

FOR THE RADIO ENTHUSIAST...

JANUARY 1981

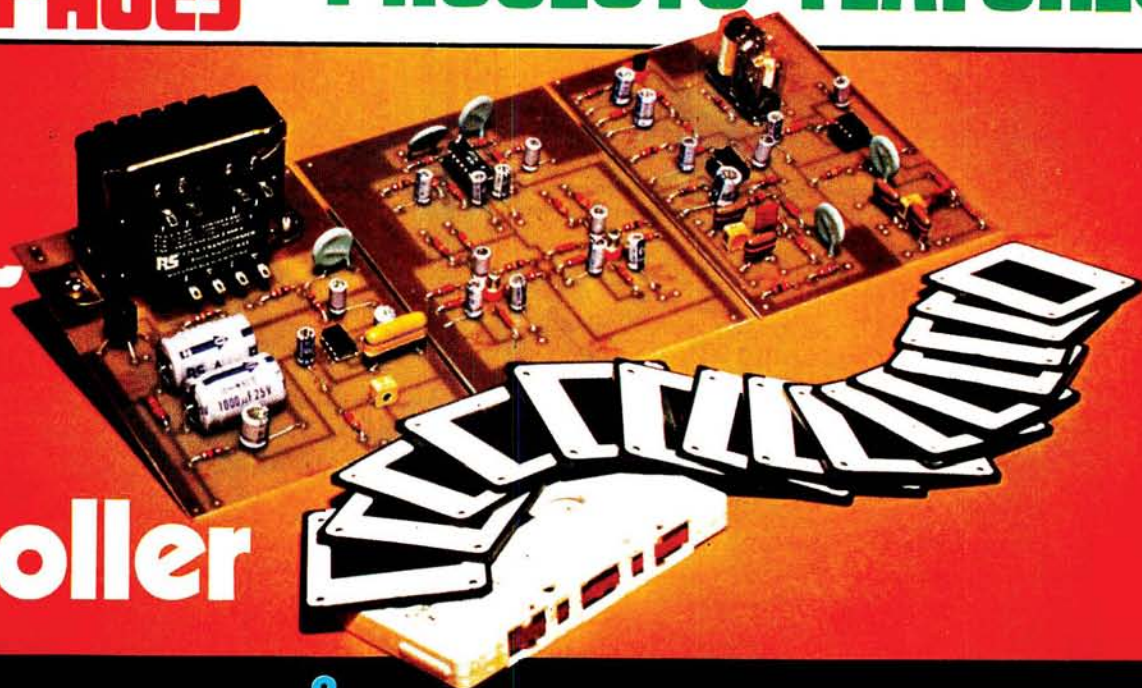
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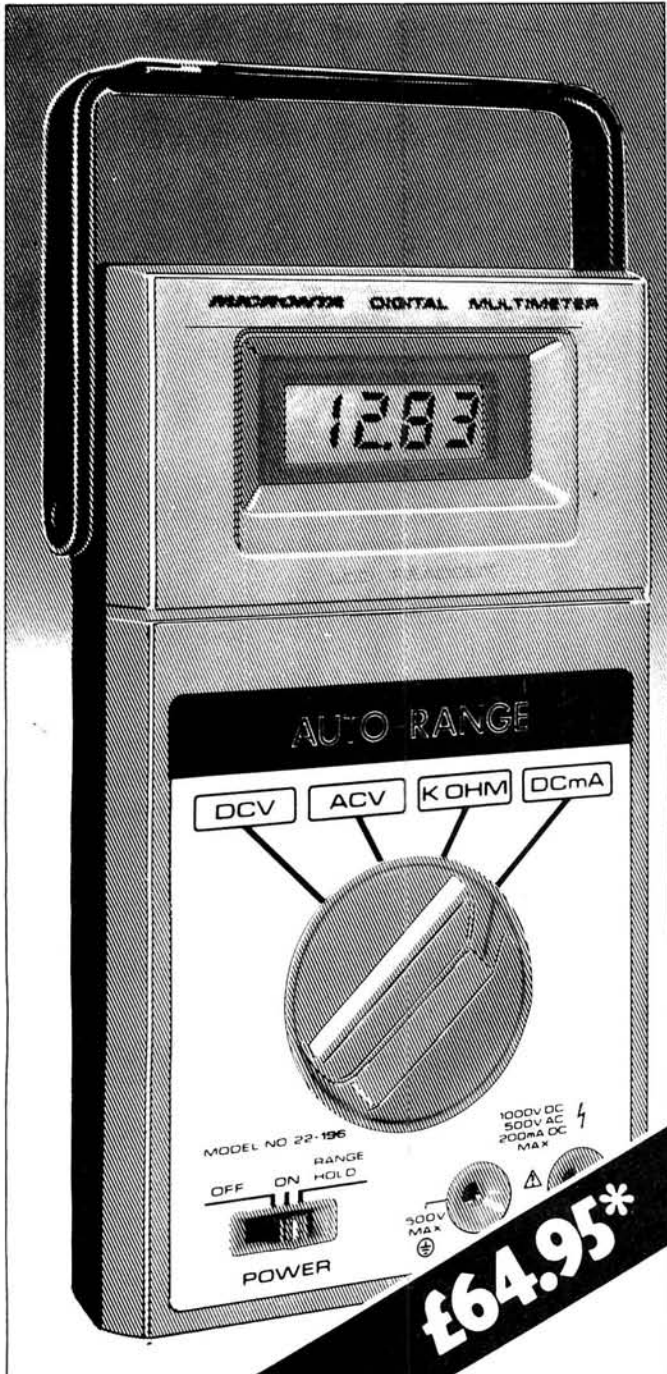
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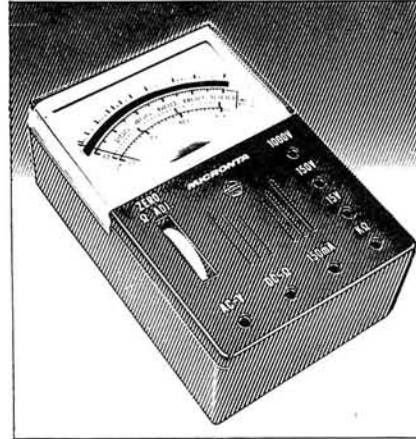
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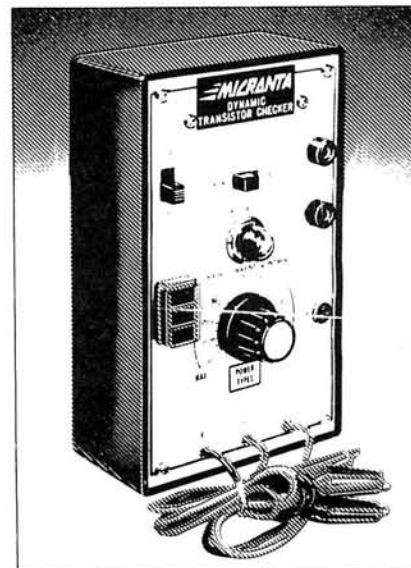
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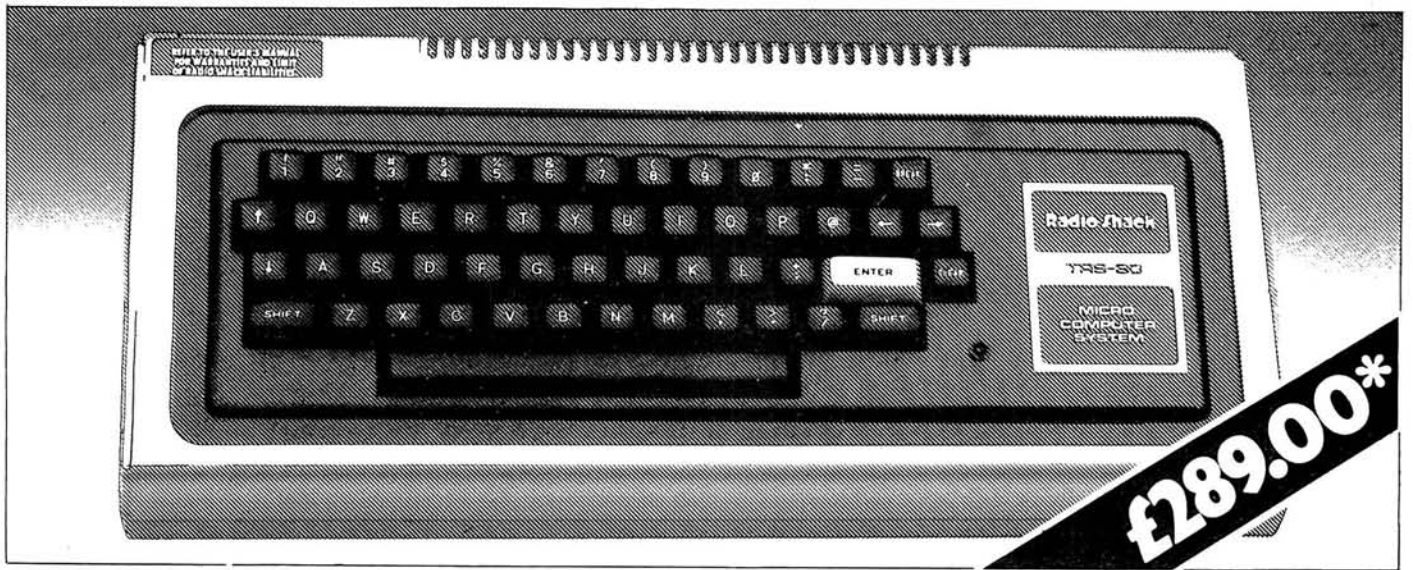
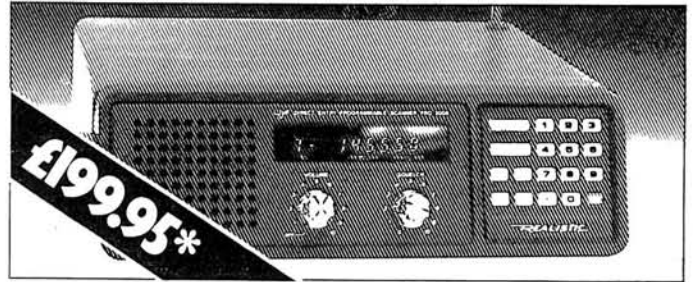
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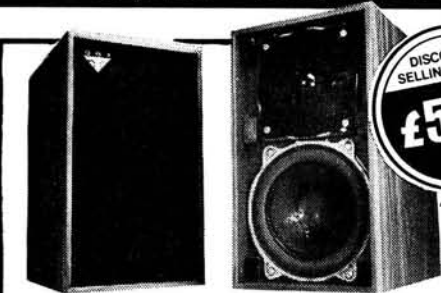
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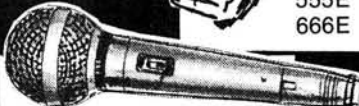
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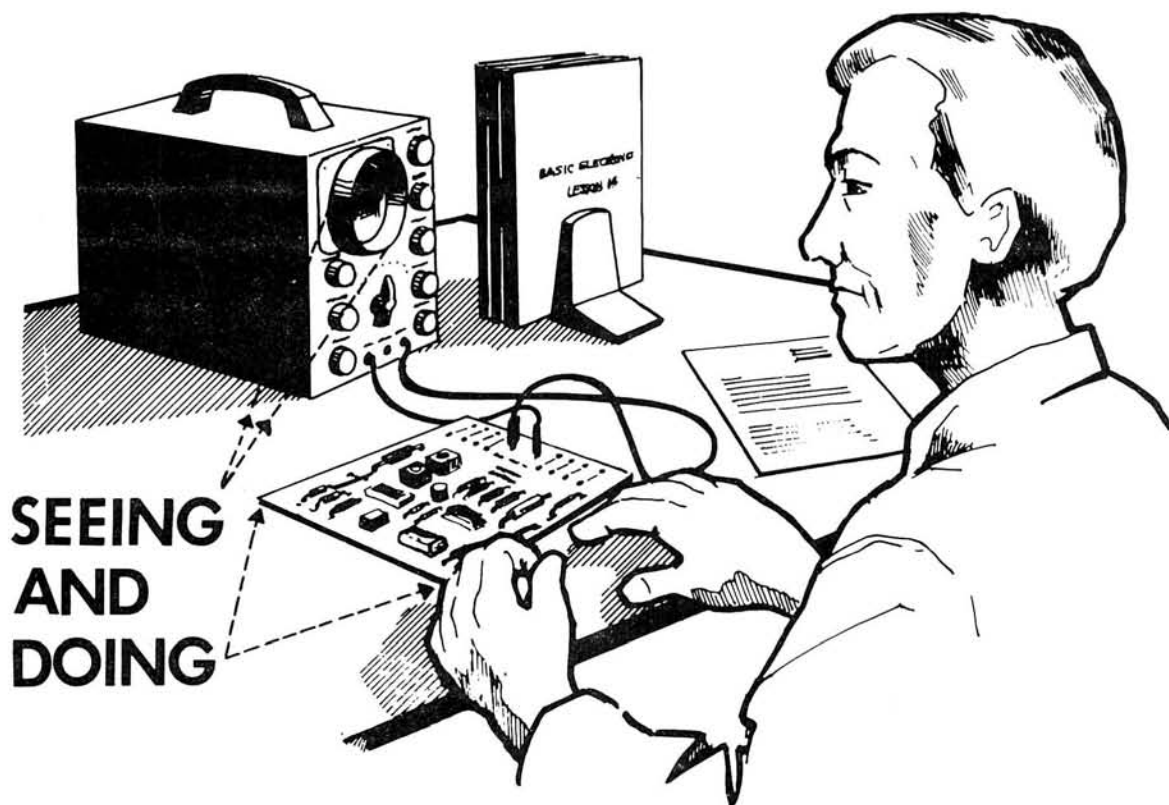
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2X016	25 + 25	1.00
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5X016	25 + 25	3.20
5X017	30 + 30	2.66
5X018	35 + 35	2.28
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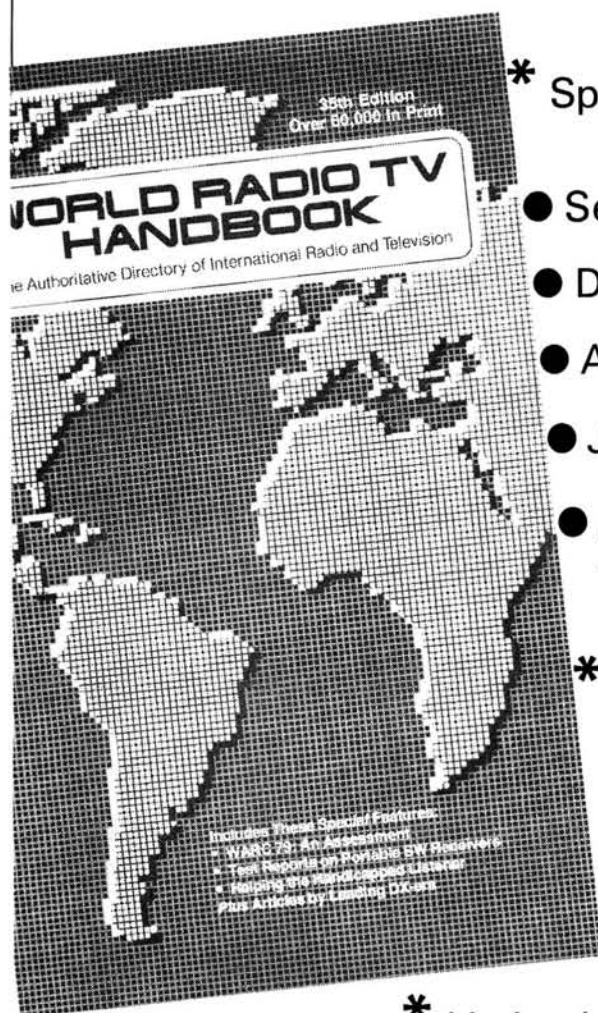
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SUPERSOUND 13 HI-FI MONO AMPLIFIER

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MAINS OPERATED SOLID STATE AM/FM STEREO TUNER



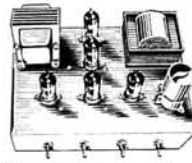
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HARVERSON STEREO 44

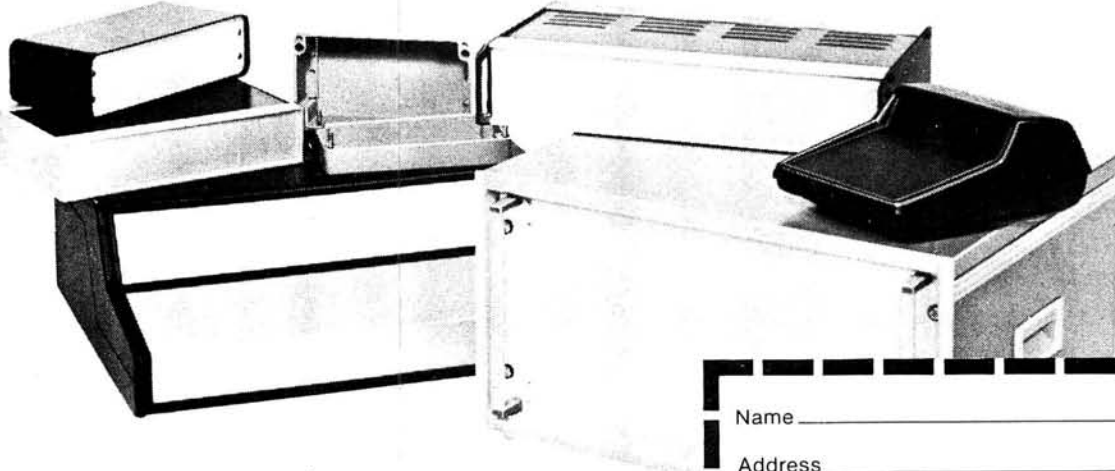
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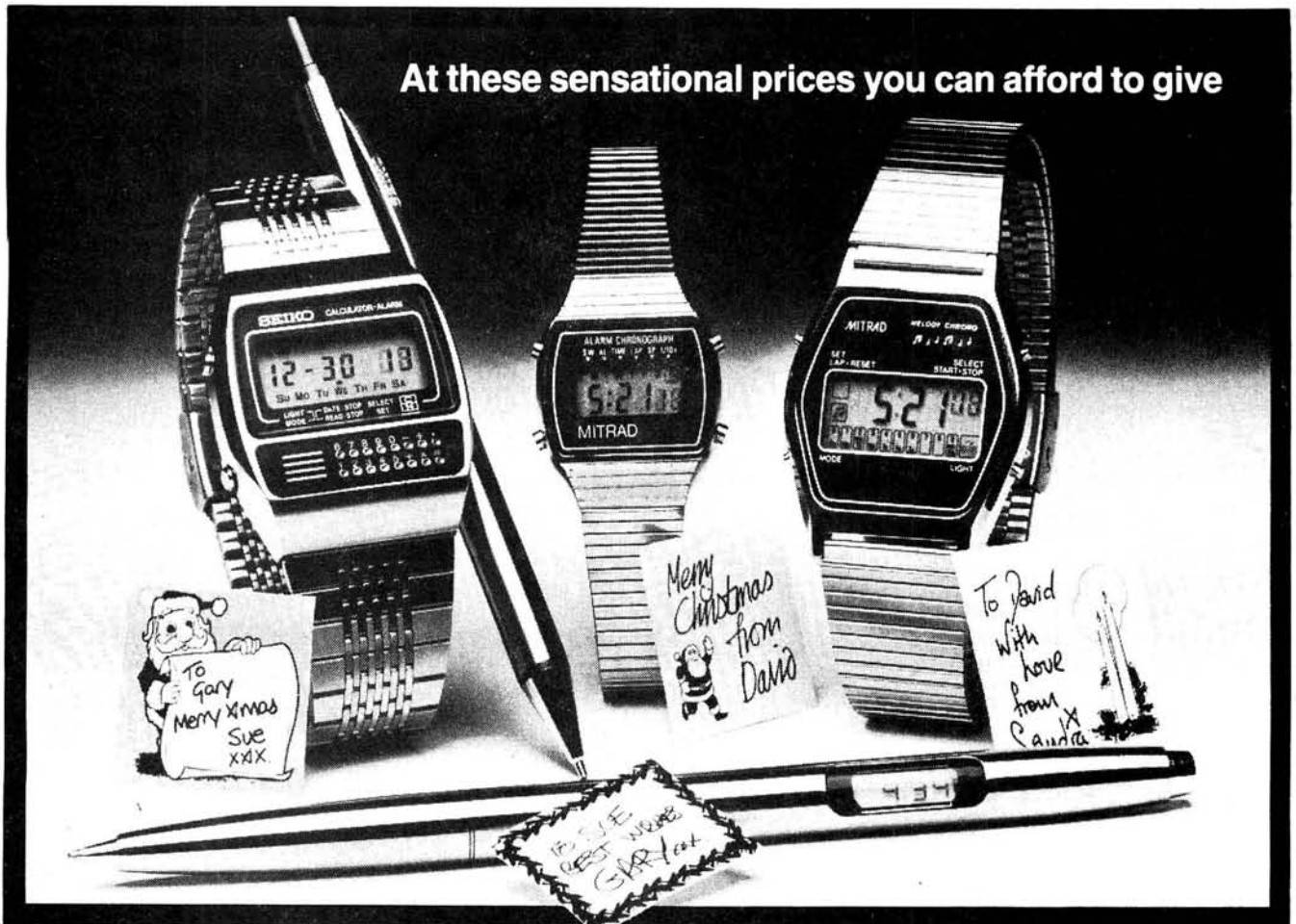
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CRYSTALS mostly 10Xj types in range 5 to 8Mc/s 20 mixed for **£2.30.**

TRANS UNIT small battery operated unit crystal controlled with two valves for use on 2 to 8 Mc/s CW with circ **£5.50.**

MAINS FILTERS Plessey 240v at 1.5 amps size 2 1/2 x 1 1/4 x 1" new **£2.20.**

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AUTO TRANS 200/250v to 115v 560 watts fully enclosed term conn new cond **£13.50.**

RADIO STATION KIT contains small Morse key, 100ft Ae wire, special high resis head set, haversack etc new cond **£5.50.**

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INFRA RED light & heat units lamp only no fittings rated 115v 500 watts ex 7" dai new 2 for **£5.40.**

HEADPHONES low res type DLR.5 can be used for sound powered intercomm link **£3.50** pair two for **£6** also new boxed at **£4.50** pair.

HAND GENERATORS for use with MK.123 TR O/P 115v 100c 40 watts and 80 watts int, new cond in fitted case with accs. **£25.**

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H.D. SLIDE RES panel mt rated 1 ohm 12 amps **£4.50.**

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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 1 1/4".

Kit RX **£38.50** Assembled RX **£47.25**
TX **£17.80** TX **£25.95**

70MC06TR When one channel is not enough then by adding this two pcb set you will have 6 channels on tx/rx. This includes a toneburst for repeaters and a scanner to ease monitoring.

Kit RX **£18.60** Assembled RX **£26.05**
TX **£11.30** TX **£18.10**

144SY25B An FM synthesiser for 25KHz steps at 144-146MHz. The output frequencies are 5.5, 11, 22 or 45MHz on receive and 6, 12 or 24MHz on transmit. This will feed most commercial radio telephones and also the PW NIMBUS. So for the cost of ten crystal channels you get full band coverage, crystal controlled toneburst, repeater ±600KHz offset, out of lock inhibit and channel selection by channel number.

Kit **£50.95** Assembled **£69.70**

INTERESTED? If you would like further details of these and our many other products then send a large SAE (please!) for the latest lists. The above prices include VAT at the current rate but please add 60p p&p on the total order. The prices include all items to make a working pcb module. We do not supply external hardware such as boxes or switches etc. This leaves you free to use the modules in whatever configuration you wish and yet have confidence that the electronics will perform well. We will gladly service any of our products providing it has been built as directed. We make a small charge for this facility depending on complexity. Kits when in stock are return of post otherwise 10-14 days. Assembled items 10-20 days.

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1+ 100+	1+ 100+	6-0-6 = 100ma	£1.00	15-0-15 = 1A	£2.90		
6 pin 7p 5.5p	20 pin 16p 14p	6-0-6 = 250ma	£1.60	6.3V = 1.5A	£2.38		
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14 pin 10p 8.5p	24 pin 20p 18p	12-0-12 = 50ma	£1.00	9-0-9 = 2A	£4.47		
16 pin 11p 9.5p	28 pin 28p 20p	12-0-12 = 100ma	£1.50	12-0-12 = 2A	£4.54		
18 pin 13p 11.6p	40 pin 32p 31p	9-0-9 = 1A	£2.40	30-0-30 = 2A	£6.28		
		12-0-12 = 1A	£2.86	14V = 2A	£3.50		
BRIDGE RECTIFIERS				400mw Zener Diodes			
1.5A	2.0A	50V	38p	50V	50p	100A	£2.25
100V	38p	100V	43p	100V	73p	100V	£2.34
200V	41p	200V	44p	200V	76p	200V	£2.60
400V	43p	400V	51p	400V	84p	400V	£2.79
600V	47p	600V	58p	600V	95p	600V	£3.54
800V	54p	800V	65p				£4.75
				Wholesale/Quantity prices available			
				1 Watt Zener Diodes			
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1946 Iron coated bit 3/16" for 1943 **£0-58**

1948 18 watt iron with iron coated bit **£5-12**

1952 Replacement element for 1948 **£2-22**

1949 Iron coated bit 3/32" for 1948 **£0-58**

1950 Iron coated bit 1/8" for 1948 **£0-58**

1951 Iron coated bit 3/16" for 1948 **£0-58**

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1932 Iron coated bit 1/8" for 1931 **£0-58**

1933 Iron coated bit 2/16" for 1931 **£0-58**

1934 Iron coated bit 3/32" for 1931 **£0-58**

1953 SK1 soldering Kit - contains 15 watt soldering iron with 3/16" bit plus two spare bits, a reel of solder, heat-sink and a booklet 'How to Solder' **£7-28**

1939 ST3 iron stand made from high grade bakelite chrom plated steel spring, suit all models - includes accommodation for six bits and two sponges to keep the iron bits clean **£1-89**

1724 Model MLX as X25 iron but 12 volts **£5-59**

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INSTRUMENT CASES in two sections vinyl covered top and sides, aluminium bottom, front and back.

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158	9in	5 1/2in	2 1/2in	£2.59

ALUMINIUM BOXES made from bright all, folded construction each box complete with half inch deep lid and screws.

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161	4in	2 1/2in	1 1/2in	£0.98
162	5 1/2in	4in	1 1/2in	£1.10
163	4in	2 1/2in	2in	£0.98
164	3in	2in	1in	£0.67
165	7in	5in	2 1/2in	£1.54
166	8in	6in	3in	£1.98
167	6in	4in	2in	£1.32

SLOPE front aluminium boxes with black vinyl base and sides & aluminium back, top & front - strong construction easily accessible.

No.	Length	Width	Height	Price
169	2 1/2in	5 1/2in	2 1/2in	£5-45
168	2 1/2in	7in	4in	£8-21

AUDIO MODULES

AMPLIFIERS

AL10	3 watt Audio Amplifier Module 22-32v supply	£3-63
AL20	5 watt Audio Amplifier Module 22-32v supply	£4-11
AL30A	7-10 watt Audio Amplifier Module 22-32v supply	£4-78
AL60	15-25 watt Audio Amplifier Module 30-50v supply	£5-92
AL80	35 watt Audio Amplifier Module 40-60v supply	£9-28
AL120	50 watt Audio Amplifier Module 50-70v supply	£15-11
AL250	125 watt Audio Amplifier Module 50-80v supply	£22-54

STEREO PRE-AMPLIFIERS

PA12	Supply voltage 22-32v input sensitivity 300mv suit. AL10/AL20/AL30	£9-83
PA100	Supply voltage 24-36v inputs:- Tape, Tuner, Mag P.U., Suit: AL60/AL80	£20-30
PA200	Supply voltage 35-70v inputs:- Tape, Tuner, Mag P.U., Suit: AL80/AL120/AL250	£20-98

MONO PRE-AMPLIFIERS

MM100	Supply voltage 40-65v inputs: Mag, P.U., Tape Microphone Max. output 500mv	£14-29
MM100G	Supply voltage 40-65v inputs: 2 Guitars, Microphones Max. output 500mv	£14-29

POWER SUPPLIES

PS12	24v Supply suit 2 - AL10, 2 - AL20, 2 - AL30 & PA12/S450	£1-90
SPM80	33v Stabilised supply - suit 2 - AL60, PA100 to 15 watts	£5-57
SPM120/45	45v Stabilised supply - suit 2 - AL60, PA100 to 25 watts	£7-34
SPM120/55	55v Stabilised supply - suit 2 - AL80, PA200	£7-34
SPM120/65	65v Stabilised supply - suit 2 - AL120, PA200, 1 - AL250, PA200	£7-34
SG30	15-0-15 Stabilised power supply for 2 - GE100MKII	£4-37

MISCELLANEOUS

MPA30	Stereo Magnetic Cartridge Pre-Amplifier - input 3.5mv Output 100mv	£3-76
S. 450	Stereo FM Tuner Supply Voltage 20-30v - Varicapped tuning	£29-39
STEREO30	Complete 7 watt per Channel Stereo Amplifier Board - includes amps, pre-amp, power supply, front panel, knobs etc. - requires 2050 Transformer	£24-25
BP124	5 watt 12v max. - Siren Alarm Module	£4-43
GE100MKII	10 channel mono-graphic equaliser complete with sliders and knobs	£26-45
VPS30	Variable regulated stabilised power supply 2-30v 0-2 amps	£8-74

TRANSFORMERS

No.	Description	P&P
2034	1.7 amp 35v suit SPM80	£6.21 £1.21
2035	2 amp 55v	£7.30 £1.47
2036	750mA 1v suit PS12	£3.68
2040	1.5 amp 0-45v-55v suit SPM120/45 SPM120/55v	£5.98 £1.21
2041	2 amp 0-55v-65v suit SPM120/55, SPM120/65v	£7.82 £1.47
2050	1 amp 0-20v suit Stereo 30	£3.74 £0.75
1725	150mA 15-0-15v suit SG30	£2.04

ACCESSORIES

139	Teak Cabinet suit Stereo 30, 320 - 235 - 81mm	£8-05
140	Teak Cabinet suit STA15 425 - 290 - 95mm	£9-78
FP100	Front Panel for PA100 & PA200	£2-07
BP100	Back Panel for PA100 & PA200	£1-84
GE100FP	Front Panel for one GE100MKII	£2-05
2240	Kit of parts including Teak Cabinet chassis sockets, knobs to build 15 watt stereo amplifier (Does not include modules)	£22-94

SPECIAL OFFERS

MINIDRILL 12v hand held battery-operated mini drill, 7.500 r.p.m. Collet chuck. Ideal for drilling printed circuits or model making. No. 1402. Complete with two drills - 1, 15. **£6.33**

TRANSFORMER 240v Primary 0-20v - 2A Secondary. By removing 5 turns for each volt from the secondary winding, any voltage up to 20v = 2A is obtainable. Ideal for the experimenter. No. 2042. **£1-50** + 86p. P & P

ANTEX MLX Soldering Iron. Sturdy 25 watt iron complete with: 4 1/2 metres of 2-core cable. Works off a 12 volt battery. Ideal for Car Boat, Caravan, No.1724. **£5-29**

METAL FOIL CAPACITOR PAKS

16204 - Containing 50 metal foil capacitor like Mullard C280 series - Mixed values ranging from 01uf - 2.2uf. Complete with identification sheet **£1-38**

TRIACS

2 amp	T05 case	Price	10 amp	Price	
100	No. 100	£0-36	100	TR110A/100	£0-88
200	TR12A/200	£0-59	200	TR110A/200	£1-06
400	TR12A/400	£0-82	400	TR110A/400	£1-29

6 amp	10 amp	Price
100	TR16A/100	£0-59
200	TR16A/200	£0-70
400	TR16A/400	£0-88

DIACS

BR100	£0-23	032	£0-23
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SILICON RECTIFIERS

200mA	IS920 50V	£0-07	3 Amp	IN5400 50V	£0-16
	IS921 100V	£0-08		IN5401 100V	£0-17
	IS922 150V	£0-09		IN5402 200V	£0-18
	IS923 200V	£0-10		IN5404 400V	£0-20
	IS924 300V	£0-12		IN5406 600V	£0-24
				IN5407 800V	£0-29
				IN5408 1000V	£0-35

1 Amp	IN4001 50V	£0-051	10 Amp	IS10 50 50V	£0-22
	IN4002 100V	£0-06		IS10 100 100V	£0-24
	IN4003 200V	£0-07		IS10 200 200V	£0-26
	IN4004 400V	£0-08		IS10 400 400V	£0-40
	IN4005 600V	£0-09		IS10 600 600V	£0-48
	IN4006 800V	£0-10		IS10 800 800V	£0-59
	IN4007 1000V	£0-12		IS10 1000 1000V	£0-69
				IS10 1200 1200V	£0-79

1.5 Amp	IS015 50V	£0-10	30 Amp	IS30 50 50V	£0-64
	IS020 100V	£0-12		IS30 100 100V	£0-75
	IS021 200V	£0-13		IS30 200 200V	£1-07
	IS023 400V	£0-15		IS30 400 400V	£1-44
	IS025 600V	£0-16		IS30 600 600V	£2-02
	IS027 800V	£0-18		IS30 800 800V	£2-33
	IS029 1000V	£0-23		IS30 1000 1000V	£2-66
	IS031 1200V	£0-29		IS30 1200 1200V	£3-31

60 Amp	IS70 50 50V	£0-86		IS70 400 400V	£2-01
	IS70 100 100V	£0-97		IS70 600 600V	£2-59
	IS70 200 200V	£1-38		IS70 800 800V	£2-88
				IS70 1000 1000V	£3-45

THYRISTORS

600ma	TO 18 Case	Price	7 amp	TO 48 Case	Price
10 THY800/10	50 THY7A/50	£0-17	100 THY7A/100	50 THY10A/50	£0-55
20 THY800/20	100 THY7A/100	£0-18	200 THY7A/200	100 THY10A/100	£0-59
30 THY800/30	400 THY7A/400	£0-23	600 THY7A/600	800 THY7A/800	£0-66
50 THY800/50	800 THY7A/800	£0-25			£0-71
100 THY800/100		£0-29			£0-90
200 THY800/200		£0-44			£1-06
400 THY800/400		£0-51			

1 amp	TO 66 Case	Price	10 amp	TO 48 Case	Price
50 THY1A/50	50 THY10A/50	£0-30	100 THY10A/100	50 THY10A/50	£0-59
100 THY1A/100	200 THY10A/200	£0-32	200 THY10A/200	100 THY10A/100	£0-66
200 THY1A/200	400 THY10A/400	£0-37	400 THY10A/400	600 THY10A/600	£0-81
400 THY1A/400	800 THY1A/800	£0-44	600 THY10A/600	800 THY10A/800	£1-14
600 THY1A/600		£0-52			£1-40
800 THY1A/800		£0-67			

3 amp	TO 66 Case	Price	30 amp	TO 94 Case	Price
50 THY3A/50	50 THY30A/50	£0-32	100 THY30A/100	50 THY30A/50	£1-38
100 THY3A/100	100 THY30A/100	£0-35	200 THY30A/200	100 THY30A/100	£1-64
200 THY3A/200	200 THY30A/200	£0-38	400 THY30A/400	200 THY30A/200	£1-87
400 THY3A/400	400 THY30A/400	£0-48	600 THY30A/600	400 THY30A/400	£2-06
600 THY3A/600	600 THY30A/600	£0-58	800 THY30A/800	600 THY30A/600	£2-43
800 THY3A/800		£0-75			

5 amp	TO 66 Case	Price	No.	Price
50 THY5A/50	100 THY5A/100	£0-41	BT	



SIMPLY AHEAD
and staying there

The range grows bigger... better...

New Profile Amplifiers - Two New Series

MOSFET

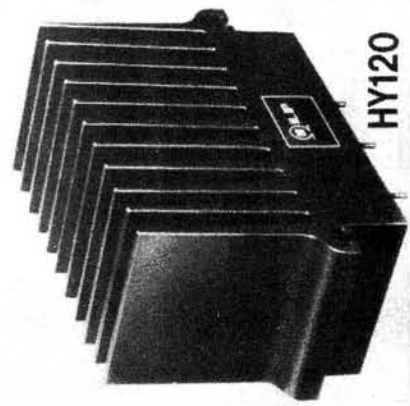
CHOOSE AN I.L.P. MOSFET POWER AMP when it is advantageous to have a faster slew rate, lower distortion at higher frequencies, enhanced thermal stability, the ability to work with complex loads without difficulty and complete absence of crossover distortion. I.L.P.'s exclusive encapsulation technique within fully adequate heatsinks has been taken a stage further with specially developed copper MOSFETs. These ensure optimum operating efficiency and reliability. Connections are via five pins on the underside. **THESE MOSFETS ARE IDENTICAL IN PERFORMANCE TO THE CHEAPEST AMPLIFIERS IN THIS EXCITING NEW CATEGORY BUT ARE ONLY A FRACTION OF PRICES CHARGED ELSEWHERE.**

Model	Output Power RMS	Distortion Typical at 1KHz	Slew Rate	Rise Time	Signal/Noise Ratio DIN AUDIO	Price & VAT
MOS120	60W into 4-8Ω	0.005%	20V/μs	3μs	100dB	£25.88 + £3.88
MOS200	120W into 4-8Ω	0.005%	20V/μs	3μs	100dB	£33.46 + £5.02

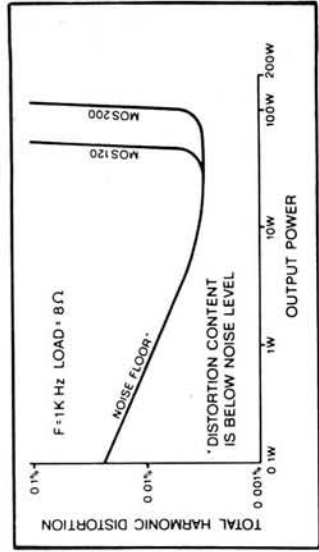
BIPOLAR

CHOOSE AN I.L.P. BIPOLAR POWER AMP where power and price are first consideration while maintaining optimum performance with hi-fi quality and wide choice of models. From domestic hi-fi to disco and P.A., for instrument amplification, there is an I.L.P. Bipolar to fill the bill, and as with our new Mosfets, we have encapsulated Bipolars within our New Profile extrusions with their computer-verified thermal efficiency and improved mounting shoulders. Connections are simple, via five pins on the underside and with our newest pre-amps and power supply units, it becomes easier than ever to have a system layout housed the way you want it.

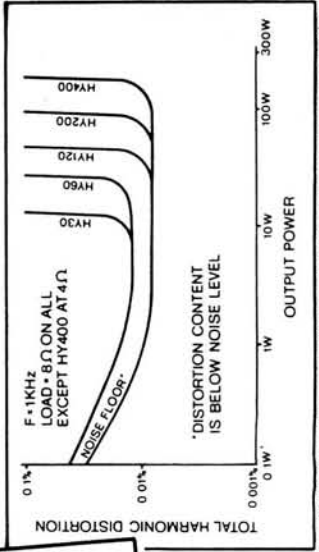
Model	Output Power RMS	Distortion Typical at 1KHz	Slew Rate	Rise Time	Signal/Noise Ratio DIN AUDIO	Price & VAT
HY30	15W into 4-8Ω	0.015%	15V/μs	5μs	100dB	£6.34 + 95p
HY60	30W into 4-8Ω	0.015%	15V/μs	5μs	100dB	£7.24 + £1.09
HY120	60W into 4-8Ω	0.01%	15V/μs	5μs	100dB	£15.20 + £2.28
HY200	120W into 4-8Ω	0.01%	15V/μs	5μs	100dB	£18.44 + £2.77
HY400	240W into 4Ω	0.01%	15V/μs	5μs	100dB	£27.68 + £4.15



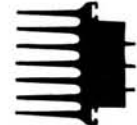
I.L.P. POWER AMPS ARE ENCAPSULATED FOR THERMAL STABILITY AND LONGER LIFE



Load impedance both models 4Ω-∞ Input sensitivity both models 100KΩ
4Ω-∞ Input sensitivity both models 15Hz-100KHz-3dB



Load impedance all models 4Ω-∞ Input impedance all models 100KΩ
Input sensitivity all models 500mV Frequency response all models 15Hz-50KHz-3dB



THE NEW PROFILE EXTRUSIONS
The introduction of standard heatsink extrusion for all I.L.P. power amplifiers achieves many advantages: - Research shows they provide optimum thermal dissipation and stability. Slotted shoulders allow easy mounting; standardisation enables us to keep our prices competitive. Surfaces are matt black, anodised for lower thermal conductivity. Extrusions vary in size according to module number.

NEW PRE-AMPS

HY6 (mono) and HY66 (stereo) are new to I.L.P.'s range of advanced audio modules. Their improved characteristics and styling ensure their being compatible with all I.L.P. power-amps, both MOSFET and BIPOLAR, giving you a chance to get the best possible reproduction from your equipment. HY6 and HY66 pre-amps are protected against short circuit and wrong polarity. Full assembly instructions are provided. Mounting boards are available as below.

Sizes - HY6 - 45 x 20 x 40 mm. HY66 - 90 x 20 x 40 mm. Active Tone Control circuits provide ± 12 dB cut and boost. Inputs Sensitivity - Mag. P.U. - 3mV; Mic - selectable 1-12mV; All others 100mV. Tape O/P - 100mV; Main O/P - 500mV; Frequency response - D.C. to 100KHz - 3dB.

HY6 mono £5.60 + 84p VAT Connectors included

HY66 stereo £10.60 + £1.59 VAT Connectors included

B6 Mounting Board for one HY6 78p + 12p VAT

B66 Mounting Board for one HY66 99p + 15p VAT

NEW POWER SUPPLY UNITS

Of the eleven power supply units which comprise our current range, nine have toroidal transformers made in our own factory. Thus these I.L.P. power supply units are space-saving, more efficient and their better overall design helps enormously when assembly building. All models in the range are compatible with all I.L.P. amps and pre-amps with types to match whatever I.L.P. power amps you choose.

PSU30 ± 15 V at 100mA to drive up to 12 x HY6 or 6 x HY66 £4.50 + 0.68p VAT

PSU36 for use with 1 or 2 HY30's £8.10 + £1.22 VAT

PSU50 for use with 1 or 2 HY60's £9.75 + £1.46 VAT

PSU60 for use with 1 HY120 £9.75 + £1.46 VAT

PSU65 for use with 1 MOS120 £13.61 + £2.04 VAT

PSU70 for use with 1 or 2 HY120's £13.61 + £2.04 VAT

PSU75 for use with 1 or 2 MOS120 £14.75 + £2.21 VAT

PSU95 for use with 1 HY200 £23.02 + £3.45 VAT

PSU180 for use with 1 HY400 or 2 HY200 £24.20 + £3.63 VAT

PSU185 for use with 1 or 2 MOS200

★ Freepost facility

When ordering or writing about I.L.P. products, you do not need to stamp the envelope. Mark it FREEPOST plus the code shown in the address below. We pay the postage for you.



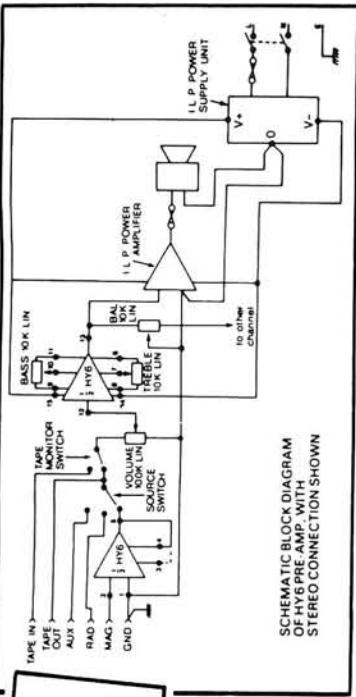
TO ORDER Send cheque or money order payable to I.L.P. Electronics Ltd and crossed. Or pay by ACCESSOR/BARCLAYCARD. Cash payments must be in registered envelope; if C.O.D. payment is wanted, please add £1.00 to TOTAL value of order.

ELECTRONICS LTD.

FREEPOST 1 Graham Bell House, Roper Close, Canterbury, Kent CT2 7EP.
Telephone (0227) 54778 [Technical (0227) 64723] Telex 965780

Available also from MARSHALLS, WATFORD ELECTRONICS and certain other selected retailers

COMPATIBLE WITH ALL I.L.P. MODULES



SCHEMATIC BLOCK DIAGRAM OF HY6 PRE-AMP WITH STEREO CONNECTION SHOWN

- DISTORTION TYPICALLY 0.005%
- S/N RATIO - 90dB (Mag. P.U. - 68 dB)
- 38 dB overload margin on Mag. P.U.
- LATEST DESIGN HIGH QUALITY CONNECTORS
- ONLY POTS, SWITCHES AND PLUGS/SOCKETS NEED ADDING
- NEEDS ONLY UNREGULATED POWER SUPPLY ± 15 to ± 60 V

IN A RANGE OF 11 MODELS USING LATEST TOROIDAL TRANSFORMERS

1971-1980 TEN YEARS OF PLANNED PROGRESS

When, in 1971, Ian L. Potts founded his now world-famous company, he saw the need for a different and more rational approach to exploiting to the full, the potential that lay in modular construction. New thinking was badly needed. The result was a range of modules revolutionary in concept. The rightness of this new thinking is shown by the size of the company today, its new factory, its vast exports, its acceptance by constructors as the modules to build with. The range grows bigger and better. Exciting new lines (in no way conflicting with existing ones) are well past drawing board stage. This is why I.L.P. are simply ahead and staying there.

BRITAIN'S FASTEST GROWING MODULE SUPPLIERS

To: I.L.P. ELECTRONICS LTD. CANTERBURY CT2 7EP

Please supply.....

Total purchase price £.....

I enclose Cheque Postal Orders International Money Order

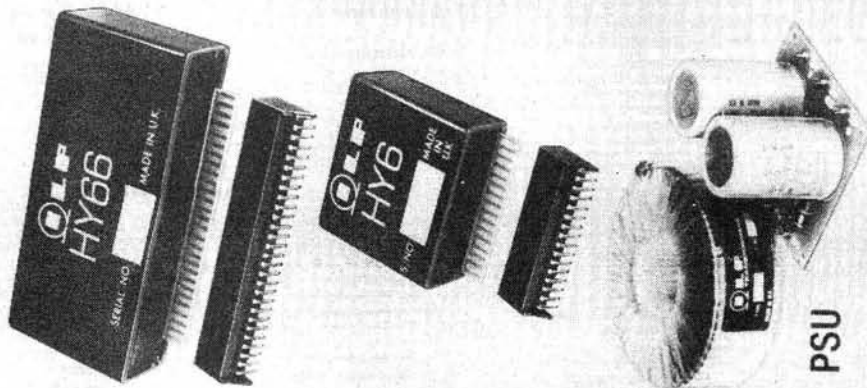
Please debit my Access/Barclaycard Account No.....

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NO QUIBBLE 5 YEAR GUARANTEE
7-DAY DESPATCH ON ALL ORDERS
BRITISH DESIGN AND MANUFACTURE
FREEPOST SERVICE



NEW

PRACTICAL ELECTRONICS PROJECT 125 WATT POWER AMP KIT

SPECIFICATIONS.

Max. Output power 125 watt RMS
 Operating voltage (DC) 50-80 Max.
 Loads 4-16 ohms
 Frequency response Measured at 100 watts 25Hz-20kHz
 Sensitivity for 100 watts 400mV @ 47K
 Typical T.H.D. @ 50 watts load 0.1 %
 Dimensions 205 x 90 and 190 x 36 mm

The P.E. power amp kit is a module for high power applications—disco units, guitar amplifiers, public address systems and even high power domestic systems. The unit is protected against short circuiting of the load and is safe in an open circuit condition. A large safety margin exists by use of generously rated components, the

output stage uses four 115 watt transistors normally only two would be used, result, a high powered rugged unit. The PC Board is backprinted, etched and ready to drill for ease of construction, and the aluminium chassis is preformed and ready to use, supplied with all parts and circuit diagrams.



AS FEATURED IN PRACTICAL ELECTRONICS OCTOBER ISSUE

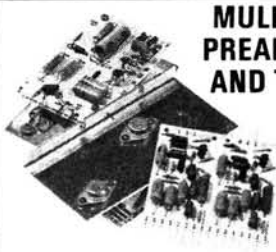
£9.50 plus £1.00 p&p
 125 watt power amp kit

ACCESSORIES
 Suitable L.S. coupling electrolytic **£1.00** plus 20p p&p

Suitable Mains Power Supply Unit sufficient for one power amp **£7.50** plus £2.75 p&p

DIY STEREO BARGAIN PACKS FEATURING FAMOUS BUILT MULLARD PREAMP MODULES

MULLARD STEREO PREAMP MODULES AND TWO 12 WATT POWER AMP KITS.



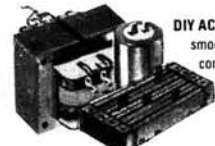
In easy to build form P.C.B.s backprinted, etched and drilled ready to use.

BUILD A 12 WATTS PER CHANNEL STEREO AMPLIFIER ACCESSORIES AND L.S. KIT EXTRA (not available separately) £6.00

DIY PACK 1 2 x power amp kits LP1182/ preamp module, suitable for ceramic and auxiliary inputs. **£6.00** plus £1.10 p&p

DIY PACK 2 2 x power amp kits LP1184 preamp module suitable for magnetic ceramic and auxiliary inputs. **£8.50** plus £1.15 p&p

DIY SPEAKER KIT Two 8" x 5" approx. 4 ohm bass. **£3.50** plus £1.70 p&p



DIY ACCESSORIES Mains transformer smoothing capacitor rectifier 4 x slider controls, for base, treble and volume. **£3.00** plus £1.60 p&p

ACCESSORIES: Available only at time of purchase of Bargain Packs

12 + 12 WATT AMPLIFIER KIT NOTE: for use with 4 to 8 ohms speakers.

With up-to-the-minute features. To complete you just supply screws, connecting wire and solder. Features include din input sockets for ceramic cartridge, microphone, tape or tuner. Outputs—tape, speakers and headphones. By the press of a button it transforms into a 24 watt mono disco amplifier with twin deck mixing. The kit incorporates a Mullard LP1183 pre-amp module, plus 2 power amplifier assembly kits and mains power supply. Also featured 4 slider level controls, rotary bass and treble controls and 6 push button switches. Silver finish fascia panel with matching knobs. Easy to assemble teak simulate cabinet and ready made metal work. For further information instructions are available price 50p. Free with kit. Size 9 1/4" x 8 3/4" x 4" approx.

£13.95 plus £2.55 p&p

NOTE: for use with 4 to 8 ohms speakers.

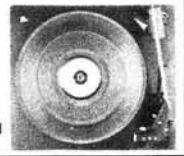
BSR chassis record deck with manual set down and return, complete with stereo ceramic cartridge



£8.50 plus £2.75 p&p when purchased with amplifier. Available separately **£10.50** plus £2.75 p&p.

8" SPEAKER KIT. 2 Phillips 8" approx. speakers. **£4.75** per stereo pair plus £1.50 p&p when purchased with amplifier. Available separately **£6.75** plus £1.50 p&p.

STEREO MAGNETIC PRE-AMP CONVERSION KIT all components including P.C.B. to convert your ceramic input on the 12 + 12 amp to magnetic. **£2.00** when purchased with kit featured above. **£4.00** separately inc p&p.



BSR Manual single play record deck with auto return and cueing lever. Fitted with stereo ceramic cartridge 2 speeds with 45 rpm spindle adaptor ideally suited for home or disco use.



£12.25 OUR PRICE plus £2.75 p&p Size approx 13" x 11"

PHILLIPS RECORD PLAYER DECK GC037



Hi Fi record player deck, 2 speed, damped cueing, auto shut-off, belt drive with floating sub chassis to minimise acoustic feedback. Complete with GP401 stereo magnetic cartridge—LIMITED STOCK. UNBEATABLE OFFER AT

£27.50 complete plus £2.75 p&p

OFFER! SAVE MONEY by purchasing 12 + 12 amp kit, BSR record deck and speaker kit together for only **£25.50** p&p £4.50.

PRACTICAL ELECTRONICS CAR RADIO KIT **£10.50** plus £1.75 p&p

(Constructors pack 7)



2 WAVE BAND MW LW
 * Easy to build * 5 push button tuning
 * Modern styling design * All new unused components
 * 6 watt output * Ready etched & punched P.C.B.
 * Incorporates suppression circuits * Now with tape input socket

All the electronic components to build the radio, you supply only the wire and solder as featured in the Practical Electronics March issue. Features: Pre-set tuning with five push button options, black illuminated tuning scale, with matching rotary control knobs, one, combining on/off volume and tone-control, the other for manual tuning, each set on wood simulated fascia. The P.E. Traveller has a 6 watts output, neg ground and incorporates an integrated circuit output stage, a Mullard IF module LP1181 ceramic filter type, pre-aligned and assembled and a Bird pre-aligned push button tuning unit. The radio fits easily in or under dashboards. Complete with instructions.

CONSTRUCTORS PACK 7A
 Suitable stainless steel fully retractable locking aerial and speaker (approx. 6" x 4") is available as a kit complete **£1.95** per pack plus £1.00 p&p
 Pack 7A may only be purchased at the same time as Pack 7.
 NOTE: Constructor's pack 7A sold complete with radio kit **£15.20** including p&p.
FEATURED PROJECT IN PRACTICAL ELECTRONICS.



30 + 30 WATT STEREO AMPLIFIER BUILT AND TESTED

Viscount IV unit in teak simulate cabinet silver finished rotary controls and pushbuttons with matching fascia, red mains indicator and stereo jack socket. Functions switch for mic magnetic and crystal pickups, tape and auxiliary. Rear panel features fuse holder, DIN speaker and input socket 30 + 30 watts. RMS 60 + 60 watts peak for use with 4 to 8 ohm speakers. Size 14 1/4" x 10" approx.

READY TO PLAY **£32.90** plus £3.30 p&p



323 EDGWARE ROAD, LONDON W2 21C HIGH STREET, ACTON W3 6NG

ACTON: Mail Order only. No callers
ALL PRICES INCLUDE VAT AT 15%
 All items subject to availability. Price correct at 1.11.80 and subject to change without notice.
 For further information send for instructions 20p plus stamped addressed envelope.

NOTE: Persons under 16 years not served without parent's authorisation.

BARGAIN OFFER!!



ARISTON PICK UP
 Ariston pick-up arm manufactured in Japan. Complete with headshell. Listed price over £30.00. **£11.95** plus £2.50 p&p

100 WATT MONO DISCO AMPLIFIER



Brushed aluminium fascia and rotary controls. Size approx 14" x 4" x 10 1/4". Five vertical slide controls, master volume, tape level, mic level, deck level, PLUS INTER DECK FADER for perfect graduated change from record deck No. 1 to No. 2, or vice versa. Pre fade level controls (PRL) lets YOU hear next disc before fading it in. VU meter monitors output level. Output 100 watts RMS 200 watts peak. **£76.00** plus £4.00 p&p

50 WATT MONO DISCO AMPLIFIER

Size approx 13 1/4" x 5 1/4" x 6 3/4". 50 watts rms. 100 watts peak output. Big features include two disc inputs, both for ceramic cartridges, tape input and microphone input. Level mixing controls fitted with integral push-pull switches. Independent bass and treble controls and master volume. **£30.60** plus £3.20 p&p





comment...

Inferior Beings?

AS I mentioned last month, the number of candidates for the May 1980 Radio Amateurs' Examination was a record, as was the number of passes. In fact, the number of candidates had virtually doubled compared with two years' previously. The most interesting statistic to emerge from an analysis of the past six years' figures is that the pass rate, i.e., the percentage of candidates who were successful in each exam, has remained almost constant during that period.

This would seem to refute the disturbing view expressed in some parts of the amateur radio fraternity, that new licensees who have passed the multiple-choice form of the RAE are inferior beings, simply because the number of passes has gone up, "therefore the pass-mark must have been lowered." Here I make what I think to be a fair assumption—that it would be untrue to say that only about a thousand people in the UK can be trained sufficiently well to pass the Radio Amateurs' Examination each May/June. (I have to confine my comments to the summer exams, because it is only for these that statistics are available.)

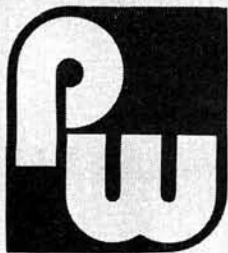
Obviously, it is statistically possible for a candidate with no knowledge whatsoever of radio, to pass the multiple choice RAE merely by choosing answers at random. However, we calculate the

probability of anyone doing this to be around one chance in 10^{30} !

The reasons behind the dramatic rise in the number of candidates are probably many. Undoubtedly, some of them must be frustrated CBers looking for a legitimate or a more flexible form of radio pastime. Others will be people who were frightened off by the previous written examinations. But you do not have to be literate to enjoy, nor to contribute to, the hobby of amateur radio. Neither does the ability to express yourself in writing automatically guarantee a sane and considerate attitude towards your fellow amateurs when on the air. It has been my experience in life that there are as big fools around with university degrees as without!

I think that it would be for the benefit of amateur radio as a whole if the newly licensed were welcomed by the old hands (and the not so old) whether individually or in clubs, and encouraged to get involved in experimenting, regardless of what sort of exam they passed. After all, that's what the hobby is supposed to be all about.

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.

BACK NUMBERS AND BINDERS

Limited stocks of some recent issues of *PW* are available at 95p each, including post and packing to addresses at home and overseas.

Binders are available (Price £4.30 to UK addresses and overseas, including post and packing) each accommodating one volume of *PW*. Please state the year and volume number for which the binder is required.

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

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

NEWS NEWS NEWS

The 1980 Girl Technician Engineer of the Year

The 1980 Girl Technician Engineer of the Year is Miss Fenella Hume, age 23, a Development Project Leader from Cambridge. At a ceremony in London, on 31 October 1980, HRH The Prince of Wales presented her with a prize of £250 and an inscribed rose bowl. A special award was also made to the runner-up, Miss Sally Buswell, 25, an Assistant Instrument Engineer from Pinner, Middlesex.

Sponsored by The Caroline Haslett Memorial Trust and The Institution of Electrical and Electronics Technician Engineers, this Award aims to focus attention on electrical and electronic engineering as a worthwhile professional career for women.

Fenella Hume holds the position of Development Project Leader with Kent Industrial Measurements Ltd. at Eaton Socon, St Neots, Cambridgeshire. She is responsible for the organisation of design projects, including the allocation of work to technicians and apprentices, and for the detailed design of



controller indicators and chart recorders. Fenella finds satisfaction in being able to use her knowledge and experience to create a well-engineered and marketable product, to prove continually the basic principles of elec-

tronics whilst designing and testing, and to train her mind to think logically.

The Institution of Electrical and Electronics Technician Engineers, 2 Savoy Hill, London WC2R 0BS. Tel: 01-836 3357.

New Book Company

A new company, ZL Communications, has recently been formed to supply technical books to the public on a mail order basis.

Subjects covered will include, amateur radio, audio (Hi-Fi and tape recording), CB radio, computers and microprocessors, electronics, radio and television.

For catalogue and further information contact: *ZL Communications, 35 Burnt House Road, Cantley, Nr Norwich, Norfolk NR13 3RT. Tel: Freethorpe (049 370) 821.*

G9BRY—Mayday, SOS, 10-62, Help

In the October 1980 edition of "10-4", the official newsletter of the Citizens' Band Association, it was announced that the Home Office had issued the CBA with a transmitting licence for 941-975MHz, with the callsign G9BRY.

The purpose of issuing the licence was to enable the CBA to evaluate the

possibilities of 900MHz CB or Open Channel. The licence is valid until 30 November 1980, the last day for comment on the Green Paper.

I understand from James Bryant, President of the CBA, that the CBA has met with a major problem—they cannot obtain any equipment for the frequency.

A search has been mounted for a pair of rigs and James assures me that the search has not only covered the UK, indeed, they have sought assistance on a world-wide scale, without success. At the time of going to press (early November) this was still the situation.

Contrary to general opinion, it would seem that 900MHz equipment is unobtainable!

Spreading Out

Amplicon Micro Systems Ltd., the micro computer marketing company of Amplicon Electronics Ltd. have recently opened a new office at Kingston House, Stephenson Way, Three

Bridges, Crawley, to provide demonstration facilities and after sales service for the Commodore range of low-cost business systems for use in business, industry, education and the home.

The Commodore PET range of products are available for demonstration, as are the new 8000 series of computers.

Further information from: *Amplicon, Richmond Road, Brighton, East Sussex BN2 3RL. Tel: (0273) 608331.*

Tools Catalogue

TRI-tronic Marketing Ltd. has produced a 12-page catalogue listing tools and hardware for the home constructor.

All the tools are professional quality and supplied at discount prices. An accompanying price list gives prices inclusive of VAT and p&p.

The catalogue is available free-of-charge from: *TRI-tronic Marketing Ltd., 75 Albert Street, Rugby, Warwickshire CV21 2SN. Tel: (0788) 73328.*

NEWS NEWS NEWS

Club News

The Wisbech Radio and Electronics Club inform me that they have changed their meeting nights from Mondays to Thursdays.

The meetings kick-off at 1930hrs, at the address below, on alternate weeks, starting Thursday, 16 October 1980.

The club extend a welcome to anyone interested in amateur radio, short-wave listening, electronics generally or passing the RAE.

Further details can be obtained from: *The Secretary, D. Dunn G8RZN, Five Bells, Parson Drove, Nr Wisbech, Cambs. Tel: (094 574) 231.*

Bye Bye 405

The Home Secretary, in a written reply in the House of Commons earlier this year, made a detailed statement about the closure of the 405-line television services and the further extension of the 625-line service.

His statement began: "The 405-line v.h.f. television services of the BBC and the IBA transmit BBC-1 and ITV in black and white only and are now substantially duplicated by the 625-line u.h.f. services which transmit BBC-1, BBC-2 and ITV in colour, and which will in due course transmit the fourth channel service. Phase II of the current u.h.f. engineering programme for extending the 625-line services to communities with populations of 500 or more (over 99% of the population) should be completed by about 1984.

"The need to close the 405-line services in the early 1980s was recognised by the Pilkington Committee and the Annan Committee on the Future of Broadcasting. The manufacture of sets capable of receiving the 405-line services ceased some years ago and the transmitting equipment is rapidly nearing the end of its useful life. Substantial capital expenditure would be required to extend its life beyond the next few years and such expenditure on a duplicate and obsolescent service could not be justified.

"I have, therefore, agreed with the broadcasting authorities on a timetable for the closure of the 405-line services. Closure will begin in 1982 and will be phased over a period of about 4 years."

The BBC and the IBA are co-operating closely in the implementa-

tion of these engineering programmes in order to minimise any inconvenience to the public. As far as possible they plan to close down their 405-line services in Bands I and III at the same time in particular areas, although this will not be possible everywhere since the BBC have 110 transmitters on 405-lines while the IBA have 47.

Stations to be closed earlier in the programme will be those in areas where there is good coverage from the u.h.f. 625-line services. The last stations to be closed will be some of the high-power main stations in areas where 625-line coverage is less complete.

BBC Engineering Publicity, Room 707A, Henry Wood House, Broadcasting House, London W1A 1AA. Tel: 01-580 4468 ext. 5434.

On the Move

Ace Mailtronix has moved into larger premises. The company specialises in electronics components for magazine projects in addition to its electronic component catalogue listing approximately 1000 items available ex-stock by mail order.

The catalogue is available now, priced 30p to mail order customers. This is refundable with subsequent orders over £5.00. Callers are welcome during normal working hours, Monday to Friday and on Saturday mornings, to whom the catalogue is free.

The new premises are at: *3A Commercial Road, Batley, West Yorks. WF17 5HJ. Tel: (0924) 441129.*

Business News

Lascar Electronics, the Essex-based instrument manufacturers have appointed Audio Electronics as their Central London stockists.

All their most popular instruments will be stocked at: *Audio Electronics, 301 Edgware Road, London W2. Tel: 01-724 3564.*

Sinclair Electronics Ltd., has been appointed the sole importer for the UK and Eire for Leader Electronics Corp. of Japan.

Leader manufactures a wide range of competitively priced, high quality test equipment, including single and dual trace oscilloscopes with

bandwidths up to 35MHz, and a comprehensive selection of items covering most test requirements in the fields of TV, Video, Audio, Amateur Radio and CB.

Leader products will be stocked in the UK by Sinclair and a few select distributors will be appointed.

Sinclair also markets a rapidly expanding range of portable test equipment, manufactured by them in the UK, under the trade name Thandar.

Sinclair Electronics Ltd., London Road, St Ives, Huntingdon, Cambs PE17 4HJ. Tel: (0480) 64646.

Coals to Tokyo

Following upon last year's State of the Art award for the Quad electrostatic loudspeaker comes the news that the Quad 44 control unit has been voted a "State of the Art" award for 1980 by Japan's foremost audio magazine "Stereo Sound". Products are selected for the award by a panel consisting of eight leading Japanese audio critics.

In Japan the opinion of the audio critics has enormous influence upon the market and the accolade given to the Quad 44 will have significant commercial benefits as well as being a source of pride to the design team at Quad. Fifteen per cent of the Quad 44 production is earmarked for airfreight to Tokyo each month to satisfy demand.

The Acoustical Manufacturing Co. Ltd., Huntingdon PE18 7DE. Tel: (0480) 52561.

Can I Help You!

Are you the secretary, organiser or general dog's body of your local radio club or any other group whose functions may interest readers of *PW*. If so, let me know and I will endeavour to publicise your rally, get-together whatever, through this column. Remember though, we compile the magazine some time ahead of publication day (e.g. this note was written in November), so, the earlier I can have details, the better.

Alan Martin

More on page 90 ▶▶▶

tape//slide controller

PART 1

Fred JUDD

Automatic control of slide projectors from magnetic tape can be done quite easily with audio signal pulses on one track of a stereo tape-recorder leaving the remaining track available for commentary, music and sound effects. With a reel-to-reel recorder a similar function can also be carried out by means of adhesive foil strips on the tape that are used to operate a relay which in turn will actuate the projector slide change mechanism. An electro-optical system could also be used.

However, if one wishes to use the now much more popular cassette deck, most of which are two-channel (stereo) then there is no alternative but to use one track for slide change pulses and the other for music and commentary which prevents having normal stereo recording and reproduction.

The controller described in this article enables automatic slide change to be carried out and yet allows one to retain the full stereo record and replay facility with any cassette or reel recorder. It can also be used with any mono (single track) cassette or reel machine. The slide projector must have the facility for automatic slide change and for this purpose must have a 2-pin connection for the external control. If this is not provided, but the projector has a remote control button, then connection can be made to this.

The controller operates on the principle that music and commentary, etc., can be recorded in stereo as normal, together with projector control impulses on one of the tracks. On replay the pulse is separated from the music, etc., and vice-versa, with the pulse being used to operate a relay. The relay has two contacts (normally open) which are connected to the auto slide change socket on the projector. The controller also incorporates dual channel mixing for stereo microphones and high level input signals, a facility that few cassette decks have, so one has provision for mixing commentary, music and sound effects, or background sound whilst recording and simultaneously programming the slide changes.

The Circuit

With the aid of the block diagram (Fig. 1) the general function of the unit can be followed. About 300mV r.m.s. of 50Hz signal is obtained from the secondary winding of the power supply transformer and fed to the pulse gate, a button-operated "electronic attenuator" i.e. giving a very clean pulse free from switching spikes which would produce audible clicks.

The pulse signal is recorded, as required for a change of slide, together with the left-hand channel audio signals



The completed Tape/Slide Controller ready to be connected to the tape-recorder and automatic slide projector

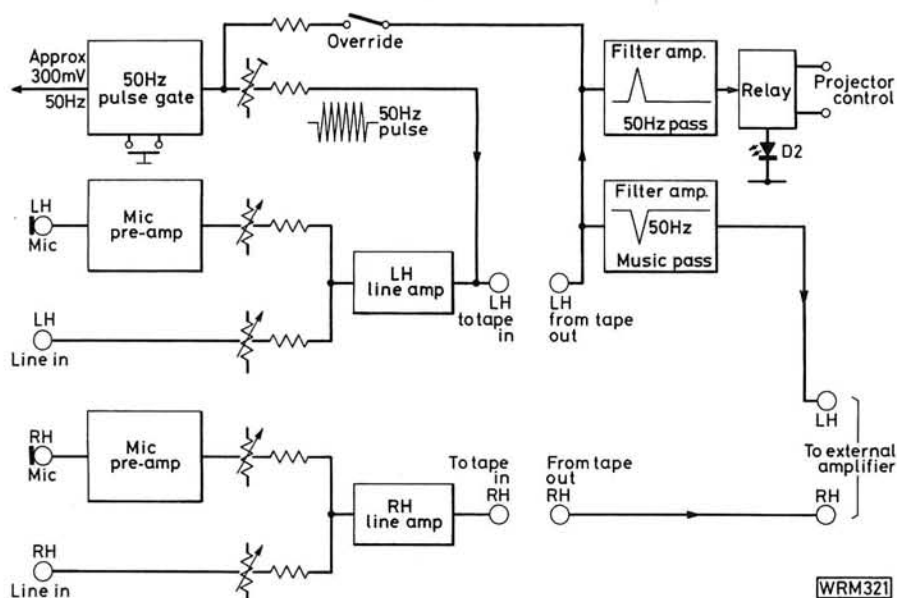


Fig. 1: Block diagram of the Tape/Slide Controller

from the microphone or high level inputs (music, etc.) onto the left-hand channel of the tape-recorder (TO LH TAPE IN). On replay these signals are returned from the left-hand channel of the recorder (FROM LH TAPE OUT). The 50Hz pass filter rejects music signals, even bass notes that might occur at 50Hz, as there is a time delay in the rectifier circuit from which d.c. is obtained (from the pulse) to actuate the relay. Music signals are passed through the 50Hz reject filter (music pass) and then to the output socket for the external amplifier. Signals for the right-hand channel, mic or high level, go to the tape-recorder via "TO RH TAPE IN" and from the tape-recorder through "FROM RH TAPE OUT" and the direct link to the external amplifier.

Most cassette and reel-to-reel recorders have a through monitoring arrangement in which case the slide projector will be automatically operated as a pulse is recorded. One can therefore prepare a commentary and music script marked with the right places for a change of slide. With the slides to be shown loaded in the correct order it is simply a matter of pressing the pulse button at the right moment whilst recording the commentary, etc. On replay (with slides reloaded) the programme is then repeated automatically. Should the recorder not have through monitoring, then the override switch can be used so that slides will still be changed whilst the pulses are being recorded. An example of how to make up a programme and operate the controller will be given later.

The full circuit is given in Figs. 2 and 3. IC1 operates as left- and right-hand channel microphone pre-amp. stages the outputs each being taken to a passive mixer circuit (R5-R8 (RH) and R27-R30 (LH)) which also takes in the left- and right-hand channels for high level signals. The output from each passive mixer section is taken to an output amplifier, one for the left-hand and one for right-hand channel to the tape-recorder. These are together on circuit board 1.

The 50Hz slide control pulse is taken from the i.c. "electronic attenuator" via R55 and coupled to the left-hand channel output of the mixer circuit. Note also that the left-hand mixing circuit IC1b and Tr2 has a reduced bass response so that any strong bass signals very close to 50Hz, from music sources being recorded, are sufficiently attenuated to prevent accidental triggering of the slide control relay. This reduction in bass response is obtained by the use of a low value by-pass capacitor (C18) in series with

R35 in the emitter return of Tr2. This does not detract from the overall bass response as most bass signals in stereo are fairly equal on both channels. The right-hand channel response is of course normal.

Signals returned from the left-hand channel of the recorder on replay include the 50Hz pulse which now has to be separated from music and commentary. This is done by a twin-T filter in negative feedback with IC3 (741 op. amp.) which also amplifies the pulse so that about 2V r.m.s. at 50Hz is available at its output. This is rectified by D1 and the d.c. used to turn on Tr3 to operate the relay. Only the relay specified should be used as the circuit design has been optimised for this.

Commentary and music signals (left-hand channel) are taken via IC2 a 741 op. amp. which passes all signals except those very close to 50Hz and also has unity gain so that signals going to the external amplifier are equalised with those from the right-hand channel. Signals for the

CONSTRUCTION RATING Intermediate

BUYING GUIDE

Readers should have no difficulty in obtaining the components for this project. The relay specified is an RS Components type and can be obtained from several of our regular advertisers who offer RS Components parts. Printed circuit boards will also be available from those advertisers specialising in this service. You are advised to study the advertisement pages for the components for this project.

APPROXIMATE COST £35

Fig. 2: Circuit diagram of the power supply for the Tape/Slide Controller

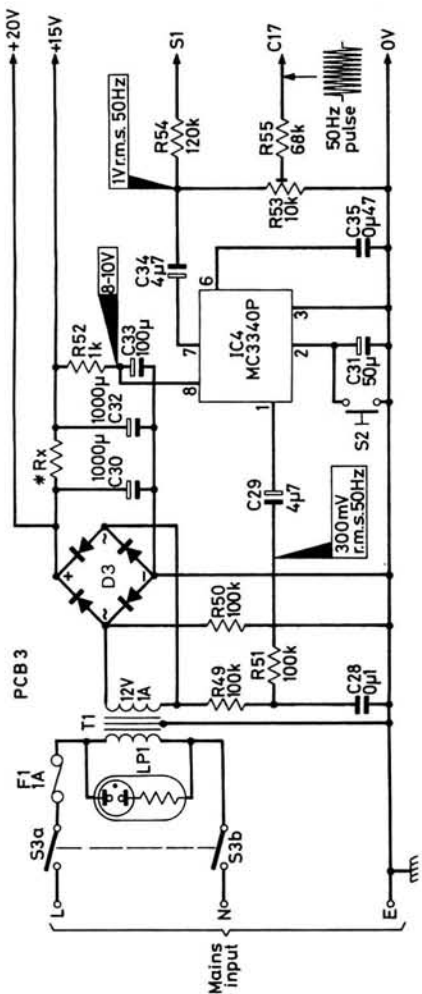
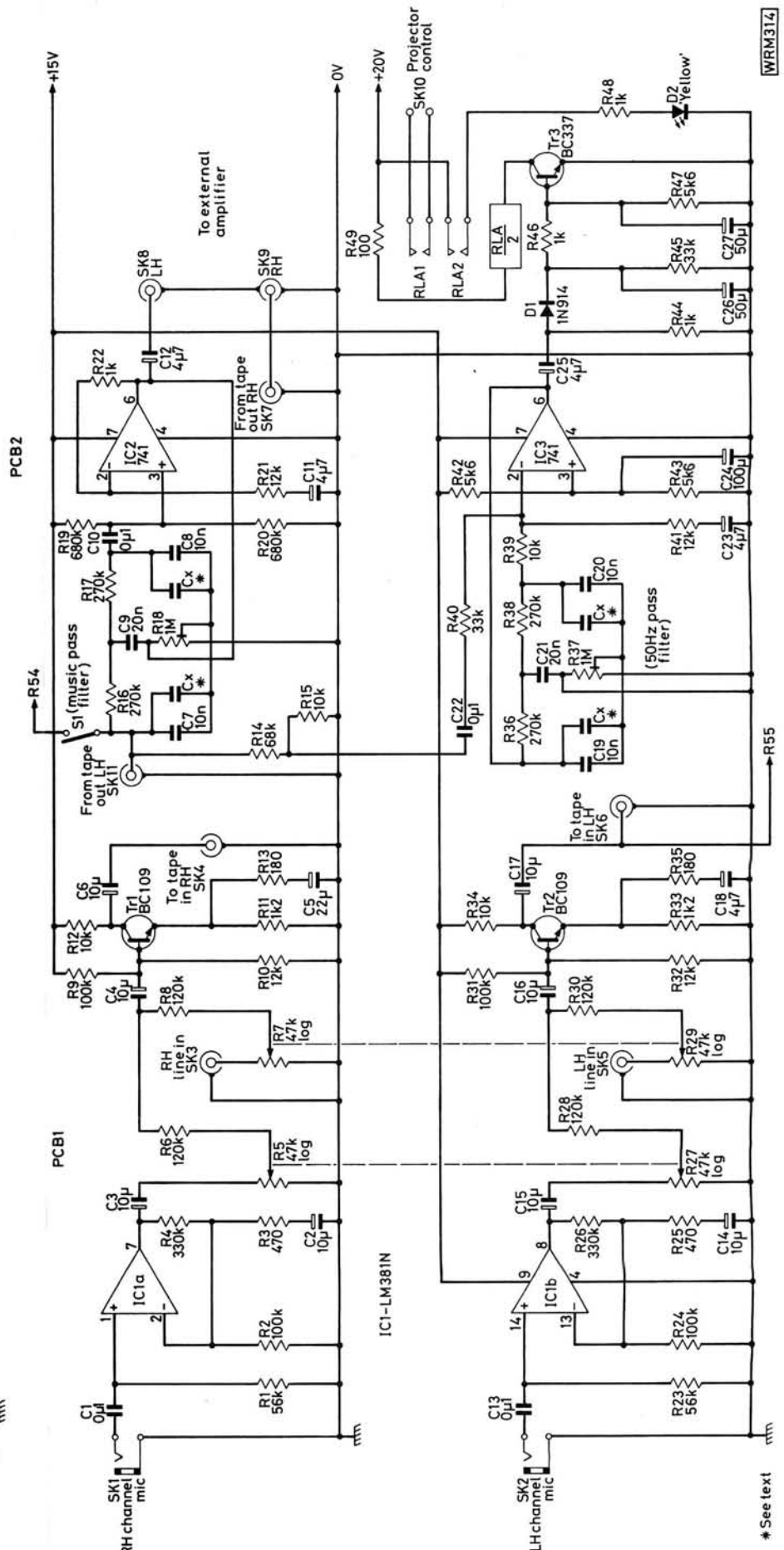


Fig. 3: Circuit diagram of the Tape/Slide Controller



* See text

WRM314

★ components

Resistors

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

100Ω	1	R56
180Ω	2	R13,35
470Ω	2	R3,25
1kΩ	5	R22,44,46,48,52
1.2kΩ	2	R11,33
5.6kΩ	3	R42,43,47
10kΩ	4	R12,15,34,39
12kΩ	4	R10,21,32,41
33kΩ	2	R40,45
56kΩ	2	R1,23
68kΩ	2	R14,55
100kΩ	7	R2,9,24,31,49,50,51
120kΩ	5	R6,8,28,30,54
270kΩ	4	R16,17,36,38
330kΩ	2	R4,26
680kΩ	2	R19,20

$\frac{1}{2}$ W 5%

270Ω	1	Rx (see text)
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Capacitors

Disc ceramic

10nF	4	C7,8,19,20
0.1μF	5	C1,10,13,22,28

Polyester

0.47μF	1	C35
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Electrolytic p.c.b. type

4.7μF 16V	7	C11,12,18,23,25,29,34
10μF 16V	8	C2,3,4,6,14,15,16,17
22μF 16V	1	C5
50μF 16V	3	C26,27,31
100μF 16V	2	C24,33
1000μF 25V	2	C30,32

Potentiometers

Side adjusting cermet

10kΩ	1	R53
1MΩ	2	R18,37

Tandem ganged

50 + 50kΩ		
log	2	R5 + 27,7 + 29

Semiconductors

Diodes

1N914	1	D1
50V, 1A bridge	1	D3
Red l.e.d.	1	D2

Transistors

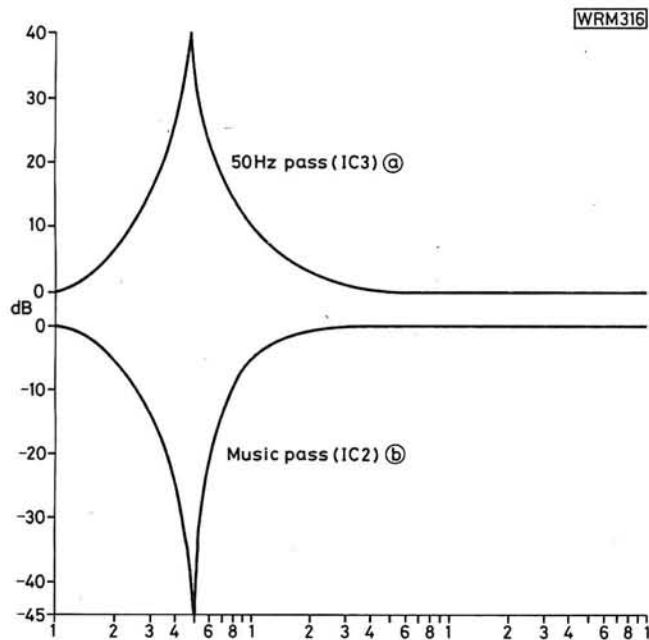
BC109	2	Tr1,2
BC337	1	Tr3

Integrated circuits

741	2	IC2,3
LM381N	1	IC1
MC3340P	1	IC4

Miscellaneous

Relay 12V 250Ω (RS349-658); Min. toggle switch s.p.s.t. (1); d.p.d.t. (1); Phono sockets, Red (4), Black (4); $\frac{1}{4}$ inch jack sockets (2); 240V panel neon; Knobs (2); 14-pin d.i.l. socket (1); 8-pin d.i.l. sockets (3); Mains transformer 12V 12VA; Min. push-button switch (1); Verobox 75-1412K (205 × 140 × 110mm); Set of three p.c.b.s; 1A fuse; Panel mounting fuseholder; Self-adhesive p.c.b. guides.



right-hand channel (to external amplifier) are taken straight through from the recorder output via the linked sockets marked "FROM TAPE OUT RH" and "EXT AMPLIFIER RH". The two filter circuits IC2 and IC3 and the relay amplifier Tr3 are contained on circuit board 2.

The remaining part of the circuitry is that of the power supply which is quite conventional but contains the electronic attenuator i.c. A 50Hz voltage for the pulse is obtained from the network R49, R50, C28, R51, which provides a sine-wave of about 300mV to the i.c. via C2. In normal operation the push-button is depressed for about 1 second to provide a long enough pulse to actuate the projector control relay. The required pulse level, as will be explained later, is obtained by the pre-set R53.

General Performance

The audio mixing section has a performance comparable with top grade domestic cassette and reel-to-reel recorders. Signal-to-noise, referenced to 0.775V r.m.s.

Fig. 4: The filters provide maximum acceptance or rejection of over 40dB at a frequency of 50Hz as shown in these response curves

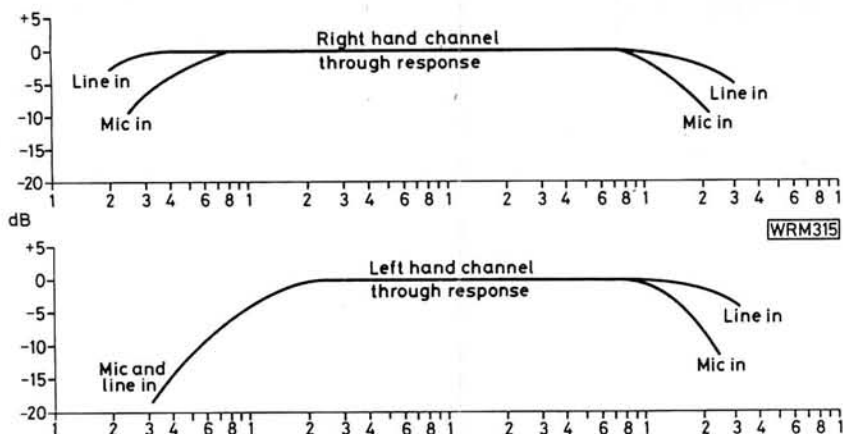
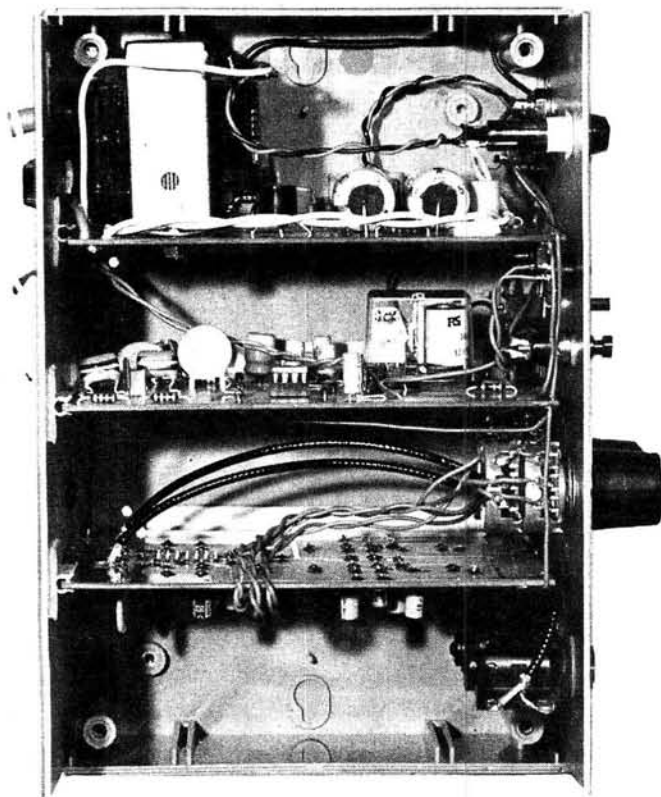


Fig. 5: The overall frequency response for each channel is shown in this diagram. It can be seen that the left-hand response has a reduced bass response



output, is 70dB for the line inputs and 55dB for the microphone inputs and t.h.d. from either inputs is less than 0.1 per cent. The microphone input sensitivity is 0.5mV for 0.775V output and at the line inputs it is 200mV for 0.775V output. The microphone inputs are suitable for impedances of 200Ω or higher. Very low impedance microphones, 25–30Ω, should have a suitable matching transformer.

Frequency Response

The overall frequency response for each channel is shown in Fig. 5 but as already mentioned the left-hand channel has a reduced bass response. The filter responses are shown in Fig. 4 and provide maximum acceptance and/or rejection at 50Hz to about 40dB. Each filter is tuneable to 50Hz by means of a preset potentiometer and the procedure will be dealt with later.

The second part will deal with construction and use of the unit.

kindly note!

PW "Tamar" 28MHz Transverter Driver, September 1980.

The specifications for RFC6 on the power supply board are:

36 turns of 23 or 24 s.w.g. enamelled copper wire evenly spaced on a 12.5mm diameter toroid. The toroid should be mounted vertically and secured to the p.c.b. with epoxy resin adhesive.

PW "Nimbus" Charger/p.s.u., Oct 1980

There are two minor discrepancies between the circuit diagram and the p.c.b. layout in the p.s.u. charger. The circuit diagram should be taken to be the definitive version. The p.c.b. should be corrected as follows, remove R3 lead from the junction with R1 and reconnect to the track adjacent to C3 positive end. Make a link from the p.c.b. location, vacated by R3 (directly below D2), to BR1 positive track pad.

the things
people say



"No, I can't hear you on the input, but that's probably because I'm only running 10 watts here."

... 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.

The BASICS of TV DXing

Part I Roger BUNNEY



Our heading photograph shows a test card received via single-hop Sporadic E propagation from ORF-Austria by N. E. Parkes, Co. Antrim, using a simple indoor dipole at his home in a block of flats

As the name suggests, DXTV is the art of receiving distant television signals, which in this context are those signals intended for domestic viewing in areas far from the receiving location. Although the broadcasting authorities take great care to engineer transmitter characteristics to minimise interference to other transmitters operating in the same spectrum but at distances far removed from the originating site, under certain propagation conditions those very signals can be carried over hundreds and perhaps thousands of miles, and be received on relatively simple equipment. The purpose of this article is to explain briefly the mechanism by which these signals travel, and to suggest the basic requirements for a receiving installation.

It may be instructive at this stage to consider the television signal itself, since across the European land-mass several transmission systems are in use. The actual vision signal is amplitude modulated onto the carrier but with one sideband partially suppressed. This is known as vestigial sideband modulation (v.s.b.). The modulation may be either negative- or positive-going, Fig. 1 will clearly show the differences. Negative-going video is employed with the UK 625-line u.h.f. transmissions—tuning onto a blank channel will reveal a greyish background with black dots of noise; positive-going video is used on the more elderly 405-line v.h.f. transmissions, a blank channel will show a very dark background with bright white noise dots. The various types of transmission used in Europe are detailed in Table 1, and with few exceptions it will be noted that negative-going vision has been adopted. Sound modulation with negative-going vision signals is generally f.m., those countries still using positive-going vision always have a.m. modulated sound. In passing, it should be mentioned that the TV transmissions that have been received from experimental satellites and those for the future will employ f.m. video modulation; such reception is of rather a specialised nature and will not be pursued further in this article.

Broadcasting of television signals is carried out in certain frequency bands and at the time of writing are as follows: Band I, 40–70MHz; Band III, 162–230MHz; Bands IV/V (u.h.f.) 470–860MHz. Decisions passed at the recent WARC '79 will mean slight alterations to those frequencies, perhaps most significantly in Band I. Study of Table 1 will clearly show that different transmission

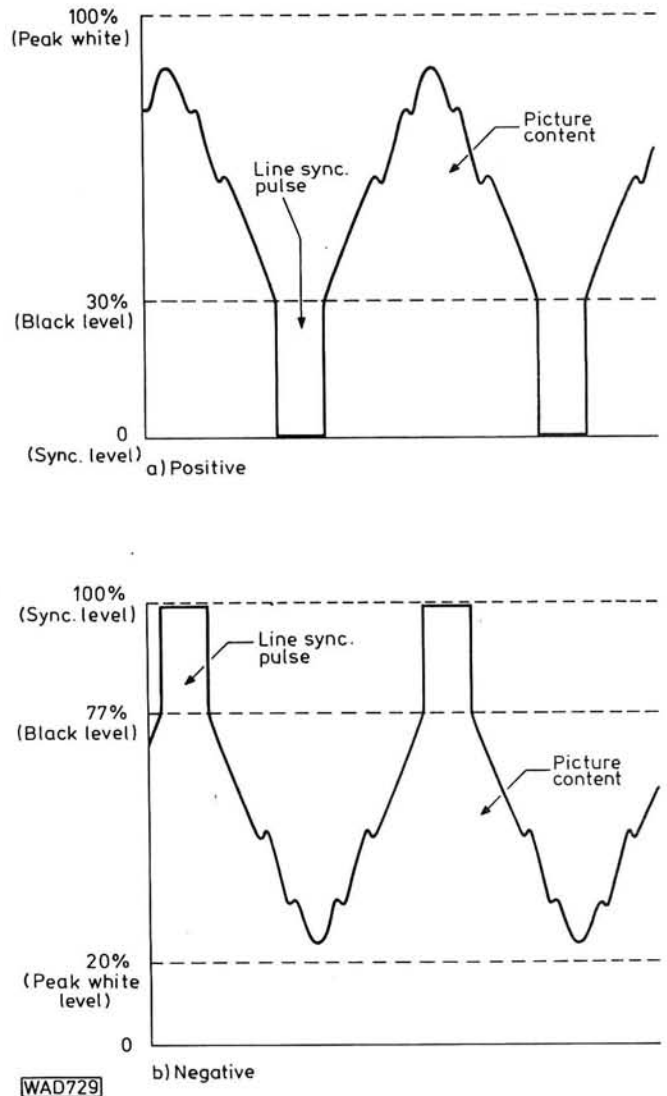


Fig. 1: Vision waveforms for: (a) positive modulation, and (b) negative modulation

Table 1
European TV Systems

System	No. of Lines	Overall Channel Bandwidth (MHz)	Vision Bandwidth (MHz)	Sound/Vision Spacing (MHz)	Vision Modulation	Sound Modulation
A	405	5	3	- 3.5	+	a.m.
B	625	7	5	+ 5.5	-	f.m.
D	625	8	6	+ 6.5	-	f.m.
E	819	14	10	± 11.15	+	a.m.
G/H	625	8	5	+ 5.5	-	f.m.
I	625	8	5.5	+ 6	-	f.m.
L	625	8	6	+ 6.5	+	a.m.

- A = UK — e.g., Ch. B3
- B = Western Europe — e.g., Ch. E2 (v.h.f.)
- D = Eastern Europe — e.g., Ch. R1 (Not East Germany)
- E = France (v.h.f.) — e.g., Ch. F2
- G/H = As for System B but u.h.f.
- I = UK — u.h.f.
- L = France/Luxembourg u.h.f. — e.g., Ch. E21

systems have varying overall channel bandwidths, the 405-line channels on System A have a much smaller bandwidth than 625-line channels. Thus it follows that in a given television band, a greater number of channels can be packed in if the overall transmission bandwidth is small. The vision frequencies used in Band I are detailed in Fig. 2 and whereas five UK 405-line channels are used, only three System B 625-line channels can be employed. In point of fact the latter System B channels extend to 48MHz and no lower, if an extension was made down to 40MHz only one extra channel would result. Band I vision frequencies have been shown, since this particular band does allow quite spectacular reception with the minimum of equipment. A free booklet from the IBA, Engineering Information Service, Crawley Court, Winchester, Hants SO21 2QA, details the UK Band III and the main u.h.f. carrier frequencies for each channel now used throughout Europe—the booklet is called *Transmitting Stations, A Pocket Guide*.

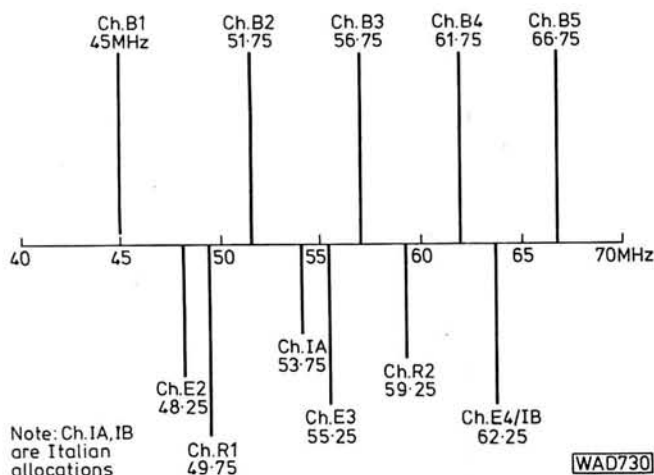


Fig. 2: Vision frequencies in Band I, 40-70MHz

Signal Propagation

Having described briefly the different types of signal waveform used for television transmission, and before going on to suggest the means to receive such elusive signals, it may be wise to detail how the signal arrives by two different modes, that of "weather assisted" or Tropospheric propagation, and that of "Ionospheric assisted" or Sporadic E propagation. There are other types of signal propagation, but for simplicity it seems best to concentrate on the more familiar types and leave the more esoteric forms of signal propagation to further study and experiment at a later stage. I am sure that most viewers have been aware that during certain types of weather condition, interference arises on the "local" TV programmes, if nothing more than an announcement suggesting that viewers may be experiencing difficulties and "do not adjust your set".

The more inquisitive of us may—possibly by accident—whilst tuning between local programmes happen upon weaker signals, perhaps of another ITV programme or if near the coast a foreign programme/test card, etc. During such conditions a glance at the weather map may disclose that the UK is under the influence of a slow-moving high-pressure system (Anti-cyclone). Reception conditions will start to build up particularly if the system is virtually stationary. Usually towards evening, as the sun falls and ground temperatures drop, an inversion may occur, caused by the different rates at which the air and surface temperatures fall. This is particularly marked during clear cloudless summer days followed with equally clear nights. During such conditions, TV signals will be propagated at both v.h.f. and u.h.f. at distances of up to 1000 miles, and certainly until such transmissions close down for the night. As they open up the next morning it will often be found that the signals are still present, but as the sun rises and temperatures rise again so conditions will fall.

This diurnal characteristic is such that an effect known as "ducting" can occur, whereby a distant v.h.f./u.h.f. signal can put an exceptionally strong signal into the UK, but stations in the same direction and at lesser distances are poorly received. The Brocken TV transmitter in East Germany is a favourite for this to be observed on Ch. E6 (Band III) and Ch. E34 (u.h.f.) when no other DX signals are present! In this instance the transmitter is located high in the mountains and literally transmits its signals directly into the duct.

High-pressure systems can also produce spectacular reception, particularly during the autumn/winter months, and foggy conditions often manifest many distant signals. At times a high-pressure system may remain for some days with no apparent improvement in DXTV, but as the system slowly moves away and the high-pressure starts to fall then signals may rise from the noise. Signals can be received along the advancing wavefront of (for example) a fast-moving cold front, where we have an abrupt temperature gradient, similar to a temperature inversion, which can give signal reception up to several hundreds of miles. Such conditions however may be present for an hour or less depending upon the speed and "sharpness" of the front.

Sporadic E

High above the Earth's surface are the various layers of the Ionosphere that support signal reception at medium and short waves, such reflection relating to the time of

day, part of the year and prevailing Solar activity. At around the 70 mile height is the E layer. I am sure many readers will recall the (happy?) days for 405-lines when during the summer months BBC1 was regularly shattered with Continental interference. That interference is or was the result of Sporadic E. Normally the E layer will not support v.h.f. signal reflection, it being transparent to signals above about 7-10MHz (this latter figure is very approximate and will vary according to the conditions as noted at the beginning of this section). Certainly for u.h.f. TV in Band I and above, the E layer is just not there during normal conditions. At times however, intense ionisation of a localised nature happens within the E layer and such patches are capable of supporting signal reflection at frequencies in Band I, often Band II (f.m.) and on very rare occasions even at the low end of Band III (I once noted Ch. E7 vision via Sporadic E at 190MHz!). The causes of such ionisation are not confirmed, although recent work by radio amateurs does show a definite connection between Meteor Showers and Sporadic E. However the net result for the DXTV enthusiast is that during the generalised period of early May to late August one can experience "Sporadic E openings".

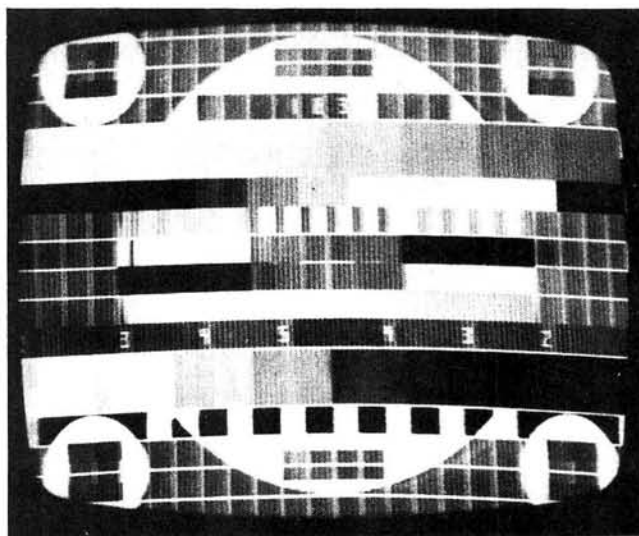
Such openings produce strong or very strong Band I TV signals from one or more stations or countries in either a very localised area or a more widespread tract of Europe, usually via a single hop of 500 miles or more, up to perhaps 1500 miles. Often double hop occurs, giving up to 3000 mile distances; an example that is received on Ch. E3 is the Amman, Jordan transmitter. To receive single-hop signals under 500 miles calls for very intense ionisation, and although this can happen it is very rare.

Sporadic E enjoys a "season" as indicated during the summer months, although as its name implies it can occur anywhere, anytime. Often a mid-winter peak of Sporadic E is noted. Signals, unlike the "fringe" type of the Tropospheric with its slow fading, are spectacular, ranging from a few microvolts to several millivolts and across a time span of seconds. Due to the strength of signals, quite simple equipment can be employed. I recall some years ago experimenting with a dipole array on a 9ft pole in the garden, and comparing the Ch. E2 Madrid signals with those coming down from a 4-element Band I array at 50ft. Signal levels were measured reaching to nearly 3mV and at times similar strength signals were noted from both aerials.

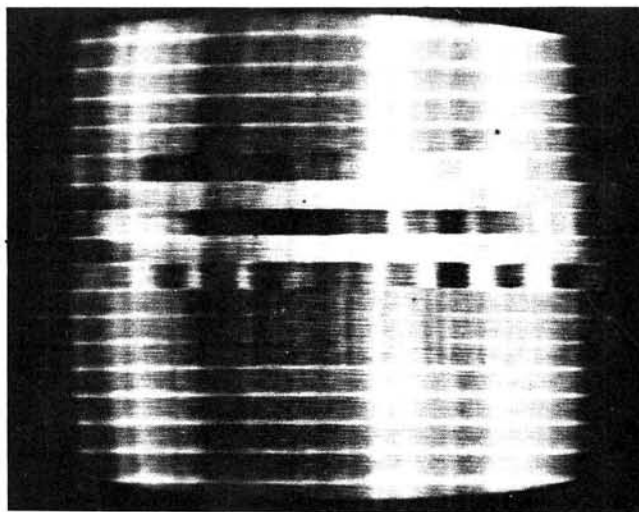
Sporadic E is certainly dramatic, the newcomer to DXTV can easily equip himself with basic apparatus and successfully receive foreign Band I signals, and once having gained experience in receiver and propagation requirements, can advance himself to the other and more difficult forms of signal reception. I personally advise enthusiasts to follow this route since if the knowledge/experience is available to convert an older receiver, minimal financial outlay results and the technical experience thus gained is invaluable for future construction, modification and experimental work. For the non-technical enthusiast such DX is possible even without removing the rear cover of his receiver, by employing a standard u.h.f. domestic TV set.

Equipment

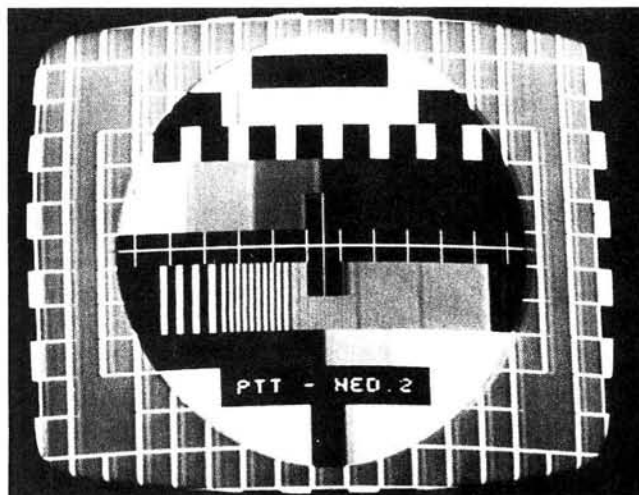
I have been active in DXTV for nearly 20 years, and have written the DXTV column in our companion magazine *Television* since the early '70s. During this time I have encountered most problems likely to beset the newcomer to this hobby. Of course in the 1960's, prior to the 625-line service, any person wishing to undertake serious DXTV operation would have to modify his 405-line set to



An example of single-hop SpE reception, showing the USSR test card on Ch. R2 (59.25MHz) as seen by Gareth Price in Lowestoft



Trans-Equatorial F2 reception of Ch. R1 Vladivostok in Perth, Western Australia by Anthony Mann. Note the characteristic smearing and multiple image effects



Good-quality Tropospheric u.h.f. reception of the Philips 5544 test card from Lopik, Holland on Ch. E27 by Gareth Price, Lowestoft

receive the 625-line negative-going video signals used across Europe (with the exception of France). In these days, with the adoption of 625-lines, little modification is necessary, there are even receivers available that already have v.h.f./u.h.f. tuners fitted and just a few of these may incorporate 5.5/6MHz sound intercarrier switching to enable the sound of the UK u.h.f. and West European v.h.f./u.h.f. services to be resolved. So, for a price, DXTV watching can be extremely easy—the dealer may even wire on the 3-pin mains plug! Unfortunately problems can result with the use of such receivers, which will be expanded on shortly. At this stage consideration of how to receive Sporadic E in Band I must be given, since this provides the easiest means of DXTV operation and at lowest cost (both in terms of labour and finance!).

As already mentioned, the enthusiast can contact his local discount warehouse or TV dealer, establish which receivers have 625-line v.h.f. coverage, possibly with 5.5/6MHz switching, and simply write out a cheque. The question of aerials will be dealt with later. The second way of achieving v.h.f. coverage is to make use of the standard u.h.f.-only receiver, preferably with a continuous tuner (i.e., one marked with Chs. 21–68 on a rotary scale), since push-button tuning—unless there are about 10 buttons—is operationally inconvenient and clumsy. The receiver in its unmodified form can be used directly for u.h.f. Tropospheric DXing, but with the inclusion into the system of a device known as a v.h.f./u.h.f. up-converter, the receiver then can be tuned over Band I and Band III. The up-converter is a small transistorised frequency converter that transfers the 40–250MHz spectrum to an equivalent slot in the u.h.f. bands, often in the Ch. 30 to Ch. 60 region. Therefore, by plugging a Band I aerial into the converter, connecting the output of the converter to the u.h.f. aerial socket of the TV receiver, and tuning the latter over the appropriate u.h.f. channels, Band I will be resolved on the u.h.f. receiver—simple but effective. The up-converter unit will normally be fitted with a wideband r.f. amplifier stage and give a throughput gain of up to 4dB. The noise figure is typically around 6dB but experience has shown that these converters can be used successfully for DXTV operation even on weak Band III Tropospheric signals.

A third means of receiving DXTV signals is by obtaining and modifying an earlier dual-standard (405/625-line) receiver. This does call for a degree of skill in the enthusiast, since modifications will entail separating the video detectors from the i.f. strip, the object being to utilise the narrow i.f. bandwidth (System A) but with the negative detector. The benefits are improved selectivity and higher gain with lower noise. For such work either the existing receiver's v.h.f. tuner can be replaced with a modern varicap equivalent, or the original tuner can be used as an i.f. pre-amplifier stage and tuning carried out with an external varicap tuner unit. The advantage of the latter method is that i.f. shaping and limiting circuits can be fitted in the i.f. feed to the main receiver, such circuits again being aimed at the improvement of weak signal working and rejection of adjacent interference. When such work is undertaken the sound signal accompanying the received video will be lost, since we are working with reduced i.f. bandwidths. With intercarrier sound this signal proceeds along the vision i.f. strip and is then taken into the sound i.f. strip at the video detector/video amplifier. Restriction of the vision i.f. bandpass down to around 3MHz will mean the sound is lost.

At this point I feel that great stress must be placed on the problems of i.f. selectivity. I am aware that many readers will be using imported v.h.f./u.h.f. receivers intended for reception of sound and vision. A glance at the Band I vision allocations will show that in many cases

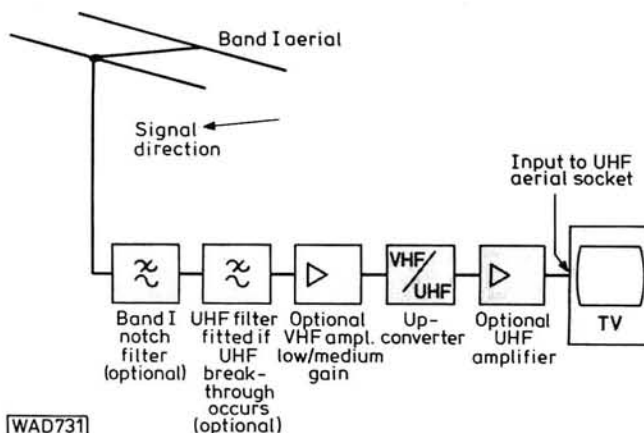


Fig. 3: Using an up-converter to provide v.h.f. coverage on a u.h.f.-only receiver

(assuming a 6MHz sound/vision separation for the UK standard) if a receiver is tuned to, say, Ch. E2 vision at 48.25MHz, the i.f. bandpass of that receiver will be capable of passing incident signals (other than the desired) if they fall within the spectrum of 48.25MHz to 54.25MHz. Indeed if above the 6MHz limit we have a strong "local" Band I station, there is every likelihood of it "splashing down" into the i.f. bandpass. Certainly if such a receiver is used at my home for receiving Ch. R1 video at 49.75MHz, the local Ch. B3 sound at 53.25MHz will all but render Ch. R1 useless, except for very strong signals, by producing "sound splatter". The problem is often made worse by the enthusiast using a high-gain aerial amplifier (pre-amplifier) whereas the correct course of action should be to notch-filter out Ch. B3 sound and then amplify. Even if there is no strong "local" to produce problems, in the first good Sporadic E opening Ch. E2 vision and Ch. R1 vision will tend to overlap and "float" over each other—such are the problems of the wide i.f. bandpass receiver.

Those enthusiasts in London living within 15 miles of the Crystal Palace Ch. B1 transmitter unfortunately tend to suffer badly with the 45MHz vision spreading up into Chs. E2/R1 vision. Again a simple notch filter on 45MHz will remove the problem, but of course the i.f. characteristics are preset, and given conditions when several strong signals are present (such as a Sporadic E opening) the problem will obviously recur. The answer is to use/modify the i.f. strip into the reduced bandwidth state, and this course is usually taken by the serious enthusiast. Such restriction can easily be incorporated by using the Philips G8 Selectivity Panel, a small active filter that has four tuned circuits capable of being "peaked up" and inserted in series with the feed from the tuner to the main i.f. strip. For exceptional selectivity it has been known for two such filters to be connected in series.

A final word if searching for an early receiver to modify. It must have very good field sync (i.e., frame locking on a weak signal) and flywheel line sync is essential. The Bush TV125/TV161 receivers are ideal for DX work and usually can be obtained at nominal cost.

For enthusiasts intending to modify an early receiver, it will almost certainly use a.c./d.c. technique—that is it will have a live chassis if connected to the mains the wrong way round. Ensure that you have a "dead" chassis, no connections go between chassis and other external units unless via isolation capacitors and always remember that death is permanent—240V will and does kill. So if in doubt—don't!

In Part 2, next month, we deal with aerials and aerial amplifiers for DXing.

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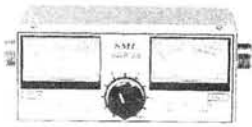
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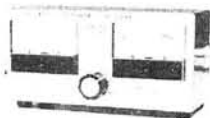
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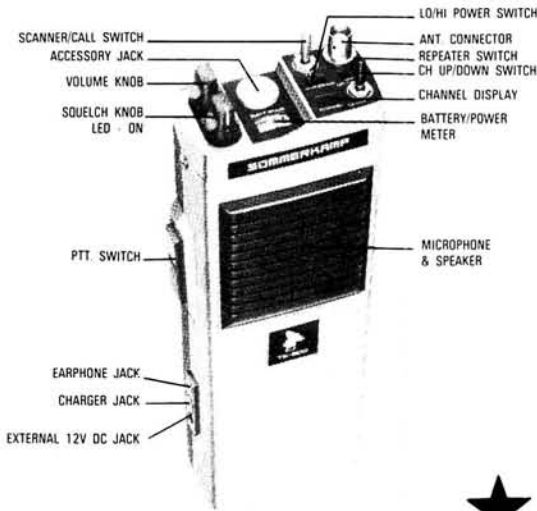
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 Frequency Control: Digitally synthesized PLL system
 Frequency Stability: 3×10^{-6} at 25°C
 8×10^{-6} at $\times 10^\circ\text{C}$ to +50°C
 Semiconductor Compliments: 17 Transistors, 5 FETs, 12 ICs, 44 Diodes
 Modulation Type: Frequency Modulation
 Supply Voltage: 12V DC
 Current Drain: Transmit: 0.4 A Receive: 0.025 A
 Antenna Impedance: 50 Ohms unbalanced
 Size: 230mm x 78mm x 43.5mm

TRANSMITTER:

Frequency Control: Phase Locked Loop Synthesizer
 Modulation: FM
 Power Output: HI.....2W LOW.....0.1W
 Spurious/Harmonic Output: Less than -60 dB
 Microphone: Condenser microphone

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USER REPORTS ON SETS AND SUNDRIES

SOMMERKAMP TS-802 2m Hand-held Transceiver

Recently introduced into the UK market is the TS-802 2m v.h.f. f.m. handy-talky, the latest in an expanding range of equipment from the Swiss Sommerkamp Co.

As supplied the rig has a scannable frequency range from 144.025MHz to 146.000MHz in channelised 25kHz steps derived from a phase-locked-loop synthesiser.

Received frequency is indicated on a miniaturised 2-digit, 7-segment red l.e.d. display which takes the form of channel numbers from 1 to 80 and R0 to R9 when repeater mode is selected (600kHz up-shift). The unfortunate result of this method of presentation is that display readings have to be decoded by the operator. For example, display channel 60 = 145.500MHz = S.20. However, until practice makes perfect, a look-up table, on the back panel, can be referred to giving display readings against true frequency.

Scanning of the available channels can be accomplished by manual step-through using the UP/DOWN toggle switch, or continuously by activating the scanning switch. The scan will cease when a signal above the preset reference level is detected.

The receiver circuit incorporates a conventional single-conversion superhetrodyne with an i.f. of 10.67MHz. The sensitivity quoted by the manufacturers is 0.5µV for 12dB SINAD (0.35µV p.d.), with a SQUELCH threshold of 0.5µV (0.1µV).

Selectivity given at 15kHz and 25kHz are -3dB and -70dB respectively. Italic figures given in brackets are those measured during our test evaluation.

The audio stage develops an output of 250mW into an 8Ω speaker with a specified 10% total harmonic distortion.

On the transmit side, the TS-802 produces 2W (1.7W) of f.m. in the HI position and 0.1W (0.3W) in the LOW. Spurious harmonic outputs are quoted as -60dB. An internally mounted, front panel capacitor microphone is supplied for normal hand-held use, but various optional handsets and "fist" microphones are available. These are interfaced via the multi-pin socket fitted into the top panel (normally hidden by the circular aluminium blanking plate).

Top-panel features, which are of necessity closely grouped, include separate VOLUME and SQUELCH, combined BATTERY STATE and "S" METER, SCANNER/REPEATER 1750Hz tone switch, SIMPLEX/REPEATER selector and UP/DOWN channel switch. The remaining feature is a BNC connector to take the supplied $\frac{1}{4}$ λ flexible rubber antenna. Side-mounted sockets are provided for earphone, charging line and external 12V d.c. supply.

Results

The initial impression of the TS-802 is made by its "chunky" solidarity. This is enhanced by an all-up weight of



1.14 kg. Being physically larger at 80 x 45 x 235mm, than equivalent hand-held rigs it was a surprise to find a conventional sized pack of 10 AA-size NiCad cells. The increased depth is required to house the large complement of on-board logic system integrated circuits (on the single-sided p.c.b.).

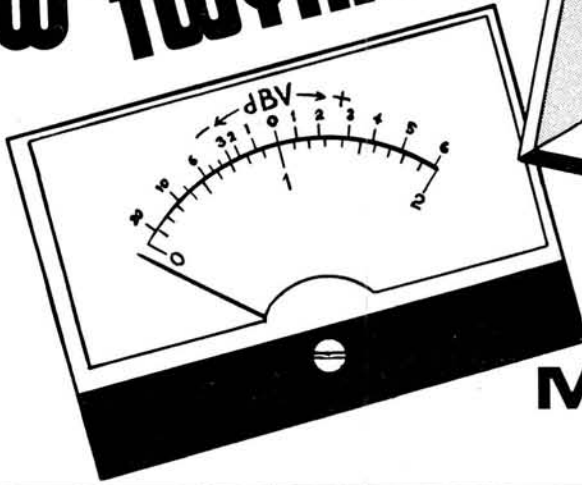
In operation the receiver section sensitivity proved adequate for the available power output, and in practice would probably complement a 10W outboard power amplifier if used in a mobile installation. Normal hand-held operation consists of holding the front grille close to the mouth and depressing the side-mounted p.t.t. switch bar. After transmissions in excess of several minutes a "two-handed" technique was adopted to preserve the reviewer's right arm muscles for the application of vocal chord lubrication!

Modulation characteristics of the evaluation sample produced low-level muffled response reports from stations worked, indicating the need for an increase in audio-drive level. Repeater working with manual toneburst, such as that fitted to this rig, is a confirmed "two-handed" affair and for operational convenience auto-tone would be much preferred. Display legibility, in anything but dull ambient light, was found to be poor, caused by a combination of the small character size and lack of brilliance. With economising circuits designed in, an adequate drive level for the displays should not deplete the available power reserves that much.

Included in the basic transceiver package is a carrying case and shoulder strap, earphone and instruction booklet giving outline specification, circuit diagram and basic driving procedures. Detailed service information is not included.

The TS-802 is currently being offered by **Arrow Electronics, 7 Coptfold Road, Brentwood, Essex CM14 4BN. Tel: 0277-226470**, at £129 including VAT and carriage, and at this price merits serious consideration by anyone contemplating purchase of a 2m hand-held. Our thanks to Arrow for the loan of the review unit.

PW 'TWHYNHAM'



DIGITAL/ANALOGUE MULTIMETER PART 2

Michael TOOLEY BA & David WHITFIELD MA MSc

With the exception of the input connectors and displays all the components are mounted on a single-sided printed circuit board. The copper-track pattern and associated component layouts are shown in Figs. 18 and 19.

It is essential that the described layout is followed closely since any deviation from the published design may give rise to spurious readings caused by hum and noise.

The components should preferably be fitted to the p.c.b. in the following order: links (10 off); terminal pins (6 off); i.c. sockets; fixed and variable resistors; transistors, diodes and regulators; capacitors; rotary switch unit with the transformer being fitted last.

Switches

The switch assembly can take two forms, either printed circuit board mounting (RS Components 327-311; 6 off 327-591 and 1 pk. 327-327) or a conventional rotary type. The former, although considerably more expensive than the normal type, is much more convenient since the p.c.b. has been designed to mate directly with the pins of the switch wafers, each of which incorporates a small

"daughter" p.c.b., thereby eliminating all wiring from the switch to the p.c.b.

Details for assembling the printed circuit switch assembly are shown in Fig. 13. Before assembling the wafers it is first essential to ensure that they are set to position 7, identified by viewing each wafer/p.c.b. assembly from the wafer side and setting the rotating contact to the lower isolated static contact as shown in Fig. 14. Prepare the shafting assembly to accept the wafers as follows: Remove the control nut, lock washer and rotation stop limit from the shafting assembly. Turn the control shaft to the extreme anti-clockwise position (position 1) and then rotate the shaft clockwise counting the stops from position 1 to position 7. Carefully slide the wafers and spacers onto the shafting assembly checking the alignment of each as it is inserted. Note that only 3.2mm miniature spacers are suitable since they define the ultimate wafer pin spacing at the p.c.b.

Carefully insert the completed switch assembly into the p.c.b. pressing down gently starting at the front (first wafer) of the switch. Do not force the assembly as this may damage the pins!

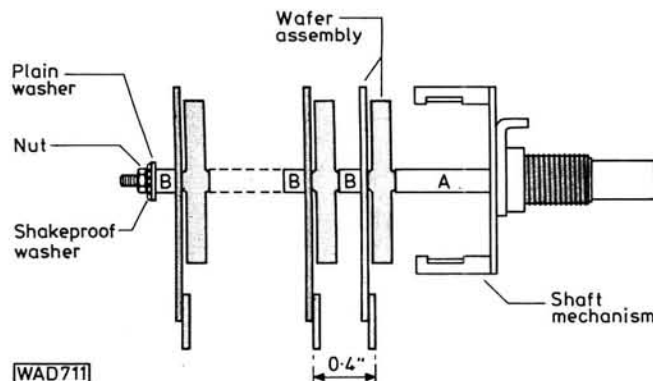
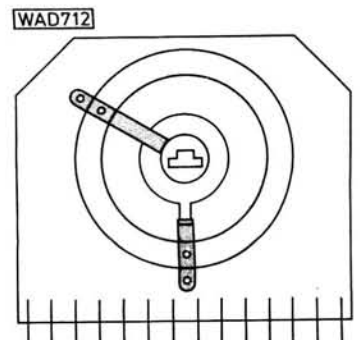


Fig. 13 (left): Details of the printed circuit type of rotary switch Fig. 14 (Right): Ensure that the switch wafers are positioned as shown before assembly



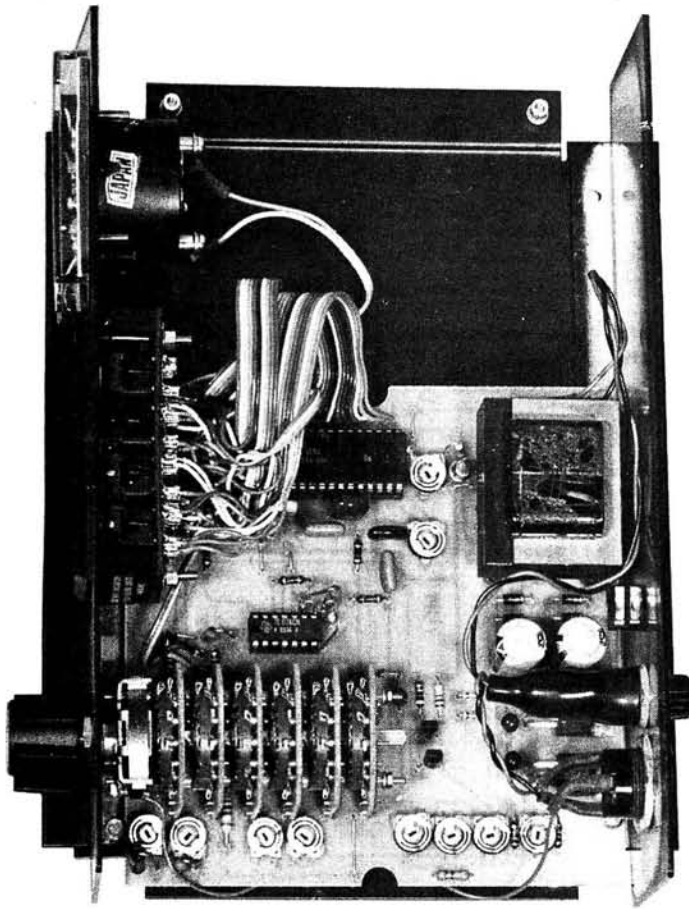
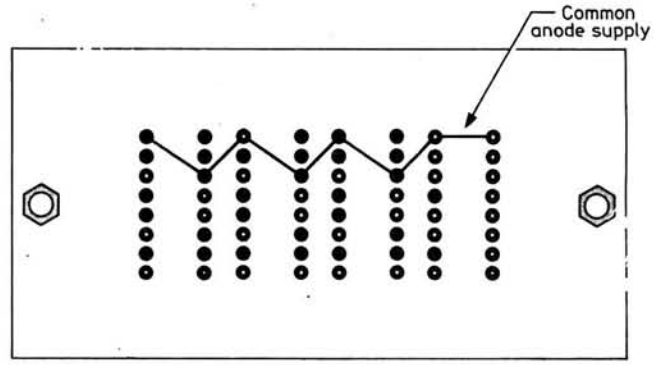


Fig. 15 (below): The pin connections for the 7107 integrated circuit. The photograph above shows the internal layout of the instrument

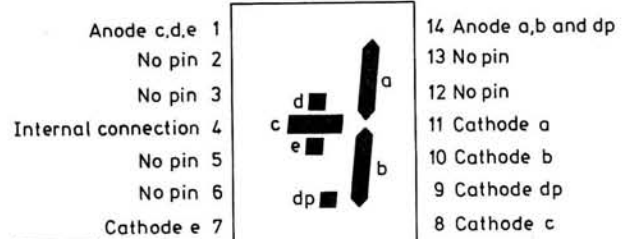
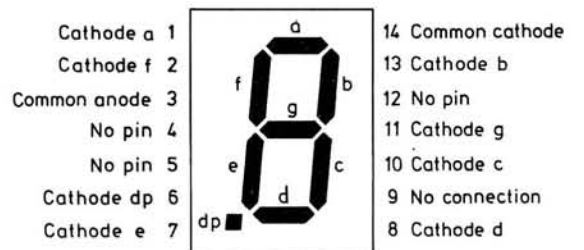


● Not connected
 ● Connected to main p.c.b. (see figure 19 for pin details)
 — Link

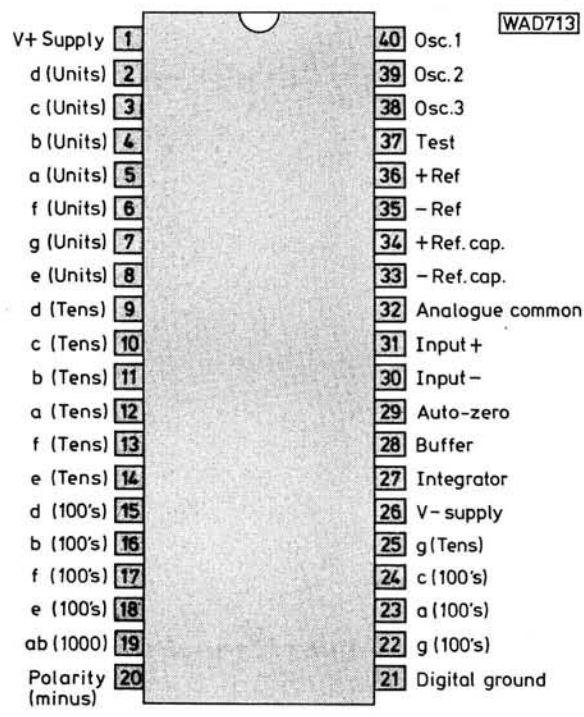
WAD714

Fig. 16 (above): The wiring on the back of the display bezel. The bottom row of pins is not used

Fig. 17 (below): Connections to the displays



WAD710



Wired Rotary Switch

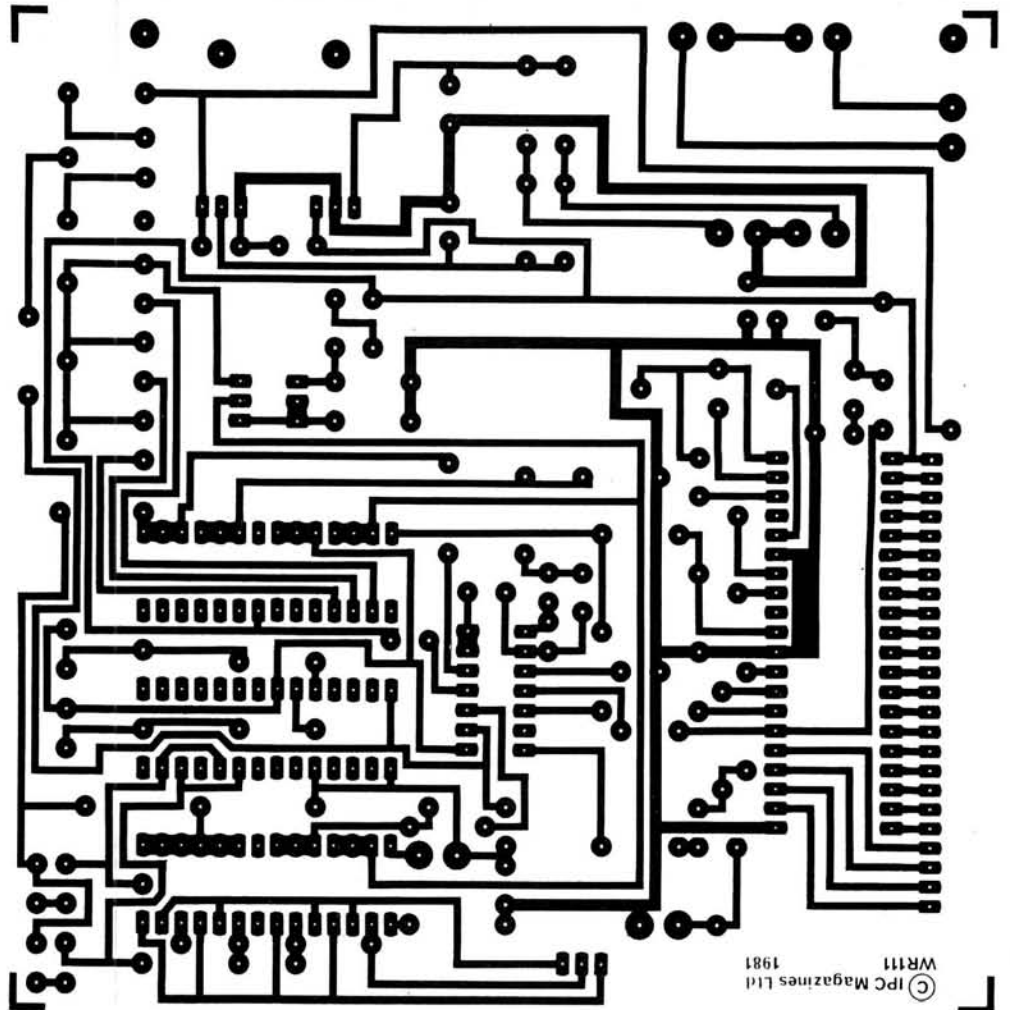
Care should similarly be taken to ensure the correct alignment of wafers when a conventional rotary switch is used. In this case, however, the spacing between wafers is not so critical. The switch wafers will need to be wired to the p.c.b. but note that, since not all the switch positions are used on some wafers, it will only be necessary to make a limited number of connections and some further economy is also possible by linking tags directly on the wafer rather than running all tags to the p.c.b.

In either case, check that the switch does not foul any of the components previously soldered to the p.c.b. and, in particular, it is wise to check that the variable resistors can be rotated throughout their travel. If this is not the case then the offending components can be eased slightly to clear the switch wafers.

Earth Link

When the p.c.b. is complete, carefully check the underside of the board for dry joints and links between tracks, then solder the copper braid link as shown in Fig. 19. This link is essential to eliminate a small (2-3mV) voltage drop

Fig. 18: The copper-track pattern of the p.c.b. shown full size. The component placement diagram, Fig. 17, is shown on the next page



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WR111
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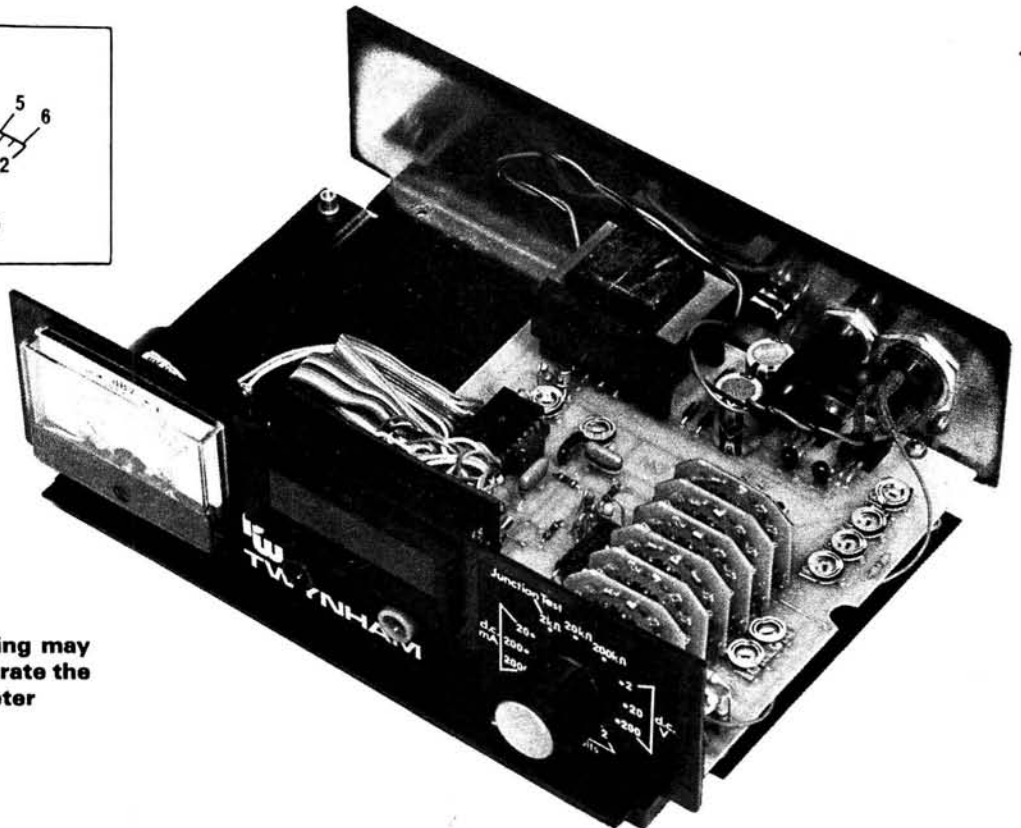
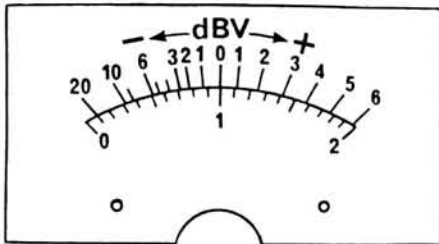
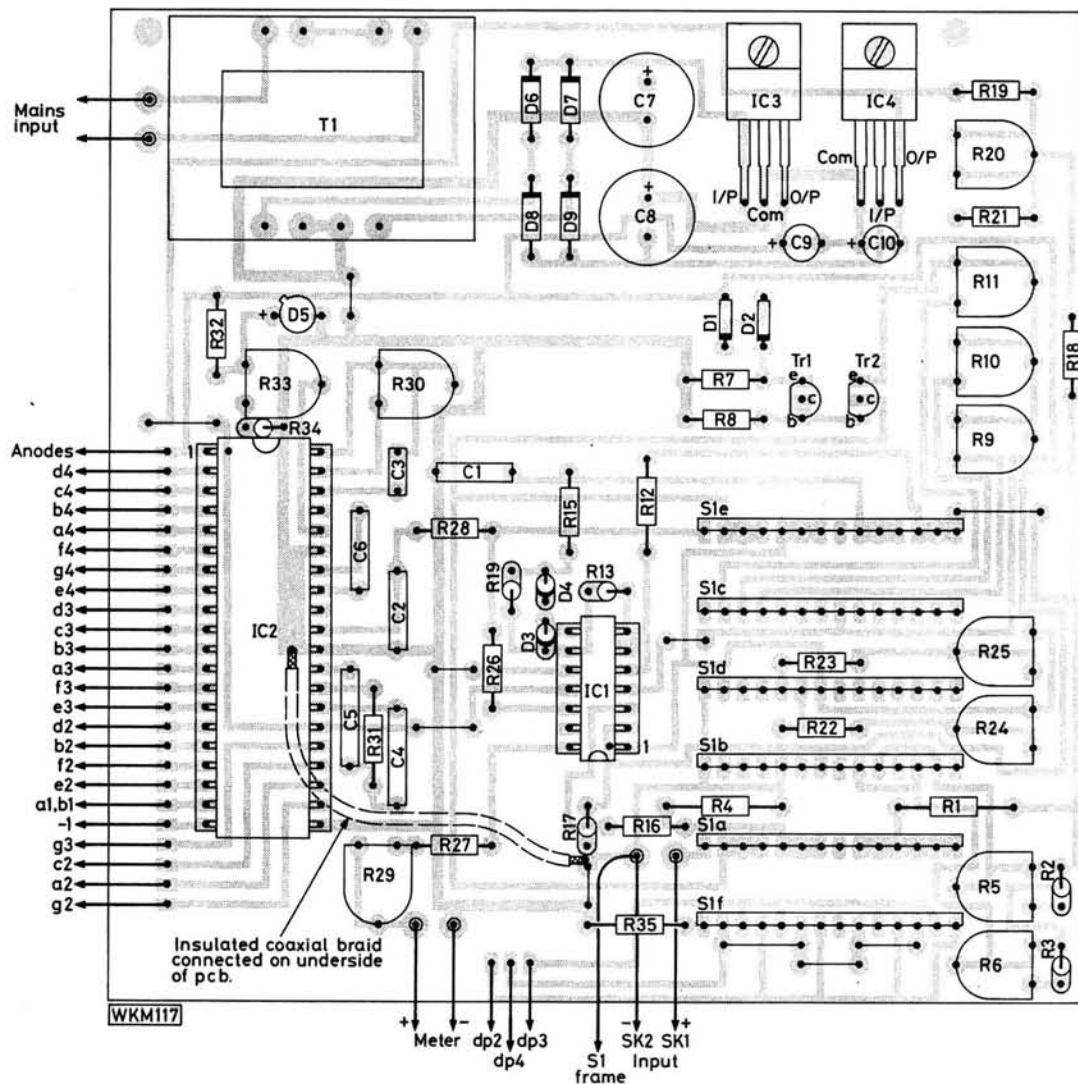


Fig. 20 (above): This drawing may be cut out and used to calibrate the dial of the analogue meter



which appears along the common 0V rail of the p.c.b. between the input terminal and the input pins of the 7107. The link should be as short and direct as possible and should be sleeved in order to prevent short-circuits. A length of coaxial cable would be ideal, with the inner conductor and insulation removed to leave just the braid and outer sleeve.

Finally connect the display to the p.c.b. using two short lengths of 20-way ribbon cable. The pin connections of the common anode i.e.d. displays are shown in Fig. 17, together with the rear of the display module wiring shown in Fig. 16.

Initial Checks

When the wiring is complete the integrated circuits (7107 and LF347) should be inserted in their holders—checking carefully that the pin-orientation is correct! The mains supply should then be connected via the fuse specified in the components list. The i.e.d. display should immediately become illuminated. If a digital frequency meter is available the frequency of the 7107's internal oscillator should be set to 50kHz (R30 set to approximately mid-position). The range switch should then be set to the 2V d.c. position with the input terminals short-circuited by means of a short jumper lead. The display should read

“000” (the first digit being suppressed). If the last digit is “1” rather than “0” this usually indicates either the presence of a small common mode voltage or the pick-up of hum and/or noise from the surrounding wiring.

When the short-circuiting link is removed from the input terminals a reading will appear on the display due to static charge accumulating on the input of the 7107. (This is due to the exceptionally high input impedance of the 2V range.) Switch to the 20V and 200V d.c. ranges and the display should read “0.00” and “00.0” respectively. Next check the over-range indication by switching to the three ohms ranges. On each of these ranges the leading digit “1” should be illuminated and the last three digits should be suppressed.

Part 3 will deal with the final calibration and use of the PW Twynham.

The following corrections should be made to the text in Part One.

- P20: R1 should read R31; C1, C6 and C2, C5.
- P21: VR1 should read R5; VR2, R6; VR11, R20; VR3, R9; VR4, R10 and VR5, R11
- P23: R10 should read R15; VR9, R30; VR10, R33; R22, R31; R23, R32; R24, R34. R35 was omitted from the components list and is $150\Omega \frac{1}{4}W$. R32 in Fig. 11 is shown as R23 and R30 should be a preset.

PRODUCTION LINES

ALAN MARTIN G8ZPW

4-metre Equipment

Microwave Modules Ltd. have recently introduced a new series of their popular all-mode transverters for the 4-metre band.

Originally only the MMT70/144 was available to down-convert from 144MHz to 70MHz. However, this new series of 70MHz equipment now includes the MMT70/28, which allows 28MHz transceivers to be used on 4-metres.

These new transverters feature the usual high quality construction techniques, with the following features; 10 watts r.f. output from rugged p.a. transistor; linear all-mode operation; low-noise receive converter (2dB noise figure) and r.f. VOX change-over.

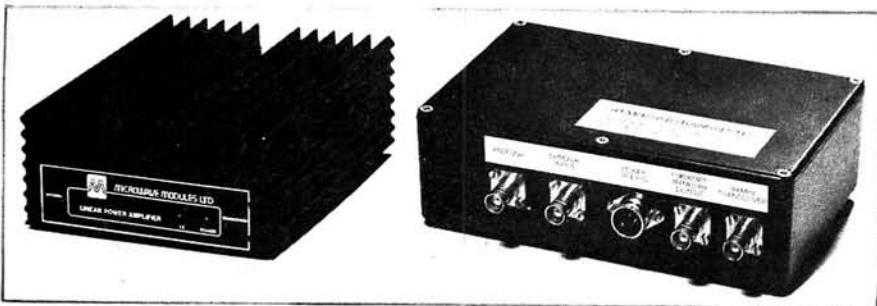
The development of the MMT70/144, which was originally a single conversion device, has resulted in an improved design, built around a double conversion principle, which down-converts the 144MHz signal before the second conversion up to 70MHz. This development has also formed the basis for the MMT70/28.

To complement this transverter range, Microwave Modules have also announced two linear power amplifiers for 70MHz, which will provide 40 watts output (MML70/40) and 100 watts output (MML70/100), both for 10 watts input. (Prospective f.m. operators please note 50 watt power restriction on this band.)

The MMT70/28 and MMT70/144 each cost £115 inc. VAT, plus £1.75 p&p, the MML70/40 costs £69 inc. VAT, plus £1.75 p&p and the MML70/100 costs £142.60 inc. VAT, plus £2.75 p&p.

The transverter range could be of particular interest to Class B licence holders, should the UK Authorities ratify the recommendations made at WARC 1979 in Geneva, which will allow them to enjoy the freedom of working the 4-metre band.

Further details and advice regarding these units may be obtained by contacting: *Microwave Modules Ltd., Brookfield Drive, Aintree, Liverpool L9 7AN. Tel: 051-523 4011.*



Hand-held Box

A pocket size, hand-held box, ideal for housing remote control handsets, instruments, etc., is the latest addition to the Vero range of plastic enclosures.

It incorporates a 20 x 50mm cut-out slot which may be used for fitting a display panel or switches and a 12 x 35mm recessed panel for labelling. A 71 x 107mm p.c.b. can be accommodated in the top section of the two part body by the use of four self-tapping screws, whilst the bottom section will house a 56 x 105mm p.c.b. The two sections snap together and are secured by four screws which enter through the base.



There is an integral battery compartment which will accept a PP3 battery and has a slide-off cover allowing easy access.

This attractively styled enclosure (order No. 652996H) costs £2.90, which includes VAT and p&p, is available from: *Vero Electronics Ltd., Industrial Estate, Chandler's Ford, Eastleigh, Hants SO5 3ZR. Tel: (04215) 66300.*

More on page 64▶▶▶

Light Bender

Edward Fletcher and Partners announce the availability of a new British-made product, the Light Probe.

Comprising a small hand-held torch and 230mm of 3mm diameter flexible fibre optic light guide, the Light Probe can be used for illumination and inspection in inaccessible areas, or where a direct light source will not penetrate. By using fibre optics, the light from the torch can be "bent" around corners as required. The fibre optic light guide can be detached and the torch used conventionally.

Main users might include the handyman, garage mechanic, electrical or electronics enthusiast and model maker. The Light Probe would make an ideal gift or novelty item, and also serve as an introduction to the new technology of fibre optics.

The price of the Light Probe is £1.99, which includes VAT and p&p (two HP7 batteries, not included), and is available only from the manufacturers: *Edward Fletcher & Partners, 25 West Park Road, Kew, Richmond, Surrey TW9 4DB. Tel: 01-876 2204.*



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MMT70/28

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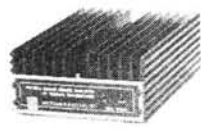
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MMT70/144

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introducing

RTTY

part 5

Jeff MAYNARD G4EJA

The microprocessor has brought quite a revolution to RTTY. The equipment from Hal outlined in the previous part of this series is only possible because of the microprocessor. Also possible is the use of an existing microprocessor-based system for RTTY purposes. So the Pet or Apple, or home-brew system, can be used to decode and display or originate RTTY. The advantages are numerous and include domestic acceptability (how many XYLs appreciate a Creed 7B thumping away in the attic?), availability and versatility. It is the latter that this article will concentrate upon.

Reception

First, the reception of RTTY by home computer. Before a program can start to examine any potential RTTY signals, it is necessary to convert the incoming tones into a suitable (i.e., TTL-compatible) signal. This is easiest to achieve with a p.l.l. as shown in Fig. 36 (Part 2 of this series should be consulted for a full description of p.l.l. demodulators and alignment details for the circuit shown).

With this interface the user can feed TTL-level Baudot code (plus noise, QRM, c.w.), etc., to an auxiliary input port. It is possible of course, to convert the Baudot to parallel form via a UART (universal asynchronous receiver transmitter) and change from a serial- to a

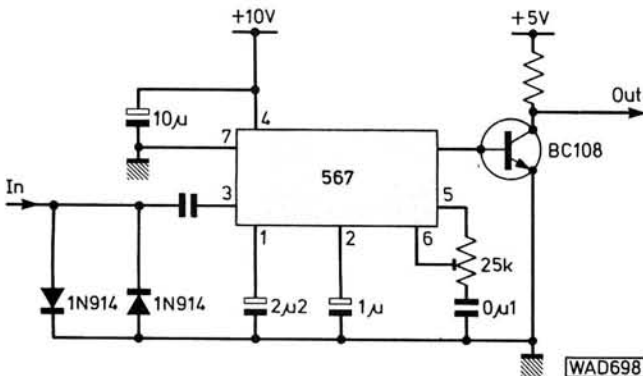


Fig. 36: A TTL interface for the home computer

parallel-type interface. However, use of a serial interface avoids the need for additional hardware and allows the conversion, when necessary, to be done by software.

In the no-signal condition the RTTY input sits at mark (TTL level high or 1). A new character is always signified by a change from mark-to-space (high to low) for 22 milliseconds. This is of course followed by further mark/space transitions but we can return to these later.

The simplest way to identify RTTY by software is as follows: The program will wait until a mark-to-space transition first occurs; if this space is still present 11ms later it can be taken as a mark. The signal is then examined at 22ms intervals from this mid-point—i.e., in the middle of each expected element—and a mark or a space registered. Following the fifth data bit, the signal should revert to mark for at least 33ms (1½ stop bits). This procedure is shown in the flow diagram of Fig. 37. The output of this routine is a 5-bit representation of each incoming Baudot character. For example, the letter A would be 11000 where 1 is a mark and 0 a space. It is possible to be more selective in the acceptance of incoming RTTY by sampling the character elements more often. For example each element could be examined, say, seven times—every 3 milliseconds—and a decision made as to whether it was a mark or a space by majority. This technique can eliminate

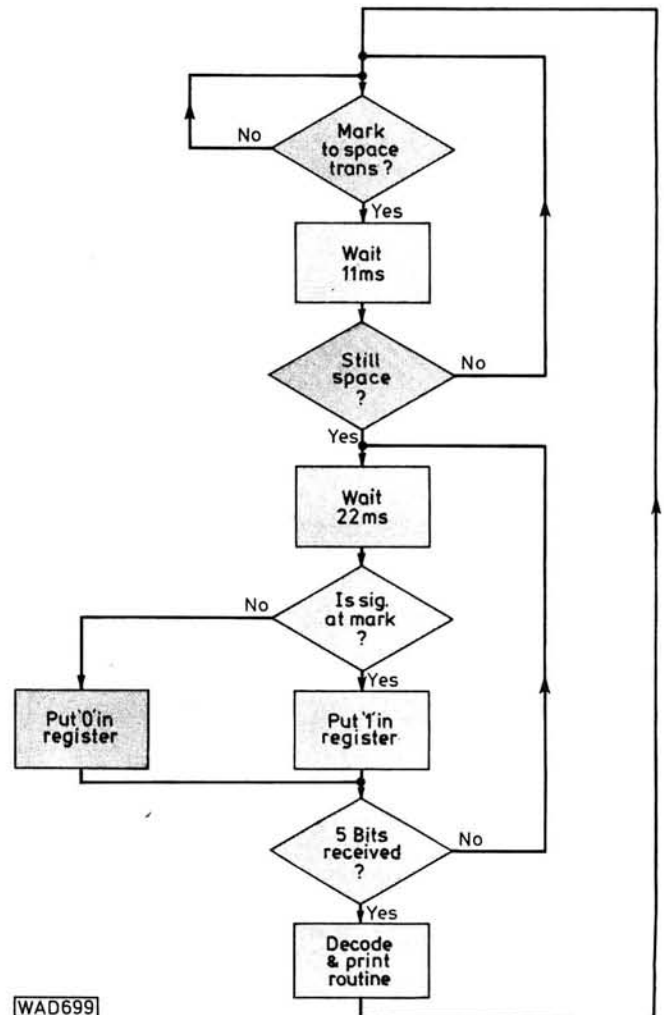
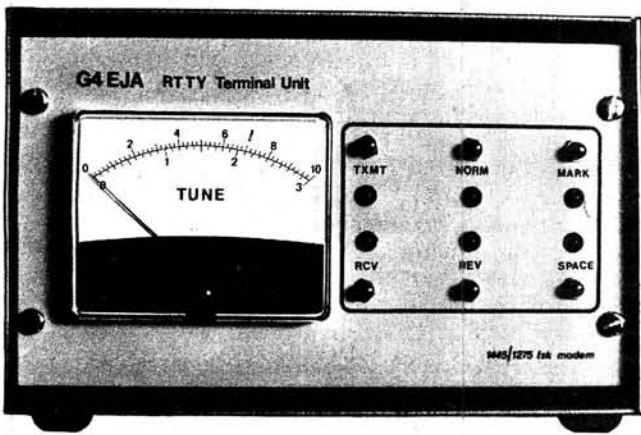


Fig. 37: RTTY to Binary conversion flow diagram



The Terminal Unit of the author's RTTY equipment

some of the problems of short noise bursts that coincide with a sampling point. Some scope for experimentation in respect of sampling frequency is clearly available.

Whichever method is adopted, the next problem is to fill in the box labelled "decode and print routine". The binary pattern (shown overleaf) is a representation of a Baudot character and as such is not directly compatible with an ASCII-based computer. To convert from Baudot to ASCII is quite simple—the Baudot code can be taken as a binary value. For example the letter T is 00001, carriage return is 00010, the letter O is 00011 and so on. Thus if the Baudot code is used as an offset to a table arranged in order of binary value, the appropriate character can be extracted directly. As another example consider the letter L, which having the code 01001 or binary 9 would have the ninth place in the table or list. Baudot codes of course represent two different characters depending on the shift being letter (lower) or figures (upper)—see Part 1. The look-up routine must take account of this by keeping a shift flag and referring to the appropriate table.

There are a number of refinements that can be inserted into a program between the decoding—as outlined above—and the printing or display of the characters. Some of these are discussed below.

Some home computers—such as the Pet—have a screen width less than that normally found on an RTTY machine. It is necessary therefore to insert carriage returns at appropriate places, taking care of course not to split a word.

To overcome the effects of QRM, it is often helpful to force the output to letter shift each time a space character is encountered. The program should include the facility to change shift from the keyboard whilst decoding is taking place.

Logging by program can be done by searching for key words such as "your call sign" DE . . . but more of this later when discussing transmitting by software. The s.w.l. can finish at this point, being unconcerned with the problems of transmitting, and can concentrate on finding the DX. There are a number of awards available for RTTY including those from BARTG, SARTG (Scandinavia), CARTG (Canadian), DARC (German) and RTTY magazine. A number of other awards—available to listeners and licensed stations—can be endorsed for RTTY. In this category is the Cheshire Award, administered by the author, for which no RTTY claims have yet been made.

Transmission

To transmit RTTY from a home computer requires first a reversal of the reception procedure. Individual ASCII characters must be converted to Baudot—the simplest method is to use the ASCII absolute value as the offset for a table look-up. The Baudot can be transmitted by switching an auxiliary output off for 22ms for each required space, remembering to leave mark for at least 33ms after the last bit and to precede the bits with a 22ms space. Suitable TTL to AFSK converters to drive the station transmitter have been described earlier in this series.

Note that the Baudot character is extracted bit by bit from the micro word by ANDing with 0000 0001 and then shifting right one bit (assuming that the Baudot representation has the signal bit 1 to the right). Incidentally, readers having difficulty following the programming techniques described might like to read the author's *Computer Programming Made Simple*, published in London by W. H. Allen and recently extensively revised to encompass the latest techniques and technology.

Transcribing from ASCII to Baudot and then to TTL is the simplest of the transmitting options. The greatest scope is in data and message manipulation—the limit being set only by the user's imagination (and perhaps system memory capacity!). Baudot uses figure- and letter-shift characters to assign alternate meanings to codes. Since this is not the case in ASCII, the user's RTTY program will need to insert shift characters as appropriate. A sequence such as shown in Fig. 38 will prove adequate. Many RTTY users find it useful to send a down shift (letter shift) each time a space is encountered.

Letter- or down-shift characters can also be sent during idle periods. For example a program could detect the fact that a key has not been depressed for, say, two seconds and start to send shifts. If text is being sent line by line—i.e., text output only commenced when a carriage return is keyed—the program can automatically send down shifts (this is known as "diddling").

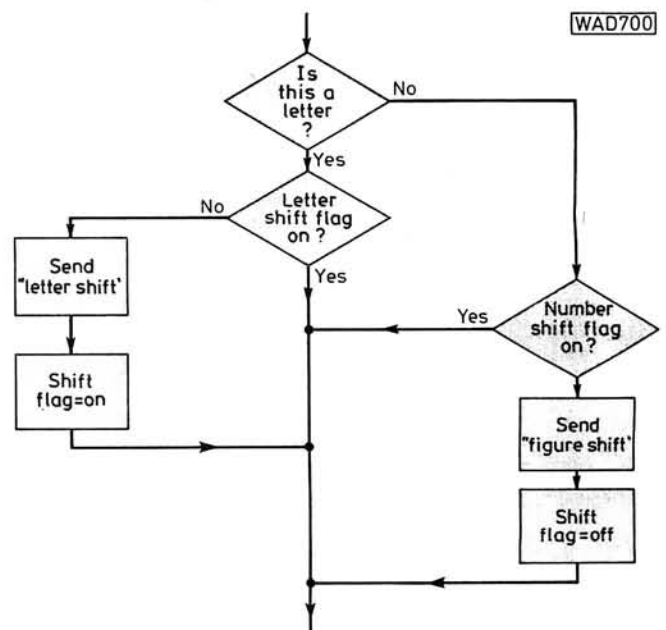


Fig. 38: A flow diagram for shift characters

A single ASCII code will indicate carriage return and line feed (CR/LF) but in Baudot these must be sent separately. It is useful—to the mechanical-based receiving station—if two carriage returns are sent; the inclusion of a down shift is another good idea. Thus, when the user presses “return” on his ASCII keyboard the Baudot sequence:

CR CR LF Let

should be generated.

Generating “standard” messages from a single key is—from the author’s own experience—one of the most useful features of a software-controlled RTTY station. A character with no Baudot equivalent—such as \$—can be selected to initiate standard messages. Thus the user could introduce ten such messages, for example:

```
$0 CQ CQ CQ CQ
$1 CQ TEST CQ TEST
$2 CQ DX CQ DX CQ
$3 RYRYRYRYRYRY
$4 THE QUICK BROWN FOX . . .
$5 DE G4EJA G4EJA
$6 IN WIDNES CHESHIRE UK
$7 YOUR REPORT IS RST
$8 PSE QSL VIA BUREAU
$9 DD/MM/YY 00:00 GMT
```

In the case of \$9, the program would of course insert the current date and the time of day. Clearly the user can extend this principle to a comprehensive range of messages including a station description (a popular RTTY topic). Again the limiting factor is imagination and memory capacity. The recording of time and date will be useful for log keeping if a hard copy is available. This is particularly the case in a contest where, to obtain maximum points, the operator must spend a minimum amount of time on clerical work whilst the contest is running. A word of caution though for those without hard copy. If log keeping information is held by software for later entry into the station log, the user must make provision for retrieving the information in case of mains or program (or any other) failure. Regular dumps to disc or cassette should be made just in case.

Reversing the mark/space tones (by inverting the TTL output) and changing the baud rate are two other useful add-ons to an RTTY program. Such is the importance of these parameters that a program-activated alarm (for a second or two) should accompany them.

Buying Software

If the inexperienced programmer finds the work required to achieve the above a little daunting (the more so because assembler language will be required to achieve the necessary processing speed) there is no cause for alarm. Ready-made systems are available for most popular home computers. A supplier of one range of amateur radio software is Nicomtech of Stephens Road, Saltash, Cornwall who has systems for TRS-80, Exidy Sorcerer, Apple and Pet hardware.

RTTY (and Morse) systems (produced by Macrotronics Inc. of California) are available for TRS-80, Exidy Sorcerer and Pet at £96.60, £96.60 and £67 respectively. These prices include a simple (phase-locked loop-based) terminal unit together with the necessary hardware interface for the computer system in question. The manual does point out that, in marginal reception conditions, a better t.u. will be desirable. Output from the

terminal unit is polar or +12 volts. Output for transmission is via a transistor (together with sidetone for Morse) which can be used to directly key a c.w. transmitter. For RTTY, however, an AFSK unit will have to be built. Any of the designs described earlier in this series will be suitable.

A package for Apple II users is also available from Nicomtech at £17.82. This provides only the necessary software and the user must construct a terminal unit and the necessary interface circuitry (diagram supplied with the software). From the same source are Apple SSTV programs and satellite prediction and logging for the Pet.

Copying RTTY QSOs on a video is just like reading the c.w. or phone parts of the band as regards format and terminology and so on. Stations will usually be found calling CQ on 20 metres (around 14.090MHz), and a typical RTTY QSO might go like this (author’s transmissions underlined):

```
CQ CQ CQ CQ DE W1ABC
CQ CQ CQ CQ DE W1ABC
CQ CQ CQ CQ DE W1ABC
PSE KKK
W1ABC DE G4EJA G4EJA G4EJA
W1ABC DE G4EJA IN WIDNES
PSE K
G4EJA DE W1ABC
OK OM TNX FOR THE CALL
UR RST HERE IS 579 579 579
NAME IS BOB AND QTH IS NY
SO HOW COPY??
G4EJA DE W1ABC PSE K
W1ABC DE G4EJA
OK BOB, ALL 100% HERE
UR SIG IS FB AT RST 599 599
NAME IS JEFF AND QTH IS WIDNES
RIG IS ATLAS 210 AND 2 ELE TRIBANDER
AT 40 FT. TU IS HOME BREW TO VDU
WITH 8K RAM
W1ABC DE G4EJA KKK
G4EJA DE W1ABC
OK, JEFF ALL COPY GOOD SIG FROM YOUR
ATLAS. RIG HERE IS TR7 FEEDING
3 ELE MONOBANDER AT 60 FT. RTTY IS
DS-3000 FROM HAL.
WX TODAY IS SUNNY AND WARM
THANKS FOR QSO AND QSL IS OK VIA
THE BURO. 73'S FOR NOW JEFF AND
CUAGN. G4EJA DE W1ABC AR SK
W1ABC DE G4EJA OK BOB, WX HERE
NOT SO GOOD. QSL IS OK AND WILL LOOK
FOR YOU IN THE CONTEST NEXT WEEK
73 73 73 DE G4EJA
BI BI
```

The final line would probably also contain a couple of bell characters. Contest QSOs are similar to those in other modes with the emphasis being on speed of course, although the exchange of information is very important. “Rag-chewing” is also popular on RTTY; the author has been known to chat to a state-side RTTY station for almost two hours, and has a regular sked with a Swedish club station.

RTTY has its adherents, as do the various other facets of amateur radio, and it is for the individual to decide whether RTTY is the mode to follow. The shortage of RTTY in some countries can give a new twist to DX; the author recently worked a station in OX (Greenland) only to be told that he was one of only two RTTY stations currently active in that country!

Letters to the Editor intended for publication must be original, and not duplicated to or copied from other publications. We reserve the right to shorten or edit them if necessary.

Letters

CB South Africa

Sir: I read your editorial of the September 1980 issue with more than the usual interest, simply because the situation of CB in your country reminds one of the pre-legalisation period of the same in South Africa a mere sixteen months ago. It started with CB sets being smuggled in from the USA, and "converted" amateur equipment. Within a few months the movement gathered momentum and got so out of hand the government was virtually forced to legalise CB. At that stage there was still the possibility of creating a civilised CB service, because the only way in which the latter can be established, is if the authorities stay one ahead of Cbers and the regulations keep pace with technology.

Unfortunately the South African lawmakers did not learn from the American experience, but blundered on the same path bound for chaos—and no excuse, they virtually copied part of the FCC rules. Only nine channels were given, which was the quickest road to frequency congestion and operator frustration. Since most sets were 40-channel, imported from the USA, everyone soon said goodbye to 9-channel CB by pulling out pins and removing hastily-added limiting circuits. With no s.s.b.-only and a.m.-only channels, we just as quickly inherited the American a.m. versus s.s.b. struggle. Unity gain omni-directional antennas were supposed to protect local communication, but eventually simply added to the congestion, which might have been relieved by directional arrays. Foreign DX was forbidden, but apparently the authorities had no knowledge of the sunspot cycle, and even worse, they gave us CB right in the explosion of a monster called Cycle 21.

Anyway, everyone soon got used to the novelty of doing their thing the legal way, and no-one was complaining, least of all the GPO who netted a tidy one million Rands (that's about £550 000) from licence fees within seven months. But then the Cbers grew tired of the mess, and after a period of pleading from one side and warnings from the other, the whole thing started falling apart. Forty per cent sold their sets, 30 per cent continued as before, and the rest erected beams and quads, installed linear amplifiers and converted their sets to 11 metre h.f. transceivers.

Right now the whole of the 11 metre band, from 26 to 28MHz, is lost for ever as far as government control is concerned, and the only hope for a truce between circling GPO vans and sneaking pirate stations is the drop of m.u.f. to its lowest readings. So, apparently the formula for establishing CB with some hope for future control, will be to legalise such

a service before John Citizen learns that he can key a mike: to give him the whole of the 11m band before he takes it himself: to give separate s.s.b. and a.m. frequencies: to legalise international DX; and to allow virtually any other technical conversion John C can do on his set—e.g., extended clarification on both receive and transmit, which gives more space.

A CB service somewhere in the v.h.f. bands is not going to eliminate illegal operation, and simply because of two factors; cost and lack of DX. A 27MHz system on the other hand gives much greater ground-wave range in relation to money invested. Even if a v.h.f./u.h.f. service is legalised in the UK, the pirate on 27MHz will not simply disappear. Once the "good buddy" operator moves up to the legal band, either because the GPO is getting too hot or because he can afford the more costly equipment, the only one to remain will be the DX operator on s.s.b. He is the backbone of the pirate movement, and being the more careful and clever operator, appears only when "skip is running". I have yet to meet the GPO official who tracks down his man when S9 signals are bombing in from all over the globe.

From what I hear and read, it seems your government is well on their way to contributing heavily to the growth of the international 11m movement. All I can say, is, keep on trying GPO hunters, patience radio amateurs, patience TV owners, patience all of you relying on communications in civil services, and happy DX UK pirates.

I have worked the world on 25 watts with a sloppy quarter-wave groundplane from Channel 1 to 99, and it was fun while it lasted. Fortunately I heard about amateur radio somewhere along the road, and being a sucker for DX and tinkering with resistors and such, found that there is a safer way in which to enjoy radio electronics. The final crunch came some months ago when the final amplifier stage went up in smoke. I am now converting it to a 10 metre set for the day when I may legally enter the world of amateur radio. But then no regrets about the "old days"—it taught me more than just the wonders of transmitters and receivers, and it's the poor man's amateur radio after all.

*The former Tango 7 and others,
Lutzville,
South Africa.
(Name and address supplied)*

CB Northern Ireland

Sir: I am writing in reply to your item *Making Haste Slowly* in *PW*, September 1980. I myself run two of these illegal transceiver units known as Citizens' Band Radios, along with at least 13000 other registered "good buddies" in Northern Ireland, and God knows how many others who are not registered.

I have to say that these illegal sets are the best thing ever to happen to Northern Ireland. As everyone is aware, the community in Belfast is divided by both political and religious differences, and there are certain parts of the city where it is unwise to go unless you live there. The CB radio has however broken down these barriers, and the whole community can "modulate" with each other without even caring what religious or political views each other hold. I myself have made several "good buddies" in West Belfast, who I would otherwise never have met as I live in the South Belfast area. The growth of CB radio has done more for the community in one year than all the politicians have been able to do in eleven years!

*"Big Muff"
(Name and address supplied)*

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. 3

Judging from the response I have received, modifying equipment is a popular pastime amongst amateurs, and I would like to thank all of you who have already contacted me with material. As this column depends on feedback from readers, please continue to write in if you have any tips to pass on.

In reply to queries regarding the simplicity of the mod for increasing the frequency range of the Trio TR-2400 that appeared in the November issue, it really is as easy as it seems. Just by cutting and resoldering one wire the TR-2400 can be made to cover 143.900–148.495MHz.

For other readers who have said that their TR-2400 is still under guarantee, and who are understandably reluctant to delve inside with a soldering iron, here is a way to “trick” the microprocessor into covering the extended frequency range without modifying the set in any way.

The first step is to hold down the REV REPT button and then key in 5500. Now release the button and the display will change to 6100 (145.500 + 600 = 146.100).

The transceiver can now be tuned between 146 and 148.495MHz by using the UP/DOWN buttons on the front of the set. When the display runs past 148.495MHz it will jump to 143.900. When this happens, only the UP button is effective, because pressing the DOWN button makes the display revert to 145MHz. Any frequency in the 146–148MHz range can be held in a memory for future use, and if one is, it is not necessary to repeat the procedure with the REV REPT button. To get back into the 146–148MHz range just recall this frequency from the memory and then move up or down with the appropriate button.

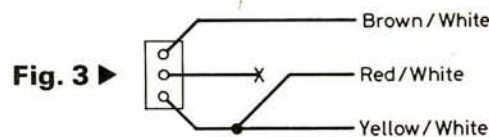
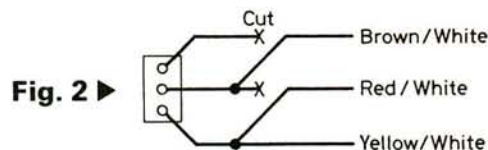
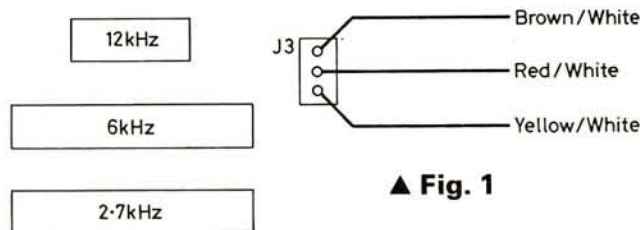
This “trick” only seems to work with early models and they can be recognised easily because their REV REPT buttons will not lock in the down position, whereas they will in the later models.

The major disadvantage with using this technique is that frequencies cannot be entered directly through the keypad.

I would like to thank Lowe Electronics for that idea, and for the following mod for the Trio R-1000.

Some keen DX a.m. listeners have said that they would like the selectivity to be narrower than the standard 12kHz (WIDE) and 6kHz (NARROW). This very simple mod will change it to 6kHz (WIDE) and 2.7kHz (NARROW) whilst leaving the 12kHz filter fitted in the set so that the mod can be reversed whenever required.

First remove the top cover and find J3, which is alongside the i.f. filters (Fig. 1). Then cut the brown/white and red/white wires and re-connect them as in Fig. 2. That's all, the mod is now done. Should 6kHz prove to be too narrow, connecting the wires as in Fig. 3 will give 12kHz (WIDE) and 2.7kHz (NARROW). With both versions of this mod the bandwidth on s.s.b. is 2.7kHz.



WAM 022

Mr Colin Coker G4FCN, has written in with a little-known piece of information about Yaesu Musen and Sommerkamp equipment. Many of the receivers manufactured by these companies have 600Ω tapping on their output transformers, as well as the more usual 8Ω connections. This should be of interest to the many who are interested in RTTY, SSTV, etc.

It should be a very simply job either to fit an additional socket to the rear of the set and to wire it up to the 600Ω tapping, or to remove the wires from the existing extension speaker socket, solder them together and insulate them, and then to connect this socket to the 600Ω tapping. If the latter method is used, it does, of course, mean that an 8Ω extension speaker can no longer be plugged in.

Thanks for the very useful tip Colin.

Wanted

There must be many amateurs who want to modify their rigs, but don't know how. With this in mind, I would like to use this corner to publish requests from readers for mods that they would like to do, in the hope that someone, somewhere, will be able to enlighten them.

One request that I have received “on the air” from several people is for a mod to extend the frequency range of the Trio TR-9000. Can anyone help? If you can, or if you know any other mods, or if you would like to find out about a specific mod, please write to: R. S. Hall, Practical Wireless, King's Reach Tower (Hatfield House), Stamford Street, London SE1 9LS.

73's
Sam G8TNT



HF SSB TRANSCEIVER

Vic Goom G4AMW

The Preselector circuits are simple filters which are tuneable over the bands selected. Two separate filters are used, the required one being selected by the rotary switch S101.

To match into the G4CLF board a 50Ω port is needed. This is provided by the tap on L103 and L101. The basic impedance of each filter is 1kΩ and this matches into the Transmitter Pre-amplifier. When in the Receive mode the Preselector is connected to the aerial via RLB/1 and S101b and needs an input impedance of 50Ω. Again this is provided by the tap on L102 and L104, these acting as auto-transformers to give the desired impedance transformation.

The four coils, L101–104 are wound on Neosid A6 coil formers which should have 900 grade iron powder screw cores and aluminium screening cans (Table 1).

The preselector circuits are built up on a simple p.c.b. and it is recommended that the alignment is checked before the screening cans are permanently fitted to the board.

The four-gang variable capacitor (Jackson Type 5318/4/102) is fitted with a reduction drive having a 10:1 reduction ratio (Jackson Type 5870/3). The four leads connecting the preselector to the four-gang capacitor (C103,104,105,106) should be as short and direct as possible and pass through the four holes provided in the p.c.b. for this purpose.

Table 1

Band	Turns	Wire	50ΩPort	Former	Core
20m	20	26 s.w.g.	4T	Neosid A6	900
80m	60	30 s.w.g.	8T	Neosid A6	900

Small coaxial cable (RG174A/U or Uniradio 95) should be used for the connections to the 50Ω ports while the plain wire connection to the tops of L102 and L104 should be tucked around the side of the box as low down as possible.

★ components

PRESELECTOR BOARD

Capacitors

Ceramic

1pF	1	C102
33pF	1	C101

Variable, air spaced, 4 gangs

10 to 102pF	1	C103,104,105,106 (see text)
-------------	---	-----------------------------

Inductors

Wound on Neosid A6 formers (see Table 1)

20T tap at 4T	2	L103,104
60T tap at 8T	2	L101,102

Miscellaneous

Printed circuit board; 3p2w rotary switch; Neosid A6 coil formers and cans (4); Reduction drive (see text).

Tx Pre-amplifier

The Transmitter Pre-amplifier is at the front-end of a very high gain, wide bandwidth chain. To cope with this the Plessey SL610 i.c. was used rather than the cheaper 1600 series version.

The input impedance of the pre-amplifier is around 1k Ω and this matches the preselector output impedance.

Adjustment of the transmitter output power is made by varying R205. The output can be varied from zero to full power by this simple means and R205 is mounted on the front panel so as to allow the operator maximum flexibility and economy of battery power.

★ components

PRE-AMPLIFIER BOARD

Resistors

$\frac{1}{4}$ W 5% High Stability Carbon film

100 Ω	2	R202,203
1k Ω	1	R201
2k Ω	1	R204

Potentiometers

4.7k Ω	1	R205
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Capacitors

Ceramic

4.7nF	1	C203
10nF	2	C201,202
0.1 μ F	1	C204

Inductors

2T on FX1115 ferrite bead	1	RFC201
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Semiconductors

Integrated Circuits

SL610	1	IC201
-------	---	-------

Miscellaneous

Printed circuit board; Relay 6V, 2p changeover (RS349-642); FX1115 Ferrite bead;

Constructional Details

The Tx Pre-amplifier is constructed on a simple p.c.b. which will be mounted on 6mm spacers. All component leads should be as short as possible with the body of each part close to the surface of the p.c.b.

Small coaxial cable is used to connect the output of the pre-amplifier to the input of the Tx First Amplifier.

The Tx Pre-amplifier board also carries the additional relay (RLB/2) which is used to disconnect the preselector aerial input and short-out the coaxial aerial lead from the aerial relay RLA/2.

RFC201, and RFC301 in the Tx First Amplifier supply line, are simply 2T of 22 s.w.g. enamelled copper wire wound through an FX1115 ferrite bead.

TRANSMITTER FIRST AMPLIFIER BOARD

Resistors

$\frac{1}{4}$ W 2% Metal Oxide

2.2 Ω	2	R302,303
10 Ω	1	R304
47 Ω	1	R305
470 Ω	1	R301

Capacitors

Ceramic disc

0.1 μ F	1	C302
-------------	---	------

Tantalum bead

22 μ F 16V	1	C301
----------------	---	------

Inductors

2T on FX1115	1	RFC301
2T: 2 + 2T on Ferrite core	2	T301,302 (see text)

Semiconductors

Diodes

IN4002	1	D301
--------	---	------

Transistors

2N4427	2	Tr301,302
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Miscellaneous

Printed circuit board; FX1115 Ferrite bead; 2-hole Ferrite core (2); Terminal pins (10).

Readers who intend to operate the Helford 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.

Tx First Amplifier

This stage uses a pair of 2N4427 transistors in a push-pull configuration to provide the required level of drive to the r.f. driver stages.

The output from this stage can be increased by reducing R304 from the design value of 10 Ω . This will enable you to run the driver stage to 25W output which in a lot of cases will probably satisfy the operator.

continued on page 63 ►►►

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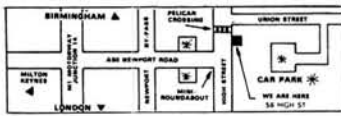
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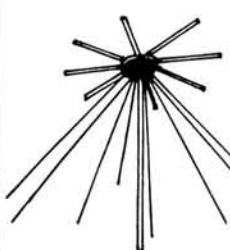
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CONSTRUCTOR'S SKETCHBOOK

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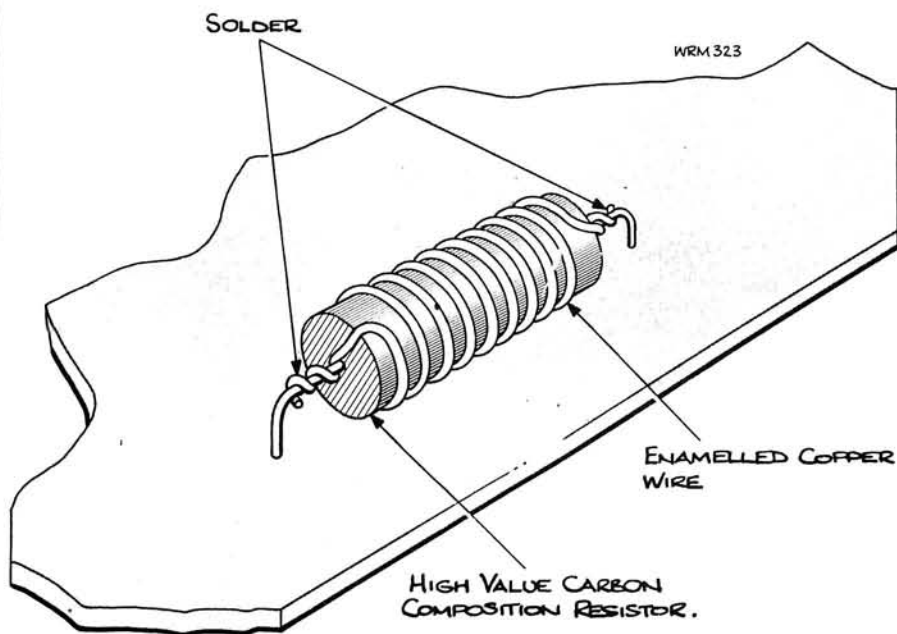
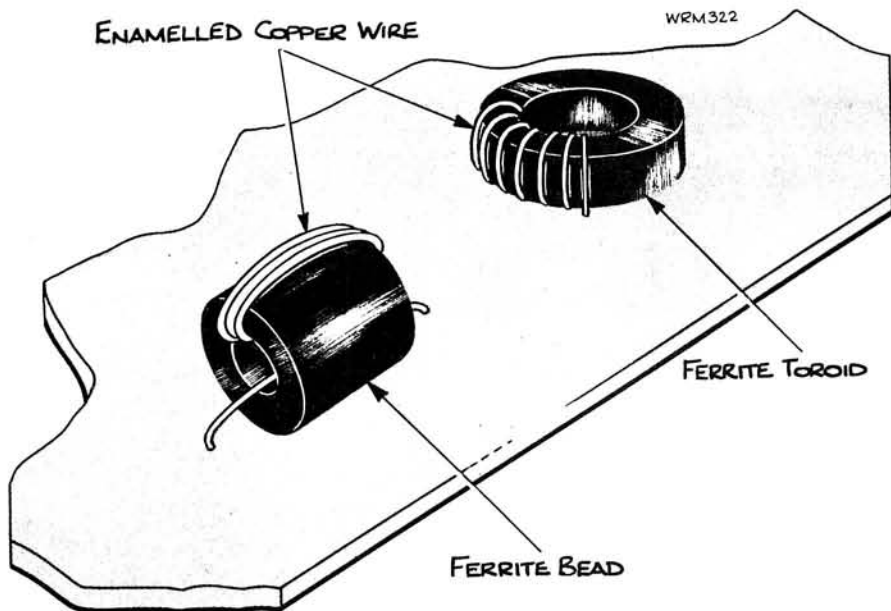
A FEW TURNS OF ENAMELLED COPPER WIRE WOUND THROUGH A SMALL FERRITE BEAD WILL KEEP r.f. OFF THE SUPPLY LINES. THESE BEADS ARE ALSO USED TO SUPPRESS PARASITIC OSCILLATIONS. JUST THREAD THE BEAD ONTO THE LEAD CONCERNED.

A FERRITE TOROID CAN ALSO BE USED PARTICULARLY WHERE TWO OR MORE WINDINGS ARE REQUIRED.

AIR CORED CHOKES NEED A SIMPLE FORMER. A LARGE VALUE CARBON COMPOSITION RESISTOR IS IDEAL. USE A 1W VERSION WITH A VALUE OF AROUND 150K Ω OR HIGHER. OCCASIONALLY A LOW VALUE RESISTOR (50 Ω) WILL BE SPECIFIED TO ACT AS A PARASITIC STOPPER AND DAMP THE CHOKE.

THE ENDS OF THE WINDING ARE SOLDERED TO THE RESISTOR LEADS - OF COURSE.

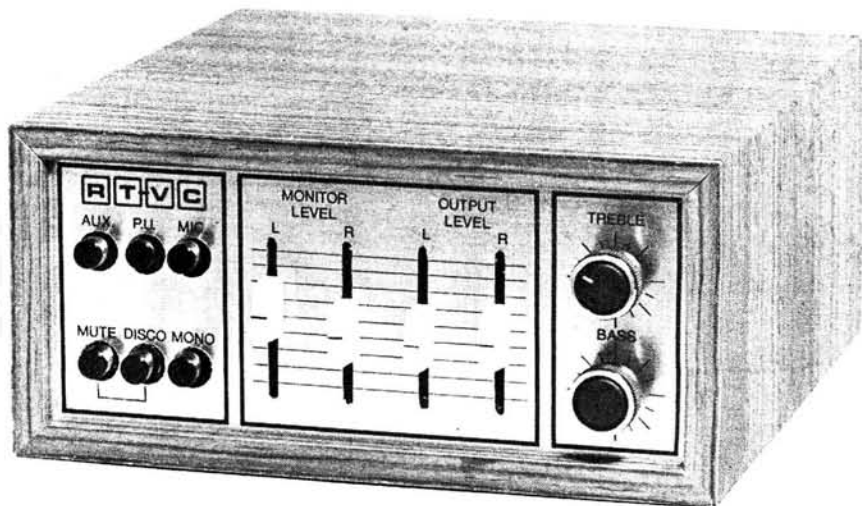
WRM324



**SPECIAL
PRODUCT
REPORT**

RTVC

**DISCO
AMPLIFIER
12+12**



In these days when equipment designs are getting ever more exotic and expensive, it is often forgotten that for some applications, a very acceptable standard of performance can be obtained by far less sophisticated means.

The 12 + 12 Stereo Amplifier Kit from RTVC, although by no stretch of the imagination using "state-of-the-art" techniques, will no doubt appeal to anyone looking for a very inexpensive way of listening to music or running a small p.a. or disco system.

Assembling the Kit

The pre-amplifier/tone control function is taken care of by a Mullard LP1183 module, which is a p.c.b. with 22 pins for external connections of inputs, outputs and controls, and using all discrete components. Two components have to be changed in each channel, and it is essential that desoldering braid is available for this operation, since the p.c.b. track lifts very easily if the soldering iron is applied for too long. (Time taken: 15 minutes including adding power supply links.)

The two power amplifiers have to be assembled from components and p.c.b.s provided. The complementary output transistors are mounted on an aluminium heatsink which doubles as the amplifier mounting bracket, and are connected to the p.c.b. by flying leads. The board is roller-tinned, but unfortunately all the holes have been drilled very much over-size so that mounting components is a very solder-thirsty operation. (Time taken: two hours for two amplifiers.)

All the controls (four slider and two rotary potentiometers, plus two 3-button switch assemblies) are mounted on the front panel, with the pre-amp. board stood off with long screws and spacers. Connecting up this lot is a long tedious process, and a goodly selection of different coloured wires (I used 14) is almost essential if mistakes are to be avoided. (Time taken to assemble and wire, excluding screened leads to input sockets: 2½ hours.)

The rear panel carries DIN input and loudspeaker sockets, stereo headphone socket and the selenium bridge rectifier and low voltage fuse holder for the power supply. There are also holes punched for optional mains on/off switch and neon indicator (not supplied). No hole was drilled for the fuse holder locating pin, and the rectifier mounting hole was

under-size. (Time taken to assemble and partly wire: 1¼ hours.)

The chipboard base of the amplifier provides a mounting for the front and rear panels, the two power amplifiers, the amplifier output capacitors, the mains transformer and the supply reservoir capacitor. The woodscrews required for fixing are not included in the kit, but must be supplied, along with wire, solder and glue for the cabinet assembly, by the constructor. The transformer weighs around 1½kg (3¼lb), and I personally would not like to risk fixing it with ½in or ⅝in chipboard screws. Instead, I used 4BA screws and nuts. Placing of the various parts is fairly critical, to allow clearance around everything, so check carefully before screwing down, not forgetting the four screened twin cables which will be required to link the input sockets at the rear with the selector switches at the front.

A "star" solder-tag is provided for the multiplicity of earthing connections, and this is fixed to one of the transformer mounting screws. This tag proved to be completely unsolderable, and reminded me of ones with similar properties which were around in the nineteen-forties and fifties. You can just imagine how popular they were in labs and on production lines! The remedy is to painstakingly file, scrape

★ **specification**

Power output:	12W r.m.s. per channel into 3Ω, or 24W mono with 2-channel mixing
Load impedance:	3-15Ω
Input sensitivity:	MIC; 2mV into 18kΩ PU; 150mV into 2.2MΩ AUX; 150mV into 2.2MΩ
Tone controls:	Bass; ±12dB at 60Hz Treble; ±12dB at 10Hz
Distortion:	0.1% at 5W at 1kHz
Hum:	Typically -55dB
Power requirements:	220-250V 50Hz a.c.

or glasspaper away every vestige of the plating around the component-lead holes before fitting the tag.

After mounting all the parts on the baseboard, the remainder of the wiring can be completed, and the front fascia fitted before putting on all the control knobs. The shafts on the two rotary potentiometers are too long and have to be cut down. The push-button knobs have a tendency to fly off, which can be either hilarious or annoying, depending upon the circumstances and your frame of mind. A drop of glue in each does the trick.

The cabinet top cover, which is also in plastics-veneered chipboard, is supplied ready mitred, and simply glues together. The recommended method of fixing the cover to the baseboard is by screwing through the mitred edges, but there is very little "meat" there, and I feel that a more secure way would be to use some form of tapped angle brackets.

Final assembly and wiring took a total of 4½ hours, making a grand total for the project (including 30 minutes checking off the components supplied against the list) of 11 hours.

The instruction leaflet is fairly easy to follow, except for the drawing of the input selector switch wiring, which was not too clear. No circuit diagram is given for the LP1183 pre-amp. module.

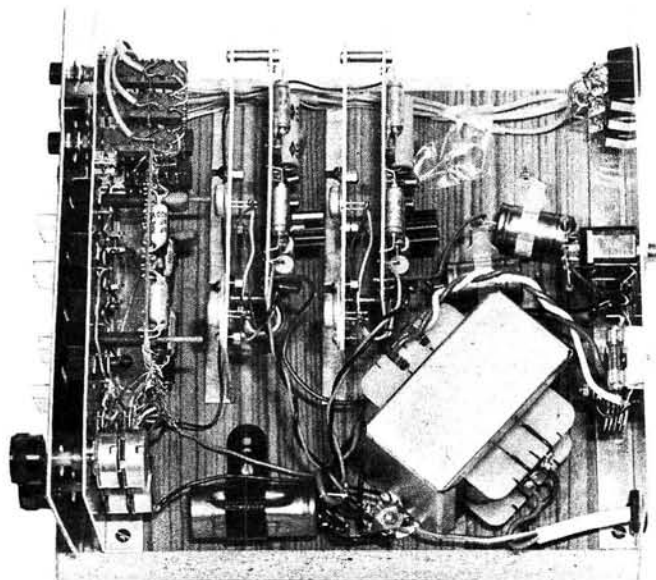
Results

The completed amplifier performed well except that noise emanating from the pre-amps was a little troublesome. This could possibly be improved by experimenting with different transistor types. The mains transformer runs very hot, and I would recommend adding some ventilation to the cabinet for continuous use.

Separate MONITOR fader controls set the output level to the TAPE OUT/MONITOR socket, which is combined with the AUX input socket. A MUTE button allows the power amplifiers to be muted, during recording, etc.

A MONO button allows the right and left pre-amplifiers to be paralleled at their inputs, whilst depressing the DISCO and MUTE buttons together parallels the power amplifier inputs, so that the right and left OUTPUT LEVEL faders then operate as a two-channel mixer.

Because of the design of the unit, construction time is fairly long, as there are a lot of connections to be made. If you have plenty of time to spare, then this kit is good value for money at £13.95 including VAT, plus £2.55 postage and packing if buying by mail order. See the RTVC advertisement in this issue for their addresses for personal shoppers and mail order.



Next month in **Pw**

again

8 Extra Pages OF PROJECTS & FEATURES

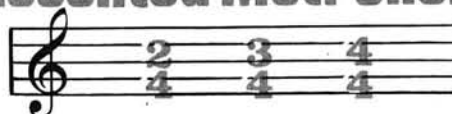
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UNDERSTANDING RECEIVER PARAMETERS





NIMBUS

Modular 2m Transceiver System

16-Channel Scanner

(Part 8)

Michael TOOLEY BA G8CKT
&
David WHITFIELD BA MSc G8FTB

There are two main functional modules, the control logic and the channel oscillators. The control logic provides the means by which the operator's requirements are used to select any of the 16 channels at any given moment, utilising digital logic elements.

The channel oscillators consist of two banks of up to 16 electronically switched crystal oscillators, one each for transmit and receive, employing analogue r.f. circuits.

Operating Facilities

The Nimbus Autoscanner has two main modes of operation, MANUAL and AUTO. In the AUTO mode there are a number of operational sub-modes, and a range of optional features. A diagrammatic representation of the total range of control facilities is shown in Fig. 2, and detailed descriptions follow.

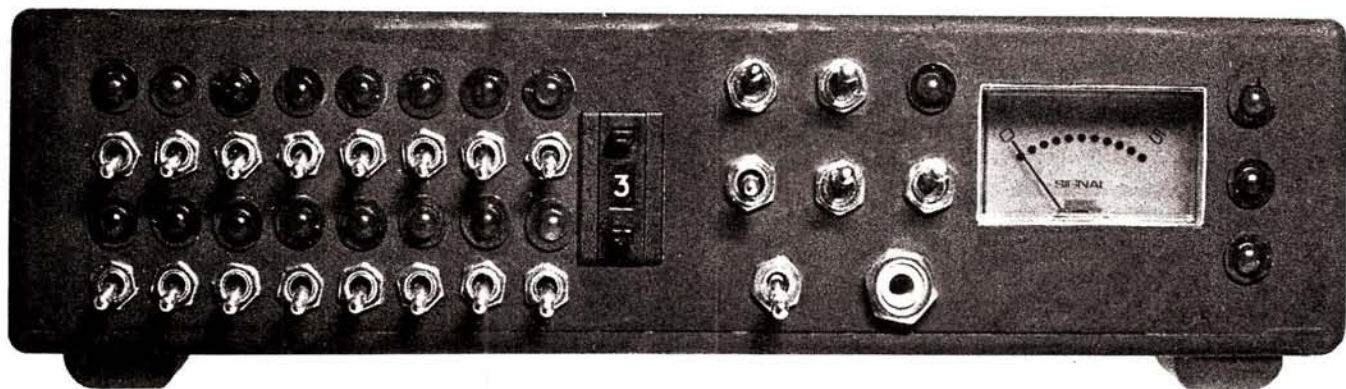
Manual Mode

In MANUAL mode the user selects the active channel directly by means of a hexadecimal-coded thumbwheel switch. Any change of switch setting, however, is ignored whilst the transceiver is in TRANSMIT mode. When the transceiver reverts to RECEIVE, the selected channel is updated to the new setting and continues to follow the switch setting until the mode again changes.

Auto Mode

In AUTO mode there are three operational sub-modes available, with a range of additional facilities, which may be used to tailor the Nimbus Autoscanner to the user's exact requirements. The sub-modes are as follows:

(1) SCAN causes the autoscanner to sweep through each of the 16 channels in turn. The time spent on each channel may be selected by the operator. In the unit



To further complement the Nimbus range of 2 metre equipment, the design presented here will expand the basic portable rig into a fully-fledged base station. It gives the user 16 additional channels that can be "interrogated" in several selectable modes including an intelligent scanning capability. As with the other items in the range, autoscanner may readily be used with similar v.h.f. equipment.

System Description

An outline block diagram of the autoscanner is shown in Fig. 1. The unit to be described either replaces or supplements the four manually switched channels provided in the Nimbus portable transceiver.

described, there are two switch-selected preset intervals of half second and two seconds. The user may also decide, at any time, to ignore any of the 16 channels without affecting either the order of the sweep or the time spent on each of the remaining channels in the sweep. Thus, for example, the autoscanner may be set up to spend two seconds on each of the channels 1-5-6-8-B-F in turn, repeating the sequence every twelve seconds. A further optional feature is the ability to sweep either continuously as just described, or to halt the sweep when an active channel above a predetermined "S" level is encountered. This is useful when monitoring a group of "vacant" channels, waiting for a signal.

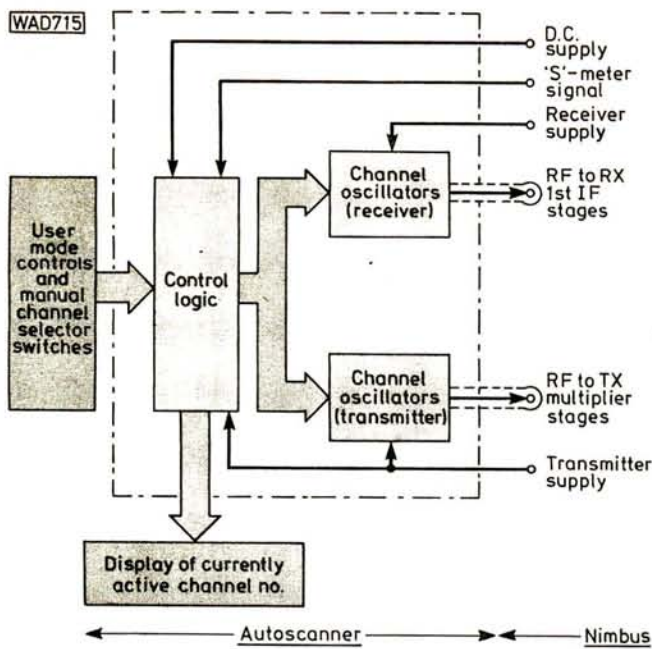
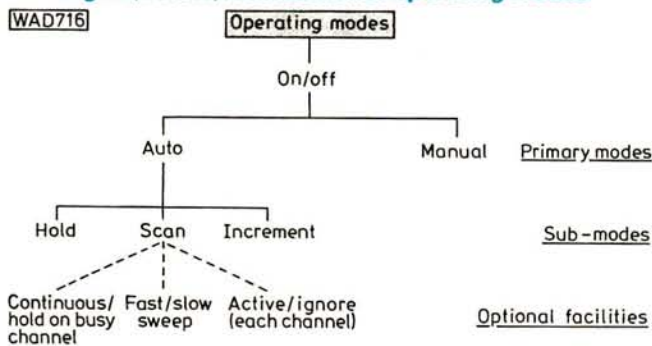


Fig. 1 (above): Block diagram of the PW Nimbus Autoscanner

Fig. 2 (below): Autoscanner operating modes



(2) HOLD causes the sweep to halt. This is useful when the hold-on-busy-channel facility in the SCAN sub-mode encounters the required signal.

(3) INCREMENT allows the user to step through each of the 16 channels in turn under manual control.

Channel Change Inhibit

In all modes and sub-modes, with the exception of INCREMENT, channel changing can only occur while the transceiver is in RECEIVE mode. The INCREMENT sub-mode allows channel change during transmission for test and alignment purposes, while making accidental channel change unlikely. At all times, the user is provided with a visual i.e.d. display of the currently selected channel.

Control Logic

The control logic determines which of the possible 16 channels is active at any given time, and thus it may be likened to an electronic channel switch. The different operating modes have already been described, and the mode selected is interpreted by the control logic to enable

the appropriate channel at the appropriate time(s). In all cases, only one channel may be active at any given moment, but the manner and the order of selection may be varied at will by the operator. The control logic also provides the operator with a constant i.e.d. indication of the currently selected channel.

A block diagram for the control logic is shown in Fig. 3. There are three main modules: the timing generator, sequencing logic and the channel selector. The logic is essentially TTL and occupies two printed circuit boards: one for the timing generator and sequencing logic and the other for the channel selector.

Timing Generator

The timing generator module provides the autoscanner sequencing logic with a number of related clock signals which are required for timing and control purposes. The idealised waveforms for these signals are illustrated in Fig. 7. In practice, the mark:space ratios will vary according to the scan rate selected, i.e., FAST or SLOW.

The circuit used to generate the timing waveforms is shown in Fig. 4. A precision timer, IC1, is used in an astable configuration to generate the master timing reference signal. The frequency of oscillation is set by R1 (only on SLOW scan rate), R2, R3 and C1. In SCAN mode, the control system is designed such that a new channel is selected for every 32 astable cycles that elapse. Switching R1 in/out of circuit, therefore, allows the sweep rate to be decreased/increased as required. The values specified for the frequency-determining components give sweep rates of approximately one new channel per half second (FAST), and one new channel per two seconds (SLOW). Constructors wishing to employ different sweep rates may use the formulae below to calculate alternative component values.

$$\text{Fast rate} = 0.0222(R2 + 2R3)C1 \text{ seconds/channel}$$

$$\text{Slow rate} = 0.0222(R1 + R2 + 2R3)C1 \text{ seconds/channel}$$

Resistances in kΩ
Capacitance in μF

CONSTRUCTION RATING Advanced

BUYING GUIDE

All components required for the PW Nimbus Autoscanner are readily available from suppliers advertising in PW. Printed circuit boards can be obtained from usual sources. The cost quoted below is for a fully crystallised, 16-channel unit.

APPROXIMATE COST £190 (FULLY CRYSTALLLED)

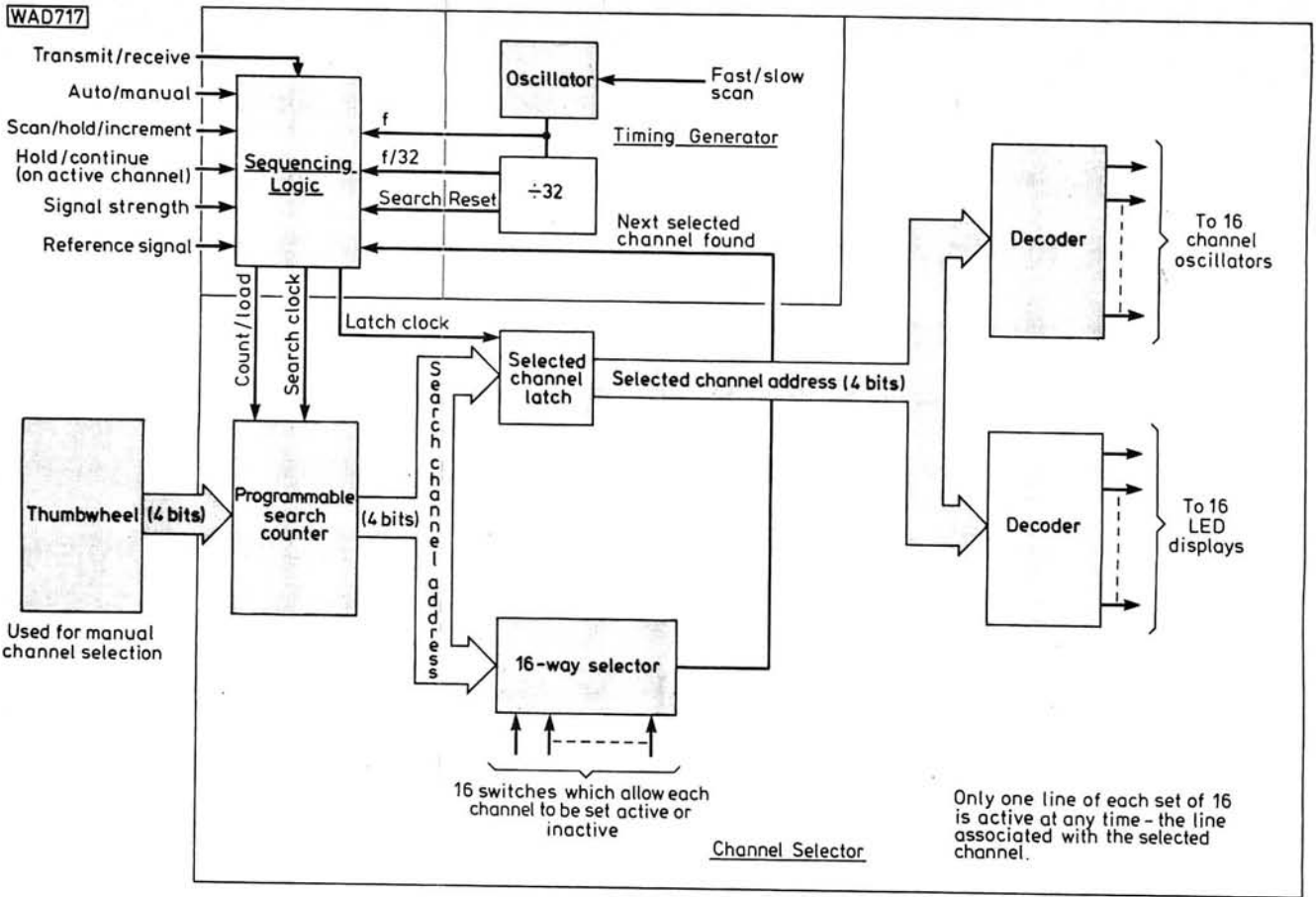
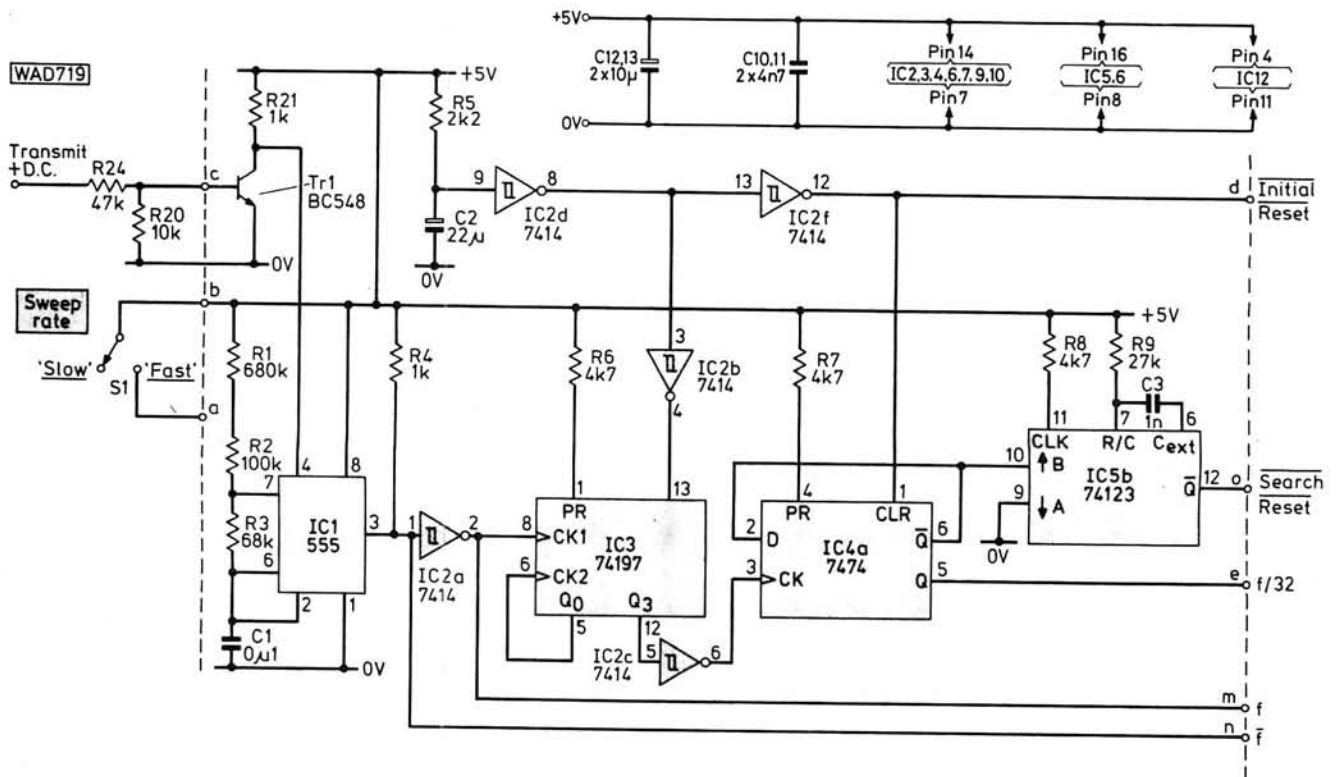


Fig. 3 (above): Block diagram for the control logic

Fig. 4 (below): Circuit diagram for the timing generator and associated power supply rails



If preferred, R1 and R2 may be replaced by a fixed resistor, to set the fastest sweep rate, in series with a potentiometer whose value will set the slowest sweep rate. Typically, a 2.2MΩ potentiometer in series with a 47kΩ resistor will provide a useful range of control.

The remaining timing and control signals are all derived from the astable oscillator output. The original reference (\bar{f}) is inverted to produce a second clock phase (f). A binary counter, IC3, and a D-type flip-flop, IC4a, are then used to divide-by-32 to produce the signal $f/32$. A monostable, IC5b, is arranged to use the falling edge of $f/32$ to generate a 10μsec negative-going reset pulse after every 32 astable cycles. The pulse duration of this reset is determined by R9 and C3.

The arrangement of R5, C2 and IC2d is used to provide a "power-on-reset" function whenever d.c. power is newly applied to the autoscanner logic. By this means, the control system is always initialised to a known state at switch-on.

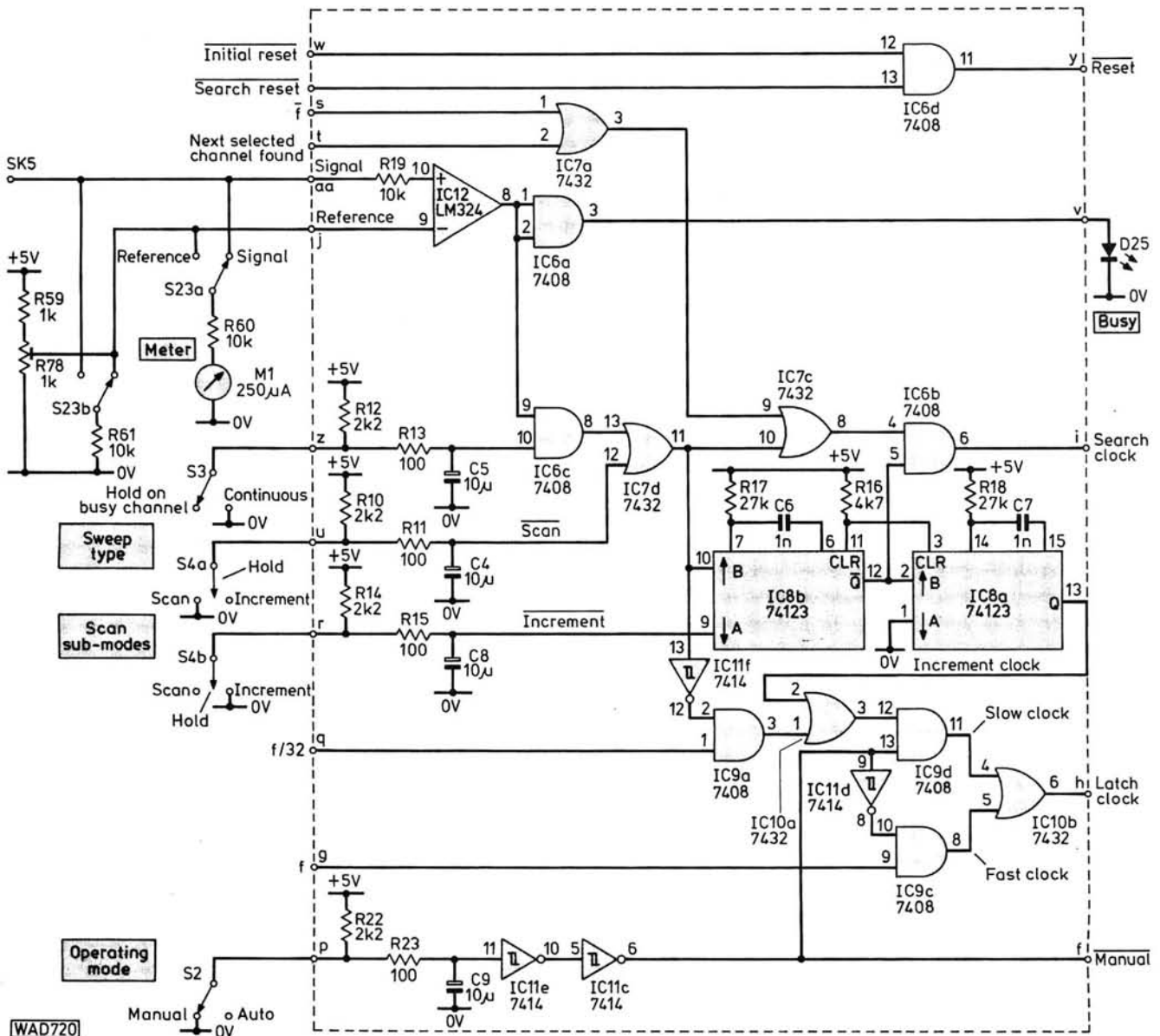
The \bar{Reset} input on IC1 is used to override the

autoscanner control logic and prevent any inadvertent change of channel while the transceiver is in TRANSMIT mode. The TRANSMIT d.c. supply rail is sensed by R20/R21, and turns on Tr1. The collector potential falls to near 0V, which provides a logic LOW to the \bar{Reset} input of the 555. This inhibits the master clock, and prevents any change of channel in either the MANUAL or the AUTO/SCAN modes. For test purposes, change of channel while in TRANSMIT mode is still possible by means of the AUTO/INCREMENT facility.

Sequencing Logic

The sequencing logic uses inputs from the timing generator and from the user control switches to produce the \bar{Reset} , Search Clock, Latch Clock, and Manual signals used by the channel selector board to determine which of the 16 channels is selected at any time. The circuit diagram for the sequencing logic is shown in Fig. 5.

Fig. 5: Circuit diagram for the sequencing logic



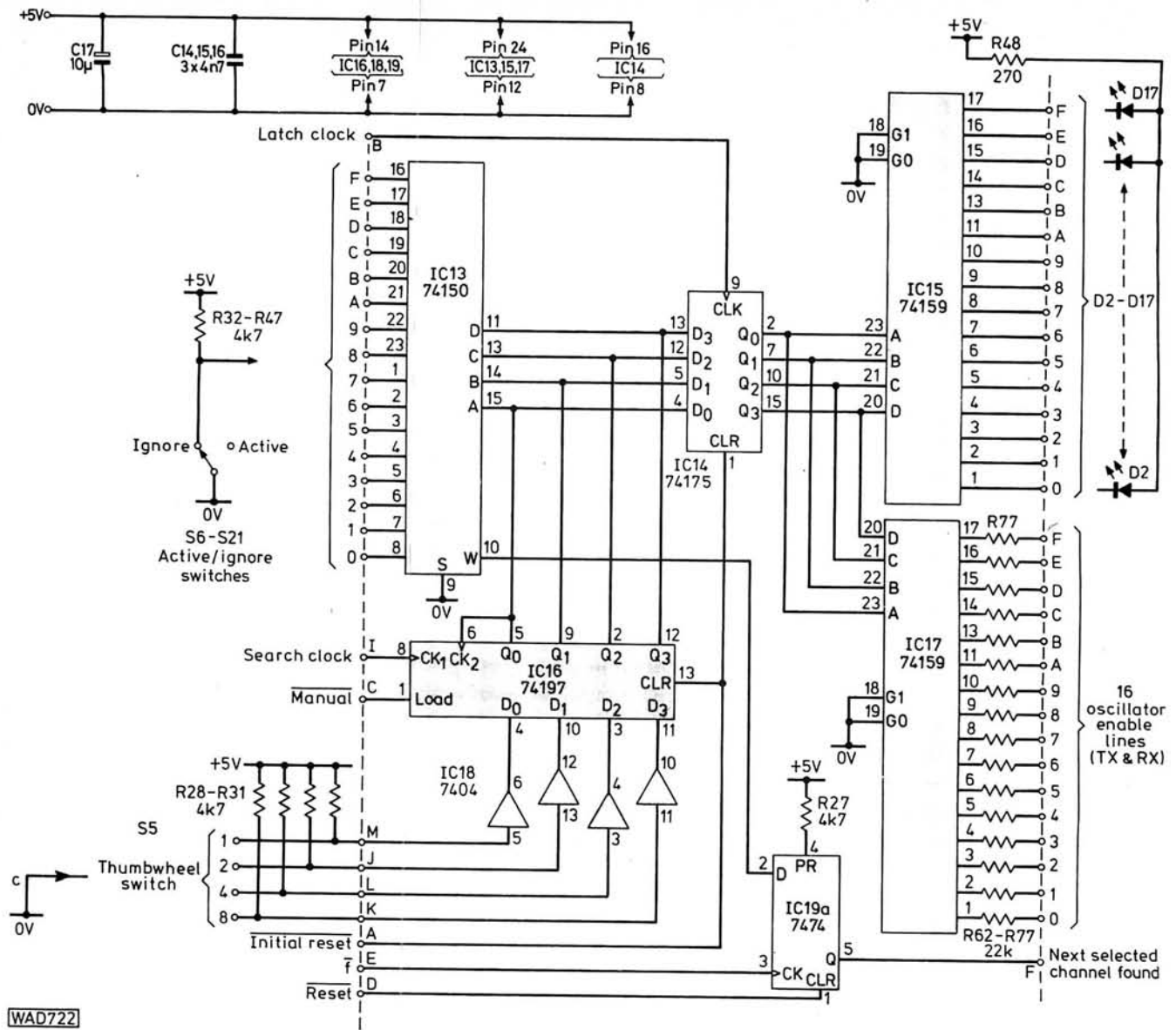


Fig. 6: Channel selector circuit diagram and associated power supply rails

The operating mode for the autoscanner is set to AUTO or MANUAL by S2. The arrangement of R22, R23 and C9, in conjunction with the Schmitt-input gate IC11e, is used to "debounce" the switch. This prevents multiple triggering due to contact bounce when the toggle switch changes over. After buffering, the level selected by S2 (Manual) is sent to the channel selector board for use as the primary mode control line and to the on-board Latch Clock steering logic.

The Latch Clock steering logic uses the Manual signal to determine whether the FAST Clock or the SLOW Clock is used to provide the clock function. In MANUAL mode, the FAST Clock (frequency = f) is used, while in AUTO mode, the SLOW Clock ($f/32$ or INCREMENT Clock, depending on whether the sub-mode is SCAN or INCREMENT, respectively) is used.

The AUTO sub-mode selection is performed by the two-pole three-position toggle switch S4. This switch has a centre-off position, used for HOLD, and is spring-biased-to-centre, used for INCREMENT, in one of the two remaining positions.

The HOLD sub-mode is selected by default by the centre-off position on S4. In this position, the INCREMENT logic is disabled by holding the A-input HIGH on IC8b by means of R14, while the search and latch clocks are disabled by R10 holding the Inhibit Clock line HIGH.

INCREMENT is the sub-mode which provides the means to advance from the channel selected by the HOLD sub-mode. Operating the spring-loaded position on S4 initiates a sequence of pulses which has the effect of stepping the autoscanner on to the next channel. The pulse sequence illustrated in Fig. 8 uses two $1\mu\text{s}$ monostables, IC8b and IC8a, to advance the search counter by one, and then update the channel latch on the channel selector board. In this way, the user may step through the 16 channels one at a time in either RECEIVE or TRANSMIT operating mode.

In the SCAN sub-mode, \bar{f} drives the Search Clock line until the Next Selected Channel Found line indicates that the channel selector search counter has advanced to the next selected (i.e., not set to "ignore") channel. The Search Clock is then inhibited for the duration, and the next rising edge of the Latch Clock causes this channel to be enabled.

In this way, the frequency of the Latch Clock determines the rate of sweep; one search-and-enable sequence occurring for each clock cycle.

An alternative to the continuous sweep described above is provided by S3 and IC12. Operation of S3 allows the sweep to be halted when the receiver's sweep sequence encounters an occupied channel. This "busy" channel is then held for as long as the signal remains. IC12 is used to compare the received signal strength with the pre-determined reference level (see later), and IC6c uses the comparator output to override the sweep whenever a signal above the threshold is encountered. Where not required, or where no signal strength line is available from the receiver, the HOLD-ON-BUSY-CHANNEL facility may be omitted by replacing S3, R12, R13, C5, IC12 and IC6c by a link between pins 12 and 13 on IC7d.

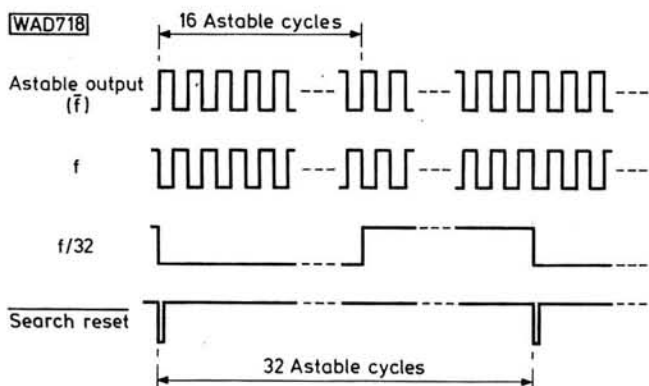


Fig. 7 (above): Timing generator signal waveform

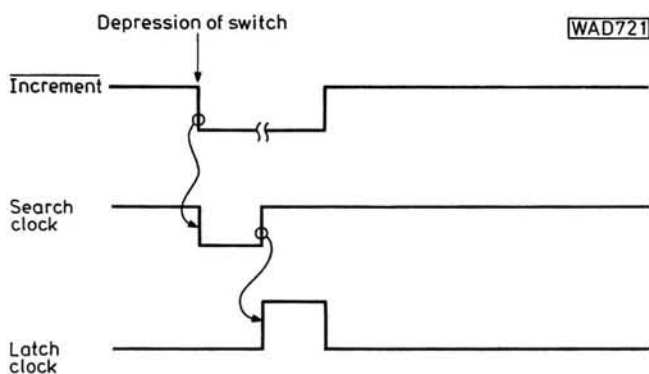


Fig. 8 (below): Pulse sequence for increment mode

Readers who intend to operate the *PW* Nimbus 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.

★ components

TIMING GENERATOR AND SEQUENCING LOGIC BOARD

Resistors

$\frac{1}{4}$ W 5% Carbon

100 Ω	4	R11,13,15,23
1k Ω	3	R4,21,59
2.2k Ω	5	R5,10,12,14,22
4.7k Ω	4	R6,7,8,16
10k Ω	4	R19,20,60,61
27k Ω	3	R9,17,18
47k Ω	1	R24
68k Ω	1	R3
100k Ω	1	R2
680k Ω	1	R1

Pre-set cermet multiturn

1k Ω	1	R78
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Capacitors

Ceramic

1nF	3	C3,6,7
4.7nF	2	C10,11
0.1 μ F	1	C1

Tantalum 10V

10 μ F	6	C4,5,8,9,12,13
22 μ F	1	C2

Semiconductors

Integrated Circuits

555	1	IC1
7408	2	IC6,9
7414	2	IC2,11
7432	2	IC7,10
7474	1	IC4
74123	2	IC5,8
74197 or 74177	1	IC3
LM324	1	IC12

Diodes

0.2in l.e.d. (green)	1	D25
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Transistors

BC548	1	Tr1
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Miscellaneous

Sub-miniature toggle switch s.p.d.t. (3); Centre-off spring-biased one way sub-miniature d.p.d.t. toggle switch; Sub-miniature spring-biased d.p.d.t. toggle switch; Panel mounting for D25; Panel mounting hardware for R78; 250 μ A f.s.d. meter (Maplin LB80B).

CHANNEL SELECTOR BOARD

Resistors

<i>1/4W 5% Carbon</i>		
270Ω	1	R48
4.7kΩ	21	R27-47
22kΩ	16	R62-77

Semiconductors

Diodes

0.2in I.e.d.	16	D2-17
--------------	----	-------

Integrated Circuits

7404 or 7414	1	IC18
7474	1	IC19
74150	1	IC13
74159	2	IC15,17
74175	1	IC14
74197 or 74177	1	IC16

Capacitors

Ceramic

4.7nF	3	C14,15,16
-------	---	-----------

Tantalum 15V

10μF	1	C17
------	---	-----

Miscellaneous

3 off 24-pin d.i.l. sockets; 3 off 14-pin d.i.l. sockets; 1 off 16-pin d.i.l. socket; Sub-miniature hexadecimal thumbwheel edge switch module (RS337-431); Pair of end cheeks (RS337-419); Ultra miniature s.p.s.t. toggle switches (16 off); Mounting hardware for I.e.d.s.

POWER SUPPLIES

Resistors

<i>1/4W 5% Carbon</i>		
1kΩ	3	R56,57,58

Semiconductors

Integrated Circuits

UA7805KC	1	IC20 (TO3 can 5V 1.5A regulator)
----------	---	----------------------------------

Diodes

1N4001	3	D19,21,23
0.2in I.e.d. (red)	1	D20
0.2in I.e.d. (green)	1	D22
0.2in I.e.d. (orange)	1	D24

Capacitors

Ceramic

4.7nF	4	C24,25,26,28
-------	---	--------------

Polyester

100nF	1	C27
-------	---	-----

Electrolytic

10μF 10V	1	C29 (axial lead)
----------	---	------------------

Sockets

4mm insulated (red)	3	SK1,2,3
4mm insulated (black)	1	SK4

Miscellaneous

Four-pole double-throw toggle switch (RS316-995 miniature toggle); 4 off anti-parasite beads; 3 off I.e.d. mounting hardware; Die-cast box approximately 220 x 145 x 55mm.

The Nimbus transceiver's signal strength output is connected to SK5 on the Autoscanner, and then via R19 to the non-inverting input of the comparator, IC12. The reference, which is applied to the inverting input of the comparator, is variable from 0 to +2.5 volts, and is derived from the +5V supply rail. The reference level is set by a screwdriver-adjustable panel mounted multiturn trimmer, R62. The signal strength meter, M1, may be used to display either the Nimbus receiver signal strength or the preset reference level. The selector switch, S23, is spring-biased to show the receiver signal strength as the normal setting. The output of the signal comparator is displayed on the I.e.d., D25, i.e., this I.e.d. is illuminated when the signal strength exceeds the reference level.

The final section of the sequencing logic comprises a single gate, IC6d. This gate provides the Reset line for the channel selector board by combining the Initial Reset and the Search Reset signals from the timing generator.

Channel Selector

The channel selector is the module which is responsible for implementing the channel selection, and as such forms the "heart" of the autoscanner. A block diagram is included in Fig. 3, and a detailed circuit diagram is shown in Fig. 6.

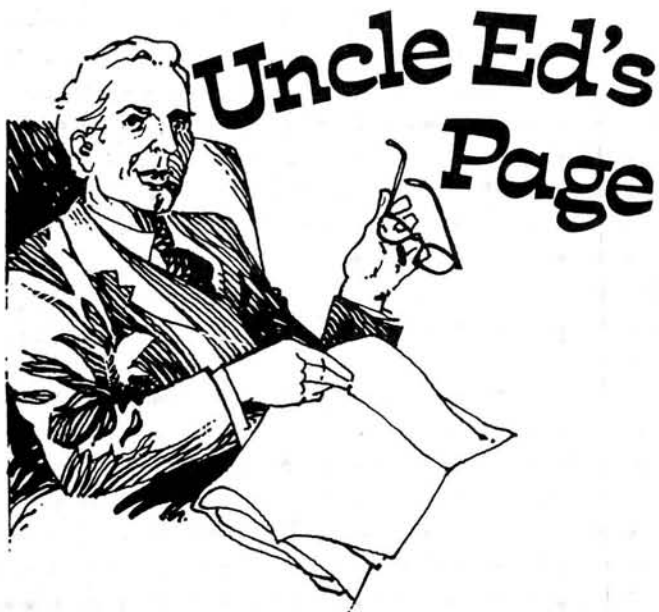
The operation of the channel selector is in one of two modes, depending on whether the primary autoscanner mode is MANUAL or AUTO. The MANUAL line from the sequencing logic is used to control the programmable 4-bit search counter, IC16. In AUTO mode, this counter is clocked by Search Clock, and increments by one for each High-to-Low transition. In MANUAL mode, the counter outputs, Q₀ to Q₃, follow the data presented at the data inputs, irrespective of the state of the clock. The output therefore reflects the current setting of the thumbwheel switch, S5. A change of mode from AUTO to MANUAL holds the last setting of the thumbwheel switch until the next HIGH-to-LOW clock transition.

In AUTO mode, the search counter output drives the 16-way selector, IC13. During a sweep cycle, this selector looks at one of the 16 active/ignore switches (S6 to S21) at a time. The search counter increments until a switch is found which is set "active", i.e., the W output from IC13 goes HIGH. The flip-flop, IC19a, is then set, causing the sequencing logic to freeze Search Clock for the remainder of the sweep cycle, i.e., until the start of the next 32 astable cycles. The saved counter value selects the next channel in the scan sequence when this is updated at the rising edge of Latch Clock. At this edge, the counter output is transferred to the selected channel latch, IC14, and the flip-flop is reset. This new value of selected channel is held in the latch while the Search Clock is re-started and the sweep cycle repeats. The latch output is used to drive two 4-to-16 line decoders, IC17 and IC15, which enable the selected channel oscillator, and illuminate the corresponding channel-selected I.e.d. indicator, respectively.

In MANUAL mode, the Latch Clock frequency is 32 times higher than in the AUTO mode. The thumbwheel switch setting thus appears to the operator to have been implemented immediately, whereas in practice there will be a slight delay of typically 30ms.

Next Instalment

In Part 2 we will be dealing with the channel oscillators, power supplies and full constructional details.



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.

DIODES

For what is basically a pretty straightforward component, the diode causes a lot of headaches for the newcomer to electronics. The diode is a device which allows current to flow in one direction only, and blocks it in the reverse direction. (This ignores the small reverse leakage current, and the large reverse current that can flow if a critical breakdown voltage is exceeded, as in Zener diodes. I'll talk about these some other time.)

Here we come against our first stumbling block—which is the forward direction and which is reverse? The answer is, it all depends; on whether you're talking about "conventional" current flow or electron flow. While we're on the subject, let me declare myself here and now as an electron-flow man, basically because I like to be able to visualise a problem, and I can "see" those negatively-charged electrons rushing

around the circuit towards the positive terminal of the power supply (attraction of opposites). "Conventional" current flow is from the positive side of the power supply to the negative, and was chosen to be that way round in the early days of electrical engineering, before it was discovered that current in a conductor was a flow of free electrons.

Unfortunately, the circuit symbol for the "solid-state" diode, which in those days would have been a copper-oxide type, was laid down to be an arrow and a bar (Fig. 1), with the arrow-head pointing in the direction of conventional current flow. The arrow-head is called the anode (a) and the bar the cathode (k).

If a battery or other source of d.c. voltage is connected across a diode, with its positive terminal to the anode and its negative terminal to the cathode (Fig. 2) a heavy current will flow—I've included the resistor to limit that current, and so stop the diode being burnt out. So, forward current flow in a diode is into the anode and out of the cathode if you're talking about conventional current, or into the cathode and out of the anode if you prefer electron flow. In either case, it happens when the anode is connected to the positive side of the supply, and the cathode to the negative. Reverse the battery and the current flow is blocked.

The bottom end of the resistor in Fig. 2 is connected to the negative terminal of the supply, and the top end is connected (via the diode) to the positive terminal. Looked at another way, there's a current flowing in the circuit, and we've said that electrons flow towards the more positive part of the circuit. Electrons are flowing left to right through the diode, so they must be flowing upwards through the resistor. Therefore the top end of the resistor must be positive compared to its bottom end, as shown.

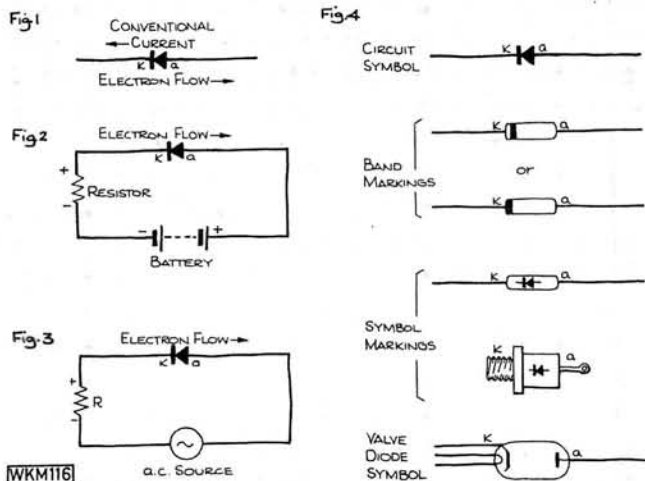
The circuit of Fig. 2 doesn't really do anything very useful, but you could replace the battery by a source of alternating voltage, such as a transformer with its primary connected to the a.c. mains (Fig. 3). The diode would then pass current when the voltage of the source had the same polarity as the battery in Fig. 2, but block it when the polarity of the source reversed. Current flow through the resistor would be intermittent, but always in the same direction. In this application the diode is being used as a rectifier, producing a pulsating d.c. supply from an a.c. source.

This brings us nicely on to another perennial question from the beginner: "Why is the cathode of a diode circuit symbol often labelled with a cross, when everyone knows that a cathode is a negative electrode?" Well, Fig. 3 gives a clue to the answer to this one, because so far as the resistor R is concerned, the cathode of the diode is what it sees as the positive side of the supply. In fact, it is just convention that the cathode of a diode is identified with a cross because it has a positive voltage produced on it when used as a rectifier.

Yet more conventions apply to the physical appearance of real diodes. First, that on diodes with cylindrical bodies, the cathode end is marked with a band. This band can be black, red, white or sky-blue pink, but it is always at the cathode end. Second, on the larger diodes which are bolted to a heat-sink or chassis by means of a threaded stud, the stud end is (almost) always the cathode. Exceptions (well, most conventions have some exceptions) are: (a) some diodes are marked with the diode circuit symbol; (b) a few stud-mounted diodes are stud anode—sometimes these can be identified by an "R" at the end of the type number, as they are known as reverse polarity package types.

Although I'm not dealing with thyristors (s.c.r.s) here, it is worth mentioning that they are, by convention, normally stud anode, though a few aren't. People do believe in making life complicated, don't they?

I've tried to summarise these conventions in Fig. 4, with a valve diode as well, for comparison. I'll continue the diode saga next month.



WKMT16



BACK-UP POWER SUPPLY UNIT FOR PORTABLE RADIOS

Keith CUMMINS

It is a well-known fact that the better quality portable radios, with respectable output stages, are somewhat heavy on batteries. Because the radio has sufficient power capability to rise above such ambient noises as washing machines, food mixers, etc., the battery life tends to be very short should the kitchen be the radio's usual location.

My wife owns a Bush TR130 radio which falls into the above category. Its usual working area is the kitchen, but nevertheless it spends a fair amount of time in other parts of the house, where the demand for high volume is much reduced. The last thing the lady of the house is interested in is trailing a power unit around with the radio. Therefore it was considered sensible to install a power unit in the kitchen where the power requirement is greatest. Another point to be taken into account is the ease of operation. The power unit is tucked away in a cupboard, and a flying lead emerges where the radio is used; the lead being electrically dead until the radio is connected to it. When the radio is connected and switched on, power from the battery is used to switch the power supply unit, which then takes over from the battery.

It is necessary to modify the radio circuit, and an l.e.d. was fitted to indicate correct operation of the power supply. The modification is simple and straightforward, the most difficult part being the addition of a 3 pin DIN socket to accept the external power.

Because use of this unit will involve modifications to existing equipment, and also necessitate the wiring of incoming mains via a relay, we emphasise that the project should not be undertaken by anyone who is not confident of what he is doing!

**CONSTRUCTION
RATING** **Beginner**

BUYING GUIDE

Readers should have little difficulty in obtaining the components. The metal box came from Zaerix Electronics Ltd., type-Minibox 521-563.

**APPROXIMATE
COST** **£10**

The layout is quite uncritical, and for this reason, the experienced constructor can devise his own. We would recommend that the unit be built into an earthed metal box, for safety reasons, since it will be permanently con-

★ components

Resistors

10% 1/4W

33Ω	1	R6
220Ω	1	R8
1kΩ	1	R1
2.2kΩ	1	R5
4.7kΩ	1	R4
10kΩ	2	R2,7
22kΩ	1	R3

Semiconductors

Diodes

BY164	1	D1
1N4001	3	D3,5,6
6.2V 400mW	1	D2
Yellow l.e.d.	1	D4

Transistors

TIP31	1	Tr1
BC109	1	Tr2
BFY50	1	Tr3

Capacitors

Electrolytic

2200μF 25V	1	C1
22μF 15V	1	C2
47μF 15V	1	C3

Miscellaneous

RLA s.p. make 40Ω coil; T1 240V primary, 14V 1A secondary; F1 100mA antisurge with fuseholder to suit; PL1 3-pin DIN plug; SK1 3-pin DIN socket; Minibox 521-563 (154 × 104 × 60mm). Zaerix Electronics Ltd.

nected to the mains. A nasty fault, though most unlikely, will then blow the fuse, with any fire risk rendered negligible.

Figs. 1 and 2 show the power supply circuit and the input modifications required by the radio. The two circuits need to be considered together, and for this reason the component numbers run sequentially from Fig. 1 to Fig. 2.

It is best to first consider battery operation of the radio; the power supply will not be plugged in, so nothing is connected to pins 1, 2 and 3. When S1 is turned on, +9V from the battery is conveyed via D6 and the switch to the remainder of the radio. Due to the voltage drop across the diode, the radio circuits are supplied with +8.4V.

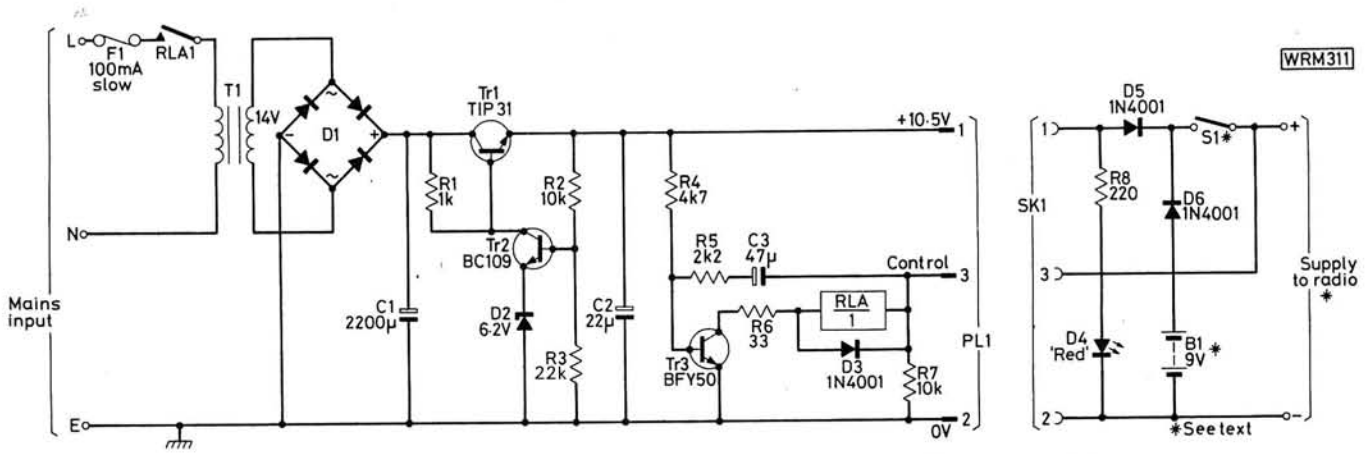
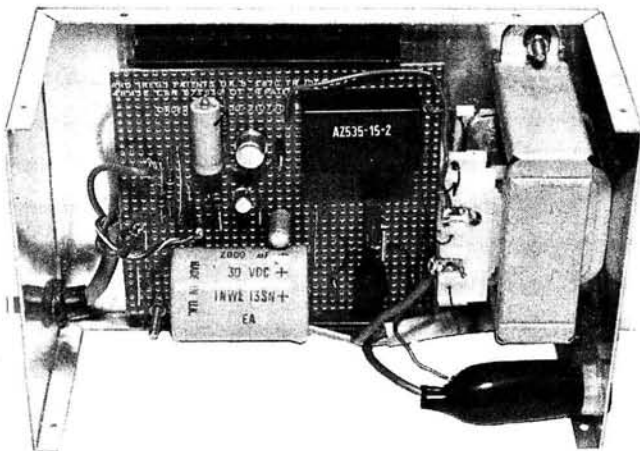


Fig. 1 and Fig. 2: Power supply circuit with the internal input modifications of the radio

If the power supply is connected, or closing S1 (or plugging in while the radio is playing) will apply 8.4V to the control line into the power supply. C3 charges up R5 and the base of Tr3, therefore the transistor turns on, and RLA placed in its collector circuit, (and also fed from the control line), energises. Mains power is applied to T1, resulting in a regulated output of +10.5V appearing at pin 1, this lights D4 indicating mains power available. D5 conducts, and lifts the supply to the radio from 8.4V to 9.9V. D6 is now reverse biased, so no current flows from the battery. R4 in the power unit maintains the base current of Tr3, so ensuring that RLA remains energised even though C3 is charged. The reader will now see the reason for including Tr3; if no mains power is available, RLA energises only for the duration of the charging time of C3. Since no maintaining current flows through R4, the relay drops out again. This ensures that in the event of power failure, or a fault in the power supply, this not left draining the battery.



Internal view of the power supply

Another point worth noting is that the power unit cannot be switched on if the battery is flat. This ensures that a weak, leaking battery cannot be left in the radio while it is running from the power supply unit.

The regulator part of the p.s.u. (Power Supply Unit), consisting of Tr1 and Tr2 and associated components follows a basically classical design. Tr2 is the error amplifier, with voltage reference Zener D2 connected in its emitter, while Tr1 is the series regulator. C2 provides h.f. decoupling to ensure stability.

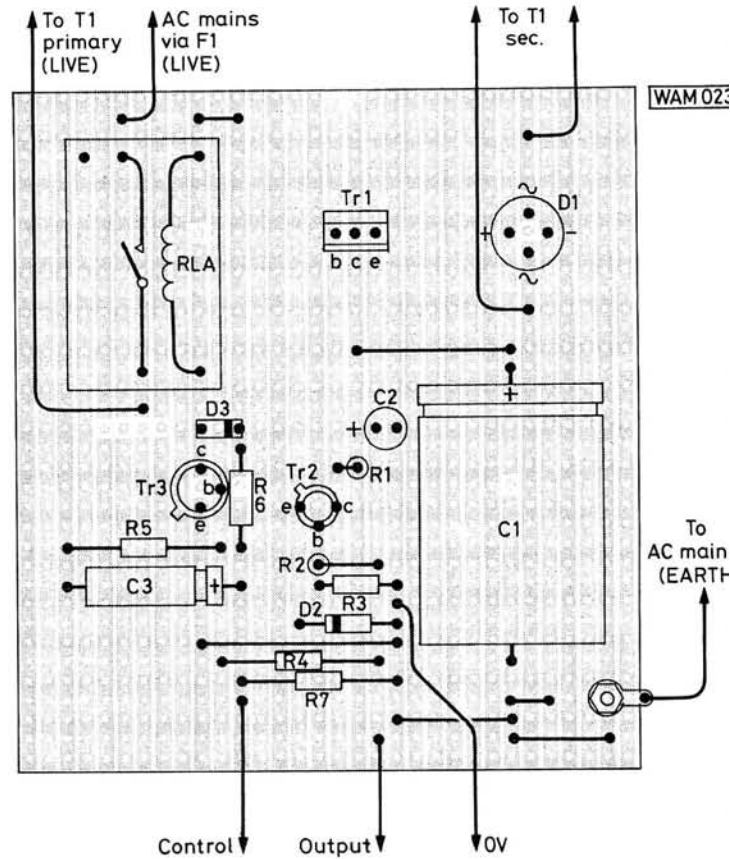


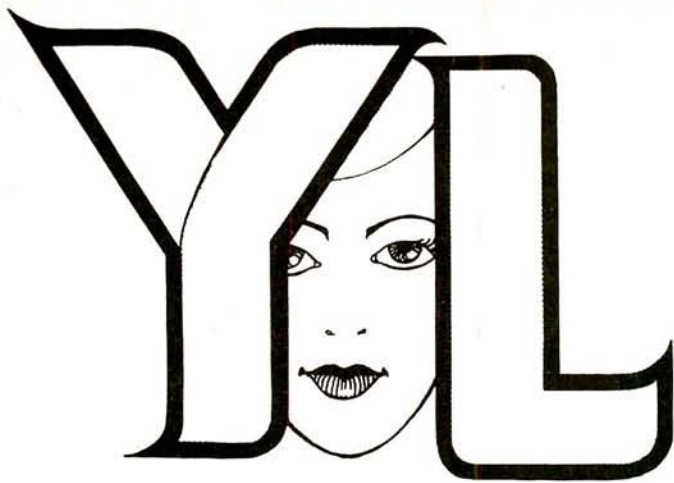
Fig. 3: Prototype Veroboard layout diagram

Choice of Relay

The relay should provide adequate insulation between contacts and frame, since mains is being handled. The resistance is not too critical, the important thing is that it should actuate at about 7V to ensure reliable operation. The relay used in the prototype was a 5 volt, 40 ohms type, hence the use of R6—this component may be omitted where a higher voltage relay is used. R7 is included to provide a discharge path for C3 if the p.s.u. is unplugged from the radio while in use, while D3 is a back-e.m.f. quenching diode.

Care has been taken to ensure that there are no "do's"

continued on page 68 ▶▶▶



the



Elaine HOWARD

Hello, and welcome to the very first YL column. Let me firstly introduce myself. After originally training as a Marine Radio Officer and being unable to get a job at sea, I started work as a Test Engineer on a Defence Project. It was after this that I decided to change to journalism, and joined *Practical Wireless* back in September. Although I am not a Licensed Amateur as of yet, I sat the Morse exam in the summer and the RAE in December, so hopefully I will be on the air very soon.

Although there are still not many licensed YLs and XYLs in comparison with the total number of licensed amateurs, at least the number is growing. There is an association called BYLARA (British Young Ladies Amateur Radio Association), which brings together like minded YLs from all around the world. They are affiliated to the RSGB and they are open to licensed and non-licensed YLs and OMs wishing to join. When I wrote to the Secretary of BYLARA, G4EZI, she sent me some very interesting information about the group. It's best to start at the beginning of the story, and this is some of the letter she sent to me:

"Now as to the history of BYLARA. The idea for a YL club in Britain was first mooted in 1977, and a meeting took place at the Drayton Manor Rally of that year, chaired by Barbara, G4EKX. This earlier effort met with failure, as it was felt that there were not enough interested YLs at that time to make forming a YL club a possibility.

Nothing was then done until 1979, when Rita, G3NOB, wrote to Mary, G4GAJ, and myself, suggesting that there were so many newly licensed YLs on the band, the time would be right to suggest the starting of a YL club again. Both Mary and I were quite enthusiastic about the idea, and we decided that this time our approach would be different. The earlier effort we feel, met with failure because the approach was: "Should we form a YL club?"—this time, we decided to be more positive about the procedure and the message to put across was: "We are forming a YL club—would you like to join us?"

So the three of us put the word around that there would be a meeting of interested YLs at the Drayton Manor Rally to discuss the proposed formation of a new YL club. At that initial meeting on the 29 April 1979, there were eight YLs present. Mary acted as chairman, and informally proposed the formation of the club, and invited anyone else who was interested to join us. It was all very informal in those days—the aims of the club, newsletter,

subscriptions, etc., were all suggested, and Mary, Rita and I agreed to fulfill the duties of chairman, treasurer and secretary, just to get the club started.

After the meeting I, as secretary, wrote to about 50 YLs to tell them about the club, and invite them to join us. Subscriptions began to roll in. Rita unfortunately was unable to continue as treasurer and was succeeded by Judith G4IAQ.

From thence the club went from strength to strength, with the admission of OMs and DX YLs as associate members.

A formal business meeting took place at Leicester (The Leicester Exhibition, 10 November 1979), to thrash out a formal constitution as the club had expanded so rapidly, and already had over 100 members.

1980 saw BYLARA displays at many radio rallies, including the Leeds White Rose Rally in March. April 1980 at Drayton Manor saw our first AGM and the election of a committee, and in May 1980 we were invited to put on a display at the RSGB Exhibition at Alexandra Palace.



Illustration courtesy of the BYLARA June newsletter



Currently, we have a membership of well over 100 members, run a weekly net on 80m, have meetings at radio rallies, have an attractive YL award and a quarterly newsletter."

So as you can see there is a very active YL community in the world of amateur radio. I was at the Ally Pally rally and I was very impressed by the stand that BYLARA had. They had collected blank QSL cards from their members and made them into a very colourful display.

If anyone has any comments to make about YLs in Amateur Radio then I would be pleased to hear them.

For further information in BYLARA please contact: Mrs D. Hughes G4EZI, 3 Primley Park Crescent, Leeds LS17 7HY.



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PW HELFORD—3

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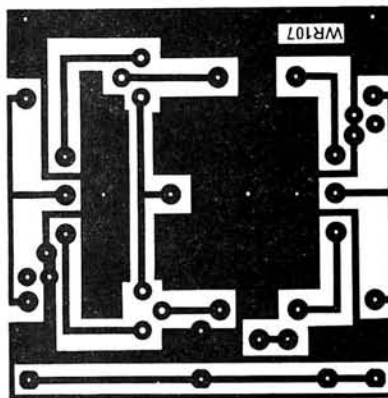
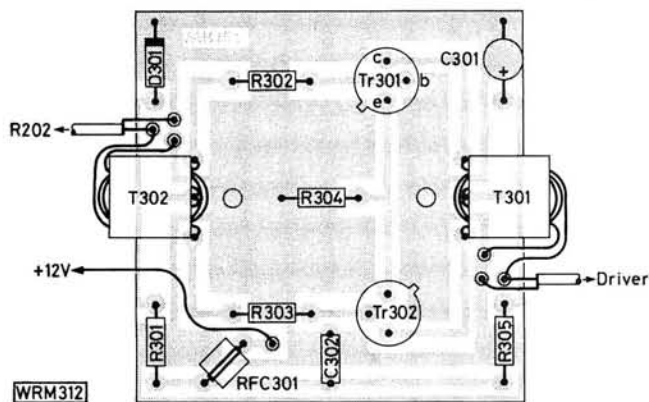


Fig. 12 (far left): The component placement drawing for the Tx First Amplifier board. Fig. 13 (left): The copper-track pattern for the Tx First Amplifier p.c.b. shown full size

Construction

Again this circuit is built on a simple p.c.b. and like the previously described boards all component leads should be kept as short as possible. When the final mechanical assembly of the completed transceiver is carried out this board will be mounted onto a removable screen using 6mm stand-offs. The output from the First Amplifier to the driver stage is made with miniature coaxial cable.

The input and output transformers are wound onto double aperture ferrite cores using 22 s.w.g. enamelled copper wire and taking care not to scratch the insulation. The cores are then fixed to the p.c.b. using epoxy adhesive and the ends of the windings taken to the appropriate pins on the p.c.b.

Table 2

	Primary	Secondary
T301	2T + 2T 22 s.w.g.	2T 22 s.w.g.
T302	2T 22 s.w.g.	2T + 2T 22 s.w.g.

First Trials

It should now be possible to carry out the first tests on the transmitting side of the *PW* Helford, albeit with only a low power output.

In Part 2, C702 was not fully specified. It must have a negative temperature coefficient.

Next month we will describe the r.f. driver amplifier.

PRODUCTION LINES

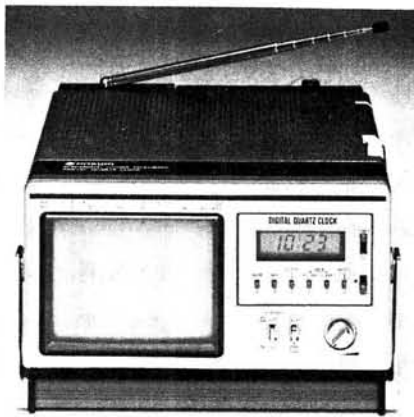
ALAN MARTIN G8ZPW

Mini TV

Hitachi have just launched a brand new product, the K2300, which is a very compact lightweight monochrome television with combined digital clock.

The set has a 4½ in tube and receives both u.h.f. and v.h.f. bands, selected at the touch of a button. Tuning has been simplified by using a vertical line on the screen, which indicates the channel being received and is cancelled by a button once tuned-in correctly. A built-in telescopic aerial is supplied, but for poor reception areas, an external aerial socket is provided. The quartz digital clock can also be set to switch the set on or off at any predetermined time.

Powered by either a.c. mains, car battery, its own internal batteries or an optional battery pack, the K2300 is also fitted with an audio recording jack and earphone socket.

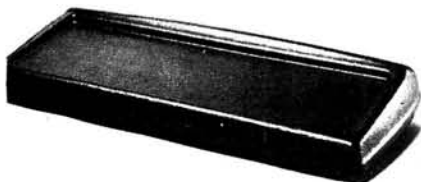


Priced at £115, which includes VAT, the K2300 is available through normal retail outlets.

Economy Keyboard Case

West Hyde Developments Ltd., the instrument case specialists have added a purpose-designed keyboard enclosure to their Princess range of cases for calculators, data input terminals and microprocessors.

Made in Britain, the enclosure is vacuum-formed in two halves which are clipped then screwed together for rigidity in final assembly. The ABS plastic is easy to drill, punch and clean and the base contains a series of mounting ribs.



The Princess keyboard costs £10.75 plus VAT and overall measurements are 435 x 205 x 70mm high. The 380 x 130mm recessed area allows plenty of room for cutting out apertures to take the keyboard assembly.

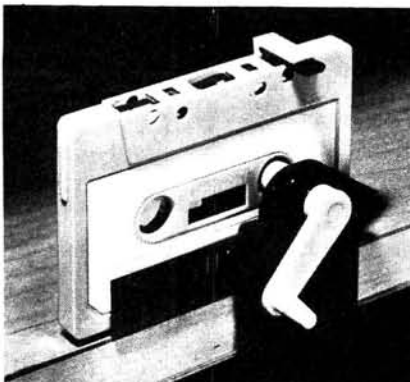
West Hyde Developments operate an efficient 24-hour response, mail order service and also a sales desk at: Unit 9, Park Street, Industrial Estate, Aylesbury, Bucks HP20 1ET. Tel: (0296) 20441.

Cassette Accessory

An answer to the perennial problem of tangled cassette tapes, faced by anyone interested in recording or recordings, is provided by Fixotape, a new device just launched by Jorephani Exports.

Simple to use, Fixotape snap-fixes to any table edge or shelf, the cassette is then fitted with the tape fed through a guide, and at the turn of a handle the tangled, twisted, creased or knotted tape is freed.

Fixotape is being marketed through normal retail outlets, particularly hi-fi and record shops, but in the event of difficulty, can be obtained, price £1.99, which includes VAT and p&p, direct from: Jorephani Exports, Park Lane, Corsham, Wilts. Tel: (0249) 714855.



UHF/TV Aerial Amp.

Antiference announce the introduction of "XtraBoost" XB1U, a new u.h.f./TV aerial amplifier for indoor use.

Designed to improve reception in difficult areas, the unit is particularly attractive for the DIY enthusiast as it is easy to install and operate.

Specification for the XB1U amplifier is: Bandwidth, 470-860MHz; Gain, 10dB (3 times); Maximum output (4 u.h.f. channels), 30dBmV 31.5mV; Input/output impedance (nominal), 75 ohms; Noise figure <4dB. Powered by a.c. mains, fused at 3A and housed in a brilliant white high-impact plastic case should cost £14.40 plus VAT.

Further information from: Antiference Ltd., Aylesbury, Bucks HP19 3BJ. Tel: (0296) 82511.



Cutting Comment

Once in a while a tool is launched on the market which is labelled "universal", "all-purpose", etc., but rarely does it live up to its name.

One that does is the All Purpose Cutter from Vero Electronics. Having had one on trial for several months, its ability to cut just about anything has been proved on paper, cloth, cardboard, 22 s.w.g. aluminium sheet, cotton, string, wire and p.c.b. stock. It will even prune the roses! And after all that it still cuts paper cleanly.

The All Purpose Cutter is made from stainless steel, with plastics coated handles, and is available from Vero stockists, priced at around £4.30 including VAT.





FRG7700 COMMUNICATIONS RECEIVER

IT IS RATHER UNUSUAL TO HAVE SO MUCH SMALL PRINT IN AN ADVERTISEMENT LAUNCHING A NEW RECEIVER, BUT THEN THIS IS RATHER AN UNUSUAL RECEIVER!

General Coverage

From 30MHz to 150KHz (and at reduced spec down past 60Khz to almost DC!) in 1MHz bands selected by a 40 way rotary switch calibrated 0-29 (plus 1, 3, 7, 10, 14, 18, 21, 24, 28 and 29 for easy amateur band changes).

All Modes

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Selectivity

4 filters fitted as standard! SSB, 2.7KHz and FM 15KHz. For AM, 3 positions! Narrow 2.7KHz, Medium 6KHz and Wide 12KHz, which with the tone control, and switchable AGC provides the operating flexibility demanded by discriminating BCL's in today's crowded bands.

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Fraction of a microvolt sensitivity provided by the latest 3SK73 mosfet RF stage makes the best use of inefficient aerials for those difficult locations. A 20dB switchable attenuator and a continuous RF attenuator on the front panel minimises problems with very powerful stations.

Ease of use

No preselectors! The use of the latest up conversion circuits with a 48MHz first IF and professional grade crystal filter plus dual PLL system provides automatic selection of the input band-pass filter direct from the band sector or memory.

The VFO has both a pleasing bright, but dimmable digital readout and a back illuminated analogue scale. It is tuned by a comfortable 1 $\frac{3}{4}$ " knob with a 'fast tune finger tip recess' through a zero backlash slow motion drive. The front panel is remarkably uncluttered, clearly labelled and the controls in logical positions. The illuminated meter is calibrated in both conventional 'S' units (0-9 +20, +40, +60dB) and in SIMPO 1-5 for broadcast station reporting.

Antennas

On the rear panel a SO239 coax socket provides a 50 ohm input (2-30MHz) for resonant antennas and convertors. In parallel, and in addition, are posts, for Earth, and for 500 ohm antenna input (up to 2MHz).

Timer

An inbuilt quartz clock/timer is featured. Time is displayed in 12 hour format (with AM/PM indicators) on the digital frequency readout, ideal for accurate log keeping. In the event of a mains failure the clock will continue to run (but does not of course, display) on the memory back up cells. For use with a tape recorder:- 3.5mm jack provides 100mV of audio (irrespective of the

position of the AF gain control) and relay contacts (15V @ 1A max) provide remote control. This relay is switched by the timer which may be programmed for switch on/switch off (and snooze - allows up to 59 minutes of listening after switch off).

Memory (option)

12 frequencies *anywhere* within the tuning range may be stored by simply touching the M button and then recalled by pressing the MR button, no preselector adjustment, no range switch adjustment. The memory is tunable by ± 1 KHz and is kept alive year long by 3 'AA' dry cells. The memory may be used for storing all the frequencies of a particular broadcast station, and with a convertor, the common marine channels, 2m FM channels (switch between the VFO and memory for repeater input/output) etc.

World Wide Portability

Power:- Mains 240-220 VAC easy adjustment 100-120V, 50/60Hz and 12 VDC external supply.

Size:- 13" x 5" x 9"

Weight:- 14lbs (with carrying handle)

Speaker:- Inbuilt 8 ohms, 1.5W of AF, External 4-16 ohm unit. $\frac{1}{4}$ " phone jack for personal listening or winking out the weak ones.

Memory:- Going on a trip? Store Radio 4 and all the BBC World Services in the memory and keep in touch with the news.

FRG7700 £309.00
PRICES INCLUDE VAT @ 15%

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FREE SECURICOR DELIVERY

MEMORY £83.95
2 YEAR DISTRIBUTOR WARRANTY



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TRIO
TR-7800

2m FM TRANSCEIVER



Trio's 2 metre mobile f.m. transceiver, the TR-7800 is the latest in a long line of well engineered, high performance rigs. Its external appearance of solid construction is further enhanced by the available facilities which to date have only been obtainable from the more expensive "multi-modes". At last a manufacturer has realised the potentially suicidal nature of mobile operation and applied a design philosophy allowing operational simplicity.

The evaluation sample arrived soundly packed, complete with mobile mounting bracket, scanning microphone, comprehensive instruction manual and approximately four metres of heavy connecting cable, a welcome change from the previous minimal allocation, which allows direct routing to the battery in most vehicles. The incorporation of in-line fusing is an example of basic installation protection, often left (and forgotten) to the unsuspecting consumer.

This report is based on considerable experience gained over a period of two months under mobile and base station operation. Manufacturers' statistics are quoted for reference in the specifications with measured parameters in italics.

Features

Referring to the accompanying photograph of the front panel, starting at the top left-hand corner, we have standard concentric volume and squelch controls. The squelch is easy to adjust, even with arms length operation it proved to be very precise with minimal closing delay. Audio output in excess of 2W is more than adequate for mobile situations and in most vehicles the internal lid mounted 75mm diameter speaker will suffice. An external 3.5mm jack socket is provided on the rear panel for connecting the optional SP.40 speaker pod.

The frequency display uses a four-digit 7-segment red l.e.d. device for keyboard entered readout and a similar 2-segment device for memorised channels. On-air transmit and busy indication is provided by respective yellow and red

l.e.d. devices as is the "S" meter which follows the current bar l.e.d. formation.

Selection of output power is accomplished by the HI-LOW latching push-button at the top right-hand corner. Low power is user-adjustable by accessible rear panel pot and can be set anywhere in the range, up to 15W. A 1750Hz repeater access tone is available by latching the TONE button. Subsequent tones are generated automatically when the microphone p.t.t. switch is depressed.

When operating in repeater mode, input monitoring is accomplished by pressing the REV button, which is of the non-latching variety.

Frequency Control

Keyboard operation of a rig is, in the reviewer's opinion, best kept to base station mode. With this concept in mind the split personality of the TR-7800 becomes apparent. By use of the KEY or MEMORY SELECT button it is possible to select frequency either via the keyboard pad, or the large rotary switch knob for access to the 15 memorised channels. All normal memory programming is conducted via the key pad.

In practice, memory programming is easy to accomplish and is comparable to operating a basic calculator. If you do make an error the displayed characters can be removed by pressing the "C" (clear) button. Inbuilt lockout will inhibit transmission if an attempt is made to enter out-of-band frequencies. Non-standard offset can be provided by using channels 13 and 14 allowing any choice of "in band" splits. This feature is useful when transverting to 70cm where repeater shifts of 1.6MHz are required.

When in keyboard mode it is possible to select frequency via the microphone UP-DOWN shift. By pressing the appropriate button once, the displayed frequency will shift 25 or 5kHz dependent on STEP selection.

In either keyboard or memory mode, holding the microphone UP-DOWN button down, or pressing the keyboard button marked SC, will cause continuous scanning of either the full 2MHz bandwidth or pre-memorised channels. If a

Test equipment

Bird model 43 Thru-line wattmeter and 50Ω dummy load;
 Marconi TF2370 spectrum analyser with TF2373 frequency extender;
 Racal 9081 synthesised signal generator;
 Marconi TF2011 v.h.f. f.m. signal generator.
 The test measurements are shown in italics

★ specifications

GENERAL

Frequency range: 144.000 to 145.995MHz
Frequency synthesiser: Digitally controlled, phase locked v.c.o.
Mode: FM (F3)
Antenna impedance: 50 ohms
Supply requirements: 13.8V d.c. \pm 15% negative earth
Operating temperature: -20°C to $+50^{\circ}\text{C}$
Current consumption: 0.4A in receive mode, squelch closed
 6A in HI transmit
 2.5A in low transmit
 Memory back-up 3mA
Dimensions: 175 x 64 x 206mm
Weight: 2.1kg

RECEIVER

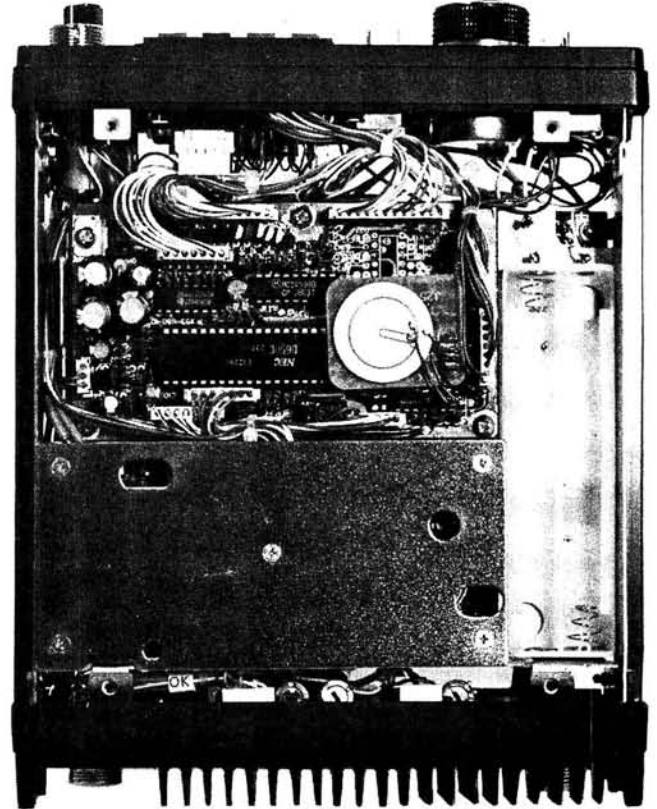
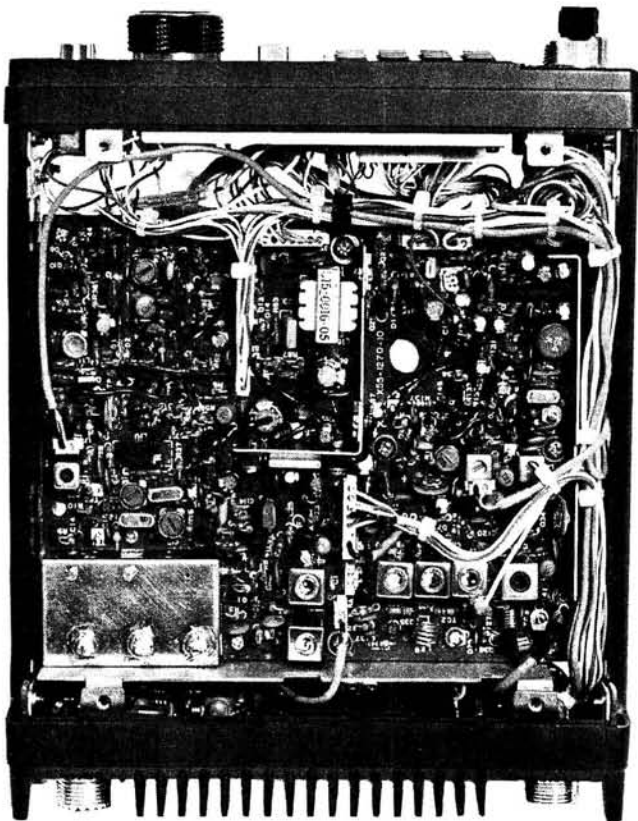
Sensitivity: Better than $0.5\mu\text{V}$ for 30dB S/N
 Better than $0.2\mu\text{V}$ for 12dB SINAD
 ($0.11\mu\text{V p.d.}$ for 12dB SINAD constant across bandwidth)
Selectivity: 12kHz (-6dB)
 24kHz (-60dB)
Adjacent channel Intermodulation response: (-88dB)
 (-78dB)

"S" Meter

calibration:
I.e.d. No. 1 ($-4\text{dB}\mu\text{V}$)
I.e.d. No. 2 ($0\text{dB}\mu\text{V}$)
I.e.d. No. 3 ($+5\text{dB}\mu\text{V}$)
I.e.d. No. 4 ($+11\text{dB}\mu\text{V}$)
I.e.d. No. 5 ($+15\text{dB}\mu\text{V}$)
Squelch sensitivity: $0.16\mu\text{V}$ (threshold)
 ($0.06\mu\text{V p.d.}$)
Audio output: 2W into 8Ω load (2.6W 10% dist. 1.7W at onset of clipping)

TRANSMITTER

RF output power into 50Ω load: (13.8V d.c. supply)
HI: 25W min. (32W)
 (25W at 12V)
LOW: 5W (adjustable) (5W)
 (5W at 12V)
Modulation: Variable reactance direct shift
Frequency tolerance: Better than $\pm 20 \times 10^{-6}$ over temperature range
Spurious output: HI: Less than -60dB (Better than 65dB down on carrier 0-1250MHz)
 LOW: Less than -53dB (Better than 60dB down)
Deviation (max.): $\pm 5\text{kHz}$
RPT. Tone-burst frequency: 1750Hz
Microphone: Dynamic 500Ω with p.t.t. and UP/DOWN switches



busy frequency is located the scan will stop automatically for five seconds. Scanning is terminated by pressing the p.t.t. switch or either of the UP-DOWN buttons.

Further features are provided in conjunction with the scanning section. When ALERT is latched in, the selected frequency memorised in channel 14 is checked at 6-second intervals, accompanied by an audible tone "blip", regardless of currently displayed frequency. By pressing the button marked OPER an instant QSY is made to memory channel 14.

Internal construction and layout follows the common Trio format of two separate circuit boards mounted back to back. This affords good access to all components which are clearly identifiable by screen printed lettering. From the r.f. point of view the TR-7800 incorporates conventional phase-locked-loop frequency synthesis, the receiver section being a double-conversion superheterodyne with a first i.f. of 10.695MHz and second i.f. of 455kHz. One interesting constructional feature is the incorporation of a final-stage power amplifier module. As this device is fully integrated all variable matching components associated with discrete final drive stages are made unnecessary, and are factory matched for life.

Operating Impressions

After carefully reading the instruction manual and relating it to the controls, operation became straightforward. Initially the hardest area to grasp was concerned with channel programming but even this soon became instinctive.

Reports received during many QSOs indicated clean, normal levels of transmitted audio with no evidence of excessive tonal colouration. The only adjustments found necessary were to the factory-set, two-second duration and amplitude level of the tone-burst generator. By removing the appropriate side cover the relevant board was easily located and adjustment made. On receive the exceptionally sensitive front-end performance was found to more than complement the rig's 25W-plus high power output. Even operating during crowded "lift" conditions produced no discernible adjacent-channel or cross-modulation effects.

For serious mobile working over distances in excess of 30 miles the transceive compatibility offered by the TR-7800 was found to be ideal, ensuring access to repeaters when audible. As a basic guide, it has been found that a transceiver with a receiver section sensitivity of 0.22 μ V, for 12dB SINAD, requires a matching output power of 25 watts.

As the rig was used in mobile and base-station modes it was found well worth while fitting the optional four AA size NiCad cells to the internal tray. This provided a power supply back-up, claimed by the manufacturers to last up to five days without recharging. Whilst connected to the mobile supply or base p.s.u., internally generated float charging of the cells is provided. For base station use only, a supply can be provided from a standard NiCad charger connected to the rear-mounted socket marked BACK-UP.

Also located at the rear of the rig is the UHF SO239 aerial connection and a further pair of user accessible potentiometers for the adjustment of the r.f. level metering and p.a. module protection circuit. This last facility progressively reduces the output power level delivered by the final stage when a mismatched condition is detected. The clarity of the display sections was found to be adequate for all light levels encountered.

In conclusion, the TR-7800 offers to the base station/mobile user state-of-the-art facilities on 2 metres f.m. at a price of £268.

The Trio 7800 is available from **Lowe Electronics Ltd., Chesterfield Road, Matlock, Derbys. Tel: 0629-2817** to whom we offer our thanks for the loan of the review unit.

BACK UP PSU FOR PORTABLE RADIOS

▶▶▶ continued from page 61

and "don'ts" concerning the operation of this unit. It can be plugged into and unplugged from the radio, whilst the latter is playing, without damage. As soon as the plug is removed, the "latching-up" collapses, the plug becomes totally dead, and the mains transformer in the p.s.u. is de-energised.

Other Voltages

It is possible to make the p.s.u. supply a nominal 6V instead of 9V, R3 should be omitted in this case. Also, R6 should be shorted out if RLA is being energised from a PP6 source.

Modification of the Radio

To simplify the modification of the TR130 radio, its car aerial input socket was removed (it is never used in the writer's car). This made way for the 3 pin DIN socket which was easily fitted after filing out the hole in the chassis. The two halves of the cabinet needed the file treatment as well.

The l.e.d. can be conveniently fitted at the lower right hand corner of the radio dial (in the case in question, just below the "Bush" motif). A hole has to be drilled, and the l.e.d. pushed through. The dial backplate is plastic, so the l.e.d. can be a push fit.

For other radios, the circuit will be the same, but of course, the constructor will need to devise his own layout.

Bearing in mind the cost of batteries these days, a power unit would not take very long to off-set the cost of construction. *Electrical and Radio Trading* journal quoted Ever Ready prices as:

PP3	0.55p
PP9	0.99p
HP2	0.29p
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**R1000 £285.20 inc VAT
carriage by Securicor £4.50**



The R-1000 is a high class general coverage receiver covering 30 bands between 200KHz and 30MHz with a PLL synthesizer that incorporates all of Trio's sophisticated electronic technology developed over recent years.

Both digital display readout (1KHz resolution) and analog display (10KHz resolution) are provided for easy and accurate tuning.

The R-1000 also includes a quartz digital clock with timer, three IF filters, RF ATT and tone control, etc. to ensure the best receiving conditions for each mode.

Due consideration has been given to innovative design and compactness, making the R-1000 an incomparable station receiver for amateur radio operators, professionals, BCL's and SWL's, etc.

THE 2 METRE FM MOBILE TRANSCEIVER

**TR7800 £268 inc VAT
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The new TR7800 is the only 2 metre FM mobile transceiver. Its performance both in your car and shack has to be experienced to be believed. Power output is 25 watts, a needle bending signal. The rig has keyboard entry for fixed station use and for programming the 15 memories. When used with the up/down shift switch on the mike the 15 memories, each having a repeater shift facility, make mobile operation a sheer pleasure. The scan facility, both on memory and 25/5Kc on keyboard means no missed contacts. Five second hold on each occupied channel gives you time to identify the station before the rig moves on to the next QSO, press the mike switch and the scan instruction is cancelled. Add the priority facility and you have it, the only 2 metre FM mobile rig.

THE HF SSB TRANSCEIVER

**TS520SE £437 inc VAT
carriage by Securicor £4.50**



In the face of ever increasing complexity in amateur radio equipment, it's comforting to know that the TS520SE is still in volume production. Radio amateurs all over the world (and dealers too) have voted the TS520SE "my favourite transceiver" because of its astounding reputation for reliability, high sensitivity receiver, and of course the unequalled Trio audio quality coming from the transmitter. The TS520SE incorporates all of the features demanded by today's amateur, and at an outstandingly low price. No wonder it's top of the list in popularity, and comparison with other transceivers will convince you that the TS520SE is the best value for money on the market today.

Of course, the bare figures cannot tell you just how nice the TS520SE feels in use, nor can they tell you the pleasure of hearing other operators saying "never heard better audio OM, what rig are you using?"

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THE **PW**

'SHERBORNE'

**SYNTHESISED
AM/FM TUNER**

PART 4

W.S.POEL

In this, the final part of the *PW* "Sherborne" series, we deal with the construction of the tuner modules, plus testing of the complete system.

Construction of the Tuner Modules

The f.m. tuner heads are presented as entirely prefabricated and pre-aligned units, so this part of the text will concern only the f.m. i.f./a.m. tuner system, and the stereo decoder.

The a.m./f.m. system p.c.b. layout is shown in Fig. 31. It is very densely packed in comparison to most enthusiast constructional projects, and if you feel this is beyond your skills, this item is also available as a prefabricated module from Ambit International. The unit is designed to fit into a proprietary set of metal work, with push-fit lids, to ensure full screening of the i.f. from any external r.f.i. and vice-versa. There is realistically very little hope of successfully contriving to produce a home-made p.c.b. of this complexity.

The i.c. can be fitted using a socket, although unless you use a Zetronix low-profile type, the fit can be impossibly tight. Care should be exercised in the selection of the correct varicap diodes for the tuned circuits; only the Toko KV1215/1235 types are suited to this application by virtue of their inherent matching. The fact that each tuned circuit is provided with its own individual varicap relaxes the requirement for absolute accuracy of matching of the tuning elements.

The choice of the other components is not very critical in terms of stability considerations. The use of disc or plate capacitors much larger than 5–7mm diameter/section is a nuisance in such a tightly packed environment, and will inevitably lead to untidy construction with unhelpful side effects on the behaviour of the system. The size and complexity of the projects demands that only trustworthy components should be used. Temptations to dip into the junk box should be resisted. The printed circuit board layouts of the ferrite rod antenna switching/tuning arrangements (Fig. 32) and Stereo Decoder module (Fig. 33) are less crowded, and should not present any difficulties.

The design work in producing the circuit of the a.m./f.m. module is as much contained in the physical layout as in the actual diagrammatic representation of the circuit elements, so whilst you are welcome to try to adapt the circuit to incorporate any of your own ideas and innovations, it is as well to start with the basic item as

shown, since it is far easier to work from a starting point of a known and proven circuit.

One final point—although it may seem unlikely to those not versed in r.f. techniques, it is really quite important to note the way in which components are fitted, since certain stand-up resistors have a polarity in terms of a "hot" and a "cold" (earthy) end with respect to r.f. considerations.

Take, for example, R14 in Fig. 14 (Part 2). The upper end is decoupled to earth via C13 and can therefore be considered to be earthed from an r.f. point of view. This is the "cold" end. As R14 is the collector load for Tr1 (a 10.7MHz i.f. amplifier), the amplified output from Tr1 is developed across it, and the lower end of the resistor is therefore the point of maximum r.f. potential in the circuit. This is the "hot" end.

In all such cases, the lead at the "hot" end of the resistor should be kept as short as possible. The earthy end is then the longer end.

The careful placement of resistors in audio sections is also advised, since it will then be possible to use the end standing up to connect test probes to check signal path continuity.

Testing

We have now completed construction of the various sections of the complete tuner. Some brief setting up information has been given for the synthesiser section, but for complete checking, the radio must be fully assembled and used in conjunction with all the features of the synthesiser.

Although various aspects of the system are interactive, the synthesiser and radio modules can be used independently if so desired, so the setting up and testing of the radio section should be treated separately in the first instance. This way, faults in the radio construction will not mislead the constructor when a complete system check in conjunction with the synthesiser is attempted.

The f.m. front end can be assumed to be working on arrival, but if you take the lid off to look inside, make sure that you put it back the same way, as the lids are not entirely symmetrical in the UM1181, and can cause the underside track to be shorted out.

The f.m. i.f./a.m. tuner module can likewise be assumed to be working on arrival, but in case you have decided to make it yourself, a few details are included below. You should not attempt to make this section unless you have a signal generator and frequency counter, and are familiar with using them in conjunction with radio fault-finding and alignment.

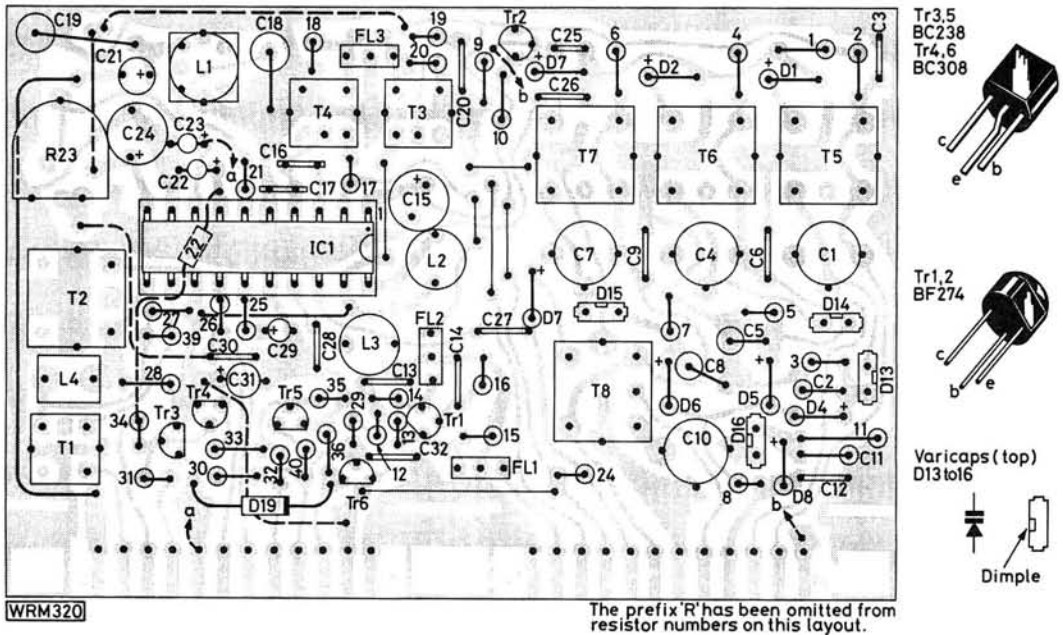
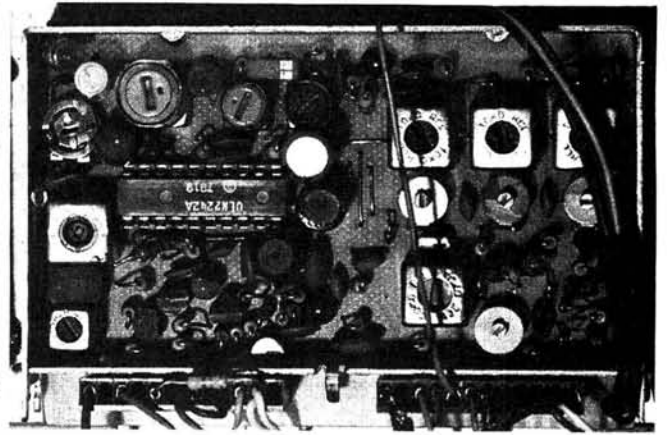
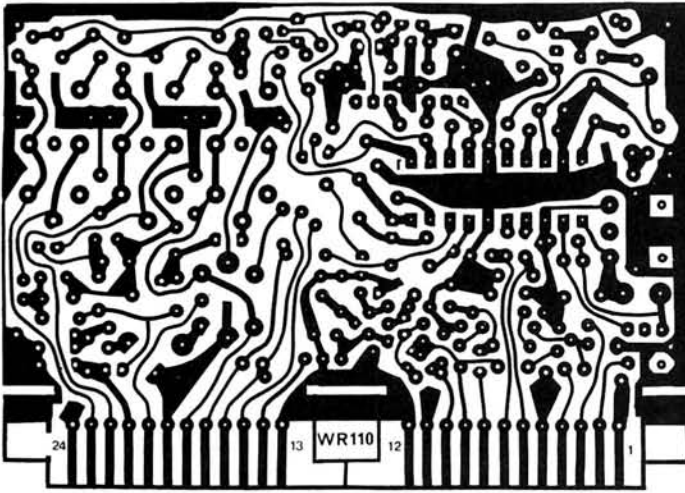


Fig. 31: FM IF and AM Tuner module, showing the p.c.b. pattern (full size) and component layout (approximately 1-3 times full size). The photograph shows a prototype version of the module, which differs in some minor respects from the one in the drawings. The leads to the ferrite rod antenna assembly are connected underneath the board

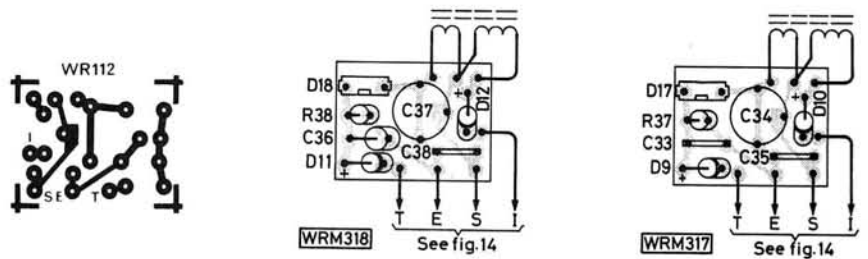
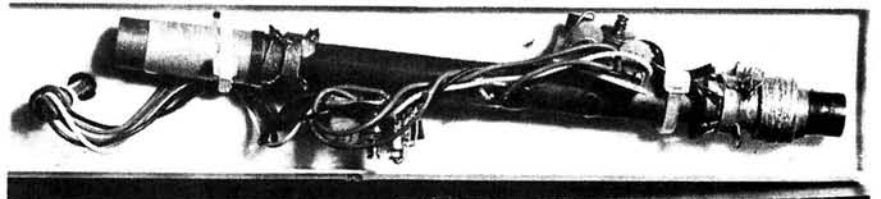


Fig. 32: The ferrite rod antenna p.c.b. pattern and component layouts for the medium-wave and long-wave switching/tuning boards, all shown full size. The photograph shows the completed antenna assembly



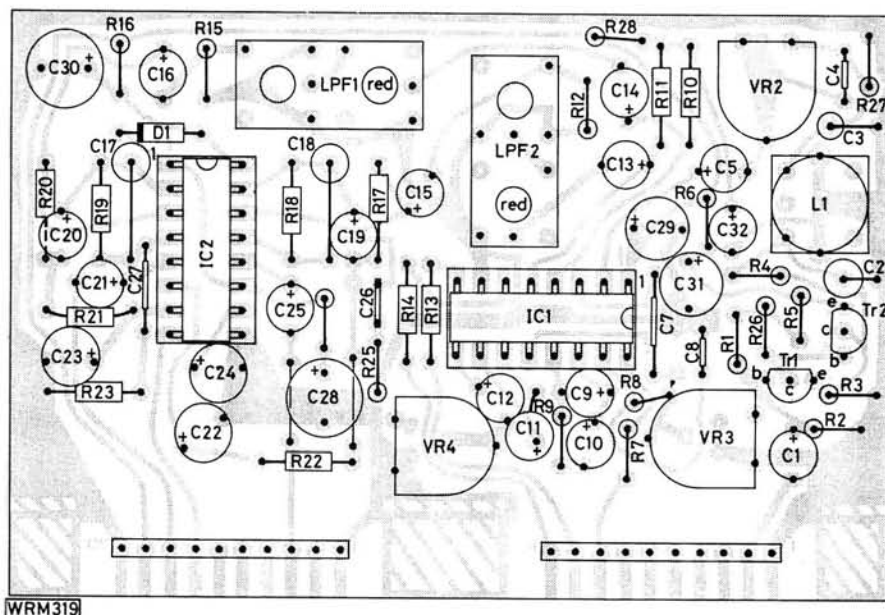
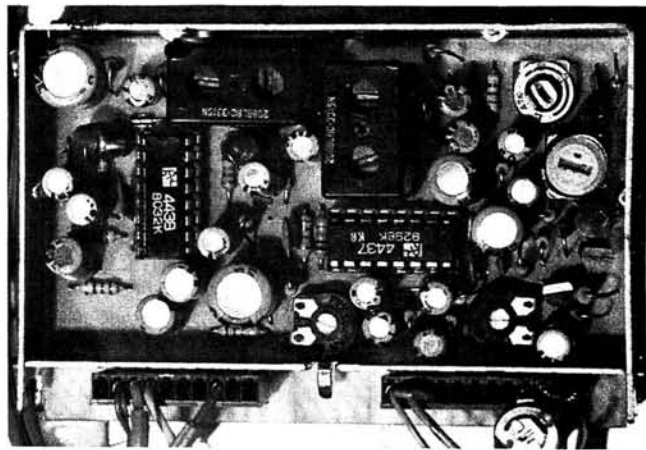
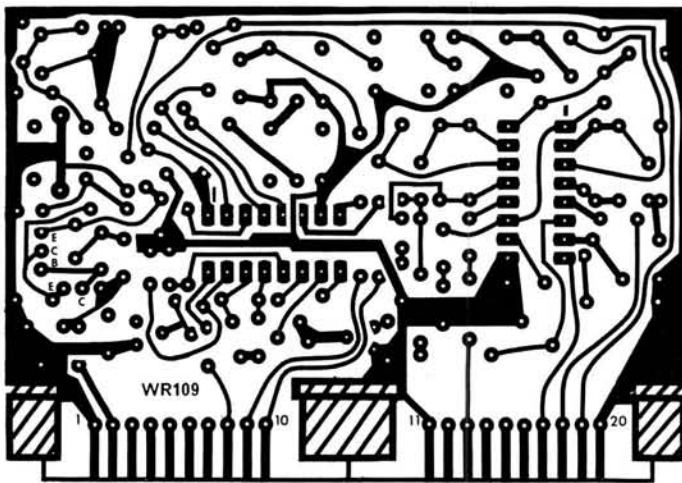


Fig. 33: The Stereo Decoder and Muting Pre-amp module, showing the p.c.b. pattern (full size) and component layout (approximately 1-3 times full size). The photograph shows the completed module

WRM319

Aligning the FM IF and AM Tuner

This section should be tested first as an f.m. i.f. and detector, and then as an a.m. radio when the f.m. function is established and working. The unit should be connected up as an f.m. i.f. in the first instance, with an i.f. feed from the tuner head—using a stable 12V tuning supply or a battery. With tuning bias of 2-4 volts, the majority of the local Band II f.m. broadcast stations should be audible. (Remember an antenna!)

The initial switch-on condition should provide smooth white noise at the audio output—with the muting system completely defeated for the time being. (Ground pin 5 of the module.) If the sound is crackling and broken up, then check to make certain that all decoupling capacitors are in place.

A centre-zero meter should be placed across the a.f.c. output (pin 3) and the a.f.c. reference (pin 11), and the detector coil T2 should be rotated for zero offset. If you use a metal trimming tool for this operation, check that the results are the same when you take it out—as it may be necessary to compensate by turning the core a fraction further clockwise before removing the tool. It should be possible to cause the meter to swing from one extreme to

the other, with the noise at the centre zero position being the characteristic smooth sound of an f.m. tuner "off station". At either extreme, the heavy d.c. offset in the audio path will cause the signal to be limited on one side, leading to clipping distortion.

An ordinary 12V d.c. meter should be connected between pin 10 and earth, as this is the output of the deviation mute detector. The output should go low when the tuning is swung through the centre of the tuning meter—but remember to disconnect the short from pin 5 to ground to re-enable the mute output, and take pin 8 to ground to disable the effects of the noise mute circuit.

The remaining parts of the muting circuit can be checked by tuning to a station and checking the output at pin 6 of the module. This output is usually high, but goes low when a signal is tuned. The very high gain front end used in this design may possess sufficient noise in the output to cause the mute to operate on inter-station noise alone. In the final system, this is not of too much concern, since the MPU is responsible for the muting whilst tuning is being carried out. However, to establish that this section is working correctly, the mute should go high when the i.f. input is shorted, or the connection from the front end is removed.

Once the noise mute function has been verified, it can be added to the deviation mute by connecting pin 6 to pin 8—or in the case of high-gain front ends, by connecting the a.g.c. output on pin 7 to pin 8, since this output goes low only after some 1000 μ V of input signal. If the detector persists in displaying a large d.c. offset, check that no part of the a.m. detector transformer secondary is earthed (see Part 2 of this article for a detailed explanation of the mechanism of this problem).

The a.m. section can be checked out by simply leaving pin 15 of the module open-circuit, and grounding the desired band selector. Start with the Long Wave, and tune for approximately 200kHz by adjusting the tuning voltage and then the core of the oscillator coil. See Table 2 for approximate voltage/frequency values. The antenna coil on the rod should be peaked by shifting its position.

Unlike many designs, the Medium Wave is completely independent of any Long-Wave trimming, and so may be treated as an entirely separate entity. Tune and trim at the points shown in Table 2 using the coil at the l.f. end, and the capacitor at the h.f. end with a bit of both in the middle.

Short Wave requires the attachment of a wire antenna at pin 20 of the module. A 10–20pF capacitor should be placed in series at this point, or the loading effect on the SW tuning is too severe for the stage to be tracked with the oscillator. If desired, the SW coils can be substituted by a MW coil for a long-wire type of MW antenna if you are after serious medium wave DX, but then an extra tuned circuit or two in the form of a preselector is a good idea to avoid overload and image breakthrough. A careful design can use the same tuning and switching voltages and still retain its tracking, with maybe a simple “peaking” trimming adjustment for optimisation. In fact, the same basic idea can be carried through to any extension of the front end of such a varicap-tuned radio system.

The major points to watch for when testing this module are simple and obvious things—like the correct orientation of the varicaps and switching diodes. Despite the apparent complexity of the system, a correctly constructed and connected unit can be made to work with the minimum of fuss—provided you have the test equipment mentioned earlier. Playing it by ear can be a lot more long-winded.

The Stereo Decoder

The input birdy filter may be omitted, since this function is carried out by the output filter of the i.f. strip. If correctly assembled, the stereo decoder phase-locked-loop v.c.o. trimming can be carried out by simply tuning to a stereo f.m. signal, and adjusting the preset VR3 until the l.e.d. lights up.

The stereo decoder can be made from component parts with minimal bother, but if you have an oscilloscope and access to alignment equipment, then so much the better. The main alignment consideration here is the accurate setting of the pilot cancel notch, which may be achieved by simply looking at the audio output whilst listening to a stereo transmission, and adjusting the pilot cancel preset VR4 for minimum 19kHz. You will see the 19kHz sawtooth disappear completely at the absolute null point. Since this is a phase adjustment, the correct adjustment of the preceding birdy filter will be interactive, and the birdy filter can only be accurately set up with a sweep generator and spectrum analyser—or by listening for the stereo test tones, and setting the core for maximum separation. A stereo generator could also be used for the purpose if required.

If you are listening to a.m. and there are loud whistles coming through, then remember to use the v.c.o. defeat

Table 2

Approx. Tuning Voltage	Typical Frequency			
	LW kHz	MW kHz	SW MHz	FM MHz
1.0	—	558	—	—
2.0	—	612	—	90.0
3.0	155	666	—	94.5
4.0	173	738	—	98.0
5.0	191	828	6.2	101.0
6.0	227	999	6.9	104.0
7.0	263	1224	7.8	106.0
8.0	290	1332	8.8	108.0
9.0	317	1476	9.3	—
10.0	335	1557	9.7	—
11.0	353	1611	—	—

facility to prevent this problem occurring. Simply using the enforced mono pin will not actually disable the v.c.o. action.

Test the muting action of the output pre-amplifier by placing 4V or so on the muting pin of the module—this effect will be swift and totally silent.

Connecting Up

If you have persevered this far through the project, then the moment of complete assembly is at hand. If your synthesiser section is working as far as you can tell from the functions that are independent of radio “feedback”, then connect up the entire system as shown in Fig. 10, in Part 2.

Start the final alignment session with at least three hours to spare, and plenty of patience! Things like the correct voltages from the power supply section, the certainty of a working set of tuner modules, etc., are taken for granted. This is no time to start debugging these minor elements of the overall system.

First switch on, see if everything is quite happy, and that there is no nasty “cooking” smell from anywhere. Select MW from the synthesiser control and press the manual tune button until you reach a known local frequency—such as 909kHz. Strong signals should be coming through, and if so, keep going through the band until something goes wrong.

The most likely problem is the loss of lock signal, causing the mute to stay shut at the extremes of the band. This is because it is possible to align the tuner module over a span of tuning voltages so that although on a manual test, the complete 520kHz to 1620kHz range may be covered, the more limited range of tuning voltage available from the synthesiser output may not be enough. Say the unit covers the entire desired frequency span with 1–13V bias, yet the synthesiser tuning voltage is 12.5V maximum. After 12.5V has been reached, the synthesiser will step on, but it will lose lock as the a.m. local oscillator cannot quite squeeze to the necessary frequency.

Adjust the trimmer of the MW oscillator coil until the synthesiser can reach 1620kHz with the voltage output available. The synthesiser will then “go over” and start from 520kHz again. If you find it necessary to do this a couple of times to get the tuning range spot on, load the top and bottom frequencies of each band into the tuning memory (first getting ENABLE to light up—which requires

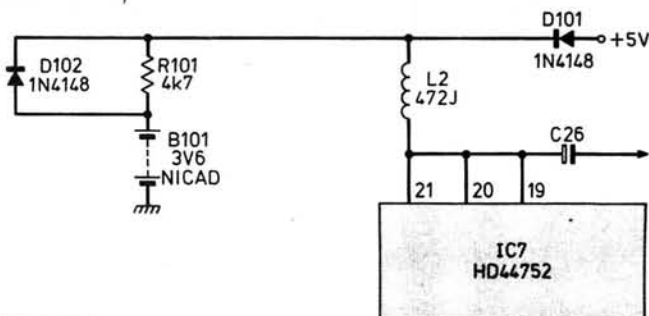
a signal to be present and locked in anyway), and then the adjustment is quite easily performed by recalling each end of the band in turn. You should have no problems with f.m., where the entire tuning span is comfortably within the range of the synthesiser output.

If you get no success at all on a.m., then check the local oscillator output from the module and its connection to the synthesiser. If you continue to draw a blank, move on to the f.m. section to try to determine if the rest of the system such as bandswitching and MPU control connections are in order.

If nothing happens on f.m. either, and you cannot obtain any "locked-on signal", then check that the prescaler supply voltage is being switched on by the switching logic—and make certain the connection is getting through to the prescaler. If you still cannot obtain any working signals on f.m., check the output of the prescaler (the input is a better place, assuming that you have the necessary 100MHz bandwidth scope). It is a fairly ragged 10MHz (approx) squarewave, and if it is actually being driven from the f.m. local oscillator, then the frequency will vary if you disconnect the f.m. tuning bias voltage, and reconnect it to a manual tuning system. The low-pass filter at the prescaler output can sometimes be too severe, and if the output of the prescaler after the l.p.f. is heavily attenuated, this can cause problems for the p.l.l. The filter can be bypassed at this stage of the test procedure to see if this is contributing to the problem, although at a later stage, you should refit it (or a slightly less severe version, with reduced turns on the choke), to prevent spurious radiation of harmonics causing birdies in Band II.

If you tune the f.m. to a known Band II frequency, and then set the synthesiser to the same value—check to see if the output of the phase detector of the p.l.l. i.c. indicates a signal that is trying to lock. If there is still nothing doing, but you are getting all the right readings on the display, and the prescaler output seems to indicate that all is getting as far as the p.l.l. input, then the synthesiser control lines to the p.l.l. i.c. may be faulty (bad soldering, bridged joint, etc.). If there is nothing getting to the prescaler, then check the l.o. buffer amplifier stage very carefully.

You will eventually reach a stage when all bands are working—and the last item to sort out is the function of the automatic tuning/scanning. Push the button and see what happens, starting with f.m. The scan stop signal from the i.f. should cause the MPU to stop exactly on station. There is no other preset adjustment for the f.m. scanning, and the only problems that arise can be caused by the incorrect setting of the detector coil. If this is so, set the synthesiser to a known local Band II transmission, and check the centre-zero tuning voltage with a meter, as described in connection with the initial testing of this module. The detector should then be trimmed for an absolute null, leading to the deviation mute signal going low exactly on channel.



WAD728

Fig. 34: A simple modification to add battery back-up to the synthesiser station memory

The a.m. scan stop signal is slightly different, and can be preset to stop only on signals above a certain signal level. The preset should be set by experimentation under average listening conditions so that relatively noise-free signals only will cause the scanning to stop. Remember that the MPU will only scan whilst a signal is in lock—so when the scan reaches a band end, and starts from the other end again, it pauses a few seconds while the various filter components on the tuning bias line charge/discharge. Likewise, if the tuner goes out of lock, the scan will stop, and the mute stay shut. The manual tuning controls will still advance the display, but the system will not in fact be doing anything more than changing the readout numbers.

For any additional information on the system or components thereof, you should refer to the manufacturers' data sheets and information. Despite the length and scope of this feature, there is much left still unsaid about other aspects of the system that the more adventurous might like to delve into. For example, the auto rotating m.w./l.w. ferrite antenna, the s.w. converter, etc.

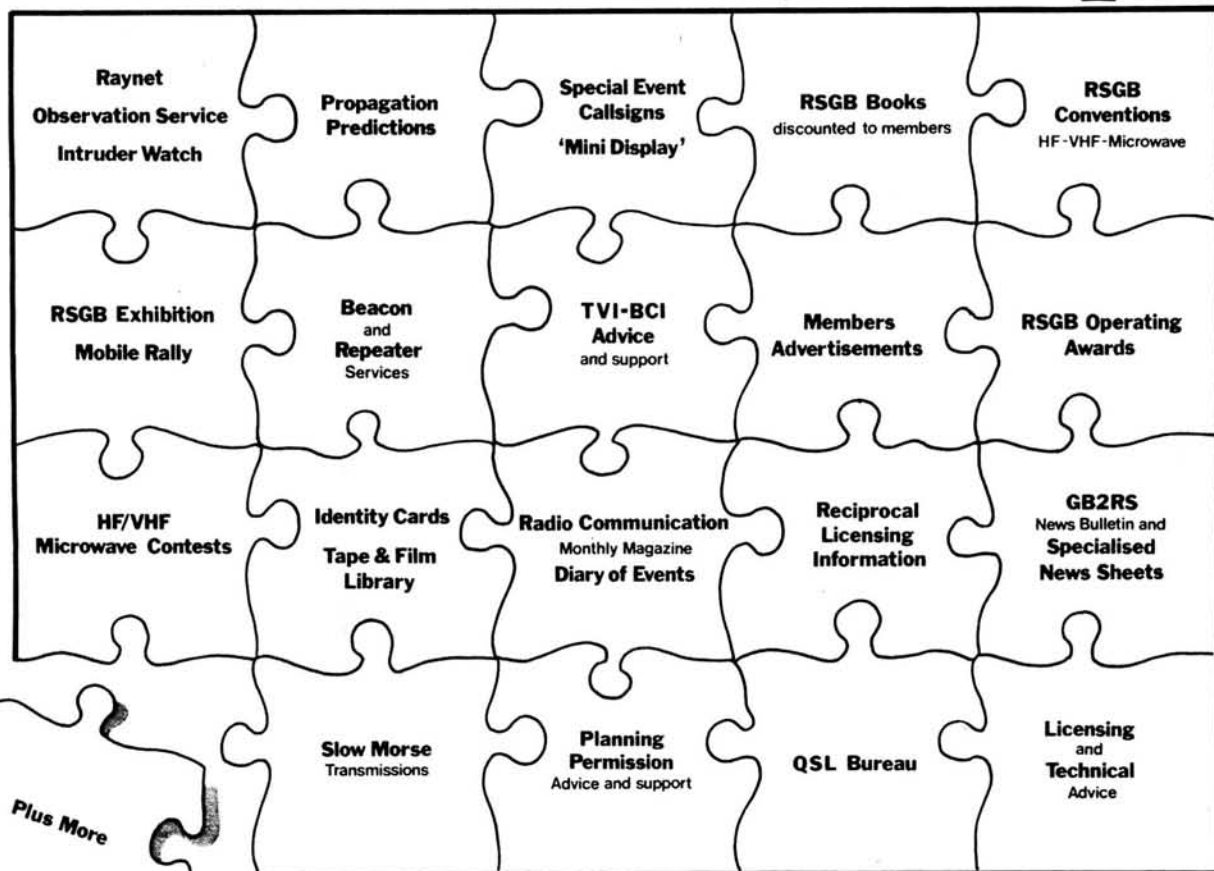
Memory Back-up

For constructors who prefer to switch off their tuner at the mains when not in use, Fig. 34 shows a way of adding a back-up battery to retain frequency and band information for the eight memory channels at all times. It is not possible to keep the clock going since this is controlled by a signal from the p.l.l. i.c. reference divider chain.

The added components are those with reference numbers in the 100 series. Diodes D101 (inserted in the +5V supply line to pins 19, 20 and 21 of IC7) and D102 form a simple gate which connects the higher of the two voltage sources to the MPU. Resistor R101 provides a charging current of around 500µA for B101 so long as the mains supply is connected to the tuner.



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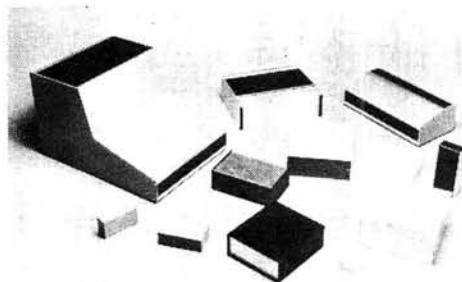
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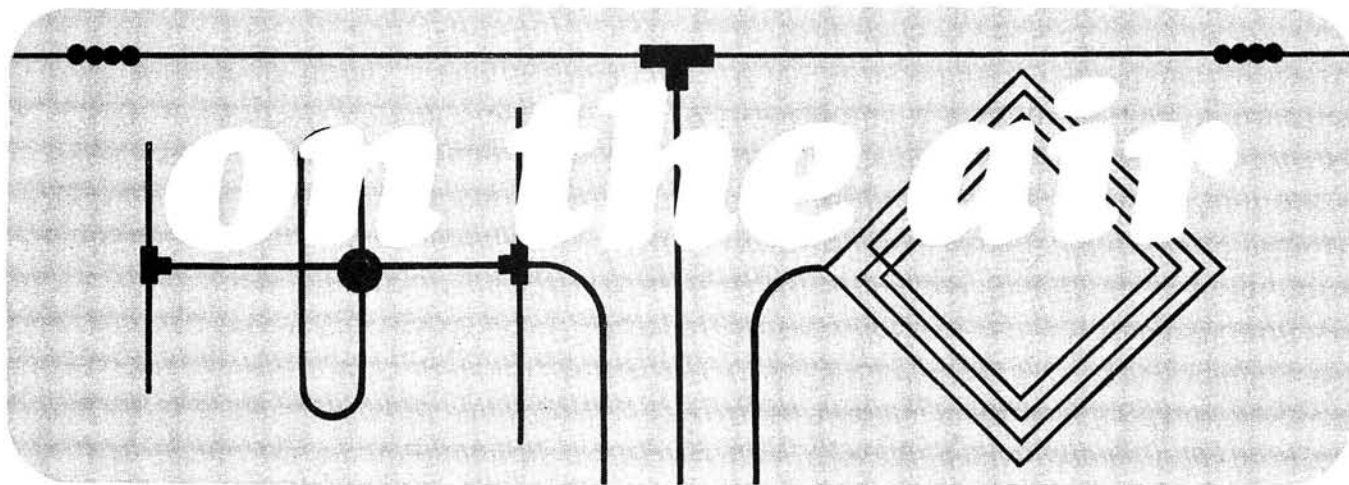
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Amateur Bands

by Eric Dowdeswell G4AR

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

The current debate on the future, or otherwise, of Citizens' Band radio in the UK crops up frequently in letters from readers, opinions usually crystallising into two principal points of view. First, that of younger people, mostly new to the world of radio communications who have, somehow, been led to believe that CB is some miraculous system that will enable them to talk around the world without the bother of having to take and pass an examination.

The second aspect is that of the reader who has experience of short-wave listening and amateur radio, who realises that he is not going to be able to get something for nothing and is prepared to sit the RAE.

The Green Paper issued by the Home Office on the subject of CB, or Open Channel as the HO prefers to call it, suggests frequencies above the u.h.f. TV band, above 928MHz or so. I am personally quite convinced that OC will never be permitted below that frequency and the various CB associations and movements might as well accept this (if the money-grabbing interests will let them). They could then get on with the campaign aimed at getting the Government to implement OC as soon as possible following the November deadline on public comment set in the Green Paper. Let us know soon the precise frequency for the proposed 40 channels, and the mode, not specifically mentioned, but assumed to be f.m.

Clubs and Clubs

Seems this feature does get read by some, judging by the several clubs reporting in this month for the first time. Apart from being a source of knowledge on amateur radio matters generally, a club is often the foundation of lasting friendships and a centre of allied social activities for all the

members of a family. It is also the means of avoiding being completely dedicated to the hobby to the extent of neglecting one's family and social responsibilities.

Ipswich RC. Exciting news for members, with the acquisition of a clubroom at the Rose & Crown, Norwich Road, Ipswich, with meetings on the second and last Weds of every month around 8pm. The previous HQ in a school imposed severe restrictions on club activities. However the school will still be used on other Weds for less formal meetings and for code classes. Incidentally, the new clubroom is separate from the bars of the pub so juniors need not fear if they want to barge in and join the club. Contact: Jack Tootill G4IFF, 76 Fircroft Road, Ipswich IP1 6PX, or ring him on 0473 44047. Club magazine *QUA* lists an interesting talk on assembling an amateur radio station, by G4GVW on Dec 10.

Wolverhampton ARS. In the list for the first time, meets every Monday, 8pm, at Neachells Cottage, Stockwell End, Tettenhall. Club station is G8TA. Unusual activity for 2m addicts is a regular DF hunt run on Sundays. All you want to know from John Cook G8EDG, 75 Windmill Lane, Castlecroft, Wolverhampton WV3 8HN.

Mid Lanark ARS. Friday nights at 7.30 finds the club in session at the Wrangholm Hall, Community Centre, Jerviston Street, New Stevenson, Motherwell, with club station GM3PXX. Maybe in time (if *PW* is early), is the bring, buy and swap night on Dec 5, with the 19th being devoted to a film night. Try club Sec Doug Smillie GM4FKD at the club QTH.

Exmoor RC. Now has club call G8SSS, 15 licensed members and six passes out of seven candidates in the last December RAE, the lazy fellow passing in May. Mike Jemison G8RZE runs the club RAE courses, obviously very well indeed, while XYL Pat, taking the next RAE, is club Sec at Homedale, Brayford, North Devon. Dare she **not** pass?! Oh, yes. Club meets 7.30pm every Thursday at Loughrigg, East Street, South Molton with ladies in particular being especially welcome.

Stevenage & District RS. RAE classes already under way, one for absolute beginners and the other for those with a fair knowledge of electronics. What a good idea! Other clubs please copy! After the bigheads have passed their RAE the beginners move up to the advanced class and so on. Worthy of mention are Frank Collet G3OVT organiser, with help from Pat Higham G8JLM and Cliff Barber G4BGP. Meetings Tuesdays 7.30pm at British Aerospace Dynamics Ltd., Plant B, Staff Canteen. Membership costs a mere £3 a year which can't be bad value for money. Trevor Tugwell G8KMV, 11 The Dell, Stevenage, Herts will help further.

Verulam ARC. Lovely to hear from Mary Claytensmith G4JKS, 115 Monshalswich Lane, St Albans, Herts AL1 4UU about the club which meets fourth Tuesday of each month at the Charles Morris Memorial Hall, Tyttenhanger Green, Tyttenhanger near St Albans at 7.30pm. December 16 is AGM and Christmas Social, in that order! Informal meetings on second Tuesdays at the RAFA Club, Victoria Street, St Albans.

Bournemouth RS. Club call now G2BRS and not G3FVU. Meets in the clubroom of the Dolphin Hotel, Holdenhurst Road, Bournemouth at 7.30pm with next meeting on Dec 7 being a skittles event versus South Dorset RS. Radio controlled ones, of course! Very interesting will be a sale of equipment on behalf of the RAIBC coffers which "may take several sessions," says their Newsletter. Not to be missed. Recent change of secretary means writing to Glenn Lloyd, 4 Gorleston Road, Parkstone, Poole, Dorset. I've heard of Poole before, somewhere!

Edgware & District RS. Meets second and fourth Thursdays 8pm at Watling Community Centre, 145 Orange Hill, Burnt Oak, Edgware with other activities like a club net on 160m, slow Morse practice, also on Top Band from G3ASR, the club station call, plus code classes before each meeting at speeds to suit those present. Coming up is a junk sale or, to put it a little more delicately, a sale of equipment surplus to requirements. It's surprising what bargains one can find at a junk sale! This one is on Dec 11. Very sorry to learn from the *Edgware Ham News* of the death of Doug Findlay G3BZG, long standing supporter of the club and RSGB president in 1957. More info on the club from: Howard Drury G4HMD, 39 Wemborough Road, Stanmore, Middx or try 01-952 6462.

RAIBC. Not a local club as are others reported in this column but a national one for the blind and/or invalid amateur or s.w.l., plus its many supporters, like Audrey, the XYL of Eric Payne G4FHE, who has recorded onto tape the whole of the *Guide to Amateur Radio*, to be copied for the benefit of blind members aspiring to a licence or for beginners to the hobby. This item culled from *Radial*, the club's magazine. Club Secretary is Frances Woolley G3LWY, 9 Rannoch Court, Adelaide Road, Surbiton, Surrey KT6 4TE.

Meirion ARS. New this year, the club has an excellent programme organised right through to next April with the annual dinner on Dec 13. So it's the first Thursday of the month at the Ship Inn, Dolgellau at 7.30pm. New members and visiting folk most welcome. PRO is Dave Morgan GW8PKA, Penybont, Gellilydan, Blaenau Ffestiniog, Gwynedd or ring Maentwrog 341.

Wirral ARS. First and third Weds, 7.45pm, Sports Centre, Grange Road West, Birkenhead, but regret that excellent newsletter does not give events for December. PRO Gordon Lees G3UJX, 30 Manor Drive, Upton will be glad to fill you in, or ring 677 1518.

Hastings Electronics & RC. Active again in recent years after long absence, now with club call G6HH (you've guessed it! Happy Hastings!) and interests covering all aspects of electronics besides amateur radio. Membership no less than 130 which speaks well for the efforts of chairman Terry Ransom G4FET. Own club premises at 479 Bexhill Road, St Leonards, but size of membership means meetings third Wednesday of the month, 8pm, at West Hill Community Centre, Croft Road, Hastings. If you want to play around with the rig then its Bexhill Road every Friday evening. Try Secretary Derek Edwards G8RYG, 214 Hillside Road, Hastings for latest news of events. Should mention club has well-written and properly printed leaflet about the club for intending members, plus ditto monthly magazine *Vital Spark*, which all helps to swell the numbers.

DX Time

The SRX-30 plus dipoles of **Basil Woodcock** BRS44266 (Leeds) seems to have been working overtime, especially on 10m where the log showed the VP8SB and VP8SU, FP0FXP, VQ9TT, VS6CT, S79MC, 3B8CF, 3B6CD, ZE1AR and 9K2EW. Three goodies on 20m were 5V4HD, 8R1RBF, and 8SVT whose QTH I'd like to know. In Chadderton, Lancs, 14-year-old **Mark Ryder** BRS43580 concentrated on 20m to find FG0FIS/FS7, FK8DH, FO0CT, HV3SJ, P29CH, S8AAP (there it is again!), VK2AGT/LH (Lord Howe Is), VK9NC, VK0KH, VP2AZE, VP8PP, 6W8FZ, 8P6BX plus 9X5DR. Nice ones on 10m were HH2FH, HK0FBF, VK5RD/VK8 and YS9RVE. Bravely, Mark says he will forego the December RAE because of schoolwork. All the better to ensure a pass OM!

A *PW* amateur bands' receiver plus preselector fed from a G5RV aerial enabled **Paul Flatman** (Ipswich) to dig deep on 21MHz and 28MHz rather than 14MHz which he found patchy. So 21 looked like D68AP (Comoro Is), HS1AMM, FG0FIS/FS7 (QSL K6LPL), J3AH (QSL W2GHK), J6LFH, T1AJ, TU4AT, VP5TCI, XT2AW (QSL KN1DPS), YB0CR and YC1GJ. Obliging on 28 were C5AAJ, FM7AV (QSL F6BFH), VP2MPB (QSL W5STI), ZS3KC, 5N8THG and 9J2BO.

Just 200 yards away from Mark Ryder, mentioned above, lives **Mike Howard** with his DX-160 and "XJK" aerial, said to be related to the W8JK (Info please! he screamed) which got plenty of DX on 20m like FH8OM, H44SH, KS6BK, P29CH, TR8DX, VK0KH, VQ9PA, T3AC (Kiribati Is), 3D2FJ and 8Q7BB on the Maldives. On 15m it was FO8EM, TU4AT, ZF1MA, 5N2LED, with A22AJ, VS6GC and YS9TE on the 10m band. Mike reckons the BV2A heard on 14 175kHz is a phoney, so be careful.

Complaints of the confusion over American call signs are well founded and the only answer is to listen well and get the QTH! I really must try to publish a list of the present situation over there, as those who are using old call books to check calls are in a right mess!

Allan Stevens (Crowthorne, Berks) is still toying with the idea of a commercial up-converter, but used his regular set to copy AI5P/SV5 in the Dodecanese (that's a W!) on 10m for a very rare one plus VP2KAQ, VP2SAM, ZP5CPE, 7X4MD on 15m. **Dave Coggins** in Knutsford, Cheshire, persisted with his phased verticals and FRG-7 to find CE9AF, FP0FXP, FR7BP/T for an excellent one on Tromelin Is, VP8JB, YJ8NPS and 3B8DB on 28MHz; H44JB, KC4USV on McMurdo Base in Antarctica, T2AAA on Tuvalu Is, plus XYL op T2XYL, TR8DX, and VK9NNW on Norfolk Is, copied on 21MHz, not to mention HL9WP, KC4USV again and VK0KH on 14MHz. Down to 7MHz where C31LU, EP2TY, FM7AV and VK3XI appeared, the last around 7095kHz. Yet lower to 3.5MHz to catch UA9AZO and 4X4VE.

As he knew I was holidaying, **Bill Rendell** of Truro kindly kept his log to two entries this month. How kind! But I'm glad you didn't all do that. They were VP8SB on 20m whose c.w. was "very crisp and very, very fast," says Bill, and FR0FLO on Reunion Is, which was a new prefix and new island captured on 15m. A continuous process of updating his HRO keeps Bill pretty busy. In Hull, **Colin Frankland** was satisfied with his month's listening on his Trio 9R59DS with indoor dipoles and Codar PR30 preselector netting EA9IE, J6LDZ on St Lucia, 3D6BP, 5H3FW and 9G1JX on 21MHz while 14MHz produced FP0FXP, J6LDB, PA0FM/PJ3 and XE2AX.

Between swotting for the RAE and copying the slow Morse from G4RS, **Robert Heeley** of Mansfield, Notts, has managed to copy some DX on his FRG-7 to which he has fitted a Microwave Modules 2m converter but we'll ignore that! 10m came up with C5ABK, SU1AL, 3B8LH, and H44WH and AM, with TG9NR for 40m. Problem for Robert is lack of space for a decent aerial so has got down to wire wound on broom handles but it works, he says, aided and abetted by an a.t.u.

Dave Duglas GM4ELV of Arrochar, Strathclyde, kindly left his Argonaut QRP rig alone long enough to drop me a line on his DXing achievements with a couple of watts or so, but is very disappointed at lack of any reports from G-land on his c.w. He has abandoned his s.s.b. gear and concentrates entirely on QRP c.w., like CM2ER, CP6EL, CX5CH, HI8VBR, lots of Ws, LU3EEG, PY1HQ, VE1HK, VK6LK, VP2AZG, VP8QG, KB2DF/VP9, YV1DOB, ZP5CD, 4Z4DX, 5B4PA, 6W8AR and 9G1EL, **all on 40m** which is an amazing performance in two-way communication. Dave's YL is studying for the RAE and Dave is off to university to gather up a BA. Best wishes to them both.

A family bereavement has kept **Bernard Hughes** BRS25901 of Worcester away from his receiver for a while. Our condolences OM. 80m came up with some nice catches indeed such as A9XCE, A35TW, CE5BYZ and OX3CO. Up to 40m for FM0FJE, FM7AV, TR8DX and 7X4MD, jumping up to 10m for CE9AF, FR0FLO/T, HK0FBF, K5LBU/ST0, 8Q7BB and lastly 9U5AY.

In General

Quite a few notes and telephone messages from regulars who had passed their May RAE and had been eagerly awaiting their calls. Like **John Dainty** of West Wickham, Kent, who studied on his own for around a year and is an invalid to boot. He is now on 2m with his new call G8YLF, and code practice is under way for a G4 before long.

Arthur White of Aisby near Grantham, Lincs, is an excited G8XYX who has already reached a code speed enough to qualify for a G4. Seems Arthur's teacher G3ZOA is delighted to have got his XYL through the RAE, too, and she is now G4KOA! How about that! For the moment Arthur has a KDK FM-2016E on 2m with a four-element beam at 40ft. Like many others, Arthur complained bitterly at the three months wait before hearing the RAE results followed by a further two months before his licence came along.

In Talgarth, Brecon, Powys **Rod Williams** BRS43353 became GW8YPR and started by charging around the local mountainside with his hand-held Icom IC-2E working people all over the place. From home, using a Slim Jim aerial, Rod has been accessing a repeater 70 miles away.

Located in Haverfordwest, Dyfed, **Royston Price** had waited six weeks for his call at the time of writing, his Trio 7600 all ready to go on 2m. He suggested the RSGB should have sent some of its staff to help out the Home Office staff in issuing the licences!

Getting his feet wet on 20m with an f.e.t./i.c. super-regen receiver, 15-year-old **Stephen Pratt** of Abingdon, Oxon, calls himself a relative newcomer to amateur radio, so welcome to the club. The RAE in December is the next target for Stephen so best wishes OM. **Jeremy Pursall** of the North Bristol ARC writes for the first time although he has been DXing around for four years. Being a trainee communications engineer he does not anticipate any trouble with the RAE very soon. Set-up now is a DX-300 but comments: "Bristol is an amateur radio drop-out when it comes to decent shops", so please note, any retailer thinking of a new market for his bits and pieces!

From **G. A. Cartwright** in Wolverhampton comes a very interesting description of his adventures in YU-land, where he accidentally came across a couple of their clubs where he was made most welcome. Anyone wanting further info, perhaps going there next year, should contact G.A.C. at 1 Patshull Road, Albrighton, Wolverhampton.

A personal appeal. I love getting all your letters and logs but **please** put your full name and QTH on every letter because if you do not I have to go wading through past files to locate the info. I manage to remember those who have been writing for many months past but as someone is reputed to have said: "there's an end to it". Ta!

Letters and logs on DX, etc., by the 15th of the month, general letters any time. Time to say "Happy Christmas" to you all and your families, who, hopefully, will get into the festive spirit and come up with plenty of nice gear for the shack. Now for my favourite Christmas joke! Wife bought the OM two RSGB ties for Christmas. He came down Christmas morning proudly wearing one, "and what's wrong with the other one?" she asked!

**Medium Wave
Broadcast
Band DX**

by **Charles Molloy G8BUS**

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

Interference from broadcasting stations is the main obstacle to successful medium wave DXing. The loop aerial offers one solution to the problem but there are occasions when it doesn't help. If the interference (QRM) is coming from the same direction as the DX or from the exact opposite direction, then it will not be possible to null-out the QRM and leave the DX. A loop has two nulls 180 degrees apart! What can be done then? One possibility is to listen for DX in those parts of the band where it can be found in-between European stations, and a quick look at the 1978 Geneva Plan will reveal where they are.

Channel Spacing

In North America the channel spacing is 10kHz starting with 540kHz and ending at 1600kHz. This is the system in use at the moment and it is in operation in Central and South America as well, including the Caribbean (ITU Region 2).

The Geneva Plan starts at 531kHz with 9kHz spacing between stations and it continues right up to 1602kHz, yielding a total of 119 channels against the 106 in Region 2. The two systems co-incide every 90kHz starting at 540kHz, then 630kHz, 720kHz and so on up to 1530kHz.

DX Slots

There are also pairs of frequencies across the band where channels of the two systems are farthest apart, the

maximum frequency difference possible being 4kHz. These too, occur at intervals of 90kHz beginning with 580kHz/590kHz, then 670/680, 760/770, etc., to 1570/1580. These are the DX slots where Region 2 broadcasts may be heard reasonably clear of interference from European all-nighters, and there are surprisingly, 24 of them. Not every one will yield DX or be free of QRM, but you will greatly increase your chances if you investigate them.

What to Listen For

The following is a selection of what can be heard, starting with two powerhouses; WNEW in New York City on 1130kHz and WCAU in Philadelphia on 1210kHz. Search for VOXM St John's Newfoundland on 590kHz, WJR Detroit on 760, WABC New York 770, WHDH Boston 850, CBH Halifax 860, CBM Montreal 940, WBZ Boston 1030, WERE Cleveland 1300, WLOB Portland 1310, WEGP Presque Isle 1390, CKLM Laval Quebec 1570 (in French).

Among the many Latin Americans around are Radio Jornal in Rio de Janeiro on 940kHz in Portuguese, Radio Vision in Caracas on 950 and Radio Coro 1210 (both in Venezuela), three Colombians, Radio Vision Barranquilla 1220, Radio Vision Bogota 1310 and Radio Universal Barranquilla 1400, and the lone Fort-de-France in Martinique which is on 1310kHz in French.

All this may sound rather complicated and the newcomer might well feel that it is just as easy to tune around the band. DX can be heard that way but it will be time-consuming if you are going to investigate every weak signal, and your rare North American might turn out to be AFN in West Germany.

To be successful the medium wave DXer has to be persistent and ingenious, but there is some satisfaction to be had when one "beats the odds". There are other ways of doing this such as listening early in the morning, but more about that next time.

Loops

There are still a few experimenters about, one of whom is **Andy Small** of Barking. He modified the standard "40 inch" loop aerial with rather surprising results. He writes: "The single inductance turn has been omitted and a length of wire is taken from the earth side of the tuning capacitor to the aerial socket on the receiver—it takes only a few minutes to modify your existing loop. The signal strength is far superior to that from the inductance winding and the tuning is equally sharp. The null works very well also and I would say that this is like having a long wire antenna with all the properties of a loop aerial." Andy then invites my comments on the set up, which is shown in Fig. 1.

The "aerial" consists of the loop together with the new single wire lead to the receiver. The latter will still pick up signal when the loop's null is pointed towards QRM and the overall effect will be to degrade the null i.e. it will be impossible to null-out a station completely though it may be feasible to reduce its strength to a lowish value especially if the lead is kept short. If you are nulling out a station to get better reception from another one on the same frequency then the residual pick-up by the "downlead" may not be noticeable. It is worth noting however that the additional pick-up required to give the increase in signal strength must be coming from the downlead so you are faced with a compromise between a stronger signal and an inferior null.

Readers often write to me asking what sort of results will be obtained from various aerial configurations. My answer is always the same—try it and see. Theory is only there as a guide and if we could predict exactly how equip-

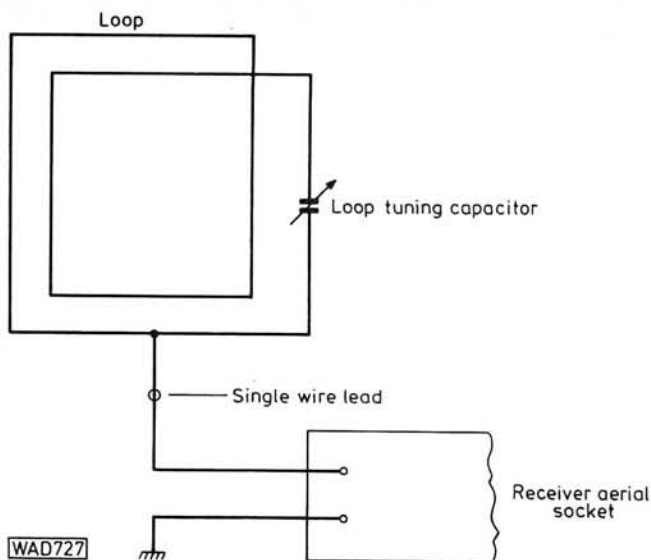
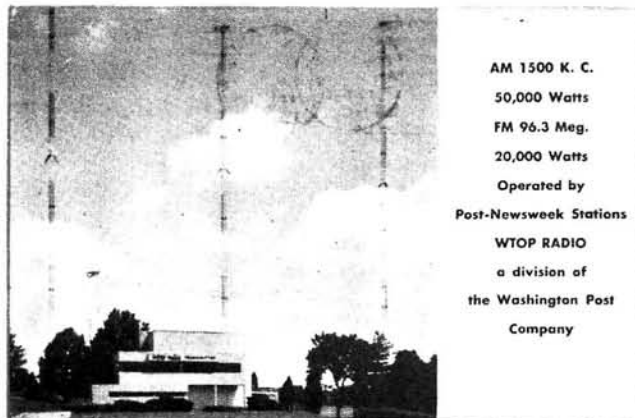


Fig. 1: The direct-coupled loop arrangement proposed by Andy Small



The QSL card of WHN New York City



Station WOTP, Washington DC's QSL card

ment will perform or what propagation will be like on any particular date then a lot of the fun would go out of DXing on the medium waves.



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DX Heard

A good log of North American DX comes from Andy Small who used his Hammarlund SP600JX and modified loop to hear CBM in Montreal on 940kHz, CHER in Sydney, Nova Scotia on 950, WHN New York City on 1050 WEGP Presque Isle in Maine on 1390, CFGO Ottawa 1440, WTOP Washington DC on 1500 and WITS Boston on 1510kHz. Andy has now logged a total of 24 North Americans since making his debut on the medium waves one year ago.

Reader **Bernt Erfjord** of Kvinesdal in Norway has been trying his luck with UK local radio DXing. He reports hearing both Radio Metro and Radio Clyde on 1152kHz and Radio Tees on 1172kHz. The receiver is an FRG-7 with long wire antenna and Bernt has been at the controls now for some two years.

From Malaysia comes a log from 18-year-old **Jeffrey Seow** who "put a few turns" round the ferrite rod aerial of his portable receiver. Stations heard included the Voice of America on approximately 1400kHz at 1310 GMT, the BBC on approx 1190kHz at 2250 and the VOA again on approx 1099 at 1138. Jeff wonders if anyone can suggest what he was listening to. Well, the BBC broadcasts from Cyprus on 1413kHz and from Oman on 1296kHz, but even allowing for poor receiver calibration we are a long way from 1190kHz. So far as I know the VOA does not broadcast near 1400kHz or 1099kHz.

It is risky interfering with the ferrite rod aerial as many receivers are designed to operate with the pick up from this alone. If you apply a larger signal than normal to the aerial circuit there is a risk of overloading and spurious responses. Suggest you try to get hold of a crystal calibrator Jeff so that you can get a more accurate estimate of frequency. Jeff would love to hear from readers of his own age; his address is: 1 North Avenue, Fettes Park, Penang, Malaysia.

A good opening to North America occurred between September 27 and October 3. **Nick Hall-Patch** of Victoria BC on the west coast of Canada reports hearing the BBC on 648 and 882kHz and West Germany on 756kHz. A tape of an unidentified station on 1017kHz logged at 0321 GMT on October 3 and sent to me for information is certainly Istanbul, which really is a good catch from Nick's QTH. An excellent start for North America for this winter.

Short Wave Broadcast Bands

by **Charles Molloy G8BUS**

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

Until recently one of the problems facing the short wave listener was how to find the station he wanted to listen to. It is possible to pick up a broadcast on the medium and

long waves just by setting the pointer to its frequency or wavelength as marked on the tuning scale. Many scales indeed have station names printed on them. Things are very different on the short waves. Many more stations are packed into the tuning scale so that the unfortunate listener will be lucky if he manages to get within 100kHz of the channel he is looking for.

Tuning Aids

Broadcasters are aware of the problem and some of them put out a distinctive interval signal for a few minutes before the start of a programme. All the listener has to do is to tune across the correct band until this signal is heard. Set manufacturers too try to help. Bandspread scales are provided on some receivers which spread out each international s.w. band. Others have logging scales from which the s.w.l. can prepare graphs of frequency against log scale readings if he is keen, or more likely, just keep a note of the log readings of stations that interest him.

Digital readout of course solves the problem completely, but at the moment it is only the more expensive modern receivers that have it. What can be done to help the owners of the large numbers of receivers still in use that do not have digital readout? A crystal calibrator will go a long way to easing the problem. Although not as convenient to use, the calibrator, which is an accessory and can be used with any receiver, will provide results just as accurate as digital readout.

Crystal Calibrator

This device is really a miniature crystal-controlled radio transmitter whose output is rich in harmonics so that it generates "marker pips" right across the short waves. The calibrator is connected to the set in place of the aerial and it may even contain a switch to enable this to be done easily. A simple calibrator with an output of 100kHz would produce markers at 100kHz intervals across the bands up to and perhaps beyond 30MHz. These will be picked up by the receiver where they will appear as unmodulated carriers, or if the calibrator is modulated, by a carrier with an audible tone on it.

A calibrator with a single output is of limited value. It is more useful to have one with several outputs, like the one offered by Cambridge Kits, who advertise in *PW*, which has separate outputs of 1MHz, 100kHz and 25kHz. When the 1MHz output is used there will be markers on every MHz, i.e. 2MHz, 3MHz and so on across the scale. If the 100kHz output is used there will be markers at 100kHz intervals and the 25kHz output will generate markers at 25kHz intervals right across the spectrum.

Using the Calibrator

How is the calibrator used? Suppose you want to set the receiver onto 9750kHz in the 31m band. Use the calibrator's 1MHz output and locate the 9MHz marker using the receiver tuning scale. It ought to be accurate enough for that! Now switch in the 100kHz output and tune to the 9100, 9200 markers in turn, continuing until you reach 9700. Now turn on the 25kHz output and tune past 9725 to 9750kHz and there you are. If you are looking for Radio Bagdad (reader **R Edwards** please note), then you are only 5kHz away from it and if you tune back slightly you should find this station easily.

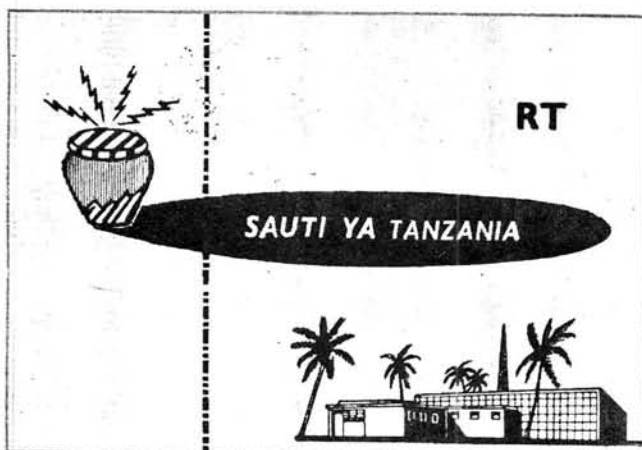
It would of course be more convenient to locate 10MHz and then tune down in frequency until you come to 9750, and this is probably what most people would do once they have had a little practice using the device. Similarly, if you want to know the frequency of the station

you are listening to, simply switch in the calibrator, locate the nearest 25kHz marker, then the nearest 100kHz and 1MHz markers and you can work it out. A little more complicated than setting the receiver on a chosen frequency but again, a little practice is required to get the feel of using a calibrator.

I used a calibrator with outputs of 1MHz, 100kHz and 10kHz for a number of years but confusion can arise when using the 10kHz output as there are so many markers. Some users prefer 25kHz to 10kHz for the lowest output as it should not be too difficult to estimate frequency between two 25kHz marker pips.



A rather attractive QSL from Tahiti



Radio Tanzania issues this QSL card



The long-awaited QSL from Uganda

Time Signal Stations

The 9th edition of a *List of Time Signal Stations* has just come to hand. It is a 50-page illustrated booklet written in English which contains lists of time signal stations in frequency order and also by country where details of the "programme" are given. The introduction is rather interesting as it explains the different time scales in use such as Ephemeris Time, Atomic Time and Sidereal Time, as well as the definition of such an unlikely quantity as a leap second. Copies are obtainable from Gerd Klawitter, D-4430 Steinfurt, Ochtrupper Str 138, Federal Republic of Germany for 6DM or 7 International Reply Coupons (available in main post offices).

Radio New Zealand

RNZ is coming in well on 15 485kHz in the early morning. **Bernt Erfjord** (Norway) picked it up at 0600 with his FRG-7 and long wire antenna, **Alex Dowie** (Hove) heard it between 0540 and 0700 on his Lowe SRX-30 plus 66ft long wire and **David Appleyard** of Uppsala in Sweden logged it at 0500 with his Panasonic DR49 and 25ft long wire. David also heard it between 1800 and 2000 with a lot of QRM from Radio Pakistan. **Simon Baird** (Taynuilt Scotland) lay in bed listening to a RNZ sports report on his Panasonic RF2200 and telescopic antenna. "Even the XYL who could not be described as an enthusiast, was impressed." How to live dangerously at 0630 on a Sunday morning!

Tony King of RNZ tells me that 15 485 has been providing quite phenomenal reception in Europe around 0400 to 0600. "The beam in this schedule will be via Australia on this frequency."

DX Heard

The time signal station BPV at Shanghai is reported on 10MHz by reader **B. S. Robertson** of Oxford, who heard it at 2000 on September 22. The identification came verbally in English and as "BPV" in Morse. Two other exotic catches heard were Tahiti on 11 825kHz at 0630 and Tanzania on 5050kHz. Tahiti was heard on a number of occasions early in the day last winter on this frequency; QRM permitting, this is the time to get a QSL from the South Pacific. Listen for the interval signal on the hour. It is quite distinctive, being a Tahitian flute with drums. Many thanks to our reader for lending his QSLs from these stations for publication.

Our Norwegian reader **Bernt Erfjord** picked up the Singapore Broadcasting Corporation on 5052kHz in English at 1600 until close down at 1630. Also heard were a number of Latin Americans around 0300, the most conspicuous being Ecos del Torbes in Venezuela on 4980 and Radio Sutatenza in Colombia on 5095kHz. Alex Dowie asks about Western Samoa, but unfortunately this country does not broadcast on either the short waves or the tropical bands. The final word is from **B. S. Robertson**, who much to his surprise received a QSL from Radio Uganda (15 325) after some 13 months, which he reckons is even longer than from Chile.

VHF Bands

by Ron Ham BRS15744

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

Among the many fascinations of operating during a v.h.f. opening is wondering whether the other bands are better from a DX point of view than the one you are using, and how best to determine the geographical extent of the prevailing disturbance. Such was the case on October 3, when, for a few hours during a lengthy spell of good tropospheric conditions, both the v.h.f. and u.h.f. bands really opened up, a situation duly exploited by most of my readers.

Solar

Cmdr Henry Hatfield, Sevenoaks and I recorded a 3-minute burst of solar radio noise, Fig. 1, at 136 and 143 MHz respectively, during the midday observation on September 30, and earlier in the morning, Henry, using his spectrohelioscope, saw a large flare take place on the west limb of the sun. We also recorded small bursts of radio noise on October 3, 8, 12, 13, 14 and 17 and mild noise storms on days 9, 14 and 16. On the 9th, Henry observed six sunspot groups. The one near the east limb had about 20 spots, while another was a long chain with about 18 spots. At 1124 he watched a triple flare occur in one group and 16 minutes later the radio noise storm began. Ted Waring, at his observatory in Bristol, counted 32 sunspots on September 26, 37 on the 29th, 19 on October 3rd and 50 on the 15th. There is little wonder that, with solar activity like this, the BBC World Service reported ionospheric disturbances during the early hours of October 5 and 12.

The 10m Band

On September 23, 24 and 25, Harold Brodribb, St Leonards-on-Sea, heard many s.s.b. signals from stations in Canada and the USA, and at 1030 on the 24th he listened to both sides of a QSO between VK6HPF and W4TFB. With the band open again, Harold identified a variety of harmonics between 28 and 31MHz coming from lower frequency broadcast stations in Alma Ata and Moscow. Like myself, Ted Waring received signals on most days between September 20 and October 15, from the International Beacon Project stations in Bahrain A9XC, Bermuda VP9BA, Cyprus 5B4CY and the two South Africans ZS6DN and ZS6PW. On October 7, Harold Goble G4FDQ, Lancing, worked into Guam on s.s.b. and at 1437 on the 10th he contacted a station in Albuquerque, New Mexico, commemorating an International Balloon Festival.

While mobile on October 1, Stan Williams G3LQI/M, using a TS-120S, a G3RVM Iambic keyer and a helical "G" whip aerial mounted on the boot of his car, worked N4BP who was running 5 watts from a solar-powered rig. Stan's main interest is h.f. c.w. mobile, and between October 1 and 11 he worked several stations in the USA, one in Alaska and a VP8. On Sunday the 12th, he parked his car outside the radio building at the Chalk Pits Museum in



Fig. 1: A solar burst recorded by the author during the mid-day observation on September 30

Fig. 2: G3LQI/M operating c.w. at the Chalk Pits Museum

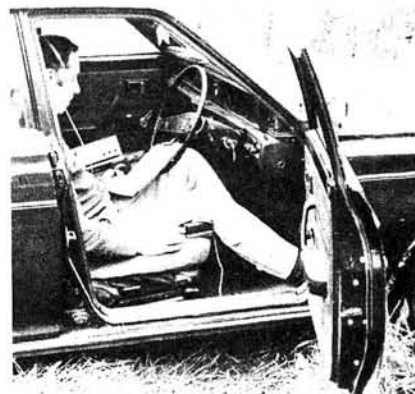


Fig. 3: G3WMU watches his son Pete G4ESC operating at the Chalk Pits Museum



Sussex and made c.w. contacts with five JAs on 15m and three Ws and a VE on 10m, Fig. 2.

The Brownlow family were also at the museum on the 12th and once again delighted the visitors by showing them how an amateur radio station, G3WMU/P can communicate with other parts of the world, Fig. 3.

Tropospheric

The atmospheric pressure rose sharply from 30.1in (1019mb) at midday on September 28 to 30.3in (1026mb)

Fig. 4: Barograph chart recorded by the author, showing the change in pressure that caused the extensive tropospheric disturbance on October 3



at noon on the 29th and then rose a little more to 30.4in (1029mb) during the evening of the 30th where it hovered, giving good v.h.f. conditions, until about 0200 on October 3. Then a gradual fall began and as expected, there was an extensive tropospheric opening, mainly affecting the u.h.f. bands, between about 1600 on the 3rd and 0300 on the 4th, Fig. 4.

For most of the time from September 28 to around midnight on October 3, I received signals averaging 529 from the 70cm beacon at Sutton Coldfield GB3SUT, with only a dipole feeding my receiver. This signal peaked to 559 at 0740 on October 1 and 599, during the peak of the opening, at 1920 on the 3rd. Throughout the period I heard signals at varying strengths from the Bristol Channel GB3BC R6 and Birmingham GB3BM R5, repeaters. and periodically a selection of continental broadcast stations in Band II. **George Grzebieniak**, London, heard 2m signals from F and PA0 on September 28 and 29, HB9ARI on October 2 and OE2CAL on the 3rd. Between 0500 and 0700 on the 4th, **T. Amp**, using a National Panasonic DR49 with an indoor aerial, heard eight French and nine other continental broadcast stations in Band II, several of them being stronger than the BBC signals.

At 1623 on September 26, Harold Brodribb heard strong signals from several French stations between 88 and 100MHz, and on the 29th another Sussex station, **Mick Senior** G4EFO, Horsham, worked into Belgium, France and Holland on 70cm and heard strong signals from the Sutton Coldfield beacon. Mick also worked G8OUU in Peterborough, via the Peterborough repeater GB3PB, RB10. This contact was of special interest to Mick because he built the original PB aeriels. Another Horsham reader, **Ken Smith** BRS20001, heard French and Dutch stations in Band II: one Dutch station, said Ken "was in full stereo". **John Hill** G8HUY, Hayling Island, Hants, told me that from midday on September 30 to early on October 5, he received signals from the beacons in Switzerland, HB9HB on 2m and HB9F on 70cm. John is a very keen 70cm operator and with 6 watts from his Icom 260E, a Microwave Modules transverter and a home-brew 27-element quad loop aerial, he worked stations in 11 countries, DL, F, G, GJ, GU, GW, HB9, OE, OK, ON and PA0 on October 3.

In nearby Portsmouth, G8HND worked an SP near Russia on 70cm and an OK on 23 cm, and **Geoff Stone** G3FZL, told me that several London stations also worked into OK on 23cm. Around 1400 on October 1, **Alan Baker** G4GNX, Newhaven, heard G8WWU work a French station on the Swiss border through the Brighton repeater GB3SR, R3, and between 2100 and midnight on the 3rd Alan worked DF1CF, near Austria, DF6LN east of Denmark, OK1XW/P (Alan's 21st country on 2m) and DF5DL on 2m c.w. and heard part of an SP's call sign on

s.s.b. Along the coast in Lancing, **Barry Ainsworth** G4GPW, also worked into OK on 2m, and **John Cooper** G8NGO, Cowfold, had a wonderful time. On September 27 he worked five PA0s and an OZ, 28th two ONs and seven PA0s, 29th four DLs, five Fs, two PA0s, and G5KW/P in the Scilly Isles "was a fantastic signal," said John. On September 30 he worked 12 Fs and three HB9s, October 1 eight Fs, 2nd three Fs and three HB9s and between 1700 and 2300 on the 3rd he worked five Fs, a GW, five HB9s, four OEs, an OK and 94 West Germans on 2m s.s.b.

Cross Band 10m to 6m

At 1356 on October 16, **John Branegan** GM4IHJ, Fife, heard Bob Billings VE1AVX, Nova Scotia with his automatic keyer on 50.005MHz. Although John did not complete a cross-band QSO with him this time, DK1ITZ did make it, so, to use John's words "6m is officially back in business".

News Items

Within the first fortnight some 45 people had enrolled for the RAE class run on behalf of the Brighton and District Radio Society, by Nigel Hewitt G8JFT, BSc, on Thursdays at 1930, at 47 Cromwell Rd., Hove, Sussex.

Finally, I would like to thank my readers, the Editor and editorial staff of *PW* and my many friends in amateur radio who gave their support to the highly successful Wireless Day at the Chalk Pits Museum on October 5.

TV

by Ron Ham BRS15744

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

Thanks to the continued support from my readers, we will in future have a column devoted to DXTV, and although this will be specialised, as far as unusual propagation is concerned, the subject will be closely allied to my v.h.f. column.

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Fig. 1: Picture received north of Leicester by Bruno Perfect in 1947



Fig. 2: An Austrian programme received by Michael Hahn in 1930 on October 3



Fig. 3: A sports programme from Belgium received by Michael Hahn on October 3



Fig. 4: A west German news programme seen by Michael Hahn on October 3



Fig. 5: SSTV picture received from Japan by Sam Faulkner at 0850 on September 28

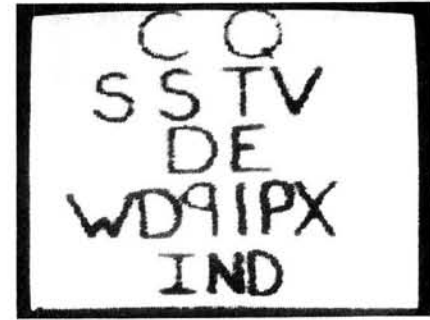


Fig. 6: SSTV picture received by Sam Faulkner at 1745 on September 27

An Early DXer

Although a limited television service operated from Alexandra Palace, London, between November 1936 and the outbreak of war in 1939, large-scale production of sets and the expansion of the service did not begin until transmissions re-started in June, 1946, and the radio factories returned to peace-time work. I well remember those early post-war days when a Channel 1 "H" aerial, a 9in screen, programmes daily from 2030 to 2200, plus an hour on Wednesday afternoons for the ladies, were all we had. For fringe area viewers, like myself, sets were souped up and pre-amplifiers fitted but even then, under normal conditions the pictures were often poor.

One of the early enthusiasts, **Bruno Perfect**, told me that in 1947, when he was living about 10 miles north of Leicester and using a pre-war receiver, an "H" aerial and a home-brew two-stage pre-amp with selected low noise SP61 valves, he received a picture from London, Fig. 1, at that awfully high frequency of 45MHz. Now with worldwide television, Band I, 40–60 MHz approximately, is a happy hunting ground for long-distance television as **Sam Faulkner**, Burton-on-Trent, found between 1730 and 1930 on September 20 when he watched *Bugs Bunny* cartoons and the American TV series *The Love Boat* from RTVE, Spain on Channels E2 and E3.

Band I

During a sporadic E disturbance from 1300 to 1630 on October 10, I received strong pictures from Russia on Ch. R1 49.75MHz and the associated sound on 56.25MHz. At 1318 a clock appeared showing 1618, followed by a YL announcer and a caption with Russian writing. At 1314 I counted 16 very strong east-European f.m. broad-

cast signals between 66 and 73MHz. Between 0800 and 0850 on October 14 I watched strong, unsteady pictures, with multiple blurred images on Ch. R1 similar to the F2 disturbances last year. **John Branegan** GM4IHJ, Fife, reports a "dreadfully smeared picture" from Central Asian Russian TV, on Ch. R1 at 0730 on the 16th, so keep your eyes on R1, it could produce some interesting results this winter.

UHF

There were signs of the approaching good tropospheric conditions on September 28 when **George Grzebieniak**, London, received Westward ITV from Huntshaw Cross on Ch. 59 and on the 29th, both Ken Smith, Horsham and I received strong, negative-image, pictures from France on Ch. 21. While heavy patterning was building up on the BBC and ITV signals, I was also receiving a strong picture from the IBA transmitter at Lichfield, Ch. 8, with a dipole feeding the receiver. George Grzebieniak and **T. Ampì**, also from London, were among the many readers I met on the Wireless Communications Day at the Chalk Pits Museum, Houghton, Sussex, on October 5. George and T. Ampì have become good friends and are in the process of modifying equipment at T. Ampì's station.

"On September 29 and October 3, I received good u.h.f. signals from Crystal Palace," writes **Simon Hamer**, from Presteigne, Wales. Simon uses a Bush 176 receiver with a 26-element, Group "A" aerial from a QTH 500ft a.s.l. with a gap in the hills in the south-east. He also has Grundig "Melody-Boy" and "Satellit" receivers and a Pioneer SX450 for Band II. During a visit to a Science Museum in Denmark recently, Simon saw, among the vintage items, a 1952 Bush TV receiver which had been converted from 405 to 625 lines by a Danish enthusiast.

Between 1930 and 2130 on October 3, **Michael Hahn** G4JRB, Rainham, Essex, received strong u.h.f. pictures from Continental stations and watched a programme similar to our *Police 5* from Austria, Fig. 2, sport with interviews with footballers from Belgium, Fig. 3, and a news bulletin from W-Germany, Fig. 4. For most of September 28, Michael received weak pictures from BRT-RTB, Belgium and NED-2 Holland, and at 1700 on the 30th he saw the evening's programmes from BRT start with *Paulus The Gnome* and then watched other items periodically throughout the evening.

T. Ampì first noticed the good conditions on September 26 when he received colour pictures from NED-2 on Ch. 27 and Germany WDR1, Ch. 30 on the 27th. He received further colour pictures from Holland, Ch. 27 on the 29th, four Swiss stations on Channels 29, 31, 32 and 34 between 0640 and 1015 on October 1 and Belgium and Germany on the 3rd. French stations were predominant with T. Ampì from 1015 on the 1st, when he received pictures from Antenne 2 on Channels 21, 25 and 34, and what looked like Ceefax on 57. On Ch. 34 the French station was fighting with the Swiss station +PTT TSI for predominance. On the 3rd he identified many Continental

signals between Channels 21 and 69, and at one time he saw BRTF on top of the IBA signal from Bluebell Hill on Ch. 43 and Ch. 44 he saw *Es folgt un 1800 Uhr*.

SSTV

"With excellent conditions on 10m during the latter half of September, my KW202 receiver with Robot 400 was rarely far away from the SSTV calling channel, 28 680kHz" writes Sam Faulkner. "SSTV activity really peaked during September 27 and 28 with pre-fixes W1 to W0 logged between 1540 and 2030 on the 27th" continued Sam, who also received his first colour CQ card (in mono) from W7KPW in Arizona while he was in QSO with WB3KOJ. Between September 23 and October 7 Sam received pictures from LA, JA and many from the USA (Figs. 5 and 6) and ZS. "SSTV from ZS land has been very much in evidence, with ZS6AM and particularly ZS6BFU replaying the video he was copying from the States at 1730 on the 27th," writes Sam, who concluded his letter with "The incredible SSTV QRM at times is an indication of the fantastic popularity this mode now enjoys, especially in Europe and the United States".



New Mini Computer

One of the smallest computers on the market, the new Tandy TRS-80 Pocket Computer, was launched in the UK in October.

The computer is battery powered which means that a number of programmes can be loaded and retained for up to 300 hours (the life of the battery) even when the power is switched off, and also makes it a highly mobile unit that can be used almost anywhere. The TRS-80 measures only 175 x 70 x 15mm and will sell for £119 (including VAT).

There are already eight packages of software available to cover varying needs. These include civil engineering, aviation, maths drill, business statistics, real estate, personal finance and a games package. These too, will be in the shops in late autumn at prices ranging from £8.95 to £13.95 (including VAT).

The TRS-80 has a 4-bit CPU consisting of two microprocessors. It can carry 1.9K of user memory (RAM) and a total of 11K of ROM-7K for BASIC interpreter and approximately 4K for the monitor.

Using the cassette interface (£17.95), multiple programmes can be loaded from cassette tape without the previous programme being erased.



Each programme in RAM can be executed selectively by a simple key input.

The machine has a display screen and a 57-key alpha-numeric keyboard. A user manual is included.

Tandy Corporation (UK) Ltd., see advertisement pages of your telephone directory for your local branch.

Zaerix Acquires Mazda

Zaerix Electronics recently announced the acquisition, from Thorn Brimar Ltd., of the radio valves and tubes marketing

and distribution business based at Rochester. With effect from 1 October 1980, Zaerix will be the exclusive licensed distributors of Mazda valves, and on the same date the business will be transferred to their London HQ.

Zaerix will be taking over the complete valve stock, together with the testing facilities of the Rochester operation. Customer service and quality control procedures will be maintained.

Further information from: *Zaerix Electronics Ltd., 46 Westbourne Grove, London W2 5SF. Tel: 01-727 5641/7774.*



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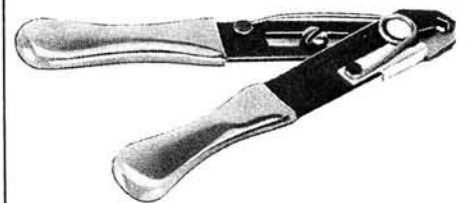


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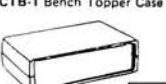
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It's a long time since one of our adverts was presented in 'list' form - but simply because we do not try to squeeze this lot in every time doesn't mean that it's not available. Our new style price list (now some 40 pages long) includes all this and more, including quantity prices and a brief description. The kits, modules and specialized RF components - such as TOKO coils, filters etc. are covered in the general price list - so send now for a free copy (with an SAE please). Part 4 of the catalogue is due out now (incorporating a revised version of pt.1).

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74LS02	0.20	7448N	0.56	74120N	1.15	74175N	1.10
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74LS03	0.20	74LS49	0.99	74123N	0.73	74177N	0.78
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74LS04	0.24	74LS51	0.24	74125N	0.38	74LS181	3.50
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74LS06	0.26	7454N	0.17	74LS126	0.57	74184N	1.35
7407N	0.38	7460N	0.17	74LS127	0.73	74185N	1.34
7408N	0.17	74LS63	1.24	74LS132	0.78	74LS190	0.92
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74LS101	0.24	74LS73	0.38	74142N	0.65	74196N	0.99
74LS11	0.20	7474N	0.27	74143N	3.12	74LS196	1.10
74LS111	0.24	74LS74	0.28	74144N	3.12	74LS197	1.10
74LS11N	0.20	7475N	0.38	74LS145	0.97	74198N	1.50
74121N	0.24	7476N	0.37	74147N	1.75	74199N	1.60
7412N	0.17	74LS76	0.38	74148N	1.09	74LS247	0.93
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7414N	0.51	7480N	0.48	74150N	0.99	74LS260	1.53
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7420N	0.16	74LS85	0.99	74LS153	0.54	74LS365	0.49
74LS20	0.24	74LS86	0.40	74154N	0.96	74LS366	0.49
7421N	0.29	7489N	2.05	74LS155	0.54	74LS367	0.43
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7423N	0.27	74LS90	0.90	74156N	0.80	74LS374	1.80
7425N	0.27	7491N	0.76	74157N	0.67	74LS377	1.95
7427N	0.27	74LS91	1.10	74LS157	0.55	74LS379	1.30
74LS27	0.44	7492N	0.38	74LS158	0.60	74LS393	1.40
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7430N	0.17	74LS93	0.99	74LS160	1.30		
74LS30	0.24	7494N	0.28	74161N	0.92		
7432N	0.25	7495N	0.65	74LS161	0.78		
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7437N	0.40	7496N	0.58	74163N	0.92		
7438N	0.33	74LS96	1.20	74LS163	0.78		
74LS38	0.24	7497N	1.85	74164N	1.04		
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4024	0.76
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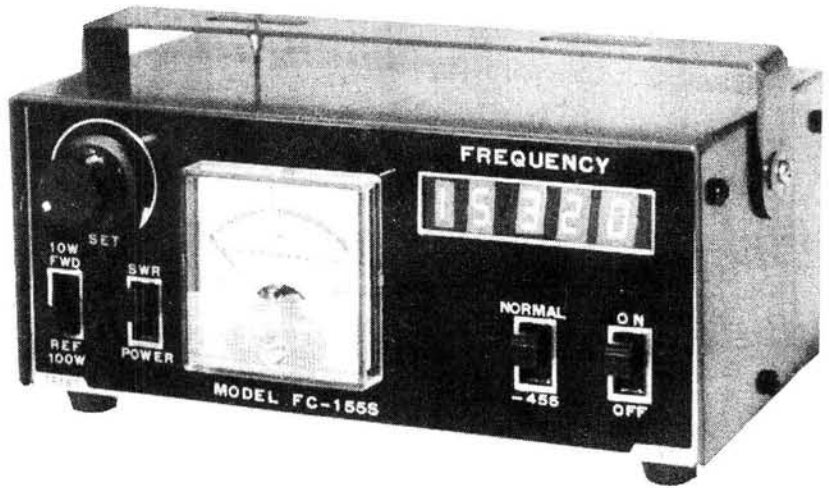
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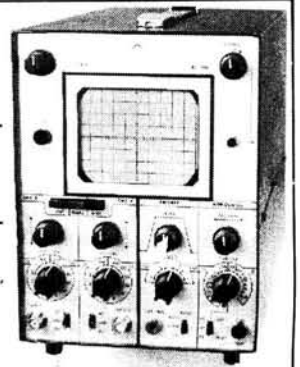
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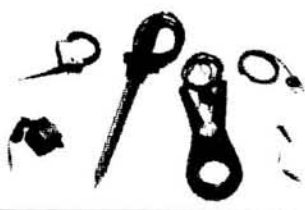
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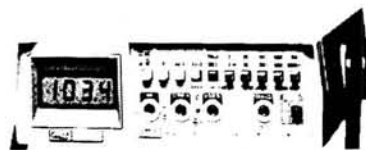
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Accessories for all 3 models:- rechargeable batteries £8, adaptor/charger £4.20, case £8.90, Enterprise prog calculator £19.95, New SC110 10 MHz oscilloscope £144.95.
COMPUTER GAMES
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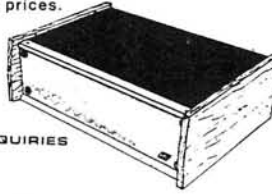
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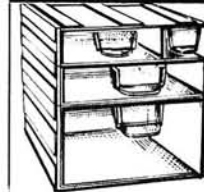
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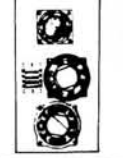
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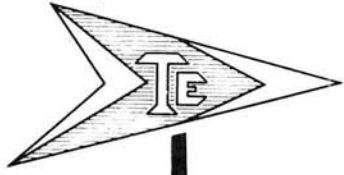
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FULLY SYNTHESIZED — covering 144-145.995 in 400 5kHz steps.
POWER OUTPUT — 1.5W with the 9V rechargeable battery pack as supplied — but lower or higher output available with the optional 6V or 12V packs.
BNC ANTENNA OUTPUT SOCKET — 50 ohms for connecting to another antenna or use the Rubber Duck supplied, supplied.
SEND/BATTERY INDICATOR — Lights during transmit, but when battery power falls below 6V it doesn't light indicating the need for a recharge.
FREQUENCY SELECTION — by thumbwheel switches, indicating the frequency.

+5kHz SWITCH — adds 5kHz to the indicated frequency.
DUPLEX SIMPLEX SWITCH — gives simplex or plus 600kHz or minus 600 kHz Transmit.
HI-LOW SWITCH — reduces power output from 1.5W to 150mW reducing battery drain.
EXTERNAL MICROPHONE JACK — If you do not wish to use the built-in electret condenser mic an optional microphone/speaker with PTT control can be used. Useful for pocket operation.
EXTERNAL SPEAKER JACK — for speaker or earphone.
 This little beauty is supplied ready to go complete with nicad battery pack, charger, rubber duck.

SPECIFICATIONS:

Transistors 4, — FETs 3, ICs 6 Diodes 21.
 Frequency coverage 144-145.995 but will go to 147.995
 Frequency Resolution 5kHz steps.
 Frequency control by digital PLL synthesizer with thumbwheel switches.
 Frequency stability within ± 1.5 kHz.
 Useable temperature -10 degrees C to 60 degrees C.
 Antenna Impedance 50 ohms.
 Power supply requirements DC 8.4V; with attendant battery pack DC 7.2 — 10.8V negative ground is acceptable.
 Current drain at 8.4V

Transmitting:	High 1.5W	Approx 550 MA
	Low 0.15W	Approx 220 MA
Receiving at max audio output		Approx 130 MA
	Squelched	Approx 20 MA

Transmitter output power High 1.5W, Low 0.15W at 8.4V.
 Mode F3, variable reactance frequency modulation, ± 5 kHz.
 Spurious Emissions more than 60dB below carrier.
 Microphone built-in Electret condenser, Optional Speaker Mic can be used.
 Operating Mode, Simplex or Duplex ± 600 kHz from receive frequency.
 Receiver Double Conversion superheterodyne FM.
 Intermediate Frequency 1st 10.695MHz; 2nd 455kHz.
 Sensitivity Better than 0.3uV for 20dB noise quieting.
 Squelch sensitivity — less than 0.3uV.
 Spurious response Rejection ratio more than 60dB.
 Selectivity More than ± 7.5 kHz at -6dB point
 Less than ± 15.0 kHz at -60dB point
 Audio output More than 300mW-8 ohms.
 Tone call Crystal controlled.

It will seduce you in it's own way the ICOM IC 251E £479 INCL. only



AFTER YEARS OF SUCCESS THE IC-211E HAS NOW BEEN REPLACED BY THE IC-251E. NOT JUST A FACE-LIFT, BUT A NUMBER OF IMPORTANT DEVELOPMENTS HAVE BEEN INCORPORATED.

MICROPROCESSOR CONTROL — CPU control with Icom's original programs provides various operating capabilities. No back-lit dial controlled by Icom's unique photo-chopper circuit. Band edge detector and Endless System provides out-of-band protection. No variable capacitors or dial gear, giving problem-free use. The IC251E provides FM, USB, LSB, CW coverage in the 144-146 MHz frequency range. Thus the IC251E can be used for mobile, DX, local calls, and satellite work (easily extended to 148 MHz).
MULTI-PURPOSE SCANNING — Memory Scan allows you to monitor three different memory channels. Program Scan provides scanning between two programmed frequencies. Adjustable scanning speed. Auto-stop stops scanning when a signal is received in all modes.
DUAL VFO's — Two separate VFO's can be used either independently or together for simplex operation, and any desired frequency split in duplex operation. Automatic 600kHz shift available on switch-on.

CONTINUOUS TUNING SYSTEM — Icom's new continuous tuning system features a luminescent display that follows the tuning knob movement and provides an extremely accurate readout. Frequencies are displayed in 7 digits representing 100 MHz to 100 Hz digits.
 Automatic re-cycling restarts the tuning at the bottom of the band when the top is reached — and vice versa. Quick tuning at the bottom of the band when the top is reached in the SSB and CW modes, and 5 KHz steps and 1 KHz steps in the FM mode, is provided for trouble free use.
EASIER OPERATION AND LIGHTER WEIGHT — The most compact, lightest weight all-mode 144 MHz transceiver. First to use a pulse power supply in communication equipment, for lighter weight and cooler running. 50mm-diameter large tuning control knob for smooth and easy tuning.
 Trouble-free controlling knobs for both receiving and transmitting. LED indicator for transmit and receiving modes.
MOST SUITABLE FOR BOTH FIXED AND PORTABLE STATIONS — Built in 240V AC and DC power supplies. Convenient Dial Lock switch for mobile operation. Easy carry handle. Effective Noise Blanking. IC-SM5 high quality stand microphone is suitable for fixed station operation. Powerful audio output 1.5 Watts at 8 ohm, for easy listening even in noisy surroundings.

OUTSTANDING PERFORMANCE — The RF amplifier and first mixer circuits using MOS FETs and other circuits provide excellent Cross Modulation and Two-Signal selectivity characteristics. The IC251E has excellent sensitivity demanded especially for mobile operation, high stability, and with Crystal Filters having high shape factors and exceptional selectivity. The Transmitter uses a balanced mixer in a single conversion system, a band pass filter and a high performance low-pass filter. The system provides distortion-free signals with a minimum spurious radiation level.

SEND FOR MORE DETAILS ON TECHNICAL CHARACTERISTICS.

Thanet for



ICOM

143 RECVLVER RD.,
 BELTINGE,
 HERNE BAY, KENT.
 Tel: 02273/63859



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- Rugged modular PA (Guaranteed of course!)
- Mobile mount which can be padlocked
- Up-down scanning microphone available

CAN YOU RESIST SUCH A TEMPTATION

Enjoy VHF mobile at it's best-IC-260E

Replacing the IC-245E, the IC-260E offers such extras as full frequency read out, upper and lower sideband, and scanning as well as FM and CW. Thus, it makes an ideal base station, when used with a DC power supply, as well as a mobile. The use of a microprocessor instead of an LSI chip has enabled Icom to offer this at a lower price than the IC-245E.

144MHz ALL-MODE TRANSCEIVER INCORPORATING A MICRO-COMPUTER – CPU control with Icom's original programs provides various operating capabilities. No backlash dial controlled by Icom's unique photo-chopper circuit. Band edge detector and Endless System provides out-of-band protection. No variable capacitors or dial gear, giving problem-free use. The IC-260E provides FM, USB, LSB, CW coverage in the 144-146MHz frequency range. Thus the IC-260E can be used for mobile, DX, local calls and satellite work. Easily extendable to 144-148.

MULTI PURPOSE SCANNING – Memory scan allows you to monitor three different memory channels. Program Scan provides scanning between two programmed frequencies. Adjustable scanning speed. Auto-stop stops scanning when a signal is received, in all modes.

DUAL VFO'S – Two separate VFO's can be used either independently or together for simplex operation, and any desired frequency split in duplex operation.

CONTINUOUS TUNING SYSTEM – Icom's new continuous tuning system features an LED display that follows the tuning knob movement and provides an extremely accurate readout.



£399 INCL.

Frequencies are displayed in 7 LED digits representing 100MHz to 100Hz digits. When in Duplex and using the tuning-knob the two VFO's track together. Automatic recycling restarts tuning at the top of the band, i.e. 145.999.9 MHz when the dial goes below 144.000.0MHz. Recycling changes 145.999MHz to 144.000.0MHz as well. Quick tuning in 1kHz steps is available, and fine tuning in 100Hz steps in the FM mode, is provided for trouble-free QSO.

OUTSTANDING PERFORMANCE – The RF amplifier and first mixer circuits using MOS FET's and other circuits provide excellent Cross Modulation and Two Signal Selectivity characteristics. The IC-260E has excellent sensitivity demanded especially for mobile operation, high stability and with Crystal Filters having high shape factors and exceptional selectivity. The transmitter uses a balanced mixer in a single conversion system, a band pass filter and a high performance low pass filter. This system provides distortion free signals with a minimum spurious radiation level for an output of 10W or more.

ADDITIONAL CIRCUITS – The IC-260E has a built-in Noise Blanker, CW Break-in CW Monitor, APC and many other circuits for your convenience. The IC-260E has everything you need to really enjoy VHF operation, in an extremely compact rugged transceiver.

Thanet for



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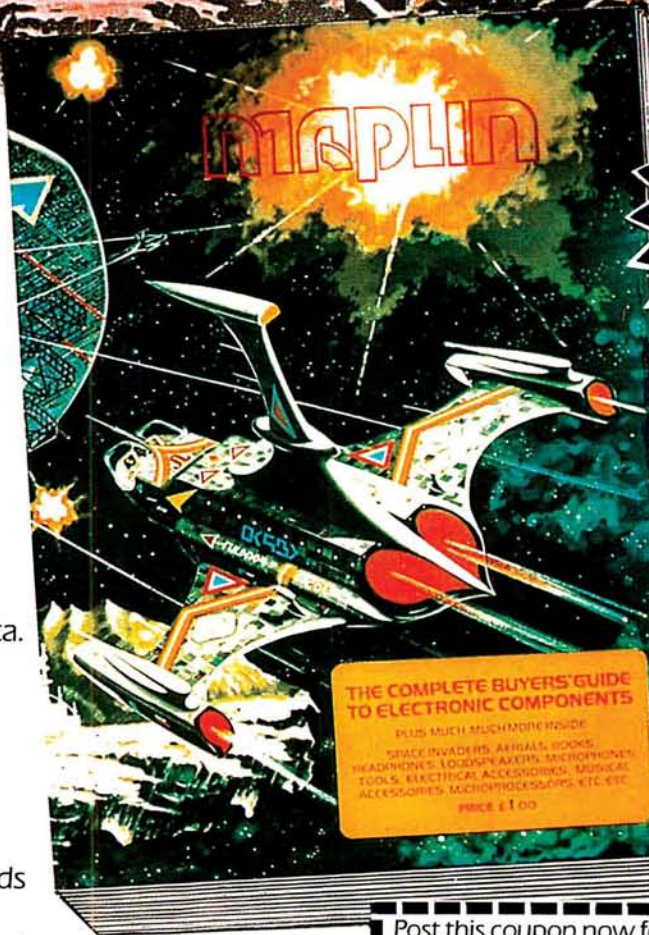


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