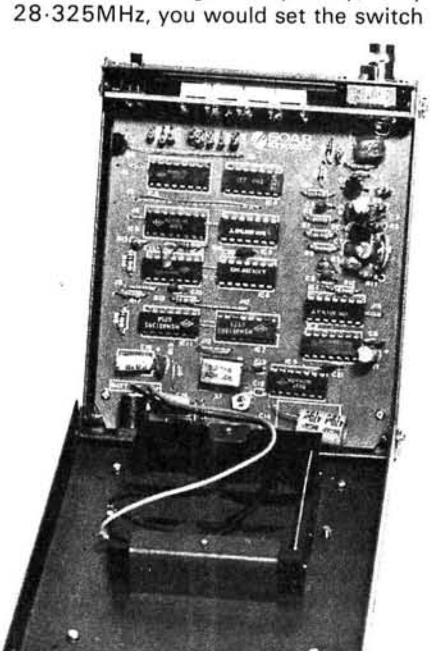
SOAR FC-841 Frequency Counter

It's not so many years ago that digital frequency meters came in 19in bench-top rack cabinets and, if you were so unwise as to think of doing so, required two strong men to move them. They weren't very easy to use, either. Then they started to benefit from space technology, and you could buy a very good 50MHz counter/timer for around a thousand pounds (mid-1960's pounds, that is), that could be carried by one man, providing it wasn't too far. I could go well over a hundred yards without changing hands!

Since then, as with most electronic units, they've got even smaller, and are just about at the limit that the space needed for the display and controls will allow. They've got cheaper, too, and counters with a very creditable performance are now within range of the enthusiast's pocket. The latest to come our way, and one which I must admit appeals to me personally, is the FC-841 by the Soar Corporation of Japan.

The FC-841 is a real "pocket-size" instrument, measuring 32 × 100 × 120mm, excluding protrusions like feet, tilt stand and input socket, and weighs around 550g. Tests carried out by the importers, Holdings of Blackburn Ltd., produced the following performance figures: Frequency range: 10Hz–65MHz (45MHz on internal batteries). Sensitivity: better than 30mV over most of range (60mV on internal batteries). Time base accuracy: not worse than ±0·3p.p.m. (0·0003%), or 1·5p.p.m. (0·0015%) on internal batteries. Time base drift: less than 0·3p.p.m. from 1 minute to 1 hour after switch-on. The checks which we carried out certainly showed the frequency accuracy and drift to be very good indeed, when checked against standard frequency station WWV by the transfer oscillator method. Holdings are prepared to guarantee an accuracy of ±0·0002% ±1 digit, and a sensitivity of 60mV at room temperature, on all units sold.

The display is a 4-digit, red l.e.d. type, with digits 10mm high. Here, I must voice my only criticism of the unit, and that is that the display is dim—no good putting it next to the window in sunlight, or under a bright desk-lamp. Apart from the ON/OFF switch, the only external control is a GATE switch, which controls the length of time that the counter gate is open, and hence the frequency range displayed. In the "kHz" position of the switch, the display indicates tens of kilohertz, with a resolution of 10Hz, and in the "MHz" position, it indicates tens of megahertz, with a resolution of 10kHz—the decimal point stays between the second and third digits. To measure a high frequency, say 28·325MHz, you would set the switch



first to "MHz", when the display would read 28·32 or 28·33 (the last digit of a counter is always subject to a possible error of ±1 digit). Switching then to the "kHz" range, the display should read 25·00 if the measured frequency is accurate, though again, there is a possible ±1 error in the final digit which indicates tens of hertz.

This procedure does take a little getting used to, and you have to be specially careful when the final digit of the "MHz" reading is around the zero area, but it causes no problems with a little practice. If you have a real 8-digit counter, you tend to ignore the most significant digits when you are trying to read a frequency accurately. In the FC-841, the display does the ignoring for you!

The input impedance is 1MΩ plus stray capacity, and the input connector is a BNC socket. The power supply can be internal, using four AA-size (Penlight) cells which fit into a battery compartment under the unit, or external in the range 8–11V d.c., or 14V via a 15Ω resistor.

All the circuitry of the unit is housed on two p.c.b.s, one for the display, controls and input connector, the other the "works", which include 11 i.c.s and five transistors. All components are identified on the p.c.b., and the whole is very neatly assembled. The manufacturer's Operator's Manual is a bit sketchy, and written in the usual Oriental English, but Holdings provide a very useful leaflet with a translation and some additional information. No servicing data is given.

The Soar FC-841 costs £45.00 including VAT, which buys you the basic unit less batteries, leads, etc. The recommended power unit for a.c. mains operation is £7, and a pre-scaler to extend the frequency range to 500MHz is available at £23. A charge of £1 is made to cover post and packing. For further details contact **Holdings Photo Audio Centre, 39/41 Mincing Lane, Blackburn BB2 2AF, telephone: Blackburn (0254) 59595/6,** to whom we offer our thanks for the loan of the review sample.

G. C. Arnold G3GSR

REMEMBER: When you deal with SMC you get:
The SMC 2-year guarantee on Yaesu. The speedy free Securicor service.
The security of dealing direct with the largest authorised importer.
The spacious, very well equipped, ably staffed test and service facility.
The knowledge that we carry tens of thousands of pounds of spare parts.
Our discreet "instant" H.P. Our personal export documentation scheme.
Our in-person, or over the 'phone, time saving credit card acceptance.
Our honest advice and evaluation of part exchange equipments' worth.
Our deep interest and knowledge in most facets of our common hobby.

AND DO NOT FORGET THE FREE FINANCE SCHEME
Give us a ring for full details (subject to clearance and a minimum of £100 invoice) we will help you to enjoy new regular priced Yaesu, KDK, Gem Quad, Ascot, SMCHS, CDE, Hy Gain, Stolle, Channel Master, SMC, Hansen, MFJ, KLM, Mirage, and Hi-Mound – Tomorrow! (You pay only The Cash Price!!!).

POWER UNI

NEW

RU120406 £15
4 amps const. 6 amps surge @ 13.8V. Low ripple.

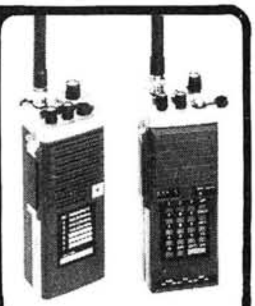
RS120810 £30
8 amps const. 10/11 surge @ 13·8V. Full foldback etc.

SS122535 £99
25 amps const. 35 surge @ 13·8V. Foldback, short circuit proof etc.

FRG7700 £309
0·15 30MHz General Coverage Receiver. AM/SSB/CW/FM (Memory Version £389)

FT202R £109
1W. 6 chnl. 2m Handheld

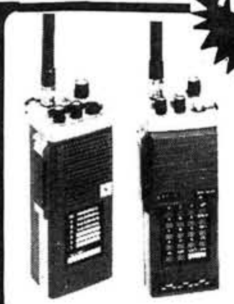
FT207R £195
3W. 2m 12½ kHz Synthesized



NEW

FT404R £179
3W. 6 chnl. 70 cms Handheld

FT708R £199
1W. 70 cms 25kHz Synthesized

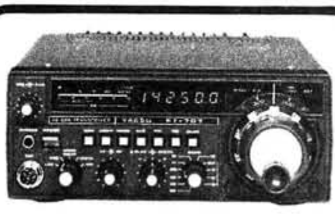


FRG7 £199
0°5 30MHz General Coverage Receiver. 230V ac. 12V dc, + Battery pack. AM/SSB

FT480R £359
2m, Synthesized. 25, 12½, 1kHz steps FM 1kHz, 100, 10Hz,steps SSB, 10W PEP.

NEW

FT780R £409
70cm, Synthesized. 100, 25, 1kHz steps FM. 1kHz, 100, 10Hz steps SSB, 10W PEP



FT707 £529
10–80m. 100W PEP,SSB, AM, CW. Variable IF Bandwidth. Digital. 8 Bander.(10W model £455)

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MODS

IMPORTANT—The ideas presented here are suggestions only, and as they are untried by this magazine, we cannot accept responsibility for any resultant damage, however caused. Before alterations are attempted, care should be taken to ensure that any guarantee is not invalidated, and it should also be borne in mind that modifications usually have an adverse effect on resale prices. In cases where specialist skills or equipment are needed, most dealers will undertake the work for a reasonable fee.

Roger Hall G8TNT (Sam)

No. 8

Rob, G8OZP, has written from Burton-upon-Trent with a very nice a.g.c. mod for the Trio R-1000. Remove the top cover and locate the two-pin plug I3 which is in the rear left hand corner of the set and which has a white/orange and a white/blue wire running to it. If this plug is removed the a.g.c. action is speeded up considerably and if switchable fast/slow a.g.c. is required, Rob points out that it is a simple matter to remove the existing wiring from the front panel dimmer switch and to re-route the two wires that run to plug I3 through this switch. Thanks for passing on the idea Rob.

Next a very simple mod for the Trio TR-9000 from Steve, G8VEF, of Lowe Electronics. In its original form the HIGH/LOW power switch on the front panel of this set gives 1W on low power and 10W on high power, but only on f.m.; on s.s.b. the output is 10W regardless of the position of the switch. To make the switch work on s.s.b. as well as f.m. simply remove the lid of the set and cut the orange wire that is attached to the rear of the HIGH/LOW power switch. That's all there is to it. Thanks Steve.

The last tip this month is for owners of the Yaesu FT-480R. Several people have said that these rigs appear to have a mind of their own and they have a tendency to zoom off frequency all by themselves, which can be quite disconcerting. Mike, G8EWU, has worked extensively with these sets and he has found that this problem usually occurs because the user has forgotten to release his auto-clarifier button. If everyone remembers not to operate on f.m. with the button depressed then the problem should disappear.

Wanted

I would like to use the rest of this month's page to publish a selection from the many requests for help that I have received. I had originally intended to publish a few each month but as space has been limited for the last few months I now have quite a backlog to get through.

Mr. D. E. Williams carried out the FT-480R listen-input mod that I published in the December column and he has written in because he would like to know if anyone has come up with a full reverse repeater mod as he would like to do that one next.

David, G8XYJ, wrote in from Welwyn Garden City because he would like an auto-toneburst mod for the Icom IC-255-IC-260 range of 2 metre transceivers.

Mr. E. S. Saunders of Nottingham wrote in to say that he has carried out the Trio TR-2300 reverse repeater mod that appeared in the May mods column but he does not want to use the other suggestion i.e. to use the l.e.d. to show that the toneburst has been switched on. He would prefer to use the diode to indicate that duplex has been selected and he wonders if anyone knows how to do this.

Mr. M. E. Lee also read the May mods page and he wonders if anyone has details for the same sort of mods that appeared there, reverse repeater etc., but this time for the sister rig to the TR-2300, the TR-3200. He would also like any mods for the Yaesu FR-101DD receiver.

Mr. D. W. Howarth, G4IFT, wrote in with a very interesting mod that I hope to be able to use in a future issue but for now here are his requests for mods. He would like information on the Yaesu FT-221R i.e. switchable High/Low power, front end mods etc. and he would also like to know if it is possible to modify the TR-2300 to give a low power output.

Mr. R. D. Woodard of Sheppey in Kent has bought himself a Trio 9R59DS and he wrote to me because he would like to know of any mods that anyone has carried out. He has not specified which mods and so I gather that any information would be welcomed.

Mr. A. D. Rock, G8PR, wrote in from Stow Bridge asking for two mods. The first is to extend the frequency range of the Yaesu FT-227R up to 148MHz, and the second is to enable the Yaesu FT-101E to transmit on 10MHz. He has seen such a mod for the FT-101 but it does not work with the FT-101E.

Vic, G3UB, wrote in asking for any information that would enable him to modify his FT-DX500 to operate on 160 metres. He wonders if the required crystal would be 7520kHz and he adds that he would prefer an outboard p.a.

Mr. D. R. Pellegrini has an SX200 and he wonders why there are two gaps in its coverage. The set does not cover between 88MHz–108MHz and 180MHz–380MHz and he would like to know of a mod that would allow these bands to be covered.

David, GI4FUM/EI4DJ, has an FDK Multi 750E and he would like to extend its frequency range, add a pip-tone on s.s.b. and also to make the set scan.

Can anyone help with any of these mods? If you can, or if you have a request for a mod or if you have a mod that you would like to have published, please write to: R. S. Hall, Practical Wireless, King's Reach Tower (Hatfield House), Stamford Street, London SE1 9LS.

73's
Sam G8TNT

the things people say

"Is my signal any better now? I have switched in my Noise Blanker."

. . . Brighton & District RS Newsletter

Have you heard any (printable) comments, funny peculiar or funny ha-ha? If so, why not send them in to our Editorial offices at Poole. We will pay for every one published.

Winding Reproduction Vintage Coils

B.C.Howard BA

There has recently been an upsurge of interest in vintage wireless sets, and details of a reproduction set in the May and June 1980 issues of *Practical Wireless* are an indication of this. As mentioned in the first article dealing with that set, many of the components are no longer available, or are very rare. This comment applies to the coils used in sets of this era, but many constructors were happy to wind their own coils, as well as make up their own variable "condensers" from the various plates and components sold by dealers.

Plug-in Coils

For a long time, the most popular coils were the 2-pin, plug-in type, in various sizes, from two or three turns of 18 s.w.g. tinned copper wire for short waves to the multi-turn coils to cover the long wave reception of Daventry and Radio Paris. The coils, with one male and one female connector, were plugged into standard baseboard mounting type bases (Fig. 2), and there was also provision for a swinging holder for reaction circuits. If variable coupling between three coils was required, you could obtain a holder in which the centre coil was fixed and each of the outside two coils could be swung to vary the coupling between each of the outside coils and the centre coil independently. Where the circuit required a tapping on the coil, usually to tap the antenna on to the grid coil, this was provided by means of a connection to a terminal on a 4BA bolt at the top of the coil.

Honeycomb Coils

Simple kits for winding these coils were obtainable from dealers and consisted of a small, ready-drilled, wooden core, and a number of steel pins which were inserted into the holes in the fashion of the spokes of a wheel. 2-pin bases were also available from the same source. These kits are now very probably non-existent outside museums, but can easily be constructed.

The wooden cylindrical former should be about 50 or 60mm in diameter and the pins about 50mm long. These can be long panel pins or round nails. For ease of winding, panel pins with their small heads are more convenient. If these are not available, the heads of ordinary round nails should be removed.

Holes are drilled into which the nails are lightly hammered. The number of holes on each edge of the cylinder is not critical, but they should be about 10mm apart, and the number on each edge should not be a multiple of 2 or 3, in order that the winding may form a regular honeycomb pattern. A simple way of working out the spacing is to wind a single turn of paper about 10 mm wide round the former, remove it and, laying the strip of paper flat, measure the length of one complete turn, i.e. the circumference of the former. The length should then be divided by a suitable number and the appropriate positions for the pins marked on the paper. These marks are then transferred to the circumference of the former and small

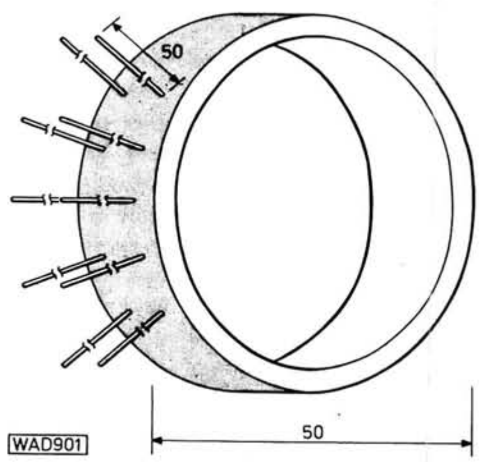
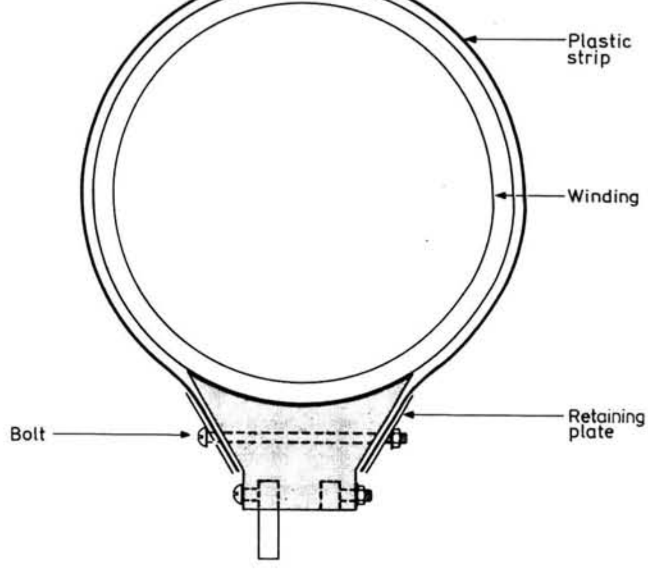


Fig. 1: Above, Former construction for a honeycomb coil. Fig. 2: Right, Plug-in coil former



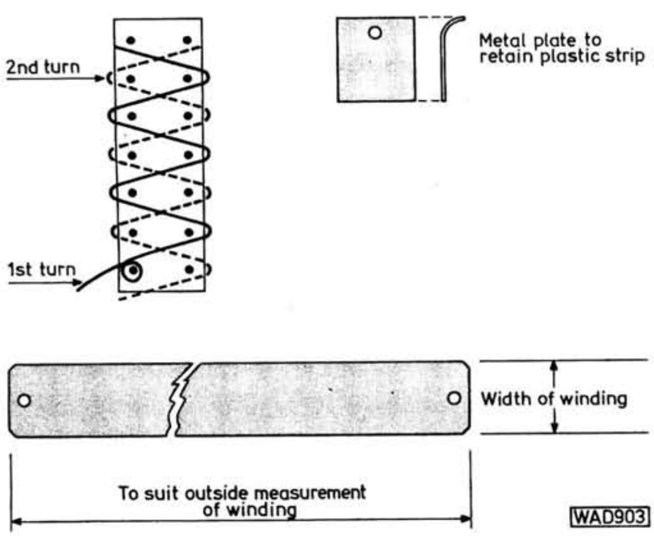


Fig. 3: Stages in the winding of a honeycomb coil

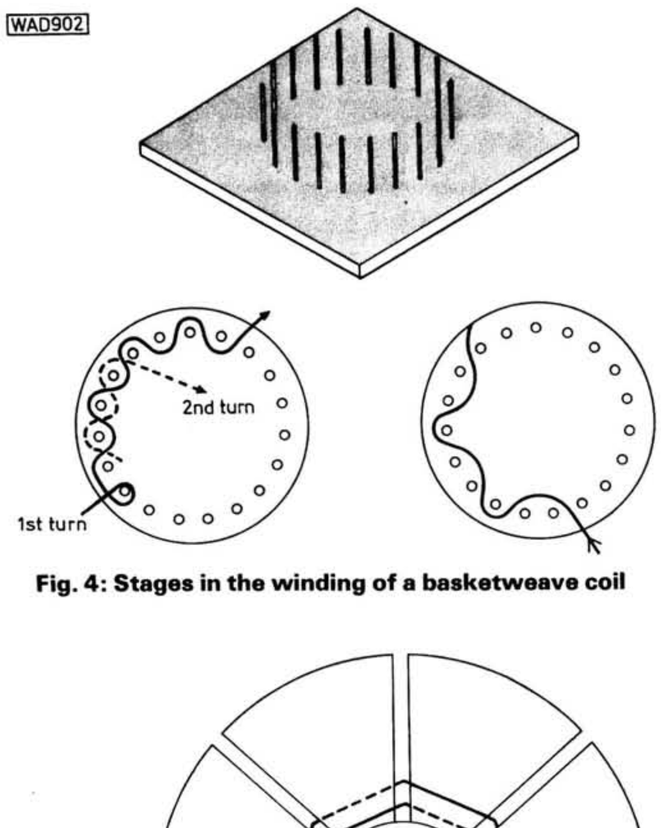


Fig. 4: Stages in the winding of a basketweave coil

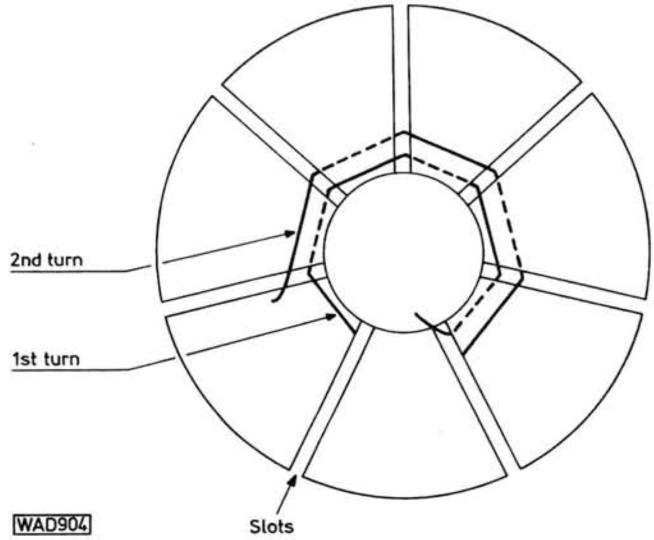


Fig. 5: Winding a basket type coil

holes made to receive the pins. The pins are then lightly hammered into the former (Fig. 1).

Using 28 or 30 s.w.g. wire, winding can commence. As with most coil winding, it is a good idea to stretch the wire slightly to stiffen it, and also to remove any kinks from the wire. This stretching also makes the wire easier to handle, and the finished job is somewhat neater. Anchor the free end of the wire round a pin, leaving about 100mm free for eventual connection to the plug base. Wind the wire across the former to the next pin on the opposite edge of the former, and continue in this fashion, taking the wire outside alternate pins, zig-zag style (Fig. 3). As there are an odd number of pins, the second layer will utilise the pins not used for the first layer, and so a honeycomb pattern will build up. About fifty turns will tune the medium wave band with a 500pF variable capacitor.

As the winding proceeds, keep the turns well pressed down, as if you were weaving a cloth, so that a compact coil is formed. When the requisite number of turns has been wound, the free end is anchored round a pin and left with about 100mm of wire to make the other connection to the base. The coil should be bound in about six places with thread, the best places being between two adjacent pins. The nails are removed and the coil is treated with a fixative to keep the turns in place. The coil is then mounted on its base and a strip of thin, stiff plastic wrapped around the coil and fixed at each end to the sides of the base with a small, metal retaining plate (Fig. 3).

Basketweave Coils

An alternative form of coil construction is the basketweave pattern. This type of coil is also mounted on a standard plug base. The pins are fixed onto the face of the cylinder, or in a circle on a flat block of wood (Fig. 4). Again, the number of pins should not be a multiple of 2 or 3. The start of the winding is as for the honeycomb coils, but the winding pattern is different. Starting from Pin 1, take the wire outside Pin 1 to the inside of Pin 2, then outside Pin 3, and continue alternately inside and outside each successive pin. With an odd number of pins, the second layer will be "out of step" with the first, the third layer will follow the first, and so on. After about 10 turns, the pattern will be evident.

When the required number of turns has been wound, the coil is finished in the same manner as the honeycomb type. A neater coil can be made by using an alternative winding pattern. Starting from Pin 1, take the wire outside Pins 2 and 3, outside Pin 4, inside Pins 5 and 6, and so on.

Basket Type

The third type of coil used is the basket type. These are mounted flat on the panel of the set. If variable coupling is required, e.g. for reaction, the moving coil is mounted on a short, wooden arm and arranged so that it can be moved closer to the fixed coil, the greatest degree of coupling being attained when the moving coil is directly above, and in the same plane as, the fixed coil.

The basket coil is wound on a circular piece of stiff cardboard, about 150mm diameter. A number of slots are cut from the circumference towards the centre of the circle. Again, the number of slots should be an odd number. Winding starts from the centre, the wire going over and under alternate segments of the card (Fig. 5). As the coil is not self-supporting, there is no need to fix the windings with a fixative. ●

power supply for Vintage Radios

G. THOMPSON

Vintage battery radios were powered by a 2V accumulator and 120V dry battery. Later models, not quite so vintage, used 1·5V and 90V batteries. Renovating this kind of wireless has the advantage that, unlike elderly mains equipment, there is little risk of serious fire hazard, or personal injury, from deteriorated mains and high tension components. However, even if suitable batteries were readily obtainable their cost and inconvenience would not be acceptable to-day. There is an obvious requirement, therefore, for a battery eliminator.

Modern components mounted on a chassis and screwed to the inside of the cabinet would be functional, but incongruous. Ideally, the unit should be contained in a mahogany and ebonite box with nickel plated brass connectors, but a reasonable compromise can be achieved with mahogany veneered chipboard and black or brown painted aluminium. The size should be such that it will readily fit into most battery compartments.

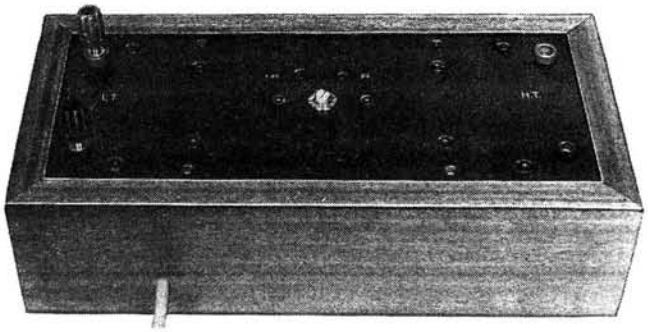
Because battery valves have directly heated filaments of small cross-sectional area the low tension supply must be exceptionally well smoothed, and close to the specified filament voltage. Ripple will appear as amplified hum at the output, while over or under running the filaments will shorten the life of the valves.

The high tension supply is not so critical, but it should be constant and reasonably well smoothed. The high tension current drawn by a battery wireless is typically about ten, and rarely more than fifteen, milliamps. It is therefore practical to limit the supply to twenty milliamps, which will protect the filaments in the event that they inadvertently come into contact with the high tension supply. Because of the vulnerability of the 'flying' battery leads both supplies should be short-circuit protected.

The power supply described has been designed with the foregoing in mind. Alternative supplies of 2 and 120 volts, or 1·5 and 90 volts, may be selected by S1, which has its spindle shortened and slotted for screwdriver adjustment. At the same time, a green l.e.d. lights for the lower voltages, or an amber one for the higher.

The Circuit

The mains input transformer has two 6V secondary windings, one of which is used for the l.t. supply. After rectification there is 6V d.c. available at the input terminal of the voltage regulator, which is about the minimum certain to overcome the dropout voltage. The low input voltage, and consequent low dissipation, ensure that heat-sinking is not a problem. The 'T' version of the LM317 regulator, which has a plastic T0220 case, is cheapest and easiest to mount. However, the T03 'K' version is equally suitable. Whichever is used it must be insulated from chassis with



the appropriate mounting kit. The 1·4V output is set by R3, and the 2V output by R2 and R3 in series. These resistors should be 5 per cent or better. The LM317 is protected against almost everything, but D1 is necessary to remove the voltage on C3 from the adjustment pin of the regulator in the event of a shorted output. The short circuit current from the LM317 is over 2A which the rectifier and transformer could not sustain over a period: the fuse is therefore included to limit the current to 800mA.

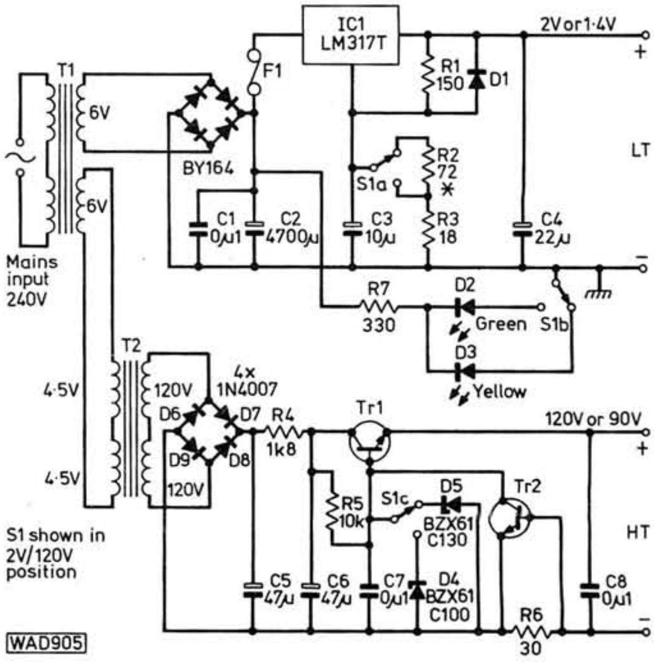
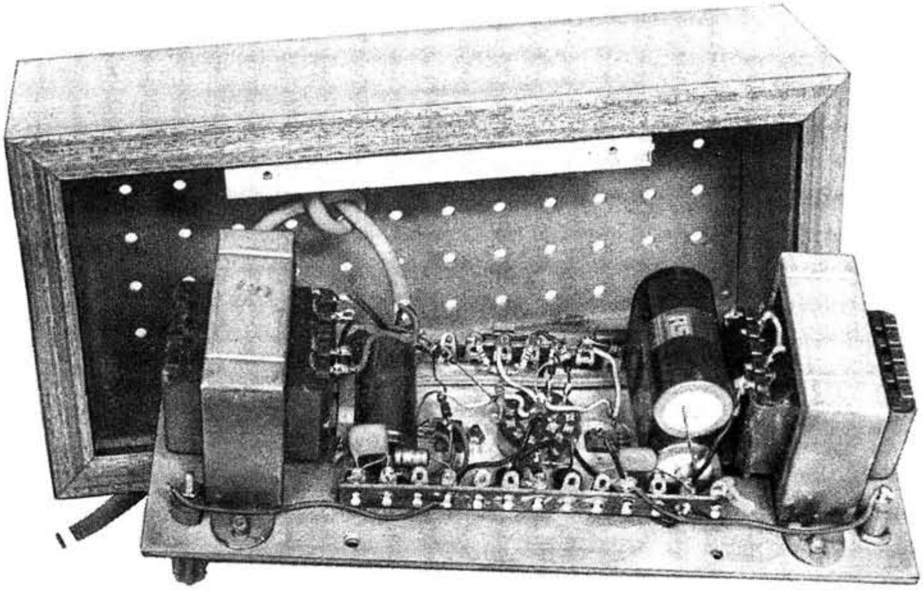


Fig. 1: Circuit diagram of the power supply. R2 is made up from two resistors R2a and R2b in parallel



The construction techniques used for this project are reminiscent of the fifties and early sixties. Tagstrips are used to mount the various discrete components

The second 6V winding of the mains transformer is fed into the 9V winding of T2, and the high tension supply extracted from the 240V winding. The rectified output, with no load, is about 200V.

Incidentally, the reasons for using these two transformers, instead of a single standard valve mains transformer, are (1) this arrangement is several pounds cheaper, (2) the final physical shape of the unit is better and (3) there is less heat dissipated in the dropping resistor.

The d.c. is fed to the collector of the series pass transistor, Tr1. through R4. The output voltage is set by the Zener diodes—D4, a nominal 90V, or D5, a nominal 120V. 100 and 130 volt Zeners are used, although 90 and 120 volt are available and may be preferred, to allow for up to ten volts drop in the automatic bias circuit. Tr2 is cut off until the h.t. current reaches twenty milliamps: it then draws current from Tr1 base, holding the supply at twenty milliamps. Further reductions in the load impedance result in the output voltage tending to zero. Tr1 is heat-sinked to chassis, but must be insulated from it. Tr2 does not need a heat-sink. Note that HT− is not connected to chassis: if it were, a separate grid bias supply might be necessary. As it is, if HT− is connected to the radio chassis through a suitable resistor(s) negative grid bias will be available at the HT− end(s). (See Fig. 2). Of course, many later battery radios already have this kind of bias, and the foregoing applies only to those which were designed for a separate grid bias battery.

continued on page 49 ▶▶▶

★ components

Resistors		
¼W 10%		
18Ω	1	R3
120Ω	1	R2a
150Ω	1	R1
180Ω	1	R2b
330Ω	1	R7
10kΩ	1	R5
½W 2% metal oxide		
30Ω	1	R6
½W 5%		
1·8kΩ	1	R4
Capacitors		
Disc ceramic		
0·1μF	3	C1,7,8
Tantalum bead		
10μF 16V	1	C3
Electrolytic		
22μF 10V	1	C4
4700μF 10V	1	C2
47μF 450V	2	C5,6

Semiconductors		
Diodes		
1N4001	1	D1
1N4007	4	D6,7,8,9
Green l.e.d.	1	D2
Yellow l.e.d.	1	D3
BZX61C100	1	D4
BZX61C130	1	D5
BY164	1	BR1
Transistors		
BD232	2	Tr1,2
Integrated circuits		
LM317T		IC1

Transformers
Primary 120 + 120V, secondary 6 + 6V 20VA
Primary 120 + 120V, secondary 4·5 + 4·5V 20VA

Miscellaneous
3p2w switch; 800mA anti-surge fuse and holder; 3mm insulated sockets, 4mm terminals; 13way tag strips (2); materials for box (see text).

SUPPRESSING & PROTECTING THYRISTORS

Part 3

Ben J. DUNCAN

Interference Suppression

Radio frequency interference (r.f.i.) is a common occurrence when thyristors and triacs are in use, it is also a great vexation to people listening (or trying to listen) to radios, televisions, and audio systems and can ruin hours of work in a recording studio.

The radio frequencies generated by thyristors and triacs, or any switching device, result from a sudden change of current in a circuit, rather like a squarewave. The step function generated by suddenly switching a current on and off has in theory an infinite number of harmonics, and though the amplitude of these falls rapidly with increasing frequency, there is usually sufficient energy to cause severe interference up to the bottom of the medium wave band.

Thyristor invertors can extend the range of the r.f.i. up to v.h.f. frequencies because of their fast switching rate. The key to r.f.i. suppression is to limit the rate of change of current (di/dt) in the circuit.

For instance, limiting the di/dt to around 0·5A/µs has been found to render r.f.i. insignificant on a.m. radio receivers. The di/dt limitation is achieved by placing chokes in series and capacitors in parallel with the thyristor or triac.

RFI can be propagated to other equipment by conduction or radiation, or a combination of both. Direct radiation is rarely a serious problem, because the wires inside a control unit are usually far too short to act as useful antennas at the frequencies where r.f.i. is most troublesome. However, interference is often picked up in proximate equipment and screening is essential where sensitive audio equipment is nearby, for example, when lighting control desks are used by discothèques and at rock concerts. Both steel and aluminium cases provide adequate r.f.i. screening. Copper screening is more expensive but provides excellent screening at high frequencies, and is most useful for invertors, which can produce high levels of r.f.i. at s.w. and v.h.f. frequencies. At these frequencies, control wires make good antennas and therefore radiated r.f.i. can be quite a nuisance.

In the majority of cases of thyristor generated interference, conducted r.f.i. predominates. A persistent example is the interference caused to mains powered radios by domestic dimmers and drill speed controllers; here the interference simply travels down the mains supply. Less common is re-radiated r.f.i. Here, the interference travels along the mains cables and is then re-radiated, to be received by portable radios. Once again, proximity is significant and a portable radio which is placed too close to mains wiring will be prone to re-radiated r.f.i. The interference in these cases can be strong because a length of mains wiring approaches the length of a $\lambda/4$ or $\lambda/2$ antenna at the frequencies of interest. Conducted r.f.i. is most troublesome when the supply impedance is high and the impedance between the noisy unit and the receiver suffering interference is low.

This condition is illustrated in Fig. 19, where a lighting dimmer interferes with a radio powered from an adjacent socket. If a separate mains cable is run to the dimmer, the conducted r.f.i. will be greatly reduced, because the r.f.i. will be attenuated by two lengths of mains cable acting as a T-pad attenuator in conjunction with the supply impedance, before it reaches the radio. To prevent re-radiated r.f.i. by-passing the supply cable impedance, the two mains cables should be separated by at least 2m and the units should be kept as far apart as possible.

The above method attenuates the r.f.i. received, but the most effective way of obliterating interference is to suppress it at source by limiting the rate of change of current (di/dt). The simplest means of doing this is by means of a series choke (Fig. 20). Note that this is placed on the *neutral* side of the mains, so that stray capacitances to earth do not hinder its effectiveness. Likewise, the value of the choke must be greatly increased at higher currents bearing in mind that the supply impedance will be lower. Fig. 21 depicts a low pass filter which provides a −18dB/octave slope below the turnover frequency which is around 50kHz using the stated values of L, C and load current. (The filter slope is really −12dB/octave, but in conjunction with the natural −6dB/octave decay of thyristor r.f.i. with increasing frequency, the slope is −18dB/octave). Suppression at 200kHz (the frequency of BBC Radio 4) is thus around −40dB.

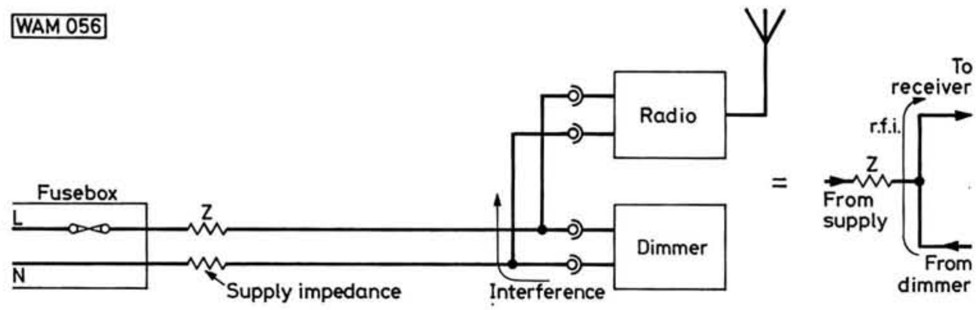


Fig. 19 (left): The effect of cable length on r.f.i. from a dimmer

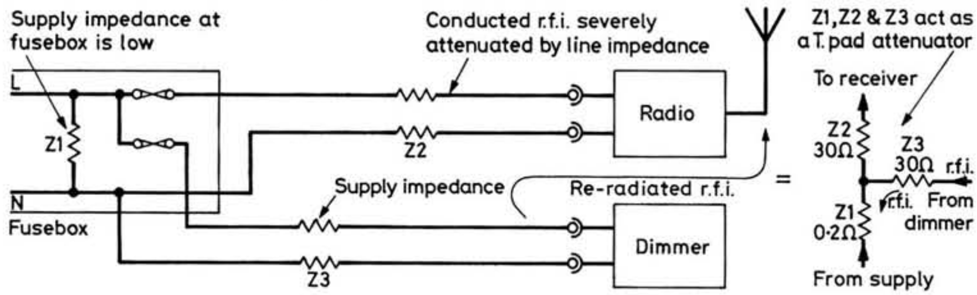
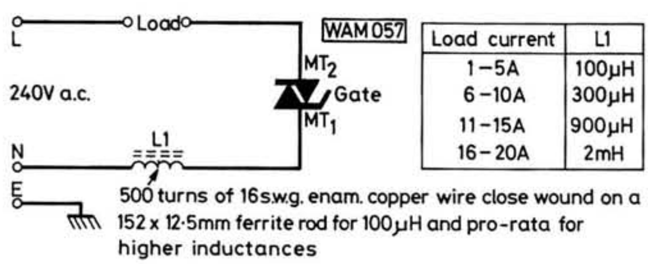
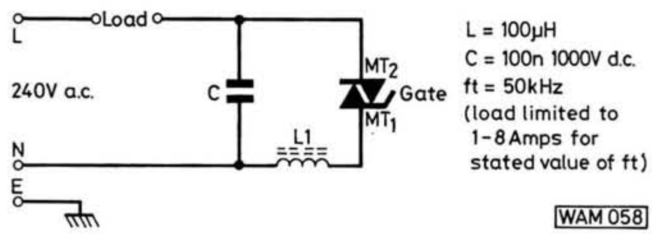


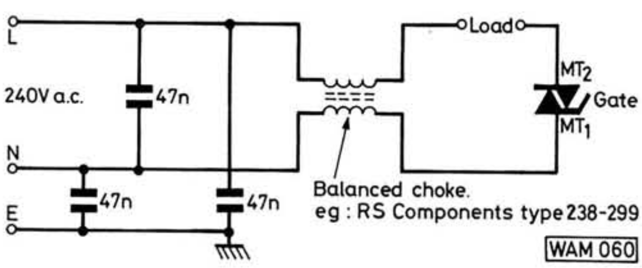
Fig. 20 (left below): The use of a series choke

Fig. 21 (below): A low pass filter giving −18dB/octave of suppression



Load current	L1
1–5A	100μH
6–10A	300μH
11–15A	900μH
16–20A	2mH





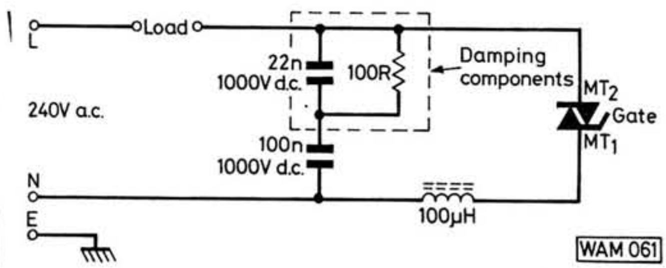
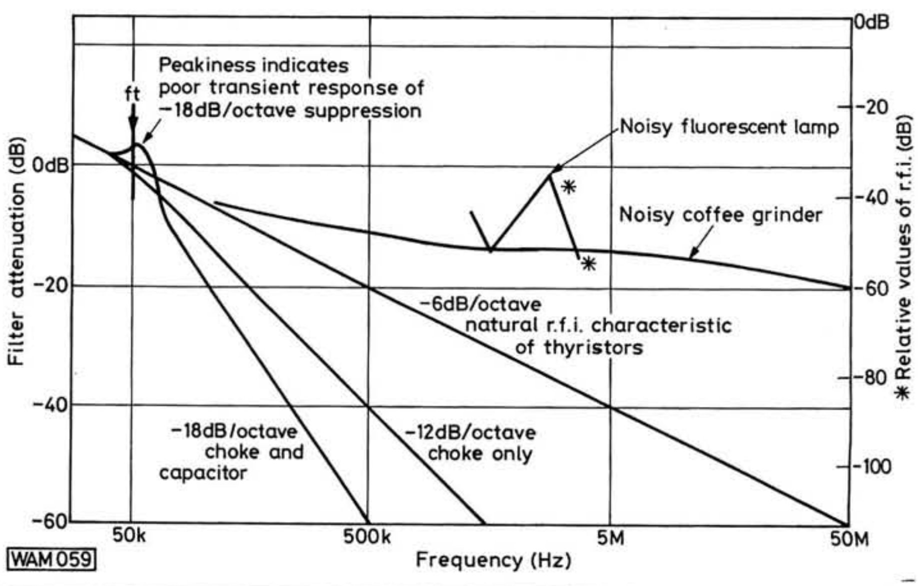


Fig. 22 (above): The load resistance in this circuit provides the damping necessary to prevent ringing

Fig. 23 (above right): A damped r.f.i. filter circuit

Fig. 24 (right): The attenuation characteristics of various filters compared with r.f.i. and noise from various sources



For maximum effect, the turnover frequencies of the *LRC* and *LC* combinations should be equal. Thus to the following equation must be satisfied when it is desired to find the value of L and C for other load currents and turnover frequencies (f_t):

$R_L=1/(2\pi f_t C)=2\pi f_t L$, where R_L is the load impedance.
For simplicity, this is assumed to be purely resistive. Assume an f_t of 100kHz is required with a 4A load. Then $R_L=240/4=60\Omega$.
L is found first:
$L=R_L/(2\pi f_t)=60/(6{\cdot}3 \times 100\,000)=95\mu H$
and $C=1/(2\pi f_t R_L)=1/(6{\cdot}3 \times 50 \times 100000)=26nF$

Fig. 24 compares the attenuation characteristics of the filters shown in Figs. 20 and 21 with the natural noise spectrum of a thyristor or triac and other common sources of r.f.i. Fig. 22 shows a twin choke (balanced) filter which can be particularly effective when the load is in the live side of the mains, or when the interference is common mode. The design of balanced chokes can be quite difficult and it is often cheaper and easier to use a standard component.

As in the case of the snubber discussed earlier, the *LC* arrangements shown in Figs. 21 and 22 are susceptible to ringing and depend on the load resistance for damping.

The poor transient response of the filter shown in Fig. 21 can be seen from the slight peakiness it exhibits at its turnover point in Fig. 24. If the load is very small, say less than 100W, then severe ringing can occur, possibly causing a triac to trigger or turn off spuriously. If the addition of an r.f.i. filter to a circuit previously known to work causes bizarre effects, this indicates ringing and can be confirmed and/or eliminated by raising the load current.

If it is not possible to raise the load current to stop the ringing, the *LC* network must be damped. This is achieved by adding a capacitor and resistor to vigorously damp the oscillations. The arrangement usually takes the form of the circuit shown in Fig. 23.

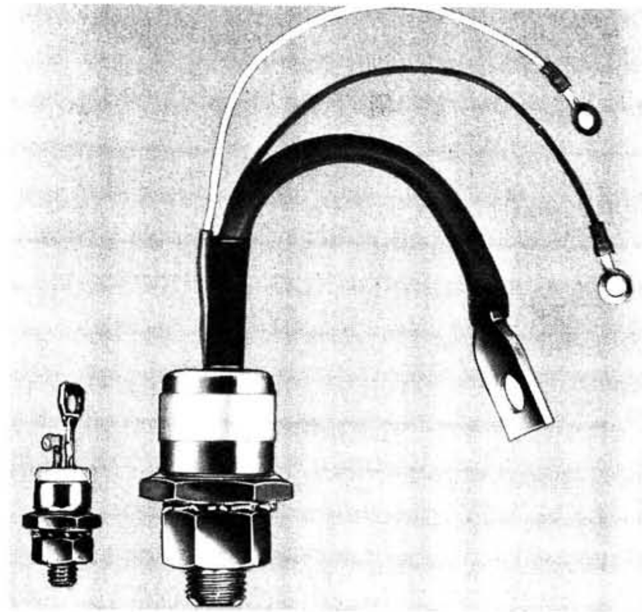
Filter components require careful selection if they are to be effective at high frequencies, where inductors have significant capacitance and vice versa. The capacitance of a choke can be lowered by adding a few layers of pvc tape over each winding.

Both the chokes and the capacitors should be wired as close to the triac or thyristor as possible, preferably within a few inches. Ferrite beads added to the lead between the choke and the triac will greatly improve the effectiveness of the suppression. When the ferrite core of a choke becomes saturated, the choke acts as if it has an air core and its impedance drops drastically. This is most likely to occur when high load currents are passed; these will require the use of chokes with beefy ferrite cores to avoid saturation. L_1 in Fig. 20 should ideally use a much larger core at the higher (>10A) load currents specified for this reason.

Zero Voltage Switching

In the past zero voltage switching has been acclaimed as the panacea of all r.f.i. problems. This is quite untrue. First, zero voltage switching is mainly limited to heating control and applications where pulsed signals are inherent, such as in random or sequential lighting displays. Second, zero voltage switching relies on the optimistic assumption that the triac or thyristor can be turned on when the mains passes through zero; the di/dt is then very high, but as there is no voltage for an infinitesimal period of time, there can be no interference.

Unfortunately, the holding current characteristics of a triac often makes true zero point switching impossible. A



Mullard BTX36 thyristor (left) and BTX38 have controlled avalanche characteristics. The maximum crest working voltage for both is 800V and the avalanche voltage is 1320V. Maximum forward currents are 16A and 70A

typical device which needs a 50mA current to pass before it will hold on without a gate signal will be turned on slightly after the zero point, when sufficient voltage is available to drive this current through the triac. This voltage is typically 2–6V and as the di/dt of the mains is at its highest about the zero point, the r.f.i. produced is by no means negligible.

Zero voltage switching is most effective at high load currents and when triacs are fired by a d.c. gate signal, which can ensure the earliest possible turn-on time after the zero point, without synchronisation problems. When zero voltage switching and *LC* filters are used together, the result is exceptional freedom from r.f.i.

Interactive Effects

Related to r.f.i. are interactive effects between groups of triacs or thyristors controlling different loads but connected to the same supply lines and in mutual proximity. This arrangement typically occurs in stage lighting control units.

Fortunately, the trigger circuitry is usually remote in elaborate systems, but the triacs are often mounted alongside the trigger circuits in low cost dimmer units. This is quite acceptable provided the power cables and trigger circuit wires are well separated. If the supply impedance is high, switching several lamps on simultaneously will cause the supply voltage to drop momentarily. It is a good idea to feed trigger circuits from a regulated supply for this reason.

Triacs can also interact directly, but this is unlikely if they each have a series choke for r.f.i. suppression. Poorly damped snubbers however can aggravate interactive effects. Chokes should be mounted well away from each other or orientated for minimum interaction. In exceptionally difficult circumstances, it may be necessary to use screened trigger wires or even to screen the power cables and connections. Careful cable routing will usually be all that is needed however.

The techniques described will extirpate the vast majority of "mysterious" triac failures and interference problems and allow the quiet efficiency and longevity of these elegant semiconductors to be appreciated. ●

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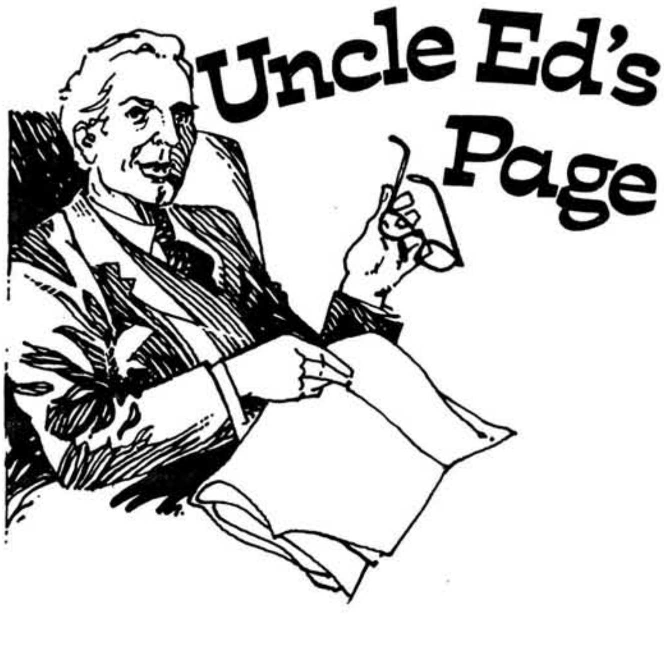


A monthly look at some aspect of the radio/electronics hobby that seems to bug the beginner, or occasionally a more advanced topic seen from an unusual angle.

ATTENUATORS—1

In the space of a couple of articles like this, I cannot hope to cover everything there is to know about attenuators. I just want to explain the principles involved, so that you can perhaps read reference and text-books with a little more understanding.

Going back to Mr Thevenin again, remember that we can consider a voltage source to be made up of a perfect generator in series with an impedance or resistance which represents all the losses in the source. Attenuators are circuits made up from a number of resistors, used to attenuate (literally "to make smaller") an audio- or radio-frequency signal. For the sake of simplicity, I shall talk about audio-frequency circuits, so our source will be an a.f. oscillator. The frequency is unimportant.

For a start, let's assume that the source impedance is fairly low, say 120Ω. Its open-circuit voltage (e.m.f.) is 2V, so when connected to a load of 120Ω, the terminal voltage will be 1V. For loads with impedance greater than 120Ω, the terminal voltage will be somewhere between 1V and 2V.

Now, supposing we want to do some tests on an amplifier with an input impedance of 600Ω (typical in an audio system), and which needs the source connected to it to have an impedance of 600Ω for correct operation. In other words, it must operate in a matched system. This is easy to achieve with our oscillator, simply by connecting a resistor of 480Ω in series with it (Fig. 1). We have effectively produced a new source, with a different internal impedance (Fig. 2). The e.m.f. remains at 2V, and the p.d. when the "new" terminals (O/P "S") are loaded with 600Ω is still 1V.

If our amplifier needed an input signal level of 500mV (half a volt), how could we achieve it and still have a source impedance of 600Ω? The answer is that we put an attenuator between the generator and the load, and there are basically two rules that must be obeyed:

1. When you consider the view seen by the source looking out at the attenuator and load in series, it must "see" its designed load impedance (in our example, 600Ω). This also means that we know that the voltage across the input to the attenuator is equal to half the source e.m.f., and makes the subsequent calculations a lot simpler.
2. When you consider the view seen by the load (our amplifier) looking back into the attenuator and source in series, it must "see" its designed source impedance (again, 600Ω). Note that the source and load impedances don't **have** to be the same. You can design attenuators to work between unequal impedances too, so that each end of the circuit "sees" what it ought to see, and the load receives the right amount of signal.

If we take the circuit of Fig. 3, we could choose resistors R1 and R2 so that they presented a load of 600Ω to the source (R1 + R2 = 600Ω), whilst their ratio would produce an output at the O/P "A" terminals of 500mV (R2= (R1 + R2) ÷ 2). Making R1 and R2 both 300Ω would do the trick. All very simple, you say! But we've forgotten something. The input impedance of our amplifier is 600Ω, so that the circuit will really look like Fig. 4, with an extra resistance of 600Ω in parallel with R2, producing an effective value for R2 of (300 × 600) ÷ (300 + 600) = 200Ω.

This has several disastrous effects:

1. The source now sees a load of 300 + 200 = 500Ω instead of the designed 600Ω, so the voltage at its output terminals will be less than 1V.
2. The division ratio of R1 and R2 is now wrong, and the attenuation will be greater than wanted.

These first two points mean you'll get less out of the attenuator than you expected, basically because of the loading effect of the load!

continued on page 61 ▶▶▶

Fig 1

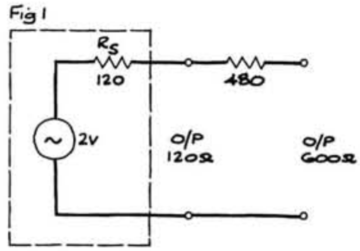


Fig 2

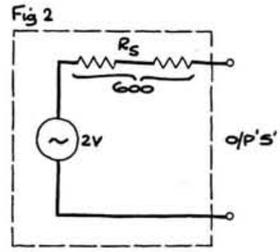


Fig 3

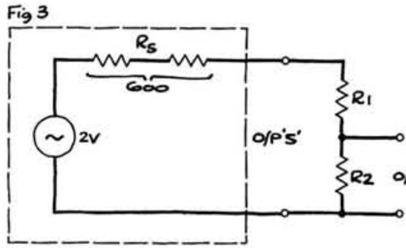


Fig 4

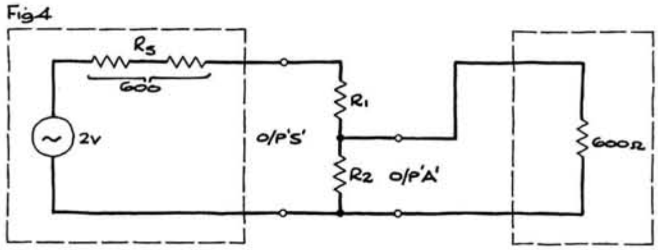
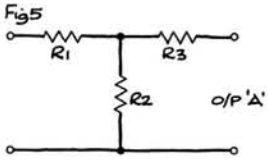


Fig 5



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NEWS NEWS NEWS

Radio Amateur Saves Life

A young Chelmsford radio amateur was recently instrumental in saving the life of a Jugoslavian youth.

25 year-old Chris Baker G4LDS, a test technician with Marconi Communication Systems Ltd., was monitoring 15m on the evening of 12 May 1981, when he heard, on 21·16MHz, a Jugoslavian amateur YU1PDP, calling "CQ, CQ, Italy, Germany, France, Emergency."

When nobody answered, Chris responded by offering to help. Apparently a youth of 17 was dying in a Belgrade hospital and only the drug Calciprin, manufactured in France and not available in Belgrade, could save him, provided it was administered within 15 hours.

Chris immediately rang Chelmsford Police HQ and soon a squad-car arrived at his house. YU1PDP passed further details of their requirements resulting in a relay between the squad car and Chelsmford Police HQ who used the Interpol link to check with Jugoslavia and trace a supply of the drug.

Within the hour, 5 boxes of the drug

were despatched via London's Heathrow Airport. Two days later, Chris heard, by telex, that the youth's life had been saved.

Chris has been a radio amateur since 1974 and currently operates a Yaesu FT101 with 100 watts output through a 3-element Tribander antenna TA 33 junior.

Practical Wireless would like to congratulate both Chris G4LDS and YU1PDP on their prompt and efficient action which illustrates the finest traditions of amateur radio.

Special Event Stations

Bromsgrove and District Amateur Radio Club (G3VGG) have organised, for the 29 July, a Special Event Station for the Royal Wedding, operating from Sanders Park, Bromsgrove. Callsign GB2WED.

There will be an award connected with this operation, details of which are available from: *Awards Manager, John Harvey G4IVJ, QTHR.*

Yeovil Amateur Radio Club (G3CMH & G8YEO) will be running special event stations at the following venues:—

International Air Day on Saturday, 1 August at HMS Heron, Yeovilton, Nr. Yeovil, Somerset. Callsign GB2FAA.

Mid-Somerset Show on Saturday, 15 August at Shepton Mallet, Somerset. Callsign GB2MSS.

Dillington House Open Day on Monday, 31 August at Dillington House College, Ilminster, Somerset. Callsigns G3CMH and G8YEO.

Further details of all these events may be obtained from: *D. L. McLean G3NOF, 9 Cedar Grove, Yeovil BA21 3JR. Tel: (0935) 24956.*

On Thursday, 30 July, Friday 31 and Saturday, 1 August, the St. Helens and District Amateur Radio Club will be operating GB2STH from the Annual St. Helens Show at the showground site, Sherdley Park, Marshalls Cross Road, St. Helens, Merseyside.

Further details from: *The Club Secretary, P. Gaskell G8PQD. Tel: St. Helens (0744) 25472.*

Catalogues

Hot off the press and available for immediate delivery is the new comprehensive Spring catalogue from West Hyde Developments Ltd., the Aylesbury based company with over 1000 different instrument cases and something like 250 000 case parts currently in stock.

The catalogue includes many important additions to their product range and is obtainable free on application to: *West Hyde Developments Ltd., Unit 9, Park Street Industrial Estate, Aylesbury, Bucks. HP20 1ET. Tel: (0296) 20441.*

Verospeed Ltd. inform me that their latest 136 page catalogue is now available. The company, which boasts a really fast turnround of orders, have increased the size of the catalogue to include many new entries.

This free catalogue is available from: *Verospeed Ltd., Stansted Road, Boyatt Wood, Eastleigh, Hants SO5 4ZY. Tel: (0703) 618525.*

T & J Electronic Components, the Chigwell based radio/electronic component suppliers, have their latest catalogue available.

Costing 45p the 50-page catalogue is available from: *T & J Electronic Components, 98 Burrow Road, Chigwell, Essex IG7 4HB. Tel: 01-500 7073/9705.*

Last, but by no means least, Rapid Electronics have their latest catalogue available. The 24-page catalogue covers many items of interest to the electronics enthusiast and will be sent out on receipt of 2 × 14p stamps by: *Rapid Electronics Ltd., Hillcroft House, Station Road, Eynsford, Kent. Tel: Farningham (0322) 863494.*

IARU

Two very sad events cast a pall over the International Amateur Radio Union Region 1 Conference at Brighton. Delegates were shattered to learn of the death on 30 April of Peter Ballestrini G3BPT, immediate past president of the RSGB and also the society's current Emergency Communications Manager and a member of Council. His contribution to the organisation of RAYNET will be sadly missed.

Earlier in the week an observer with the VERON delegation from the Netherlands, Mr A. H. Kokee PA0KOK, passed away.

A full report on the conference will appear soon in an issue of *Practical Wireless.*

More on page 57 ▶▶▶

INTRODUCING SSTV PART 1

M.J. AXSON BA G8WHG

The ability to transmit and receive pictures adds a whole new aspect to amateur radio. It can be quite fascinating to see pictures of someone to whom you have spoken many times, but never met. Circuit diagrams can be exchanged as can pictures of the shack and its equipment. The scope is enormous.

It has long been possible to transmit conventional fast-scan television, but the cost and complexity of the video equipment has made it very much a minority interest. It was with this in mind that slow-scan television was developed, initially in the USA by WA2BCW, who published his first article on the subject in August 1958. Interest was soon aroused in other countries, G3AST and G3LEE being early in the field in Britain, and now SSTV enthusiasts are to be found in all parts of the world on the h.f. and v.h.f. amateur bands (Table 1).

Table 1

Band (MHz)	IARU Recommended frequency (MHz)	Most popular frequency (MHz)
3·5	3·735	3·730
7	7·040	7·040
14	14·230	14·230
21	21·340	21·340
28	28·680	28·680
144	144·500	144·230
432	432·500	—
	60Hz Mains	**50Hz Mains**
Line Speed	15Hz	$16\frac{2}{3}$Hz
No. of Lines	120	120
Frame Speed	8 secs	7·2 secs
Aspect Ratio	1:1	1:1
Scanning direction H	left to right	left to right
V	top to bottom	top to bottom
Sync pulse length		
Horizontal	5ms	5ms
Vertical	30ms	30ms
Subcarrier frequency		
Sync	1·2kHz	1·2kHz
Black	1·5kHz	1·5kHz
White	2·3kHz	2·3kHz

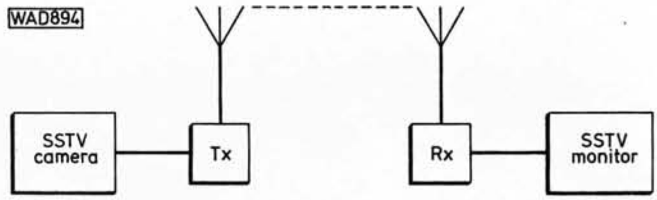


Fig. 1

The basic SSTV system is simplicity itself (Fig. 1). For reception an SSTV monitor is attached to the audio output of a conventional receiver, and for transmission an SSTV camera (or even more simply, a flying-spot scanner) provides the video signals to the audio input of the transmitter. No modifications are required to either RX or TX and the mode of transmission may be either s.s.b. or f.m.

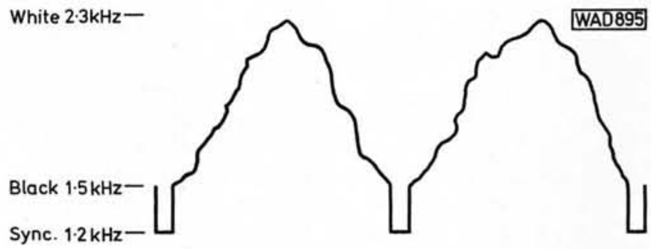


Fig. 2: Two lines of SSTV picture

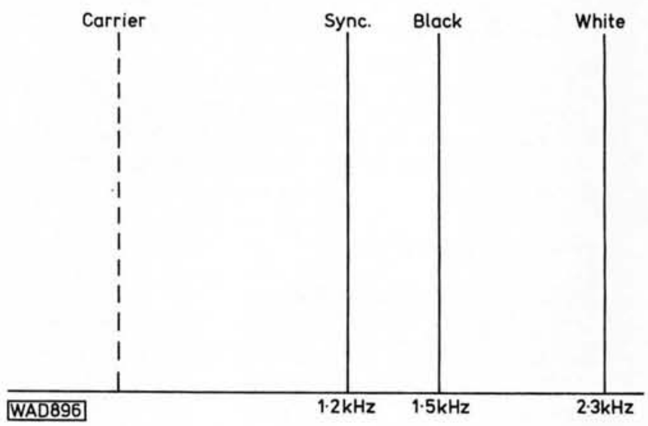


Fig. 3: Frequency spectrum of SSTV signal

In order to transmit video information within the normal audio bandwidth, we must slow down the rate at which the information is sent. This is made possible by sacrificing the ability to send moving pictures, which is no great loss in the context of amateur radio. A lower standard of definition is also used, but since the SSTV monitor is usually placed near to the receiver and operator, a small screen is used and acceptable pictures result.

The standard adopted was for a square picture made up of 120 lines. In addition to the video information forming the picture, synchronising pulses must also be sent at the start of each line and frame so as to keep the monitor in step with the camera. The a.c. mains frequency is ideal for derivation of the sync pulses and line speeds are locked to the 50Hz and 60Hz supplies used in different parts of the world. The ratios used are $\frac{60}{4} = 15$Hz and $\frac{50}{3} = 16\frac{2}{3}$Hz, which are close enough for the same monitor to be used for both standards. It will be seen that the transmission time for a complete frame is $\frac{120}{15} = 8$ secs or $120 \div 16\frac{2}{3} = 7{\cdot}2$ secs.

The video information is presented as a range of audio tones starting with the black level at 1·5kHz and going through varying shades of grey to the white level at 2·3kHz. The sync pulses are sent at 1·2kHz which is far enough away to allow them to be separated easily. Since figuratively speaking they are 'blacker than black' the retrace does not appear in the picture.

Sub-carrier frequency modulation is used which moves the transmitted carrier frequency according to the audio tone to be sent. This is a similar process to that employed in a.f.s.k. for RTTY, but in this case a range of tones between 1·2 and 2·3kHz is transmitted rather than only the mark and space tones. When heard on the air SSTV signals sound similar to RTTY signals but they have a more musical quality and there is a noticeable bleep when the frame sync pulse is transmitted.

Equipment Requirements

Since we are dealing with audio frequencies below 2·3kHz only simple and inexpensive audio circuits are needed so making SSTV an ideal subject for home construction. Ordinary domestic cassette tape recorders may be used to store pictures, the prime requirement being good speed regulation, since any speed variations will cause line to line jitter in the picture. Careful attention to the tape drive and the use of high quality cassettes will usually give good results. A simple check can be made by recording a steady tone and playing it back, when if all is well, there should be no noticeable variation in the frequency.

Many amateurs begin by building a monitor and enter transmitting by having programs pre-recorded by an established SSTV operator who has a camera or flying-spot scanner available. This is a quick and inexpensive way of getting started.

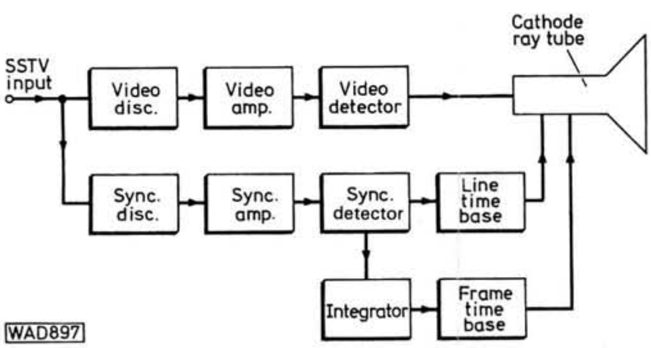


Fig. 4

A block diagram of a simple monitor is shown in Fig. 4. The incoming SSTV signal is fed from the receiver speaker terminals into a conventional limiter/amplifier where amplitude variations caused by QRM and QRN are reduced by the limiter and the signal is boosted by the amplifier before passing to the video and sync discriminators. These are frequency sensitive circuits which separate the video and sync information. The sync discriminator is sharply tuned to 1·2kHz whilst the video discriminator is tuned to pass only 1·5 to 2·3kHz.

After amplification and detection, the frame sync pulses are separated from the line sync pulses and both trigger their respective timebases so causing the raster to be drawn on the screen. Simultaneously the video frequencies are amplified and slope detected producing low output for 2·3kHz (white level) and high output for 1·5kHz (black level). The resulting voltage is then applied to the grid of the c.r.t. to provide intensity modulation of the electron beam. Thus light and dark variations are placed at appropriate points on the screen so reproducing the SSTV picture. Since a single frame takes 7·2 secs to receive, it is essential that the c.r.t. has a long persistence (P7) phosphor.

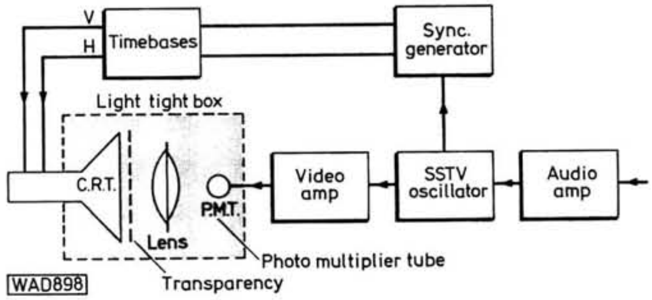


Fig. 5

Flying-spot Scanner

Slow-scan cameras present more of a problem, mainly due to the difficulty and cost of obtaining suitable Vidicon tubes. These were developed in the late 50's and early 60's for various space probes, notably the Mariner missions to Mars, but the average amateur cannot afford NASA prices! Hence the popularity of the flying-spot scanner (Fig. 5).

A light-tight box houses a c.r.t. and a photomultiplier tube. A transparency is placed in front of the c.r.t. (which has short persistence phosphor, P1). Horizontal and vertical slow scan sweep is applied to the c.r.t. and since no video modulation is applied, the resulting raster is completely white. The light from this raster is modulated by the transparency and focussed by the lens system on to the photomultiplier producing a small video output voltage. This is then amplified and applied to the SSTV master oscillator which produces a 1·5–2·3kHz audio signal. The sync generator causes the SSTV oscillator to produce 1·2kHz sync pulses at the appropriate times.

Sampling Camera

Satisfactory though this was in many ways, the wish to transmit live pictures rather than photographs remained, and for this purpose a camera was essential. An ingenious solution was arrived at in the form of a sampling camera. The principle is shown in Fig. 6, and a block diagram in Fig. 7. A fast-scan camera signal is sampled and converted to a slow-scan signal. The normal British standards for fast scan are a line speed 15·625kHz and a frame speed of 50Hz. If the camera is turned on to its right side the 50Hz scan now becomes horizontal and if divided by 3 it is at the correct slow scan speed. Division can be achieved by replacing the original frame sync pulse by a slow-scan sync pulse and adding a capacitor in the camera to slow down the frame timebase. The original 15·625kHz line speed now running along the vertical axis is sampled over a period of 7·2 secs and the output is slow-scan video which is fed to the SSTV master oscillator. Such was the state of the art in the mid 1970's and then along came the microprocessor which was to provide a revolutionary approach to SSTV.

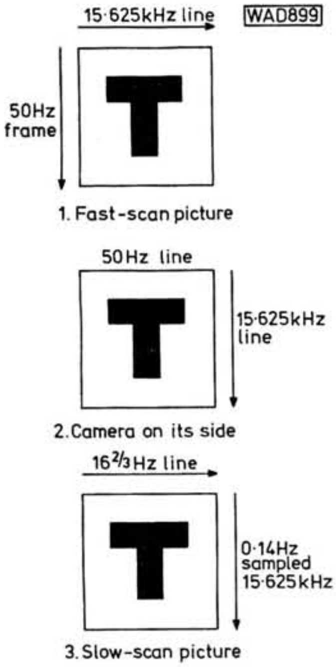


Fig. 6: Principles of the Sampling Camera system

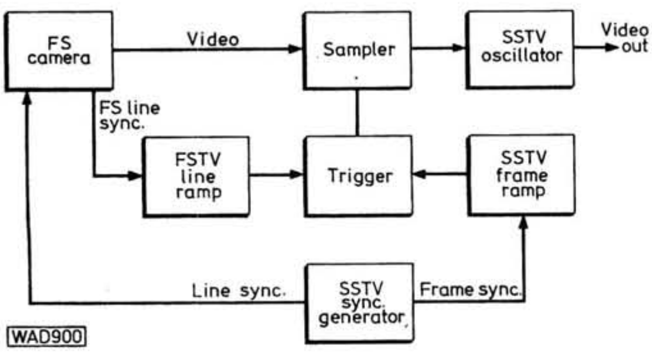


Fig. 7: Sampling Camera system block diagram

Scan Conversion

Since the beginning, the idea of converting fast-scan to slow-scan and vice versa had been in the minds of the pioneers, but the practical difficulties had been too great, until the advent of digital electronic techniques, which made scan conversion a practical possibility. Briefly, the system consists of a fast-scan camera whose output is fed into a 'black box' which converts the video signal to slow-scan standards for normal transmission. At the receiving end, another black box is placed between the receiver and a conventional fast-scan TV receiver. No modifications are required to the TV on which the incoming SSTV pictures are displayed in bright long-lasting form. Although rather expensive at first, the continuing fall in the cost of c.m.o.s. has brought scan conversion within the reach of most amateurs.

We will investigate the contents of the 'black boxes' in Part 2 of this series.

PW 'STOUR' TOP-BAND TRANSCEIVER

PART 4

David G. BARRELL G4BMC

Having completed the full constructional details of Boards 1–5, we continue this month with circuit diagrams and descriptions of Boards 6, 7, 8 and 9

Board 6—Receiver RF Amplifier

Having built two rather mediocre front ends using dual gate f.e.t. devices, a circuit was found using two bipolar transistors in a push-pull arrangement which looked very much "stronger".

As the circuit was a broad-band arrangement a filter was used ahead of the amplifier with broad-band transformers at the input and output to obtain a 50Ω match.

The use of relatively high power transmitting type r.f. transistors in an r.f. amplifier of this type may at first seem a bit of an "overkill". However by the use of such devices, run with heavy voltage and current feedback, together with a high d.c. standing current, a very linear front end can be constructed. This results in an amplifier possessing low distortion products and good dynamic range.

It was decided that although the rest of the transceiver would have no variable tuning arrangements a tunable front end filter at 2MHz would be adopted to provide a fairly high degree of selectivity. The pre-selector tuning should be fairly sharp with no double peaks occurring. If such peaks are encountered then the top coupling capacitor, 6C3, should be reduced in value.

No heatsinking was required on the transistors and although they run fairly warm they are kept well within their ratings.

An attenuator before this amplifier was not found to be necessary and the receiver seems to cope with all on the air signals without any signs of cross-modulation or overload.

Constructional Details

The board is constructed on double-sided glass fibre p.c.b. with Veropins used for all the external connections. The variable capacitor 6C1 was made by pruning the vanes from a two gang 300pF device until the tuning of this component was not unduly sharp, whilst still covering all of the 160m band. In the finished transceiver the variable capacitor, was mounted above the chassis with the p.c.b. located immediately beneath it. This method of construction was decided on by the ease of physical layout only, and it could be mounted on the same side as the board provided the leads between the variable capacitor and the board are kept fairly short.

The toroids must be mounted with the correct sensing as shown in the diagram and different toroids of greatly varying μ were used in two prototypes; certainly at the frequency in use there was no noticeable difference. The broad-band transformers 6L3 and 6L6 consist of 7 turns of 32 s.w.g. wire trifilar wound; 6L4 and 6L5 consist of 6 turns of 32 s.w.g. wire bifilar wound. Neosid toroids (28-002-27) were used in all cases. No problems were encountered with the stability of this amplifier and the unit worked perfectly from "switch-on". The only alignment necessary being to peak the cores of the pre-selector coils.

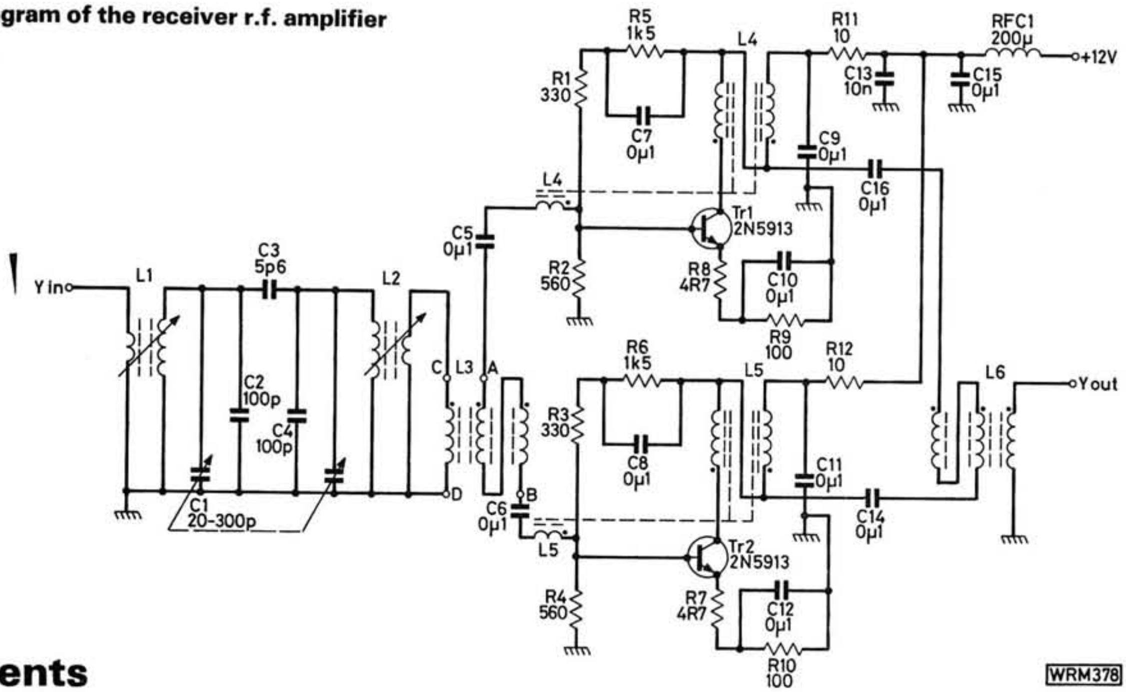
Transistors 6Tr1 and 6Tr2 should be mounted very close to the ground plane without touching it (the cases of the 2N5913 devices are connected to the collectors); a distance of 1mm maximum should be aimed for. Solder as many of the earthed connections to both top and bottom ground planes as possible.

Inductors 6L1 and 6L2, which are resonant at 2MHz, in conjunction with 6C1, 6C2 and 6C4, were wound on Neosid HA2 miniature screened inductance assemblies. Winding a couple of test coils and checking with a g.d.o. will soon give the correct number of turns to resonate at 2MHz with the 100pF resonating capacitor. (50 turns were used with the pot cores used).

It might have been possible to use this unit as the first 2MHz transmit amplifier but it was felt that a much simpler amplifier would suffice. With this in mind it was not thought worthwhile to arrange all the necessary switching involved to save on one amplifier in the transmitter chain.

Readers who intend to operate the Stour should be in possession of the appropriate licence issued by the Home Office to those who have passed the City and Guilds Radio Amateurs' Examination. Details may be obtained from: The Home Office, Radio Regulatory Department, Amateur Licensing Section, Waterloo Bridge House, Waterloo Road, London SE1 8UA.

Fig. 26: Circuit diagram of the receiver r.f. amplifier



★ components

BOARD 6

Resistors

¼W 5% Carbon Film

4·7Ω	2	R7,8
10Ω	2	R11,12
100Ω	2	R9,10
330Ω	2	R1,3
560Ω	2	R2,4
1·5kΩ	2	R5,6

Capacitors

Disc Ceramic

10nF	1	C13
0·1µF	11	C5–12, C14–16

Sub-miniature Ceramic

5·6pF	1	C3

Silver Mica

100pF	2	C2,4

Variable Air-spaced two gang

20–300pF	1	C1 (see text)

Semiconductors

Transistors

2N5913	2	Tr1,2

Miscellaneous

Neosid HA2 miniature inductance assembly (2); Neosid toroids 28-002-27 (4); 32 s.w.g. enamelled copper wire; p.c.b. (1)

Note: Component refs. in text are pre-fixed with the board ref. 6.

RF Amplifier Board Connections

(1) Y in connects from the antenna change over relay, RLB.
(2) Y out connects to Y in on the mixer board 4.
(3) +12V connects to +12V rail on receive and transmit.

Board 7—Microphone Amplifier and Balanced Modulator Board

This board contains the following circuitry.
(1) A 741 operational amplifier 7IC1, which is used as the microphone amplifier.
(2) An MC1496 (14 pin d.i.l. type) 7IC2, used as a balanced modulator.

Circuit Description

The 741 op.amp. 7IC1 is used as an audio amplifier with the voltage gain set by 7R5 divided by 7R2; increasing 7R2 decreases the gain. The circuit as shown is suitable for a high impedance microphone and worked very well with the author's microphone from the Yaesu FT101. If a low impedance microphone is to be used then a matching stage will be required ahead of the 741.

The 12V switching to the mic. amp. was originally intended to be switched on only during transmit. However this method proved unsuitable due to carrier breaking through at the moment of switch on. The audio amplifier appeared to unbalance the balanced modulator for a short period. To avoid this problem the 12V supply was left permanently connected and, to avoid any feedback during receive, the mic. input was shorted to ground via a relay contact. The mic. gain is controlled by a 1MΩ potentiometer, 7R1, at the input to the 741.

The balanced modulator, which is nothing but a balanced mixer, uses an MC1496. This is used in a fairly standard circuit and is capable of good performance provided that it is not overdriven.

The carrier balance is achieved by adjusting 7R10, a 50kΩ potentiometer, and adequate balance is obtained without extra balancing at the output.

True c.w. operation may be accomplished by unbalancing the modulator. Care must be taken not to overdrive the following stages and of course **10W input power to the p.a. is the legal maximum for 160m.** Resistor 7R17 has been set to 10kΩ and is grounded via the key for c.w. operation.

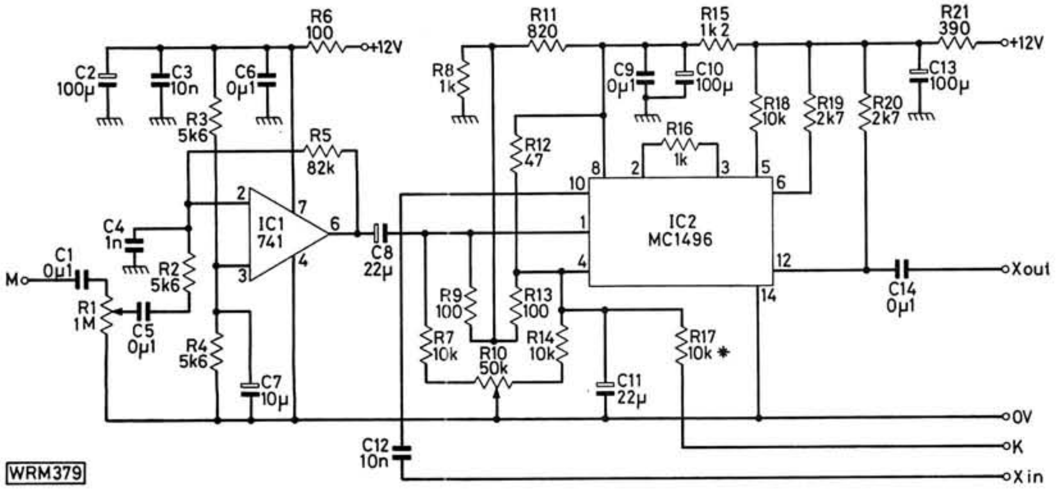


Fig. 27: Circuit diagram of the microphone amplifier and balanced modulator

The lower the value of this resistor the more the circuit becomes out of balance, thus a potentiometer and fixed resistor at this point would enable c.w. drive level to be pre-set if required.

Another method which could easily be used with the circuit shown would be to inject d.c. into pin 1 of the MC1496. This again could be via a potentiometer and a fixed resistor as shown in Fig. 28.

★ components

BOARD 7

Resistors

¼W 5% Carbon Film

47Ω	1	R12
100Ω	3	R6,9,13
390Ω	1	R21
820Ω	1	R11
1kΩ	2	R8,16
1·2kΩ	1	R15
2·7kΩ	2	R19,20
5·6kΩ	3	R2,3,4
10kΩ	4	R7,14,17,18
82kΩ	1	R5

Miniature horizontal preset

50kΩ	1	R10
1MΩ	1	R1

Capacitors

Disc Ceramic

1nF	1	C4
10nF	2	C3,12
0·1μF	5	C1,5,6,9,14

Single ended Electrolytic 16V

10μF	1	C7
22μF	2	C8,11
100μF	3	C2,10,13

Semiconductors

Integrated Circuits

741	1	IC1
MC1496	1	IC2

Miscellaneous

p.c.b. (1)

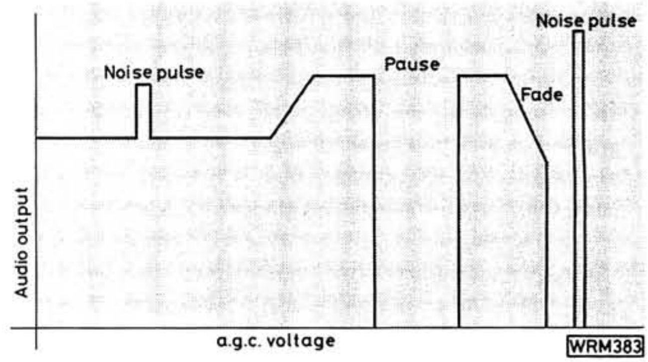
Note: Component refs. in text are pre-fixed with the board ref. 7.

Connections on Board 7

(1) +12V to positive line.
(2) X out connects to X in on Filter Board 3.
(3) K is the c.w. key connection.
(4) X in connects to 9MHz oscillator Board 2.
(5) M is the microphone input.

Constructional Details

This board is constructed on double sided p.c.b. and Veropins are used for all connections.



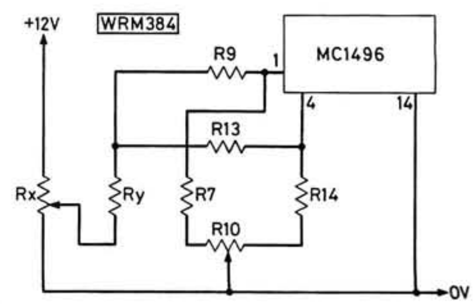


Fig. 28

Board 8—Automatic Gain Control and 8V Regulator Board

This board contains the following circuitry.

(1) 10mV clipper (8Tr1 and 8Tr2)
(2) Automatic gain control generator IC1 SL621
(3) Inverting amplifier 8Tr3
(4) Automatic gain control regulator 8Tr4
(5) 8·5V regulator 8IC2, LM723

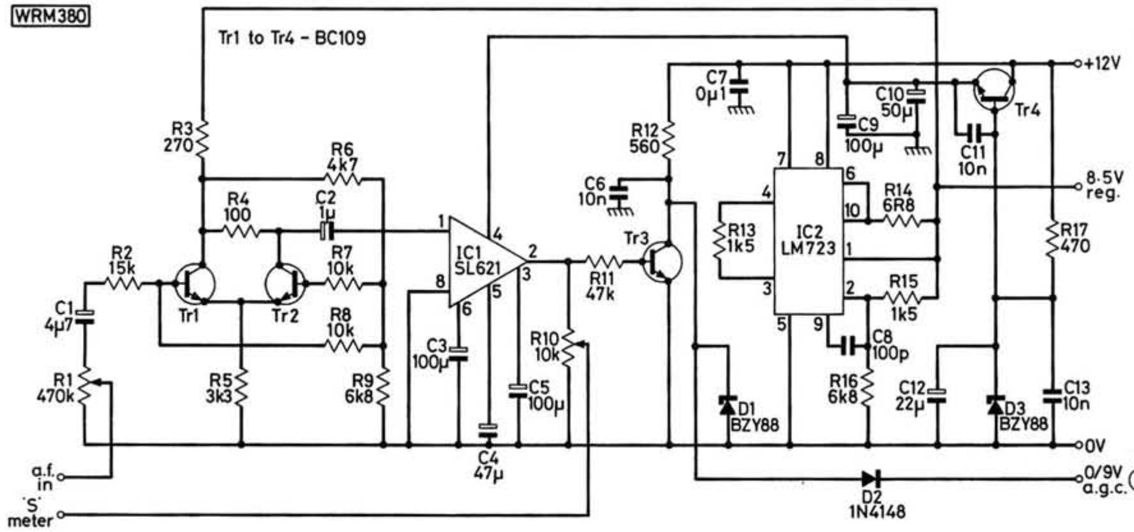


Fig. 29: Circuit diagram of the automatic gain control and voltage regulator

Circuit Description

The a.g.c. circuit is an audio derived system with the a.f. voltage being taken after the output from the 741 audio amplifier. The actual input comes from the top of the volume control R19. The a.f. voltage is fed to the input of 8Tr1 via 8R1, which is used to set the level at which the a.g.c. starts to operate. It is important that the clipper consisting of 8Tr1 and 8Tr2 has a stabilised supply, therefore it is fed from the 8V regulator circuitry which is contained on the same board. If fed from the 12V rail any small variation in supply voltage, due to voltage drop via the supply leads etc., would cause the a.g.c. to operate.

The clipped a.f. voltage is applied to pin 1 of 8IC1 via 8C2. The SL621(8IC1) is a fairly complex i.c. which has been designed specifically as an a.g.c. generator with full "hang" time lag. The output of this i.c. is 0–6V with 0V corresponding to the no signal input; the 6V is obtained when a large signal is present. The CA3028 circuits, which the a.g.c. voltage is used to control, require reverse a.g.c. An inverting amplifier, 8Tr3, is therefore used to invert the output voltage from the SL621. A Zener diode, 8D1, located between the collector of 8Tr3 and earth, is included to prevent the collector voltage of 8Tr3 rising above 9V. The maximum gain of the CA3028 occurs at this voltage.

The a.g.c. voltage is taken from the collector of 8Tr3, and is fed through 8D2, a general purpose silicon diode, which is used to isolate 8Tr3 circuitry during transmit. During transmit a fixed voltage is used to supply the CA3028s.

The "S" meter output is taken from pin 2 of the SL621 via a 10k potentiometer. This is a very simple "S" meter circuit but the meter was only required to give comparative signal reports and an accurate 6dB per "S" point system was outside the scope of the author's design facilities.

A stabilised 6V supply was required for the SL621. A separate regulator was included to fulfil this function and consists of 8Tr4, 8D3 and associated circuitry.

The operation of this particular form of a.g.c. will seem very different to those not used to "full hang" a.g.c. The i.c. contains circuitry to enable the a.g.c. voltage to be unaffected by short noise pulses. However a steady input will produce the required a.g.c. voltage. When the signal ceases the a.g.c. voltage remains at its previous level for about a second and then returns to its full output within a few milli-seconds. This type of "switching" on and off was an odd sensation when first encountered; short pauses in speech during s.s.b. transmissions leave the receiver gain set at the correct level with, during strong signal levels, no receiver noise during such pauses.

The main voltage regulator for the transceiver is 8IC2, an LM723, which is used to supply a regulated output of approximately 8·5V. The regulator has short circuit protection via 8R14 and its output current is limited by this resistor to a value of approximately 70–80mA.

Connections on Board 8

(1) "S" meter connects to relay RLB contacts feeding 1mA meter (during receive).
(2) AGC 0/9V (A) connects to 1. CA3028 a.g.c. Board 3 (first i.f.).
2. CA3028 a.g.c. Board 1 (C) (second i.f.).
3. 8·5V stabilised line via relay RLA contacts during transmit.
(3) AF in (AF) connects to top (opposite to earth end) of volume control R19 **using screened cable.**
(4) +12V connects to the 12V supply rail.
(5) 8·5V reg. connects to 1. v.f.o. 2. Clarifier circuitry. 3. Relay RLA contacts to a.g.c. line see (2):3, to allow 8·5V to be connected to the CA3028's during transmit.

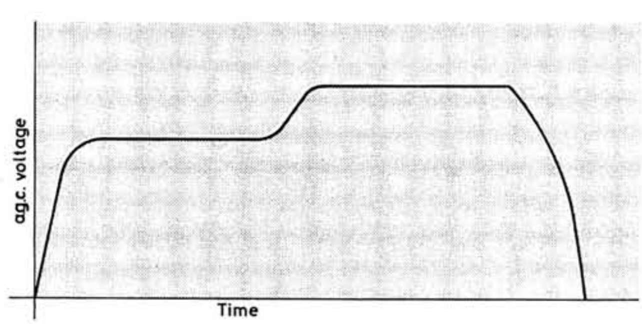


Fig. 30: SL621 operation, showing hang action characteristic

★ components

BOARD 8

Resistors
¼W 5% Carbon Film

6·8Ω	1	R14
100Ω	1	R4
270Ω	1	R3
470Ω	1	R17
560Ω	1	R12
1·5kΩ	2	R13,15
3·3kΩ	1	R5
4·7kΩ	1	R6
6·8kΩ	2	R9,16
10kΩ	2	R7,8
15kΩ	1	R2
47kΩ	1	R11

Horizontal preset

10kΩ	1	R10
470kΩ	1	R1

Capacitors
Disc Ceramic

100pF	1	C8
10nF	3	C6,11,13
0·1μF	1	C7

Single Ended Electrolytic 16V

1μF	1	C2
4·7μF	1	C1
22μF	1	C12
47μF	2	C4,10
100μF	3	C3,5,9

Semiconductors
Integrated Circuits

LM723	1	IC2
SL621	1	IC1

Transistors

BC109	4	Tr1,2,3,4

Diodes

BZY88C9V2	1	D1
BZY88C6V8	1	D3
1N4148	1	D2

Miscellaneous
Printed Circuit Board (1).
Note: Component refs. in text are pre-fixed with the board ref. 8.

BOARD 9

Resistors
¼W 5% Carbon Film

2·2Ω	1	R13
10Ω	5	R4,6,7,11,12
39Ω	1	R5
100Ω	1	R10
330Ω	1	R2
470Ω	1	R3
560Ω	1	R1

½W 5% Carbon Film

1kΩ	2	R8,9

Capacitors
Disc Ceramic

50nF	1	C1
0·1μF	6	C2–7

Single Ended Electrolytic 16V

100μF	1	C8

Semiconductors
Transistors

2N3866	2	Tr2,3
2N4427	1	Tr1

Miscellaneous
Neosid toroid 28-002-27 (1); Neosid toroid 28-011-27 (2); 24 s.w.g. enamelled copper wire; p.c.b. (1).
Note: Component refs. in text are pre-fixed with the board ref. 9.

Constructional Details

A double sided glass fibre p.c.b. is used with Veropins for the external connections. Single sided board would probably have been perfectly adequate but as the author did not have a supply of this, the usual double sided format was adopted.

Adjustments

When used in situ with the transceiver there are two variable components on this board. Potentiometer 8R1 controls the amount of audio reaching the clipper circuitry 8Tr1 and 8Tr2. This should be advanced far enough to ensure minimum distortion on the leading edges of received s.s.b. signals. The effect will be very noticeable on strong signals. If adjusted with the slider directly connected to 8C1 (ie. all audio signals applied directly to the clipper) the a.g.c. will operate on the a.f. noise present even with no antenna connected. The correct setting of this potentiometer is not critical and a few tests listening to strong signals will soon show the correct setting.

The other adjustment on this board is 8R10 which controls the available current supplied to the "S" meter. This should be adjusted so that the strongest signals drive the meter to full scale.

Note that if 8R1 is adjusted so that the centre slider is connected to earth receiver audio will be totally lost.

Board 9—Driver Board

The driver board contains the following circuitry.
(1) 9Tr1 a Class A broad-band stage.
(2) 9Tr2, 9Tr3 operating in parallel Class A, in a broad-band configuration.

Circuit Description

The 2MHz r.f. from band-pass filter F1 is applied to the base of 9Tr1 via 9C1. The transistor 9Tr1, a 2N4427, is

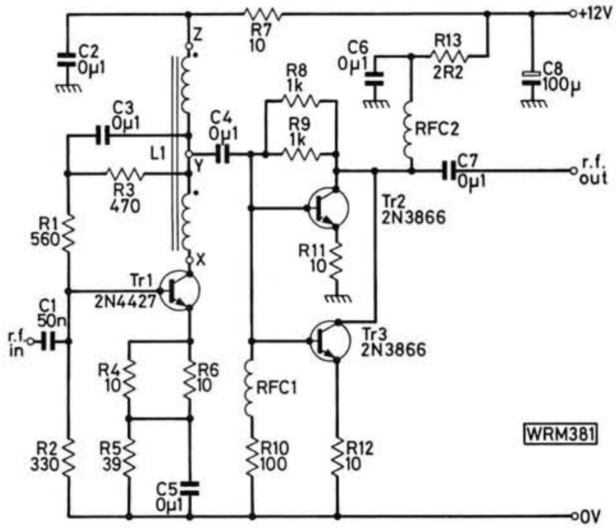


Fig. 31: Circuit diagram of the driver board

used in Class A with a fairly high standing current, typically 60mA with a 13V supply voltage. The stage has both emitter degeneration via the unbypassed 5Ω resistor, two 10Ω $\frac{1}{4}$W resistors in parallel, and negative feedback via 9C3, 9R3 and 9R1. The collector load is the standard bifilar wound broad-band transformer used in many situations throughout the transceiver. The output from this stage is routed to 9Tr2, 9Tr3 via 9C4.

Transistors 9Tr2 and 9Tr3, a pair of 2N3866 devices, are operated in Class A and in parallel. Again emitter degeneration is used via 9R11 and 9R12. The standing current through each transistor is in the order of 120–130mA and both 9Tr2 and 9Tr3 should have adequate clip-on heatsinks.

This amplifier was originally developed for use as a broad-band (2–30MHz) device and if it is only to be used at 2MHz it would be worth trying cheaper transistors such as the BFY50 or BFY51 for 9Tr1, 2 and 3. The +12V supply is on only during transmit.

Connections to Driver Board

(1) r.f. in connects to band-pass filter F1 output.
(2) r.f. out connects to band-pass filter F2 input.
(3) +12V to 12V supply via relay RLA contacts (+12V connected during transmit only).

Constructional Details

This is a very simple board to construct on the usual double-sided glass fibre p.c.b. All earth connections should be soldered top and bottom to connect the upper and lower ground plane wherever possible.

Effective heatsinks should be used especially on 9Tr2 and 9Tr3 which will, after a few minutes of transmission, become quite hot to the touch. Resistors 9R8 and 9R9 should be $\frac{1}{2}$W devices.

Radio frequency choke 9RFC1 consists of 7 turns of 24 s.w.g. wire wound on a Neosid 28-002-27 toroid, with 9RFC2 of identical construction but mounted on a 28-011-27 toroid. Inductor 9L1 is formed of 7 turns bifilar wound on a 28-011-27 toroid, observing the sensing shown.

Part 5 will cover the v.f.o. and Filter Boards together with functional layouts of Boards 6, 7, 8 and 9

VINTAGE RADIO POWER SUPPLY

▶▶▶ *continued from page 33*

CONSTRUCTION RATING **Beginner**

BUYING GUIDE

The components used for this project should be easily obtainable from advertisers. The materials for constructing the case can be bought from any good d.i.y. shop. If a suitable piece of aluminium sheet is not available then a piece of Formica sheet could be used.

APPROXIMATE COST **£12**

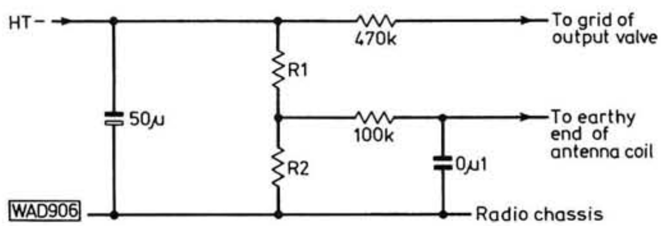


Fig. 2: This is a means of obtaining negative grid bias voltage for those sets which do not have automatic grid bias built in

Construction

All parts are mounted on a 3mm aluminium plate 250 × 100mm. A tag strip along each side provides convenient anchor points for the components. The layout is not at all critical, but C1 should be mounted close to the LM317, and C7 to Tr1.

The sides of the box are Contiboard, the inside dimensions a clearance fit for the aluminium plate, and the depth 70mm. The corners are mitred. A wood block, short enough to clear the transformer at each end, is glued to each long side, about 4mm below the edge, on the inside. The plate is supported on the blocks, and screwed to them. The best finish for the box is polyurethane varnish, which strengthens the veneer: the aluminium top can be matt black, or black or brown gloss. The bottom of the box is perforated hardboard, and four small plastic feet ensure some air flow.

A mains switch on the unit would be of little value, being normally out of sight. On no account should the ON-OFF switch of a vintage battery radio be used to switch mains voltages: the unit should be switched at the wall socket.

3mm insulated sockets, to accept wander plugs, are used for the h.t. connections; the insulated connectors used for l.t. will accept either spade terminals or 4mm plugs. ●

PRODUCTION LINES

ALAN MARTIN G8ZPW

Low-cost Storage Bins

The last thing the constructor can afford is wasted time searching for components, small tools, nuts, bolts and the hundred other odd items required in the workshop. The next to last thing he can afford is costly storage equipment.

Rather than spend time making one's own bins, a firm manufacturing parts bins for industry now has a range available through many retail outlets or by mail order. These are fibreboard storage bins made by Bankers Box of Doncaster.

The bins are supplied flat and are easily folded into shape in a few seconds. No clips or staples are used as the folds are designed to provide plenty of strength, also the surface is resistant to oil and grease detoriation.

The bins come in seven sizes from 51 wide × 102 high × 305mm long up to 203 × 102 × 457mm. As an example of price, the 100 × 100 × 305mm size, in a pack of ten, usually retails at £3.50 which includes VAT, add 99p p&p for mail orders. Alternatively, a 50 pack costs only £12.95 plus VAT and £1.29 p&p.

For details of other prices and availability contact: *Bankers Box, Record Storage Systems, Doncaster Road, Kirk Sandall, Doncaster DN3 IHT. Tel: (0302) 884566.*

SR-9 Monitor Receiver

Our apologies to Catronics Ltd. and any of our readers who may have been misled by an unfortunate misprint in the Catronics advertisement on page 60 of our June 1981 issue.

The mistake occurred in the price of their Search SR-9, a v.h.f. f.m. monitor receiver which gives fully tunable coverage of the 2m band from 144 to 146MHz and incorporates a facility for installing optional crystals which will provide up to eleven fixed channels for the most popular frequencies. The VAT inclusive price (carriage add £1.50) for the Search SR-9 should have been **£46.00** not £78.00.

A marine band version is also available and both are obtainable from: *Catronics Ltd., Communications House (Dept. 186), 20 Wallington Square, Wallington, Surrey SM6 8RG. Tel: 01-669 6700.*

More on page 57 ▶▶▶

Receive Converters

Datong Electronics Ltd. have recently introduced two new receive converters for the amateur market, they are:–

First, model DC144/28 is a 2m down-converter which is especially designed to give improved overload and spurious signal performance compared with conventional converters. At the same time a very low noise figure is achieved. This makes the unit ideal for use in areas of high 2m activity where weak DX signals compete with strong local signals.

Technical features include a high dynamic range which has been achieved by using balanced Schottky diode mixer fed with a high oscillator level. To further reduce spurious signals, critical tuned circuits are completely enclosed in screening cans. This also reduces the level of local oscillator reradiation.

Priced at £31.00 plus VAT (£35.65 total), the DC144/28 is also available as a p.c.b. module (less case and connectors) at £25.00 plus VAT (£28.75 total).

Second, model PC–1 up-converts signals in the range 50kHz to 30MHz up to 144–145MHz, so that they can be received on any of the popular 2m all mode transceivers or on v.h.f. scanning receivers.

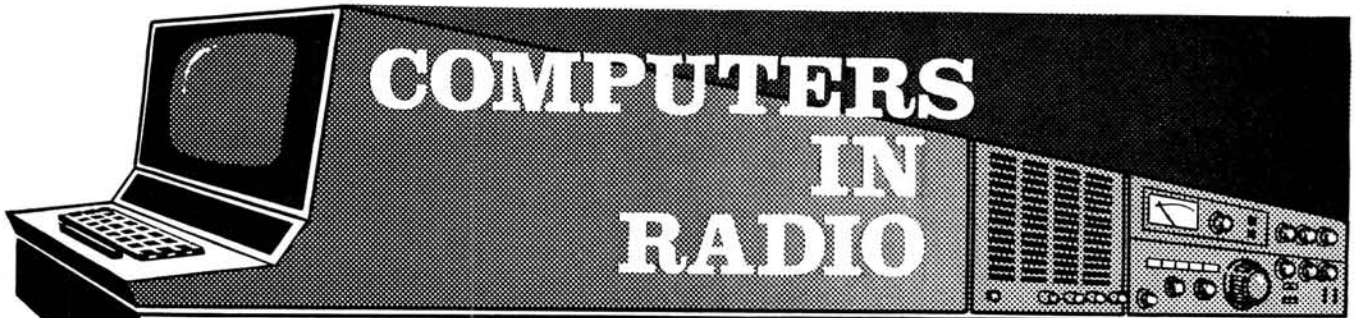
In effect the 2m receiver then becomes a high performance general coverage communications receiver with a performance that is generally far superior to that of low to medium cost general coverage receivers.

Technically model PC–1 is notable for its use of a parametric mixer as the frequency converter. Such mixers, previously used only in military-type equipment, feature very low noise levels plus very good strong signal handling ability. When converting up in frequency (as in this case) they also exhibit gain instead of loss and the result is that no other active elements are required in the signal path.

Frequency selection is by two digital switches reading directly in MHz and the correct bandpass filters are automatically connected to the input by internal logic.

The PC–1 costs £105.00 plus VAT (£120.75 total).

Total prices quoted include p&p and both units are available from: *Datong Electronics Ltd., Spence Mills, Mill Lane, Bramley, Leeds LS13 3HE. Tel: (0532) 552461.*



INTRODUCING THE MICROCOMPUTER—3

by Mervyn J. Axson BA G8WHG

Once we know the latitude and longitude of the QTH locator we can work out the approximate distance from our own location. It can only be approximate because the QTH locator does not give the precise position of a station, but only the latitude and longitude of the midpoint of a "square" measuring 4′ × 2′ (or roughly 4 miles by 2·5 miles), in which the station is located, so the distance calculated could have a maximum error of ± 2 miles approx. For this reason, rather than compounding the error, it is better to look up your own parameters on an Ordnance Survey map and to insert these in the program rather than letting the program calculate them from your QTH locator.

The distance can be calculated by spherical geometry or more correctly trigonometry (Fig. 1). If we know the two sides, b and c, and the included angle of the spherical triangle the third side, which is the great circle distance between B and C (Norwich and Hamburg in the example) is given by the formula:

$$\cos a = \cos b \cos c + \sin b \sin c \cos A$$

The latitude of Norwich is 52° 38′N of the equator and therefore 37°22′ from the North Pole. Similarly, Hamburg at 51° 32′N is 38° 28′ from the pole. Angle A is the difference in longitudes of Hamburg, 6° 44′E and Norwich, 1° 17′E=5° 27′:

cos a=cos 37° 22′ cos 38° 28′ + sin 37° 22′ sin 38° 28′ cos 5° 27′ In fact, we do not need to do the subtraction of the latitudes B and C from 90 to obtain the distances from the pole (90 − lat), since sin (90 − x)=cos x and cos (90 − x)=sin x, the formula can be rewritten:

cos (dist)=sin lat 1 sin lat 2 + cos lat 1 cos lat 2 cos (long 1 − long 2)

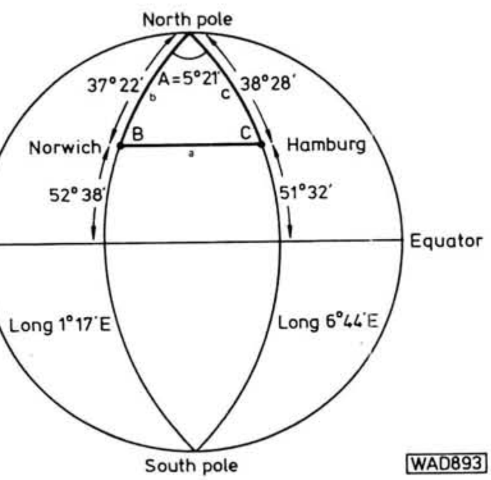


Fig. 1: Calculating the Great Circle distance between two points on the Earth's surface

We have assumed that both locations are on the same side of the Greenwich meridian i.e. both East or both West longitudes. If one is East and the other West then the angle A is the sum of the two, and cos (long 1 − long 2) should be replaced by cos (long 1 + long 2). You will see a simple way to carry this out when we come to code the program in BASIC but before we do there are two further points to mention.

BASIC does offer the functions SIN(X) and COS(X) so the conversion of the latitudes and longitudes to their sines and cosines presents no problem. What BASIC does not do directly is to give a function for the inverse of a cosine (ARCCOS), or in simplier terms, convert the cosine back to decimal degrees. It does however give the Arctangent (ATN (X)) and the BASIC handbook tells us that Arccos may be derived from this. ARCCOS (X)= −ATN(X/SQR(−X*X+1)) + 1·5708. The other point is that BASIC works in radians rather than the decimal degrees that we have been using. To convert from decimal degrees to radians we multiply by $2\pi/360$. In order to save typing these into the program each time that they are to be used, BASIC allows us to define our own functions in the form DEF FNX (V)= 'xxxxxxxxx'. Then whatever function is defined by this statement will be applied to the variable that we put in the brackets.

```
1430 DEF FNA (V)=−ATN (V/SQR(−V*V+1) + 1·5708
1440 DEF FNB (V)=V*2π/360
```

We already have the latitude and longitude of the QTH locator in variables L2 and L4 respectively, so let us put our own in variables L6 and L8. The QTH of G8WHG is latitude 53°9′N and longitude 2°11′W so remembering to convert to decimal degrees:

```
1450 LET L6=53·15
1460 LET L8=2·183
```

Since the location is longitude W we want to change cos (long 1–long 2) to cos (long 1 + long 2) if the QTH locator is longitude E. Since 2− (−2) is the same as 2 + 2 we simply make L4 negative if required:

```
1470 IF B$="EAST" THEN L4=−4
```

Obviously if your own location is longitude E then you would change line 1470 to IF B$="WEST" THEN L4=−L4. We can now use FNB to convert to radians and then do the sums to extract the distance.

```
1480 L2=FNB(L2) : L4=FNB(L4) : L6=FNB(L6) : L8=FNB(L8)
1490 E=(SIN(L6)*SIN(L2))+(COS(L6)*COS(L2)*COS(L8−L4))
1500 LET E=FNA(E)
1510 LET E=E*360(2*π)
```

Variable E now contains the distance between the two points in the form of the length of the arc of the great circle joining them in decimal degrees. One degree of a great circle equals 60 nautical miles and 33 nautical miles equals

```
LISTING OF "LOGBOOK" - 10.03.81.        M.J. AXSON.

60 OPEN1,4
70 INPUT"TIME IN FORM HHMMSS";TI$
80 PRINT#1,"TIME";TAB(12);"NO";TAB(10);"CALL SIGN";TAB(8);"RS IN";
90 PRINT#1,TAB(10);"RS OUT";TAB(10);"LOCATOR";TAB(8);"DISTANCE";TAB(8);"POINTS"
95 PRINT#1
100 Z=0
110 DIM C$(255)
120 INPUT"CALLSIGN";D$
130 FORI=0TOZ
140 IFD$=C$(I)GOTO 500
150 NEXT
160 PRINT"NOT WORKED"
170 PRINT"GOING TO WORK ?"
180 INPUT"TYPE Y IF YES, N IF NO";E$
190 IF E$="N" GOTO120
200 C$(Z)=D$
210 Z=Z+1
215 Z$=STR$(Z)
220 PRINT
230 INPUT"RECEIVED RST";R
240 PRINT
250 INPUT"SENT RST";R1
260 Q=LEN(Z$)
265 PRINT#1,TI$;TAB(10);Z;TAB(13-Q);D$;
266 Q=LEN(D$)
267 PRINT#1,TAB(16-Q);R;TAB(11);R1;
270 GOTO1000
500 PRINT"WORKED - CONTACT ";I+1
510 GOTO120
1000 PRINTCHR$(147)
1010 INPUT"QTH LOCATOR";A$
1020 L1=ASC(MID$(A$,1,1))
1030 L2=ASC(MID$(A$,2,1))
1040 N1=VAL(MID$(A$,3,1))
1050 N2=VAL(MID$(A$,4,1))
1060 L3=ASC(MID$(A$,5,1))
1070 L3=ASC(MID$(A$,5,1))
1080 LET L2=L2-24.5
1090 LET I=N1+1
1100 IF N2=0 THEN I=I-1
1110 ON I GOTO 1120,1130,1140,1150,1160,1170,1180,1190
1120 LET L2=L2+.479 : GOTO1200
1130 LET L2=L2+.354 : GOTO1200
1140 LET L2=L2+.229 : GOTO1200
1150 LET L2=L2+.0875 : GOTO1200
1160 LET L2=L2-.021 : GOTO1200
1170 LET L2=L2-.146 : GOTO1200
1180 LET L2=L2-.271 : GOTO1200
1190 LET L2=L2-.396
1200 IF L3=65 OR L3=66 OR L3=72 GOTO 1230
1210 IF L3=67 OR L3=71 OR L3=74 THEN L2=L2-.042:GOTO 1230
1220 L2=L2-.083
1230 LET A=INT(L2)
1240 LET B=(L2-A)*60
1250 IF L1<85 THEN LET L1=2*(L1-64)-1:B$="EAST":GOTO1270
1260 LET L1=2*(90-L1)+1:B$="WEST"
1270 LET N2=N2-1
1280 IF N2=-1 THEN N2=9
1290 IFB$="WEST" GOTO 1350
1300 LET L4=-58+(N2*12)
1310 IF L3>69 AND L3<73 GOTO 1340
1320 IF L3>65 AND L3<69 THEN L4=L4+8 : GOTO 1390
1330 L4=L4+4
1340 GOTO 1390
1350 LET L4=58-(N2*12)
1360 IF L3>69 AND L3<73 GOTO 1390
1370 IF L3>65 AND L3<69 THEN L4=L4-8 : GOTO 1390
1380 L4=L4-4
1390 L4=L4/60
1400 L4=L1+L4
1410 LET C=INT(L4)
1420 LET D=(L4-C)*60
1430 DEF FNA(V)=-ATN(V/SQR(-V*V+1))+1.5708
1440 DEF FNB(V)=V*(2*/360)
1450 LET L6=53.15
1460 LET L8=2.183
1470 IF B$="EAST" THEN L4=-L4
1480 L2=FNB(L2):L4=FNB(L4):L6=FNB(L6):L8=FNB(L8)
1490 E=(SIN(L6)*SIN(L2))+(COS(L6)*COS(L2)*COS(L8-L4))
1500 LET E=FNA(E)
1510 E=E*360/(2*)
1520 E=E*60*38/33
1530 E=INT(E+.5)
5000 PRINT
5010 PRINT
5020 PRINT"LONGITUDE = ";C;"DEGREES";INT(D);"MINUTES ";B$
5030 PRINT
5040 PRINT"LATITUDE = ";A;"DEGREES";INT(B);"MINUTES NORTH"
5050 PRINT
5060 PRINTA$;" IS APPROX ";E;" MILES FROM G8WHG"
5070 E1=INT(E*1.609+.5)
5075 E1$=STR$(E1)
5077 Q=LEN(E1$)
5080 PRINT"OR APPROX ";E1;" KILOMETRES"
5090 P=INT(E1/50)+(INT(E1/50)+1)
5100 PRINT#1,TAB(12);A$;TAB(10);E1;TAB(16-Q);P
5110 PRINT
10000 GOTO 120
READY.
```

SAMPLE RUN OF LOGBOOK - 10.03.81. M.J. AXSON.

TIME	NO	CALL SIGN	RS IN	RS OUT	LOCATOR	DISTANCE	POINTS
160028	1	GW8WDC/P	59	59	YN75J	63	3
160121	2	G8UVV	59	59	YN78J	24	1
160244	3	G4DEE	59	59	YN39B	48	1
160414	4	G8XDT	59	59	YN38D	43	1
160459	5	G8UVE	59	59	YN18D	71	3
160553	6	G4HYG	54	55	YN28C	63	3
160654	7	GW8JUL/P	57	56	YN75B	56	3
160750	8	G4ERP/P	51	53	ZL01J	137	5
160827	9	G8TLG/P	59	59	YN38H	55	3
160933	10	GW4GNO/P	53	41	YL05J	148	5
161039	11	G3GSR	11	59	YK07J	248	9

Fig. 2: Complete program and sample run of contest logbook

38 statute miles so we can obtain the answer in statute miles and display it on the screen:

```
1520 E=E*60*38/33
5050 PRINT
5060 PRINT A$; "IS APPROX";E;"MILES FROM G8WHG"
```

E will very probably have ended up as a whole number with a string of numbers after the decimal point, which gives a misleading sense of accuracy, so we will add one more line to convert it to the nearest whole number before printing:

```
5030 E=INT(E+·5)
```

Having got the program to work so far, we can now extend it to keep the station log for a contest. When you hear a station calling, you want to know rapidly whether or not you have already worked it in the contest, so first let us keep a list of the callsigns worked in the computer's internal memory. We can do this by "setting up an array using a single subscripted variable"! All this means is that we store the callsigns in a variable, say C$, followed by a number in brackets which can range from Ø to 255, so the callsign of the first station to be worked is stored in C$(Ø), the second in C$(1) and so on, until the 256th to be worked is stored in C$(255). (If we want to cover more than 256 stations, we can set up another array, say C1\$, which will bring us up to 512. If this is not enough we can have C2\$ and so on up to the limit of the computer's memory). We then want to be able to input a callsign to the computer and tell it to search its memory to see whether or not it has been worked and give the appropriate answer:

```
100 Z=Ø
110 DIM C$(255)
120 INPUT"CALLSIGN";D$
130 FOR I = Ø TO Z
140 IF D$ = C$(I) GOTO 500
150 NEXT
160 PRINT "NOT WORKED"
170 PRINT "GOING TO WORK?"
180 INPUT "TYPE Y IF YES, N IF NO";E$
190 IF E$ = "N" GOTO 120
200 C$(Z) = D$
210 Z=Z+1
270 GOTO 1000
500 PRINT "WORKED—CONTACT"; 1+1
510 GOTO 120
```

Line 100 sets a counter "Z" to Ø so that the first callsign will be stored in C\$(Ø) by line 200. Line 110 tells the computer the size of the array and line 120 asks us to input the callsign. Lines 130 to 140 are a FOR ----- NEXT loop, which is a very valuable BASIC statement for repeating an operation. In this case the FOR statement tells the computer that I should successively have the value from Ø to whatever value "Z" has reached i.e. the subscript of C\$ for the last callsign stored in the memory. Line 130 then tells the computer to look in the memory and compare the callsign stored with the new one. If they are the same, the operation is transferred to line 500 which tells us that the station has been worked as contact No. X and then 510 puts the program back to 120 to ask for the next callsign. If D\$ is not the same as C\$(Ø) line 150 returns to 130 where I set to 1 and the operation repeated. If the callsign D\$ is not found in the memory then line 160 will be reached. We can now try to make contact with the calling station and if successful answer the question in line 170 with a "Y", when line 200 will now store the callsign in C\$(Z) and 210 will increment Z by one ready for the next callsign to be worked. The other logkeeping operations can then be carried out as we will see shortly. However if contact is not established, we respond to line 170 with "N" and the program will be returned to line 120 by line 190.

Obviously, if we want to keep a written record a printer must be attached to the computer and we must arrange for the required details to be sent to the printer rather than to the v.d.u. screen. Output peripherals are given numbers and in the case of the PET microcomputer, the printer is coded as device No. 4. so we give an open statement:

```
60 OPEN 1,4
```

Now any statement started with PRINT 1 will be sent to the printer. It is useful to have a note of the time automatically printed in the log for each contact and most microcomputers do have an inbuilt clock function. In the case of the PET this is stored in the variable TI\$ and is in the form of "HHMMSS" for hours, minutes and seconds since power up. You can however set TI\$ to read actual clock time:

```
70 INPUT"TIME IN FORM HHMMSS"; TI$
```

We now want to print column headings on the log sheet:

```
80 PRINT#1,"TIME"; TAB(12);"NO"; TAB(10); "CALL-SIGN"; TAB(8); "RS IN";
90 PRINT#1, TAB(10); "RS OUT"; TAB(10);"LOCATOR"; TAB(8); "DISTANCE"; TAB(8);"POINTS"
95 PRINT#1
```

The TAB(X) is to format the output to the printer e.g. 12 spaces will be left between TIME and NO. As you will see we use the TAB function again to print out the data for each station, but in a slightly different form, since the actual length of data items will vary, so we must take this into account so as to line them up under each other in the log. e.g. callsigns may vary between 4 data items (G2XX) and 8 data items (GM8XXX/P). There is a function LEN(X\$) which will count the number of data items in the string and we can then deduct this number from the TAB to give the correct spacing, e.g. Q=LEN(D\$) and then PRINT#1, TAB(20–Q) ensures correct lining up. BASIC will not find the length of a number by this method so we have to play a trick on it. STR\$(N) converts a number to a string i.e. 300 becomes "300", so we can then find out the length as before.

There are just two more points to be considered before the program is complete. We have got our distance in miles but for contest work we use kilometres so:

```
5070 E1 = INT(E*1·609 + 0·5)
```

This gives an alternative answer in kilometres approximately. We can now get the computer to work out the points scored for each contact according to the distance. The usual RSGB scoring for v.h.f. contests is 1 point for up to 50km, 3 points for 50 to 100km, 5 points for 100 to 150km and so on. A statement in the following form will calculate the point score:

```
5090 P = INT(E1/50) + (INT)(E1/50)+1)
```

If E1 = 47 the sum is 0 + 0 + 1 = 1, and for E1 = 147 it is 2 + 2 + 1 = 5.

The whole program is shown in Fig. 2. and it does look quite complicated, but by taking it a stage at a time and making each part work, then expanding to do something else as well, the process has been relatively painless. This is the secret of successful programming, start simply, get it working and then expand. And, if it works, leave it alone!

kindly note!

Active Receiving Antenna March 1981
The ferrite toroid to form T1 should be a Neosid 28-511-28 (12 o.d. × 6 i.d. × 3mm enamel coated).

the things people say

"Right, I've got that all OK. To avoid timing out, I must wait for the "K". Er . . . Er . . . is that the long burst of Morse, or the short bit?"

. . . Brighton & District RS Newsletter

"This car I've borrowed is most peculiar. If you put the right-hand indicators on and then turn left, they cancel."

. . . heard by G3GSR

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- ★ Optional Noise Blanker that can deal with the Russian Woodpecker.

R. L. DRAKE PRICE LIST

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RRM-7	Range receive modules for Aux-7 (500 KHz)	**5.75**	*0.50*
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NB-7	Noise Blanker for TR-7	**66.24**	*1.00*
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MMK-7	Mobile mounting kit for TR-7	**34.50**	*2.00*
MN-7	ATU/RF Wattmeter. 160-10 m (250w)	**124.20**	*5.00*
MN-2700	ATU/RF Wattmeter 160-10m (2kw)	**207.00**	*5.00*
WH-7	RF Wattmeter/VSWR Bridge (HF)	**59.80**	*2.00*

Model	Description	Inc. VAT	*Carr.*
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CW-75	Electronic Keyer	**59.80**	*2.00*
P-75	Phone patch	**59.80**	*2.00*
7804	Service Manual for TR-7	**18.50**	*2.00*
7805	Service Manual for R-7	**18.50**	*2.00*
7037	TR-7 Service Kit	**37.95**	*1.00*
L-7E	Linear Amp. 2kw. 10m-160m with tubes (2)	**897.00**	*10.00*
3-500Z	Tube for L-7E and L-75E	**69.00**	*2.00*
L-75E	Linear Amp. 1kw 10-160m with tube (1)	**598.00**	*5.00*
TV-42LP	Low Pass Filter 100w	**10.35**	*1.00*
TV-3300LP	Low Pass Filter 2kw	**18.40**	*1.50*
7073	Hand Microphone for TR-7	**18.40**	*1.00*
7077	Desk Microphone for TR-7	**29.90**	*2.00*
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The Thurlby FM77T is a complete digital frequency meter built into a module less than 12mm thick and costing under £20.00.

With no additional components the FM77T will directly measure and display frequencies up to 3999·9kHz. With external pre-scaling, this can be extended to 39·999MHz or 399·99MHz.

Stability is better than ±25p.p.m. over a 10°C to 30°C temperature range and is defined by a built-in crystal timebase. The display is a high contrast reflective l.c.d. with 9mm high characters, user selectable decimal points and kHz/MHz indicators.

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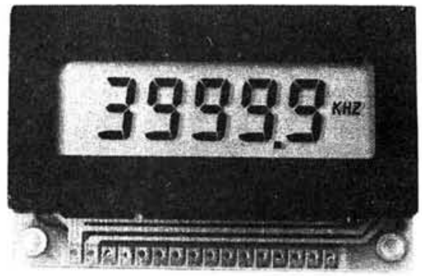


Priced at £19.95 plus VAT and no charge for carriage, the FM77T is obtainable from: *Thurlby Electronics Ltd., Office Suite 1, Coach Mews, The Broadway, Huntingdon, Cambs. PE17 4BN. Tel: (0480) 63570.*

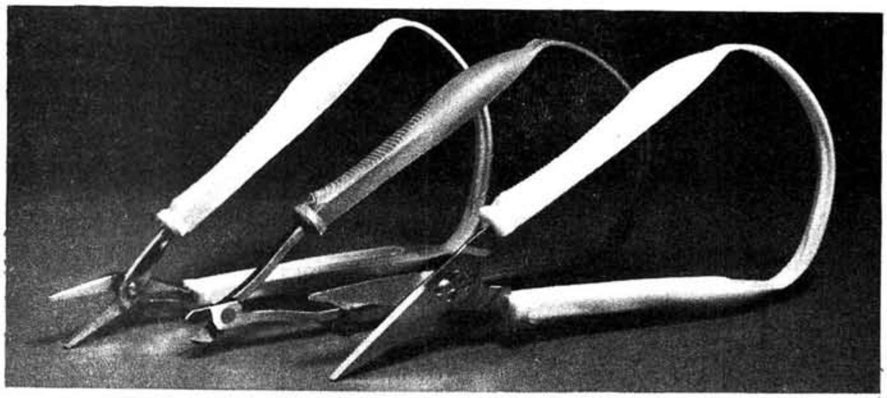
Miniature Handtools

Tele-Production Tools Ltd., the Westcliff based manufacturer of Handtools and Production aids, recently introduced a set of three new "Easi-Grip" miniature handtools designed principally for the electronics engineer.

This "Easi-Grip" set consists of miniature carbon steel side cutters, fine nosed stainless tweezer-pliers and a serrated stainless steel scissor/shear for cutting fine wires, boards, foil etc.

The average tool weight is only 40g and costs £3.75 each which includes VAT and p&p, or £10.00 for the set.

Tele-Production Tools Ltd., Stiron House, Electric Avenue, Westcliff-on-Sea, Essex SS0 9NW. Tel: Southend (0702) 352719.



NEWS

New Clubs

Skegness and District Radio Society was founded in February this year and meets on the first and third Tuesday every month at the White Swan, Burgh-le-Marsh, at 2000hrs.

RAE classes and Morse instruction have been started along with a wide range of activities and club constructional projects.

New members and visitors are welcome and can obtain further details from: *Jack Joslin G3NPY, 150 Roman Bank, Skegness, Lincolnshire PE25 1SE.*

Watford Radio Club has just been formed, and although the membership at present is small, the organisers hope to attract local amateurs and s.w.l.s.

Further information can be obtained from either: *Ken G6BKZ on Garston (092 73) 79022 or Mr A. C. Thompson, 2 Fairfolds, Watford, Herts. WO2 4TW.*

Queen's Award for Plessey

Plessey Semiconductors has won the Queen's Award for Export Achievement.

The award, given for outstanding export performance over three consecutive years, demonstrates the success with which the company has penetrated world-wide markets.

The company currently exports over 70% of production and its successes include selling integrated circuits for Japanese television receivers and military circuits to the USA.

HAP-UK Tapes Catalogue

The Handicapped Aid Programme, the international organisation which promotes s.w. radio amongst handicapped people and offers them practical assistance, has just published a catalogue containing full and detailed information on the tapes produced by the Programme.

Currently available is a six tape series devoted to the fascinating world of radio, as well as a Foreign Language Recognition Course. There is also an Identification Signals Tape, a recording from Radio Netherland's DX Juke Box programme called "New Year Nonsense from the Netherlands" and an album entitled "Long Live Shortwave!"

The HAP Tapes Catalogue gives a detailed description of each of the recordings as well as prices and is available from HAP offices in the UK and Canada free of charge, although return postage is required.

HAP-UK, PO Box 4, St. Ives, Huntingdon, Cambs. PE17 4FE.

Radiothon

The Sankey and Penketh Amateur Radio Club ("SPARKS" to their friends) will be running a Radiothon from 10am on Saturday 8 August until 10pm on Sunday 9 August at Sankey Valley Park, about a mile west of Warrington on the A57. The aim is to raise money for local charities. Special station GB3SVP will be looking for contacts on all h.f. bands and 2m, and there will be talk-in on S9.

Added attractions are a bring-and-buy stall, and on the Sunday, the Sankey Valley Dry Land Boat Regatta. Further information from *G3VZU or G4HYC, both QTHR.*

RADIO SPECIAL PRODUCT REPORT

TRIO TS-830S

HF SSB TRANSCEIVER

A new h.f. transceiver, the TS-830S, emerged from the Trio stable at last year's Leicester Show following on the popular TS-520SE and TS-820 series. After trying the Yaesu FT-101ZD and the Trio TS-830S the author decided to purchase the latter having used Trio equipment for the past 15 years with consistently good results both on transmit and receive. This report is based on an extensive operational evaluation.

The most important feature of the TS-830S is that the new 10, 18 and 24MHz amateur bands are fitted as standard in readiness for their licensed availability.

As supplied the transceiver is ready for reception only on these new frequencies and to prevent inadvertent transmissions diodes are fitted across the crystals. Simple instructions are contained in the manual detailing the procedure for the removal of these and so making the rig ready for normal transceive operation on these three bands when they become available.

The receive side of the transceiver features a conventional double conversion system with the first i.f. on 8·830MHz and the second at 455kHz.

Incoming signals from the antenna are routed via a switchable 20dB r.f. attenuator to the r.f. amplifier and then through a buffer amplifier stage to the first mixer. Signal amplification takes place at the first i.f. before passing through the noise blanker "gate" from which a portion is taken to the adjustable noise blanker circuit and into the second r.f. mixer.

Further i.f. amplification is provided before the *Q* multiplier, notch filter, buffer, final i.f. amplifier and product detector. An r.f. gain control is provided to adjust the automatic gain control, a.g.c., and threshold voltage. Two stages of audio amplification complete the receiver line up.

The v.f.o. which tunes between 5·5 and 6MHz feeds into the phase lock loop unit, which in turn drives the digital frequency counter and display and also provides the v.c.o. and carrier voltages.

Many new features have been incorporated in the TS-830S, enabling a reduction or removal of the ever present QRM found on the amateur bands. Several methods of reducing adjacent channel QRM are employed, one being the v.b.t. or variable bandwidth tuning system; see Fig. 1. This has the effect of varying the bandwidth of the i.f. and is most effective by being able to cut down any excessive "splatter" from other amateur signals. It does of course degrade the incoming signal, as one would expect. Whilst the specifications indicate a possible 1·2kHz shift of the signal, it was found that a 1kHz shift was possible by adjustment of the i.f. shift control.

By using the i.f. shift and the variable bandwidth tuning control it is possible to eliminate quite a fair percentage of QRM unless of course the unwanted signal is on the exact frequency you are listening on. Not having these facilities on the Trio-520S resulted in quite a lot of QSOs being lost, even when the QRM was only 1·0kHz offset.

The i.f. shift moves the crystal passband frequency by 1·1kHz, this being achieved by using a phase locked loop, in the local oscillator circuit and the v.b.t. altering the passband width of the i.f.

Several dual concentric controls are used in the 830S; incorporated with the i.f. shift is the NOTCH control. Quite a lot of information on the use of this method of filtering has appeared in magazines over the course of years and this one is most useful on c.w. Notch filtering is also very useful when copying sideband signals because with careful adjustment it is possible to eliminate an interfering c.w. signal at around 1kHz from the received frequency. Measurements taken using this control appear in Fig. 2 and match those given by the manufacturer.

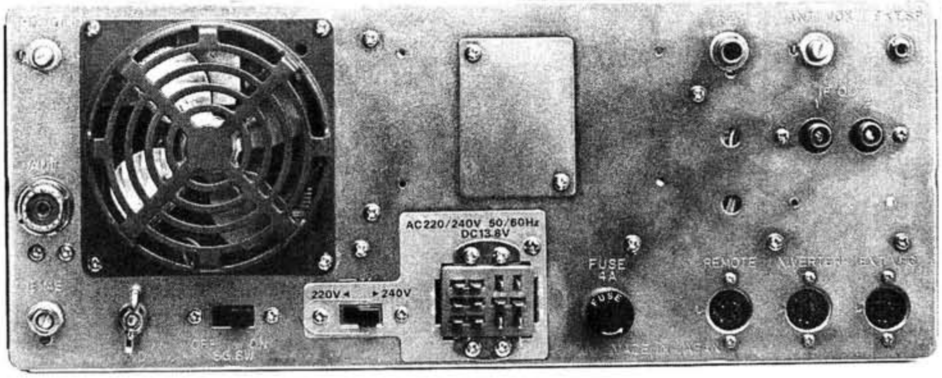
The band switch is a 10 position step control, covering the amateur bands from 1·8MHz to 29·7MHz, with a spare location corresponding to the fully clockwise position 7 of the switch.

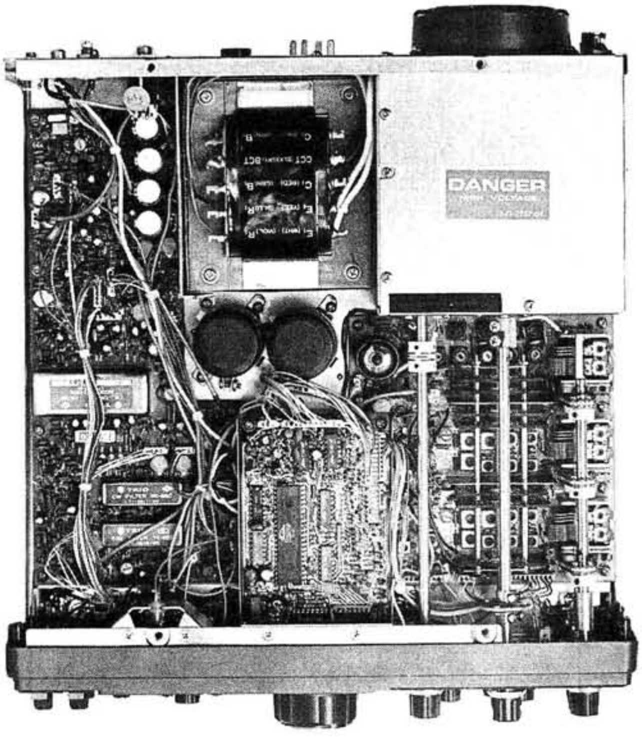
Also provided is a WWV/JJY position on the band switch allowing the reception of standard frequency signals on 10MHz.

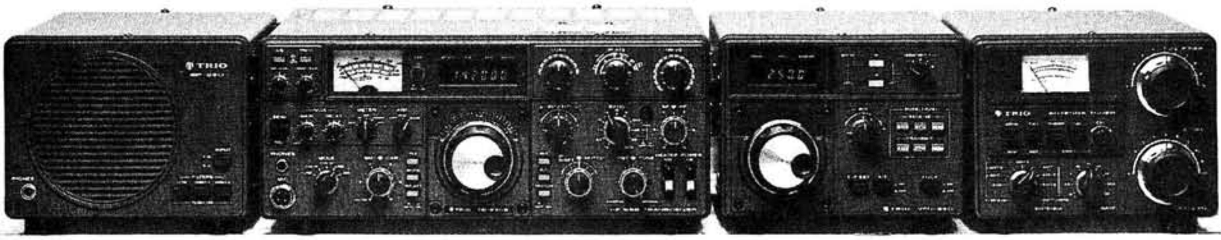
The r.f. and audio gain controls are also of the dual concentric pattern which is common practice in Trio equipment. To obtain correct "S" meter readings it is essential to have the r.f. gain fully clockwise. Using a calibrated signal generator and injecting 40dB of signal on the 14MHz band yields a reading of S9; in comparison with other receivers the "S" meter is not over generous.

The transceiver has both r.i.t. and transmitter incremental tuning, x.i.t., the latter not being a feature of some of the other Trio transceivers. This control is operated by two press bar switches and the r.i.t. is extremely useful on a net where some of the older models of the KW-2000 range seem to be unable to radiate a signal on the frequency they are listening on. Also, when working DX, some stations listen above or below their transmit frequency and it is possible to get a 2kHz shift either up or down without having the expense of a separate v.f.o. Two l.e.d.s are used to indicate which mode is being used.

TRIO
TS-830S







The drive control also acts as a sensitivity control on receive; adjusting this for maximum "S" meter reading coincides with maximum drive to the p.a.

A variable, front panel, noise blanker control is fitted to adjust the threshold level of the noise amplifier, enhancing the circuit effectiveness under varying noise and signal levels.

As with previous Trio transceivers a switch is fitted to remove the supply to the heaters of the driver and p.a. valves. This effects quite a considerable saving in both electricity and valve wear as the transceiver uses only 32W on receive.

A display hold switch is fitted adjacent to the digital display enabling the frequency shown on the display to be held whilst tuning the transceiver, using the rotary dial to show the frequency shift. The display is a six-digit fluorescent type with a read-out resolution to 100Hz, giving a very accurate frequency reading during transmit and receive. Checked against a standard frequency, based on the BBC 200kHz Droitwich transmissions, the reading was only 200Hz high on the 14MHz band.

An automatic gain control switch is fitted giving a choice of SLOW, FAST and OFF. The SLOW position is used to copy s.s.b. and the FAST for c.w. On a very weak signal the OFF position is used as this prevents the a.g.c. circuit bringing up the inherent receiver noise.

A monitor switch is also provided on the front panel which samples the i.f. section during transmission and feeds a small portion of the recovered audio to the headphone jack socket.

Items found on the rear panel include the antenna connector, which is an SO239 socket and an output from the wide-band low level i.f. signal for use with a compatible panoramic display. The Trio SM-220 is the matching monitor

★ specifications

GENERAL

Frequency range:	160m band 1·8–2·0MHz 80m band 3·5–4·0MHz 40m band 7·0–7·3MHz *30m band 10·1–10·15MHz (10·0MHz WWV) 20m band 14·0–14·35MHz *17m band 18·068–18·168MHz 15m band 21·0–21·45MHz *12m band 24·89–24·99MHz 10m band 28·0–29·7MHz **Transmission capability internally disabled*
Modes:	s.s.b.–A3J-J3E c.w.–A1-A1A
Power supply:	220–240V a.c. 50/60Hz
Power consumption:	transmit 295W receive 32W (heaters off)
Dimensions:	333 × 133 × 333mm
Weight:	13·5kg

TRANSMITTER

Final power input:	220W p.e.p. (s.s.b.) *(Using two-tone oscillator 215W p.e.p. into 50Ω load)* 180W d.c. (c.w.) *(160W d.c.)*
Frequency stability:	Within 1kHz during first hour after one minute warm-up *(1–2kHz during first hour)* Within 100Hz during any 30 minute period after warm-up *(120Hz during 30 minute period after ten minute warm-up)*
Carrier suppression:	Better than 40dB *(42dB)*
Sideband suppression:	Better than 60dB *(57dB)*
Spurious radiation:	Better than 60dB *(65dB checked with spectrum analyser)*
Harmonic radiation:	Better than 40dB *(40dB)*
Audio frequency response:	400Hz to 2·6kHz within −6dB

RECEIVER

Receiver sensitivity:	0·25V at 10dB S + N/N *(0·25V at 10dB S + N/N)*
Image ratio:	Better than 60dB *(55dB)*
IF rejection:	Better than 80dB *(80dB)*
Receiver selectivity:	s.s.b./c.w. wide 2·4kHz (−6dB) 3·6kHz (−60dB) c.w. narrow with YK-88C filter (option) 500Hz (−6dB) *(s.s.b./c.w. wide 2·4kHz (−6dB))* *(c.w. narrow with YK-88C filter 500Hz (−5dB))*
Audio output:	1·5W *(1·4W into 8Ω load)*

Test results are shown in italics

unit for the TS-830S, which apart from displaying the output and input waveforms has a built-in two-tone oscillator and also serves as a high sensitivity 10MHz oscilloscope.

Other available options on the receive side are reduced bandwidth filters for c.w. reception. The mode switch has two positions for c.w. reception, c.w.-W and c.w.-N. In the latter it switches the signal through the crystal filter, the bandwidth depending on which filter is fitted. Alternative filters are available to provide −6dB bandwidths of 270Hz, 500Hz and 250Hz with corresponding −60dB figures of 1·1kHz, 820Hz and 500Hz. In the s.s.b./c.w. WIDE position a filter is used giving a bandwidth of 2·4kHz at −6dB and 3·6kHz at −60dB.

To complete the review of the receive side two DIN sockets are fitted on the rear panel, one for connection of the separate matching v.f.o. (v.f.o.–230) and the other provides a low audio output for feeding a tape recorder.

On the transmitter side the drive to the p.a. valves is supplied by the only other thermionic valve used, a 12BY7A. The TS-830S does not use one of the special manufacturer's type required in some transceivers to obtain sufficient drive on the 10m band. The p.a. valves consist of a pair of 6146Bs which have been featured by Trio in several of their h.f. transceivers, pointing to their ruggedness and subsequent dependability.

Tuning of the p.a. valves is accomplished by means of the load control, using the American term PLATE control. The output circuit is of the familiar π type configuration with the 6146Bs operated in parallel; r.f. negative feedback and limiting by means of amplified a.l.c. voltage ensures optimum i.m.d. characteristic. The p.a. tuning is fairly broadband and is flat for about 50kHz either side of the selected frequency, the same applying for the drive control. In fact on some bands it has been found that retuning of this control is not required.

An effective r.f. speech processor is fitted, selectable by means of a push-bar switch on the front panel. The amount of processing is adjustable by a variable control with a reference scale fitted on the meter to indicate the amount of audio compression. During tests on the h.f. bands this has enabled signals to get through some of the QRM present, producing favourable reports from semi-DX stations.

Microphone input is by means of the standard 4 pin plug and a microphone impedance of 500Ω to 50kΩ can be used, but if a higher impedance is used one does not get such a "tailored" response and reports of "boominess" are given.

For c.w. transmission it is possible to operate break-in by

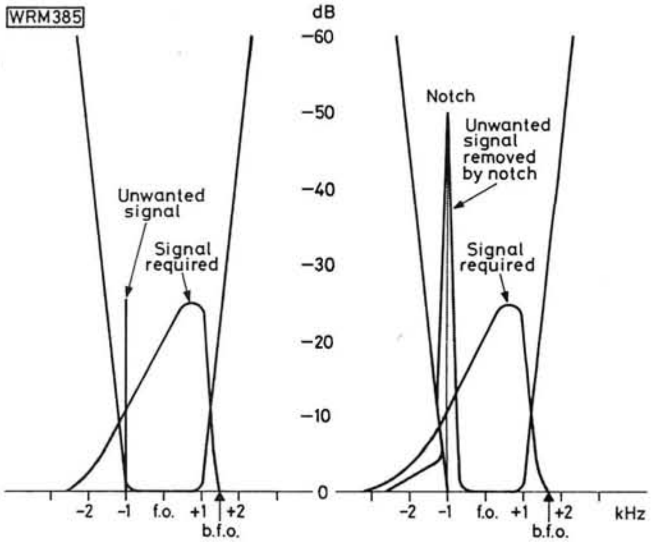


Fig. 1

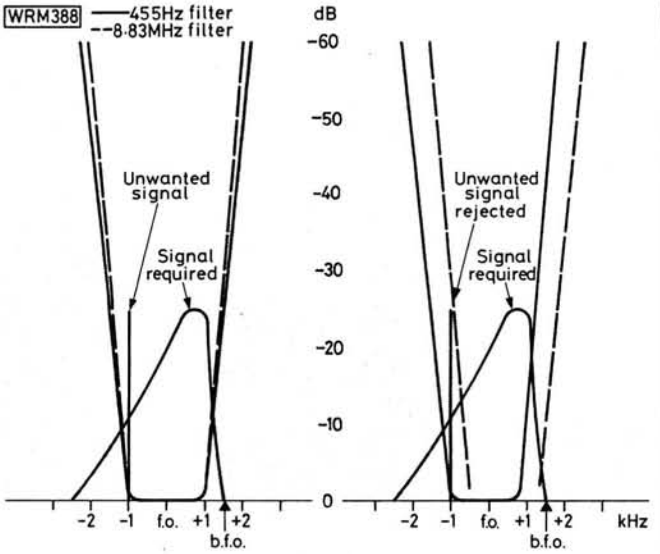


Fig. 2

turning the VOX control on and the mode switch to C.W. FINE. When using c.w. the carrier level control knob must be advanced; the manual recommends drawing 240mA of anode current but in practice 200mA seems to be sufficient to get the full 160W of d.c. output.

To sum up, the TS-830S transceiver is a very good piece of equipment backed up by a comprehensive manual. The receiver is of advanced design on previous Trio transceivers and consistently good reports on speech quality have been received in months of use on all the amateur h.f. bands; it fully lives up to "the state of the art" in both design and operation.

UNCLE ED

▶▶▶ *continued from page 39*

3. The load will not "see" anything like 600Ω as a source impedance. What it will see is R2 in parallel with another impedance made up of R1 in series with the source impedance R_s. This works out at 225Ω. In case you're worried about where the generator comes in this calculation, the answer is that as far as source impedance is concerned you can ignore it. If you remember, Thevenin's Theorem says the **generator** is "perfect" with zero internal impedance, i.e. a short-circuit. I know it's not easy to imagine that a short-circuit can generate a voltage, but that's the way to think about it.

The solution to our problem is to add a third resistor to the attenuator (R3 in Fig. 5), to increase its output impedance. Yes! You're right—we've been here before—that's just what we did with the 480Ω resistor back in Fig. 1. But now comes yet another complication. Because R3 makes the attenuator output impedance up to 600Ω, and the load impedance is 600Ω, the voltage at the O/P "A" terminals will be only half the voltage across R2. So, the ratio of R1 and R2 must be changed accordingly. In an attenuator with equal input and output impedances, R1 and R3 have equal values. If you're thinking that this is a sure recipe for going round and round in ever-decreasing circles in trying to work out the values of the attenuator resistors, you're right. Luckily, though, there are tables and a simple formula that have been devised to do it all for you—all you have to do is feed in the impedance and the attenuation ratio in decibels. I'll talk about the tables and formula, and tidy up some other points next month. Then I suppose I'd better think about a future article on decibels—wish I'd never mentioned the things!

PASSPORT TO AMATEUR RADIO—1

▶▶▶ *continued from page 19*

Conditions on the amateur bands vary with the time of day and season of the year and it is often desirable to operate early in the morning or late at night.

Then our first Junior Operator was born and I moved gracefully to the spare bedroom. Not bad, but I had to operate very quietly, (no drilling, filing or chassis bashing after 6.30p.m.).

A few years later, our second Junior Operator arrived and I moved even more gracefully, into our carless garage, with its cold concrete floor and collection of gardening implements, (a constant reminder of what else I should be doing!).

Then we got around to buying our first car and we agreed that I needed a more permanent "shack", so I bought a 4 × 2·5m sectional cedarwood shed, the best I could afford at the time. I lined it with hardboard, painted it, carpeted it and fitted it with benches, shelves, mains sockets, a heater and a 'phone to the house, ("is it coffee time yet?").

When we moved house a few years ago, I dismantled it and re-assembled it at the new address (QTH) and everything fitted back again as though it had never been moved. A point worth remembering.

Every radio shack is going to have an antenna (aerial) system connected to it and the relative positions should be carefully considered, to keep antenna feeder cables as short as possible.

Unless you are lucky enough to live way out in the country, the size and appearance of your antenna system may upset your neighbours or contravene the local planning regulations, so be careful and considerate before ordering a 20m crank-up tower.

Amateur radio is not just confined to talking to other amateurs from your shack. If you are interested in mobile operation you may have regular chats to others on your way to and from work, vehicle to vehicle or through your local repeater station. Mobile Rallies are held up and down the country during the summer months and entertainment is usually provided for all the family.

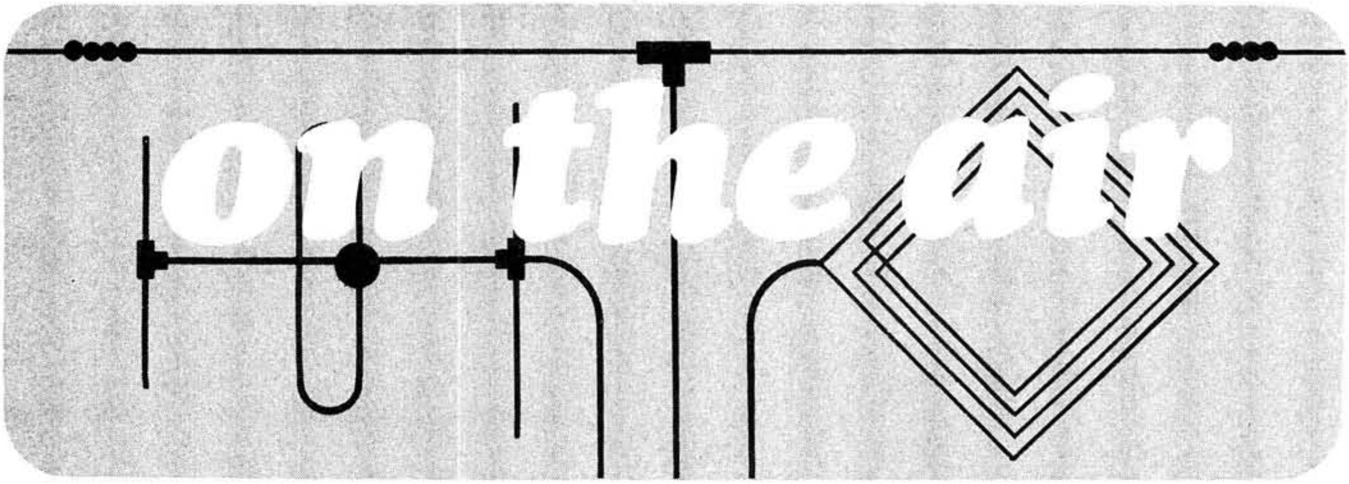
You may be keen on Contest operating and this might be with portable equipment from a hilltop or under canvas, as in the RSGB National Field Day, which is a regular June event for many Radio Clubs.

Even if you are interested in some specialised technical aspect, whether it be satellite communication, amateur television or any other, it is very likely that you will meet another amateur with similar interests who will be keen to assist, collaborate or advise.

If you wish to help others in the community you may like to join your local RAYNET (Radio Amateur Emergency Network) and take part in Civil Defence exercises. You could help your local Scout Group, by offering to provide a station so that they can take part in JOTA (Jamboree on the Air), an international two-day event which is held in October, each year.

As you can see, there are many facets to Amateur Radio, perhaps one of them will be the bug that bites you and sets you on course to becoming a licensed radio amateur.

NEXT MONTH: THE AMATEUR LICENCE AND STUDYING FOR THE RAE



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.

Readers will probably have seen already the Home Office specifications that will govern the equipment to be used on the new 27MHz CB f.m. band which ranges from 27·60125MHz to 27·99125MHz, and realised that this abuts the bottom end of our 10m band. But a word of warning to those who may consider buying some of the new gear coming on to the market which covers the new CB f.m. band and part or all of the 28MHz amateur band.

It will be illegal to use such equipment on the CB f.m. band even if a CB licence is obtained. The new regs specifically state that no CB equipment will be approved if it is capable of using frequencies other than the new CB ones, or a mode other than f.m. The gear would probably offend in other ways too, such as power output level, and frequency deviation.

But enough of CB, I'm sure the new regs will have been pretty well covered in all the journals by the time this appears in print.

My comments on several occasions about the necessity of having tunable r.f. circuits in the front ends of receivers, to reduce or eliminate intermodulation of signals, seem to have helped some readers to recognise this problem in their own sets, instead of complaining about the broadcast stations in the amateur bands which is one manifestation of intermodulation.

Unfortunately, in an effort to make the life of the listener that much easier the latest communications receivers have often got fixed wideband filters in the r.f. stages, which pass these often very powerful BC signals which then appear as images on amateur bands, and elsewhere. The fact that this is more economical for the set manufacturer is quite beside the point however! The listener is the last person to be considered when the spec of a new receiver is drawn up.

One reader had this trouble on a new set, particularly on the 10m band, and returned the set to the retailer but of course he was not able to do anything to cure the trouble since it is inherent in the design. I'm quite sure that there are many more readers who are blaming the BC stations but hopefully this homily may help them to see where the trouble lies. It may seem ridiculous after spending a tidy sum on such a receiver but my advice is to use an antenna tuning unit between the antenna and the receiver, and to resonate it to the band in use. This will be very effective against image signals generally. This remedy also applies to many other and less sophisticated receivers of course.

If the CBers can get away with obtaining almost all they want from the Government from sheer weight of their lobbying then perhaps we amateurs ought to start a lobby against the set manufacturers with a "we want tunable front ends" campaign!

Clubland

More and more clubs are reporting an influx of CBers who have become a little disillusioned with the mode and want something a bit more intriguing than a mere radio telephone. Clubs can do a lot in this area to clear away the CB a.m. users and gain members in the process.

Clubs affiliated to the RSGB should remember that last-minute changes of club programmes can be disseminated via GB2RS on Sunday mornings. See *Radcom* for details.

Wirral & District ARC. Alternate Weds, 8pm, in the dining room of the Concourse Sports Centre at West Kirby, with July 8 the starting date, when a DF hunt is scheduled. Don't leave the XYL at home, there are six OM/XYL teams in the club with a total of eight licensed ladies. More from Ian Brooks, 28 Paignton Road, Wallasey L45 6TT.

Wakefield & District RS. Alternate Tues in Room 2, Holmfield House, Denby Dale Road, Wakefield, with July 14 having G3WWF chatting on propagation and a car treasure hunt on the 28th. Rick G4BLT, 1 Wavell Garth, Sandal Magna, Wakefield is your contact, or Wakefield 255515.

Crawley ARC. Modern transceiver testing by G4GHO and G3GRO ought to draw the crowds on July 22 at the Trinity United Reformed Church, Ifield, but contact David Hill G4IQM on Crawley 26316 for more info.

Norfolk ARC. Meetings Weds, 7.45pm at Crome Community Centre, Telegraph Lane East, Norwich with any amendments published in *Eastern Evening News*. July 8 is computer demo night courtesy Anglia Computer Centre, while 22nd has a quiz, intermediate dates being informal, with c.w. classes. You'll be too late to book for the visit to a Jaguar flight simulator at a RAF QTH but it gives some idea of what the club gets up to! Try Paul Gunther G8XBT, 6 Malvern Rd, Norwich or 610247.

Merion ARS. The society will be running a stand at the Dolgellau Sports and Hobbies Exhibition during Carnival Week August 3 to 8 with active h.f. station and 2m talk-in on Ch. 22. More from D. Morgan GW8PKA, Penybont, Gellilydan, Blaenau Ffestiniog, Gwynedd.

Verulam ARC. Fourth Tuesday at Charles Morris Memorial Hall, Tyttenhanger Green near St Albans at 7.45. July 28 is v.h.f. propagation night with a reminder of Bring & Buy on August 25. Informal meetings on second Tues at RAFA HQ, Victoria Street, St Albans. Hilary Claytonsmith G4JKS, 115 Marshalswick Lane, St. Albans, Herts can tell you more.

North Bristol ARC. Club night every Friday at 7.30 at SHE7, Braemar Crescent, Northville, Bristol 7 with 100 members waiting to welcome you with RAE and code classes and, of course, the shack is operational as G4GTC. Current club project is a QRP 80m transceiver which can be copied by any member. Let Ted Bidmead G4EUV, 4 Pine Grove, Northville, Bristol BS7 0SL tell you all about it, or Bristol 691685.

White Rose RS. Recent rally was highly successful with a new committee in now to spend the profits! Every Wed at Moortown RUFC, Moss Valley, King Lane, Leeds with 150 members, but, hopefully, not all at once. Note also White Rose Award net around 3·775MHz Thursdays 8pm. It's Dave G8UYZ, PO Box 73, Leeds LS1 5AR. Oh, yes, club calls are G3XEP and G8LVQ.

Sutton & Cheam RS. A v.h.f. transceiver won the club's constructional contest for Jim Baldwin G4KGE, with the annual dinner/dance catering for the social side of things. Meetings at alternative QTHs Sutton College of Liberal Arts and Banstead Institute, High St, Banstead but Sec G. Brind G4CMU, 26 Grange Meadow, Banstead, will fill you in, on events that is.

West Kent ARS. Newsletter QLF informs that July 17 has County Emergency Planning Officer discussing role of the amateur in an emergency, with DF hunt on the 31st. Those dates are Fridays but on each following Tuesday an informal meeting is held at the Drill Hall in Victoria Rd, Tunbridge Wells. WKARS net is on 28·7 MHz Sundays 1100GMT. QLF also has excellent design for a 2m s.w.r. and power meter. Ah, yes, main meetings are at Adult Education Centre, Monson Rd, Tunbridge Wells, but ring Bryan Castle G4DYF on Sevenoaks 56708 for the latest gen.

Dartford Heath DF Club. Latest mag *Compass Points* has massive article on a Doppler shift DF system which looks like a new approach to an old art. No fixed meetings but at least one DF hunt a month. Let Margaret Burchmore G8LXK fill in the gaps from 49 School Lane, Horton Kirby, Dartford, Kent. Should mention that Steve Carey G8UVD will be demonstrating the above mentioned DF system at the Cray Valley club on August 6.

Barking R & ES. *Carrier,* the club mag, has been taken over by two of the club's YLs and a nice job they seem to have made of it. And why not! Big event to come is a two-day show July 18/19 at Central Park, Dagenham, running h.f. and v.h.f. stations with exhibits of old and new equipment, plus a CCTV section, and a selection of TV games. Regular meetings from 7 to 10pm Mondays (constructional), Tuesdays (code classes), Wednesdays (operating on G3XBF/G8XBF) and social time on Thursdays. Secretary A. Sammons on 01-594 2471 will be glad to enlarge on the meetings held at Westbury Recreation Centre, Westbury School, Ripple Road, Barking, Essex.

Cheltenham ARA. First Thursday and third Friday monthly at the Old Bakery, Chester Walk, Clarence St, C'ham, with Dave Butler G4ASR relating the 1980 transatlantic meteor scatter tests on July 2 and natter night on the 17th. Old friend and long time member of CARA Edgar Janes G2FWA passed away in May. General info in the club from Grant G4ILI on 43891.

Edgware & District RS. Yours truly had a pleasant meeting with members on the club net on 160m recently including publicity officer Howard Drury G4HMD, 38 Wemborough Road, Stanmore, Middx (or 01-952 6462). Second and fourth Thursdays 8pm at Watling Community Centre, 145 Orange Hill Road, Burnt Oak, Edgware with a film show on July 9. Much activity now with preparations for the various field days to come.

Braintree ARS. Operates G4JXG and G6BRH. Zoofari on August 15 at Whipsnade looks like a good day out for one and all. An appropriate time for newcomers to go along is July 17 for the social evening, with a lecture on UFOs on the 20th. Otherwise meetings on first and third Mondays at the Braintree Community Centre, Victoria Street, B'tree, next to the bus station. Yet another young lady to explain the affairs of the club, Janet Storey, 33 Redwood Close, Witham, Essex or 513482.

Bournemouth RS. Now settled down in its new QTH, the conference room of the Coach House Motel, Tricketts Cross, Ferndown, at 7.30pm first and third Fridays, altogether a vast improvement on the previous place, according to the BRS newsletter. This excellent 14-page mag covers a wide variety of club interests from field days to operation on 3cm. Ring G. T. Lloyd G8GTB on Poole 83093 or write to 49 Kingston Road, Poole, Dorset for details of forthcoming events.

Cheshunt & District RC. Advance news of an RAE course starting in September next at the East Herts College at Turnford, calculated to lead up to the May 1982 exam. Course most likely to be on Monday evenings but more and later info from club Chairman Jim Sleight G3OJI, 18 Coltsfoot Road, Ware, Herts or (0920) 4316. He will also be glad to give you details of the club which meets every Wednesday 8pm in the Church Rooms, Church Lane, Wormley, near Cheshunt, Herts. For July it's a 2m set-up on Broxbourne Common on the 8th, natter-night and code practice on the 15th, computers and amateur radio from Bob G8KHI on the 22nd.

Radio Amateur Invalid and Blind Club. Supporters of the club should feel delighted at their teaching efforts which resulted in 15 new licences following the December RAE. A very rewarding job, one which many more amateurs could very well emulate. The club picnic takes place on July 5 at the Fairground, Broadlands Estate, Romsey, Hants and they will also be present at the Sussex mobile rally at Brighton racecourse on the 19th. Big event Aug 1/3 is the IYDP Weekend-on-the-Air at St. Loyes College, Exeter. More from G. Draper, 1 Carlyon Close, Exeter EX1 3AZ on this event, otherwise RAIBC info from Frances Woolley G3LWY, who lives at 9 Rannoch Court, Adelaide Road, Surbiton, Surrey KT6 4TE.

On the Bands

Newcomer to the column 16-year-old **Paul Willmott** of Marlow in Bucks is also BRS46723. He has been listening around since November on an 1155 receiver that needed a bit of work doing on it before it functioned, including the construction of a suitable power unit. The RAE in December is the next target and a G4 ticket, following code practice from friend G4JRR. Present short bit of wire for an antenna hasn't brought in much DX, just Europeans and the odd W station, but a proper dipole ought to be in the air now.

From Seaton in Devon a note from **Stephen Littley,** also for the first time, also 16 years old, who passed his RAE last December but, I'm glad to report, practising the code like mad to go straight for his G4. Listening so far has been on a simple t.r.f. receiver and a 20 metre-long wire without an a.t.u. Naughty boy! Obviously he had the set tamed as he copied things like C6ADV, J3AH, TYA11 and ZL4AV on the 80m band, and HP1XFG, TN8AJ, VP2VEZ, VK2WC and 8R1W on 20m. Goodness knows what he'll hear with a proper receiver.

Anne Edmondson (Edinburgh) found a rare one in SV0BL on Rhodes who said QSL to K9QXY. She has been running around getting permission for a couple of poles to improve her present 10 metre-long wire feeding the Realistic DX200 receiver. But she has a potential problem when she gets her ticket, in the nearby Scottish TV studios and all the electronic gear there! Anne gets along to the Edinburgh ARS meetings so she will not lack for teachers in the art of amateur radio!

From Hull **Colin Frankland** BRS45342 confirms that TYA11 is legit and is N4HX in disguise, expecting to be there until mid-1982. Rather naughty to use a callsign group allocated to another service! **Phil Charlesworth** G8SNG hasn't yet deserted this column for the v.h.f. one, although he is mainly active on 2m. He still listens around on his SRX-30 in Cranwell, Lincs, with an indoor wire but found FK8DR on 20m and AG1J on Wake Is, he says, but I'd be careful OM, this could be in the good old US of A!

In Earl Shilton, Leics, **Dennis Sheppard** ploughs his lonely RTTY furrow but says there has not been much activity in this mode on 10m of late, only ZS6AKO being noteworthy. On 15m he copied CE3CBG, JR6RIU, YB2BLI, DU1EM, PP7GV and 8J3XPO, with AH6AC/KH2, VK5XO, 4X6CV and LU9DER around on 20m. Catches on 80m included TYA11 and 7X2RM plus ZL1BHE on 20, and VS5PP and VK6WC on 15 and 10m respectively, all s.s.b. Gale force winds laid low Dennis's antennas, the 2m beam being a write-off. He has his 18AVT up again, about 3·5 metres above ground.

Basil Woodcock BRS44266 is not in Leeds at the moment but gallivanting with relations in VE and W-land for a month. Before departing Basil copied H44JE, 9L1MP, TYA11, VK9NL and VE7AAZ/4U on 28 MHz band, with HS1AMY and ZD7BW on 21 and JT1AN (congrats, OM), VK9NS, VP8QI, and 9M2GA on 14 MHz, all s.s.b. He says that WA4VDR/MM is on an icefloe in the Arctic and QSOs Miami University. Could it be a new country, I ask myself! Brief, brief note from **David Cox,** Highbury Park, London N5, who with his Trio R-1000 got

KG6RN, HP1XCM, HH2MC, TG9EP and VU2IF (QSL to N7AGC) on 20m plus VS6CT, VS5PP and DU7RLC on the Negros Is, all on 15m. If you would let me have your complete QTH OM I'd be glad to answer your letter!

The bandswitch on the 9R59DS of **David Warr** (Weymouth) has been working overtime covering 10 to 80m in his log. That and G5RV and ZL Special antennas brought him A4XIH and TYA11 on 10m, N6DPH/DU2, TYA11, YC2BJS and 6T1YP for 15m, FR7CE, FY7AN, KJ6BZ, ZD8RH, VK9NL, 5N8AFE, 6O1TI, and VP8AEN (QSL GM3ITN) on 20m, while 40m gave up FY7AN, TYA11 (doesn't he ever QRT??), and 6W8AR. Of note on 80m was TI2DB. David has tried out the 1kΩ carbon pot idea across the antenna and earth terminals of his set and reckons it has enabled him to copy DX he otherwise would have lost. Good!

In Hull, the aforementioned **Colin Frankland** and his 9R59DS plus PR30 preselector and 23 metre-long dipole (strange length, that) produced 5B4ES and 9G1WA on 10m; J3AE, TG9RQ, TYA11 (QSL K4YT), W3IVP/5N1 and 9H1EL on 15m; HP2SXG and XE2QQ both on 20m. Could that antenna be some kind of magic multi-band design?? Colin is BRS45342 by the way. **Bob Gibson** in Wadhurst, East Sussex, seemed surprised to get an answer to his letter to me, and told me of some of his experiments with antennas both vertical and horizontal wires, finishing up with a fan dipole for three bands, 10, 15, and 20m. That's three dipoles cut to appropriate length connected at their centres to a common coaxial feeder. In my view the best compromise of all multi-band designs since the polar pattern does not change from band to band. The FRG-7 of Bob located 7P8AC, DU1FLA, HC1BP, KA6CMD/KH2 and P29NLS on 10m, the /KH2 reputedly being on Guam. On 15m 7X2KRC, 9M2CW, KH6BOG, and VK8DU (that's a rare one) were logged, with unusual 5A2KJ, VP8AGX on Adelaide Is, and VU2TN for 20m.

In Chadderton, near Oldham, **Mike Howard** BRS44755 seems to have had his own private line to a lot of fabulous DX on Top Band but then he has two large 8-turn loops, fed out of phase, located at the ends of an 8 metre-long rotatable boom, turned by the renowned Armstrong method! His country total on 1·8MHz is a remarkable 64 and all continents, recent treasured QSL being from VK6HD. This is on c.w. of course with the odd one on s.s.b. So on Top Band, between about 1·8MHz and 1·890MHz it is EA8OK, EL2FY, I0TON, JA3ONB on 1·960MHz, LA9SC, LU8DQ and LU9ELF, OJ0MA, OY7ML, PY1ZAE, UD6DMR, UF6FOW, UI8LAG, UJ8JAS, UM8MAZ and the redoubtable VK6HD, phew! Oh, yes, I forgot VS5RP, VS6DO, 3A2EE and 4X4NJ. I'm just checking . . . yes, it's all on TOP BAND! Well done, OM.

Another reader who uses his receiver, an FRG-7700, to good advantage on all bands is **David Coggins** in Knutsford, Cheshire, who, with a 12 metre-long inverted-L antenna plus 2-element quad on 10m and a.t.u. rustled up FH8OM, J73LC, VS5PP, YJ8NPS, 8R1J and 9M2OK on the 28MHz band; KH6FKG, VK9NS, VR6TC on 14; DU1EFZ, FG7BP, HS1AMM, YB2BJM and VR6TC again, on the 21MH band. Two goodies on 7MHz were VK3XI and ZL4BC, while a watch on the c.w. end of 1·8MHz produced an OK1 and a UT5.

In Berkhamsted, Herts, **Jon Kempster** BRS45205 has been hard at it on 10, 15 and 20m with his FRG-7, 20m dipole and 20 metre-long wire and a.t.u. finding 8P6WDT/MM and 9X5AB on 20m; AO2HAM said to be a DXpedition in the Bay of Biscay, YC2BJS, HV3SJ, 3B8AE/3B9 and HS1AMY all on 15m, with 10m producing HM0U (QSL JA6HNK), VP2ARS (QSL OE2DYL), S79RD, ST2FF (QSL YU2DX), TYA11 and 9G1WA. Jon has spent some time at the shack of G3VRY seeing how it all works, no doubt spurring Jon on to get his RAE! It never fails!

In a general DX vein, a note from **Ean Retief** ZS6UD points out that the call ZD9GM reported by Mike Howard in March column has not been issued yet, ZD9GI being the latest. Ean's own call ZD9GG is also being pirated. Only active stations this year have been ZD9GH and ZD9BU/MM but ZD7HH and others could be on a two-day DXpedition there just as this comes out, in early July. Ean mentions also 6O0DX who has I2YAE for QSL manager.

Top Band addicts may like to know that LA1EKO on a North Sea rig will be active between 1·810 and 1·840 MHz on July 11 from 2200GMT on c.w., thought to be the first Top Band effort from such a QTH. Power will be 10W into a short vertical antenna. LA1EKO also operates on 2m in various modes with 15W. QSLs for LA1EKO to the op, **Mike Theiss** LA5SAA, N-4120, Tau, Norway.

A very picturesque card from **Vic Rivera** tells of operations from 5W1, ZK1CG and, with his own call KA7HRK/KH8, but it will be over by the time this appears in print. If anyone has copied Vic then QSLs to PO Box 38, Raratonga, Cook Islands, South Pacific.

By the time I get down to the next lot of copy for the column I shall have spent a couple of weeks on Corfu with birdwatching in mind, far from the world of amateur radio. May I wish all those going on holiday a pleasant time, with the weather to go with it.

Logs, letters etc by the 15th of the month as usual and another plea to club newsletter editors. PLEASE ensure the club sec or other official's full QTH is on page one together with details of meeting place and day/s of the month. "Alternate Tuesdays" still occurs and is meaningless if no other dates are given. Ta!

Medium Wave Broadcast Band DX

by Charles Molloy G8BUS

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

As the season advances it is worth having a last look at summer-time DXing on the medium waves. The area roughly to the south of the UK is a good one at this time of year. Sunset, which is a good time for DXing, occurs at approximately the same hour at all places and there is a lot less interference than at the same time in winter.

Azores

This group of islands is part of Portugal and lies to the west of that country, well out in the Atlantic. At one time it was rather difficult to log the Azores but Emissora do Club Asas do Atlantico is now a regular signal on 1570kHz right at the top edge of the band. This station will QSL to a report in English. Its address is Aeroporto de Santa Marta, Azores, and do not forget to enclose an International Reply Coupon (IRC). Programming is in Portuguese and the callsign, which follows the Portuguese series, is CSB81. The Azores is a separate DX country within Europe and local time is GMT minus one hour.

Canary Islands

The Canaries are to be found off the west coast of Africa near to Morocco. They belong to Spain, so the Spanish language and callsigns are in use. The time zone is GMT and they make up a separate DX country in the African continent.

Radio Las Palmas on 1008kHz is a consistent signal behind the Dutch station on this channel, but a loop or the ferrite rod antenna in a portable receiver should help to reduce this QRM at most locations in the UK. The callsign of R. Las Palmas is EAJ50 and the address for a QSL is Avenida Rafael Cabrera 10, Las Palmas de Gran Canaria, Canary Islands.

Books for radio amateurs

RSGB Publications

A Guide to Amateur Radio (18th edn, paperback)	£3.07
A Guide to Amateur Radio (18th edn, hardback)	£6.32
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Amateur Radio Techniques (7th edn)	£6.16
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80m DXing (CTI)	£3.03
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Prices include postage, packing and VAT where applicable. Postal terms: cheques/POs with order (not stamps or book tokens). Goods are obtainable (less P & P) at RSGB HQ, 9.30-5pm, Monday – Friday.

The RSGB is the national society representing all UK radio amateurs and membership is open to all interested in the hobby, including listeners. The Society also publishes a complete range of books, log books and maps for the radio amateur. Contact the membership services section for more information about amateur radio, the RSGB and its publications.

Radio Society of Great Britain
35 Doughty Street, London WC1N 2AE
Telephone 01-837 8688

WOOD & DOUGLAS

With the winter evenings approaching, the constructional season for radio amateurs is about to begin. If you are undecided on your winter project perhaps you can find something in our range of over 30 kits and modules to suit you.

70FM05TR In case you missed October's review of this single channel FM transceiver for 70 cms here are a few details. The receiver sensitivity is typically 0.4µV and uses dual gate MOSFETS and a high quality crystal filter. *The audio output drives an 8Ω speaker.* The transmitter gives 500mW of RF and has a modulator on the pcb. Both boards use readily available crystals and measure a very compact 6" by less than 1¼".
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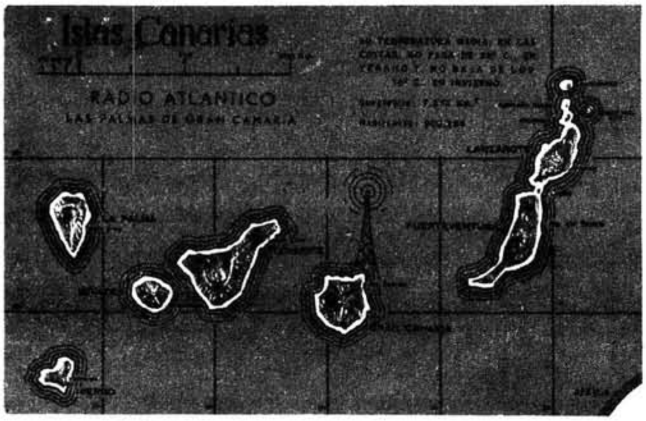
The government-owned Radio Nacional de España outlet in Tenerife is on 621kHz, a frequency it shares with Belgium and with Batra in Egypt. The Belgian signs off at 2145 in summer and a loop should easily suppress Batra. The address of RNE Tenerife, which like government stations in Spain, does not have a callsign, is San Martin 1, Santa Cruz de Tenerife.



A QSL card from the Canary Islands

West Africa

Radio Senegal at Dakar is conspicuous on 765kHz after the French-speaking Swiss station on this channel goes off at 2300. Programming is in French as well as local languages. The station is on the air until 0100GMT and reports should go to Radiodiffusion du Senegal, B.P. 1765, Dakar, Senegal.

Conakry in the Republic of Guinea, which is nominally on 1404kHz, broadcasts all night and is usually located quite easily after France on the same frequency signs off. The station has drifted or moved recently and now appears to be on approximately 1395 kHz where it creates a heterodyne with Albania. Conakry announces as "La Voix de la Revolution" and programming is in French. Nearby Guinea-Bissau is on 1071kHz along with QRM from Czechoslovakia and France. The language is Portuguese but the station did QSL to an English report from me before independence. Write to Radiodifusão Nacional, Caixa Postal 191, Bissau, Republic of Guinea-Bissau.

Ougadougou in Upper Volta is never strong, but I did pick it up last year on my Vega 204 portable using the internal antenna. This broadcaster styles itself La Voix de la Renouveau, it is on the air until midnight GMT and it does QSL. Write to Radiodiffusion Television Voltaique, B.P. 7029, Ougadougou, Upper Volta.

Morocco

The Atlantic coast of Morocco has a number of medium wave stations. Some of the programmes are in Berber as well as Arabic which adds interest for the listener. Berber music has a decided African flavour. Listen for Agadir on 936kHz, Rabat on 819kHz and you might be lucky enough to pick up Laayoune on 657kHz which is on the coast near the Canary Islands. Reception reports should go to Radiodiffusion Television Marocaine, 1 Rue el Brihi, BP1042, Rabat, Morocco.

Language Identification Aids

Reader **Martin Whittington** (Dartford) asks if there is a cassette tape available with pre-recorded languages as a guide to station identification. Radio Canada International produced such a tape several years ago which had examples of 55 different languages with a commentary which pointed out key words and sounds to look for. Language identification is important on the medium waves, as the DXer is listening to domestic services which seldom use other than their own language over the air.

This tape is still available from the Handicapped Aid Programme who have a selection of tapes of interest to the DXer, including one with interval signals. Send a s.a.e. with enquiries to HAP (UK), PO Box 4, St Ives, Huntingdon, Cambs, PE17 4FE.

Readers' Letters

"I don't know if you print foreign reports but I thought you might like to know what m.w. DXing is like down here," writes **Tim Dodsworth** from Ingham NQ in Australia. The receiver is a DX302 used with a 100 metre-long wire. Tim reports hearing American Samoa on 1120kHz at 2130EAT, and occasionally Papeete in the Society Islands on 738kHz around 1930. Glad to hear from you Tim, hope you soon log your first North American.

Rhys Thomas (Bridgend) reports completion of his differential matching amplifier (d.m.a.) which to his surprise, worked first time. He tried some local radio DXing where the increased signal strength (about 20dB) and deeper, sharper null allowed better use of the loop. The following were logged between 2300 and 0200 using a Trio R-1000 receiver, loop and d.m.a.: Radio Clyde, BRMB Birmingham, London Broadcasting and Plymouth Sound, all on 1152kHz; Devonair Radio (Exeter) on 666kHz and Manx Radio in the Isle of Man on 1368kHz, the last one being a regular, good enough for easy listening after sunset. Rhys wonders if any reader could tell him where to get hold of a plan for an Audio Notch Filter, tuneable if possible, to get rid of that 5kHz heterodyne (on short-waves) which is annoying when all other aspects of reception are excellent. Replies direct to Rhys Thomas at 46 Litchard Cross, Bridgend, Mid-Glamorgan, CF31 1NX.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With friendship

My QSL from Bissau

Reader **J. Cardow** (Stockport) thinks that many DXers will not be able to use the standard "40 inch" loop because of space restrictions and he refers to the article *An Active Rotating Aerial Tuning 550-2600kHz* which appeared in the September 1976 edition of *Practical Wireless.* Ferrite rod antennas have a lot less pick-up than a standard loop, but if used with a d.m.a. or amplifier to make up an active antenna, can be a useful tool for the DXer. Our reader also mentions that Ambit supply a lightning arrester which is listed under Plugs and Sockets as item SE567 in their catalogue.

Overloading is an all too common problem these days. **Lee Roberts** (Walsall) complains that it is impossible to DX on the medium waves from his QTH using his Realistic DX300 because of severe overloading from BBC Radio 1 on 1053kHz and 1089kHz, Radio 3 on 1215kHz and Radio Birmingham on 1459kHz.

This receiver has an internal ferrite rod antenna for use on the medium waves, so if you rotate the whole receiver you may be able to reduce the strength of the offending signal by pointing the null of the internal antenna towards it. In spite of the problems, Lee managed to pick up Two Counties Radio in Bournemouth on 828kHz and he says that if you ring this station on (0202) 294881 "you will be greeted by a nice young lady".

Short Wave Broadcast Bands

by Charles Molloy G8BUS

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

Everyone knows that broadcasting stations emit radio waves but what is the system used to identify and separate them? The markings printed on short-wave receiver tuning scales are often confusing to the newcomer to short-wave listening. What do they represent?

Frequency and Wavelength

The number of waves or cycles sent out in one second is called the frequency, while the distance between two successive waves is called the wavelength. It is by using wavelength and frequency that we can locate a radio signal.

Frequency is measured in hertz (Hz) where one Hz equals one wave per second. The hertz is far too small to use on the short-waves so the megahertz is used instead. One megahertz equals one million hertz and is abbreviated to MHz. It is the frequency in megahertz that is displayed on the scale of most short-wave receivers, the international s.w. bands being located in the range 6MHz to 26MHz.

Wavelength, which is measured in metres, is the distance between the peaks of two successive waves. Broadcasting on the short-waves is grouped into bands, it being customary to use wavelength to identify them. The 49 metre band will be found near 6MHz and is often denoted by a short thick line on the tuning scale with 49m printed above it. The 41m band is located near 7MHz, the 31m band near 9MHz, the 25m band near 12MHz, the 19m band just above 15MHz, the 16m band near 18MHz, the 13m band near 21MHz and the 11m band near 26MHz.

Can we convert MHz to metres easily? Yes, 300 ÷ MHz equals metres and 300 ÷ metres equals MHz. For the mathematically minded, MHz times metres equals 300, which means that if one increases the other decreases. If we tune "up the band" in frequency we are going "down the band" in wavelength.

Kilohertz (kHz)

This term confuses many listeners. There are 1000kHz in 1MHz. Although it is not convenient for space reasons to print the frequency in kHz on a tuning scale, it is kHz that is displayed on a digital readout and many stations announce their frequency in kHz. Radio Canada International on the 19m band is on 15·325MHz, which is the same as 15 325kHz and is announced over the air as "fifteen three two five". Frequency lists and station schedules are printed in kHz, although the International Radio Regulations lay down that MHz should be used on these bands. Short-wave tuning scales are usually, for space reasons, printed in MHz.

Choosing a Receiver

A short-wave set is a rather personal piece of property. When readers write and ask me to recommend a particular model they do not realise that I have no means of telling what will be pleasing to them. If you don't like a particular set then you will never be happy with it, no matter how well it performs, a point illustrated by a considerable trade in good quality second-hand gear. There are a few pointers though that should help the prospective buyer, starting with one generalism. By and large you will get what you pay for. A receiver costing £300 will be a lot better than one at £30.

Do you want a communications receiver, such as the FRG-7 or one of the better class portables such as the Grundig Satellit 1400? There is little point having an FRG-7 if your antenna is going to be a few feet of wire hanging from the back. Portables are designed to work with their own whip antenna and they can give excellent results, picking up broadcasts from all over the world. This type of receiver could be the answer to anyone who is unable to put up a good antenna. It can also be used away from home, on holiday, in a boat or caravan.

Get a demonstration of any prospective purchase. Is the receiver easy to operate? Is the layout of the controls convenient for you? You will spend hours at the receiver so you want to be comfortable and at ease. Above all, do you like the set ? Performance is important but it is not everything.

The current QSL from Radio Canada

Receiver Shopping List

The fourth edition of this guide to short-wave receivers is due out about now. The list, which is in price order, based on retail prices in the Netherlands, covers cheap portable sets, serious short-wave listening, semi-professional DX-s.w.l., DX professional class. There is also a section giving general hints on choosing a receiver including surplus receivers. The *Receiver Shopping List* is available free of charge from Media Network, English Section, Radio Netherlands, PO Box 222, 1200JG Hilversum, Holland.

UTC/GMT

Greenwich Mean Time (GMT) is in general use by short-wave broadcasters as a universal time, even in countries located

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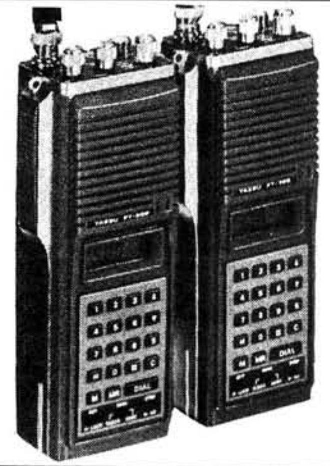
But here you will find ALL the leading makes . . . YAESU, ICOM, TRIO/KENWOOD, DRAKE, COLLINS etc. . . so Brenda (G8SXY) and Bernie (G4AOG) invite you to make your choice, either in the shop, or on our stand at major Rallies through the year. At Ealing there's sometimes another choice too . . . mostly you'll be offered a cup of Brenda's coffee, but around 4 o'clock it might well be a cup of tea!



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Yaesu's marvellous new hand-held for either 2m or 70cm operation. Its LCD display (with night-lamp feature) is coupled to a 4-bit microprocessor giving 10 memories, up/down scanning in 25 or 50kc steps (manual or auto) plus memory scan and scanning between two desired frequencies, priority channel with search-back, keyboard entry allowing split frequency for non-standard repeaters . . . and lots more.

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C.	140-150 MHz,	150-160 MHz,	160-170 MHz
D.	118-130 MHz,	140-150 MHz,	70- 80 MHz

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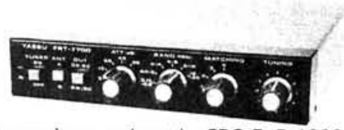

FRT-7700

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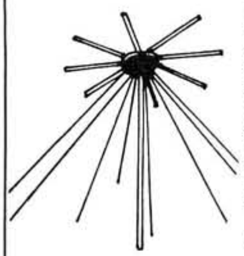

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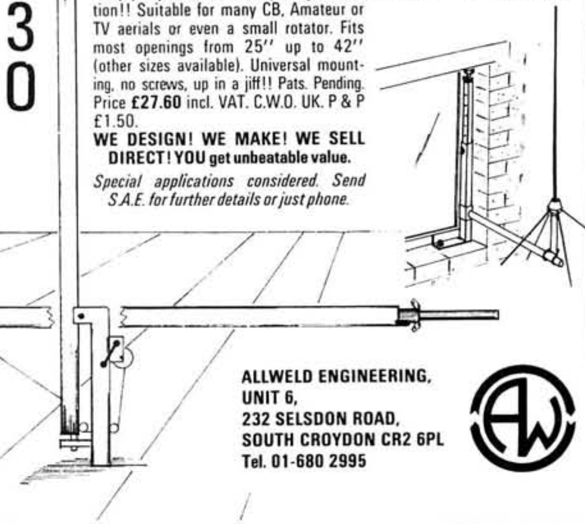

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on the far side of the globe from the Greenwich meridian. This practice is gradually changing. Co-ordinated Universal Time (UTC) is now coming into use by international agreement so that in a couple of years it will have replaced GMT completely.

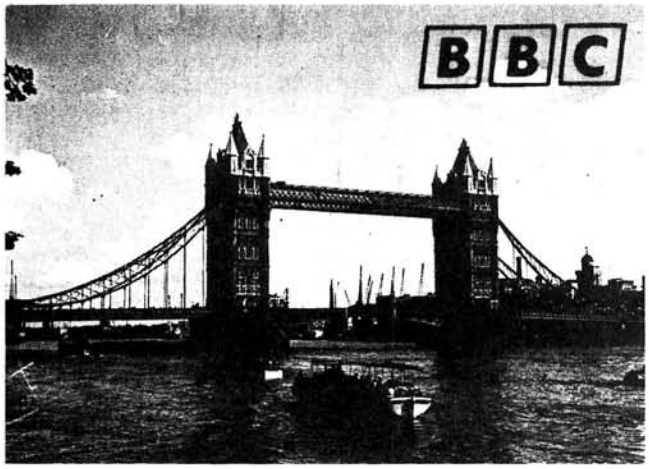
Although there is a slight difference between the two time scales — GMT is related to the rotation of the earth while UTC is based on the transition frequency of the element caesium — for practical purposes the two are the same. Why then the change? There appears to be a desire by international broadcasters to have a universal time scale that is independent of any geographical location. A few broadcasters, such as Radio Canada International, have already adopted UTC which may puzzle short-wave listeners until the new scale is in more general use.

Readers' Letters

"Having just read your section of *On the Air* I detected, I think, a feeling of sympathy towards the beginner" writes reader **Stephen Blanchard**, who lives at Spilsby in Lincolnshire. He goes on to say that he is interested in short-wave listening/DXing but has not a clue where to start.

Fortunately this is a hobby that has few rules. Tune round the band and stop when you hear something that interests you. This can be done with the simplest of receivers and will give you the feel of the short-waves and what can be heard there. There is also a booklet called *This is DXing* which is obtainable free of charge from Radio Netherlands at the address mentioned earlier. This column does indeed have an interest in beginners, who are invited to write about their problems, interests and successes.

Does anyone know what has happened to Radio Uganda on 5·027MHz in the 60m band? asks **Peter Walker** (G6BWL). The blue network of the home service is normally on this frequency with a power of 250kW, but it has not been heard recently and there have been rumours of an explosion near a broadcasting station in Uganda. The international service on 9·685MHz in the 31m band, which is usually heard in English in the evenings, is absent as well.



A Listener card from the BBC

Stations Heard

Dubai Radio has been heard on 21·655MHz in the 13m band at 1630 by twelve-year-old **Lee Roberts** of Walsall, who has a Realistic DX300 receiver. **John Bowlzer** (13) has a Grundig Melody Boy 1000 which he uses with a 30 metre-long wire. DX heard includes Radio Dominica on the 49m band (5·965MHz) at 0200. **Roy Patrick** (Derby) reports hearing Cairo on out-of-band frequency 6·225MHz in Turkish at 1800.

Some interesting broadcasts from Latin America were logged by **Paul McKee** of Belfast who reports hearing Radio Colosal in Colombia on 4·945MHz(60m) at 0123, Radio Nacional Ascuncion in Paraguay on 11·920MHz (25m) at 2147, the Voice of Nicaragua on 5·590MHz (49m) at 0530 and Radio Reloj in Costa Rica on 4·832MHz at 0430.

A National Panasonic DR28 with telescopic antenna used on the kitchen table pulled in Canada on 15·325MHz (19m) at 1905, Kuwait on 11·655 (25m) at 1910, India on 11·620 at 1940 and Australia on 21·630 (13m) at 1830, for **W.B. Stewart** of Lossiemouth — a nice round the world tour. A Vega 206 with 30 metre-long wire are in use in Swansea by **Philip Morris** who reports hearing *DX Party Line* from HCJB in Ecuador on 21·480MHz (13m) at 2130, Radio Nacional Brasil on 15·280 (19m) signing off in English at 2159, the Voice of Nigeria on 15·120 at 2145 and Radio Korea on 15·575 at 2200.

VHF Bands

by Ron Ham BRS15744

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

Late April and early May will be remembered by many radio enthusiasts for a massive radio blackout, the world's first 23cm repeater with 6MHz spacing, a large number of stations worked from the IARU conference and the start of the 1981 Sporadic-E season.

Solar

Although the sun was active in the X-ray part of the spectrum between April 20 and May 17, there was relatively little recorded at the longer radio wavelengths, in fact the only events I recorded, at 143MHz, were two strong bursts at midday on May 6, one each on the 8th and 15th, and a slight noise storm during the early afternoon of the 16th. **Cmdr Henry Hatfield,** Sevenoaks, recorded a mild noise storm at 136 and 198MHz during the afternoon of April 26, and I heard solar noise around 28MHz at 0915 on the 27th. According to the report Henry had from the Boulder observatory, a very powerful X-ray burst occurred earlier at 0720 and was no doubt responsible for the sudden blackout on the h.f. bands which lasted, in varying degrees, for about five hours.

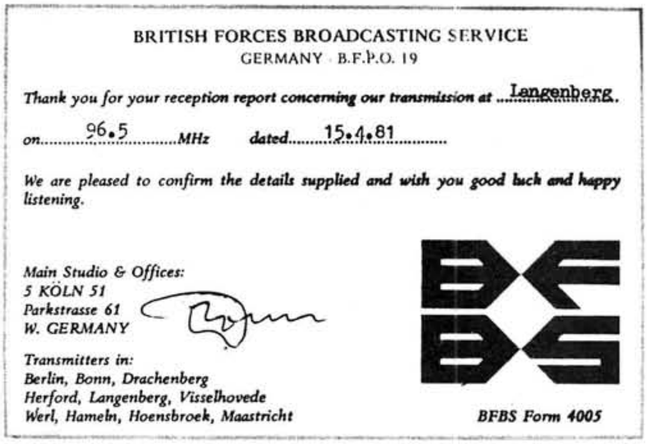
Down in Bristol, **Ted Waring**, who projects the sun's image through his optical telescope, counted 36 sunspots on April 20, 21 on the 27th, 42, 60 and 40 on May 2, 3 and 4 respectively, 66 on the 8th and 70 on the 13th. Between 0845 and 0915 on May 14, Henry recorded a large burst at both 136 and 198MHz and later, using his spectrohelioscope, saw a large formation of sunspots on the north-east limb, which no doubt was the cause of the strong solar noise I heard in the 10m band at 0930 on the 16th. During the BBC World Service programme *Waveguide* on May 15, it was reported that there were some 16 short-wave fade-outs during April, the worst of this sunspot cycle, due to a lot of X-ray radiation from the sun.

The 10m Band

"Something happened around 0800 on April 27, everything dropped out," said **Ron Munn** G2ALO, a near neighbour of mine. Ron was involved in his regular sked on 20m with Dave Oates, ZL3MF, who was a colossal signal before he suddenly faded out. The following week, Dave told Ron that when the Europeans faded out, signals from stations in Japan and the Pacific islands became extra strong and later that evening, Dave saw traces of the aurora australis. I did my routine check on 10m around this time and apart from solar noise, it was completely dead. A further check at midday revealed only a 539 signal from the Cyprus beacon and an OZ calling CQ. I tried again at 1651 and heard ZS6AUV working a G, and later I heard many amateurs discussing the event during their QSOs through the v.h.f. repeaters.

The only signals I heard on 20m early in the morning were two G stations talking about the poor conditions. This must have been a massive event because the solar burst and the resulting world-wide short-wave fade outs were reported in the news bulletins on BBC Radios 1 and 2 and on April 30 in the World Service programme *Waveguide*. Although the band was generally quiet from April 20 to 30, the DX did pick up in early May when I heard signals from VK around 0800 on days 1 and 4, JA on 1, 2, 3, 4, 5 and 8 and ZL on 8. "Conditions on 28MHz have been variable," writes **Harold Brodribb** from St Leonards-on-Sea, Sussex, who heard South African and South American stations on April 25, Nigerian on the 28th and from Canada and the USA on May 4.

During the 28-day period from April 20 to May 17, I received signals, at some time during the day, from the International Beacon Project stations in Bahrain A9XC on 17 days, Bermuda VP9BA 2 days, Cyprus 5B4CY 19 days, Caracas YV5AYV 5 days, Germany DL0IGI 15 days, Mauritius 3B8MS 6 days, New Zealand ZL2MHF 2 days, South Africa ZS6PW 7 days and Norway LA5TEN, once at 0935 on May 17 during a Sporadic-E disturbance. I first heard YV5AYV at 0855 on April 28 at 569, the only signal on the 10m band. Throughout the period, DL0IGI averaged about 529 unless there was a Sporadic-E then it peaked around 589. Ted Waring also noted this periodic perk-up in strength from the DL beacon, especially as it had been weak or missing with him over the previous couple of months. Ted's IBP observations are about the same as mine but with the addition of ZS6DN on 13 days and LA5TEN during the late afternoons of April 20 and May 6 and 11.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BFBS Form 4005

Fig. 1: QSL card from BFPO on 96·5MHz received by Simon Hamer

Sporadic-E

The first sign that the east-European broadcast band, approximately 66-73MHz, was being influenced by the 1981 Sporadic-E season came at 0830 on May 1 when I logged four f.m. stations between 66 and 68MHz, two more at 0900 on the 5th, eight around 1300 on the 6th and six at 1804 on the 14th.

RTTY

On April 18/19, **Phil Hodson** G8RBY was among the operators at his club station, the Melton Mowbray Amateur Radio Society, using the call-sign G4FOX for the RTTY contest on 2m and 70cm. During the weekend they made 38 contacts on 2m and 14 on 70cm with a best DX of 393km with ON1GL. Phil is still looking for a complete 2m RTTY contact with GM if anyone would like to arrange a sked. His best so far is about five seconds of good copy from GM3KJF in Ayr.

During the period April 20 to May 17, I logged 63 RTTY stations around 14·090MHz spread over 13 countries, DJ, EA, F, HA, HB, I, OE, OK, ON, OZ, UA, Y2 and W5. Many of those I received were calling CQ but I also read two-way QSOs between OZ and EA at 1307 on April 24, F6 and ON at 0830 on the 25th, a local contact between two EAs at 0850 on the 30th,

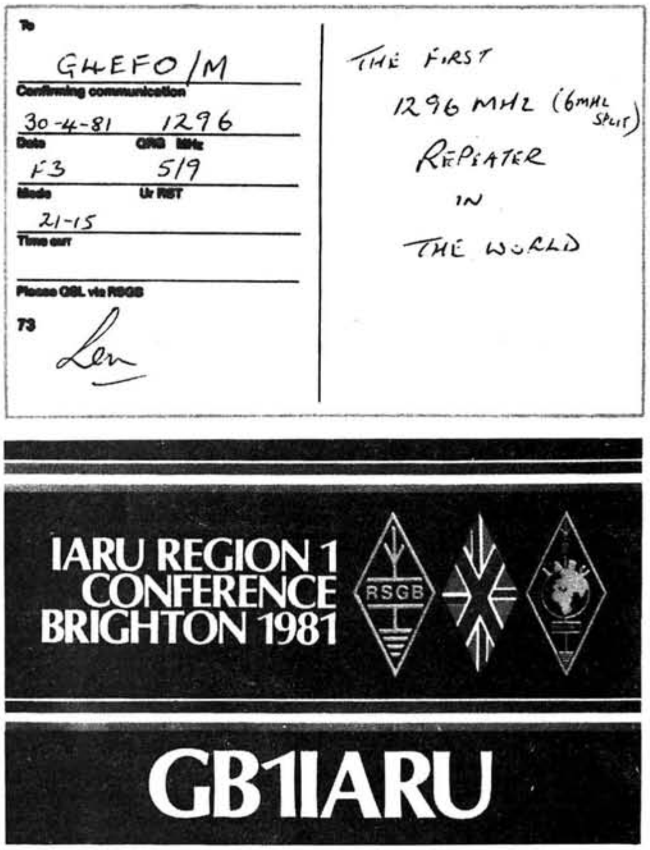


Fig. 2: Historic QSL card for G4EFO/M confirming his contact with the first 23cm repeater with 6MHz spacing

OK and Y2 at 1010 on May 3, OE and ON at 1304 on the 8th and I and OK around 1400 on the 12th. Just to prove that RTTY can be full of interest, I logged 13 stations in 6 countries, EA, HA, I, OK, SM and Y2, many calling CQ contest on 20m, between 1005 and 1025 on May 3, and around 1000 on the 10th I copied "I5EPM/P CQ 0909 EMERGENZA SIMULATAC PRATO" which I assume was some form of exercise similar to our Raynet.

"It may interest licensed amateurs and patient s.w.l.s, interested in RTTY and OSCAR, to know that orbital data can be obtained, on a daily basis, by using the DL1WX RTTY Auto-Log," writes **Alexander Shearer** GM3SWK from the Isle of Lewis. This is a computer-controlled system built by DL1WX, and OSCAR orbits are among the many data messages stored in its memory. Alex sent me a print-out from his teleprinter, and one of the signals he received having called the German station reads: "I hope you will enjoy using the first computer QTC-QSP service installation with an electronic-log. Here is +Jupp+ DL1WX in Langenfeld standing by for you". The system is operating between 1600 and 2000GMT on Tuesdays and Thursdays and between 0800 and 1200 on Saturdays and Sundays on 14·098MHz, and on Mondays, Wednesdays and Fridays between 1600 and 1800 on 21·090MHz. "All that is necessary is to access the appropriate memory by transmitting a set format and the 'machine' replies with the data addressed to the callsign of the enquiring station," says Alex. It seems that DL1WX periodically calls CQ, and from Alexander's print-out I read: "If you want info over this computer system then type:— RYRYRYRYRY . . . DL1WX QST INFO? NNNN" and from the comprehensive list of instructions sent to Alex by the "machine" I see the access code for OSCAR predictions is: DL1WX QST For OSCAR? NNNN. Unfortunately, s.w.l.s must wait for someone to ask the "machine" before they can get the gen.

Tropospheric

Despite the generally poor v.h.f. conditions, **Simon Hamer**, Presteigne, Wales, kept up his Band II DXing. When a heavy snow storm on April 25 cut off his mains supply, he used the batteries in his Grundig Satellit 1400. Well done Simon and congratulations on getting a QSL card for the reception on 96·5MHz on the BFBS station at Langenberg (Fig. 1). During the period April 20 to May 12 Simon, operating mainly between 1400 and 2100, listened to a variety of programmes from stations in Belgium and France, and from the UK, BBC Radios London and Solent and the ILR stations LBC and Thames Valley.

News Items

Congratulations to the Sussex Repeater Group who built and installed the world's first 23cm repeater, GB3WX RM9, with 6MHz input/output spacing to coincide with the IARU Conference in Brighton. A special licence was issued by the Home Office, arranged by RSGB, allowing the repeater to be operated from April 30 to May 3 and the results impressed many of the delegates. "Contrary to popular opinion it was perfectly usable in built-up areas," said **Mick Senior** G4EFO, who made the first mobile contact through the repeater to the conference station GB1IARU (Fig. 2). Mick was among the many amateurs in the Brighton/Worthing areas that worked and heard signals through GB3WX from both fixed and mobile locations.

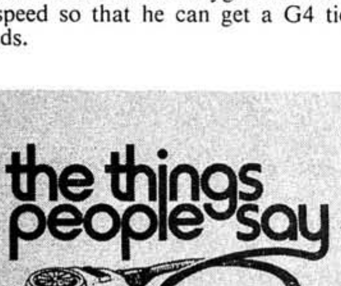
This report should be of particular interest to **John Tye** G4BYV, Dereham, Norfolk, who said that OZ stations were working into southern G on 23cm during a tropospheric lift on April 14. Among the team of wireless operators at the Brighton Conference station was Stan Williams G3LQI, who analysed the log and said that from a total of 3627 stations worked, 78 were on 70cm, 9 on 4m, 219 on 10m, and from his analysis of the 568 stations in the 2m log, 289 were on f.m., 273 on s.s.b., 4 c.w. and 2 RTTY spread through 14 countries.

One of our Lancashire readers, **Norman Wright** G4IYI, who visited the Chalk Pits Museum on May 4, uses a home-brew f.m. rig with two QQV03-10 valves and a Slim Jim aerial on 2m, and is often heard working through his local repeater, GB3MP R6. Norman also has a Heathkit HW100 and a 5RV aerial for the h.f. bands, and over the years has built several pieces of equipment from *PW* designs.

Congratulations to **George Grzebieniak** RS 41733, London, who has earned the RSGB's 4m Listener Award No. 6. The much-needed QSL card to complete the qualifying score arrived from a GM who George heard during an auroral opening.

At approximately 2000GMT on May 3, Phil Hodson heard a strange signal, best described as a "whistler" on 144·615MHz at a beam heading of 035°. Phil monitored this and noted a downshift in frequency of 335kHz in 1hr and 25 mins and at 2125 it suddenly vanished. Any suggestions? QTHR.

Lance Adamson passed the RAE at Marle Place, Burgess Hill, having completed the course under the tutorship of Richard Canning G6YJ. At present Lance is listening on an Eddystone EA12 with an 18AVT Hygain aerial, and is getting his Morse up to speed so that he can get a G4 ticket and work on the h.f. bands.



"Would the mobiles move off the repeater and let the DX in!"

... heard by G4BYV

Have you heard any (printable) comments, funny peculiar or funny ha-ha? If so, why not send them in to our Editorial offices at Poole. We will pay for every one published.

TV

by Ron Ham BRS15744

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

When a Band I signal, in early May, was so strong that **Harold Brodribb** could see the jewellery and watch worn by a YL speaker at a meeting in Poland, then we know that the Sporadic-E season has begun and that such events are likely to occur at any time, during daylight hours, up until the middle of August.

Sporadic-E

On most days between April 20 and May 17, I heard television sync pulses on Channel R1 49·75MHz, and although there were frequent strong bursts of signal showing test cards, mainly from Austria, Poland and Russia, conditions were not often good enough for a consistent picture. Recently I installed an Antiference XS3 wideband amplifier to give me equal distribution of signals between my antenna and R216 communications receiver and JVC 3060 monochrome and CX-610GB colour television receivers, which can all tune through Band I.

At 0955 on April 20, a long burst of signal on R1 revealed what looked like a film about children on bicycles, and at 1630 on April 29, **Sam Faulkner,** Burton-on-Trent, saw a children's programme on Ch. E3 55·25MHz and a YL announcer introduce a sports feature which included basket-ball with the name "Real Madrid" on some of the players' shirts. Sam also saw pictures of the same game on Ch. E2 48·25MHz and is sure they were coming from RTVE, Spain. Both Sam and I were among those who witnessed the Sporadic-E disturbance at midday on May 6 when, at 1200, Sam received pictures from RAI Italy on Ch. 1A 53·75MHz, of a YL presenter introducing a film. At 1215 he saw a photographic programme on R1 being interfered with by a test card from Czechoslovakia.

Around this time I watched pictures of a chess game on R1 and at 1235GMT, I received a strong steady picture announcing a forthcoming programme which read "PRZERWA W. OBRADACH, SEJMU PRL, do GODZ 1500." Just before 1300GMT a clock appeared with "TP" on its face and showing 1500, followed on the hour by a caption "TV POLSKA PROGRAM 1". Then came the very strong sound and picture from what looked like their parliament or delegates at a large conference. The reception was so clear that Harold Brodribb had time to study the decor of the room and noticed a large eagle on the wall with spread wings, "as on the old Polish postage stamps" writes Harold. At this time I was also hearing Italian sound on Ch. 1A with Ch. R2 sync riding up on the same shared frequency 59·25MHz.

Around 1013 on April 20, **Nicholas Brown,** Rugby, received a weak, unidentifiable picture on E2 but at 1340 he saw, for the first time, the test card from Iceland strong enough to read the "RUU ISLAND" scribed on it. However, I bet there were some curses, for by the time Nick had got his camera this DX signal had gone. I know the feeling Nicholas. At 0836GMT on May 14 the caption "PRZERWA" appeared on R1 followed by a clock showing 1036. DX conditions ebbed and flowed all day and between 1800 and 1830 there were strong pictures on E2 of a circus complete with a triple high-wire act, and horses with YL riders standing on their backs. At one time, typical of Sporadic-E, the circus faded out and a strong test card from Portugal RTP-1 replaced it for a minute or two. Periodically the E2 sound 53·75MHz was very strong as was the Russian news, with a YL reader and the BPEMR caption behind her.

Pictures and sound from Russia were exceptionally strong on R1 between 0630 and 1000GMT on May 17, in fact there was a general opening toward the USSR as **Gerry** and **Richard Brownlow** found on 10m later in the day, when they operated G3WMU/P from the Chalk Pits Museum at Amberley, Sussex.

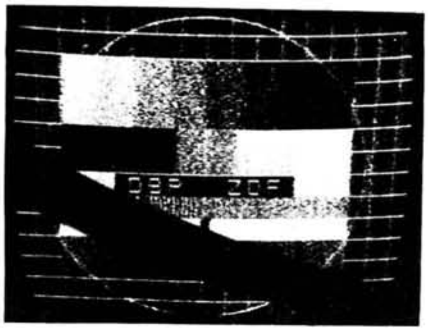
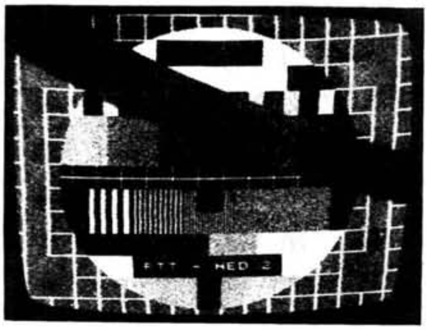


Fig. 1 (top left): Test card from Germany received by Steve Spiller



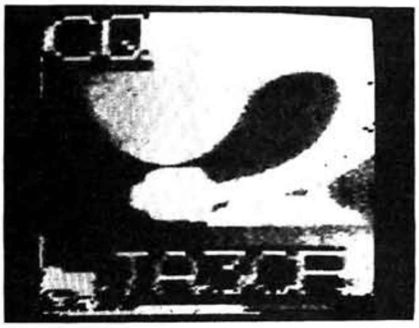


Fig. 2 (bottom left): Test card from Holland received by Steve Spiller

Figs. 3 & 4: SSTV callsign graphics from Canada and Japan received by Sam Faulkner on 10m during early April

First I saw a film about sport and travel, then at 0659 a YL announcer appeared with a digital clock showing 1059. The announcer and the clock were seen again, between programmes about children and travel at 0745 and 0815, showing 1145 and 1215 respectively.

Tropospheric

Despite the poor weather and the atmospheric pressure being around or below 30·0in (1015mb) for most of the period, a short-lived tropospheric opening did occur on April 22 while the pressure was falling from a peak of 30·3in (1026mb) which it had reached at midday on the 21st. During the event I received strong test cards in Band III from Belgium RTBF-1 on Ch. E8 and BRT UTU-1 on E10. Although **Steve Spiller,** one of our u.h.f. TV DXers from Sutton, Surrey, made the unfortunate mistake of using a camera shutter speed of 1/60s instead of 1/30s, his photographs of Dutch and German TV (Figs. 1 and 2) do show the strength of these signals during a tropospheric opening. Steve hopes to install equipment for v.h.f. TV in due course and I will be looking forward to receiving his reports.

SSTV

"The past few weeks have been very enjoyable, with really excellent SSTV coming through from Japan, South Africa and South America," wrote Sam Faulkner on May 10. Sam also tells me that Gerald ZS6BTD, Johannesburg, is one of our regular readers and that he has purchased a JVC CX-610GB and intends to modify it for SSTV colour. Sam also received pictures on 10m, when the band was good, from stations in EA8, HK, KP4, LU, VE3, VP9 and Ws 3, 4 and 9. Among the memorable QSOs in Sam's log were the keyboard graphics and portrait of VP9IH, a new and welcome station, working into G at 1630 on April 24, HK3DBQ and W1SGA at 1815 on May 3, and consistent signal after 1630 from LU5AN on April 19 and 26 and May 2 to 5, and LU4DDR between 1700 and 2000 on May 3 to 6.

"Conditions to ZS were excellent during early May," said Sam, who saw ZS6BTD working KP4YD at 1300 on May 2. At 1630 he had "closed-circuit copy" from ZS6BQT, who was showing views of Johannesburg, and at 1640 a very strong picture from ZS6BTD on 29·180MHz with a colour video replay for G3NOX. Between 0740 and 1000 on May 4, Sam received pictures from JA1DEQ, JA1HHL, JA1PGH and JA1XGI on the 10m calling channel 28·610MHz, the most interesting of these being the excellent graphics and self portrait from JA1DEQ. From 1610 to 1635 on May 8, Sam received fine pictures of the shack and very impressive equipment from ZS6BTD who he logged again at 1600 on May 10 when he was in QSO with G3NOX.

"The technical side of colour SSTV is rather complicated," writes Sam, who was delighted to witness, in mono, a colour experiment between G3NOX and ZS6BTD and writes, "with projects of this kind amateur radio is always assured of being in the forefront of technology".

News Items

Dave Oxnard writes from Sweden saying that he has installed DXTV gear with a dipole antenna for Band I, a 16-element Yagi for Band III, and a 91-element array for u.h.f., all rotatable and mounted 12 metres above the ground. So far Dave has received pictures from Poland and Russia and I will be looking forward to having more reports.

Andrew Emmerson G8PTH, who writes *TV on The Air* in the British Amateur Television Club journal *CQ-TV,* is a collector of vintage TV broadcasting equipment and already has a number of old monitors, two early monoscope cameras used for producing test card "C", and is looking for a special monoscope tube, type C912 or 2F21. If anyone can help, Andy, QTHR, will be pleased to hear from you.

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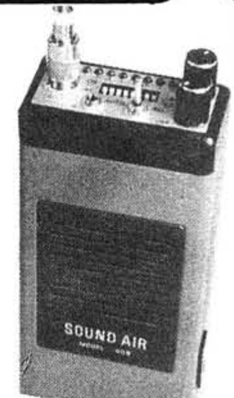

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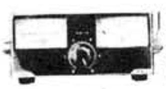

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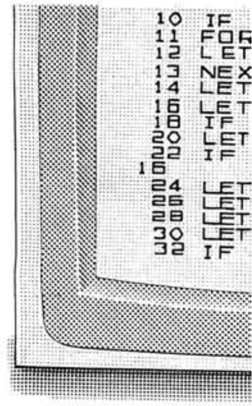
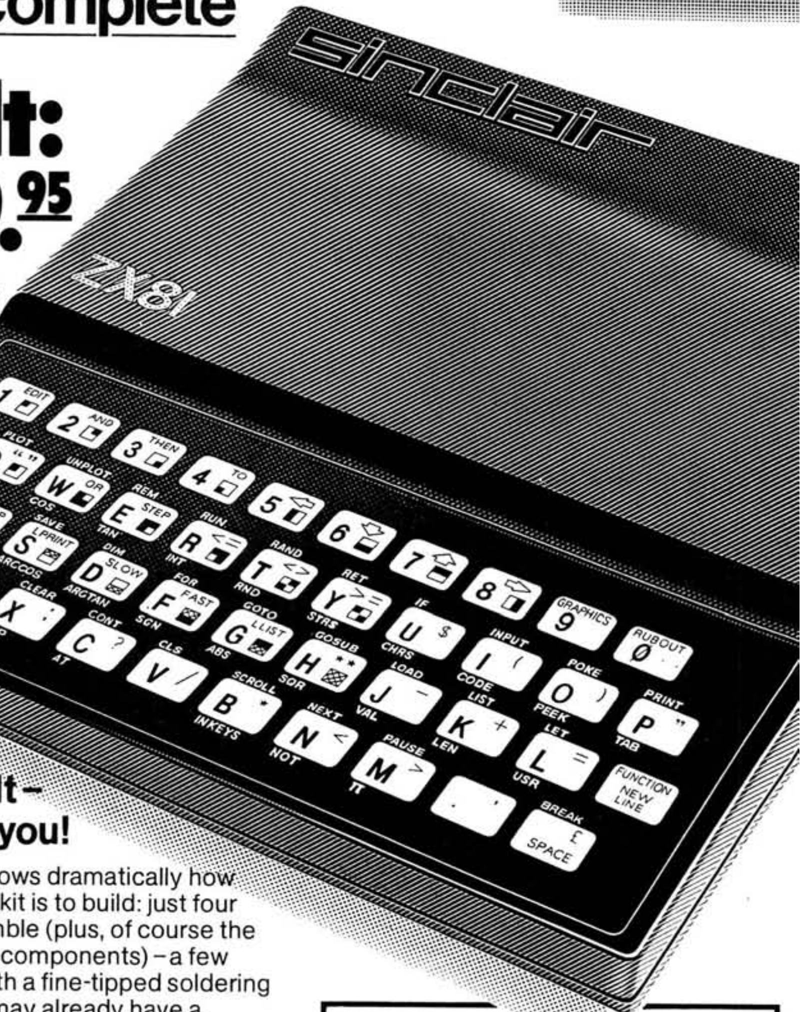
New! Sinclair ZX81 Personal Computer.

Kit: £49.95 complete



Built: £69.95 complete



Reach advanced computer comprehension in a few absorbing hours

1980 saw a genuine breakthrough – the Sinclair ZX80, world's first complete personal computer for under £100. At £99.95, the ZX80 offered a specification unchallenged at the price.

Over 50,000 were sold, and the ZX80 won virtually universal praise from computer professionals.

Now the Sinclair lead is increased: for just £69.95, the new Sinclair ZX81 offers even more advanced computer facilities at an even lower price. And the ZX81 kit means an even bigger saving. At £49.95 it costs almost 40% less than the ZX80 kit!

Lower price: higher capability
With the ZX81, it's just as simple to teach yourself computing, but the ZX81 packs even greater working capability than the ZX80.

It uses the same micro-processor, but incorporates a new, more powerful 8K BASIC ROM – the 'trained intelligence' of the computer. This chip works in decimals, handles logs and trig, allows you to plot graphs, and builds up animated displays.

And the ZX81 incorporates other operation refinements – the facility to load and save named programs on cassette, for example, or to select a program off a cassette through the keyboard.

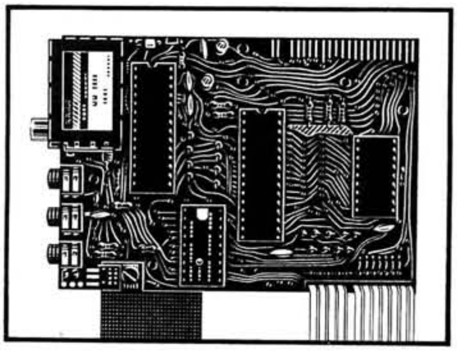
Higher specification, lower price – how's it done?
Quite simply, by design. The ZX80 reduced the chips in a working computer from 40 or so, to 21. The ZX81 reduces the 21 to 4!

The secret lies in a totally new master chip. Designed by Sinclair and custom-built in Britain, this unique chip replaces 18 chips from the ZX80!

Kit or built – it's up to you!

The picture shows dramatically how easy the ZX81 kit is to build: just four chips to assemble (plus, of course the other discrete components) – a few hours' work with a fine-tipped soldering iron. And you may already have a suitable mains adaptor – 600 mA at 9 V DC nominal unregulated (supplied with built version).

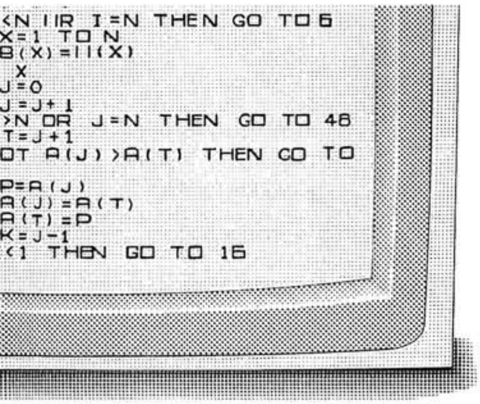
Kit and built versions come complete with all leads to connect to your TV (colour or black and white) and cassette recorder.



Proven micro-processor, new 8K BASIC ROM, RAM – and unique new master chip.

New Sinclair teach-yourself BASIC manual

Every ZX81 comes with a comprehensive, specially-written manual – a complete course in BASIC programming, from first principles to complex programs. You need no prior knowledge – children from 12 upwards soon become familiar with computer operation.



New, improved specification

- Z80A micro-processor – new faster version of the famous Z80 chip, widely recognised as the best ever made.
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Coming soon- the ZX Printer.

Designed exclusively for use with the ZX81 (and ZX80 with 8K BASIC ROM), the printer offers full alphanumerics across 32 columns, *and* highly sophisticated graphics. Special features include COPY, which prints out exactly what is on the whole TV screen without the need for further instructions. The ZX Printer will be available in Summer 1981, at around £50 – watch this space!

16K-BYTE RAM pack for massive add-on memory.

Designed as a complete module to fit your Sinclair ZX80 or ZX81, the RAM pack simply plugs into the existing expansion port at the rear of the computer to multiply your data/program storage by 16!

Use it for long and complex programs or as a personal database. Yet it costs as little as half the price of competitive additional memory.

How to order your ZX81

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	Mains Adaptor(s) (600 mA at 9 V DC nominal unregulated).	10	8.95	
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	3X016	25+25	1.60	
	3X017	30+30	1.33	
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	3X030	240	0.33	
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	4X014	18+18	3.33	
	4X015	22+22	2.72	
	4X016	25+25	2.40	
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	5X015	22+22	3.63	
	5X016	25+25	3.20	
	5X017	30+30	2.66	
	5X018	35+35	2.28	
	5X028	110	1.45	
	5X029	220	0.72	
	5X030	240	0.66	
225VA 110x45mm 2.2 Kg	6X014	18+18	6.25	£10.06 +£1.73 P/P +£1.77 VAT
	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	
	6X028	110	2.04	
	6X029	220	1.02	
	6X030	240	0.93	
300VA 110x50mm 2.6 Kg	7X016	25+25	6.00	£11.66 +£1.73 P/P +£2.01 VAT
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	7X018	35+35	4.28	
	7X026	40+40	3.75	
	7X025	45+45	3.33	
	7X028	110	2.72	
	7X029	220	1.36	
	7X030	240	1.25	
500VA 140x60mm 4 Kg	8X017	30+30	8.33	£15.53 +£2.05 P/P +£2.64
	8X018	35+35	7.14	
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	8X025	45+45	5.55	
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	8X028	110	4.54	
	8X029	220	2.27	
	8X030	240	2.08	

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	P2404	7.5+7.5	0.20	
	P2405	9+9	0.17	
	P2406	12+12	0.12	
	P2407	15+15	0.10	
	P2409	20+20	0.07	
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	P3403	6+6	0.50	
	P3404	7.5+7.5	0.40	
	P3405	9+9	0.33	
	P3406	12+12	0.25	
	P3407	15+15	0.20	
	P3408	17.5+17.5	0.17	
	P3409	20+20	0.15	
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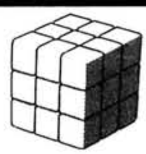

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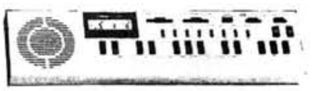

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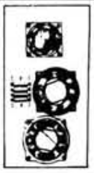

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