practical WIRELESS

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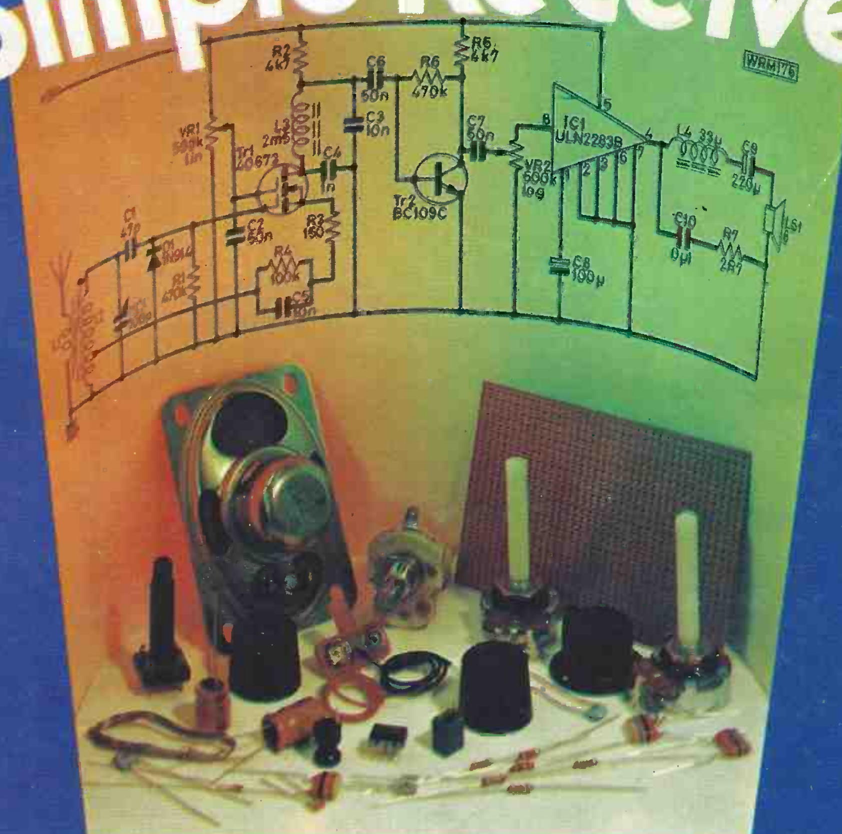
OCT 1979

FREE Professional Trimming Tool

for adjustment of single or double coil cores

Simple Receiver



also:

VHF DF Loop Aerial

Beginning: Hi-Fi Glossary

practical
WIRELESS
BRITAINS LEADING JOURNAL FOR THE RADIO & ELECTRONIC CONSTRUCTOR

OCTOBER 1979
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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, at the above address, giving a clear description of the problem and enclosing a stamped self-addressed envelope. Only one project per letter please.

Components are usually available from advertisers. A source will be suggested for difficult items.

SUBSCRIPTIONS
Subscriptions are available to both home and overseas addresses at £10·60 per annum, from **"Practical Wireless" Subscription Department, Oakfield House, Perrymount Road, Haywards Heath, West Sussex RH16 3DH.**

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Limited stocks of some recent issues of *PW* are available at 75p each, including post and packing to addresses at home and overseas.

Binders are available (Price £3·75 to UK addresses and overseas, including post and packing) each accommodating one volume of *PW*. Please state year and volume number for which the binder is required.

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All reasonable precautions are taken by *Practical Wireless* to ensure that the advice and data given to readers are reliable. We cannot however guarantee it and we cannot accept legal responsibility for it. Prices are those current as we go to press.

☐ NEWS & VIEWS

☐ FOR OUR CONSTRUCTORS

☐ GENERAL INTEREST

☆ SPECIAL OFFER

Our November issue will be published in early October
(for details see page 43)

ERSIN Multicore 5 CORE SOLDER

Handy size reels and dispensers

of the world's finest cored solder to do a professional job at home

Ersin Multicore Solder contains 5 cores of non-corrosive flux that instantly cleans heavily oxidised surfaces and makes fast, reliable soldering easy. No extra flux is required.

handy size reels of

***SAVBIT, 40/60, 60/40 and ALU-SOL** solder alloys*

These latest Multicore solder reels are ideal for the toolbox. Popular specifications cover all general and electrical applications, plus a major advance in soldering aluminium. Ask for a free copy of 'Hints on Soldering' containing clear instructions to make every job easy.

Ref.	Alloy	Diam. (mm)	Length metres approx.	Use	Price inc. VAT
Size 3	40/60 Tin/Lead	1.6	10.0	For economical general purpose repairs and electrical joints.	£3.22
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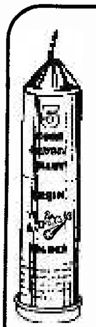
Size 12	SAVBIT	1.2	13.7	For radio, TV and similar work. Increases copper-bit life tenfold.	£3.22

SAVBIT



handy solder dispenser

Contains 2.3 metres approx. of 1.22mm Ersin Multicore Savbit Solder. Savbit increases life of copper bits by 10 times.

Size5 78p inc. VAT

For soldering fine joints

Two more dispensers to simplify those smaller jobs. PC115 provides 6.4 metres approx. of 0.71mm solder for fine wires, small components and printed circuits.

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Or size 19A for kit wiring or radio and TV repairs. 2.1 metres approx. of 1.22 mm solder.

Size 19A 83p inc. VAT

[illegible]

Bib Hi-Fi Accessories Limited,

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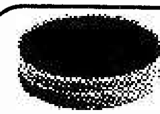
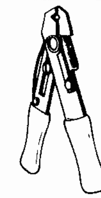
SOLDERING FLUX PASTES



'ERSIN' A non-corrosive, rosin based flux for general and electrical soldering in conjunction with 'Ersin' Multicore solders. **Ref AF14 60p** inc. VAT

'ARAX' For general metal joining in conjunction with 'Arax' Multicore solders. **Ref RF10 60p** inc. VAT

BIB WIRE STRIPPER and CUTTER



Easily adjustable for most sizes of flex and cable. Fitted with extra strong spring for automatic opening. Easy grip handles and handle locking device.

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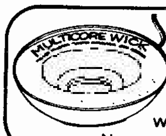
EMERGENCY SOLDER

Self-fluxing, tin/lead solder tape that melts with a match. For electrical and non-electrical applications.

Size ES36 55p inc. VAT

MULTICORE WICK



for solder removal and desoldering. Absorbs solder instantly from tags, printed circuits, etc. Only needs 40-50 watt soldering iron. Quick and easy to use. Non-corrosive. **Size AB10 £1.29** inc. VAT

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A reel of 1.2mm 'Ersin' Multicore solder for general electrical use.

Size 13A £2.99 inc. VAT

A reel of 3mm 'Arax' Multicore solder for general non electrical use.

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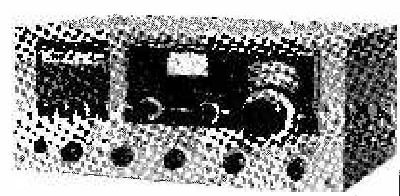
THE SHOP THAT SPECIALISES IN HAM RADIO

RECEIVERS – TRANSMITTERS

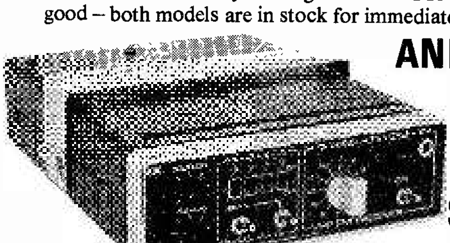
TRANSCEIVERS – HF – VHF – UHF



£214 inc. VAT **FREE SECURICOR DELIVERY** **£178 inc. VAT**

This month we present to you two excellent short wave receivers that give you top value for money. In July we mentioned how the FRG7 was the perfect receiver for both the beginner and experienced listener or radio amateur alike. And, of course, our many hundreds of satisfied customers know that we have a special test schedule that every receiver has to pass before it is despatched to its proud new owner.

We can now tell you that we are stocking the latest version of the Lowe SRX30 receiver. Now this receiver is very similar in many respects to the FRG7. In fact, electrically, there's not a great deal of difference between the two receivers. In other words, the ability of the SRX30 to pull the stations in is every bit as good as the FRG7. But there is a difference. It's not quite so pretty as the FRG7 but electrically it's every bit as good – both models are in stock for immediate free Securicor despatch.



AND NOW VHF! Yes, the TM56B receiver is ideal for home and car, having both 12v DC and 240V AC mains supplies built-in. We've already sold hundreds. It covers all the popular amateur VHF channels and repeaters. It also features automatic scanning of up to 4 channels of your choice. The amateur band version is £106. We can also supply a marine version with 10 channels fitted at £115 – as used by coast guards and river pilots, etc.

STOP PRESS Super 27/28mHz mobile aerials in stock – £18.50 plus £1 carriage.

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TRANSCEIVERS RECEIVERS

(with or without World Record beating Partridge VFA antenna)

TRANSCIEVERS

Here's our 10-1 VAO – send us just 4 9p stamps (36p) for the latest YAESU fully illustrated Catalogue and this comes to you with our VAO CREDIT VOUCHER worth £3.60 for your eventual TRANSCEIVER purchase. Or a couple of stamps brings you the FT1012, Atlas or Swan leaflets.

Here's a short list of transceiver equipment now available – prices on request.

ATLAS RX III., ATLAS RX 110., ATLAS TX 110L., FT901 DM., FT901ID., FT901DE., FT101Z., FT101ZD., FT7D., FT 202R., FT7B., LINEAR FL 2100B, QTR 24, SWAN ASTRO 150 FT225R., FT 225RD., FT227RB.

VALUE ADDED OFFER/2

Include a Joystick ·5-30 m/cs 500w.p.e.p. Antenna System "J", as part of your transceiver order – system will only cost £40.50 inclusive! SAVING £13.50!!!

RECEIVERS – PACKAGE DEALS

VALUE ADDED OFFER/3

VAT is up but we've increased savings on packages from £14.15 to £21.45! Complete Radio Stations, all cables, headphones, Joystick System A antenna – ON THE AIR IN SECONDS!

SUPER PACKAGE R.1.
Features FRG7 RX **£240.80**

SUPER PACKAGE R.2.
Features the "ROLLS" FRG 7000. **£409.00**

RECEIVERS ONLY
FRG7 **£204.40** FRG 7000 **£372.60**

JOYSTICK ANTENNA SYSTEMS

SYSTEM "A" 200w p.e.p. or for the SWL **£48.55**

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Buy it with Access

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G3CED G3VFA

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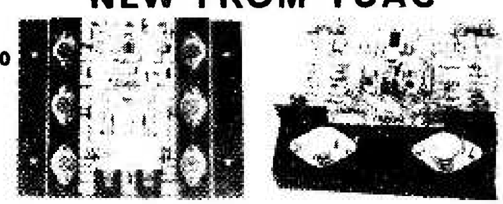
NEW FROM TUAC

TD500  TD150

7" x 9" x $1\frac{3}{4}$" ULTRA QUALITY HIGH POWER 5" x 5" x 2"
New D.C. Coupled Design
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Featuring—Electronic Short Open and Thermal Overload Protection.
Brief Spec.—Input Sensitivity 0·775 v. R.M.S. (O.D.B.) at 25K Ohms. Frequency Response 20 Hz – 20 KHz. T.H.D. at full power 0·1%.
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Continuous Ratings

+ VAT 15%

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Ref	Amps	Price	P&P
112	0.5	2.90	0.78
79	1.0	3.93	0.96
3	2.0	5.35	0.96
20	3.0	8.37	1.14
21	4.0	6.79	1.14
51	5.0	10.86	1.32
117	6.0	12.29	1.45
88	8.0	15.45	1.64
89	10.0	18.98	1.64
90	12.0	21.09	1.95
91	15.0	24.18	2.08
92	20	32.40	O.A.

50 VOLT RANGE

Pri 220/240V Sec 0-20-25-33-40-50V Voltages available 5, 7, 8, 10, 13, 15, 17, 20, 33, 40 or 20V-0-20V and 25V-0-25V.

Ref	Amps	Price	P&P
102	0.5	3.75	0.78
103	1.0	4.57	0.96
104	2.0	7.88	1.14
105	3.0	9.42	1.32
106	4.0	12.82	1.50
107	6.0	16.37	1.64
118	8.0	22.29	2.09
115	10.0	27.48	O.A.
109	12.0	31.79	O.A.

MAINS ISOLATORS (SCREENED)

PM 120/240 Sec 120/240V CT

Ref	VA	Price	P&P
*07	20	4.84	0.78
149	60	7.37	0.96
150	100	8.39	1.14
151	200	12.28	1.14
152	250	14.61	1.50
153	350	18.07	1.64
154	500	22.52	2.16
155	750	32.03	O.A.
156	1000	40.92	O.A.
157	1500	56.52	O.A.
158	2000	67.99	O.A.
159	3000	95.33	O.A.

*Pri 0-220-240V Sec 115 or 240V. State sec. volts required

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240V cable in 115V USA flat pin outlet

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200	12.02	1.48	65W
250	12.55	1.48	69W
500	20.13	1.64	67W
1K	30.67	2.30	84W
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12 OR 24V OR 12-0-12V

Pri 220-240 volts

Ref	Amps 12V	Amps 24V	Price	P&P
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213	1.0	0.5	2.90	0.78
71	2	1	3.86	0.78
18	4	2	4.46	0.96
85	5	2.5	6.16	0.96
70	6	3	6.99	0.96
108	8	4	8.16	1.14
72	10	5	8.93	1.14
116	12	6	9.89	1.32
17	16	8	11.79	1.32
115	20	10	15.38	2.08
187	30	15	19.72	2.08
226	60	30	40.41	U.C.

END OF LINE OFFERS

Ref				Price	P+P
30-Isolator	240V:240V	200VA		**£4·54**	£1·04
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6-250-0-250 @ 100ma 1) Sec 6·3V @ 3·5A 2) Sec 0-5V, 6·3V @ 2/1 amp **£3·20** 78p

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218-250-0-250V @ 150ma 1) Sec 6·3V @ 4A 2) 0-5V, 6·3V @ 2/1 amp **£3·50** 78p

27-250-0-250 @ 60ma 1) Sec 6·3V @ 2·5A 2) Sec 6·3V @ 1 amp **£3·00** 78p

220-410-0-410V @ 180ma 1) Sec 6·3V @ 4 amp CT 2) Sec 6·3V @ 2A 5V @ 2 amp **£5·30** 96p

82-4 amp Battery Charger (transformer) **£4·81** £1·04

86-6 amp Battery Charger (transformer) **£5·80** £1·04

M184 – To match EL84 15W **£1·62** 32p

M616 – 0-240V: Screen 1) 13-0-13 1A. 2) 12V 150ma **£2·10** 60p

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M708 – 6K to 3KΩ matching trans. 5 watt **90p** 40p

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M973 – 100V Line to 8Ω 40 watts **£2·90** 60p

M1015 – Choke 8A @ 5mH 150A Surge **£1·50** 45p

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Ref	mA	Volts	£	P&P
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212	1A, 1A	0-6, 0-6	3·14	0·78
13	100	9-0-9	2·35	0·38
235	330, 330	0-9, 0-9	2·19	0·38
207	500, 500	0-8-9, 0-8-9	3·05	0·71
208	1A, 1A	0-8-9, 0-8-9	3·88	0·78
236	200, 200	0-15, 0-15	2·19	0·38
214	300, 300	0-20, 0-20	3·08	0·78
221	700 (DC)	20-12-0-12-20	3·75	0·78
206	1A, 1A	0-15-20-0-15-20	5·09	0·96
203	500, 500	0-15-27-0-15-27	4·39	0·96
204	1A, 1A	0-15-27-0-15-27	6·64	0·96
239	50	12-0-12	2·88	0·38

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100V	25A*	£2·10
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Ref			P&P
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172	1A	3·26	0·78
173	2A	3·95	0·78
174	3A	4·13	0·86
175	4A	6·30	0·96

VAT 15%

Mini Multimeter:—DC1000V AC 1000V AC/DC 1000 /V DC 100ma Res 150K **£7·20** P & P 62p VAT 15%

U4315 Budget Meter. 20KΩ/V Ranges to 1000V, 2.5A AC/DC 500KΩ Res. In steel case **£15·85.** PP £1·15 VAT 15%

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3A	16·17	1·48
4A	20·65	1·84
5A	29·30	2·15

VAT 15%

AUTO TRANSFORMERS

Ref	VA (Watts)		£	P&P
113	15	0-115-210-240	2·73	0·71
64	75	0-115-210-240	4·41	0·96
4	150	0-115-200-220-240	5·70	0·96
67	500	0-115-200-220-240	12·09	1·64
84	1000	0-115-200-220-240	20·64	2·08
93	1500	0-115-200-220-240	25·61	0A
95	2000	0-115-200-220-240	30·31	0A
73	3000	0-115-200-220-240	65·13	0A
80S	4000	0-10-115-200-220-240	84·55	0A
57S	5000	0-10-115-200-220-240	98·45	0A

Step up or step down

PANEL METERS

43mm × 43mm		82mm × 78mm	
0-50μA	5·20	0-50μA	6·70
0-500μA	5·95	0-500μA	6·70
0-1mA	5·95	0-1mA	6·70
0-30V	5·95	0-30V	6·70

VU ind. Panel 48mm × 45mm **2·60**
VU. Ind. Edge 54 × 14mm 250μA F S D **2·60**
Carriage 65p. VAT 15%

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7425	30p	74142	200p
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7427	34p	74147	190p
7428	36p	74148	150p
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7433	40p	74153	70p
7437	35p	74154	100p
7438	35p	74155	90p
7440	17p	74156	90p
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7443	112p	74160	100p
7444	112p	74161	100p
7445	100p	74162	100p
7446A	93p	74163	100p
7447A	70p	74164	100p
7448	80p	74165	130p
7450	17p	74166	100p
7451	17p	74167	200p
7453	17p	74170	240p
7454	17p	74172	720p
7460	17p	74173	120p
7470	36p	74174	93p
7472	30p	74175	85p
7473	34p	74176	90p
7474	30p	74177	90p
7475	30p	74178	160p
7476	35p	74180	90p
7480	50p	74181	200p
7481	100p	74182	90p
7482	84p	74184A	150p
7483A	90p	74185	150p
7484	100p	74186	500p
7485	110p	74190	100p
7486	34p	74191	100p
7489	170p	84192	100p
7490A	30p	74193	100p
7491	80p	74194	100p
7492A	45p	74195	95p
7493A	30p	74196	95p
7494	84p	74197	80p
7495A	70p	74198	150p
7496	65p	74199	150p

74221	160p
74251	140p
74259	250p
74265	90p
74278	290p
74279	140p
74283	190p
74284	400p
74285	400p
74290	150p
74293	150p
74294	200p
74298	200p
74365	150p
74366	150p
74367	150p
74368	150p
74390	200p
74393	200p
74490	225p
74 LS SERIES	
74LS00	13p
74LS02	18p
74LS04	14p
74LS08	22p
74LS10	22p
74LS13	38p
74LS14	76p
74LS20	22p
74LS22	28p
74LS27	38p
74LS30	22p
74LS47	90p
74LS55	30p
74LS73	50p
74LS74	40p
74LS75	50p
74LS83	110p
74LS85	100p
74LS86	40p
74LS90	60p
74LS93	60p
74LS107	45p
74LS112	100p
74LS123	75p
74LS132	900p
74LS133	60p
74LS138	60p
74LS139	60p
74LS151	100p
74LS153	60p
74LS157	60p
74LS158	120p
74LS160	100p
74LS161	100p
74LS162	140p
74LS163	100p
74LS164	120p
74LS165	80p
74LS173	110p
74LS174	110p
74LS175	110p
74LS181	320p
74LS190	100p
74LS191	100p

74LS192	140p
74LS193	140p
74LS195	140p
74LS196	120p
74LS221	100p
74LS240	175p
74LS241	175p
74LS242	175p
74LS243	175p
74LS244	195p
74LS245	280p
74LS251	200p
74LS257	120p
74LS259	175p
74LS298	240p
74LS373	200p
74LS374	195p
81LS95	140p
81LS96	140p
81LS97	140p
81LS98	140p
8T28	230p
9301	160p
9302	175p
9308	316p
9310	275p
9311	275p
9312	160p
9314	165p
9316	225p
9322	150p
9368	200p
9370	200p
9374	200p
9601	100p
9602	225p
INTERFACE I.C.s	
MC1488	100p
MC1489	100p
75107	160p
75182	230p
75450	120p
75451/2	72p
75491/2	96p
C-MOS I.C.s	
74C00	25p
74C02	25p
74C04	27p
74C08	27p
74C10	27p
74C14	90p
74C20	27p
74C30	27p
74C32	36p
74C42	110p
74C48	250p
74C73	75p
74C74	70p
74C85	200p
74C86	65p
74C90	95p
74C95	130p
74C107	125p
74C150	250p
74C151	260p

74C157	250p
74C160	155p
74C161	155p
74C162	155p
74C163	155p
74C164	120p
74C173	120p
74C174	160p
74C175	210p
74C192	150p
74C193	150p
74C194	220p
74C195	110p
74C221	175p
4000 SERIES	
4000	15p
4001	17p
4002	17p
4006	95p
4007	18p
4008	80p
4009	40p
4010	50p
4011	17p
4012	18p
4013	50p
4014	84p
4015	84p
4016	45p
4017	80p
4018	89p
4019	45p
4020	100p
4021	110p
4022	100p
4023	22p
4024	50p
4025	20p
4026	130p
4027	50p
4028	84p
4029	100p
4030	55p
4031	200p
4033	180p
4034	200p
4035	110p
4040	100p
4041	80p
4042	80p
4043	90p
4044	90p
4046	110p
4047	100p
4048	55p
4049	40p
4050	49p
4051	80p
4052	80p
4053	80p
4055	125p
4056	135p
4059	600p
4060	115p
4063	120p
4066	55p

LINEAR I.C.s

AY1-0212	600p	MC1496	100p
AY1-1313	668p	MC3340	120p
AY1-5050	212p	MC3360	120p
AY5-1224A	225p	MK50398	750p
AY5-1315	600p	NE531	100p
AY5-1317	750p	NE543K	225p
AY5-1320	320p	NE555	25p
CA5019	80p	NE556	70p
CA3046	70p	NE561B	425p
CA3048	225p	NE562B	425p
CA3080E	72p	NE565	130p
CA3089E	225p	NE566	155p
CA3090AQ	375p	NE567	175p
CA3130E	100p	RC4151	400p
CA3140E	70p	SN76003N	175p
CA3160E	75p	SN76013N	140p
FX209	750p	SN76013ND	120p
ICL7106	925p	SN76023ND	120p
ICL8038	340p	SN76033N	175p
LM301A	36p	SP8515	750p
LM311	190p	TBA641B11	225p
LM318	200p	TBA800	90p
LM324	70p	TBA810	100p
LM339	90p	TBA820	90p
LM348	95p	TCA940	175p
LM377	175p	TDA4500	250p
LM380	75p	TDA1004	325p
LM381AN	150p	TDA1008	300p
LM389N	140p	TDA1022	600p
LM709	36p	XR2206	400p
LM710	50p	XR2207	400p
LM733	100p	XR2216	675p
LM741	29p	XR2240	400p
LM747	70p	ZN414	90p
LM748	35p	ZN424E	135p
LM3900	70p	ZN425E	400p
LM3911	130p	ZN1034E	200p
LM4136	120p	95H90	800p
MC1310P	150p		
MC1458	55p		
MC1495	400p		

VOLTAGE REGULATORS

Fixed Plastic TO-220

1A	+ve		1A	–ve	
5V	7805	75p	5V	7905	90p
12V	7812	75p	12V	7912	90p
15V	7815	75p	15V	7915	90p
18V	7818	90p	18V	7918	90p
24V	7824	90p	24V	7924	90p
100mA	**TO-92**		**100mA**	**TO-92**	
5V	78L05	35p	5V	79L05	80p
12V	78L12	35p	12V	79L12	80p
15V	78L15	35p	15V	79L15	80p

OTHER REGULATORS

LM309K	135p	TBA625B	120p
LM317T	200p	TL430	65p
LM323K	625p	78HO5KC	675p
LM723	37p	78MGT2C	140p

OPTO-ELECTRONICS

2N5777	45p	ORP12	90p	ORP61	90p
OCP71	130p	ORP60	90p	TIL78	70p

TRANSISTORS

AC127/8	20p	BFY51/2	22p
AD149	70p	BFY56	33p
AD161/2	45p	BFY90	90p
BC107/8	11p	BRY39	45p
BC109	11p	BSX19/20	20p
BC147/8	9p	BU105	190p
BC149	10p	BU108	250p
BC157/8	10p	BU205	220p
BC159	11p	BU208	240p
BC169C	12p	BU406	145p
BC172	12p	MJ2501	225p
BC177/8	17p	MJ2955	100p
BC179	18p	MJ3001	225p
BC182/3	10p	MJE340	65p
BC184	11p	MJE2955	100p
BC187	30p	MJE3055	70p
BC212/3	11p	MPF102	45p
BC214	12p	MPF103/4	40p
BC461	36p	MPF105/6	40p
BC477/8	30p	MPSA06	30p
BC516/7	50p	MPSA12	50p
BC547B	16p	MPSA56	32p
BC549C	18p	MPSU06	63p
BC557B	16p	MPSU56	78p
BC559C	18p	OC28	130p
BCY70	18p	OC35	130p
BCY71/2	22p	R2008B	200p
BD131/2	50p	R2010B	200p
BDY56	200p	TIP29A	40p
BF200	32p	TIP29C	55p
BF244B	35p	TIP30A	48p
BF256B	70p	TIP30C	60p
BF257/8	32p	TIP31A	58p
BF259	36p	TIP31C	62p
BFR39	27p	TIP32A	68p
BFR40	27p	TIP32C	82p
BFR41	27p	TIP33A	90p
BFR79	27p	TIP33C	114p
BFR80	27p	TIP34A	115p
BFR81	27p	TIP34C	160p
BFX29	30p	TIP35A	225p
BFX30	34p	TIP35C	290p
BFX84/5	30p	TIP36A	270p
BFX86/7	30p	TIP36C	340p
BFX38	30p	TIP41A	65p
BFW10	90p		
BFY50	22p		

TIP41C	78p	2N3866	90p
TIP42A	70p	2N3903/4	18p
TIP42C	82p	2N3905/6	20p
TIP2955	78p	2N4036	65p
TIP3055	70p	2N4058/9	12p
TIS43	34p	2N4060	12p
TIS93	30p	2N4061/2	18p
ZTX108	12p	2N4123/4	22p
ZTX300	11p	2N4125/6	22p
ZTX500	15p	2N4289	20p
ZTX502	18p	2N4401/3	27p
ZTX504	30p	2N4427	90p
2N457A	250p	2N4871	60p
2N696	35p	2N5087	27p
2N697	25p	2N5089	27p
2N697	45p	2N5172	27p
2N706A	20p	2N5179	27p
2N708A	20p	2N5191	83p
2N918	30p	2N5194	90p
2N930	18p	2N5245	40p
2N1131/2	20p	2N5296	55p
2N1613	25p	2N5401	50p
2N1711	25p	2N5457/8	40p
2N2102	60p	2N5459	40p
2N2160	120p	2N5460	40p
2N2219A	30p	2N5485	44p
2N2222A	20p	2N6027	48p
2N2369A	16p	2N6247	190p
2N2484	30p	2N6254	130p
2N2646	50p	2N6290	65p
2N2904/5A	30p	2N6292	65p
2N2906A	24p	2N128	120p
2N2907A	30p	3N140	100p
2N2926	9p	3N201	110p
2N3053	20p	3N204	100p
2N3054	65p	40290	250p
2N3055	48p	40360	40p
2N3442	140p	40361/2	45p
2N3553	240p	40364	120p
2N3565	30p	40408	70p
2N3643/4	48p	40409	65p
2N3702/3	12p	40410	65p
2N3704/5	12p	40411	300p
2N3706/7	12p	40594	97p
2N3708/9	12p	40595	105p
2N3773	300p	40603	58p
2N3819	25p	40673	90p
2N3820	50p	40841	90p
2N3823	70p	40871/2	90p

DIODES

BY127	12p
OA47	9p
OA81	15p
OA85	15p
OA90	9p
OA91	9p
OA95	9p
OA200	9p
OA202	10p
1N914	4p
1N916	7p
1N4148	4p
1N4001/2	5p
1N4003/4	6p
1N4005	6p
1N4006/7	7p
1N5401/3	14p
1N5404/7	19p

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400 mW 9p
1 W 15p

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100+ 741 £16
100+ 555 £20
100+ RCA 2N3055 £36

BRIDGE RECTIFIERS

1A 50V	21p
1A 100V	22p
1A 400V	30p
2A 50V	30p
2A 100V	35p
2A 400V	45p
3A 200V	60p
3A 600V	72p
4A 100V	95p
4A 400V	100p
6A 50V	90p
6A 100V	100p
6A 400V	120p
10A 400V	200p
25A 400V	400p

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0.125" 12p 50+ 10p
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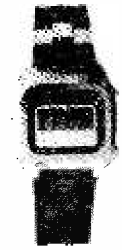
QUARTZ LCD 5 Function



Hours, mins, secs., month, date, auto calender, back-light, quality metal bracelet.

£6.65

Guaranteed same day despatch.
Very slim, only 6mm thick.

M1

SOLAR QUARTZ LCD 5 Function

Genuine solar panel with battery back-up. Hours, mins., secs., day, date. Fully adjustable bracelet. Back-light. Only 7mm thick.

£8.65

Guaranteed same day despatch.

M2

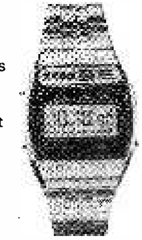
QUARTZ LCD 11 Function SLIM CHRONO

6 digit, 11 functions. Hours, mins., secs., day, date, day of week. 1/100th, 1/10th, secs., 10X secs., mins., Split and lap modes. Back-light, auto calendar. Only 8mm thick. Stainless steel bracelet and back. Adjustable bracelet. Metac Price

£10.65 Thousands sold!
Guaranteed same day despatch.

M3

QUARTZ LCD ALARM 7 Function



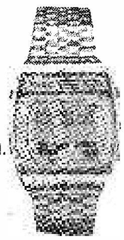
Hours, mins., secs,. month, date, day. 6 digits, 3 flags plus continuous display of day and date or seconds. Back-light Only 9mm thick.

£12.65

Guaranteed same day dispatch.

M4

MULTI ALARM 6 Digits 10 Functions



* Hours, mins., secs.
* Months, date, day.
* Basic alarm.
* Memory date alarm.
* Timer alarm with dual.
* Time and 10 country zone.
* Back-light.
* 8mm thick.

£18.65

M5

FRONT-BUTTON Alarm Chrono Dual Time

6 digits. 5 flags, 22 functions. Constant display of hours and mins., plus optional seconds or date display. AM/PM indication, month, date. Continuous display of day. Stop-watch to 12 hours 59·9 secs., in 1/10 second steps. Split and lap timing modes. Dual time zones. Only 8mm thick. Back-light. Fully adjustable open bracelet.
Guaranteed same day dispatch

£22.65

M6

SOLAR QUARTZ LCD Chronograph with Alarm Dual Time Zone Facility

6 digits, 5 flags. 22 functions. Solar panel with battery back-up. 6 basic functions. Stop-watch to 12 hours 59·9 secs., in 1/10 sec., steps. Split and lap timing modes. Dual time zones. Alarm. 9mm thick. Back-light. Fully adjustable bracelet.

£27.95

M7

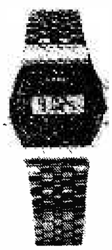
ALARM CHRONO with 9 world time zones

* 6 digits, 5 flags.
* 6 basic functions.
* 8 further time zones.
* Count-down alarm.
* Stop-watch to 12 hours 59·9 secs. in 1/10 sec. steps.
* Split and timing modes.
* Alarm.
* 9 mm thick.
* Back-light.
* Fully adjustable bracelet.

£29.65

M8

SOLAR QUARTZ LCD Chronograph



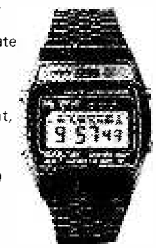
Powered from solar panel with battery back-up. 6 digit, 11 functions. Hours, mins., secs., day, date, day of week. 1/100th, 1/10th, secs., 10X secs., mins. Split and lap modes. Back-light, auto calendar. Only 8mm thick. Stainless steel bracelet and back. Adjustable bracelet.
Metac Price

£12.65

Guaranteed same day despatch.

M9

SEIKO Alarm Chrono



LCD, hours, mins., secs., day of week, month, day and date 24 hour Alarm, 12 hour chronograph, 1/10th secs., and lap time. Back light, stainless steel, HARDLEX glass.

List Price £130.00
METAC PRICE

£105.00

M10

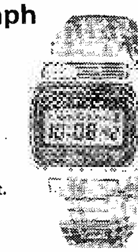
SEIKO MEMORY BANK

Calendar watch M354 Hours, mins., secs. Month, day, date in 12 or 24 hour format all indicated continuously. Monthly calendar display month, year and all dates for any selected month over 80 year period. Memory bank function. Any desired dates up to 11 can be stored in advanced. 2 year battery life. Water resistant.

List Price £130
Metac Price **£79.50**

M11

SEIKO-STYLE Dual time-alarm Chronograph

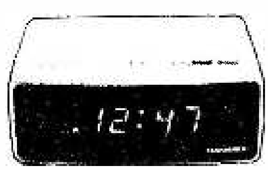


Mineral glass face. Battery hatch for DIY battery replacement. Top quality finish with fully adjustable bracelet.

£35.00

M12

HANIMEX Electronic LED Alarm Clock



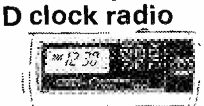
Features and Specification
Hour minute display Large LED display with p.m. and alarm on indicator 24 Hours alarm with on off control. Display flashing for power loss indication. Repeatable 9-minute snooze Display bright dim modes control Size 5.15" x 3.93" x 2.36" (131mm x 11mm x 60mm) Weight 1.43 lbs (0.65 kg) AC power 220V.

£9.65 Thousands sold!
Mains operated.

Guaranteed same day despatch.

M13

HANIMEX portable LCD clock radio



* Time set & alarm controls.
* Snooze & sleep controls.
* Wake to music or alarm.
* AM/PM indicator.
* Battery operated. No plug required.
* Receives all standard AM radio broadcasts.
* Drawstring carrying case included.
* Back-light.
* Batteries supplied free.
* Quartz crystal controlled.

£17.95

M14

QUARTZ LCD Ladies 5 Function

Only 25 x 20mm and 6mm thick. 5 function. Hours, mins., secs., day, date and back light and auto calendar. Elegant metal bracelet in silver or gold. State preference.

£9.95

Guaranteed same day despatch.

M15

Price breakthrough only £18.95

OUTSTANDING FEATURES

* **DUAL TIME.** Local time always visible and you can set and recall any other time zone (such as GMT). Also has a light for night viewing.
* **CALENDAR FUNCTIONS** include the date and day in each time zone.
* **CHRONOGRAPH/STOPWATCH** displays up to 12 hours, 59 minutes, and 59.9 seconds.
* On command, stopwatch display freezes to show intermediate (split/lap) time while stopwatch continues to run. Can also switch to and from timekeeping and stopwatch modes without affecting either's operation.
* **ALARM** can be set to anytime within a 24 hour period. At the designated time, a pleasant, but effective buzzer sounds to remind or awaken you!

Guaranteed same day dispatch.

M16

HOW TO ORDER

Payment can be made by sending cheque, postal order, Barclay, Access or American Express card numbers. Write your name, address and the order details clearly, enclose 30p for post and packing or the amount stated. We do not wait to clear your cheque before sending the goods so this will not delay delivery. All products carry 1 year guaranteee and full money back 10 day reassurance. Battery fitting service is available at our shops. All prices include VAT.

Trade enquiries: Send for a complete list of trade prices — minimum order value £100
Telephone Orders: Credit card customers can telephone orders direct to Daventry or Edgware Rd., 24 hour phone service at both shops 01-723 4753 03272-76545.

CALLERS WELCOME
Shops open 9.30 - 6.00.

Metac ELECTRONICS & TIME CENTRES

North & Midlands
67 High Street, DAVENTRY
Northamptonshire
Telephone: 03272 76545

South of England
327 Edgware Road
LONDON W.2
Telephone: (01) 723 4753

IT'S FREE

Our monthly Advance Advertising Bargains List gives details of bargains arriving or just arrived—often bargains which sell out before our advertisement can appear—it's an interesting list and it's free—just send S.A.E. Below are a few of the Bargains still available from previous lines.

5000 WATT HEATER KIT
Why not make a standby heater, you never know oil, gas even coal could run out this winter so be prepared and in any case a big heater is a good thing to have for an emergency. We are offering the kit at a very special price until September 30th only. The kit consists of:—two metal bladed tangential blowers, two 2·5 kW mineral filled metal clad heating elements, a three level switch, thermal safety cutout, mains and wiring connector panel, all the necessary tag ended leads and last but not least the wiring and assembly diagram. You have to provide the case material yourself, but our diagram gives all the details—the special off season price is **£7·95** + £1·20, carriage £2. Price after September 30th is **£11·50** + £1·75 + carriage.

HUMIDITY or the amount of water held in the air—it has a big effect on many things—unless the humidity is right for instance—chicken eggs won't hatch—tomato flowers won't set—cigars aren't fit to smoke—just to name a few, but most important is, we breathe the air, so humidity has a big effect on our health—air thats too dry makes us feel listless and also damages lungs and respiratory passages—too damp can kill us and in fact it does, fog (humidity 100%) is responsible for premature deaths of may people during winter months. Bearing in mind these facts its surprising that so few of us do anything to control humidity. This company sells a humidity controller switch made by Honeywell of U.S.A. price **£1** + 15p, this adjustable for varying humidities and it will switch 10 amps at 240v—but its just a switch, and if one of our readers would design a simple to make humidifier, we will reward him and pass his design to any interested readers.

FLUORESCENT CHOKES
Another off season special offer. 80 watt chokes **£1·75** + 27p, 65 watt **£1·35** + 20p, 40 watt **£1·25** + 18p. Prices are based upon an order for minimum of 20 chokes, but are subject to a discount of further 15% if you order 100 chokes. Try to collect but if not then add 25p per choke for carriage. Special Summer offer ends Sept. 31st.

RECORD PLAYER MOTORS
As fitted to Magnavox, B.S.R., Garrard etc. 2 pole motors **£1·50** + 22p, post 35p. 4 pole (note these are also fitted to some tape recorders) **£2** + 30p post 40p per motor. An interesting point about these motors is that they will replace a motor which is not quite the same, as the part with the winding on can usually be replaced separately

A DOOR SWITCH
Neat tubular pattern for letting into door frame. All you have to do is drill a ½" dia hole and chisel out for the fixing. This is a changeover switch, so can be used in opening or closing circuits. Price **57p**.

CROUZET SKELETON MICRO SWITCH
Crouzet ref. 319/C this a changeover switch with unlimited uses, contacts rated 10 amps stackable and very light weight, snap action. Price **29p**.

MINI DECADE THUMB WHEEL SWITCH
Stackable, panel hole size 1½" high and approx ⅜" for each switch. Matt black with white figures—gold plated break before make contacts. Price **87p**.

ROCKER SWITCH
Double pole 13 amp 250v for hole size 1⅛" × ⅞" white with nickel plated surround. DOT ref. 82/631. Price **41p**.

VARIABLE AUTO TRANSFORMERS (Variacs)
We have 12 only 8 amp variacs, these are unused being removed from new Ex Gov. power supplies—these variacs enable normal 230/40 mains to be varied smoothly from 0 volts to 270 volts in one volt steps. The current passing through the variac can be anything up to 8 amps continuous or 12 amps intermittent. These are ideal for dimming lighting or heating, speed control etc. and on the work bench for testing unknown transformers etc. The up to date price in the trade catalogue is £50 + vat, but our price is only **£34·50** + £3 carriage.

MOTORS FOR VARIACS
Do you have a job which calls for the remote control of variacs—say the raising and lowering of the house lights in a theatre or the control of the air conditioning by thermostats set at different temperatures. If so you may like to know we have motorised cradles to take up to 4 variacs—mains operated, these drive the variacs backwards or forwards and have limit switches at the end of their 320° travel. Price **£46** + carriage £5.

LOW TORQUE MICROSWITCH
Can be operated by air flow, coins or other small weights so they have many applications—SPDT silver contacts rated at 250v 5a expected life of 10,000,000 operations. Price **52p**.

LIGHT DEPENDENT RESISTOR ORP12
A cadmium sulphide l.d.r. with clear end window—resistance reduces as light increases, dark resistance 1 meg plus, sun light resistance 100—200 ohms. Price **87p**.

SUB MINI TRIMMING POTS
Wire leads suit 1 matrix board—top adjusting available in following values: 10 ohms, 10k, 20k, 50k, 100k, 200k, 250k, 500k and 1 meg. Price **74p** each or **62p** if ordered in ten of one value.

MULTI TURN POT
1⅛" cermet—20 turn metal cased with three leads for p.c.b.—multi-contact wiper ensures minimum noise and excellent stability—slipping clutch end stop, one value only at present this is 2 kΩ. Price **63p**.

SPECIAL CABLES
In addition to the list given in our May/June newsletter we have a few more to add—these have medium duty 7·0076 copper conductors P.V.C. insulated and colour coded, twisted into pairs, each pair braided with a metal screen then all are laid together and covered, black pvc 4 screened pairs **45p**, 5 screened pairs **50p**, 8 screened pairs **60p**, 16 screened pairs **95p**. All prices are per foot and subject to VAT and 60p carriage if order under **£6**.

POWERFUL LOW SPEED MOTOR
230v or 115v mains driven, 45 r.p.m. approx at 50 Mz 60 r.p.m. at 6 Mz. Size is approx 2⅞" dia × 2⅛" deep ⅛" dia shaft ⅞" long—mountable from front or rear, this extremely powerful, in fact the writer could not stop it by hand. Price **£3·75** + 56p, post 40p.

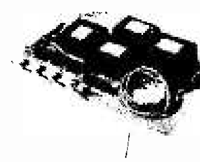
¼ H.P. MOTORS Normal base mounting, ex computors but tested, 230—240v 50 hz good length spindle mostly American make. Price **£8·62** each, carriage £2·00.

STEREO HEADPHONE LEAD
Black curly 10ft approx. terminations, stereo jackplug one end—miniature two pin plugs on other. Price **57p**.

MAINS OPERATED WATER PUMP
Most readers will know that we stock the Jabsco drill pump which was made to work with most portable drills, the price is **£2·15**, we have coupled this to an 110 rpm motor, mounted them on a metal chassis and offer this as a general purpose pump. It is suitable for most liquids and certainly for water. The pump will lift the liquid up to quite a head. Price **£10·60**, post £1·00.

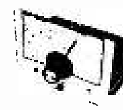
HEAVY DUTY MAINS RELAY
With three c/o 15 amp contacts—fitted with plastic dust cover, this has push on tags for quick connections. Price **£3·26**.

MULLARD UNILEX

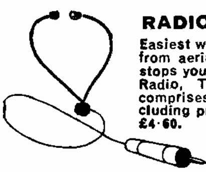


A mains operated 4 + 4 stereo system. Rated one of the finest performers in the stereo field this would make a wonderful gift for almost anyone in easy-to-assemble modular form and complete with a pair of speakers this should sell at about **£30**—but due to a special bulk-buy and as an incentive for you to buy this month we offer the system complete at only **£15** including VAT and postage.

SHORTWAVE CRYSTAL SET



Although this uses no battery it gives really amazing results. You will receive an amazing assortment of stations over the 10, 25, 29, 31 metre bands. Kit contains chassis front panel and all the parts **£2·30**—crystal earphone **65p** including VAT and postage.



RADIO STETHOSCOPE

Easiest way to fault find, traces, signal from aerial to a speaker, when signal stops you've found the fault. Use it on, Radio, TV, amplifier, anything. Kit comprises transistors and parts including probe tube and twin stetho-set **£4·60**.

WINDSCREEN WIPER CONTROL

Vary speed of your wiper to suit conditions. All parts and instructions to make **£4·25**.

DRILL CONTROLLER

Electronically changes speed from approximately 10 revs to maximum. Full power at all speeds by finger-tip control. Kit includes all parts, case, everything and full instructions. **£3·75**.

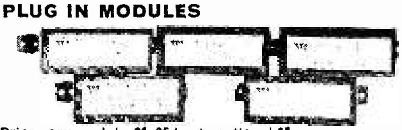
SOUND TO LIGHT UNIT

Well proved circuit flashes up to 750 watts of lamps.
Complete kit includes S.C.P. mains input leads, all parts and very neat plastic case **£4·95**.

CASSETTE OUTFITS

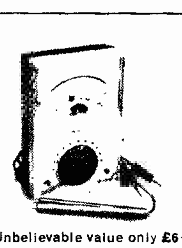
Complete mechanisms with record/playback and erase heads—all electronics and speaker **£9·75** post and VAT paid. *Note* these are all cased up ready to use but case may be slightly incomplete, cracked or broken.

PLUG IN MODULES



Prices any module **£1·95** basis optional **65p**

MINI-MULTI TESTER



Amazing. deluxe pocket size precision moving coil instrument jewelled bearings—1000 opv—mirrored scale.
11 Instant ranges measure:—
DC volts 10, 50, 250, 1000
AC volts 10, 50, 250, 1000
DC amps 0-1mA and 0-100 mA
Continuity and resistance 0-150K ohms.
Complete with insulated probes, leads, battery, circuit diagram and instructions.
Unbelievable value only **£6·50** + **50p** post and insurance.

FREE Amps ranges kit enable you to read DC current from 0-10 amps, directly on the 0-10 scale. It's free if you purchase quickly but if you already own a mini tester and would like one send **£1·50**.

TERMS: Cash with order—but orders under £6 must add 50p to offset packing, etc.
BULK ENQUIRIES INVITED. PHONE: 01-688 1833.
ACCESS & BARCLAYCARD ACCEPTED

J. BULL (ELECTRICAL) LTD

(Dept. PW), 103 TAMWORTH RD., CROYDON CR8 1SG

LATCHING RELAY
This is in fact a double relay, mechanically arranged so that when relay no. 1 closes it will stay closed until no. 2 is closed. Each relay has its own coil (50v dc) and its own c/o contacts, useful in burglar alarm and similar circuits. Price **£3·45**.

DOUBLE ENDED MOTOR
Mains operated, capacitor run, power estimation at approx. ¼ h.p., this has spindle coming out each side and should be very suitable for converting into a doubled ended polisher or grinder, holes conveniently placed in the housing make it very easy to stand in the right position and the speed although not high is adequate. We are offering these with capacitor at **£4·70**, post £1·50.

THREE POSITION ROCKER SWITCH
10 amp changeover with a centre off standard size pushes into hole size approx. 1" × 7/16". Special bargain this month, 10 for **£2·30**.

WATERPROOF HEATING WIRE
As used for electric blankets etc. This has dozens of other applications—in gloves or socks for people with poor circulation are obvious uses. One unusual use suggested by a customer is a 'grow' bag heater. The wire which consists of an element wound on glass fibre then covered by clear PVC has a resistance of 60 ohms per yard. The price is **23p** per metre.

FAST RUNNING OUT
The miniature 24hr timer module, with facility for 32 on offs and 16 amp contacts. If you want one of these send your order this month or you will be too late. Price is **£7·71**. Extra on off triggers **£1·15** per set.

ANOTHER UNREPEATABLE BARGAIN
Which will soon be sold out, is the Sensitive Voltmeter/Relay—fully described in our January newsletter—brand new offered at only about 1/10th of manufacturers price namely **£8·93** and post £1. The 4½" 1 mA movement alone is worth more than double this and we give a circuit diagram of the non energy consuming relay/alarm circuit built into the voltmeter's case.

HALF PRICE CABLE OFFERS
Copper clad—made to B.S.I. specification. Prices are only about half the present list prices so be clever buy now while stocks last.

Size	Type	Price 100 metres	Carriage
1·5 mm	Single c.c.	£2·87	£1·00
1·5 mm	Single double insulated	£3·02	£1·50
1·5 mm	Flat twin	£5·17	£1·75
4 mm	Single c.c.	£8·72	£2·50
4 mm	Flat twin	£11·45	£3·00
6 mm	Flat three core	£25·92	£4·00
6 mm	Twin & E.	£25·92	£4·00
10 mm	Twin & E.	£40·25	£6·00
16 mm	Twin & E.	£62·20	£8·00

ELECTRICAL ACCESSORIES SUMMER PRICES
Waterproof cast metal thermostat box **£2·87** + 37p post **40p**.
Wall mounting Multiswitches metal box with front GEC, single switch **57p**, twin switch **60p** + 8p. Architrave single **69p**. Architrave double **86p**.
Quad switch **87p**, 6 switch **£1·15**, 12 switch **£1·73**.
Switches for above 5 amp sp. **35p**, 15 amp sp. **52p**.
5 amp 2 way **40p**, 2 way and off **58p**.
13 amp sockets unswitched brown **34p** + 4p, switched brown **59p**.
Junction box **23p**.
Spurs white **40p**, with socket **66p**.
16 line connecting box **£1·70**.
Dim and full switch, 4 pole c/o with centre off 10 amps. **£1·15**.
Water heater switch 20 amp 250v flush **57p**.
5 amp 3 pin switched sockets, 5 for **£1·70**, unswitched 5 for **£1·15**
3 Bank rocker switch, interlocked for blow heaters **57p**.
Waterproof 5 amp single pole 250v switch **32p**.
Flexible conduit 5⅛" and 7" internal dia. **34p** per metre.
Garden waterproof flood lamp **£6** + 60p.
Mem. switch ref. 1613 **52p**.
Mem. switch ref. 1600 **34p**.
Brown surface switch square or round 5 amp 250v **41p**.
Immersion Heater 2 kw **£3·45**, 3 kw **£4·60**, thermostat **£3·45**.

THERMOSTAT WITH REMOTE PROBE
This is a Satchwell thermostat using sensor connected to the switch by a 26" length of capillery. Adjustable 30° to 140°F with control knob. Price **£2·60**.

4 WAY CONNECTOR BLOCKS
Twin grub screw in PVC type, 10 blocks for **69p** + 9p.

DC VOLTAGE CHANGING
For operating 12v equipment from 6v car battery etc etc., based on a circuit which appeared in a recent addition of the Wireless World this device fills an urgent need in that it doubles a DC voltage (within the limits of the transistors used). The ones we supply are suitable for operating up to 40 volts so providing the final voltage does not exceed this then you can double any voltage you like (or you can treble it or alter it to suit yourself). The kit comprises—2 selected power transistors, 1⅜" ferrux pot core FX 2242, enamelled copper wire, electrolytic condenser for smoothing and heat sink etc. Price of the kit is **£3·45**, the case 80p extra.

COMPONENT BOARD Ref. W0998. This is a modern fibre glass board which contains a multitude of very useful parts, most important of which are:- 35 assorted rectifiers including four 3 amp 400v types (made up in a bridge), 8 transistors type BC 107 and 2 type BFY 51, electrolytic condensers, SCR ref. 2N 5062 250uf 100v DC and 100uf 25v DC, and over 100 other parts including variable, fixed and wire wound resistors, electrolytic and other condensers. A real snip at **£1·15**.

SUPER 2N3055
Transistor RCA 52360, in our experience this does all the 3055 can do but does it better, we have good stock of these price 57p.

SPEAKER CABINETS
Simulated teak finish, nice handy size 11" × 8" × 4½" approx. modern black sponge type front. price **£2·36**, post £1·50.

IN CAR SPEAKER CABINET
White with black edge very modern looking plastic with threaded studs for mounting speaker complete with back, price **£1·75**, post **60p**.

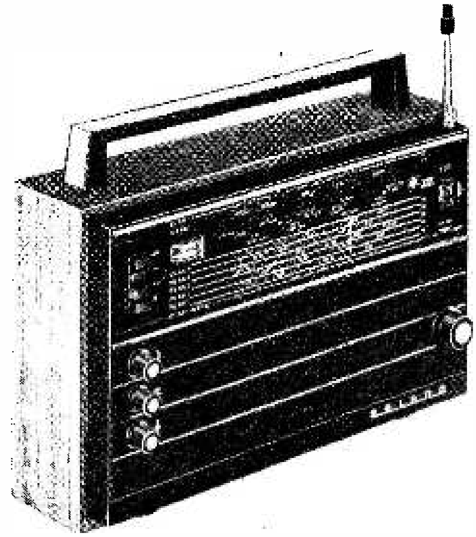
AC CAPACITORS
For use on fluorescent lighting for power factor correction or as a voltage dropping device, these are very rugged and will stand DC voltages up to three times their RMS voltage. A big purchase enables us to offer these at about one third of the current manufacturers price, all are 300v RMS working or higher and are in aluminium cans with tags or wire ends, following values: 1·25uf **40p**, 1·5uf, **52p** 3uf **63p**, 4uf **74p**, 7uf **98p**, 8uf **107p**, 15uf **£1·45p**.

COMPUTOR COOLING FANS
The famous Plannair, these are a six bladed 4½" fan rotating at approx. 3000 revs per minute, in a die cast case size approx. 5" square with 4 fixing holes and cable entry box. Not new but any not in perfect working order would be replaced. Price **£5·75** + 40p post.

Fluorescent Fittings definitely the time to think of lighting. We are making a special offer of fluorescent fittings to callers, complete with tubes, summer prices are 2 ft. **£4·02**, 1 metre **£4·60**, 4 ft **£5·46**, 5 ft **£6·61**.

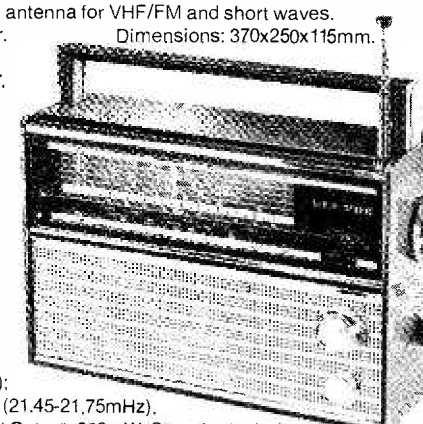
Calculator Key pad Ex broken up calculators these are approx. 2½" square and have the normal 10-9 buttons plus on/off, divide, multiply, plus, minus buttons as well few only left of these **88p**.

Vega are long on Short Wave Value



Vega value is convincingly demonstrated in the superb short-wave coverage of the 206, Spidola and Selena models: no less than *six* short-wave bands on the 206 and Spidola, five (including "trawler" bands) on the Selena. Engineered in the USSR to the highest electronic standards, these powerful portables – and the other models in the range – give you top performance (for complete "home" listening too) and reliable service at competitive prices.

Vega Selena 210/2 MB
Superhet portable receiving VHF/FM, long, medium and 5 short-wave bands: 19.85-19.4m (15.1-15.45mHz); 25.8-24.8m (11.7-12.1mHz); 31.6-30.7m (9.5-9.77mHz); 50.4-41.0m (5.95-7.3mHz); (marine) 186.9-76.0m (1.605-3.95mHz). Intermediate frequency: 465kHz. Rated Output: 500mW (max. 750mW) 31 semi-conductor circuitry. Independent bass and treble tone controls. Automatic frequency control. Built-in mains convertor. Sockets for: line aerial, earth, tape-recorder, earphone or extension speaker. Inbuilt ferrite rod aerial for long and med waves. 8-section telescopic swivelling antenna for VHF/FM and short waves. Battery condition/tuning meter. Dimensions: 370x250x115mm. Weight: 4.08kg (9lb) without batteries. **Price: £39.34 inc VAT.**



Vega 206 Superhet portable receiving long and medium waves plus 6 short-wave bands: 150-60m (2-5mHz); 60-40m (5-7.5mHz); 32.35-24.8m (9.3-12.1mHz); 19.85-19.4m (15.1-15.45mHz); 16.95-16.75m (17.7-17.9mHz); 14-13.8m (21.45-21.75mHz). Intermediate frequency: 465kHz. Rated Output: 150mW. Circuitry comprises 12 semi-conductors including voltage stabilising diode, plus turret waveband selector, treble control, inbuilt ferrite rod aerial for med and long waves, 7-section telescopic antenna for short waves. Sockets for: line aerial, 9v DC external power source, tape-recorder, earphone or extension loudspeaker. Dimensions: 229x297x105mm. Weight: 2.7kg (6lb) without batteries. **Price: £24.15 inc VAT.**

Vega Spidola 250 Superhet portable receiving VHF/FM, long, medium and 6 short-wave bands: 150-60m (2.0-5.0mHZ); 60-40.5m (5.0-7.4mHz); 31.6-30.7m (9.5-9.78mHz); 25.7-24.8m (11.7-12.1mHz); 19.85-16.75m (15.1-17.9mHz); 14-13.8m (21.45-21.75mHz). Intermediate frequency: 465kHz. Rated Output: 800mW. Circuitry includes 23 semi-conductors, independent bass and treble tone controls, automatic frequency control. Battery condition/tuning meter. Inbuilt ferrite rod aerial for long and medium waves. 8-section telescopic swivelling antenna for VHF/FM and short waves. Sockets for: line aerial, 9v DC external power source, tape recorder, earphone or extension speaker. Dimensions: 250x365x105mm. Weight: 3.4kg (7.5lb) without batteries. **Price: £34.79 inc VAT.**

Note: prices shown are rec retail. You may find lower prices locally.

See these and the other fine Vega radios right away. Ask us to send you the Vega Radios colour brochure.

TOE

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VEGA
programmed for value

BI-PAK SEMICONDUCTORS,

TRANSISTORS

Type	Price	Type	Price	Type	Price	Type	Price	Type	Price
AC126	£0.21	BC148	£0.08	BC549	£0.12	BU105	£1.84	ZTX108	£0.11
AC127	£0.21	BC149	£0.08	BC550	£0.16	BU105/02	£2.24	ZTX109	£0.11
AC128	£0.18	BC157	£0.12	BC556	£0.16	BU204	£1.61	ZTX300	£0.13
AC128K	£0.30	BC158	£0.12	BC557	£0.15	BU205	£1.61	ZTX500	£0.14
AC132	£0.23	BC159	£0.12	BC558	£0.14	BU208/02	£2.58	2N1613	£0.23
AC134	£0.23	BC167	£0.14	BC559	£0.16	MJE2955	£1.04	2N1711	£0.23
AC137	£0.23	BC168	£0.14	BD115	£0.58	MJE3055	£0.69	2N1889	£0.51
AC141	£0.25	BC169	£0.10	BD116	£0.92	MJE3440	£0.60	2N1890	£0.51
AC141K	£0.35	BC169C	£0.12	BD121	£0.75	MPF102	£0.32	2N1893	£0.35
AC142	£0.23	BC170	£0.10	BD124	£0.81	MPF104	£0.40	2N2147	£0.86
AC176	£0.21	BC171	£0.10	BD131	£0.40	MPF105	£0.40	2N2148	£0.81
AC176K	£0.30	BC172	£0.10	BD132	£0.40	MPSA05	£0.23	2N2160	£1.15
AC178	£0.29	BC173	£0.10	BD133	£0.46	MPSA06	£0.23	2N2192	£0.44
AC179	£0.29	BC177	£0.18	BD135	£0.44	MPSA55	£0.23	2N2193	£0.44
AC180	£0.23	BC178	£0.18	BD136	£0.40	MPSA56	£0.23	2N2194	£0.44
AC180K	£0.32	BC179	£0.18	BD137	£0.40	OC22	£1.73	2N2217	£0.25
AC181	£0.23	BC180	£0.29	BD138	£0.41	OC23	£1.73	2N2218	£0.25
AC181K	£0.32	BC181	£0.10	BD139	£0.41	OC24	£1.55	2N2218A	£0.23
AC187	£0.21	BC182L	£0.10	BD140	£0.41	OC25	£1.15	2N2219	£0.23
AC187K	£0.32	BC183	£0.10	BD155	£0.92	OC26	£1.15	2N2219A	£0.25
AC188	£0.21	BC183L	£0.10	BD175	£0.69	OC28	£0.92	2N2904	£0.23
AC188K	£0.32	BC184	£0.10	BD176	£0.69	OC29	£1.09	2N2904A	£0.24
AD140	£0.69	BC207	£0.13	BD177	£0.78	OC35	£1.03	2N2905	£0.20
AD142	£0.98	BC208	£0.13	BD178	£0.78	OC36	£1.03	2N2905A	£0.23
AD143	£0.86	BC209	£0.14	BD179	£0.86	OC70	£0.27	2N2906	£0.18
AD149	£0.69	BC212	£0.10	BD203	£0.92	OC71	£0.17	2N2906A	£0.21
AD161	£0.40	BC212L	£0.10	BD204	£0.92	TIC44	£0.33	2N2907	£0.23
AD162	£0.40	BC213	£0.10	BDY20	£0.92	TIC45	£0.40	2N2907A	£0.25
AD161/162MP	£0.81	BC213L	£0.10	BF457	£0.43	TIP29A	£0.46	2N2926G	£0.10
AF124	£0.35	BC214	£0.10	BF458	£0.43	TIP29B	£0.48	2N2926Y	£0.09
AF125	£0.35	BC214L	£0.10	BF459	£0.44	TIP29C	£0.51	2N2926O	£0.09
AF126	£0.35	BC227	£0.18	BF594	£0.35	TIP30A	£0.46	2N2926R	£0.09
AF127	£0.37	BC238	£0.18	BF596	£0.32	TIP30B	£0.48	2N2926B	£0.09
AF139	£0.40	BC251	£0.17	BFR39	£0.28	TIP30C	£0.50	2N3053	£0.18
AF186	£0.58	BC251A	£0.18	BFR40	£0.29	TIP31A	£0.46	2N3054	£0.46
AF239	£0.47	BC301	£0.32	BFR79	£0.32	TIP31B	£0.48	2N3055	£0.46
AL102	£1.38	BC302	£0.33	BFR80	£0.32	TIP31C	£0.50	2N3614	£1.15
AL103	£1.36	BC303	£0.32	BFX29	£0.25	TIP32A	£0.46	2N3615	£1.21
AU104	£1.61	BC304	£0.44	BFX30	£0.35	TIP32B	£0.48	2N3616	£1.21
AU110	£1.61	BC327	£0.18	BFX84	£0.25	TIP32C	£0.50	2N3646	£0.10
AU113	£1.61	BC328	£0.17	BFX85	£0.28	TIP41A	£0.50	2N3702	£0.09
BC107A	£0.09	BC337	£0.17	BFX86	£0.29	TIP41B	£0.52	2N3703	£0.09
BC107B	£0.10	BC338	£0.17	BFX87	£0.25	TIP41C	£0.55	2N3704	£0.08
BC107C	£0.12	BC440	£0.35	BFX88	£0.25	TIP42A	£0.50	2N3705	£0.08
BC108A	£0.09	BC441	£0.35	BFY50	£0.18	TIP42B	£0.52	2N3706	£0.09
BC108B	£0.11	BC460	£0.44	BFY51	£0.18	TIP42C	£0.55	2N3707	£0.09
BC108C	£0.12	BC461	£0.44	BFY52	£0.18	TIP2955	£0.69	2N3708	£0.08
BC109A	£0.09	BC477	£0.23	BIP19	£0.44	TIS43	£0.25	2N3709	£0.08
BC109B	£0.10	BC478	£0.23	BIP20	£0.44	TIS90	£0.20	2N3710	£0.08
BC109C	£0.12	BC479	£0.23	BIP19/20MP	£0.92	UT46	£0.23	2N3711	£0.08
BC147	£0.08	BC547	£0.12	BRY39	£0.51	ZTX107	£0.11	2N3819	£0.21
		BC548	£0.12					2N3820	£0.40

74 SERIES TTL ICs

Type	Price	Type	Price	Type	Price	Type	Price	Type	Price
7400	£0.10	7427	£0.27	7472	£0.23	74105	£0.43	74163	£0.71
7401	£0.12	7428	£0.29	7473	£0.28	74107	£0.27	74164	£0.78
7402	£0.12	7430	£0.12	7474	£0.28	74110	£0.41	74165	£0.78
7403	£0.12	7432	£0.25	7475	£0.33	74111	£0.66	74166	£0.89
7404	£0.12	7433	£0.34	7476	£0.28	74118	£0.92	74174	£0.74
7405	£0.12	7437	£0.25	7480	£0.50	74119	£1.35	74175	£0.71
7406	£0.25	7438	£0.24	7481	£0.97	74121	£0.27	74176	£0.66
7407	£0.25	7440	£0.13	7482	£0.78	74122	£0.44	74177	£0.66
7408	£0.14	7441	£0.57	7483	£0.66	74123	£0.46	74180	£1.72
7409	£0.14	7442	£0.46	7484	£1.01	74136	£0.59	74181	£0.66
7410	£0.12	7443	£0.80	7485	£0.78	74141	£0.63	74182	£0.80
7411	£0.19	7444	£0.80	7486	£0.25	74145	£0.63	74184	£0.80
7412	£0.17	7445	£0.74	7489	£1.95	74150	£0.78	74190	£0.78
7413	£0.27	7446	£0.69	7490	£0.36	74151	£0.55	74191	£0.71
7414	£0.57	7447	£0.55	7491	£0.73	74153	£0.55	74192	£0.69
7416	£0.26	7448	£0.64	7492	£0.40	74154	£0.94	74193	£0.66
7417	£0.26	7450	£0.12	7493	£0.34	74155	£0.57	74194	£0.71
7420	£0.12	7451	£0.12	7494	£0.86	74156	£0.57	74195	£0.69
7421	£0.23	7453	£0.12	7495	£0.57	74157	£0.57	74196	£1.20
7422	£0.18	7454	£0.12	7496	£0.57	74160	£0.66	74197	£1.20
7423	£0.24	7460	£0.12	74100	£0.97	74161	£0.71	74198	£2.12
7425	£0.21	7470	£0.28	74104	£0.44	74162	£0.71	74199	£2.12
7426	£0.26								

CMOS ICs

Type	Price	Type	Price	Type	Price	Type	Price	Type	Price
CD4000	£0.16	CD4015	£0.87	CD4026	£1.38	CD4043	£1.01	CD4070	£0.19
CD4001	£0.17	CD4016	£0.48	CD4027	£0.57	CD4044	£0.94	CD4071	£0.19
CD4002	£0.18	CD4017	£0.86	CD4028	£0.78	CD4045	£1.61	CD4072	£0.19
CD4006	£1.05	CD4018	£0.97	CD4029	£0.97	CD4046	£1.49	CD4081	£0.19
CD4007	£0.19	CD4019	£0.48	CD4030	£0.55	CD4047	£1.00	CD4082	£0.20
CD4008	£1.05	CD4020	£1.03	CD4031	£2.30	CD4049	£0.48	CD4510	£1.13
CD4009	£0.51	CD4021	£0.94	CD4035	£1.15	CD4050	£0.48	CD4511	£1.09
CD4010	£0.55	CD4022	£0.94	CD4037	£1.09	CD4054	£1.26	CD4516	£1.15
CD4011	£0.17	CD4023	£0.17	CD4040	£1.01	CD4055	£1.15	CD4518	£1.15
CD4012	£0.18	CD4024	£0.74	CD4041	£0.87	CD4056	£1.55	CD4520	£1.15
CD4013	£0.48	CD4025	£0.17	CD4042	£0.82	CD4069	£0.19	CD4014	£0.92

LINEAR ICs

Type	Price	Type	Price	Type	Price	Type	Price	Type	Price
CA3011	£0.92	CA3130	£1.06	MC1350	£1.38	UA710C	£0.46	SN76115	£2.18
CA3014	£1.55	CA3140	£0.80	MC1352	£1.61	72710	£0.34	SN76660	£0.86
CA3018	£0.74	LM301	£0.33	MC1469	£3.39	UA711C	£0.36	SL414A	£2.24
CA3020	£1.95	LM304	£1.84	MC1496	£1.03	72711	£0.36	TAA550B	£0.40
CA3028	£0.92	LM308	£1.15	NE536	£3.05	UA723C	£0.52	TAA621A	£2.30
CA3035	£1.61	LM309	£1.72	NE550	£1.09	72723	£0.52	TAA621B	£2.87
CA3036	£1.15	LM320-5V	£1.72	NE555	£0.27	UA741C	£0.27	TAA661	£1.72
CA3042	£1.72	LM320-12V	£1.72	NE556	£0.69	72741	£0.27	TAD100	£1.49
CA3043	£2.12	LM320-15V	£1.72	NE565	£1.38	741P	£0.23	TBA540	£2.41
CA3046	£0.80	LM320-24V	£1.72	NE566	£1.38	UA7447C	£0.69	TBA810S	£0.86
CA3052	£1.84	LM380	£0.97	NE567	£1.95	72747	£0.69	TBA810	£1.12
CA3054	£1.26	LM381	£1.66	UA702C	£0.52	UA748	£0.40	TBA820	£0.80
CA3075	£1.72	LM3900	£0.66	72702	£0.52	72748	£0.40	TBA9200	£2.87
CA3081	£1.72	MC1303L	£0.97	UA703	£0.28	748P	£0.40	TCA270S	£2.30
CA3089	£2.30	MC1304	£2.18	UA709	£0.28	SN76013N	£2.01	TBA800	£0.92
CA3090	£4.14	MC1310	£1.09	72709	£0.52	SN76023	£2.01		
CA3123	£2.18	MC1312	£2.18	709P	£0.28	SN76110	£1.72		

THYRISTORS

1 amp TO 5 Case

Volts	No:	Price
50	THY1A/500	£0.29
100	THY1A/100	£0.32
200	THY1A/200	£0.36
400	THY1A/400	£0.43
600	THY1A/600	£0.51
800	THY1A/800	£0.66

3 amp TO 66 Case

Volts	No:	Price
50	THY3A/50	£0.32
100	THY3A/100	£0.34
200	THY3A/200	£0.37
400	THY3A/400	£0.48
600	THY3A/600	£0.57
800	THY3A/800	£0.74

5 amp TD 66 Case

Volts	No:	Price
50	THY5A/50	£0.41
100	THY5A/100	£0.51
200	THY5A/200	£0.57
400	THY5A/400	£0.65
600	THY5A/600	£0.79
800	THY5A/800	£0.93

7 amp TO 48 Case

Volts	No:	Price
50	THY7A/50	£0.55
100	THY7A/100	£0.58
200	THY7A/200	£0.65
400	THY7A/400	£0.71
600	THY7A/600	£0.89
800	THY7A/800	£1.05

10 amp TO 48 Case

Volts.	No:	Price
50	THY10A/50	£0.58
100	THY10A/100	£0.65
200	THY10A/200	£0.71
400	THY10A/400	£0.80
600	THY10A/600	£1.13
800	THY10A/800	£1.40

16 amp TO 48 Case

Volts	No:	Price
50	THY16A/50	£0.62
100	THY16A/100	£0.66
200	THY16A/200	£0.71
400	THY16A/400	£0.88
600	THY16A/600	£1.03
800	THY16A/800	£1.59

SILICON RECTIFIERS

200mA

IS920 50V	£0.07
IS921 100V	£0.08
IS922 150V	£0.09
IS923 200V	£0.10
IS924 300V	£0.11

1 Amp

IN4001 50V	£0.05
IN4002 100V	£0.05
IN4003 200V	£0.07
IN4004 400V	£0.08
IN4005 600V	£0.09
IN4006 800V	£0.10
IN4007 1000V	£0.11

1.5 Amp

IS015 50V	£0.10
IS020 100V	£0.11
IS021 200V	£0.12
IS023 400V	£0.14
IS025 600V	£0.16
IS027 800V	£0.18
IS029 1000V	£0.23
IS031 1200V	£0.28

3 Amp

IN5400 50V	£0.16
IN5401 100V	£0.17
IN5402 200V	£0.18
IN5404 400V	£0.19
IN5406 600V	£0.24
IN5407 800V	£0.28
IN5408 1000V	£0.34

10 Amp

IS10/50 50V	£0.21
IS10/100 100V	£0.24
IS10/200 200V	£0.26
IS10/400 400V	£0.40
IS10/600 600V	£0.48
IS10/800 800V	£0.58
IS10/1000 1000V	£0.69
IS10/1200 1200V	£0.79

30 Amp

IS30/50 50V	£0.64
IS30/100 100V	£0.79
IS30/200 200V	£1.06
IS30/400 400V	£1.43
IS30/600 600V	£2.02
IS30/800 800V	£2.23
IS30/1000 1000V	£2.65
IS30/1200 1200V	£3.31

60 Amp

IS70/50 50V	£0.86
IS70/100 100V	£0.96
IS70/200 200V	£1.38
IS70/400 400V	£2.01
IS70/600 600V	£2.58
IS70/800 800V	£2.87
IS70/1000 1000V	£3.45

OPTOELECTRONICS

LED'S (diffused)

O/no.	Type	Price
1501	Size ·125mm RED	£0.11
1502	Size ·125mm GREEN	£0.21
1503	Size ·125mm YELLOW	£0.21
1504	Size ·2mm RED	£0.11
1505	Size ·2mm GREEN	£0.21
1506	Size ·2mm YELLOW	£0.21
1509	Size ·2mm CLEAR	£0.12

SUPER 'Hi-Brite' Type

1521	Size ·3mm (·125) RED	£0.11
1522	Size ·5mm (·2) RED	£0.11
1514	ORP12 Light dependant resistor	£0.63
1520	OCP71 Photo transistor	£0.40

LED CLIPS

1508/·125 pack of 5 ·125 clips	£0.17
1508/·2 pack of 5 ·2 clips	£0.20

DISPLAYS

DL303 RED 7 segment D.P. left (·30" height) common anode single digit O/NO: 1523 **£0.80**

DL707 RED 7 segment D.P. left (0·3" height) common anode single digit O/NO: 1510 **£0.92**

DL527 RED 7 segment D.P. left (0·50" height) common anode Two-digit reflector O/NO: 1524 **£1.95**

DL727 RED **7 segment D.P. right (·510"** height common anode Two-digit light pipe O/NO: 1521 **£2.53**

DL747 RED **7 segment D.P. left (·630"** height) common anode Single-digit light pipe O/NO: 1511 **£1.72**

OPTO-ISOLATORS

Isolation Breakdown – Voltage 1500 – continuous fwd current 100mA.

CIL74 Single-channel 6 pin DIP standard type – optically coupled pair with infra-red LED emitter and NPN silicon photo transistor O/NO: 1497 **£0.57**

CILD74 Multi-channel 8 pin DIP two isolated channels O/NO: 1498 **£1.15**

CILQ74 Multi-channel 16 pin DIP four isolated channels O/NO: 1499 **£2.53**

2nd GRADE LED PAK
A pack of 10 standard sizes and colours which fail to perform to their very rigid specification, but which are ideal for amateurs who do not require the full spec. O/NO: 1507 **£1.72**

AUDIO MODULES

Amplifiers

AL20	5 watt amplifier module	£3.73
AL30A	7-10 watt amplifier module	£4.35
AL60	15-25 watt amplifier module	£5.39
AL80	35 watt amplifier module	£8.44
AL120	50 watt amplifier module	£13.74
AL250	125 watt amplifier module	£19.24

Pre-amplifiers

PA12	Stereo pre-amplifier module	£8.94
PA100	Stereo pre-amplifier module	£18.45
PA200	Stereo pre-amplifier module	£19.07

Power Supplies

PS12	Power supply (24 volts DC)	£1.72
SPM80	Stabilised power supply (33V)	£5.06
SPM120/45	Stabilised power supply (45V)	£6.67
SPM120/55	Stabilised power supply (55V)	£6.67
SPM120/65	Stabilised power supply (65V)	£6.67
SG30	Power supply for equaliser	£4.37

Miscellaneous

MPA30	Stereo magnetic cartridge pre-amp	£4.42
S.450	Stereo tuner	£26.72
Stereo 30	Complete 7 watt stereo amplifier board	£22.66
BP124	Siren alarm module 5 watts	£4.02
GE100MKII	10 channel mono graphic equaliser	£23.00

SOCKETS

1611	8 pin DIL	£0.09
1612	14 pin DIL	£0.11
1613	16 pin DIL	£0.12
1720	18 pin DIL	£0.18
1721	20 pin DIL	£0.20
1722	22 pin DIL	£0.22
1614	24 pin DIL	£0.24
1615	28 pin DIL	£0.26
1723	40 pin DIL	£0.34
1616	T018 transistor	£0.13
1617	T03 transistor	£0.37
16117	T05 transistor	£0.13
1724	14 pin DIL Wire wrap gold plated Cambion	£0.25

G.P. SWITCHING TRANSISTORS

T018 sim to 2N706/8 BSY27/28/95A ALL usuable devices no open & shorts. ALSO available in PNP sim. to 2N290/BCY70.
20 for **57p** – 50 for **£1.15** – 100 for **£2.07** – 500 for **£9.20** – 1,000 for **£16.10** – when ordering state NPN/PNP.

SILICON DIODES G.P.

300mW 40PIV (min) sub min FULLY TESTED ideal for Organ builders.
30 for **57p** – 100 for **£1.72** – 500 for **£5.75** – 1.000 for **£10.35.**

METAL FOIL CAPACITOR PAK

Containing 50 metal foil capacitor – like Mullard C280 series – mixed values ranging for ·01uf-2·2uf. Complete with identification sheet O/NO: 16204 **£1.38.**

JUMBO PAK SEMICONDUCTOR

16222 – Transistors Germ and Silicon Rectifiers-Diodes-Triacs-Thyristors-ICs and Zeners ALL NEW & CODED. Approx. 100 pieces offering the amateur a fantastic bargain PAK and an enormous saving **£2.58.**

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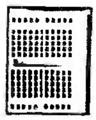
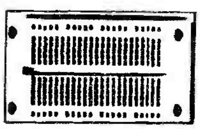
EXPERIMENTOR BREADBOARDS FROM CSC

No soldering modular breadboards, simply plug components in and out of letter number identified nickel-silver contact holes. Start small and simply snap-lock boards together to build breadboard of any size.
All EXP Breadboards have two bus-bars as an integral part of the board, if you need more than 2 buses simply snap on 4 more bus-bars with the aid of an EXP.4B.

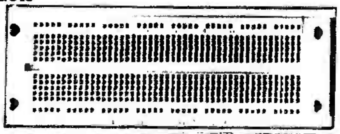
EXP.325. The ideal breadboard for 1 chip circuits.
Accepts 8, 14, 16 and up to 22 pin IC's.
ONLY £1·70



EXP.350. £3·73
270 contact points with two 20-point bus-bars.

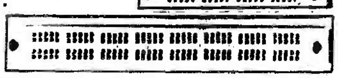


EXP.300.
550 contacts with two 40-point bus-bars.
£6·13



EXP.650 for Micro-processors. **£3·83**

EXP.4B.
More bus-bars.
£2·45



ALL EXP.300 Breadboards mix and match with 600 series.

ANTEX IRONS

1943	15 watt quality soldering iron with 3/32" bit	**£4·88**
1947	Replacement element for 1943	**£2·18**
1944	Iron coated bit 3/32" for 1943	**£0·53**
1945	Iron coated bit 1/8" for 1943	**£0·53**
1946	Iron coated bit 3/16" for 1943	**£0·53**
1948	18 watt iron with iron coated bit	**£4·59**
1952	Replacement element for 1948	**£2·18**
1949	Iron coated bit 3/32" for 1948	**£0·53**
1950	Iron coated bit 1/8" for 1948	**£0·53**
1951	Iron coated bit 3/16" for 1948	**£0·53**
1931	X25 25 watt iron, ceramic shaft and another shaft of stainless steel to ensure strength	**£4·88**
1935	Replacement element for 1931	**£1·84**
1932	Iron coated bit 1/8" for 1931	**£0·57**
1933	Iron coated bit 2/16" for 1931	**£0·57**
1934	Iron coated bit 3/32" for 1931	**£0·57**
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	**£6·38**
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	**£1·86**
1724	Model MLX as X25 iron but 12 volts	**£5·29**

DIODES

Type	Price	Type	Price	Type	Price	Type	Price
AA110	£0·09	BY100	£0·25	BYZ11	£0·52	OA90	£0·11
AA120	£0·09	BY101	£0·25	BYZ12	£0·46	OA91	£0·11
AA129	£0·09	BY105	£0·25	BYZ13	£	OA95	£0.11
AAY30	£0·10	BY114	£0·25	BYZ16	£0·47	OA182	£0·15
AAZ13	£0·17	BY124	£0·25	BYZ17	£0·41	OA200	£0·09
BA100	£0·11	BY126	£0·17	BYZ18	£0·41	OA202	£0·09
BA102	£0·37	BY127	£0·18	BYZ19	£0·41	SD10	£0·07
BA148	£0·17	BY128	£0·18	OA5	£0·69	SD19	£0·07
BA154	£0·14	BY130	£0·19	OA10	£0·40	IN34	£0·08
BA155	£0·16	BY133	£0.24	OA47	£0·09	IN34A	£0·08
BA173	£0·17	BY164	£0·58	OA70	£0·09	IN914	£0·07
BB104	£0·17	BY176	£0·86	OA79	£0·11	IN916	£0·07
BAX13	£0·08	BY206	£0·34	OA81	£0·11	IN4148	£0·07
BAX16	£0·09	BYZ10	£0.51	OA85	£0·11	IS44	£0·06
						IS920	£0·07

CASES AND BOXES

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

No.	Length	Width	Height	Price
155	8in	5½in	2in	£1·72
156	11in	6in	3in	£2·92
157	6in	4¾in	1¾in	£1·79
158	9in	5¼in	2½in	£2·43

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

No.	Length	Width	Height	Price
159	5¼in	2¼in	1½in	£0·85
160	4in	4in	1½in	£0·85
161	4in	2¼in	1½in	£0·85
162	5¼in	4in	1½in	£0·97
163	4in	2½in	2in	£0·87
164	3in	2in	1in	£0·60
165	7in	5in	2½in	£1·43
166	8in	6in	3in	£1·82
167	6in	4in	2in	£1·18

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

169	2⅛in	5⅜in	2¾in	12in	3½in	8in	£5·45
168	2⅜in	7¼in	4in	16in	4½in	11in	£8·21

VERO plastic case box. These boxes consist of top and bottom sections which include fixings points for horizontal mounting PC boards/chassis plates, the two sections are held together by four screws which enter through the base and are concealed by plastic feet.

No.	Length	Width	Height	Price
170	140mm	40mm	205mm	£4·14
171	140mm	75mm	205mm	£4·62
172	140mm	110mm	205mm	£6·00

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. **£7·79**

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: 4½ metres of 2-core cable. Works off a 12 volt battery. Ideal for Car, Boat, Caravan. No.1724 **£5·29**

CARBON RESISTOR PAKS

These paks contain a range of Carbon Resistors assorted into the following groups.

16213	60 mixed 1/8w 100ohms-920ohms	£0·69
16214	60 mixed 1/8w 1Kohms-82Kohms	£0·69
16215	60 mixed 1/8w 10Kohms-83Kohms	£0·69
16216	60 mixed 1/8w 100Kohms-820Kohms	£0·69
16217	40 mixed 1/2w 100ohms-820ohms	£0·69
16218	40 mixed 1/2w 1Kohms-82Kohms	£0·69
16219	40 mixed 1/2w 10Kohms-82Kohms	£0·69
16220	40 mixed 1/2w 100Kohms-820Kohms	£0·69

CERAMIC PAKS

16160	24-3 or each value 22pf 27pf 33pf 39pf 47pf 68pf	£0·69
16161	24-3 of each value 100pf 120pf 150pf 180pf 220pf 270pf 330pf	£0·69
16162	24-3 of each value 470pf 560pf 680pf 1000pf 1500pf 2200pf 3300pf	£0·69
16163	24-3 of each value 4700pf 6800pf 01uf 015uf 022uf 033uf 047uf	£0·69

ELECTROLYTIC PAKS

16201	values from 47mfd – 10mfd	£0·69
16202	values from 10mfd – 100mfd	£0·69
16203	values from 100mfd – 680mfd	£0·69

COMPONENT PAKS

16164	200 resistors mixed value approx (count by weight)	£0·69
16165	150 capacitors mixed value approx (count by weight)	£0·69
16167	80 1/2w resistors mixed values	£0·69
16168	5 pieces assorted ferrite rods	£0·69
16169	2 tuning gangs MW LW VHF	£0·69
16170	1 pack wire 50 metres asssorted colours single strand	£0·69
16171	10 reed switches	£0·69
16172	3 micro switches	£0·69
16173	15 assorted pots	£0·69
16175	30 paper condensers – mixed values	£0·69
16176	20 electrolytics trans. types	£0·69
16177	1 pack assorted hardware – nuts, bolts gromets etc	£0·69

BOOKS BY BABANI

BP6	Engineers & Machinists Ref. Tables	40p†
BP14	2nd book Transistor Equivs & Subs	£1·10†
BP22	79 Electronic Novelty Circuits	75p†
BP24	52 Projects Using IC741 (or Equiv)	75p†
BP26	Radio Antenna Book Long Distance Reception & Transmission	85p†
BP27	Giant Chart of Radio Electronic Semiconductor & Logic Symbols	60p†
BP32	Build Metal & Treasure Locatore	85p†
BP34	Practical Repair/Renovation C/TV	95p†
BP35	Handbook of IC Audio Preamplifier & Power Amplifier Construction	95p†
BP36	50 Cicts use Germ/Sil/Zener Diodes	75p†
BP37	50 Projects Using Relays/SCR/Triacs	£1·10†
BP39	50 Field Effect Trans Projects	£1·25†
BP40	Digital IC Equivs & Pin Connection	£2·50†
BP41	Linear IC Equivs & Pin. Connection	£2·75†
BP42	50 Simple LED Circuits	75p†
BP43	How to make Walki-Talkies	£1·25†
BP44	IC 555 Timer Projects	£1·45†
BP45	Projects on Opto-electronics	£1·25†
BP46	Radio Circuits Using IC's	£1·35†
BP47	Mobile Discotheque Handbook	£1·35†
BP48	Electronics Projects for Beginners	£1·35†
BP49	Popular Electronic Projects	£1·45†
BP50	IC LM3900 Projects	£1·35†
BP55	Radio Stations Guide	£1·45†
BP160	Coil Design & Construction Manual	85p†
BP202	Handbook of Integrated Circuits Equivalents & Substitutes	75p†
BP205	1st Book Hi-Fi Speaker Enclosures	75p†
BP213	Circuits for Model Railways	85p†
BP215	Shortwave Circuits & Gear for Experiments & Radio Hams	85p†
BP216	Electronic Gadgets & Games	85p†
BP217	Solid State Power Supply Handbook	85p†
BP221	28 Tested Transistor Projects	95p†
BP222	Short-wave Receivers for Beginners	95p†
BP223	50 Projects using IC CA3130	95p†
BP224	50 CMOS IC Projects	95p†
BP225	A Practical intro to Digital IC's	95p†
BP226	Build Advanced Short-wave Receivers	£1·20†
BP227	Beginners Guide to Building Electronic Projects	£1·25†

REGULATORS

Positive	Price
uA7805 TO220	£0·85
uA7812 TO220	£0·85
uA7815 TO220	£0·85
uA7824 TO220	£0·85
uA7818 TO220	£0·85
Negative	
uA7905 TO220	£0·92
uA7912 TO220	£0·92
uA7915 TO220	£0·92
uA7924 TO220	£0·92
uA7818 TO220	£0·92
72723 14 pin DN	£0·52
uA723C TO99	£0·52
LM309K TO3	£1·72

BRIDGE RECTIFIERS

SILICON 1 amp

Type	No.	Price
50v RMS	BR1/50	£0·23
100v RMS	BR1/100	£0·25
200v RMS	BR1/200	£0·29
400v RMS	BR1/400	£0·41

SILICON 2 amp

Type	No.	Price
50v RMS	BR2/50	£0·52
100v RMS	BR2/100	£0·55
200v RMS	BR2/200	£0·60
400v RMS	BR2/400	£0·67
1000v RMS	BR2/1000	£0·78

SILICON 10 amp

Type	No.	Price
50v RMS	BR10/50	£1·50
200v RMS	BR10/200	£1·70

SILICON 25 amp

Type	No.	Price
50v RMS	BR25/50	£1·90
200v RMS	BR25/200	£2·20

CASSETTES

o/no.3193	30 min lettertape	£0·38
o/no. 301	Dindy C60 tape	£0·41
o/no. 302	Dindy C90 tape	£0·52
o/no. 303	Dindy C120 tape	£0·75

TRIACS

2 amp TO5 case

volts	No.	Price
100	TR12A/100	£0·36
200	TR12A/200	£0·59
400	TR12A/400	£0·82

10 amp

volts		
100	TR110A/100	£0·88
200	TR110A/200	£1·06
400	TR110A/400	£1·29

6 amp

volts		
100	TR16A/100	£0·59
200	TR16A/200	£0·70
400	TR16A/400	£0·88

10 amp

volts		
400	TR110A/400P	£1·29

DIACS
BR100 £0·23 D32 £0·23

ZENER DIODES

400 mw (Bzy88) D007. Glass encapsulated range of voltages available. 1·3v, 2·2v, 2·7v, 3·3v, 3·9v, 4·3v, 4·7v, 5·1v, 5·6v, 6·2v, 6·8v, 7·5v, 8·2v, 9·1v, 10v, 11v, 12v, 13v, 15v, 16v, 18v, 20v, 22v, 24v, 27v, 30v, 33v, 39v. **No. Z4 10p**

1w-1·5w Plastic and metal encapsulated. Range of voltages available. 1·3v, 2·2v, 2·7v, 3·3v, 3·9v, 4·3v, 4·7v, 5·1v, 5·6v, 6·2v, 6·8v, 7·5v, 8·2v, 9·1v, 10v, 11v, 12v, 13v, 15v, 16v, 18v, 20v, 22v, 24v, 27v, 30v, 33v, 43v, 47v, 51v, 68v, 72v, 75v, 82v, 91v, 100v. **No. Z13 18p**

10w Metal stud type SO10 case. Range of voltages available. 1·3v, 2·2v, 2·7v, 3·3v, 3·9v, 4·3v, 4·7v, 5·1v, 5·6v, 6·2v, 6·8v, 7·5v, 8·2v, 9·1v, 10v, 11v, 12v, 13v, 15v, 16v, 18v, 20v, 22v, 24v, 27v, 30v, 33v, 43v, 47v, 51v, 68v, 72v, 75v, 82v, 91v, 100v. **No. Z10 44p**

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**

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The Microprocessor in the Home

AT THE Symposium on Consumer Electronics, organised jointly by SERT and IPRE and staged in July at the University of Essex, there was naturally much talk of microprocessors and their application in the home and car.

There are already quite a few examples either in use or on the verge of introduction, cookers, sewing machines, TV systems, hi-fi systems, heating controls, door chimes, car exhaust emission control systems for instance. With the exception of m.p.u.-based remote control systems, which can cope with a home entertainment system comprising hi-fi and TV, and perhaps room lights as well, these are all "dedicated" applications, where each microprocessor services one appliance only.

The idea of having a central computer in the home, controlling the whole domestic environment and a string of appliances too, has been put forward as the ultimate arrangement, but I have very deep reservations about its desirability. It seems to me that the chaos and disruption caused by the breakdown of a single appliance such as a washing machine is bad enough without running the risk of bringing the entire household to a halt by a single fault. It was interesting to find that, among the Symposium delegates, even those from companies manufacturing microprocessors, opinion was fairly evenly divided as to the advisability, or otherwise, of pursuing a policy of centralised control.

When so much energy is being directed towards finding new applications for microprocessors, regardless of how inappropriate or frivolous those applications might be, it was reassuring to find that development engineers in the consumer electronics field are thinking very deeply about the implications of using microprocessors. These implications are different at the design, manufacture, service, modification and repair phases, and each should be given appropriate weight.

The other application of the microprocessor—to the microcomputer—is a fast-growing one. In the UK, it tends to be confined at present to the computer hobbyist, who sees it as a means of learning about computing, or simply as an intellectual exercise. In the United States, the microcomputer is in widespread use in small businesses, medical practices and the like, as a means of record-keeping and accounting. No doubt this will, in time, become popular on this side of the Atlantic too, and could well extend to the home, where it would be a boon in checking bank-accounts, keeping track of perpetually-changing mortgage rates, or remembering insurance premium due-dates or even Aunt Kate's birthday!

PW PERSONALITY

Photograph courtesy of St Dunstans

Ron Ham—"On the Air" Contributor

Completely immersed in radio since the age of 10, one of Ron's greatest interests is in propagation. His installation of receivers and aerials covering the v.h.f. and u.h.f. bands, plus a home-built 136MHz solar radio telescope, yields much information, and his activities and research in this field have won him a large number of awards at home and overseas.

Ron has also made a study of the history of radio, and has a large collection of antique and wartime radio equipment, which has been exhibited all over southern England and featured on TV. It now has a permanent home at the Chalk Pits Museum at Houghton, Sussex.

In great demand as a lecturer and author, Ron also broadcasts regularly on BBC World Radio Club and Radio Brighton on amateur radio topics. He somehow finds enough spare time to help run an ATC squadron, and to pursue such hobbies as archaeology and rifle shooting, an interest which he shares with his wife Joan, also an avid historian.

NEWS... NEWS... NEWS...

Staff Change

Please note that Peter Preston, lately Technical Editor of *Practical Wireless*, is no longer employed by IPC Magazines Ltd.

A piece of History

To mark the 50th anniversary of the formation of Pye Radio Ltd., a twenty page booklet has been produced. This traces the development of the company and its products from its origins in 1922, and is a fascinating record.

The booklet, entitled *The Story of Pye Wireless*, is written by Gordon Bussey, author of *Vintage Crystal Sets 1922/1927*, and is available from *Pye Limited, Publications Department, 137 Ditton Walk, Cambridge.*

Trade News

Retailers, distributors and manufacturers in the electronic component supply business, interested in joining "Group One", an established association of retailers and others, are invited to contact Mr. Alan Sproxton, 234 London Road, Mitcham, Surrey CR4 3HD.

On the Move

Lascar Electronics, the Essex-based manufacturers of digital panel meters and counters have moved to larger premises in Basildon. They are now at: *Unit 1, Thomasin Road, Burnt Mills Industrial Estate, Basildon, Essex. Tel: (0268) 727383.*

Amateur Radio Convention

Blackwood and District Amateur Radio Society inform us that this year's "Welsh Amateur Radio Convention," now in its sixth year, will be held at Oakdale Community College, Blackwood, Gwent on Sunday, 30 September.

There will be a tape/slide lecture for the h.f. DX enthusiast and colour films for the v.h.f. and u.h.f. enthusiast. Newcomers to the hobby have not been forgotten; they can have their imaginations stirred by "The Privileged Ones," a tape/slide lecture incorporating actual recordings of QSO's, on all aspects of amateur radio. For a "live" demonstration they can visit the Convention "Radio Shack".

In addition, there will be trade stands and demonstrations of r.t.t.y., amateur TV and RAYNET. Talk-in will commence at 0900hrs on S22, doors open at 1000hrs and the official opening by Mr J. Bazley G3HCT, President of the RSGB, will be at 1100hrs. Refreshments will be available and the admission fee of 50p will enable some lucky visitor to win a digital frequency meter.

Further details from: *Convention Secretary, R. B. Davies GW3KYA, 16 Vancouver Drive, Penmain, Blackwood, Gwent NP2 0UQ. Tel: (0495) 225825.*

Boss sells BOSS

Having built up BOSS Industrial Mouldings Ltd. into one of Europe's largest manufacturers of Enclosures, Indicators, Breadboarding Systems and other hardware products, Ian Boss formally sold, on Wednesday, 27 June, all his interests in the organisation which now becomes part of the Pistor Elektrotechnik Group.

Based in Ludenscheid, Westphalia, West Germany, the Pistor Group are mainly orientated towards the electrical and domestic appliance industries throughout Europe where they have many years experience in the fields of indicators and controls, etc.

Under their new Managing Director, David Musgrove, BOSS Industrial Mouldings Ltd. will continue to utilise all their existing sales outlets whilst at the same time investigating wider market areas for current and future products.

BOSS Industrial Mouldings Ltd., Higgs Industrial Estate, 2 Herne Hill, Road, London SE24 0AU.

Free Catalogues

With the ever increasing popularity of Discos on the entertainment scene, the Disco buffs may like to know there is now a brand new up to the minute catalogue featuring over 1000 new disco products available for the mobile and club DJ.

The new Roger Squire's catalogue is a mine of information and includes colour pattern charts on lighting effects, together with a comprehensive pictorial listing of items, such as cartridges, stylii and other disco spares, that are often difficult to obtain.

The 60-page catalogue is available free of charge by writing to: *Roger Squire's, FREEPOST, Barnet, Herts EN5 5YB.*

Stevenson, the Kent-based electronic component supplier, inform us that their 80-page catalogue is available to readers if they apply to: *Stevenson, 76 College Road, Bromley, Kent BR1 3BR. Tel: 01-464 2951/5770.*

Mobile Rally

Harlow and District Amateur Radio Society are holding their Annual Mobile Rally on Sunday, 30 September 1979, at Netteswell Comprehensive School, Harlow.

The Rally is a major event in the amateur radio calendar and attracts many hundreds of visitors.

Club News

Southdown Amateur Radio Society's Hon Secretary has changed his address. All correspondence should now be sent to: *Hon Sec R. P. Jeffries G8KQN, 84 Mill Road, Hailsham, East Sussex BN27 2HU.*

NEWS... NEWS... NEWS...

RAE Courses

Swinton—On Thursdays, commencing 13 September. Further details from course lecturer: *P. Whatmough G4HYE (G8BPF). Tel: 061-794 3706. Moorside School, East Lancashire Road, Swinton, Manchester.*

Hemel Hempstead—Commencing Wednesday, 26 September. Enrolment Monday, 10 September. Further details from the course lecturer: *C. Burke G3VOZ. Tel: (0442) 833300. Hemel Hempstead College of Further Education, Marlowes, Hemel Hempstead, Herts.*

London N1—Commencing Monday, 17 September. Enrolment Monday, 10 September. This very busy class has activities on every Monday, Tuesday, Wednesday and Thursday, when an instructor in Morse code will be in attendance. Further details from: *Senior Tutor, Fred Barns G3AGP, De Beauviour ILEA School, Tottenham Road, London N1 4 BW.*

Newcastle upon Tyne—On Tuesdays between 1900 and 2100hrs, commencing in September. Further details from: *The Principal, Gosforth Adult Association, Gosforth Secondary School, Gosforth, Newcastle upon Tyne. Tel: (0632) 668439.*

Crawley—On Thursdays between 1900 and 2100hrs, commencing 27 September. Enrolment at the Evening Centre on Monday, 10 and Tuesday, 11 September between 1900 and 2100hrs. Further details from course tutor: *R. Scrivens G3LNM. Tel: Crawley (0293) 22540. Ifield Evening Centre, Sarah Robinson School, Ifield, Crawley, West Sussex.*

Knottingley—Commencing September. Enrolment Monday, 10 September. *Knottingley High School, Knottingley, West Yorkshire.*

Borehamwood—On Wednesdays between 1900 and 2100hrs, commencing Wednesday, 26 September. Enrolment Monday, 10 and Tuesday, 11 September between 1900 and 2030hrs. Lecturer: *G. L. Benson G3HB. Borehamwood College of Further Education, Elstree Way, Borehamwood, Herts. Tel: 01-953 6024.*

Paddington—On Mondays and Thursdays, 1900–2100, commencing 17 September, course tutor: *D. T. Busby G4HFL.* Enrolment Thursday 6th, Friday 7th, Monday 10th and Wednesday 12 September. This is the class nearest to Central London. *Amberley Adult Institute, Amberley Road, Paddington.*

Walsall—Commencing late September. Enrolment Monday, 17 and Tuesday, 18 September between 1830 and 2030hrs. Further details from: *F. Fear, 185 Longwood Road, Aldridge, West Midlands. Tel: (0922) 52606. Broadway North Centre, Walsall.*

Canterbury—Commencing late September. Further details from course lecturer: *Alan G3LCK, Canterbury 66081. College of Technology, New Dover Road, Canterbury.*

Harrow—On Wednesdays, commencing 3 October, course tutor *D. T. Busby G4HFL.* Enrolment at Nower Hill High School, 1000–1500, Saturday 15th and 1900–2100, Tuesday 18 September. *Hatch End High School.*

Possible RAE

The Cheshunt and District Radio Club are hoping to run an RAE Course in conjunction with the authorities at The East Hertfordshire College of Further Education, Turnford, Herts starting in September.

The Club meets every Wednesday at 20.00hrs at Church Room, Church Lane, Wormley, Herts. Visitors are very welcome.

For further details of the RAE Course and club membership, please apply to: *The Chairman C.D.R.C., Jim Sleight G3OJI, 18 Coltsfoot Road, Ware, Herts SG12 7NW. Tel: (0920) 4316.*

Hi-Fi Symposium

"Latest Developments in High Fidelity" is the title of a symposium organised by the Society of Electronic and Radio Technicians, to be held at the Institute of Marine Engineers, 76 Mark Lane, London EC3, on Thursday, 25 and Friday, 26 October 1979.

This is a non-residential symposium and papers are being sought in the following areas: digital techniques; amplifiers and tuners; loudspeakers and microphones; room and building acoustics. It is intended to organise a discussion on objective and subjective methods of assessing the performance of hi-fi systems. A number of other areas of discussion are under consideration.

The Symposium will bring together experts in the various technical subjects to be discussed to keep engineers and technicians up-to-date with the latest developments in this rapidly growing field, and should appeal to all those concerned with design, development, production, test and maintenance of high-fidelity equipment. It is anticipated that the registration fee will be £50 plus VAT for members of the Society and £70 plus VAT for non-members. The daily rate will be £30 plus VAT and £40 plus VAT, respectively. The fee covers attendance at all sessions, preprinted papers, morning coffee, lunch and afternoon tea, plus attendance at social events.

For further details apply to: *The Symposium Secretary, S.E.R.T., 8–10 Charing Cross Road, London WC2H OHP. Tel: 01-240 1152.*

Microprocessors

Three one-day courses on microprocessors are being held at the University of Salford in September. They are "Preparing for the Microprocessor Age" on 24 September (cost £40), "Fundamentals of Microprocessors" on 25 September (cost £60) and "Microprocessor Systems" on 26 September (cost £60). Course 1 is a general awareness course for non-technical managers and course 2 is a review of the basic principles of digital systems and microprocessor architecture, including "hands-on" sessions. Course 3 covers the operation of the microprocessor and its interfacing with other devices in detail. Further modules in the series will be offered later in the academic year. Fees, which are reduced by 10% if more than one module is attended, include refreshments and printed notes. Further information from the *Administrative Assistant (Short Courses), Room 110, University of Salford, Salford M5 4WT. Tel: 061-736 5842 Extn: 449.*

Meetings

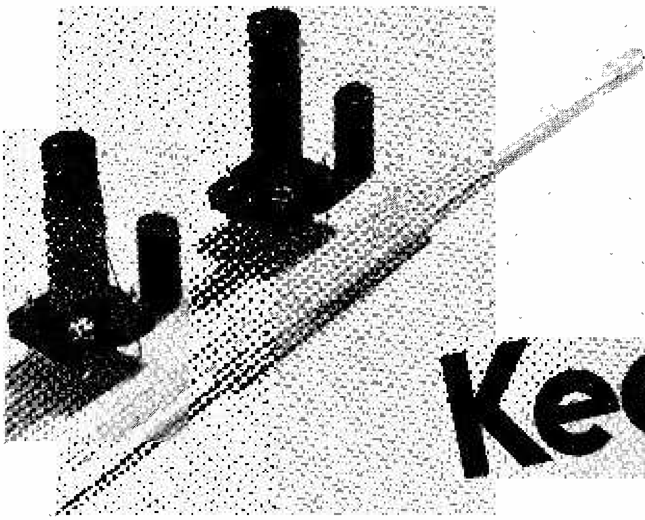
The East London Group of the RSGB meets at 3pm on Sundays at the Wanstead Community Centre, 21 The Green, Wanstead, London E11. Autumn topics as follows:

September 16—Tom Mitchell G3LMX on "Getting Started on A5" with demonstrations of amateur fast-scan TV equipment.

October 21—Dr. Dain Evans G3RPE of the RSGB will talk on the society and its activities, and may be persuaded to digress into his favourite topic, microwaves.

November 18—Rev. George Dobbs G3RJV talks about QRP (Low Power) operating and activities.

Further details from Hon. Sec., Rod Holmes G3PKQ phone 01-558 2928.



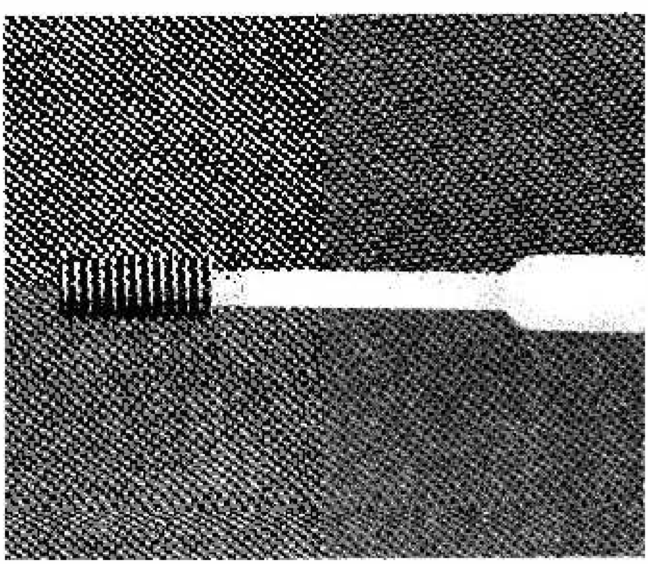
Keep in trim!

Using Your Practical Wireless Free Gift

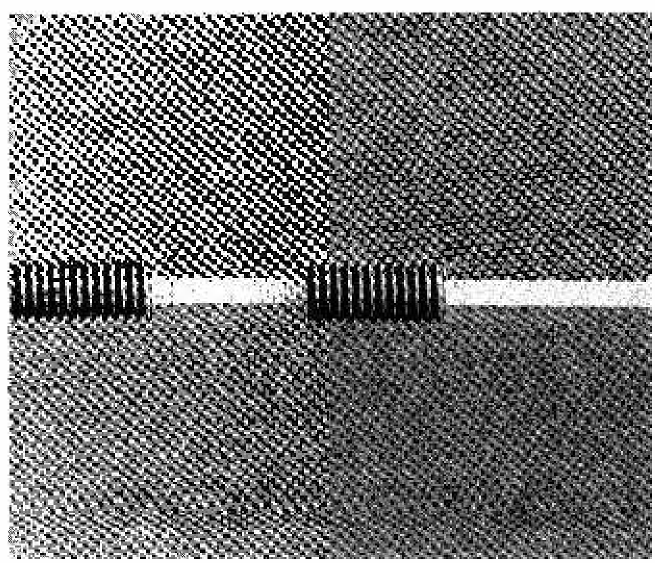
Our cover-mounted free gift this month, presented by *Practical Wireless* in association with Neosid Ltd., is a professional-grade trimming tool for the adjustment of 6mm diameter screw-cores with 0·1in A/F hexagonal holes, or screwdriver-slot holes. The Neosid coil-assembly specified for our "Simple Receiver" project this month uses such a core, in this case with hexagonal hole.

The tool is double-ended. The short end is intended for use in single-core assemblies, or in the upper core of double-core assemblies. The longer end has a thin neck which allows it to pass through the hole in the upper core in a double assembly and reach the lower core. The latter can then be adjusted without disturbing the setting of the upper core, as shown below.

This tool (Ref. H.S.3) is one of a range made by Neosid Ltd., to fit their screw cores, and now available to the home constructor through Neosid Small Orders. A selection from that range, fitting 3, 4 and 6mm screw cores with screwdriver-slot holes and 6mm cores with hexagonal holes, is available in a special pack costing 50p, which also includes a special long trimmer for adjustment of 6mm screw cores used in TV receiver convergence coil assemblies. For further details see the Neosid advertisement in this issue, and the new Neosid Small Orders catalogue.



The short end of the trimming tool is for use with single-core assemblies, or the upper core of double-core assemblies



The long end has a thin neck, allowing it to pass through the hole in the upper core in a double-core assembly to reach the lower core

SIMPLE SUBSTITUTION BOXES

S.V. ESSEX

The substitution box is one of those pieces of equipment that, once acquired, the constructor wonders how he ever managed without! The basic idea is very simple—the substitution box contains a range of, say, resistors, one of which is selected by means of a switch. The box is connected into the circuit being investigated in place of a fixed component. By selecting each component in the box in turn, the best value can be ascertained and a permanent component can then be soldered into the circuit in place of the substitution box.

The first thing to be decided is whether to use a decade box or one using preferred values. Whilst the former is often found in laboratories, the accuracy provided (and hence the cost) often far exceeds the requirements of the amateur experimenter. The preferred value type of substitution box, using readily available components, is much better suited to the sort of work the constructor will be engaged in, and the boxes described in this article are of this type.

For each type of box a decision must be made regarding the minimum and maximum values that one requires, and also how many components one wishes to use to cover this range. It would obviously be nice to have a resistance box covering the range 1Ω–10MΩ, using the complete E12 (or even E24!) preferred values, but this would be rather expensive. It would be better to spend the money on several smaller boxes, containing the most frequently used component values, than on one large box. As in most things in life, a compromise must be decided upon to produce an acceptable solution.

Resistance Substitution Box

Resistors in the range 1Ω–1MΩ are encountered regularly in practice, but there is a restriction on the lowest value of resistance that can be used (for a reasonable power rating) due to the current rating of the switches used. The normal single-wafer rotary switches used here are not normally designed to switch currents in excess of about 300mA, and although they may withstand several amps non-switched, it is best not to exceed the ratings if long life and reliability is important. Using a 10Ω resistor as the lowest value enables it to dissipate almost 1 watt, which is a reasonable power rating for the lower resistor values.

A convenient form for the resistance box is shown in the circuit diagram (Fig. 1). Two single-pole, 12-way switches are each connected to 12 resistors. One switch selects the lower values, and the other the higher values. A two-way switch selects either the "high" or the "low" ranges as required.

Using 24 resistors in this way enables the desired range to be adequately covered with most of the commonly encountered values being included. The resistor values selected for the prototype are given in the components list.

Power Ratings

For simplicity of use, it is advisable for all 12 resistors in each range to have the same power rating. As already mentioned, 1 watt is a convenient figure for the "low" range resistors and will be found to be adequate for nearly all applications.

In the "high" range, high power dissipations are not normally encountered and a lower rating $\frac{1}{2}$W can be used.

Although 2% (or even 1%) resistors could be used, this would prove to be expensive and this degree of accuracy is rarely required. 5% resistors are the best choice since they are cheap, readily available, and more than adequate for most applications.

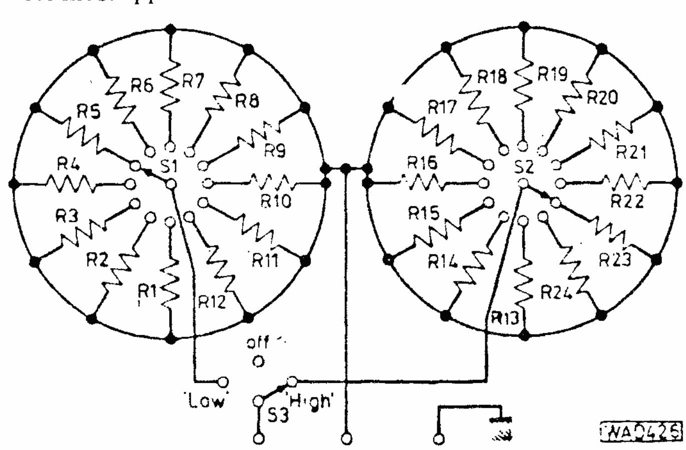
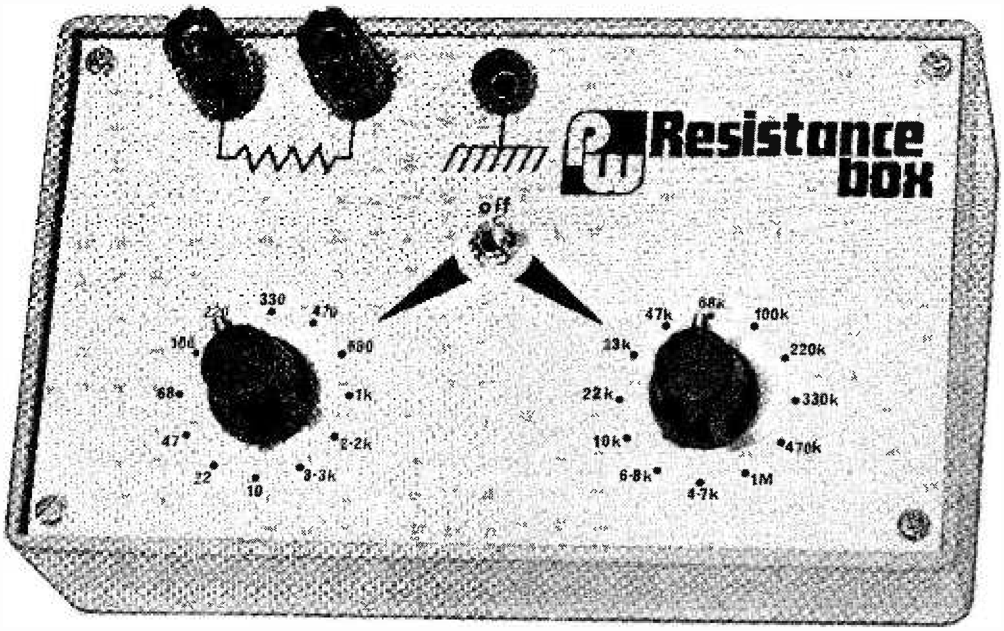


Fig. 1: Circuit diagram of the simple resistance substitution box



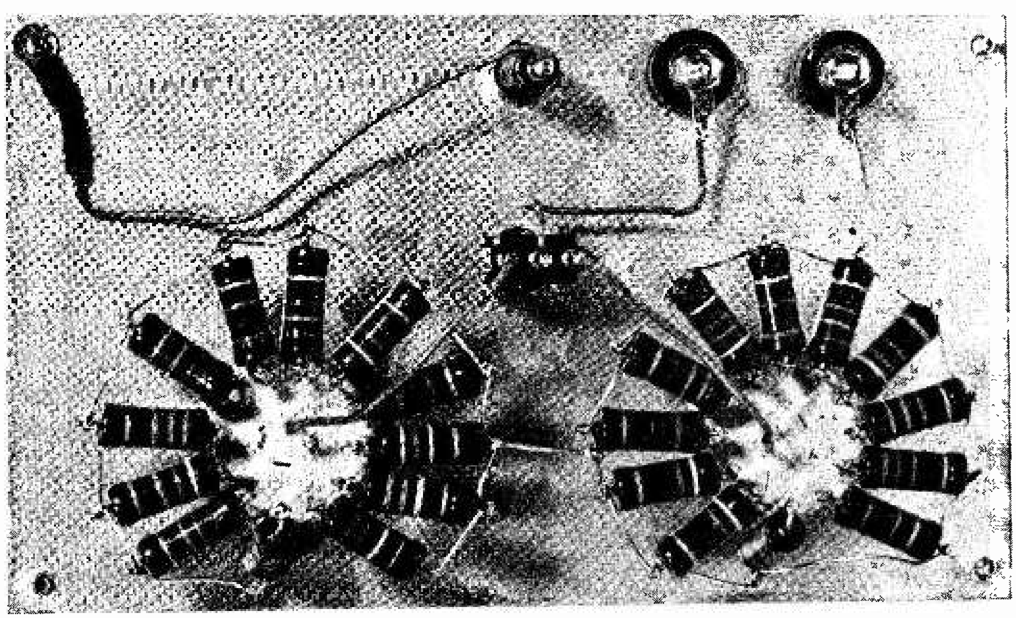
Construction

The resistance substitution box can be neatly built into a small plastics box, 162 × 97 × 40mm, with the two connection terminals at one end and the range change switch at the top, between the two rotary switches. The use of a centre-off switch for changing ranges is to be recommended, as it allows the box to be switched out of circuit at will. This is useful when the box is connected in parallel with another component, as it enables a direct "before" and "after" comparison to be made. As slide switches are not very reliable in the long term, a toggle switch should be used in this position.

An earth connection to the box is a worthwhile addition, and a 4mm socket was used in the prototype, connected electrically to the box by means of a solder tag bolted to the lid. Connections to the box can be either by terminal posts or by flying leads with crocodile clips at the ends, as required.

No specific constructional details will be given for the box as these are not important. All components are mounted on the lid. Four self-adhesive rubber feet are attached to the bottom of the box.

The method of mounting the resistors to the switches can be seen in the accompanying photographs. One end is soldered to a ring of 18 s.w.g. tinned copper wire which acts as a common connection and as a mechanical support. The wiper of each switch is taken to the range switch. Finally, the resistance values should be marked on the surface of the box.



This picture shows the construction used for the prototype resistance substitution box. Both sections used 1 watt resistors although ½ watt could have been used for the higher values

★ components

Resistance Box

Resistors

¼W 5%

10Ω	1	R1	4·7kΩ	1	R13
22Ω	1	R2	6·8kΩ	1	R14
47Ω	1	R2	10kΩ	1	R15
68Ω	1	R4	22kΩ	1	R18
100Ω	1	R5	33kΩ	1	R17
220Ω	1	R6	47kΩ	1	R13
330Ω	1	R7	68kΩ	1	R19
470Ω	1	R8	100kΩ	1	R20
680Ω	1	R9	220kΩ	1	R21
1kΩ	1	R10	330kΩ	1	R22
2·2kΩ	1	R11	470kΩ	1	R23
3·3kΩ	1	R12	1MΩ	1	R24

Miscellaneous

Rotary switch 1p 12w (2); Min. toggle switch centre off s.p.d.t. (1); Case (Bimbox 1005) 162 × 97 × 40mm (1); Knobs (2); Terminals 4mm Black (2); Socket 4mm Green (1)

Capacitance Substitution Box

The large range of capacitance values to be accommodated here presents a problem. If a minimum of 100pF and a maximum of 470µF are chosen, both of which are used often enough to make their inclusion desirable, and the convenient 1-2-5 (or 1–2·2–4·7) sequence for successive values is used, then about 18 capacitors will be required.

Although it would of course be possible to use two 9 way switches, or one 12-way switch and one 6-way switch, this was not the solution adopted.

Instead, use was made of the fact that the most commonly used capacitors lie in the range 10nF to 1·0µF, and so the arrangement used was to have two independent ranges, one extending from 100pF to 1·0µF and the other from 10nF to 470µF. Although this arrangement means that the entire range cannot be covered without changing connections, this is rarely required and having two sections both covering the most frequently used values increases the usefulness and versatility of the unit at little extra cost.

The circuit diagram for the capacitance substitution box is given in Fig. 2.

Voltage Ratings

To cover the required capacitance range, three different types of capacitor are required, all with different voltage ratings, and it is therefore impossible to standardise on a common voltage rating for the complete substitution box. This is unavoidable and therefore it is wise to mark the voltage ratings for the capacitors on the box together with the actual capacitance values.

For the lowest range, 160V polystyrene capacitors are used: 10nF to 1·0µF has 250V polyester capacitors, and the upper ranges 40V electrolytics. If this last rating is felt to be insufficient, unlikely with transistor circuits, capacitors with a higher rating can be used, but this will mean the use of larger components which may not fit inside the box specified.

The completed capacitor substitution box. The printed front panel on page 26 can be cut out and used directly on the front panel of the box

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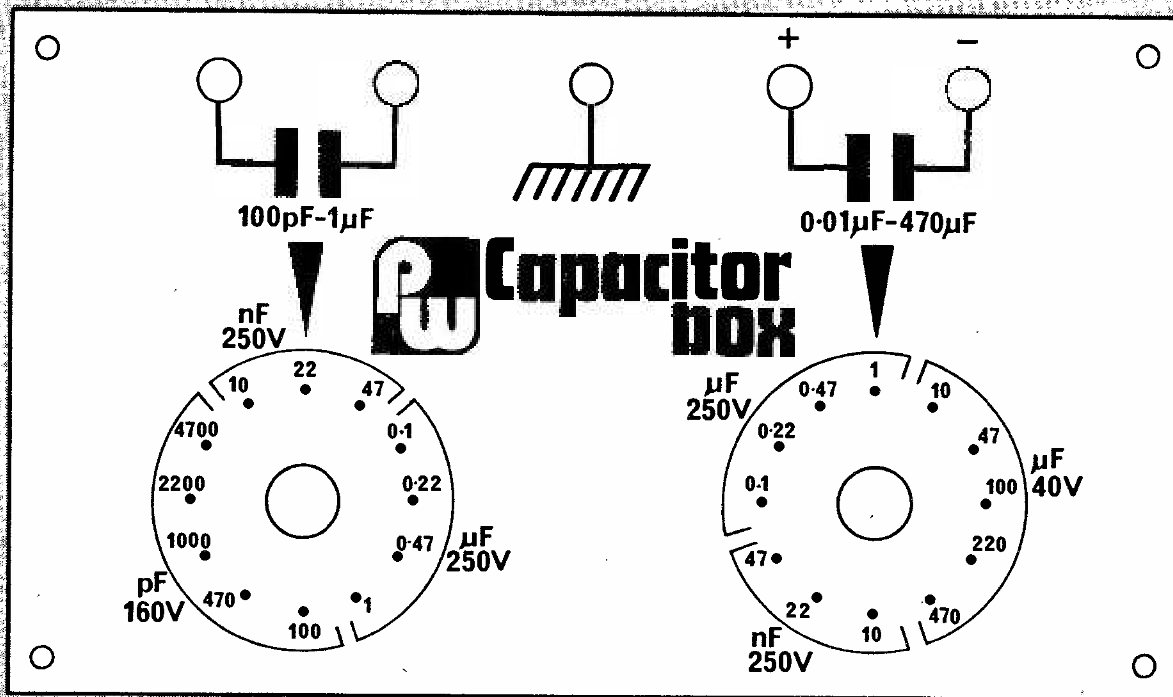
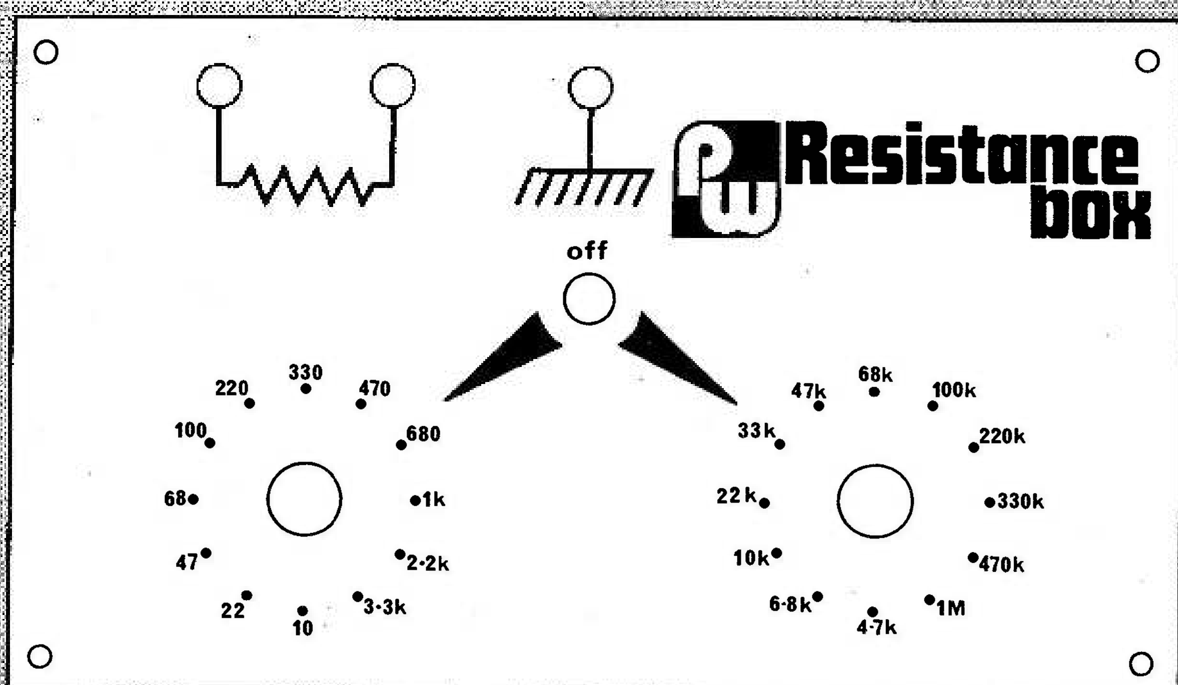
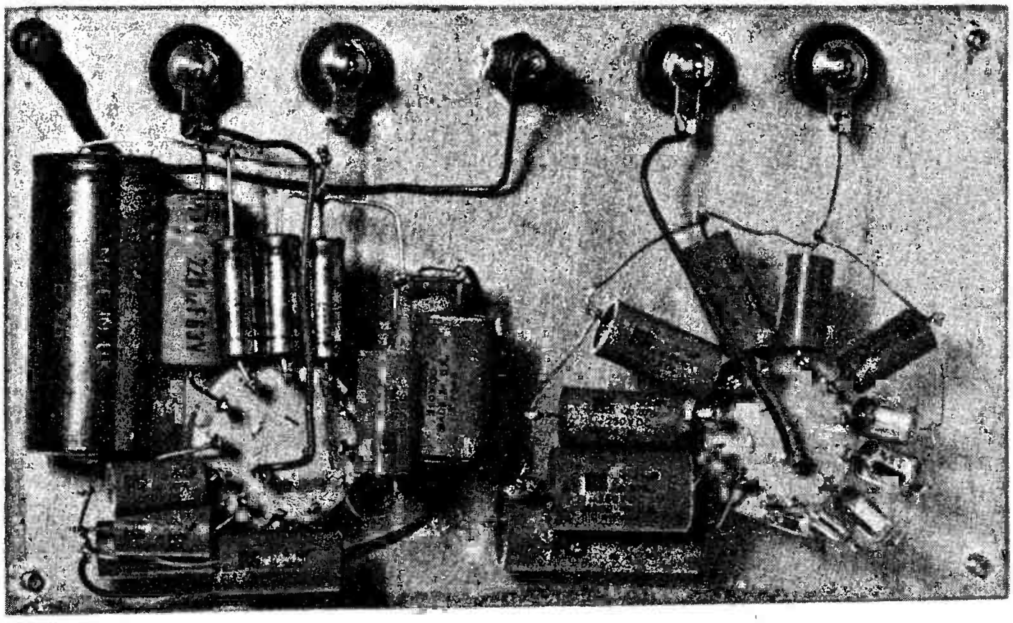


Full size front panel drawing for the Capacitor box. This can be cut out and pasted onto the metal front panel of the box



Full size front panel drawing for the Resistance Box. Like the drawing for the Capacitor Box, this can be used to provide a professional looking front panel. Both these front panels are available as film overlays from the Editorial Offices, price £1.30 each inclusive.



Constructional details of the Capacitor Box. This is the prototype box and the layout of the larger capacitors may need to be varied slightly depending on physical size

★components

Capacitance Box

Capacitors

Polystyrene 160V

100pF	1	C1
470pF	1	C2
1000pF	1	C3
2200pF	1	C4
4700pF	1	C5

Polyester 250V axial leads

10nF	2	C6, 13
22nF	2	C7, 14
47nF	2	C8, 15
0·1µF	2	C9, 16
0·22µF	2	C10, 17
0·47µF	2	C11, 18
1µF	2	C12, 19

Electrolytic, 40V axial leads

10µF	1	C20
47µF	1	C21
100µF	1	C22
220µF	1	C23
470µF	1	C24

Miscellaneous

Rotary switch 1p. 12w. (2); Case (Bimbox 5005), 162 x 97 x 40mm (1); Knobs (2); Terminals, 4mm Red (1), Black (3); Socket 4mm Green (1).

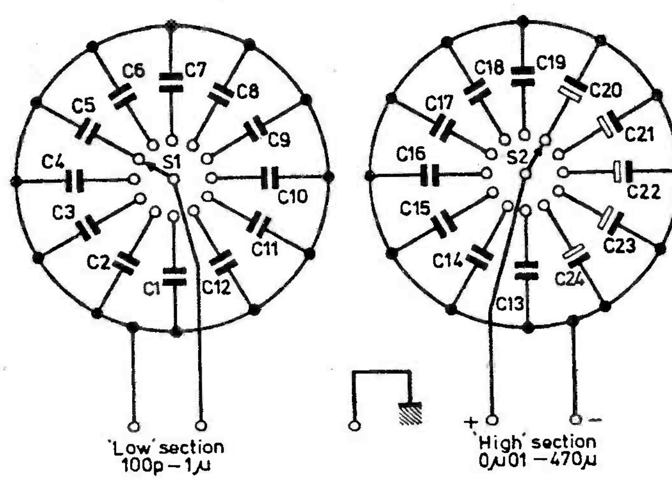


Fig. 2: Circuit diagram of the Capacitor Substitution Box

Construction

Construction follows that of the resistance substitution box, although because of the thinner lead-out wires generally used for capacitors the thick common copper wire may need to be supported. This could be accomplished by means of stand-off insulators or tagstrips.

The photo showing the underside of the prototype lid reveals the construction method used in the prototype, with no extra support being needed. It is wise to sleeve any wire that could possibly touch any other component.

Note that the insulation between the two sections should be preserved, and that the terminals for the high capacitance section should be colour-coded to prevent incorrect polarity voltages being applied to the electrolytics. ●

HI-FI GLOSSARY

1

Gordon J KING

As with most specialised subjects, the four-decade growth of high-quality sound reproduction (now universally termed hi-fi, which means sound reproduction as close to the original as possible) has nurtured a complementary vocabulary which, while readily understood by the technical devotee, is often dismissed as mere technical jargon by those whose interest is less academic. The purpose of this series of articles is to yield down-to-earth explanations of some of the more important terms and to reveal their implications with regard to both technical and auditioning performance.

Recent years have seen a steady change in bias from almost solely laboratory assessment towards the subjective (listening) evaluation of the hi-fi potential of all classes of equipment. Following an unstable "overshoot" into exclusively subjective assessment, stability has been restored so that now the more serious worker is aware that lab measurements just cannot be ignored, and that to achieve a true assessment of hi-fi equipment, listening tests need to be allied with lab tests.

It is true that certain of the "old-style" lab tests fail to expose subtle differences between the auditioning of different makes and designs of equipment of similar class; but recent "dynamic" tests are beginning to show a closer correlation between what is measured and what is heard. It is necessary, of course, for the designer to link his lab development work to properly controlled listening tests, so that he can investigate scientifically why one design of amplifier, say, auditions less or more favourably than another.

Correlation tests like this are not easy to establish and can lead to totally incorrect conclusions unless extremely carefully conducted and the results properly analysed. Of recent years the term "musicality" has been brought into the hi-fi jargon. Exactly what this is meant to mean is hazy. Hi-fi implies reproduction as close as possible to the original, so unless the original is immediately available for comparison a meaningful subjective measure would seem impossible.

Music source signals used for auditioning tests are commonly plagued with several magnitudes more distortion than produced by the hi-fi equipment through which the signals are passing! If "musicality" implies a subjective measure of the acceptability of the reproduction by a listener, then an amplifier which disguises the source distortion owing to it producing a certain brand of "cancelling" or, perhaps, more palatable (usually even-order as distinct from the odd-order of the source) distortion might be judged to be a superior auditioner on that particular music source to one of exemplary linearity—clearly, a dangerous basis for ultimate judgment.

Other lab tests are now also taking account of the fact that a loudspeaker is a complex load rather than a pure resistive one with which amplifiers used to be (and still are in some cases) exclusively tested. Things like these will be highlighted as the series develops. The total series will investigate around 40 different items of "jargon" in essentially alphabetical order.

A

ACOUSTICAL FEEDBACK

Feedback from a loudspeaker to a microphone is well known. When a microphone is brought within range of a loudspeaker, both connected to a common amplifier, a closed-loop feedback situation obtains which is partly electrical (through the amplifier from microphone to loudspeaker) and partly acoustical (from the loudspeaker back to the microphone via the air or other sound conducting medium). When the loop gain exceeds unity and the input and output signals are in phase, the amplifier changes into an oscillator and a howl emanates from the loudspeaker at a frequency determined by the resonant properties of the feedback loop, which include the amplifier (pretty neutral), the microphone, loudspeaker and room itself.

The same thing can happen when a microphone is replaced by a record deck. Owing to the surface area of the record upon which the stylus of the pickup is resting, and the high gain of an amplifier in record playing mode, the deck becomes microphonic and when tapped with the amplifier turned up fairly high, the noise will also be heard from the loudspeaker. In some cases the acoustical coupling is so bad that a disturbing *howlback* will develop above a certain volume control setting.

Normally, of course, one would operate below this threshold, but even so record reproduction can be impaired even though the system is not actually oscillating, owing to sound from the loudspeakers getting back into the amplifier via the deck microphony a fraction of a second after the original sound signal from the cartridge proper.

The result is *coloration* of the reproduction of a degree related to the acoustical "deadness" of the deck. Decks are now being made with low microphonic tendencies, and listening tests have certainly revealed that these audition better than those which are less well damped acoustically. The spectrogram of Fig. 1 shows the pickup output from one deck I tested with the stylus resting on a stationary record and with the deck subjected to 96dBA of pink noise from an adjacent loudspeaker. A sound pressure level (s.p.l.) meter was used to set the sound intensity at the deck and the spectrogram was made by plotting the output from a narrow filter swept automatically from 20Hz to 2kHz. 0dB of the spectrogram corresponds to 5cm/s recorded velocity, and as the pickup cartridge had a sensitivity of 1mV per cm/s it follows that the output at the primary resonance around 70Hz was 40dB below 5mV, or 50μV.

HI-FI GLOSSARY

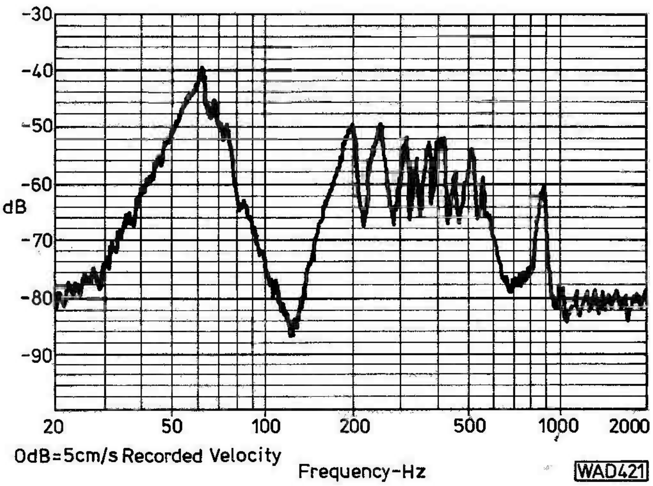


Fig. 1: Output from pickup cartridge with stylus resting on stationary record and deck subjected to 96dBA of pink noise using narrow bandwidth analysing filter swept from 20Hz to 2kHz. 0dB equals 5cm/s recorded level (see text)

A small signal it is true, but some less-well-damped decks can yield 100µV or more at various resonance frequencies, which is a spurious signal of sufficient amplitude to mask the subtle nuances of the recorded signal. Judged critically, acoustical feedback can impair the coherence of low-level ambience and the congruity of the stereo reproduction as a whole.

ACOUSTICAL RESISTANCE UNIT

Reflex type loudspeaker systems use a port to "tune" the enclosure to a low frequency close to the fundamental resonance frequency of the bass driver. When this is done the bass output of the driver is reinforced by the bass output from the port, while at the same time the bass driver is properly loaded acoustically. An *acoustical resistance unit* (a.r.u.) is sometimes fitted over the port to help to control the *Q*-factor (e.g., the sharpness of resonance) of the system, especially when the dimensions of the enclosures render this difficult by other means (see also under Bass Reflex).

ACOUSTICAL SUSPENSION

When it is required for a loudspeaker system to be fully effective at the lower music octaves, it is necessary for the fundamental resonance of the system to occur at the lowest possible frequency. This is because the resonance introduces a kind of high-pass filter effect to the system, the frequencies below resonance then being swiftly rolled-off. Moreover, the acoustical loading of the bass driver is progressively diminished as the frequency is decreased, so to avoid the onset of serious distortion it becomes necessary to prevent the low frequencies from reaching the loudspeaker by the use of a high-pass filter in the amplifier.

The smaller the enclosure, the more difficult it becomes to maintain a distortion-free low-frequency delivery. The call of recent years for small loudspeaker systems to fit in the shrinking domestic scene has encouraged the development of the so-called "enclosed box" system. Sometimes referred to as "infinite baffle", a more accurate title is *acoustical suspension*.

This is because the main restoring force for the cone of the bass driver is provided by the "stiffness" of the air volume in the sealed enclosure. For adequate bass performance, the fundamental resonance of the unloaded driver must be as low a frequency as possible, and this is achieved by a high suspension *compliance* (compliance is the reciprocal of stiffness, so the higher the compliance the less the stiffness) and a relatively high cone mass. These two factors result in a low-frequency fundamental resonance (f_0) because:

$$f_0 = 2\pi\sqrt{\frac{1}{MC}}$$

where M is the mass in kg and C the compliance in metre/newton (m/N). Thus the higher the mass and/or compliance, the lower f_0.

The best acoustical suspension system is equipped with a specially developed bass driver which has a reasonably high mass (though not excessively high as this would impair the transient performance) and a very high compliance so that the fundamental unloaded resonance is around 25 to 30Hz. When the driver is loaded in the sealed enclosure, the air stiffness reduces the effective compliance so that the resonance frequency increases to about 60 or 70Hz, depending on the volume of the enclosure. Some very good loudspeaker systems based on this principle have emerged over the years; but the craft of good design lies in achieving the best compromise between bass unit and enclosure volume.

To avoid coloration as the result of resonance modes at higher frequencies within the enclosure, damping is applied by lagging the enclosure inside with an acoustically

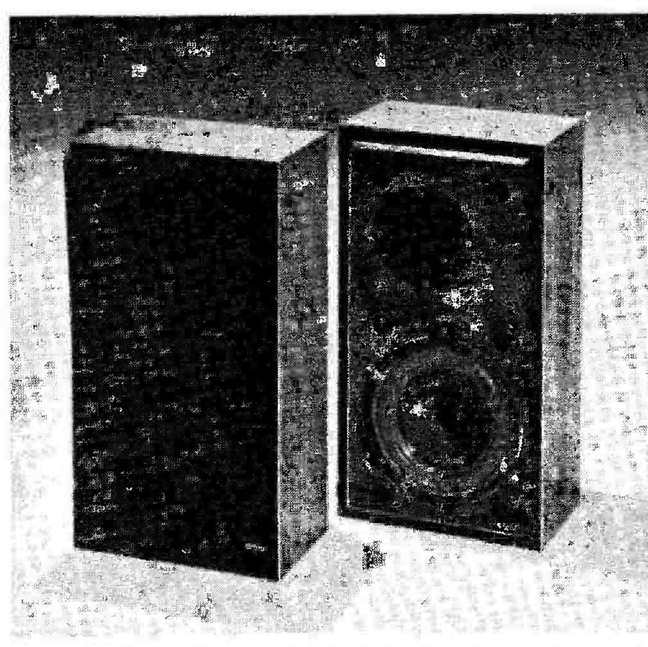


Fig. 2: Example of an acoustical suspension loudspeaker system, where the bass driver is below and the h.f. unit above

HI-FI GLOSSARY

absorbent material such as bonded acetate fibre (b.a.f.) or similar deadening material.

The higher frequencies are handled by smaller driver units which are sealed at the rear from the air pressure within the enclosure. Some systems may use only one h.f. unit (Fig. 2), while more expensive systems may have a total of three units fed with their appropriate range of frequencies from a filter system, called a *crossover filter* or *frequency divider*.

ANTI-SKATING DEVICE

This is a device fitted to a pivoted pickup arm to retain as near as possible a neutral torque on the stylus of the cartridge as a record is being played. When a gramophone record is made, the cutter follows a true radial path from the outside to the inner groove spiral. This means that the axis of the cutter is always at right-angles to the true radial path. However, when a record is played with a pivoted arm the stylus of the pickup follows an arc across the record so that the axis of the cartridge fails to correlate at all positions across the record to 90 degrees with respect to the true radial path. This deviation from the 90-degree requirement is called *lateral tracking error* and is responsible for harmonic (mostly 2nd) distortion.

To help to solve the problem, the geometry of the pickup system is arranged so that on a full swing of the arm the stylus would overhang the centre point of the record. This is called *overhang*. Additionally the axis of the cartridge is displaced from the effective axis of the arm by a given angle. This is called the *offset angle*. When these two bits of geometry are properly attended to, a good deal of the otherwise resulting lateral tracking error is eliminated, because then whatever the position of the arm across the record the angle between a true radial line and the axis of the cartridge holds close to 90 degrees, as shown in Fig. 3.

For optimum correction, the amount of overhang and offset angle needs to be related to the effective length of the arm (the shorter the arm the more correction necessary). An *alignment protractor* is commonly used to establish the overhang relative to a given arm length and offset angle, so that the error is least at the inner groove spiral where the wavelengths of the recorded information are the shortest (the record/stylus interface velocity reduces, of course, as the record plays into the groove spiral).

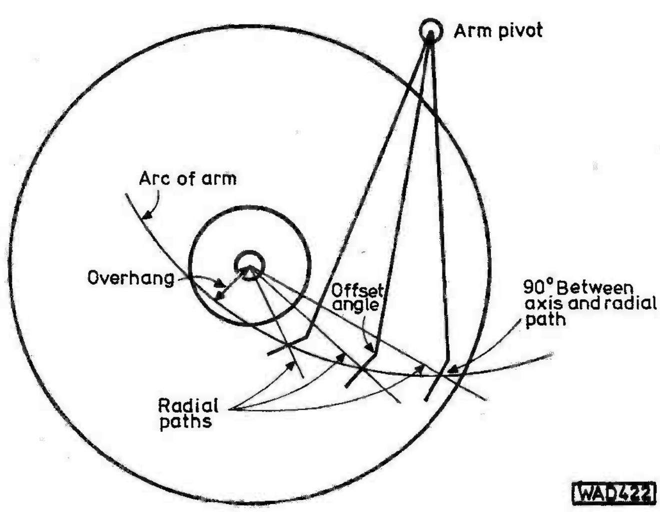


Fig. 3: Illustration of overhang, offset angle and lateral tracking error (see text)

However, resulting from this geometry **and** the record/stylus interface friction of a playing record a small force (*bias*) develops at the stylus tip such that the arm is subjected to an inward (towards record centre) torque. This is sometimes called *sidethrust*. Without correction, therefore, the stylus suspension of the cartridge is pulled slightly away from balance. Not only can this affect the balance of left-on-right and right-on-left stereo separation, but it can also call for up to 20 per cent more downward force (*tracking force*) than would otherwise be necessary for the cartridge faithfully to track a given recording level.

The anti-skating device (sometimes and more accurately called *sidethrust correction*) merely provides an equalising torque (*bias*) in the opposite direction. This force, which is rarely more than an equivalent of about 350mg (3·5mN), depending on the tracking force and the nature of the stylus tip (whether it is spherical, elliptical, etc.), is commonly applied by a dangling weight on a fine thread. Magnetic force and spring force are also used.

Adjustment is provided on the arm so that the force can be set as near as possible to counteract the sidethrust. At best this can only be approximate because the record/stylus interface friction is for ever changing in concord with the record modulation! It is easily possible to overcompensate, which can be worse than no compensation at all! The best way of setting the adjustment is with a specially recorded test record on which are increasing level bands of lowish frequency signal on which mistracking is clearly audible by a severe buzz or rise in distortion. The plan is then to set the anti-skating force in conjunction with the tracking force for the least mistracking on the heavily modulated bands.

The correction is more important with low playing force pickup systems (tracking around 1g or so); but in general the subjective difference between an arm working without and with correction is negligible.

B

BALUN TRANSFORMER

As this bit of jargon is now cropping up more in hi-fi, and is the subject of numerous queries, I thought it would be desirable to offer a definition and some brief practical data on construction. It mainly concerns the f.m. tuner. The term derives from **bal**anced-to-**un**balanced.

The aerial input of f.m. tuners should, for use in the UK, be designed to match directly to 75 ohm unbalanced coaxial cable. For the American and European markets the requirement is for a 240 or 300 ohm balanced input.

HI-FI GLOSSARY

Hi-fi tuners destined for a "mixed" market are not uncommonly equipped with two inputs, one 75 ohms unbalanced and the other 240/300 ohms balanced. A few, though, get to the UK market place with a 240/300 ohm balanced input only, which makes it impossible directly to match them to 75 ohm coaxial cable.

If coaxial cable is coupled to the higher impedance balanced input there is a bad mismatch with a consequent high voltage standing wave ratio (v.s.w.r.), so that the full sensitivity advantage of the tuner cannot be realised. If the tuner's aerial input circuit is as shown in Fig. 4(a), then a fair match to coaxial is possible by connecting the braid to an "earthy" chassis point on the tuner and the inner conductor to one terminal of the 240/300 ohm balanced input.

Not all tuners have such an input circuit, and with some it is difficult, if not nigh impossible, to obtain a safe chassis connection for the braid. To obtain a correct 75 ohm unbalanced coupling, therefore, it is necessary to employ a balun transformer connected round backwards; that is, so that the unbalanced aerial feeder is converted to appear as a balanced input at the tuner, as shown in Fig. 4(b).

A circuit for such a transformer is given at (c) and its construction at (d). By using a ferrite core (I have found the larger type of ferrite beads ideal for the purpose) a transformer of very low insertion loss becomes possible. The circuit shown has a ratio of 1:2, and since the impedance step-up is the square of the turns ratio, the 75 ohms input is translated to 300 ohms balanced output.

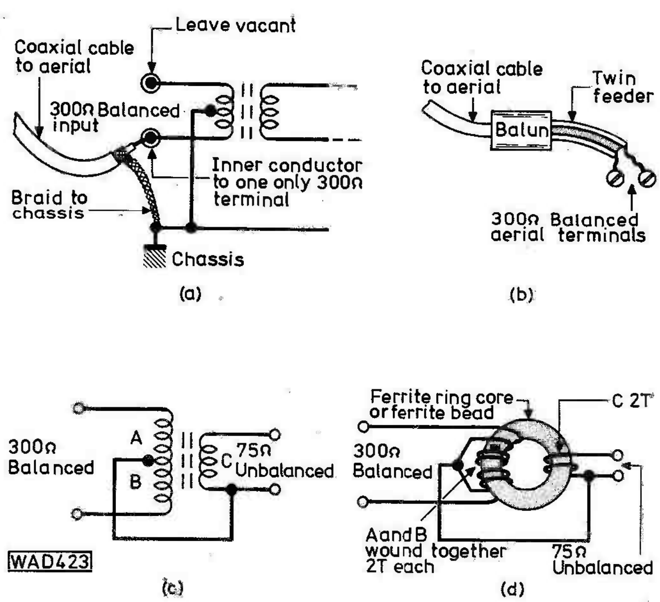


Fig. 4: If an f.m. tuner has a 300 ohm balanced input only, wired as shown at (a), then a 75 ohm unbalanced coaxial input can be connected by putting the braid to chassis and the inner conductor to one of the 300 ohm terminals, leaving the other vacant. (b) the connection of an external balun. (c) circuit of balun transformer. (d) construction of the transformer at (c)

BASS REFLEX

This term refers to a type of loudspeaker enclosure with an outlet (called *vent* or *port*) which allows the air in the enclosure to be resonated to a specific low-frequency, associated with the fundamental resonance frequency of the bass driver (see under Acoustical Resistance Unit and Acoustical Suspension).

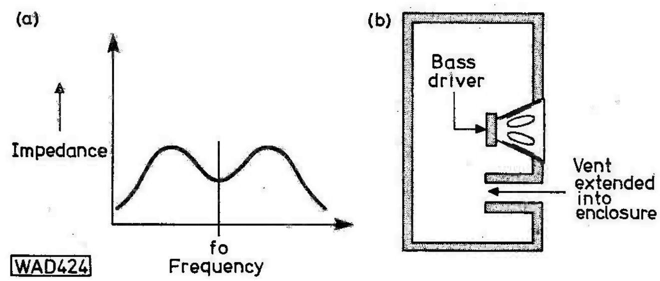


Fig. 5: Loudspeaker impedance curve resulting from bass reflex loading (a). Extended vent (b)

For the correct results, the enclosure needs to be tuned (by its volume and vent dimensions) so that the air resonates at a frequency related to the fundamental resonance of the bass driver. When this happens, the acoustical loading at the back of the cone maximises and then, owing to an inversion of phase within the enclosure, the emission from the vent is in phase (step) with the emission from the front of the cone. The bass output is then reinforced, while the fundamental resonance of the driver is desirably damped.

At either side of enclosure resonance, the loading on the cone diminishes. If an impedance curve is plotted, it will be found to exhibit two smallish peaks (an a.r.u. may be employed further to reduce the peaks), one each side of the resonance frequency, as shown in Fig. 5(a).

The lower the fundamental resonance frequency of the driver, the greater the air volume required in the enclosure. This is why the enclosure for this type of loudspeaker system needs to be fairly large for the efficient delivery of the low music octaves. However, it is possible to achieve a lower enclosure resonance frequency in a volume of limited size by extending the vent into the enclosure by means of a "tunnel" or tube, as shown in Fig. 5(b). Care needs to be taken over enclosure damping, as explained under Acoustical Suspension.

BIAS

This is a general term which means many things! In radio generally we know of it in terms of a standing voltage to the control grid of a value or standing current to the base/emitter circuit of a transistor so that the swings of signal operate on the most linear part of the transfer (input/output) characteristic, thereby keeping the distortion at the lowest possible level.

In hi-fi it also refers to sidethrust compensation or anti-skating bias, and to a high-frequency signal upon which the signal for recording is superimposed in a tape recorder. This is called *HF Bias* and is better defined below.

HI-FI GLOSSARY

The amount of magnetism imparted to magnetic tape or any other magnetic material does not linearly follow the magnetic force required to impart the magnetism. This implies that the *transfer curve* is non-linear, and the nature of the non-linearity is approximated by the curve in Fig. 6 which relates to both the north- and south-going poles of magnetism.

If an audio signal is applied to the recording head without being superimposed upon a high-frequency bias, the distortion on the replay signal is severe as shown at (a). However, when h.f. bias is used, the audio signal is lifted away from the central kink of the transfer curve so that it operates over the more linear outer parts of the curve on the alternate half-cycles of bias signal, as shown at (b). The distortion is then significantly reduced.

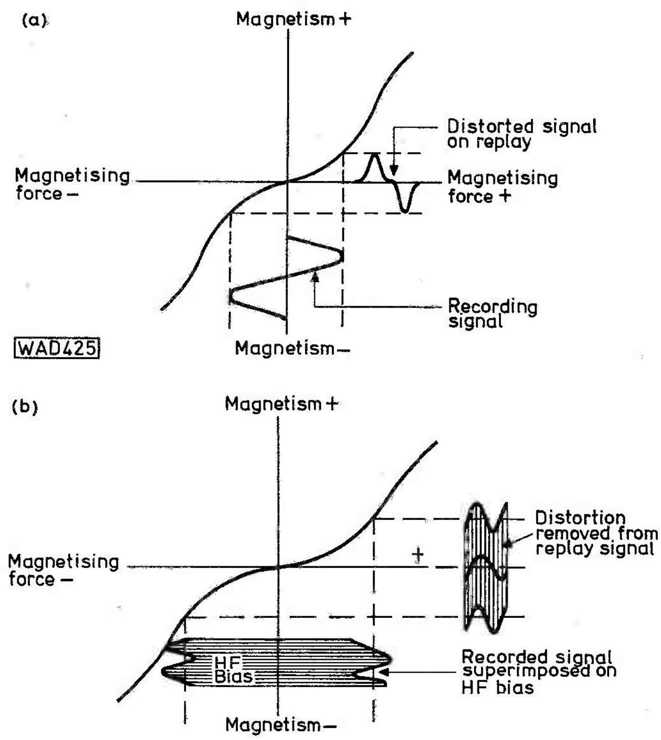


Fig. 6: By using h.f. bias as at (b) the transfer non-linearity of magnetic recording tape and the resulting signal distortion at (a) is eliminated

The frequency of the h.f. bias needs to be, at least, several times the highest audio frequency, and is typically 100kHz in hi-fi tape machines. The strength of the bias needs to be related to the magnetic properties of the recording tape. Chromium dioxide and cobalt-modified ferric oxide tapes require about 50 per cent more bias amplitude than basic ferric oxide tapes.

BIRDIES INTERFERENCE

When the stereo decoder of a hi-fi f.m. tuner is activated by the received 19kHz pilot tone of the *multiplex* (MPX) signal which carries the stereo information, a 38kHz signal is produced by frequency-doubling or digital multiplication in the decoder. At the transmitter the stereo information is amplitude-modulated on a 38kHz subcarrier, but to avoid using up unnecessary deviation the subcarrier is suppressed and thus has to be regenerated in the decoder. For correct demodulation the regenerated subcarrier has to be phase-coincident with the suppressed subcarrier. This is achieved by the pilot tone, which is synchronised to the subcarrier at the transmitter. Total deviation used up by the pilot tone is about 10 per cent maximum deviation, or ±67·5kHz because maximum deviation of broadcast f.m. corresponds to ±75kHz (100 per cent modulation level). Much more deviation would be used up if the subcarrier was transmitted, of course, so there would be less available for the mono and stereo audio information, impairing the signal-to-noise (S/N) ratio.

The 38kHz regenerated subcarrier synchronously switches the stereo demodulators to yield the original left- and right-channel audio signals. This switching and the frequency-doubling tends to produce a train of harmonic components, mostly of odd-order series owing to the "square-wave" nature of the switching signals involved. A particularly troublesome harmonic is the 5th, which falls at 190kHz (e.g., five times 38kHz).

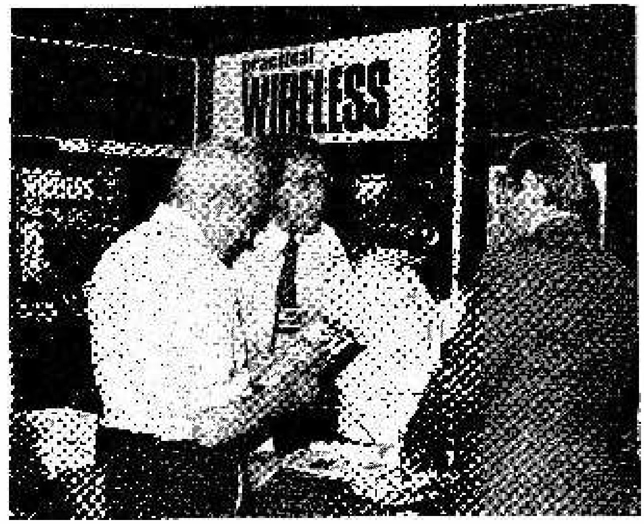
Band II f.m. channels are spaced by 200kHz in the UK. It is thus possible for a tuner to be tuned to one transmission and respond slightly to an adjacent channel transmission 200kHz away. The f.m. detector will then be in receipt of two signals, and owing to intrinsic non-linearity a spurious signal at 200kHz will be present at the output of the f.m. detector.

This detector feeds directly into the stereo decoder, so it is possible that this 200kHz signal will beat with the 5th harmonic of the subcarrier signal to yield a 10kHz signal. Although in the audible spectrum, this is a rather high frequency and not easily discerned. However, since it is perturbed by the modulation (deviation) of the transmission signals it manifests as a warbling type of interference. This is what is generally known as birdies interference. If the interference vanishes when the tuner is switched to mono mode, then there is no doubt at all that this is the cause of the trouble.

It can be overcome by connecting a low-pass filter (f_0 or turnover frequency around 53kHz) between the output of the f.m. detector and the input to the stereo decoder. Some tuners are equipped with such a filter which is either in circuit permanently or switchable. The sidebands of the stereo information extend to about 53kHz so these must be retained. the low-pass filter rolls off the higher unwanted beat signals which are responsible for the interference. Unless the filter is carefully designed to be as phase-linear as possible (e.g., with the least group delay) the stereo separation at the higher audio frequencies will suffer.

Indexing

To assist any reader requiring to index the items of jargon, those which have been fully or partly defined in this instalment are given below in alphabetical order.



The Great British Electronics Bazaar

This, the first ever "Bazaar", was staged at Alexandra Palace from 28–30 June and provoked much interest among radio and electronics hobbyists.

The wide selection of stands, representing instrument manufacturers, component suppliers, microcomputer specialists and a cross-section of the UK electronics magazines, seemed to be doing quite brisk business. Certainly, we on the *Practical Wireless* stand spent a rewarding three days in terms of the opportunity to exchange views with some of our readers.

The programme of lectures, seventeen in all, were well attended. They covered computing, teletext, musical instruments, radio, and electronic construction for beginners. The *Practical Wireless* lecture, *How to Become a Radio Amateur,* was presented by John Thornton Lawrence, co-author of our very popular series of articles *So You Want to Pass the RAE?* and gave a good insight into the requirements, the rewards, and the costs (both monetary and social!) of taking up amateur radio as a hobby.

We understand from the exhibition organisers that plans are already well under way for the 1980 "Bazaar", which will again be at Alexandra Palace. Details will be announced in due course.

HI-FI GLOSSARY

INDEXING—continued

Birdies interference
Coloration
Compliance
Crossover filter
Frequency divider
HF bias
Howlback
Lateral tracking error
Mass
Multiplex (MPX)
Musicality
Offset angle
Overhang
Port
Resonance frequency
Sidethrust correction
Tracking force
Transfer curve (characteristic)
Vent

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The keyboard consists of a mode switch selecting degrees, radians or grads mode, and 40 keys providing a total of 44 functions as listed in the table. Automatic repeat and constant operations for arithmetic and y^x functions are included.

The LC-780, which comes complete with batteries, instruction book, and carrying wallet with space for cards, has a manufacturer's recommended retail price of £29.50. We offer the calculator **plus a free desk stand** to *Practical Wireless* readers for £16.95 including postage, packing and VAT. A one-year guarantee for parts and labour is given by the manufacturer.

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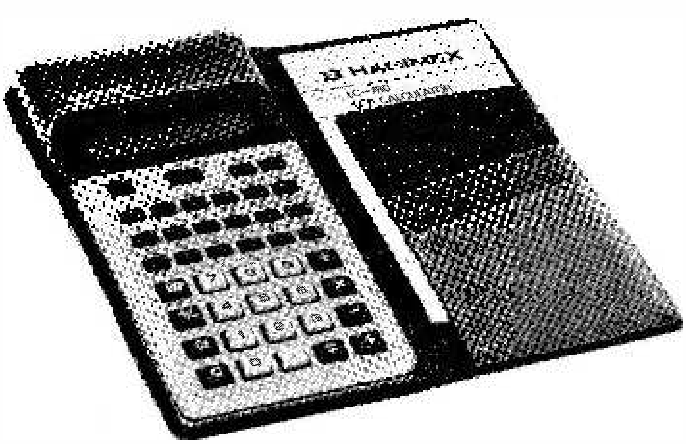
functions

Arithmetic:	$+, -, \times, \div$
Mathematical:	$x \leftrightarrow y, \sqrt{x}, \sqrt[3]{x}, x^2, y^x, \pi, 1/x$, (,)
Memory:	M+, MS, M↔X, CM, RM
Trigonometric:	SIN, COS, TAN, SIN^{-1}, COS^{-1}, TAN^{-1}
Hyperbolic:	SINH, COSH, TANH
Logarithmic:	Ln, Log, e^x, 10^x
Factorial:	n!
Conversion:	$\underrightarrow{\mathrm{DEG}}, \underrightarrow{\mathrm{DMS}}, \underrightarrow{r\theta}, \underrightarrow{xy}$
Statistical:	$n, \bar{x}, \Sigma x, \Sigma x^2, \sigma^{n}, \sigma^{n-1}$, DATA, DEL



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Cut Round Dotted Line

HOTLINES

A REVIEW OF RECENT DEVELOPMENTS
In general, the author does not have any more information on products than appears in the article.

Supersonic Typist

The humble office typewriter could be in danger of becoming extinct in its present method of operation. Electronic printers, used for hard copy printout, are developing at a rapid rate, and some of the techniques used could oust the more conventional typewriter approaches.

The latest printer to be launched on the market, and that illustrates a potential in typewriter applications, is one that employs the "ink jet" principle. Conventional typewriters have "hammers", with the characters on them, that are impacted against a piece of paper with an inked ribbon interposed between the two. The ink jet printer doesn't have any hammers at all, but it does have a lot of electronics. Basically, it operates on similar principles to an electrostatic c.r.t. A nozzle, which fires tiny, electrically charged droplets of ink, is aimed at the paper. The droplets, because they are electrically charged, can be guided electrostatically. On their way to the paper, they pass between four plates, two vertical and two horizontal. By applying the necessary potentials to these plates, the droplets of ink can be guided to form letters, numbers, etc., on the paper.

The new beastie has two speeds; 1090 characters per second, and 530 c.p.s. The faster speed gives a dot matrix type printout, whereas the slower speed allows a higher "letter" quality. Literature tells that the new printer produces individual droplets at 103kHz. A Japanese version (literally) of the 6800 microprocessor is at the heart of the electronics. An 8-bit data byte is required to accurately control the position of each droplet, and the machine also contains the 14K of ROM needed. The unit could prove a winner if compatibility is observed. It should be useable in its own "write"(!), and could be offered with suitable interface, for use with a standard ASCII keyboard. Finally, a compatibility with computers to form a reasonably low cost print output unit should give it immense appeal in many markets.

Hypersonic Typist

Talking of printers; while nearly 1100 c.p.s. is fast, it doesn't compare with the latest laser printer to be marketed. Working from magnetic cards or a computer, the 6670 laser printer can print up to 36 pages every minute! This type of non-impact printer is becoming more popular as variations come onto the market. The programs for different type fonts can easily be stored electronically in ROMs and, of course, such printers are extremely fast and quiet. The crown for the fastest of these units rests (according to my last information) with a unit that can print an almost unbelievable 160 pages per minute. Even a party political speech should take no more than 10 minutes to produce using one of these.

Cut Your PCB

Hobbyist journals usually carry an advertisement or three for etching kits enabling purchasers to make their own, bespoke p.c.bs. A company in Hanover has just launched a system that works differently.

A piece of suitable copper-clad board is clamped in position, a button is pressed, and a small tool is lowered that cuts away the unwanted metal, leaving only the desired pattern: no exposure, development, printing, wet etching, etc. The user needs only a rough sketch of the required pattern. He then traces over this using a joystick control. Positional outputs from the joystick are logged as X–Y coordinates in a control instrument. Individual pattern programs can be stored on tape so that repeat boards may be produced at any time. Up to six programs can be stored on a C120-type cassette. The unit also drills holes for the location/insertion of components.

Heart Watch

Some two years ago, a company introduced a small, wristwatch-size heart rate monitor. Now, another arrival on the scene promises to be far less expensive than its predecessor (which costs around $500 in the US). The newcomer takes the form of a wristwatch with a digital readout. It has all the usual timekeeping functions and is, to all intents and purposes, a digital watch.

Beneath its digital readout is a small, round area. To check heart rate, the user simply places a finger over this area, and heart rate is displayed, digitally, on the watch readout. Modus operandi relies on a small l.e.d. that shines out a light at the applied finger. This light is reflected back onto a photosensor. As blood passes through the finger, the slight expansion and contraction of surrounding tissues causes the light to be very slightly pulsed or varied in intensity. The photodetector uses the slight pulses to make a count which is then displayed.

In addition to cramming all the watch components into an average size case, the manufacturers also have to include the electronics for the heart rate facility. This has to cancel out any interference due to ambient light and then pass the signal on to sample-and-hold circuitry and on to a filter network. This signal is then converted to a logic output by using a discriminator circuit, and thence to the l.c.d. readout. Some 6 op. amps. are used in the electronics, each measuring only $0{\cdot}41 \times 0{\cdot}25$mm and taking a miserly $2{\cdot}2\mu$A. The grand total current drawn by the entire chip is only 18μA.

Smoke Chips

If a particular application becomes popular, it isn't usually too long before the i.c. manufacturer puts the whole lot on a single chip. This is now the case with smoke detection—well, almost.

Known as the CS-179, this i.c. has most of the circuitry on board. An internal timer creates 22ms pulses at 15s intervals. Each pulse is used to activate/energise amplifiers i.r. detector, photodiode and relevant logic circuitry. The photodiode receives the i.r. pulses but if any optical attenuation between the two (like smoke) goes above a preset level, then the logic circuitry starts calling for help. The attenuation level can be easily set by an external potentiometer. After receiving the first "above threshold pulse", the unit waits until a second one arrives as a confirmation before triggering alarm circuitry.

One clever feature is that after receiving the second danger pulse and sounding the alarm, the unit alters the timer frequency such that the pulses are only 1s apart. Thus when two, 1s "no smoke" pulses are received, the unit will switch off the alarm—instead of carrying on for 30s.

Ginsberg

BURGLAR ALARMS PART 2

P. J. WALES

The aim of this series of articles is to show the home-constructor or d.i.y. enthusiast how he might go about installing his own security system, using a combination of mass-produced devices and home-produced design and electronics.

It would be impossible, naturally, to describe and specify a single system that would suit all pockets, premises and security requirements. Security is very much a personal matter and any effective system must allow for the varying habits of the occupants as much as for the value of goods to be protected, the actual design of the building, how much cash is available to be spent on the system and a host of other variables. It is mainly for the would-be installer to decide the exact form and level of protection that his system is to provide; essentially, all *PW* can do is to point the way as regards design and wiring, and show how to "connect the thing up". So, whether you are considering a very basic level of security or whether you want to instal a full-blown system to British Standard BS3545, we hope to be able to give you a very good idea of how to go about it.

The order in which you should carry out the various parts of the installation depends largely on you, the weather conditions and, if you have one, what sort of mood your wife is in. In other words, there is not really any logical sequence that we can recommend—you must plan your own operations according to the circumstances that confront you. What we are doing in this series is to break the subject down into conveniently explicable areas—you should thus be able to more easily decide your own personal plan of attack!

Tools

The average motley collection of household tools should be quite sufficient for most of the installation and the only item unlikely to be in your tool-box is a long drill for drilling through walls, and for use when installing the wiring into the "security door". Therefore, it might be a good idea to beg, borrow or even buy a 3ft × $\frac{3}{8}$in drill.

The other items you will need are: a junior hacksaw; a chisel; a drill plus bits and the normal hammers; screwdrivers and pliers, etc. The professionals use crimp-type termination techniques which employ a special tool to crush the crimp onto the wire producing a cold-welded joint; this avoids having to use a soldering-iron in awkward locations and using this method might, therefore, save your carpets and fingers from being burnt!

Security Door

The "security" or "final exit" door is normally that which occupants habitually use in leaving or entering the house and should be a strong door (*not* a patio door) preferably fitted with a mortice lock. In being transformed into a security door this lock must be replaced with a security type; this version incorporates a switch which renders the system "live" as the door is locked.

The wires are brought into the frame edge of the door via a "door-loop"—in effect, a short length of coiled or ribbon cable with a tamper-proofed box at each end (Fig. 1). Carefully remove the existing conventional lock and fit the security one; some work with the chisel will almost certainly be necessary, the aim being to remove the least possible quantity of wood and to make the maximum use of existing fittings. Try to line up the lock bolt with the keep (the rectangular hole in the door-frame that the bolt moves into as the door is locked) so that the keep itself does not have to be relocated.

If your aim is to instal a full-blown system that satisfies the requirements of BS3545 you will need, at this point, to fit a "lock-plate". This is a printed circuit matrix on a flexible base which is slid in with the lock. It must, of course, be towards the outside of the door as the aim of it is to give an immediate alarm if an intruder tries to drill through the lock. If such an attempt is made, the track on the lock-plate will be broken and the alarm will sound. Naturally, this is one of the devices that should be subject to 24 hour monitoring—therefore, it should be incorporated into the 24 hour loop along with the personal attack buttons, fire sensors and tamper-proofing switches.

When the new lock is a flush fit in the door and works smoothly, the area isolation switch (or switches) can be fitted. These are mounted (Fig. 1) in a standard sliding-door pull fitted into the edge of the door so that when the door is closed, the switch is inaccessible and cannot be moved. Start by chiselling the cut-out in the edge of the door to the correct dimensions for the lock face, and then offer up the door pull with the switches mounted in it (sliding-door pulls, it is worth mentioning, are usually chrome-plated and therefore you will need to drill *slowly* to get through them). Mark the points in the cut-out where the backs of the switches make contact, and then drill holes that are large enough for them to slide into when the door pull is eased into its final position.

Installing the wiring into the door is more tricky. Use the 3ft drill to bore a hole from the lock recess to the opposite side of the door-frame and another from the area isolation switches to meet it. Then drill a hole through the face of the door (where one of the tamper-proofed boxes will be located) to meet the first hole before using a long piece of stiff wire to hook the connecting wires through. You will find it easier to make two separate "runs" through the door, one for the area isolation switches and the other for the security lock connection, rather than to try to arrange the split in the cable to be halfway across.

Door Sensors

Door sensors of the magnet-operated concealed reed-switch variety should be fitted as shown in Fig. 1. Saw carefully across the door-stop at about 4in from floor level and carefully chisel section C away. Drill hole A for the sensor itself and hole B as the exit route for its lead wires—obviously, the two should meet! Chisel a channel from hole B to the floor and then use stiff wire to hook the lead wires through from hole A. You may, of course, have to do a little more chiselling in order to get the wires under the carpet gripper if one is fitted, before taking the wires off in the required direction. When inserting the sensor, ensure that it fits just below the surface of the door-frame—now mark a hole in the edge of the door to line up with it and then drill it so that it is a firm fit on the magnet actuator. Opening and closing the door, check with a continuity-tester of some kind (a battery and bulb is the simplest!) that the switch is functioning correctly. When you are satisfied, wire the device into the main security loop.

It is often possible to instal a second magnet behind the first to ensure that the sensor functions reliably; you may find this to be a necessary precaution if the gap between the door and frame is rather wide. Make sure that the second magnet is inserted correctly though, otherwise you will weaken rather than intensify the field strength!

Finally, replace the section of door-stop by gluing it into its original position (a couple of panel-pins will hold it while the adhesive hardens), and then apply filler around the sensor head and cut-marks to achieve a finished surface. A coat of paint will then add the final touch.

Pressure Mats and Windows

The fitting of pressure mats or pads is fairly easy; as with all security devices, careful siting is the main requirement. Those to be installed under the stair-carpet, for example, should be able to fit flat within the depth of the stairs so that they are not permanently bent. If this is not the case, they will eventually go short-circuit.

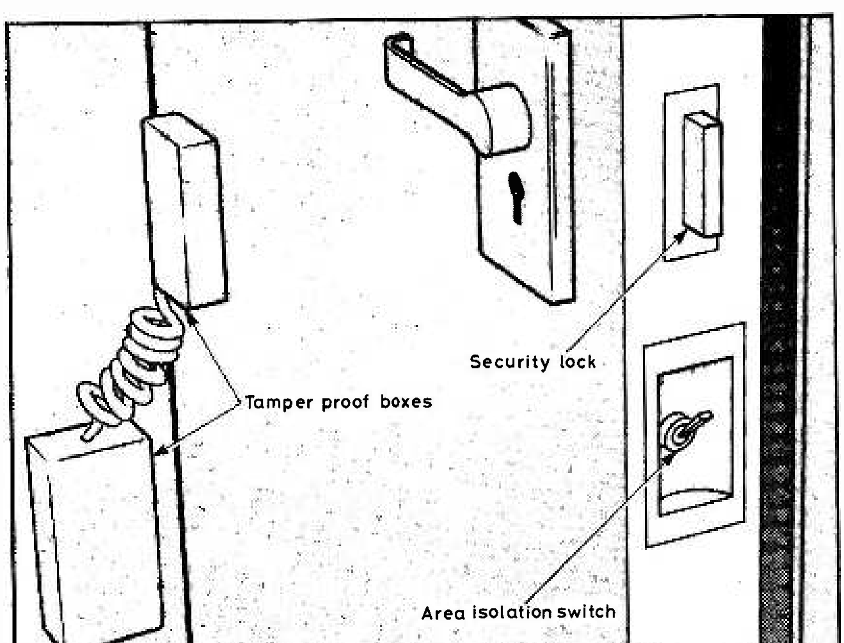
When placed under windows, the larger type of mat should be used. Put them under the carpet so that anyone climbing or jumping down from the window-sill is certain to land on them—about 9in from the wall is about right. You may find it necessary to lay two mats adjacent to each other to achieve the coverage required.

Wiring to vibration sensors must be surface wiring, but it is usually possible to disguise it to some extent by hiding it behind the curtains. The sensors themselves should be stuck to the window-glass and, to maximise the sensitivity of the device, as far from the window-frame as possible. A word of caution, though: if the window is large and there is heavy traffic passing nearby, false alarms could result. Please try to aim for a reasonable compromise if you consider a good night's sleep to be priceless!

Alarm Generators

The weak link in any security system almost invariably lies in its method of communication with the outside world. No matter how many gadgets are deployed around the house, how sensitive they are or how effectively they function, the system is totally useless if no-one can be made aware that a device has been disturbed. As nearly everyone knows, the usual main alarm generator used is a very loud bell, mounted outside where it will attract the maximum attention. If "Fingers" can silence it even before it has started to sound, he can enter your premises at his leisure, setting off all the alarms that he likes, without caring a hang! Obviously, this must be prevented if the system is to be at all worthwhile.

We can make a good start by making it as difficult as possible for him to get at the alarm generator, and this can be done in two ways. Firstly, a fair measure of



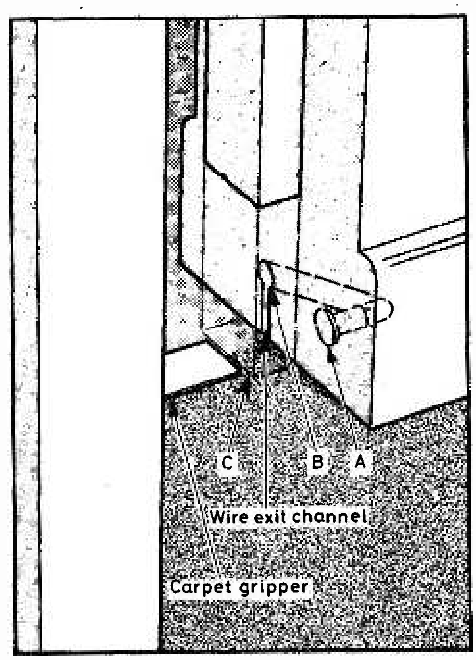


Fig. 1: Details of security fittings for doors. The left-hand drawing shows the fitting of a security lock, area isolation switch and the tamper-proof boxes for taking the wiring from door to wall. The other drawing shows the method of installing magnetically operated door sensors

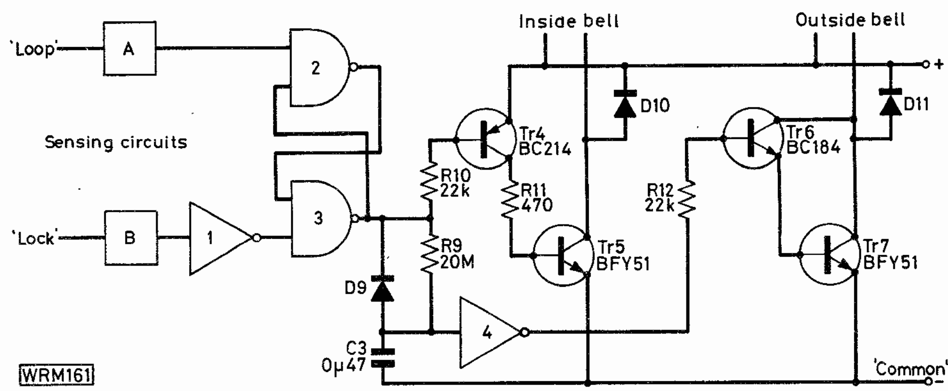


Fig. 2: Circuit diagram of the control unit. The two sensing circuits A and B are identical and are shown in detail in Fig. 3

protection can be simply provided by mounting the noise-maker high up on the wall of the house; already, "Fingers" needs a ladder, an item which is large, inconvenient and difficult to handle in silence. Still more protection can then be added by locating the bell or siren in a steel box which will, of course, incorporate a tamper-proofed lid. If our hero removes this, he will break the 24 hour loop (which we described in Part 1); the batteries also contained within the box will enable the alarm to sound. The same will occur if the cable to the box is cut—the bell is then said to be "self-actuating".

The idea is to make the alarm generator as inaccessible, visible and as impractical to disable as possible; thus its siting is quite critical. Mount it high on a wall, facing the road where it can plainly be seen by passers-by. Make it obvious (paint the box bright red, perhaps, and have the word "Alarm" on it in large capitals!) and incorporate the tamper-proofing and external wiring into the 24 hour loop. With these precautions taken, the whole business of levering the box off the wall, for example, and silencing it with a blanket in the back of a van will have been made very tricky indeed.

Naturally, making the outside bell-box inaccessible to an intruder means that it is inaccessible to you also—so the installation is not easy! Having selected a location for the box (try and tuck it up under the eaves to give it some protection from the weather), use the 3ft drill to bore a hole through the wall for the cable; you will probably find it easiest to do this from inside the attic. If you now leave the drill poking through the wall, you can use it to support the bell-box while you mark out the correct mounting holes on the outside surface of the wall. Having removed the box, drill the mounting holes for a suitable size of Rawlplug and then screw the box firmly into position. Remember—the more effort you spend in putting the box up, the more difficult it will be for "Fingers" to get it down again!

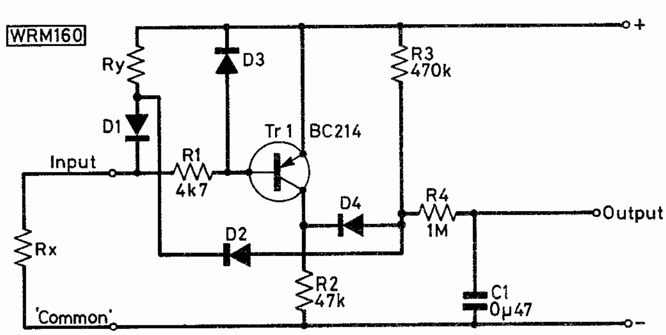


Fig. 3: Circuit diagram for the two sensing circuits of Fig. 2

In addition to an outside bell, you will also require an inside bell. Although we have called both alarm generators "bells" (that is, after all, the traditional alarm), a different form can easily be used. A very loud siren for the outside "bell" for example, and perhaps a buzzer or other less powerful form of audible warning device for the inside "bell". The inside sounder is not intended to be very loud, it must be pointed out, because its principal function is to warn the occupant that the system has been turned on with a sensor in the alarmed condition—you left a door or window open, perhaps. It therefore only needs to be powerful enough to be heard by the occupant after he has security-locked the final exit door, but is still immediately outside. Generally, therefore, it will need to be located on the ground floor.

Sensing and Control

The circuit diagram of the control unit is shown in Fig. 2. Note that the sensing circuit "A" and "B" are identical to each other and are included in the p.c.b. copper pattern and component layout (Fig. 4). For ease of explanation however, we have shown the sensing circuit itself separately in Fig. 3.

The control unit must, of course, be trouble-free in operation and has been designed in the belief that simplicity breeds reliability. In order to achieve the basic aim using a minimum number of components, a circuit has been devised which will produce a negative output for either an open or short-circuit input, and a positive output when the correct resistance is present in the loop.

Considering this circuit first (Fig. 3), Tr1 is the active component which is held in conduction by applying a bias voltage to its base via R1; this voltage is set by the potential divider Rx and Ry, the values of which we have deliberately left unspecified. If we did specify an exact value for these two components, this would inform the "opposition" as to the most important parameter of the system, and the available security would be much reduced, of course. So we leave it to you to decide the exact values of these two resistors—the conditions that must be satisfied are that Rx = 10Ry, where Rx must be in the range 1kΩ to 1MΩ and Ry, therefore, must be between 100Ω and 100kΩ. Leaving the choice to the individual constructor means that the number of resistors a knowledgeable intruder could insert into the circuit in an attempt to defeat it, is very large.

The sensing circuit design is such that large reductions in supply voltage to the circuit are possible before Tr1 ceases to conduct. This guards against false alarms caused by, for example, the failure of the mains supply. Let us suppose that a mains-derived 12V supply fails and that

BRITISH STANDARD BS3545

This mighty tome is produced in several parts by the British Standards Institute and sets out, in very great detail, specifications for security equipment and the manner in which it is installed. In very condensed form, the essential points that it makes as far as our system is concerned, are as follows:

★ All wiring in the installation must be self-protecting or within the protected area; the alarm must sound if any wiring, whether or not it is exposed, is cut . . .

★ All active components must be protected, or within the protected area. Therefore all boxes must have tamper-proofing switches in them, and items such as the final exit lock must be inside the protected area also . . .

★ In the event of a mains failure, the standby power supply must be capable of running the system for 72 hours and then sounding the alarm for one hour. If rechargeable batteries are used and become discharged, the power supply must be able to fully charge them within 24 hours. The system must give an alarm if the supply charging the batteries fails . . .

★ If the system develops a fault when switched on, it must advise the user without delay.

a 6V supply from dry batteries replaces it, and that you have selected respective values of 100Ω and 1kΩ for Ry and Rx. With the 12V supply, the current flowing through Ry, D1 and Rx will be 10·9mA, the potential difference across Ry will be 1·09V to which we can add 0·6V for the p.d. across D1 (forward-biased silicon diode)—therefore, the base-emitter bias voltage applied via R1 to Tr1 will be 1·69V. If the mains supply now fails, and a 6V supply is substituted, the current through Ry/D1/Rx becomes 5·45mA, the p.d. across Ry becomes 0·55V to which, again, we can add 0·6V for the p.d. across D1. The base-emitter bias now becomes 1·15V—Tr1 is there-

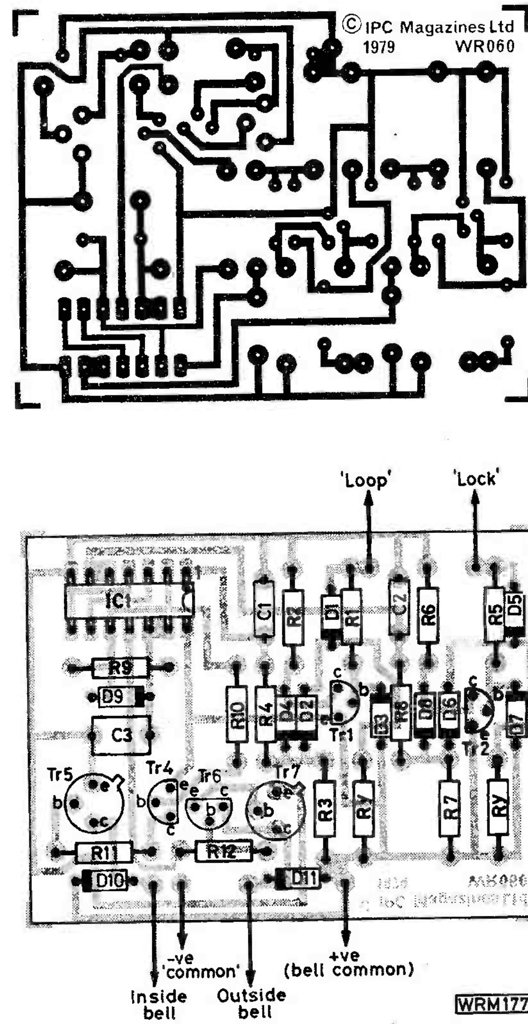


Fig. 4 (Top): The p.c.b. copper track pattern, shown full size, of the control unit. (Below) The component placement drawing for this unit

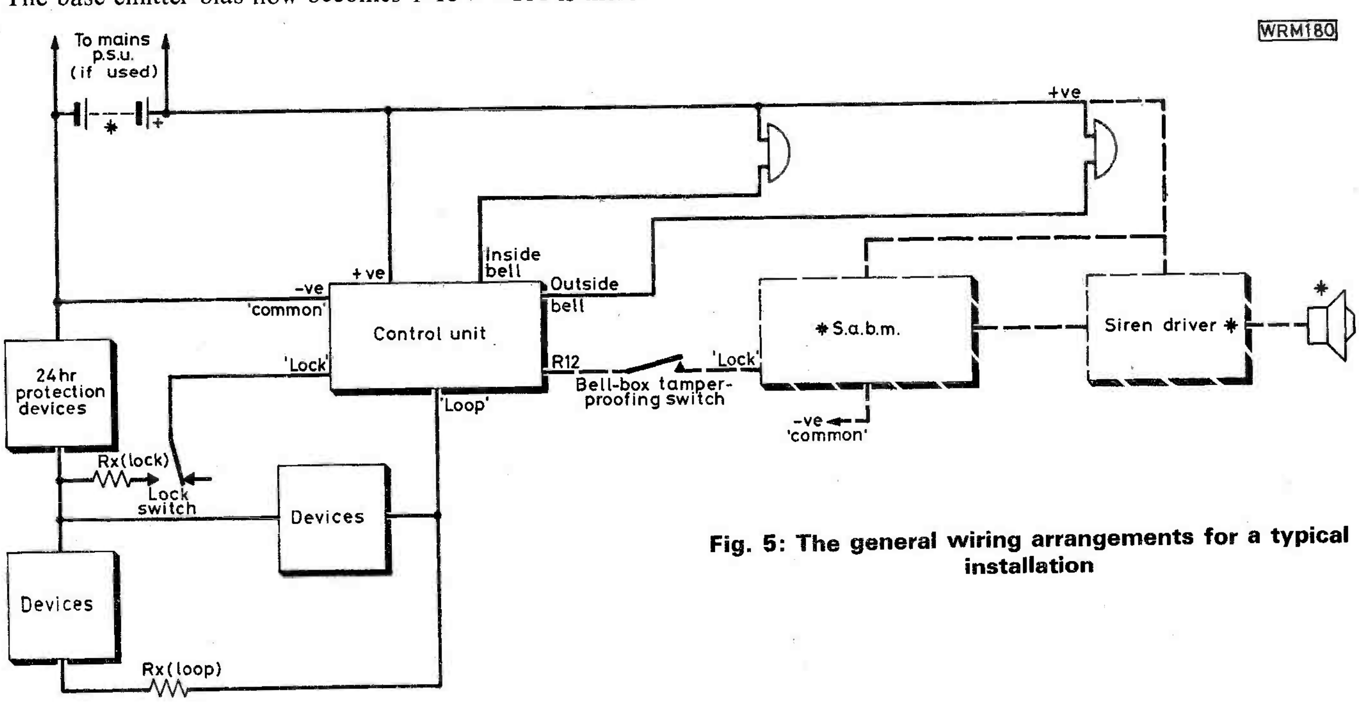


Fig. 5: The general wiring arrangements for a typical installation

★ components

CONTROL-UNIT AND SIREN DRIVER CIRCUITS*

Resistors

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

470Ω	1	R11
3·3kΩ	1	R14
4·7kΩ	2	R1, R5
10kΩ	2	R13, R15
22kΩ	2	R10, R12
47kΩ	2	R2, R6
470kΩ	2	R3, R7
1MΩ	2	R4, R8

$\frac{1}{4}$W 10%

1·5MΩ	1	R16
20MΩ	1	R9
Unspecified	2	Ry

NB. The value of Ry is selected in conjunction with that of Rx (see circuit diagrams and text).

Capacitors

Polycarbonate

47nF	1	C9
0·22μF	3	C4, C5, C8
0·47μF	3	C1, C2, C3

Electrolytic 16V

47μF	1	C7
220μF	1	C6

Semiconductors

Diodes

1N4148	12	D1-12

Transistors

BC184	1	Tr6
BC214	3	Tr1, Tr2, Tr4
BFY51	2	Tr5, Tr7

Integrated circuits

LM380N	2	IC3, IC4
LM556	1	IC2
4011B	1	IC1

*The component quantities given above are sufficient to construct one only of each circuit.

Miscellaneous

Equipment wire for interconnections, printed circuit boards (available from advertisers in *PW*), 10–15W horn loudspeaker (Maplin XQ74R or similar—required for use with the siren-driver), buzzer or sounder (for use as "inside bell"—RS 248-808, 249-429 or similar), dry or rechargeable batteries, cable, fixings and fittings, plastic cases, security and fire devices, general household and d.i.y. materials as required.

NB. Security devices and fittings are available from advertisers in *PW*.

fore still firmly conducting and will remain so down to much lower supply voltages, thanks to the "stabilising" action of D1.

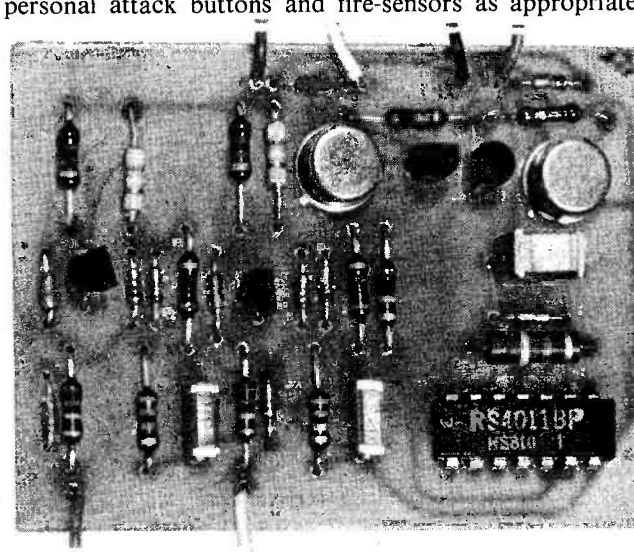
So, providing that Rx is left undisturbed, Tr1 will stay in a conducting condition and the output will thus be positive. With the transistor conducting, D2 and D4 are reverse-biased and the output is thus connected to the positive rail via R3 and R4.

If, say, a pressure-mat is operated short-circuiting Rx, the negative rail forward-biases D2 via the short-circuit, taking the output negative through R4. If a reed-sensor is disturbed, Rx is open-circuited removing the base-emitter bias from Tr1 which stops conducting. Thus its collector will go negative via R2, forward-biasing D4 and again the output will be negative. Capacitor C1 is a slugging capacitor which, with R4, produces a delay of 1 second which serves to prevent false alarms from being generated by noise on the loop circuit.

This same circuit (as sensing circuit "B") is also used to condition the control-unit logic according to whether the system is "on" or "off"—this is, of course, determined by the security lock contacts. The output is reversed in polarity by the inverter (1) before being fed to the bistable latch (NAND gates 2 and 3).

Passing on to the control unit itself (Fig. 2), when the door is unlocked the output of the inverter (1) will hold the latch in the non-alarm state; changes in the loop resistance caused by doors opening and closing, etc., will have no effect on the control unit outputs. When the door is locked, however, the "hold" is removed from the latch but it stays in the same condition for as long as the output from the sensing circuit remains positive. If any of the alarm sensors in the loop are now activated, sensing circuit "A" produces a negative output and the latch immediately changes state. The output of gate 3 goes negative, turning on Tr4 and Tr5 causing the rail voltage to be applied to the inside bell. Capacitor C3 charges via R9 to provide a 10 seconds delay before turning on Tr6 and Tr7 via inverter (4)—these transistors apply voltage to the outside bell. The delay is, of course, to cater for the situation where the householder sets the system by means of the security lock, only to find that the inside bell sounds because he has left a door open. Obviously, this is going to happen quite frequently and it is only fair to give him a chance to reset the system by unlocking the door again, before the outside bell sounds!

In the simplest type of system, this basic circuit is used on its own and is mounted in the bell-box together with the batteries. The external connections to the p.c.b. are as shown in Fig. 4. The common wire to the "lock" and "loop" sensing circuits is wired via the permanently-sensed items (tamper-proofing switches, 24 hour loop, lock-plate, personal attack buttons and fire-sensors as appropriate)



The completed p.c.b. for the control unit. Compare this with Fig. 4

to the "lock", "loop" and "isolation" resistors (value Rx—see Part 1, Fig. 2).

The other side of these resistors then forms the return path for the appropriate sensing circuit. The point at which the common wire is connected to the p.c.b. is also connected to the negative terminal of the battery. The effect of interrupting this common wire (operating a personal attack button, for example), is to make Rx open-circuit for both sensing circuits, of course. They will thus both produce a negative output which will present two positive inputs to NAND gate (3)—its output will therefore be negative, and the alarms will sound as described previously.

Fig. 5 shows a general wiring arrangement for a typical installation which should clarify how the interconnections should be made, and which should be studied in conjunction with Fig. 2 of Part 1 in the September issue of *PW*.

S.A.B.M.

Increasing the level of security to British Standard makes matters, as one might expect, rather more complicated. Two of the basic control-units are now required—one inside the house, and the other outside in the bell-box. The latter we shall now term a "self-actuating bell module" (s.a.b.m. for short!) which acts as a slave of the inside unit. This inside unit now assumes the title of "control-unit".

The inside control-unit is connected with its "lock" and "loop" sensing circuits as before, but Tr6 and Tr7 are not used. The output to the external s.a.b.m. is taken instead from the end of R12 (at the point where it would have been connected with the base of Tr6). R12 now acts as Rx (loop) and, although it is marked as 22kΩ can, if desired, be changed providing, of course, Rx is still made to be equal to 10Ry. In other words, if the value of 22kΩ is retained, Ry in the s.a.b.m. must be 2·2kΩ. The output from the end of R12 is connected to the "lock" input of the s.a.b.m.; the "loop" input is unused, and is left open-circuit.

When the main control-unit registers an alarm, the positive potential that was previously used to turn Tr6 and Tr7 on, is now used to turn Tr2 of the s.a.b.m. off. This causes the output of the s.a.b.m. "lock" sensing circuit to go negative as previously described, causing Tr4 and Tr5 of the s.a.b.m. to turn on (the inside bell-feed—not used) and, after a delay of 10 seconds, Tr6 and Tr7 also. Do note, though, that the delay introduced by the internal control-unit must be added to this; the total delay from the moment when the internal control-unit senses a disturbance to the alarm actually sounding is therefore around 20 seconds.

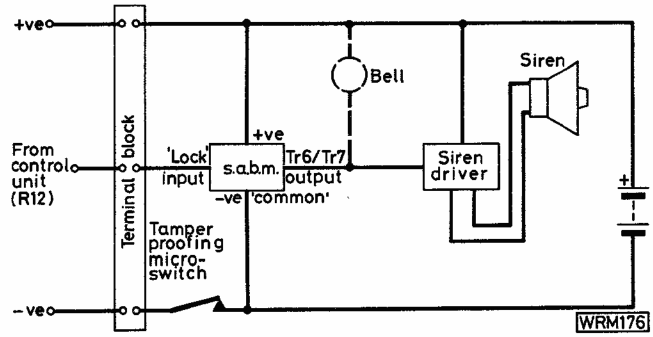


Fig. 6: Bell-box wiring diagram

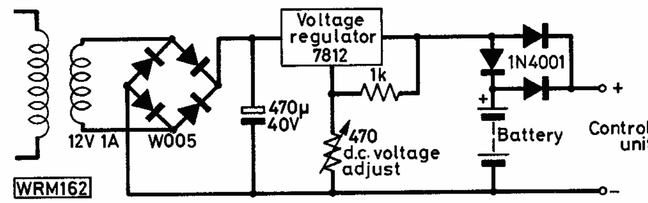


Fig. 7: Circuit diagram of the power supply

Siren

If you want to make a lot of noise with your main alarm—and there is much to recommend it—then a really loud siren is the answer. Fig. 8 shows the circuit diagram for a siren driver circuit the output of which, when fed into a horn loudspeaker, will produce a simply incredible amount of noise (well over 100dBA, in fact). Its note is that of an American police-car siren.

It works thus: IC2 is an LM556 which is effectively halved, each half being made to perform different functions in the circuit. One half runs as an astable multivibrator (duty cycle 150 : 1), producing a negative-going pulse which is fed via D12 to the input of the other half of the device (pin 3), which is run as a voltage-controlled oscillator sweeping from 400Hz to 650Hz at the rate determined by the multivibrator. Integrated circuits IC3 and IC4 are LM380N's, connected as a bridge amplifier which feeds the final output to the loudspeaker. The voltage of the input signal applied to the bridge amplifier is sufficient to ensure that its output is always a square-wave—the output of the amplifier is therefore raised from 2W in single-ended configuration, to well over 10W.

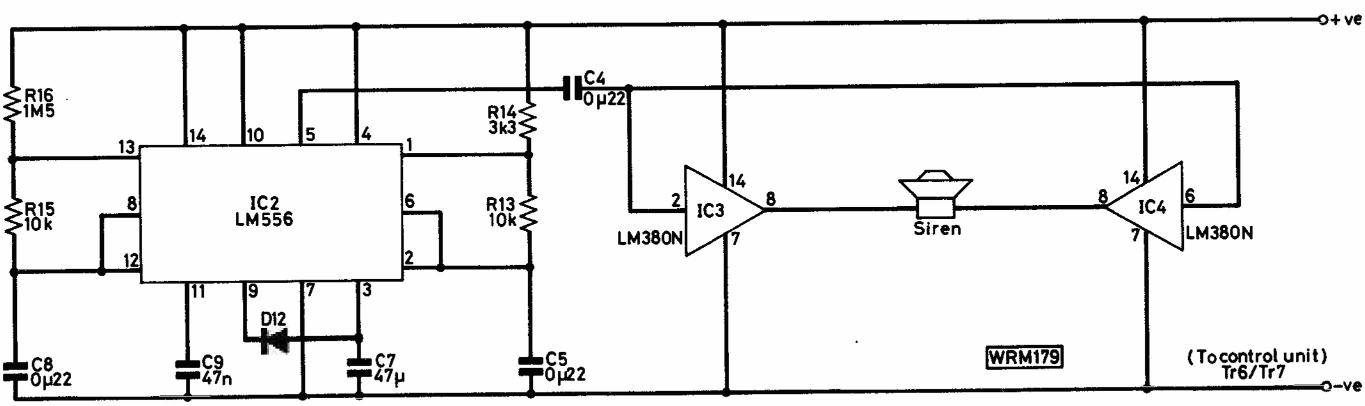


Fig. 8: Siren-driver circuit diagram

The "siren" itself is a horn loudspeaker which is suitable for external use in a protected environment—ordinary speakers would, of course, soon have soggy cones if used in the outside box!

The circuit is activated by the "Outside Bell" connection from the s.a.b.m. When there is an alarm, Tr6 and Tr7 conduct as we discussed previously; by so doing, they act as a switch extending the negative rail to the siren driver, turning it on.

One final point concerning the siren circuit. The observant among you may have noticed two spare pairs of holes shown on the p.c.b. diagrams (Fig. 9), adjacent to pin 1 of IC3 and IC4. If you find on completing your siren circuit that the audio output is rather distorted and unstable, use these holes to connect a 4·7μF 16V tantalum bead electrolytic capacitor across pins 1 and 2 of each LM380N (positive lead to pin 1!)—this has the effect of slightly lowering the gain of each device and should effect a cure.

The question of how to power the system depends, once again, largely on the approach of the individual constructor and how much money he is prepared to spend. The power can, of course, be quite simply supplied by using dry batteries—they will need to be outside in the bell-box with the control-unit in the basic system, in order to sound the alarm if the box is ripped off the wall or if the cable to it is severed. In the case of the full system (incorporating the s.a.b.m.), you will require a set of batteries indoors as well if you want the inside bell to sound when this happens; at least you are then provided with some warning, albeit not very loud, if "Fingers" does contrive to silence the main outside alarm.

Dry batteries will naturally have to be changed periodically, and it is undoubtedly less troublesome to have a mains-derived power supply which can then be used to charge sealed lead-acid batteries in the outside box. In order to meet BS3545, however, you will still need inside batteries (but they can be dry ones) to power the inside bell if the cable to the outside box is cut during a power failure. Unlikely, but it could, of course, be just your luck that a villain tries to gain entry during, say, a scheduled power cut brought about by an industrial dispute.

So, rechargeable cells are certainly worth thinking about, particularly if your outside box is 20ft up the wall! Fig. 7 shows the circuit diagram for a 12V power supply which you could simply construct on Veroboard, mount in a plastic case with the indoor dry batteries, and attach to the wall in your airing-cupboard, perhaps. It is there that the mains supply for the immersion heater might be conveniently situated and could be used to power the system. Do remember though, that mains electricity and water, when combined, are lethal!

Although we have not shown a specified d.c. supply voltage on our diagrams, 12V is recommended. It is unwise to exceed this figure if false alarms are to be avoided.

You should by now have ample information upon which to base the design and installation of a security system for your house. Naturally, we cannot be specific in describing a wiring-route for any particular house beyond saying that it is a good idea to follow water-piping when descending from floor-to-floor, and that the outside bell-box is normally best reached from inside the loft.

Therefore, a great deal of very careful thought needs to be devoted to the project before you start. It is attention to detail that will make your system really effective as a deterrent—where the outside box should be placed, how sensors should be distributed about the house, the nature of the power supply. You could, perhaps, use a second "dummy" outside bell-box—if the would-be intruders go for this one first, it may win sufficient time to enable you to ring the police. Remember that to beat the thief, you must be as devious and cunning as he is and, hopefully, more so.

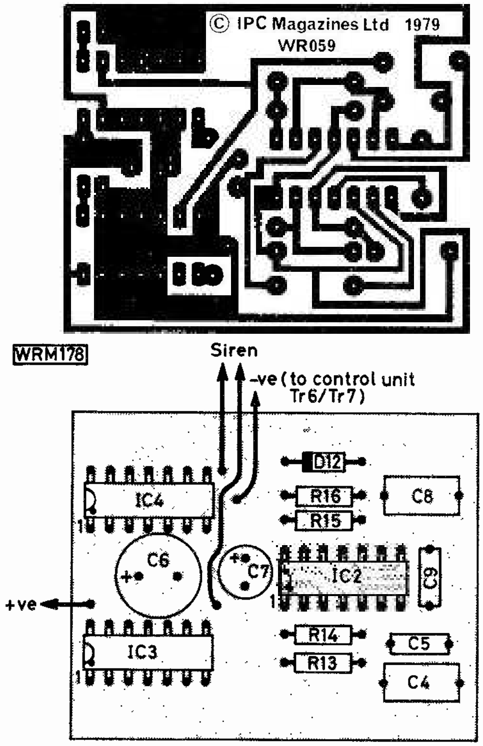


Fig. 9 (Top): Copper track layout of the siren-driver p.c.b. shown full size. (Below) The component placement for this board

Having designed a system use a colour code for the loops, stick to it religiously throughout and, most importantly, do not neglect to prepare an accurate written record of everything you do. The system, hopefully, will be very reliable—but if a fault crops up in five years time, you will obviously find it extremely difficult to track down if you cannot somehow exhume the details of the original installation!

Put all external electronics in a sealed plastic case and varnish the completed p.c.b. to guard against condensation; you are up against the British winter, remember, and the external bell-box will not in itself provide sufficient protection against the all-pervading damp that we know and love so well!

The final hint? Please, do use only top quality components in the construction of your system if you value a good night's rest and wish to avoid faults and false alarms. Also, when constructing the control-unit or s.a.b.m. do take the necessary precautions when handling the CMOS i.c.—keep it in the conductive foam until it is needed, avoid touching the pins with your fingers, and make sure that your soldering-iron is properly earthed. If you fail to do this, you could be faced with false alarms, even some months after the completion of the installation.

Next Instalment

Part 3 of our "Burglar Alarms" series describes how you can construct your own microwave motion detector unit.

As it is really a constructional project in its own right, we thought we would give the device an identifying title from our list of nearby popular resorts.

From this list we have selected the name which seemed most appropriate—yes, in Part 3 of "Burglar Alarms" you will find the *PW* "Parkhurst"!

AERIAL SPECIAL

NEXT MONTH IN... practical WIRELESS

FREE PRACTICAL AERIAL DATA CHART

The last *PW* Aerial Chart was published in 1972, and has been in demand ever since. Next month we bring you an updated and expanded version, double-sided and measuring 508 x 356mm. Don't miss it—1986 is a long way off!

also:

AERIALS FOR 160m

The designer of the VMOS Top Band Transmitter featured in our July issue, John Green, gives us the benefit of his experience in developing aerial systems for this band, and ways of matching them to a 50Ω broadband output circuit

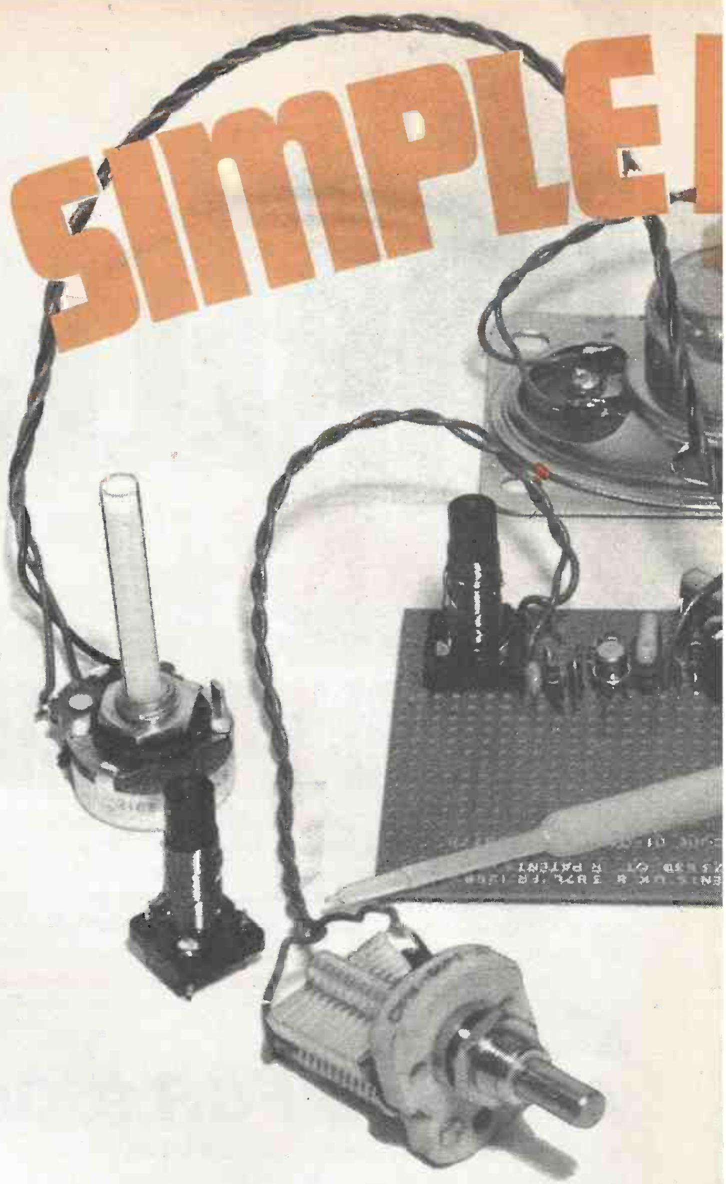
MW/LW LOOP AERIALS

In recent editions of "On the Air", Charles Molloy has been giving hints and tips on using and modifying the ever-popular *PW* Loop Aerial design. We asked him to gather them all together in one article, and here it is

and:

HI-FI GLOSSARY Continuing

SIMPLE



"Wireless" is a word I personally think is slowly becoming extinct. The greater part of today's radio magazines seem to consist of electronic games, games on TV, electronic organs, Hi-Fi stereo amplifiers, etc. There seems little room left for the amateur who would like a wireless circuit to construct without having 75 per cent of it already done for him.

Last year I talked to quite a number of young "chaps", both at work and at my local radio club, who are just getting interested in electronics and who would like to start constructing but are so bogged down (like many of us) by the number and variety of i.c.s that they just don't know where to start. Hence the reason for this article.

Super-regen

The circuit will quickly be recognised as our old friend the Super-regen (Super-regenerative receiver). I have a good communications receiver but still get a lot of enjoyment from using one of these circuits, and there is a certain fascination to quickly winding a random number of turns on a coil former, plugging it in and listening to what frequency one gets. This simple receiver is easy to construct and get going, and is also cheap. The receiver is very sensitive and can extract the audio-signal information from a signal as low as 0·5 microvolt.

The r.f. signal developed across L1 is inductively coupled into the detector tuned circuit L2 and VC1. This r.f. signal is applied to G1 of the f.e.t. 40673, which operates as a gate-leak detector (similar to the grid-leak detector of a valve). The capacitor C2 and the gate-leak resistor VR1 bias the circuit so that only the positive peaks of the r.f. signal result in a current flow through the 40673. These current pulses vary according to the a.m. signal superimposed on the r.f. carrier wave. These audio-signal variations are amplified in the source-to-drain circuit of the 40673.

The source-to-drain current of the 40673 flows through a portion of the tuned circuit L2, and the r.f. components of this current are inductively coupled back to the tuned circuit by the autotransformer action of L2, in the correct phase to reinforce the signal developed at G1 of the 40673. This regenerative feedback permits repeated amplification of the signal and increases the sensitivity of the detector circuit. Feedback is controlled by VR1.

Maximum regeneration for a.m. occurs at a critical point just before the detector oscillates, and for c.w. and s.s.b. just beyond the point of oscillation. The r.f. choke L3 and C3 and C4 form low-pass network that filters out the r.f. components in the drain circuit current. Tr2 is a simple stage of audio amplification.

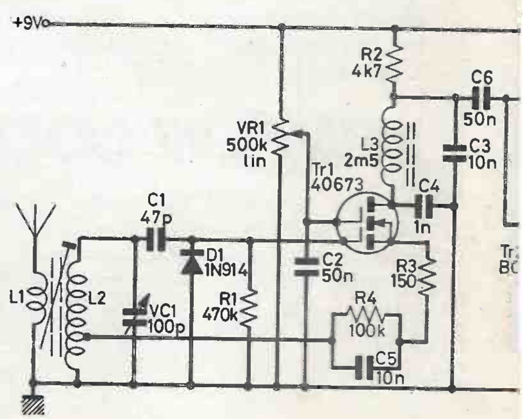


Fig. 1: Circuit diagram of the simple regen
Neosid 6mm diameter coil former and hav
number of turns tapped at 25 per cent from
wind the coils attach the end of the wire to
view) and wind 75 per cent of the turns fo
round clockwise and attach. Take the wire
the remaining turns of L2. Take the wire do
again and wind L1, finishing with the wire
turns, L2 40 turns tapped at 10 turns from
similar enamelled copper wire. You will nee
L2 to obtain th

SIMPLE RECEIV

E. VAUGHAN

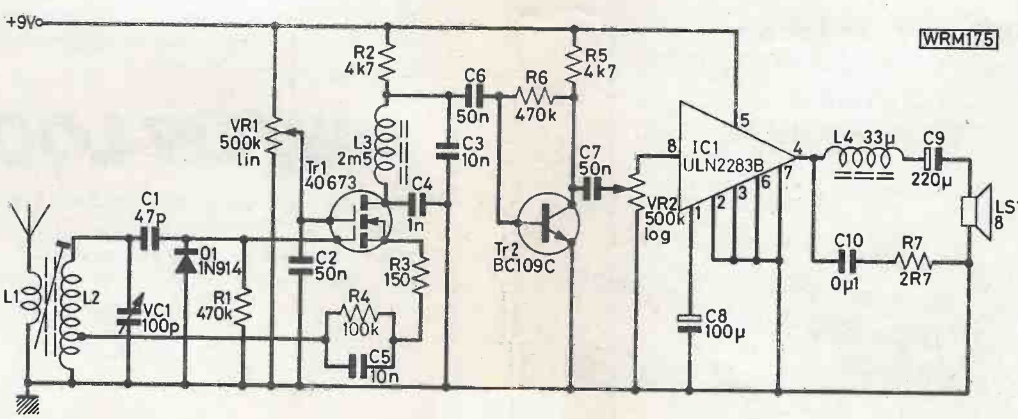
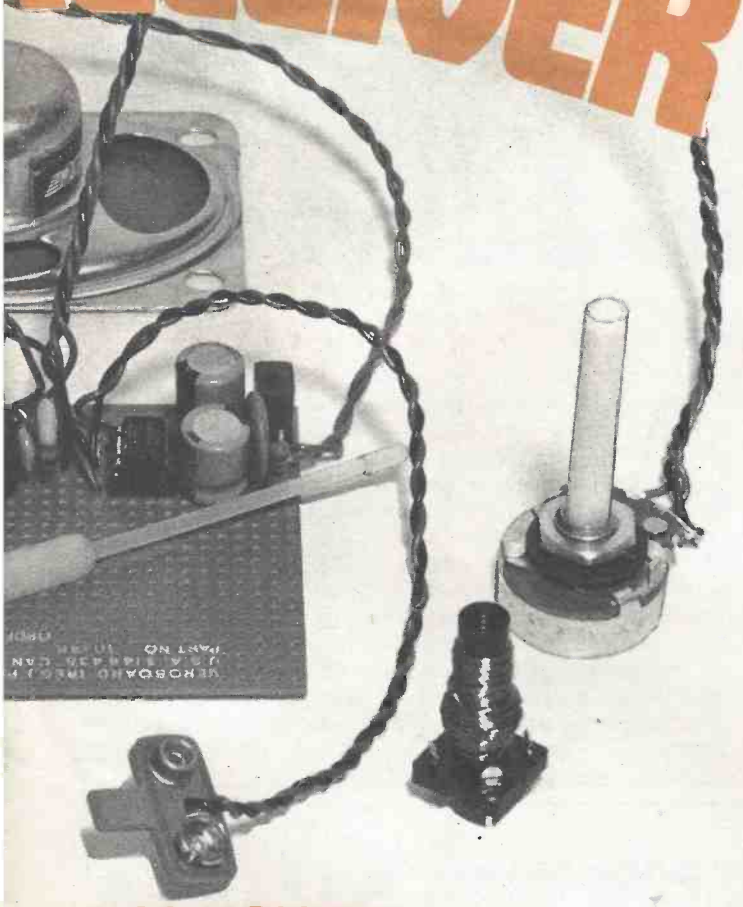


Fig. 1: Circuit diagram of the simple regenerative receiver. L1 and L2 are wound on a Neosid 6mm diameter coil former and have the following ratio of turns. L2 has any number of turns tapped at 25 per cent from the earthy end. L1 has 25 per cent of L2. To wind the coils attach the end of the wire to the solder tag to the right of the notch (top view) and wind 75 per cent of the turns for L2. Take the wire down to the next tag round clockwise and attach. Take the wire back up the former and continue winding the remaining turns of L2. Take the wire down to the next tag round and then back up again and wind L1, finishing with the wire to the last tag. Suggested turns are L1 10 turns, L2 40 turns tapped at 10 turns from earthy end. The wire could be 24 s.w.g. or similar enamelled copper wire. You will need to be prepared to experiment with L1 and L2 to obtain the best results.

Practical Wireless, October 1979

RECEIVER



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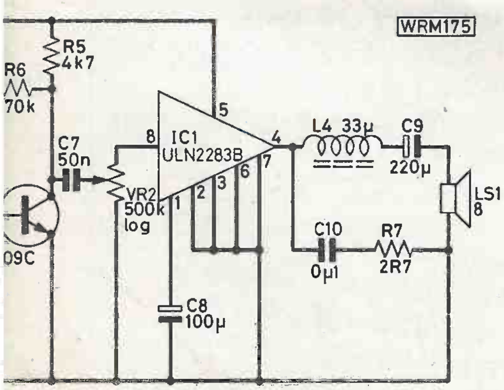


rative receiver. L1 and L2 are wound on a the following ratio of turns. L2 has any he earthy end. L1 has 25 per cent of L2. To he solder tag to the right of the notch (top r L2. Take the wire down to the next tag back up the former and continue winding vn to the next tag round and then back up o the last tag. Suggested turns are L1 10 arthy end. The wire could be 24 s.w.g. or l to be prepared to experiment with L1 and best results.

★ components

Resistors
¼W 5%

2·7Ω	1	R7
150Ω	1	R3
4·7kΩ	2	R2, 5
100kΩ	1	R4
470kΩ	2	R1, 6

Potentiometers

500kΩ lin.	1	VR1
500kΩ log.	1	VR2

Capacitors
Ceramic Disc

47pF	1	C1
1nF	1	C4
10nF	2	C3, 5
0·1µF	1	C10

Polyester

50nF	3	C2, 6, 7

Electrolytic p.c.b. type

100µF 15V	1	C8
220µF 15V	1	C9

Variable

100pF	1	VC1

Semiconductors
Diodes

1N914	1	D1

Transistors

BC109C	1	Tr2
40673	1	Tr1

Integrated circuits

ULN2283B	1	IC1

Inductors

33µH	1	L4 (Toko 7BA 144LY-3R3)
2·2mH	1	L3 (Toko 8RB 187LY-222)

Miscellaneous
6mm dia. Neosid coil formers with dust cores to fit; 8pin d.i.l. socket (1); Veroboard; Loudspeaker 8Ω; Battery connector; Knobs; Enamelled copper wire for coils (L1, L2).

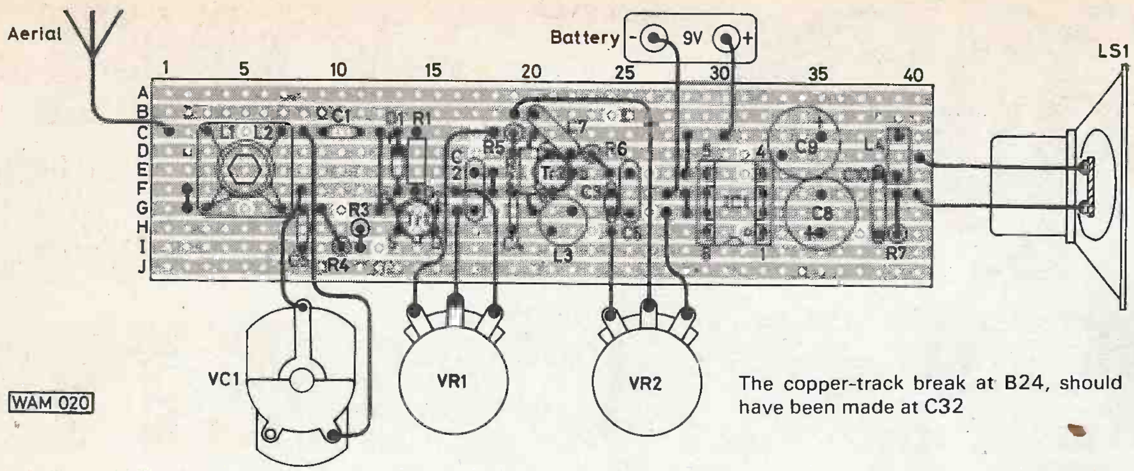


Fig. 2: Suggested Veroboard layout of the simple receiver. Other layouts could be tried

The ULN2283B may be unfamiliar to a number of readers. It has an output of 800mW and will operate on a supply of 3 to 9V, an improvement on the LM380.

> Readers should take note of the fact that this project is intended to be experimental in nature.
>
> If you do not want to be bothered with winding coils and trying different numbers of turns then this is not for you.
>
> For these reasons no details have been given of how to house the completed receiver.

The circuit is easily translated into a simple layout on a piece of Veroboard. The coils L1 and L2 are wound on a 6mm diameter Neosid former. The exact number of turns for each winding can be the subject of experiment, but as a start try L2 with 40 turns tapped at 30 turns from the start. Wind 10 turns for L1 close to the earthy end of L2. These windings can be varied, keeping to the same proportions for the tap and L1. Apart from the Veroboard layout, no other details are given as these have been left to the reader.

This project is intended to be experimental in nature, and if you do not manage to pick up any signals with your first coil do not be discouraged—try winding another one.

Editing Home-Recorded Cassettes

PART ONE

B. BARNARD

Considering the high quality performance of many domestic cassette recorders, it seems a great pity that the problem of producing a home-recorded cassette off radio (which, after all, is the one and only source of everybody's favourite music) to anything like professional standard, is fraught with problems and disappointment.

The reason, of course, is that too much guesswork is involved—guessing *is* involved—guessing when we should start to reduce the recording level controls to fade out the presenter's voice without losing too much music; and guessing when to cut in the new piece of music without leaving an abrupt start in the middle of a musical passage.

Constant spacing between items is also difficult, sometimes impossible, so that the finished cassette is amateurish and disappointing when played back.

A recording session for these reasons becomes a matter of considerable concentration and tension with too much disappointment at the end of it.

Facilities

It may be helpful to list those facilities we would like to have that would remove the guesswork and get us nearer to a professional result.

The ability to fade and cut, in or out, with a high degree of precision *after* the recordings are made.

We need to control the spacing between items.

We require a constant record level.

We would like to be able to mix one item into another or to bridge the gaps with our own material.

We should be able to change the sequence of items from that established on the original recording without resorting to the rather desperate method of splicing.

There are others but I believe those are the most important ones.

All of them can be obtained only by using two high quality machines—one to transmit the recorded material in any order that we may choose, the other to record what is sent on a new cassette.

Few of us have ready access to two machines for this purpose but the two "Fader Units" I will describe give most of the above facilities with the necessary precision. The principle upon which both work is the outside control of the energy in the erase head, so we can control its action on recorded material.

Erase

The first uses d.c. erase which is the standard method on battery-operated portable cassette recorders. This method incorporates the facility for marking visible cues on the tape wherever they are required and for their complete removal after editing; it is therefore worthy of the title "Editing Desk" rather than "Fader Unit".

Apart from the tape transport mechanism, the components are few and not costly. Editing is done remote from the domestic entertainment equipment at any convenient time or place; no modifications or changes to the domestic set are required and the business of recording tapes for subsequent editing is greatly simplified. Cuts and fades can be introduced on the recorded cassette to a precision of about half-a-second.

There is a disadvantage that d.c. in the erase head produces some increase in tape noise in the silent passages following editing; personally I have not found this to be of any great practical significance providing the d.c. current is not allowed to rise above that needed to give complete erasure and the spacing between items is kept short.

We also have the option of filling the gaps with our own material—cassettes for party music can have party background noise inserted for instance. Another point sometimes made in connection with d.c. erase is that it

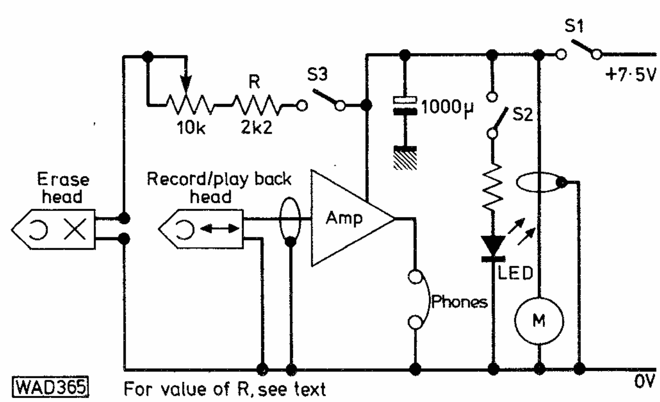


Fig. 1: Circuit diagram of the complete d.c. editing desk

may magnetise the tape and this may be transferred to the play head of the domestic machine.

I have not found this in practise but I make it a routine to demagnetise the heads regularly—it is a sensible precaution in any circumstance. It is also wise to demagnetise the Editing Desk heads after each editing session.

Construction

The complete circuit of the desk is shown in Figure 1. The d.c. supply is split after the power switch S1, using a twelve-way tag strip from which are fed the motor, monitor amplifier, and the erase control circuit. The components needed are few.

Plugs and Sockets for supply (if required)	2
LED and associated resistor	1
10kΩ Linear Potentiometer with d.p. switch	1
Phone Jack Socket	1
SP battery switch	1
25mm length of plated brass rod (tape guides)	2
Battery-operated cassette mechanism with heads and motor	1

Obtaining the cassette mechanism should not prove too difficult or very expensive; from time-to-time they are advertised in the columns of *PW* and that is how I obtained mine some time ago. But there must be thousands of battery portables bought by indulgent parents and now long discarded which their owners would be pleased to sell for a comparatively small sum: The heads do not have to be in very good condition as we are not concerned with quality when editing and as long as the motor and capstan transport the tape at reasonably constant speed and the erase and play head work, that is all we require. It will be mono, of course, but this is perfectly suitable for erasing stereo.

Inspection of the erase head circuit shows that one section of the d.p. switch on the potentiometer connects d.c. to the head via R, which is 2·2kΩ in my case. The other section of the switch connects the l.e.d. which indicates that the circuit is live. This l.e.d. is essential; without it, it is too easy, accidentally, to leave the erase activated and so ruin a perfectly good recording when playing the tape to find the next editing point.

The value of R, a fixed resistor between the potentiometer and the erase head, requires some explanation and experiment may be necessary to find the most suitable value. The erase head in my equipment has a d.c. resistance of 700 ohms, I believe this is typical but there may be variations between manufacturers. Complete erasure occurs with 2·5 milliamps through the head winding and there is no discernible erasure when this is reduced to about 100 microamps. So this is the sweep of current we require when we move the potentiometer from minimum to maximum.

But the head current should be limited to that required for complete erasure and no more. R must therefore be chosen so that complete erasure coincides with the end stop on the potentiometer. For the 700Ω head, this value is 2·2kΩ. Note that a fade-in is completed by turning the control until the switch is off thus disconnecting the head and extinguishing the l.e.d.

The choice of a linear potentiometer is deliberate. A log type would spread the fade more evenly over the scale but this brings about a practical disadvantage in that, for a rapid fade, there would be unpleasant wrist twisting involved in having to move the control knob through some 300 degrees. The linear potentiometer is much better and restricts the active fading to some 120 degrees giving a more positive and smoother control. These limits of travel should be marked on the scale.

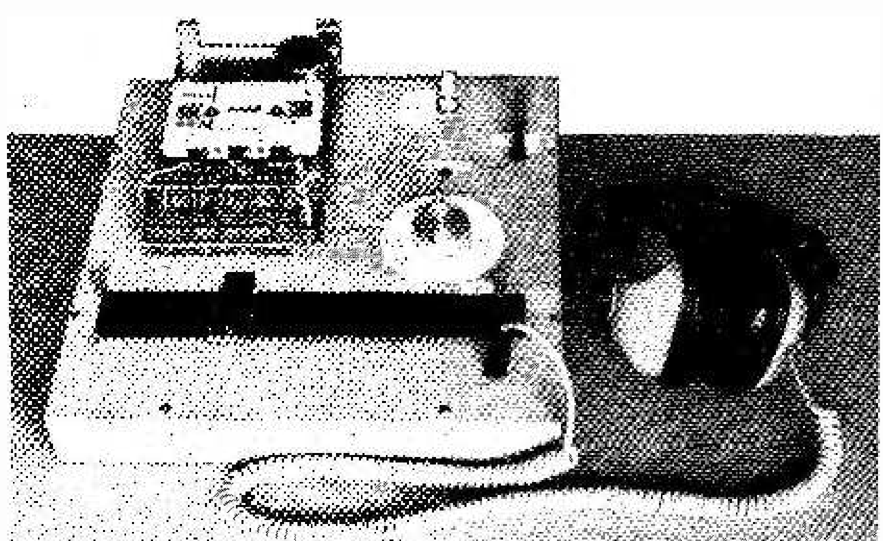
The monitor amplifier is a simple two-stage a.f. circuit which operates the phones, checks editing as it proceeds and monitors the tape to find editing points. A loudspeaker can be used but I prefer phones for this work.

The tape mechanism is mounted on the desk top to allow the tape to be seen as it travels and visible marks can be used to indicate editing points.

Power Supplies

The voltage at which the Editing Desk works will be decided by the motor voltage. If this was intended for battery operation it will almost certainly be 7·5 volts. If some other motor has to be used, then another value for the fixed resistor R will have to be found to obtain the correct erase current.

The total current of my desk in the "Play" mode (it is never used in the "Record" mode) including the monitor amplifier and l.e.d. is 155 milliamps; since use is intermittent, battery operation is perfectly feasible and the batteries can be fixed inside the desk casing.



General view of the d.c. editing desk

However, I found it very convenient to use a variable stabilised supply unit connected to the two supply sockets on the desk top. This unit is a most useful tool and was described in *Practical Wireless*, December 1975.

Using The Desk

We now have a device by means of which we can introduce smooth, regular fades in or out of any duration we may require. We can also apply cuts from signal to zero or zero to signal. This last is done by setting the fader control to "Zero Signal" or "Max. Signal" as appropriate, putting the power switch to "On" and pressing the "Play" button. It now remains to see how we can make the best use of these new facilities.

First let me deal with the recording procedure that we may now use. It is greatly simplified and the guesswork has been removed.

The domestic machine on which the recording is to be made is set up in the usual way; the record level controls are set to the best point and they will not be touched throughout the recording session which immediately resolves any problem there might be of changing levels due to using them as faders.

We then record the music we want up to the point when the presenter or disc jockey breaks in and we continue to record his voice for a period of time that will be our silent break between musical items after editing. Usually I allow three seconds for this and then press the "Pause" button; we now wait for the presenter to finish talking or announce the next item and release the "Pause" button.

It need not worry us if his voice spills into the new item—we will cut him out and fade the music in when editing. In this way the time between items will be reasonably constant.

Our recording session is thus reduced to the simple use of a "Pause" button and the only exception is when we decide to reject an item in which case we rewind back using the tape counter to identify the right point and wait for a more acceptable item.

When the cassette is complete, we transfer it to the editing desk. It consists of complete musical items with three-second breaks of disc jockey's chatter separating them. We now have to deal with these breaks.

The tape mechanism is set up on the desk top in such a way that we can watch the tape as it travels and we will therefore mark cue dots on the tape face and action them with the fader as they appear: this system is very accurate if reasonable care is taken.

Play the end of the first item the presenter's talk, and the beginning of the new item, several times and decide how it is to be treated. If there is a clear space between the end of the music and the voice, and the following item, we may decide on cuts. But if the voice spills into the music, it is a case for fades.

When the decision is made we must next mark the tape accurately where the fades or cuts are to occur. For a fade-out three cue marks are required: the first marks the beginning of the new item: the second marks the end of the first item and the third, the point at which the fade-out must start.

Cue dots have to be put on the coated side of the tape and because of this they must be totally removed after editing. The method used is therefore of first importance. I have tried many and the following is one that I have found entirely satisfactory as it leaves no trace of sound after removal. I use a black felt pen (Platignum Painting Stick) with the broad felt point: this gives a clearly visible black dot without using any pressure on the tape.

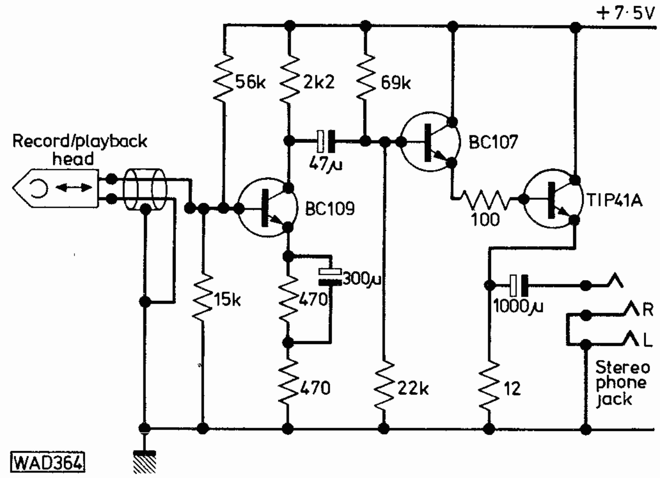


Fig. 2: Circuit of the monitor amplifier. The output transistor does not need a heatsink and can be any available *npn* audio power type

Obtain a smooth round wooden peg (the bevelled handle of a small waterpaint brush is suitable) and insert this in the hole in the cassette casing where the capstan usually fits; push it gently from the lower side until the increasing diameter makes it fit snugly in the hole and behind the tape: this will hold the tape against the pen. Apply the felt pen very gently to the tape face so that the ink marks only the extreme lower edge. There is no need to use pressure—the ink takes very easily. Allow the ink about 30 seconds to dry.

To remove the dot after editing is a very similar process: insert the wooden peg as before and apply a tuft of cotton wool on an orange stick moistened with methylated spirit to the dot. Let the spirit dissolve the ink and then wipe clean working always towards the lower edge of the tape and thus avoid spreading the ink and spirit onto the top stereo tracks or along the length of the tape.

The cue dots are located as follows: establish the point by listening to the tape where the presenter's talk ends (note the final word or syllable) and just before the new item starts. Remove the cassette. The precise cue is now opposite the play head. The drawing (Fig. 3) shows the various "windows" on the face of a cassette and we may choose any of them to make the cue mark but, before doing so, we must allow for the distance—$1\frac{1}{8}$ inches—between the erase head (which does the editing) and the play head.

Fortunately, the distance between the two small "windows" is the same distance, so it would seem sensible to

continued on page 56 ▶▶▶

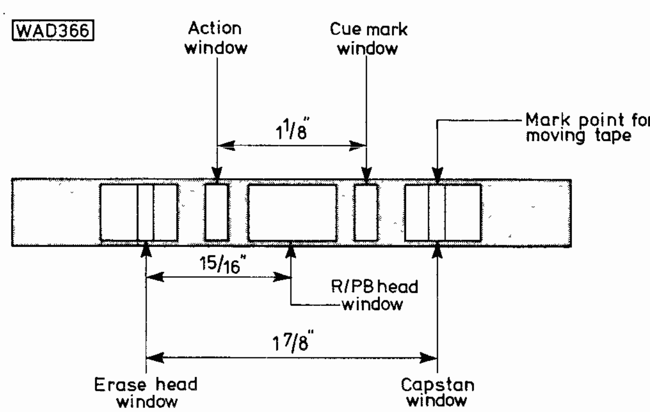


Fig. 3: Dimensions of standard Compact Cassette

VHF DF LOOP AERIAL

F. C. JUDD G2BCX

An interesting exercise, not only in radio direction finding but in map reading as well, is provided by v.h.f. DF hunts, frequently run by radio clubs. When a *horizontally* polarised aerial is used by the hidden transmitter, then a small beam aerial or dipole could be used to obtain direction, although with a beam one has to estimate the maximum received signal, which is not defined enough for obtaining accurate bearings. Providing it is properly balanced, a dipole is better, as the nulls in the polar pattern (minimum signals) are much more defined. If the hidden transmitter is using a *vertically* polarised aerial, then a dipole is of no use, as it becomes omnidirectional when used vertically. A small conventional beam aerial presents the same problem, in that the maximum signal indication is not defined well enough to obtain accurate bearings. The 2-element ZL Special (*PW*, May '77) is an exception however, and is very useful for DF work as it has one fairly sharp null. Its polar pattern is cardioid when the aerial is operated vertically, but more of this later.

The loop aerial described in this article is for use when signals are from a *vertically* polarised source. It consists of a split loop, one half-wavelength in circumference, tuned and balanced to operate with 50 ohm coaxial cable as shown in Fig. 1(a). The current and voltage distribution, together with the direction of the current in each half-loop (arrows) are shown in Fig. 1(b). Since the currents in each half are in phase opposition, the polar pattern is a figure-of-eight, like that of a horizontal dipole, with two maxima and two minima as in Fig. 1(c).

This loop will also operate very efficiently as a transmitting aerial with a v.s.w.r. close to 1 : 1 when properly tuned. This means that stations, mobile or handheld, taking part in the DF hunt can communicate with each other to pass bearings and map readings, etc., without having to change aerials. It is appreciated that this loop system does not provide a means of sensing, i.e. of determining which minimum is giving true direction, but this is not greatly important when two or more stations at reasonable distances apart are working as a team. Information on direction finding is given later.

Making the Loop Aerial

General construction details for the loop are given in Fig. 2. The loop itself is made from 4·7mm ($\frac{3}{16}$in) diameter aluminium rod although 6·3mm ($\frac{1}{4}$in) may be used. Bending the rod to form the two half-circles is not difficult if done gradually and with aid of gentle heating from a small blow-lamp. The bottom ends are flattened by hammering on a hard surface, after which they can be filed smooth and drilled 4BA clearance as shown.

The lower mounting block, and the top block that supports the upper ends and keeps them separated, must be made from Perspex or similar good-quality insulating material. The upper ends are at high r.f. potential. The box for mounting the loop on and housing the two 30pF trimmers may be a plastics electrical junction box, or similar, with removable lid and of dimensions approximately as shown. The handle can be a short length of 25mm dowel or broomstick, secured to the underside of the box with a wooden collar, by gluing and screwing.

The diagram Fig. 3 shows how provision is made for a compass platform and a sighting bar. Note also the hole each side of the box allowing access to the 30pF trimmers after the aerial is assembled and ready for tuning. Connection to the loop from a length of 50 ohm coaxial cable is made via the S0239 socket at the base of the box.

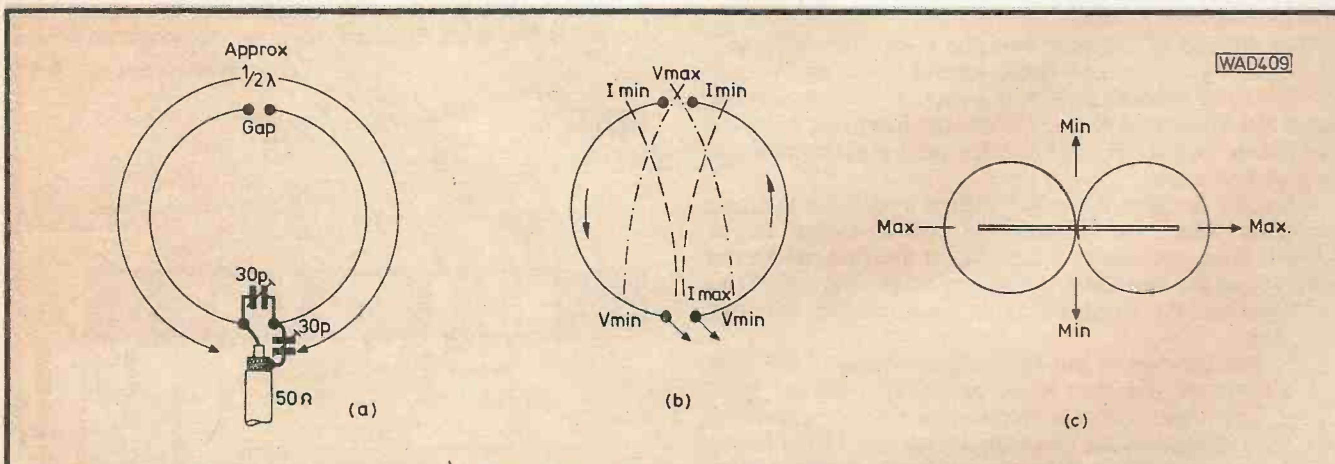


Fig. 1(a): Configuration of the ½λ loop **Fig. 1(b): Current and voltage distribution** **Fig. 1(c): Polar pattern of the loop**

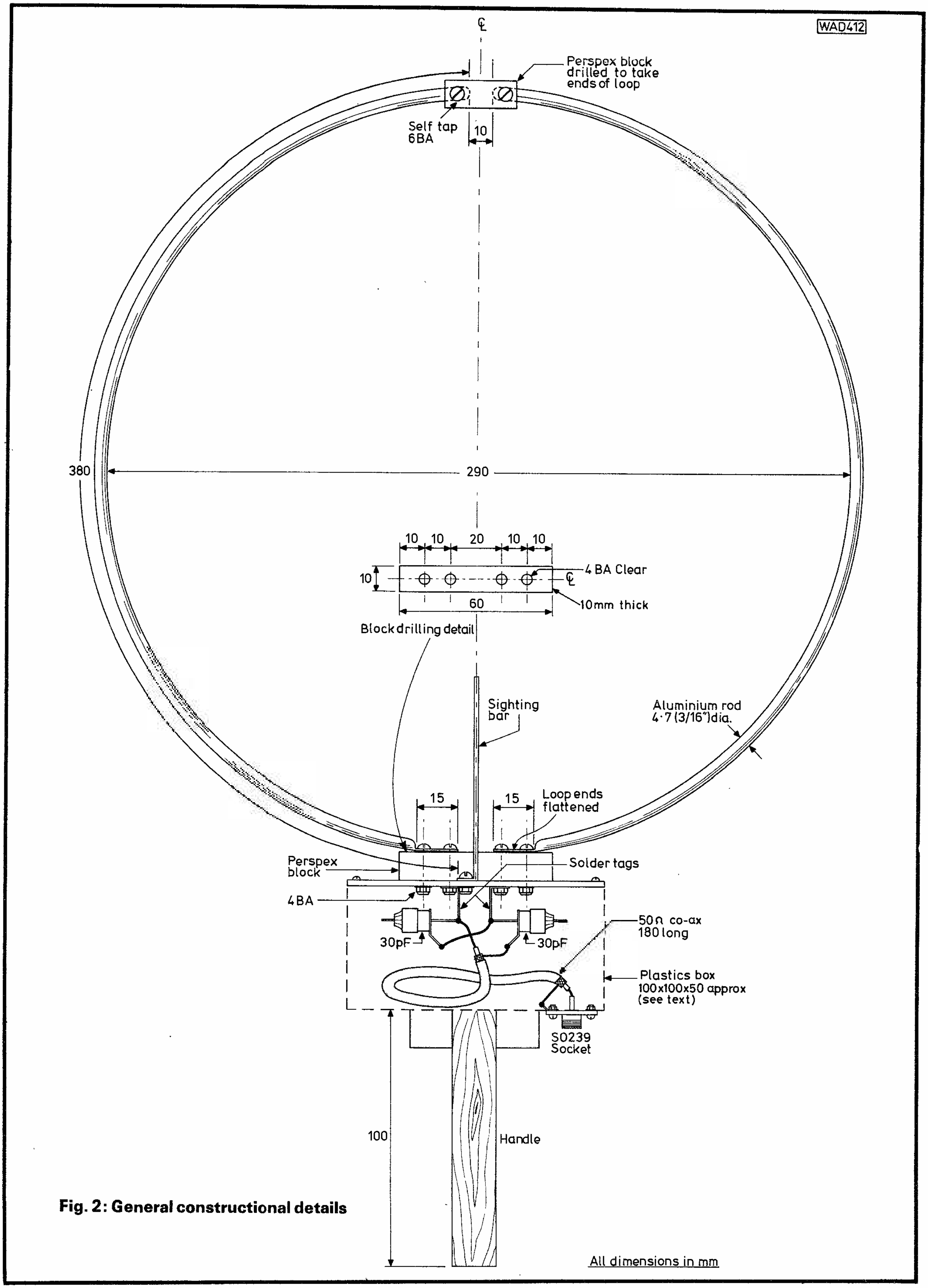


Fig. 2: General constructional details

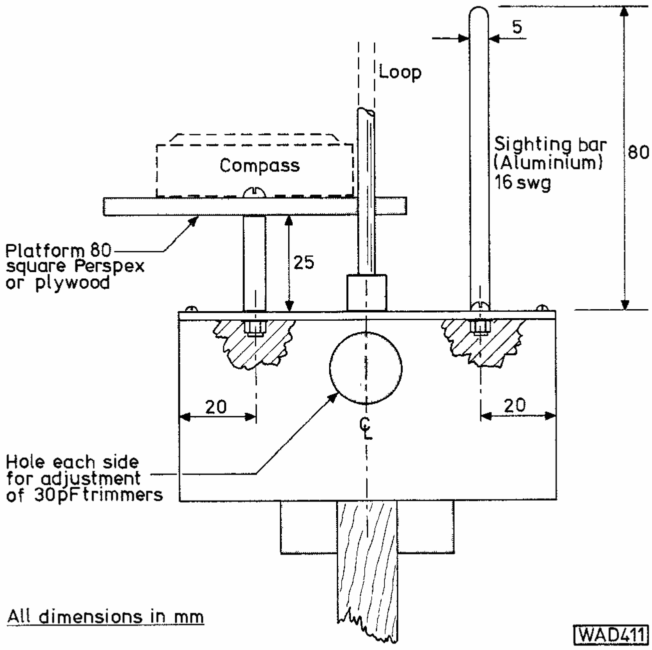


Fig. 3: Arrangement for a compass platform

Tuning and Checking the Loop

The length of the external coaxial cable will depend on how the loop will be used. For example, when connected to a mobile rig, one will need to use the loop a metre or more from the car to avoid reflection from the car body, so that about 3 metres of cable should be used. Handheld transceiver operators will need only about 1 metre. The length is otherwise not critical and may be chosen entirely to suit convenience.

With the loop aerial connected to the transmitter/receiver and with the length of coaxial cable decided upon, all that is necessary is to adjust the two trimmers for maximum power (on transmit) into the aerial, or better still, minimum v.s.w.r. Do this at midband (145MHz) and tuning will hold good to the outer limits of the band. If a receiver only is to be used, then adjust the trimmers until a received signal is at maximum. Remember the loop has two nulls and two maxima, so for a transmitting test with another station the loop must be end-on to that station for maximum signal. Checks for the two nulls (minimum signal) should be made out of doors and well clear of other 2m aerials, and indeed any other conducting elements likely to cause reflection and give rise to false nulls. Each null should be sharp and reduce a received signal down to noise level or even completely out. Check also that the nulls are 180° apart.

A small hand type compass can now be fitted to the compass platform. It need not be permanently fixed, but instead secured with strong elastic bands and aligned so that 0/360° points to one side of the loop, i.e. in the direction of the null in line with the sighting bar.

Direction Finding

The polar pattern shown in Fig. 4, taken with the writer's Polar Pattern Indicator aerial performance display, is from the prototype loop. It clearly shows a virtually perfect figure-of-eight shape with two well-defined nulls at 305° and 125° respectively and therefore 180° apart. The other pattern (Fig. 5) is an almost perfect cardioid from a two-element ZL Special. In team operation in a DF hunt this can be used for "sense" of direction. Once this has been obtained, the remainder of the team can be notified that the hidden transmitter is to the North or the East (or whatever) general direction from them.

For those new to radio direction finding the following notes may be found useful. Ordnance Survey maps 1 : 50 000 series with 1 kilometre squares are ideal for DF work. Indeed, they are essential if accurate results are to be obtained, especially when the start of operations may be several miles from the transmitter to be located. A team of three is ideal if location is to be found quickly, although two operators could work together fairly efficiently. A lone operator would need to move about a lot more in order to get the necessary cross bearings.

The illustration (Fig. 6) is based on the 1km squares of a 1 : 50 000 Ordnance Survey map, and here the hidden transmitter is on a reference of approx 67 Easting and 92 Northing (note that on a full-scale map, the Eastings and Northings are each given in three figures, making six

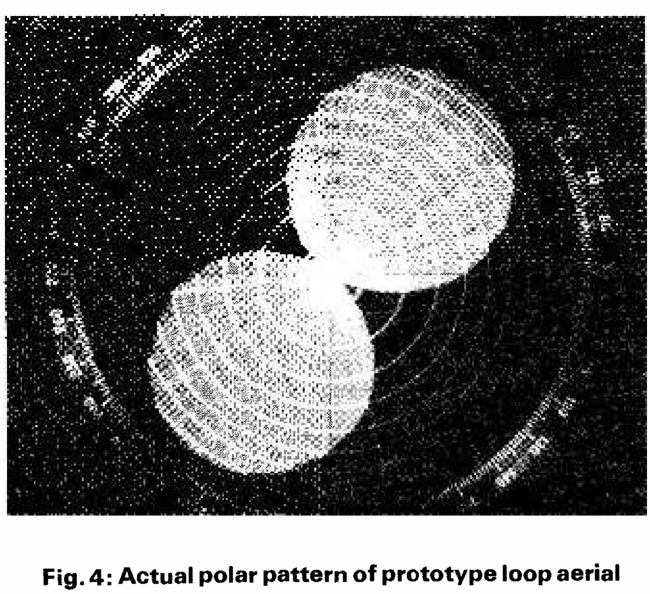


Fig. 4: Actual polar pattern of prototype loop aerial

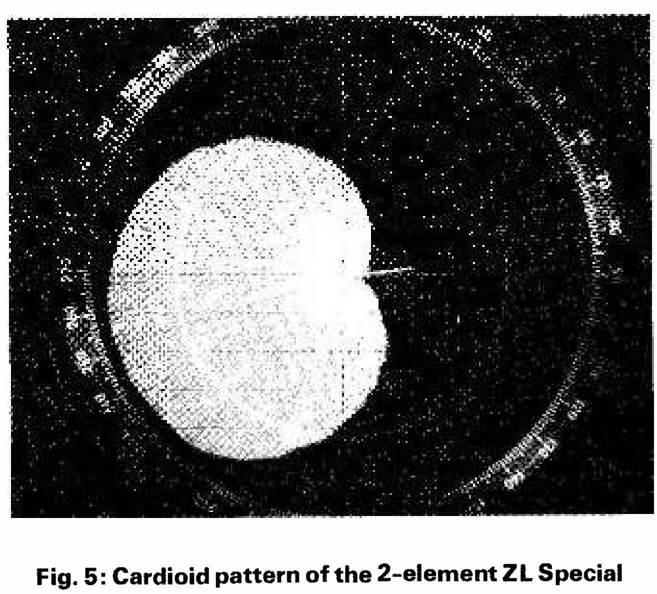


Fig. 5: Cardioid pattern of the 2-element ZL Special

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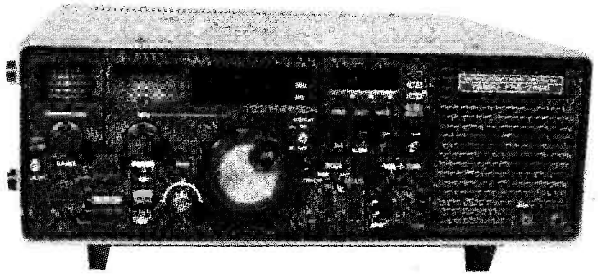

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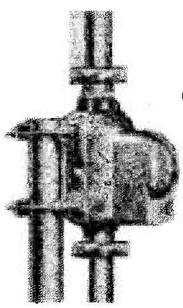

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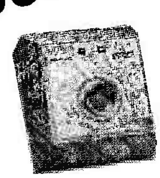

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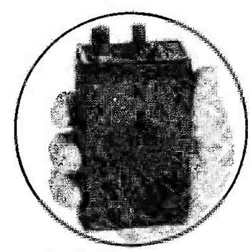

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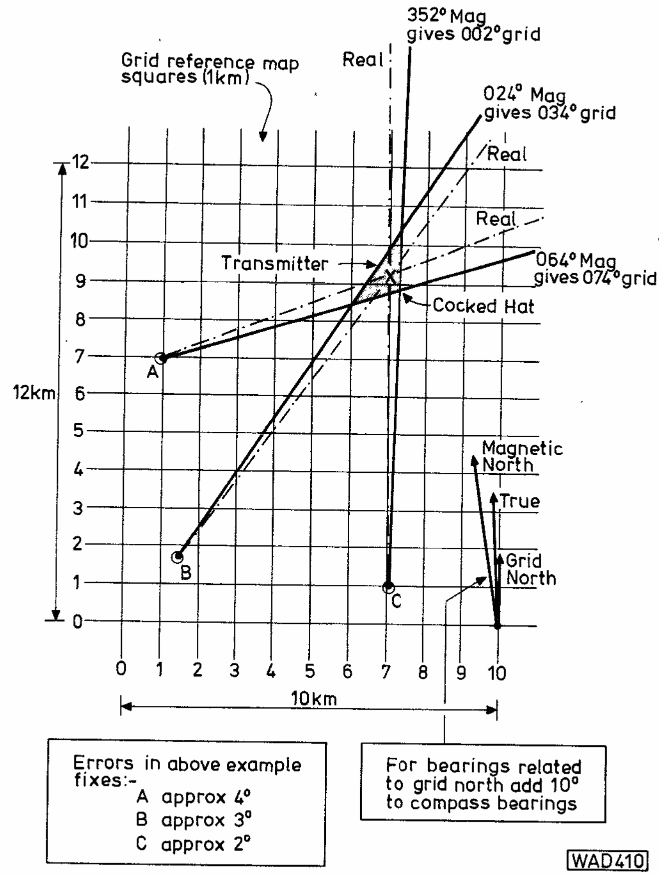

Fig. 6: Example of obtaining a fix on a hidden transmitter from three positions. Errors shown are about average in practice, but do produce the "cocked hat" area enclosing the true position

figures for the full grid reference). The bearings taken by DF stations A, B and C are shown by the solid lines and are about average as far as error is concerned. They form a triangle of "cocked hat", around the true position of the transmitter. Remember that we have started from several miles away, but at this stage have located the transmitter to within about a square kilometre. The next step is for each member of the team to move in closer, in this case A goes to point 96, B to 86 and C to 88. Even with similar errors in bearing, e.g., between 2 and 4 degrees, the now much shorter range should establish a location of the transmitter to within an area of about 0·1km or a little over 100 yards square. The procedure can be repeated and again, with average errors, location to within 0·01km or about 10 yards square should be possible.

Remember, that an Ordnance Survey map grid North is slightly different from true North, and magnetic (compass) North is different from true. The total amount to be added to a magnetic bearing for the grid map is about 10°. If, for example, your magnetic bearing is 024° then using the vertical grid lines of the map as 0/360° (North) the bearing to be plotted on the map will be 034°.

Ascertaining the null is usually best done by listening, preferably on headphones, and accuracy in obtaining the minimum stems largely from practice in aurally estimating this, although a signal level meter is helpful of course. Remember that nulls can sometimes be confused by the arrival of signals from other than the direct path, due to reflection, so if a null appears to be confused or not well defined, try moving to another position. ●

EDITING HOME-RECORDED CASSETTES

▶▶▶ continued from page 49

make the cue mark in the righthand small "window" and action it when it passes through the lefthand small "window".

There are, however, two practical reasons for modifying this: the first is that when we are watching moving tape it is impossible to operate the controls the instant the cue dot is seen; with practice, I can manage to complete the action by the time the tape cue has almost reached the playhead area. And so we must compensate for this.

The other reason is that it is not easy to mark the cue dot in the small "window"—it is much easier in the larger one next to it where the capstan engages the tape.

For both these reasons, we will mark the tape in the capstan "window" and will action the cues as they pass the lefthand small "window".

This process is repeated for all the cues that are required. I said earlier that three are required for a fade-out: only two are needed for cuts and these should be done with the tape stationary. From this it follows that there will be no "operator time lag", so the starting position of the cue must be adjusted. Mark it in the capstan "window" as before but then move it by hand-winding to the "Cue Mark Window" (Fig. 3).

For a fade-out, we have to fix the position of the cue dot for marking the start of fade point. This is done by hand-winding the tape right to left from the "end of fade" cue. The required distance is found by marking the tape in the capstan "window" and winding it till the mark is exactly over the hole in the erase head "window"; it is marked again at the capstan position and the first mark removed. This action is repeated as necessary, each movement shifts the tape $1\frac{7}{8}$ inch or one second of playing time; thus for a four-second fade, we repeat the action four times.

The choice of black for the felt pen may seem surprising but I tried all the colours that are readily available and found it the best even on the dark tape that some manufacturers produce. White might be better but this does not seem to be obtainable.

Splicing Table

One other item requires comment. In the photograph of the complete desk, there is a dark area on the cabinet top with tape guides at each end. The dark part is a strip of Fablon and the purpose is to permit examination of the tape and to facilitate repair and splicing if and when this is necessary. A loop of tape of the required length is very carefully drawn out of the cassette while it is held in the hand, the cassette returned to the machine with the heads disengaged and the loop draped loosely around the guides and placed along the Fablon strip. A small piece of perspex is hinged just above the Fablon and is lowered onto the tape and holds it in place coated side upwards; it is thus safely held for any work that may be necessary.

I have used this method successfully when I wanted to over-record or mix on a fade-out: it is important to know exactly how much tape is available for this kind of fine editing and the edge of the Fablon is marked for three, four and five-second fades, measurement being made from the "end of fade" cue held against the left-hand guidepost.

PART TWO COVERS AC EDITING TECHNIQUES

RADIO SPECIAL PRODUCT REPORT

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The transmitter measurements were easier to perform. The first equipment tried unfortunately suffered from such bad instability that it was impossible to get any output on any band other than 80m, but this transceiver was exchanged for another one and the problem disappeared. However, the results of the other measurements were checked and found to be very close to those of the second equipment—a heartening discovery, as it indicates a degree of accuracy and repeatability both in the equipments and measurement systems. Output power, 3rd and 5th order intermodulation and harmonics and spurious are the vital parameters measured, and, as can be seen from the results, they are well within specification. Spectrum analysis up to 1·2GHz showed that there were no 'awkward' responses which artificially accentuate the harmonics, and the equipment is very clean in harmonic terms. All the measurements of intermod. products and spurious outputs were measured with respect to 1 tone of the two tone test signal, and thus tabulated figures are 6dB worse than with respect to p.e.p. Current commercial specifications are −43dB wrt p.e.p., so this rig is well in! IMD performance is up to the usual standard expected professionally for this class of transmitter.

Finally, the Tx a.f. response. This gives a good picture of the s.s.b. filter passband, which cannot be so easily measured on receive. It is suspected that the filter stopband is degraded by leakage around the filter to about 60dB, which although not terribly good, is adequate. The results suggest that the top of the filter response is somewhat narrower than the specification, as is the −60dB point, but this could well be caused by the a.f. stage responses.

Note: Signals from the generator(s) were measured in terms of p.d., i.e. actual voltage at the load.

General Comments

The rig was tried on the air with an indifferent piece of wire as an aerial. As a result, no DX contacts took place, but the main comments from station after station, especially those who knew the author's voice, were that the speech quality was very good. In spite of the weak signal at times, it seemed that this very natural speech helped the signal to get through. Interestingly enough, the author's YL also got these good reports on speech quality, and few s.s.b. rigs manage to reproduce the female voice very well. The a.t.u., as mentioned earlier, is a very flexible system, and although as a T network, it offers little rejection to the harmonics, these are far enough down anyway. In any case the use of a low pass filter is advisable if harmonics are likely to be a problem, rather than rely on the a.t.u.

The main tuning dial was found a bit small for fixed work, and the other control operations have been mentioned. However, as a mobile rig, it is, in the author's opinion, very good for what it is—a no strings, high performance mobile rig, with good fixed station capabilities. The main disappointment is in the receiver spurious responses, which are really rather high.

Noise blankers are notoriously hard to test effectively, and this was no exception. However, feeding pulses of 0·2µs rise and fall time and 20Hz repetition rate into the aerial at the same time as a signal loaded up the a.g.c. until the signal disappeared. Switching in the noise blanker produced the signal—with pulses still there, admittedly, but vastly reduced. Furthermore, the noise blanker did not effect the intermodulation. However, because it operates on strong signals, such things as the 'woodpecker' on 14MHz were not strong enough to actuate it, although passing cars and the electric ignition on the gas cooker would!

Sensitivity and AGC

Frequency MHz	SINAD @ 1μV dB	10μV dB	1mV dB	AF output change dB from 1μV to 30mV
3·75	17	31	42	3
7·05	19	32	42	3
14·175	17	31	42	4
21·225	17	31	42	3
28·775	18	32	42	3

S Meter Calibration

Input level in dBm for S meter reading		Frequency MHz
S2	—112	3·750
S3	—111	
S4	—110	
S5	—107	
S6	—97	
S7	—92	
S8	—84	
S9	—77	
S9 10	—67	
S9 20	—53	
S9 30	—41	
S9 40	—20	
S9 60	Could not be reached	

Although these measurements are only tabulated for 3·75MHz, the maximum variation between bands was measured as 7dB.

AF Output

Reaches clipping at 4 watts for 1μV input on all bands.

Receiver Intermodulation

Tune Frequency MHz	Unwanted Frequency 1 MHz	Unwanted Frequency 2 MHz	Level dB rel. to 1μV
3·7	3·72	3·74	72
3·7	5·7	2·00	80
3·7	1·7	2·00	78
17·02	7·04	7·06	71
7·02	11·02	4·00	80
14·2	14·22	14·24	73
14·2	20·4	6·20	77
21·2	21·22	21·24	71
21·2	30·22	9·02	73
28·7	28·72	28·74	70
28·7	17·7	11.0	71

The level column represents the level of equal signals of the frequencies to produce an input equivalent to 1μV.

Cross Modulation

With a wanted signal at 30μV, and an unwanted signal modulated 30%, and separated by 10Hz, cross modulation could not be measured, as its effects were masked by reciprocal mixing.

Blocking

With a 10μV wanted signal, a signal removed by 10Hz and greater than 100 millivolts was required to produce 3dB reduction in output.

Reciprocal Mixing

A wanted signal at 1μV was set on tune. An unwanted signal at the given frequency separation was increased in level until the SINAD ratio was decreased by 3dB.

Frequency MHz	kHz separation level in dB above 1μV			
	10	50	100	300
3·75	80	90	90	94
7·05	81	87	89	93
14·175	80	89	89	90
21·225	79	89	89	90
28·725	80	87	87	88

Dial Calibration

The dial was adjusted at the nearest 100Hz point.

Frequency	Indicated frequency
3·500	3·500
3·525	3·5258
3·550	3·5509
3·575	3·5750
3·600	3·6000
3·625	3·6250
3·650	3·6499
3·675	3·6751
3·700	3·7000
3·725	3·7250
3·750	3·7500
3·775	3·7750
3·800	3·8000
3·825	3·8255
3·850	3·8499
3·875	3·8748
3·900	3·9000
3·925	3·9250
3·950	3·9499
3·975	3·9752
4·000	4·0000

Internal Spurious

Band	Level rel. 1μV
3·5	None
7·0	None
14·0	14·250 —10dB
21·0	21·200 +20dB
28·5	None

External Spurious

Levels greater than +80dB rel. 1μV are neglected.

Tune frequency MHz	Spurious freq. and level dB μV	
3·700	4·501 63	5·301 77
	9·002 63	21·705 39
	29·108	
7·050	9·002 50	25·053 43
14·200	9·002 58	15·152 77
	16·103 77	18·006 63
	32·208 40	
21·200	9·002 62	14·298 75
	15·904 60	18·005 63
	19·595 55	19·602 70
	26·496 47	28·612 60
	30·203 70	31·792 57
28·700	9·002 76	14·299 77
	18·006 77	19·595 62
	23·405 53	27·907 80
	30·555 76	33·998 40

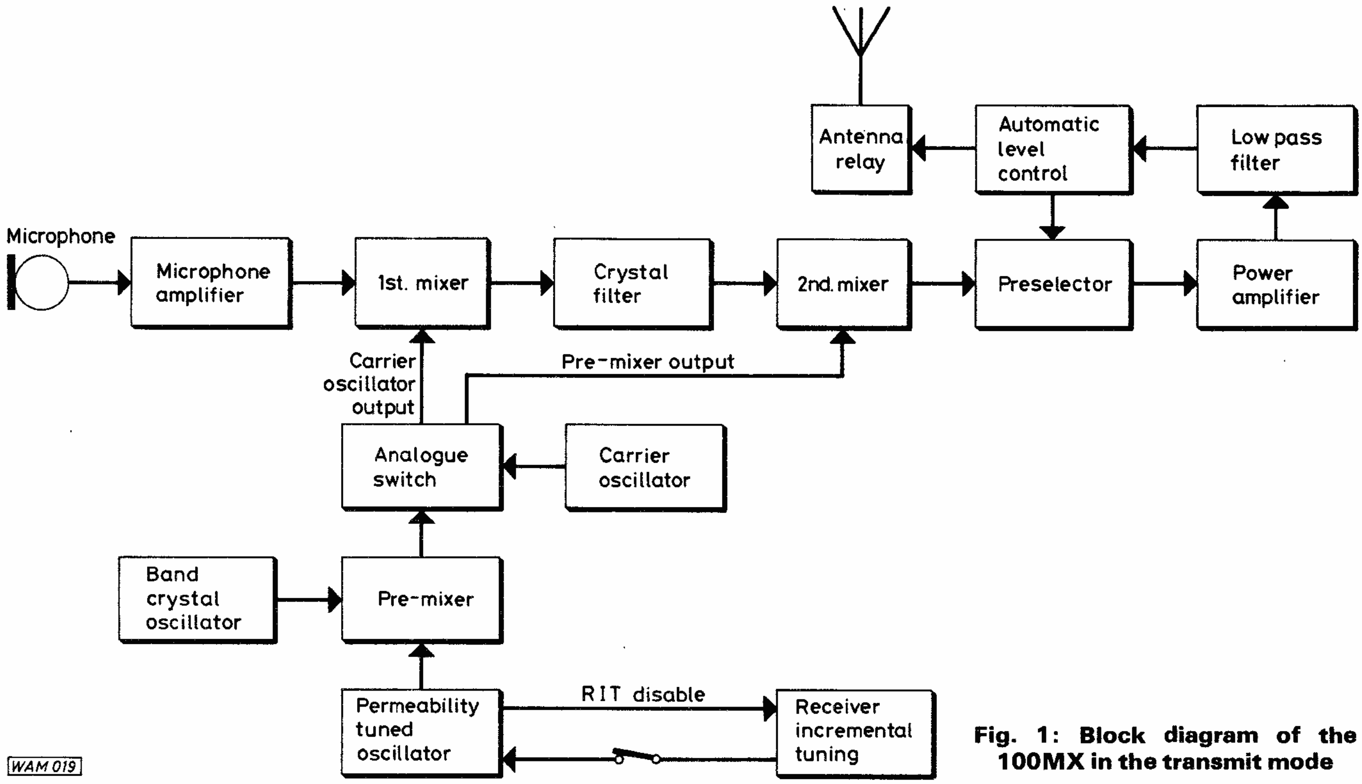


Fig. 1: Block diagram of the 100MX in the transmit mode

RIT Range

At 3·5MHz	plus 1·88	minus 1·50Hz
At 4·0MHz	plus 1·55	minus 1·22Hz

Drift

The receiver was switched on from cold, and a signal fed in to give a 910Hz tone. The frequency of this tone was then measured over a period.

Time minutes	Freq. Hz
00	910
05	860
10	818
15	785
20	744
25	710
30	680
35	657
40	638
45	616
50	597
55	583
60	565

Transmitter Measurements

Output Power and Intermodulation Distortion

Frequency MHz	p.e.p. 3rd order output	i.m.d. products watts	5th order i.m.d. products
3·75	127	−28	−33
7·05	128	−31	−34
14·2	100	−29	−36
21·2	100	−25	−36
28·7	100	−26	−32

IMD Products are measured with respect to one tone of a two tone test signal.

Transmitter AF Response

Modulation frequency Hz	Wanted sideband dB	Unwanted sideband dB
50	−50	−58
100	−35	−50
300	−13	−52
400	− 7	−55
700	− 2	−55
1000	0	−55
1500	− 1	−55
2000	0	−55
2200	− 1	−55
2400	− 2	−55
2700	− 4	−55
2900	− 6	−55
3100	− 9	−55
3200	−28	−56
3400	−35	−57
3700	−56	−58
4000	−60	−60
5000	−60	−60
7000		

Carrier Suppression

USB	−61dB rel. p.e.p.
LSB	−58dB rel. p.e.p.

Harmonics and Spurious Outputs

Measured at 100 watts two tone output.

Frequency	Spurious frequency and level
3·75	All harmonics and spurious more than −60dB
7·05	5.05 and 9.05 −52dB. 14·1MHz −58dB 21·15MHz −60dB
14·2	9·001 −48dB. All others more than −60dB
21·2	18·2 and 24·2 −55dB. 9, 12, 18·002MHz −57dB 42MHz −58dB
28·7	20, 18MHz −55dB. All others more than −60dB

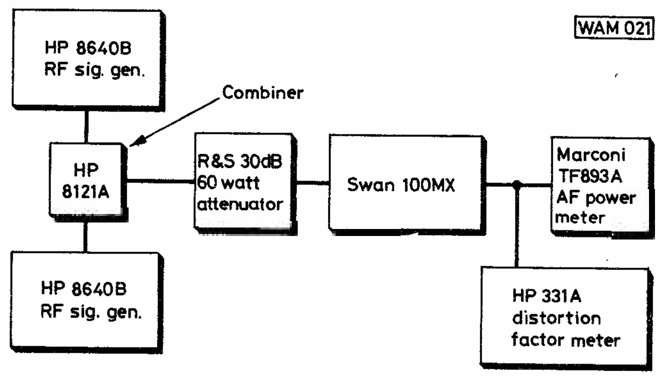


Fig. 2: Receiver measurement system used on the Swan 100MX Transceiver

The handbook is a reasonable publication listing the necessary information for putting the rig on the air. The circuit diagrams and p.c.b. layouts are adequate for someone with reasonable technical knowledge, although a components list would be useful. Knowing the manufacturer of a $\frac{1}{8}$ watt 4·7kΩ 5% resistor is not generally vital, but of a double balanced mixer i.c. referred to as Z501 is!

Mechanical construction is of a sound standard, and the equipment is quite attractive in looks. It is supplied with a mounting bracket and hardware for mobile use: VOX is standard and not an add on extra, and the power is high enough to produce a reasonable signal.

All in all then, quite a reasonable rig. The receiver spurious response is disappointing, but otherwise the electrical performance is very good. Besides the minor points mentioned, the mechanical side is well thought out and although perhaps a little expensive just for a rig designed primarily for mobile use, the fixed station performance is probably adequate for the average, run of the mill operator on s.s.b. As with all transceivers without good built in c.w. filters, c.w. can be another story! RTTY and SSTV require extra cooling, and perhaps the receiver selectivity may prove inadequate for these modes. But in general, a nice little set! And the a.t.u. is rather nice on its own account!

Prices

Costing £459 plus VAT. the Swan Electronics. 100MX SSB Transceiver reviewed was kindly loaned by Amateur Electronics UK, 508–514 Alum Rock Road, Birmingham 8. Tel: 021-327 1497, and we would like to thank them for their invaluable assistance in this respect.

KINDLY NOTE!

Changes in Broadcast Band Listening, Jul/Aug 1979

There have been a number of changes of address of organisations mentioned in this article:

1. The Twickenham DX club changed its name in March to become the British DX Club at 55 Boundary Road, Worthing, Sussex. They are still looking for new members and publish a monthly bulletin entitled *Communication*.
2. The European DX Council is no longer based in Germany. For full information on the current projects send one IRC (or an s.a.e. in Britain) to EDXC, P.O. Box 4, St Ives, Huntingdon, Cambs, PE17 4FE. A new edition of the EDXC Reporting Guide is now available.
3. The Handicapped Aid Programme in the UK (HAP-UK) is still run by John Rose, but he has moved house and is likely to do so again in the near future. Also because more people have now become involved, and HAP runs best on a local scale, the EDXC address above should now be used for all correspondence concerning HAP-UK. EDXC will forward the mail to those concerned. This simplifies problems with addresses, especially when they have to be given out over the air.
4. UK DX Camp. J. Marks is now at 5 Salter Avenue, Norwich, Norfolk NR4 7LX.

Bi-Fet Integrated Circuits, August 1979

A small section of text was unfortunately omitted from page 52, completely changing the meaning of the paragraph commencing "Progress is still continuing . . .".

It should have read: ". . . both Texas and National have developed laser trimmed devices with offsets below 0·5mV. Precision Monolithic have developed a laserless trimming system known as "Zener-zap", which also provides offsets of less than 0·5mV, for use on their proprietary BI-FET series."

Our apologies to the author for this error.

Selective Sound Operated Switch, July 1979

There are some tracks missing from the p.c.b.
IC2 Pins 1 and 2 should be linked
IC4 Pins 3 and 5 should be linked
IC4 Pins 12 and 13 should be linked
These links can be made easily with short lengths of wire soldered to the track side of the board.

PW "Hythe" Marine Band Receiver, Feb.–Mar. 1979

The RED core of IFT2 is associated with the INPUT, and the BLUE core with the output of the device. Therefore, IFT2 should be mounted so that the RED core is adjacent to C11 and the BLUE core adjacent to C12.

On the component location diagram (Fig. 4 in Part 1), C12, connected between IFT2 output and IC1 pin 12, has been incorrectly labelled as C17.

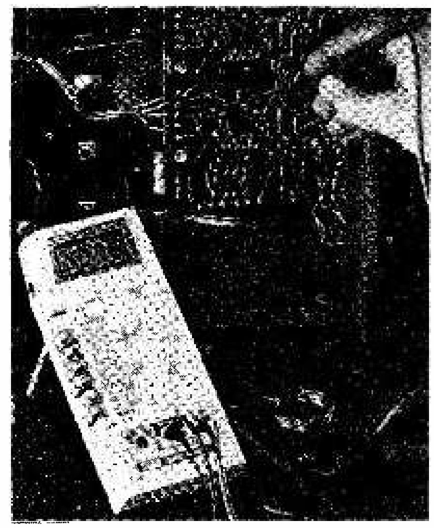
DX'ers Audio Filter, May 1978

Some readers have experienced problems with this unit, and the following notes have been produced by the designer.

1. The output of the unit is excessive for some headphones, in particular the more sensitive low impedance types. A resistor of about 100 ohms in value connected in series with the output will eliminate this problem (which manifests itself as a high background noise level, excessive and uncontrollable volume, plus attendant distortion).
2. Some receivers seem to have a nominal output level which is far too high for the filter. Adding a load resistor of about 10 ohms in value across the input of the filter may help here, and the addition of a resistor of about 82 ohms in value in series with the input lead will provide attenuation if necessary.
3. Instability may occur if the connections to the output socket are transposed, causing the front panel to be connected to the 'live' output and causing feedback through the bodies of VR1 and VR2.
4. Similarly, transposing the input socket connections will lead to an excessive pick up of mains hum, radio interference, etc.
5. Rather erratic operation on some units may possibly be due to component tolerances causing the gain of the high- and low-pass filter amplifiers to become too high, producing pronounced peaks in the frequency response of the unit and perhaps instability as well. Reducing R5 to 82kΩ or 68kΩ and R9 to 12kΩ or 10kΩ should correct this if such a problem should arise.

PRODUCTION LINES

alan martin



New Low-cost d.m.m.

Fluke claim a price/performance breakthrough with the introduction of their latest handheld 8022A digital multimeter aimed at a very wide market. This practically indestructible 3½ digit d.m.m. offers all the advantages of a digital meter at analogue prices.

Called the "Troubleshooter", the 8022A is a battery powered 3½ digit meter, offering 10 ranges of a.c. and d.c. volts from 200mV to 1000V, 8 ranges of a.c. and d.c. current from 2mA to 2A and 6 ohms ranges covering 200 ohms to 20M ohms including 3 diode test ranges. Readings are displayed on a razor sharp l.c.d. display with ranging decimal point. Designed for single handed operation, the 8022A features in-line mounted push-button switches for easy range and function selection. This approach also eliminates the electrical and mechanical reliability problems associated with rotary switches.

Other features of the 8022A include a 200 hour battery life (from a standard 9V battery) giving approximately 2 years normal service, a "battery low" l.c.d. indication when remaining battery life is less than 20 hours, a basic d.c. accuracy of ±0·25% over 1 year and a full range of accessories. Parts count is kept extremely low using a custom built CMOS chip for most of the internal circuitry. Both over-range and negative polarity are clearly displayed on the l.c.d. display. The a.c. and d.c. voltage ranges cover 200mV to 1000V in five steps with a maximum resolution of 100μV. Current ranges cover 2mA to 2A with a 1μA maximum resolution on a.c. and d.c. Resistance ranges extend from 200mΩ to 20MΩ with a resolution of 0·1Ω on the lowest range.

The 8022A features extensive protection against overloads or mis-use. Overloads of up to 1000V on all voltage ranges, 500V on all resistance ranges, 2 Amps on all current ranges or 6kV transients will not damage the d.m.m. At the same time, the operator is protected from shock by special Fluke-designed safety test leads with shrouded banana plugs, which prevent accidental shocks or short circuits even if the leads are pulled from the input jacks while still connected to a live circuit. The test probes have special finger-guards to further reduce shock hazard and the case and tilt stand are completely non-conductive.

Operation of the d.m.m. is enhanced by a wide range of accessories such as probes for d.c. voltages to 40kV, a.c. currents to 600A, temperatures, d.c. currents to 20 Amps, RF signals to 500MHz and a battery eliminator pack. A built-in tilt stand allows the d.m.m to be used standing up or in a hanging position.

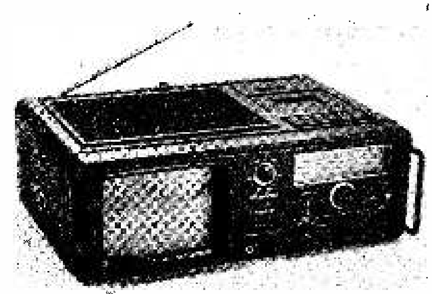
Costing only £89, the 8022A is now available for immediate delivery from Fluke with a full 2 year warranty. A full technical service covering the UK is offered from Fluke's Watford premises and the newly opened Northern Service Centre in Stockport, Manchester.

For further information contact: *Fluke International Corporation, Colonial Way, Watford, Herts. WD2 4TT. Tel: (0923) 40511.*

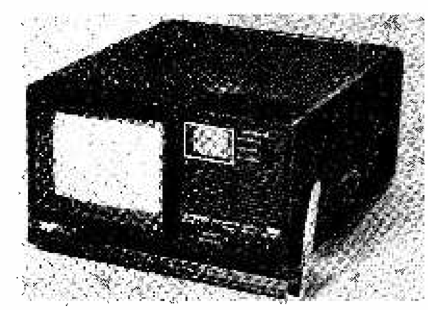
Mini TVs

Plustronics Ltd. tell us that the Plustron range of portable TVs and 3-in-1 entertainment centres continues to grow, there is now six models in the TVRs range.

The original TVR—the TVR5 is a combined 5in TV and 3-waveband radio. The TVRC7 was the first Plustron 3-in-1 portable with a 7in TV screen, 3-waveband radio and cassette recorder, it is compact and light and can be carried anywhere. The TVRC7D offers an important extra—a dual standard feature giving TV reception in the UK and most European countries too. The TVRC5D features the same facilities as the TVRC7D, but with a 5in TV screen in an even more compact cabinet. The TVR5D is an "upright" TVR, though still fully portable and includes the dual standard facility as well as v.h.f./m.w./l.w. radio and 5in TV screen.



The first 3-in-1 portable TV, the TVRC7



The latest colour portable TV, the CTV55D

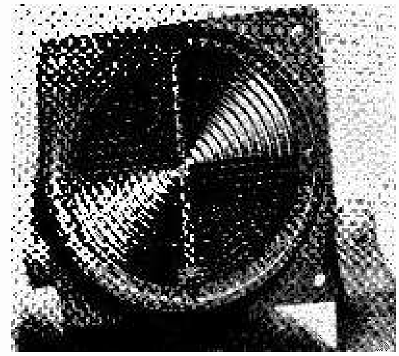
The latest in the range is the CTV55D —claimed to be the world's first battery operated portable colour TV. The 5½in screen gives superb colour fidelity and a special "Auto" switch which helps keep the colour tuning perfect.

All the TVRs feature a four-way power system, mains or batteries, with optional extras including a 12V d.c. cord to run off a 12V car battery and a rechargeable battery pack. External aerials can be used in poor reception areas and each TVR is supplied with an earpiece for private listening.

The TVRs are priced from around £110 for the TVR5 to £299 for the CTV55D and are imported, distributed and fully guaranteed by: *Plustronics Ltd., Hempstalls Lane, Newcastle, Staffs. Tel: (0782) 615131.*

PRODUCTION LINES

alan martin



Hot stuff

The new Miniflam blow torch now being made generally available by Henri Picard & Frere Ltd., is a carefully engineered tool which can be fuelled either with butane for soft soldering and general heat applications or with butane/oxygen for brazing and metal cutting.

The Miniflam is charged with butane in exactly the same way as a rechargeable cigarette lighter. Each charge lasting an hour or so. The advantage of this method is that there is no gas cylinder to impede its use and upset the balance and comfortable 'feel' of the torch, which weighs only 130g and is 18cm long.

The flame is controlled by gas pressure and air volume regulators. Any conformation can be achieved from gentle and diffuse to short, pinpoint and intense; but it should be borne in mind that the temperature of the flame remains constant at around 1600°C; only its intensity at the flame tip being variable. The secret of successful and economical operation lies in not increasing the gas pressure and therefore flame intensity beyond the optimum for the job. This is particularly relevant when the soft-soldering attachment is used. The bit heats up very quickly and the flame need do no more than caress its base. Too fierce a flame will increase gas consumption without any gain in performance.

The use of a butane-oxygen mixture increases the flame temperature to around 2750°C. For this purpose a miniature low pressure oxygen cylinder is linked by a tube and an adaptor to the Miniflam nozzle. The torch can then be used for brazing most metals in common use in the electronics and jewellery industries or for cutting metal sheets up to 1·5mm thick. It must always be remembered, however, that the Miniflam is a miniature tool and the heat area which it is designed to produce is correspondingly small. Miniflam oxygen cylinders which are specially imported for use with this tool hold sufficient gas for thirty minutes average controlled use.

Recommended retail prices, which include VAT, are: Miniflam torch £18·77—Soldering bit £1·59—Oxygen cartridge £1·59—Oxygen adaptor £9·49; plus 25p per item P&P.

The Miniflam is available from specialist hand tool dealers (a list can be supplied on request) or by post from: *Henri Picard & Frere Ltd., 357/359 Kennington Lane, London SE11 5HY. Tel: 01-735 9805.*

Solar Cell

Ferranti Electronics Ltd. have developed and produced a Silicon Solar Cell principally for educational use.

The cell, designated the ESC3 series, measures 76mm diameter and is capable of producing 0·9A at 0·5V under good sunlight conditions. Physical protection is provided by a tough moulded case and by a Fresnel lens which also acts as a light collector. Power take-off is via pins on the rear of the case. Accidental short-circuiting of the output will not damage the cell, and any number of cells can be arranged in series/parallel combinations to provide increased output values.

In addition to providing an educational aid for schools, colleges and universities it can provide the electronics enthusiast with a power source for operating functional models and electro-mechanical devices.

The ESC3 series should be available in early September and the one-off price will be in the region of £12.00. Further information can be obtained from: *Ferranti Electronics Ltd., Fields New Road, Chadderton, Oldham, Lancs OL9 8NP. Tel: 061-624 0515.*

Watchdog

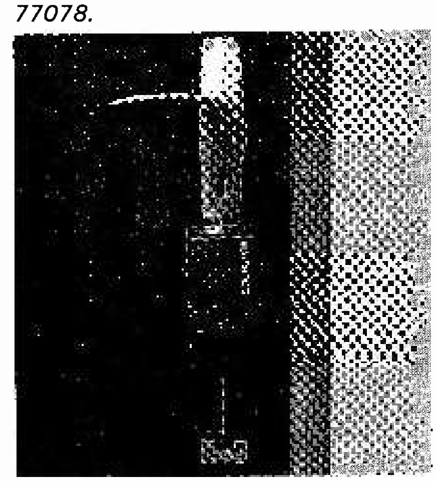
Recently introduced by Manx Electronics, is the "Watchdog", a portable, easy-to-instal burglar alarm.

The "Watchdog" measures only 120 × 65 × 30mm and takes moments to instal on any non-metallic door with metal handles.

To instal the unit, close the door; unlatch the lower back cover and let the ground antenna chain hang down freely; unfold the wire loop and hang the unit on the door handle; switch on and adjust the "Tune" control until the alarm sounds, remove your hands from the unit and the alarm should stop, if not, readjust the "Tune" control. The "Watchdog" is now set and any intruder touching the metal handle on the other side of the door will immediately trigger the alarm, which will continue until the intruder lets go of the handle.

Powered by a 9V PP3 battery, the unit should give approximately 170 hours continuous operation in the unactivated condition.

The "Watchdog" costs £6.50 plus VAT and £1.00 P&P, and is available from: *Manx Electronics, 69a High Street, Epping, Essex. Tel: (0378) 77078.*



ON THE AIR

AMATEUR BANDS

by Eric Dowdeswell G4AR

It will not have escaped the notice of readers of this column that the subject of Citizens' Band radio is coming up more and more frequently these days on the radio, TV and in the press. As usual on a technical subject, an awful lot of rubbish is being aired, such as the political correspondent of a very well-known daily paper who wrote that CB radio was being used "mainly by motorists and other untrained amateurs"!

Obviously there are many people, including our younger folk, who would like to chatter to each other over the air, and indeed, feel that they have a right so to do. Those that are aware of the existence of the radio amateurs' licence are often of the opinion that the examination is "too difficult", when what they really mean is that it is too much trouble. They want to get on the air the easy way.

In my own magazine *Electrical & Radio Trading*, of which I am the Technical Editor, I have had occasion to write quite a lot of late concerning CB radio and the prospects for its introduction into the UK, so it might be an idea to get one or two ideas straight.

Those people now using CB sets on 27MHz in this country, and there are said to be many thousands, are doing so largely *because* it is illegal. If it were to be legalised tomorrow half of them would look around for something else illegal to get their hands on.

This present Government, and previous ones, should be congratulated rather than villified for not condoning CB radio on 27MHz. They have had the courage not to be stampeded into a stupid decision, unlike so many other countries, several of which now rue the day that they ever heard of 27MHz CB radio. The present Government will undoubtedly approve a service in due course, choosing a frequency in the v.h.f. range where abuse of the relevant regulations is far less likely to occur. Approved apparatus, possibly emitting a coded inaudible identification signal, will almost certainly be required, as has now become the law in the US, at long last.

We shall get what the original idea of CB radio was all about, namely the ability of two or more people to talk to each other over the air for a comparatively short distance. Hopefully it will not be called Citizens' Band radio at all but perhaps the Domestic Radio Service so that we can forget the plague that is CB which has struck the US and other countries.

To those of my readers who are waiting for a DRS in order to get on the air and "talk to the world", as some of our "shamateur" journalists put it, I say "forget it"! Sit down and start to study for the Radio Amateurs' Examination and you will achieve something worthwhile when you have got your licence, something that will stand you in good stead for many years to come, plus a sense of satisfaction that can never be obtained with anything that is got "for free".

General

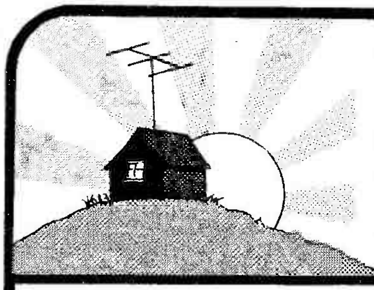
Because of postal problems and delays in the publication of *PW* (not, I would add, due to *PW*'s editorial staff. Somebody had to say it!) the Log Extracts feature of this column every month has become something of a joke. Originally intended to provide the latest news on DX activity the delays now in getting this information into print means that some DX stations come and go before even appearing in print.

I would still like the logs to come rolling in but in lieu of Log Extracts I will select the choicer bits of DX news and include them in the main column. It is now even more important to see that logs and information reach me on or around the 15th of each month. Three weeks beforehand or one week after is pointless, yet very common, in spite of my monthly exhortations! As I've said before, letters of a general nature are welcome at any time.

DXing

From Manchester, **Mike** G4HWB writes to say that a "whole coachload of relatives from VK land" has stopped his DXing for a while. He's hoping the WARC will give us some more bands so that some of the existing gear will get on to the secondhand market and he'll be able to get it cheaply, which he can't manage to do at the moment. I'll say "hear, hear" to that! It happened in the US when CB went to 40 channels from 27. The old gear was dirt cheap then. On c.w. Mike worked HZ1HZ (10m), FG7XA and 8P6HZ (15m) with P29LS on s.s.b. (10m) and CT2CH plus FM0ABK on 20m s.s.b.

Dennis Sheppard (Sheerness, Kent) doesn't find RTTY activity too high during the summer months but his KW202 and 132ft Windom found JA4ONZ, ZC4JG and 5Z4PD on 15m RTTY, and HI8XDF, VK2ZN, ZL4GJ, 9M2CR, K0BJ/H44, 5W1BV, 6Y5SS on the 20m band. **John** and **Steven Goodier** who reside near Stockport logged ZA1KAM but I wouldn't waste an IRC on him!



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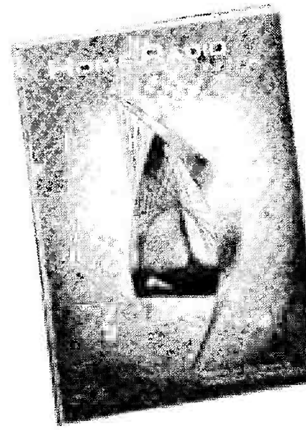

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The trouble is such pirates are given an air of authenticity by the many who work them "just in case"! Better to be safe than sorry! They also found VQ9KK/C on Ghagos Island (15m) who ought to be there for another month or two.

David Coggin has a DX160 and 170ft of wire at Knutsford in Cheshire, plus a one-element quad for 10m on which band he logged CE8CH, FR7BU, with HM2PN, HP1ACJ, HR3JJR on 15m. On 20m it was FO8DO, HC6FC, both s.s.b. 40m produced ZL1BOQ and ZP5CBL. In Stowmarket, Suffolk, **Dave Palmer** also looked at 40m s.s.b. with his Trio JR310 and 100ft aerial and got FM7WS, YS9RVE and ZP5LX. 20m provided HM1NJ, K6SAE/KH2 on Guam, KX6PP and YI1BQD while on 15m it was FO8DT, KX6BU, S79MC, VQ9KK, 5N0SID, 5L2AY and 9V1VV, with 10m revealing VK8NCC, XT2AV plus 5N0EAD. Dave had a go at a friend's AR88 and wished he had the six positions of selectivity on his Trio!

Leigh-on-Sea, Essex, is the QTH of **Ian Marquis** BRS41426 whose Frog-7, the FRG-7 to newcomers, found VU2BK on 40m c.w. with FH8CY and SU1DP on the same mode on 10m. On 20m, s.s.b. was logged from VS5MS and 4S7EA with HH2V, KX6BQ, VS6AK and 5W1AX on 15m. **John Dainty** was surprised in West Wickham, Kent, to log W5NT and W5XZ on 80m s.s.b., the latter working a G4, so things may already be looking up on the l.f. bands.

Here and There

Peter Hawks in Stourbridge, W. Mids, hearing the DX using beam aerials, wonders if a listener ought to have something similar. Most certainly yes! The average SWL would be absolutely astounded if he listened to, say, the 20m band using even a two-element beam. Somehow the SWL sticks to odd bits of wire until he gets his own ticket, then forks out on a beam. If one is really intent on getting a licence, for the v.h.f. or h.f. bands, then I'd always recommend getting a beam while still a listener.

There is often the odd strange callsign in logs, so once again I must suggest a copy of **Geoff Watts'** prefix list which has now gone up to 50p postpaid, from 62 Belmore Road, Norwich NR7 0PU, but is still worth every penny. **Norman Wright** (Chorley, Lancs) let slip that he became G8SJM last March and has lately acquired an AR88, so what about the code test and a G4 call soon OM?. After buying a DX160 and putting up a 100ft of wire **David Warner** in Cheshunt, Herts, has threatened to send in some logs and to try for the RAE. **R. G. Anderson** reports from Canvey Island, Essex, that he too has caught the bug, this time from his brother-in-law who happens to be VK2BYS! Receiver is a Panasonic RF2800 with digital frequency readout.

Users of the Lowe SRX-30 receiver might like to contact **John Meele** of 4 Byways Caravan Park, Strode Road, Clevedon, Avon, who has one but has not seen any mention of the set in this column. John's QTH is pretty grim from the radio point of view as one can imagine with a 30ft wire and a.t.u. Well, John, the FRG-7 certainly stole the limelight but that doesn't make it the better set of the two. Following its review in *PW* the SRX-30 might now pick up a bit of lost ground.

And now we have a note from **David Parker** of Elstead, Surrey, with the news that he is now G4IKK. Well done OM, and good luck on the air with your new identity. A KW2000 or Heathkit rig seems to be in the pipeline, so hope you can get on the air soon and baptise the new call.

HAVE YOU SEEN THE NEW *PW* QSL CARD?

Then turn to page 56

Back to the DX scene for a moment with some tit-bits from regular **Bill Rendell** (Truro, Cornwall) with his AR3 valved set and 115ft outdoor wire. We exchange notes on our second hobby of birdwatching but Bill manages to slip in the odd bit about the bands! On 20m s.s.b. it was C5ABK (QSL via G3LQP), CT2BB, HS1ABD, K0AX/DU2 (QSL via WB4OSN), P29JS, VK7AE, VP1WS, VP2MH, VP8RX on Falkland Island, and YI1BGD, heard by most people, QSL via Box 5864, Baghdad. From 15m s.s.b. Bill dug up CT3AR, C5AAG (QSL via LA7GV), HS1ABD, JR6FF on Okinawa, J3ABQ (QSL W5SJS), SV9KI (normally SV0??), VP2SV, VP2VFC on Tortilla, XT2AV (QSL VE2ATS) and YB0WR.

Club Round-Up

Newly-formed **Wigston RC** already has 20 members, half of whom are licensed, with others awaiting good news of the RAE. Meetings now on first and third Fridays of the month at the United Reformed Church in Wigston, Leicester. Interested? If so contact Steve Parker, 59 St Michael's Avenue, Leicester. If you have nothing to do on the second and fourth Thursdays of the month and live in northern Kent then you could do worse than visit the **North Kent RS** at St Mary's Institute, 2 North Gray Road, Bexley, around 8pm. Planning of the forthcoming season's programme is under way. Current activities include code practice and operating the club's station G4CW. Write to: Hon Sec Dr. C. P. Conduit, c/o 49 Baldwyns Park, Bexley, Kent.

Northern Heights ARS has a new meeting place, I've been informed: Wednesdays at 8pm at the Bradshaw Tavern, Illingworth, Halifax. Beginners' sessions at regular intervals will eliminate the feeling that newcomers to clubs often get, that of being cold-shouldered. It often happens and is quite unintentional, just that nobody in particular has been delegated to look after him or her. Shouldn't happen at the NH ARS. Their newsletter is interesting and informative but for more info contact: Sec Marcus Topham, 1200 Great Horton Road, Bradford, or Geoff Theasby G8BMI at 12 Southfield Avenue, Riddlesden, Keighley.

Back down south to the **Winchester ARC** meeting on the third Saturday of the month at 8pm, with talks on radio fundamentals, lectures and demonstrations, films and much activity from the club's v.h.f. station. Informal meetings on the first Friday, also 8pm, at the Crown Hotel, North Walls, Winchester. Contact: Peter Simpkins G3MCL, Lawn End, Park Road, Winchester, who guarantees a warm welcome to new members and visitors.

No marks out of ten for the **Bournemouth RS** that couldn't muster enough hands to run HF NFD this year! With over a 100 members one wonders what the alternative attraction was! I've known clubs with half a dozen members get into the field for NFD, and thoroughly enjoy every minute. To compensate, Bournemouth area RAIBC rep Alan G4GQH reports much good work done to get invalid amateurs on the air or kitted out with receivers and aerials. If interested look in on the Bournemouth RS or contact: D. Wade, 70 Creekmoor Lane, Poole, Dorset.

The very active **Cray Valley RS** has its annual contest over the weekend of October 6/7 for listeners and transmitting amateurs, on all bands from 160 to 2m. Main object is to contact society members and qualify for club awards. Details from: Owen Cross G4DFI, 28 Garden Avenue, Bexleyheath, Kent.

Wednesdays at 7.30pm sees the **Derby and District ARS** under full steam at the clubroom, 119 Green Lane, Derby, with light refreshments to follow. Lectures and events to suit all tastes with RAE and code instruction. If *PW* is out on time then you may like to know about a cheese and wine party on Sept 12 but for more info write to: Jenny Shardlow G4EYM, 19 Portreath Drive, Darley Abbey, Derby.

Finally, whew, the **West Kent ARS** meets at the Adult Education Centre, Monson Road, Tunbridge Wells, at 8pm. On Sept 14 there is a 2m foxhunt, "meet in the car park behind M & S at 8pm", says Brian Castle G4DYF, Sec of 6 Pinewood Avenue, Sevenoaks, Kent, who can supply more details. On Sept 28 an open evening "especially for newcomers to the hobby and other visitors", and even further ahead *PW* contributor Ron Ham talks about Man on the Moon.

MEDIUM WAVE DX

by Charles Molloy G8BUS

While on a short visit to Shetland last June, I was surprised to hear the lunch-time broadcast from Torshavn in the Faroes, which now puts out 5kW on 531kHz. The receiver was a rather ancient Realistic portable which has a 6in ferrite slab aerial and the QTH was Lerwick on the boat deck of the *St Clair* which does the regular run from Aberdeen. The surprise was due to the distance which must be around 200 miles, the low power of the transmitter and the fact that the path was in daylight.

Groundwave Reception

During the day, medium and long wave radiation into the ionosphere is absorbed by the D layer. Nothing comes back, there is no sky wave and only the ground wave can be received, that is until darkness comes and the D layer disappears. The ground wave peters out (attenuates) quickly with distance, the effect being more apparent at high than at low frequencies. The range of the ground

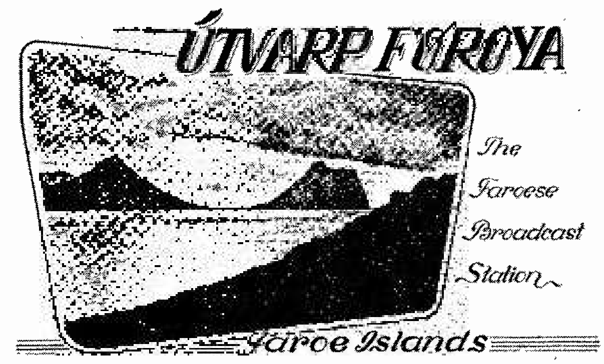

Fig. 1: The QSL card received by Charles Molloy from Torshavn in the Faroes

wave is greater at the l.f. end of the medium waves than at the h.f. end, and it is greater again on the long waves. Attenuation is also lower over water than over land, so the combination of low frequency and a sea path accounts for the daytime reception of Torshavn in Lerwick.

Twilight DXing

It was with mixed feelings that I listened to Torshavn as it had taken considerable effort to log and QSL this station from my home QTH in Lancashire. When it was on its pre-Geneva 584kHz there was QRM from Austria, Spain, France and the USSR, and only one of them could be nulled out at a time with a loop. The position on 531kHz is much the same with QRM from East Germany, Finland, Switzerland and Algeria.

My solution was to listen for the 0715 sign-on at a time of year when it was sunrise at my QTH, which is around the time of the equinoxes. QRM would be declining with the arrival of daylight, while the path to the Faroes would still be in darkness. Try on 531 at 0715 during September and the further north your QTH then the better your chance of success. The station is on the air from 0715 to 0915, from 1200 to 1300 (later on Wednesday and Saturday) and from 1830 to 2030 (2305 on Saturday). The language is Faroese, the identification "Utvarp Foroya" and the interval signal is a few notes on a xylophone.

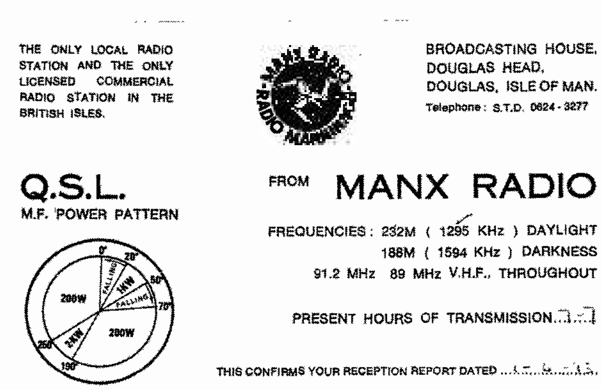

Fig. 2: An early QSL card from Manx Radio in the Isle of Man

A similarly placed but easier station is Manx Radio in the Isle of Man, which comes roaring in at my QTH during the day. The frequency is 1368kHz and it broadcasts from 0655 to 2200 daily. It could be an interesting catch for DXers in some parts of the UK (including Shetland) and if there are problems with QRM then try around sunrise or sunset. Twilight, as reader **Mark Hattam** has pointed out, is a good time for DXing on the medium waves.

A last word about Torshavn. Although I succeeded in logging Torshavn on several occasions, I was unsuccessful in obtaining a QSL owing perhaps to the lack of suitable material for a reception report. I should have sent them a tape! It was not until there was a general election in the Faroes and Denmark, and the station was on the air well into the night giving the results that I was able to obtain the coveted QSL card. Cheating? Not really. Anyway I think I deserved the QSL after all the effort I put into verifying this "medium waves only" country.

Spain

"Aqui Bilbao (This is Bilbao)" was the name of an international programme which used to be on the air during the 1950s, and it has appeared again every Sunday from 0030 to 0200 over Radio Bilbao on 990kHz (303m) with a power of 10kW. There is a mailbag programme in English, French and German, "Top of the Basque Pops" and "Introducing Tonight" with personal appearances of Basque artists and personalities. Listeners' letters are welcome and should go to Radio Bilbao, Rodriguez Arias 6, Bilbao, Spain.

Another list of Spanish New Frequency Assignments on the m.w. and l.w. bands is available from the DX Luxal Club. Send two International Reply Coupons, which are obtainable at main post offices to the club c/o Luis Diez Alonzo, Isaac Peral 18, Santander, Spain.

DX Heard

"I recently bought an Eddystone EC10 Mk2 hoping to enjoy broadcasts from various US stations, but up to now I have only heard one", writes **Stanley Flitcroft** from Bolton. Were you listening at the right time? Reception has been quite good this summer in spite of the approach of the sunspot maximum. **David Sidebottom** (Fleetwood) has been more successful. Using his Realistic DX160 and 20 inch loop between 0200 and 0400 in July, he pulled in CJCH in Halifax, Nova Scotia on 920kHz, CJYQ St John's, Newfoundland on 930kHz, CHER Sydney N.S. on 950, CHNS Halifax N.S. on 960, WEVD New York 1330, WLAM Lewiston Maine on 1470. Two others whose location was not determined were CKEC on 1320 (New Glasgow N.S.) and WSAR 1480 (Falls River, Massachusetts). Stations don't come through until 0200 at this time of year (July) concludes David.

Another DX160 user is **K. Lewis** of Pensilva in Cornwall. The rest of his rig includes a 90ft long wire, a.t.u. and a pre-amp. He pulled in ZDK in Antigua on 1100, CJCH 920, WCAU Philadelphia on 1210, WNEW New York on 1130 plus an unidentified Canadian on 1320 (probably CKEC) and a Latin American on 760.

Solar Activity and the Medium Waves

The maximum of the current sunspot cycle is expected before the end of 1979. Solar activity improves reception on high frequencies but has a detrimental effect on low frequency DXing, especially on northerly paths such as that between UK and North America. There is evidence that Latin American DX actually improves when reception of North America is poor, so in answer to David Sidebottom, the prospects for the coming winter are below average reception of North America and better than usual reception across the long sea path to South America.

I will probably regret having made this prediction as m.w. DXing is a law unto itself! Reports of North American DX heard during the period September to December would be much appreciated, even of everyday DX such as CJYQ, as the current prediction for the sunspot maximum is November. Reception should be possible from midnight onwards in September and a little earlier towards the end of the year.

News Items

According to a statement from All India Radio, the Indian Government will be pressing the World Administrative Radio Conference in Geneva this year for an allocation on the long waves. They reckon that a single l.f. frequency with a number of synchronised transmitters would cover the whole of India. It should also be receivable in the UK, QRM permitting.

Regular listeners on the medium waves will have noticed the appearance on 612kHz of "Radio 2" which is the second programme of Radio Telefis Eireann. This transmission emanates from Tullamore with a power of 200kW, and it comes in well at my QTH. The same programme can be heard from the Dublin transmitter on 1251kHz which has a power of 20kW.

"Are You on the Right Wavelength" is the title of a 10-page booklet produced by the BBC Engineering Department. The aim of this booklet is "to indicate to listeners which frequencies (wavelengths) they should use to receive the BBC's domestic radio services. It will be particularly useful to motorists and other travellers, because the best frequency can vary from one part of the country to another". The booklet, which contains six coloured maps, can be obtained for return postage from the BBC, Broadcasting House, London W1A 1AA.

In reply to **S Keightley** of Grimsby; the address of the National Radio Club of America given in the December issue has been changed to PO Box 32125, Louisville, Kentucky, USA.

SHORT-WAVE BROADCASTS

by Charles Molloy G8BUS

"I finally tried out my d.f.m. (digital frequency meter) on my Philips Radio Cassette and it works fine", writes **Fred Pilkington** (Newmarket), who goes on to say that he discovered that he had the radio tuned up on the wrong i.f.! Well, it can happen to all of us Fred.

I too have taken the plunge, and am now the proud owner of an "Honest Frequency Meter type FC5M" which is available from Lowe Electronics. It has two inputs. One is without offset which allows the instrument to be used as an ordinary d.f.m. while the other has 455kHz offset which enables it to be used for digital readout with many single-conversion receivers.

At the time of writing I have made only a temporary connection to the BRT400 via a 2pF fixed capacitor to pin 4 of V3, which is the grid of the mixer triode. The results are quite staggering and I now know where I am to an accuracy of 1kHz anywhere in the range 150kHz to 30MHz. Quite a change from my first 1-valve receiver which has a scale marked 0 to 100.

The oscillator/mixer section of the BRT400 is in a screened compartment, and I anticipate problems when I try to make a permanent connection for readout, but I will report on this next time.

Indoor Aerials

From time to time readers like **Paul Martin,** who lives seven stories up, or **Neville Black** who is limited for garden space, ask if there is a substitute for a long wire. Unfortunately there is no substitute. An indoor aerial cannot be as good as an outdoor one of similar size because it is screened by walls, tiles etc., and it is also liable to pick up electrical and TV interference from house wiring.

None-the-less, many DXers have no choice but to use an indoor aerial and they will welcome the appearance of *A Guide to Indoor Aerials and Invisible Installations for Short Wave Listeners with no Garden or Restricted Space.* This is the title of a 32-page A4-size illustrated booklet produced by R Benham-Holman G2DYM. The author is a retired BBC engineer who is now an aerial consultant and the booklet, which contains some really useful information, can be obtained by sending three 9p stamps together with a 16p 10×7 s.a.e. to G2DYM Aerials and Projects, Cobhamden Castle, Uplowman, Nr Tiverton, Devon. With an address like that he must surely have room for a long wire! The booklet contains practical information that is available nowhere else and in that respect it is unique.

Tropical Bands

"I seem to have turned into a 60-metre addict", writes **Steve Parry** from Colwyn Bay who uses an FRG-7, PR30 preselector, homebrew notch filter and 100ft of wire strung up and down the attic. On 60m he pulled in Radio Mozambique on 4760kHz at 1924, Radio Bertoua Cameroon on 4750 at 2114 in French, Luanda Angola on 4790 at 1910, Sao Tome 4807 at 2042 in Portuguese, Surinam 4850 at 0355 in English and Dutch, Radio Relogia Brasil on 4905 at 2231. On the 75m band the Voz do Sao Vincenta in the Cape Verde Islands was heard on 3930kHz at 2306 with programming in Portuguese.

The 90-metre band appears in a log from **Jim Edwards** of Bryn near Wigan, who pulled in Radio Iris Esmeraldas in Ecuador on 3380 from 0430 until sign-off at 0500, using his FRG-7, a.t.u. and 100ft long wire. DX on 60 metres included Radio Quito in Ecuador on 4920 at 0400, R. Brasil Central on 4985 at 0400, Radio Surcolombiana Colombia on 5010 at 0425, and at a more reasonable time, Radio Garoua in Cameroon on 5010 at 2145.

More 90m DX is reported by **K. Lewis** (Pensilva, Cornwall) who picked up R. Universidad in Venezuela on 3395 at 0200, SIO 233, and an unidentified (probably R. Iris) on 3380 at 0300, SIO 232. The rig consists of a Realistic DX160, a.t.u. and 90ft long wire. On 60m Tegucigalpa in Honduras was heard on 4820 at 0302 in English, SIO 232, Liberia on 4770 at 2012, SIO 544 also in English, Radio Atlantida Peru on 4790 at 0210, SIO 233 and Radio Centro Colombia 4926 at 0325, SIO 333.

To conclude some really good Tropical Band DX this month a report from **Neville Black** (Newcastle) who has an FRG-7000, a.t.u. and 60ft long wire, mentions Radio Diffusora do Macapa in Brazil on 4915 at 0015 and Radio Yuracuy 4940 at 0200 in Venezuela. Nigeria on 4900 closing down at 2310, Borborema in Brazil on 5025 at 2340 and Sutatenza in Colombia on 5095 at 0112.

Why not try the tropical bands as a change from normal s.w. DXing? A path of darkness between transmitter and receiver is essential for any DX to be heard, and you do need a good aerial as a portable with whip is not really adequate. The main band is 60 metres, 4750–5060kHz but there is also DX on 75m, 3900–3950kHz and 90 metres, 3200–3400kHz.

Time Signal Stations

A note from **Gerd Klawitter,** D-4430 Steinfurt, Ochtruper Str 138, Federal Republic of Germany, mentions the 8th edition of his *List of Time Signal Stations.* It is a 40-page booklet which has been compiled from information received, up to 10 April 1979, direct from the stations themselves. As well as listing stations, callsigns and locations in frequency order there is a section for each country which gives details of each "programme". These can be quite complicated for as well as accurate time, there is information on ionospheric conditions and predictions.

The list is obtainable direct from Gerd for 4DM or 5 International Reply Coupons, which are available from main post offices.

Readers' Letters

A number of readers have identified Hebra Radio mentioned in the July issue, as IBRA Radio (International Broadcasting Association) which is owned by the Pentecostal Movement in Sweden. IBRA broadcasts into 52 countries and in 37 languages and its address in the UK is 5 Curlew Crescent, Bedford.

Two useful tips come from **Steve Parry** (Colwyn Bay), who reports hearing Radio Dominicana on 5970kHz at 2330 in Spanish, and Radio TV Papeete in Tahiti on 11825 at 0520 in French. The receiver was an FRG-7. **Alistair Dupres** (Cardiff) now has an FRG-7 which he uses with a long wire, and he reports hearing Radio Korea on out-of-band 15 570 with English programming at 2000, Radio RSA on 25 170 in the 11m band at 1300 and Radio Free Grenada on 15 151 at 2200. I do not have the address for R. Free Grenada but St George's, Grenada

Reports on the various bands are welcome and should be sent direct by the 15th of the month to:

AMATEUR BANDS Eric Dowdeswell G4AR, Silver Firs, Leatherhead Road, Ashtead, Surrey KT21 2TW. Log by bands, each in alphabetical order.

MEDIUM and SW BANDS Charles Molloy G8BUS, 132 Segars Lane, Southport PR8 3JG. Reports for both bands **must** be kept separate.

VHF BANDS Ron Ham BRS15744, Faraday, Greyfriars, Storrington, Sussex RH20 4HE.

Tecknowledgey for sale.

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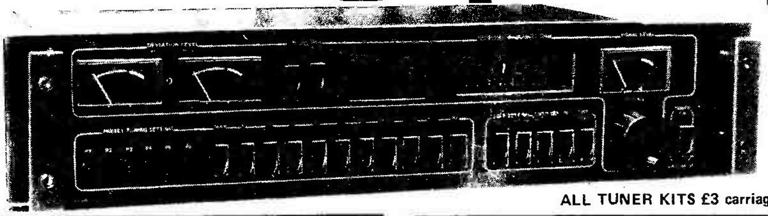
DIY Hi-Fi will never seem the same again. Ambit's Mark III tuner system is electrically & visually superior to all others. Some options available, but the illustrated version with reference series modules: £149.00 + £18.62 VAT

With Hyperfi Series modules £185.00 + £23.12



Features of the system

* Precision construction & design of all parts
* Time/frequency display
* State of the art performance with facilities for updates, using modular plug in systems.
* Deviation level calibrator for recording
* All usual tuner features

ALL TUNER KITS £3 carriage

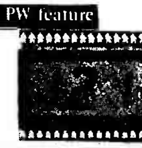
Digital Dorchester All Band Broadcast Tuner: LW/MW/SW/SW/SW/FM stereo

A multiband supernet tuner, constructed using a single IC for RF/IF processing - but with all features you would expect of designs of far greater complexity. The FM section uses a three section (air gang) tuned FET tunerhead, with ceramic IF filters and interstation mute; AM employs a double balanced mixer input stage, with mechanical IF filters - plus a BFO and MOSFET product detector for CW/SSB reception. Styled in a matching unit to the Mark III FM only tuner, employing the same degree of care in mechanical design to enable easy construction. MW/LW reception via a ferrite rod antenna.

Electronics only (PCB and all components thereon)	£33.00 + £4.95 VAT
Complete with digital frequency readout/clock-timer hardware	£99.00 + £14.85 VAT
Complete with MA1023 clock/timer module with dial scale	£66.00 + £9.90 VAT

Hardware packages are available separately if you wish to house your own designs in a professional case structure. Please deduct the cost of electronics from complete prices.

LW MW FM LCD Digital Frequency Display - July PW feature



Update your old radio, or build this into a new design. Or use it as a servicing aid - this low power unit with LCD display reads direct frequency in kHz/MHz, or with usual AM/FM IF offsets for received frequency. Low power LCD means no RFI - 15-20mA at 9v even with the divide by 100 prescalar. FM resolution is 100kHz, AM 1kHz. Sensitivities better than 10mV

Complete kit £19.50 + £2.93 VAT, built and tested module £27.00 + £4.05VAT

Ambit stocks and distributes a wide range of frequency counter LSI for all types of DFM- part two of the catalogue contains details of the MSM5523/4/5/6 range, and the versatile MSL2318 divide by ten or hundredprescalar IC. The DFM1 combined counter for AM,FM SW and direct/clock/stopwatch/timers - details available, but SAE please !

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FM/AM tuning synthesiser, see details elsewhere in th is advertisement

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CA3089E	1.94	29	SL1610	1.60	24	LM381N	1.81	27
CA3189E	2.45	37	SL1611	1.60	24	LM382N	1.65	25
HA1137W	2.20	33	SL1612	1.60	24	KB4436	2.53	38
HA11225	2.20	33	SL1613	1.89	28	KB4438	2.22	33
SN76660N	0.75	11	SL1620	2.17	33	TDA1028	3.50	53
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TDA1090	3.35	50	SL1623	2.44	37	TDA1074	3.75	56
TDA1083	1.95	29	SL 624	3.28	49	Audio power		
TDA1220	1.40	21	SL1625	2.17	33	TBA820M	0.75	11
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KB4406	0.50	07	SL1630	1.62	24	LM380N	1.00	15
MC1350	1.20	18	SL1640	1.89	28	ULN2283	1.00	15
see comms ics also			SL1641	1.89	28	TDA2002	1.95	29
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KB4412	2.56	38	SL6690	3.20	48	TDA2020	2.99	45
KB4413	2.75	41	MC3357	3.12	47			
SD6000	3.75	56	MC1496	1.25	19			
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TTL:Standard AND LP Schottky

All prices listed in pence *

	'N'	'LSN'
7400	13	20
7401	13	20
7402	14	20
7403	14	20
7404	14	24
7405	18	26
7406	38	
7409	17	24
7410	15	24
7411	20	24
7412	17	
7413	30	
7414	51	
7415		24
7416	30	
7417	30	
7420	16	24
7421	29	24
7423	27	
7425	27	
7426		27
7427	27	29
7428	35	32
7430	17	24
7432	25	24
7437	40	24
7438	33	24
7440	17	24
7441	74	
7442	70	99
7443	115	
7444	112	
7445	94	
7446	94	
7447	82	89
7448	56	99
7449		99
7451	17	24
7453	17	
7454	17	24
7455	35	24
7460	17	
7463		124
7470	28	

	'N'	'LSN'
7472	28	
7473	32	38
7474	27	38
7475	38	40
7476	37	38
7478		38
7480	48	
7481	86	
7482	69	
7485	104	99
7486		40
7489	205	
7490	33	90
7491	76	110
7492	38	78
7493	32	99
7494	78	
7495a	65	99
7496	58	120
7497	185	
741XX series		
74107	32	38
74109	63	38
74110	54	54
74111	68	
74112		38
74113		38
74114		38
74116	198	
74118	83	
74120	115	
74121	25	
74122	46	
74123	46	
74124		137
74125	38	44
74126	57	44
74128	74	
74132	73	78
74136		40
74138		60
74139		60
74141	56	

	'N'	'LSN'
74142	265	
74143	312	
74144	312	
74145	65	97
74147	175	
74148	109	191
74150	99	
74151	64	84
74153	64	54
74154	96	
74155	54	110
74156	80	110
74157	67	55
74158		60
74159	210	
74160	82	130
74161		78
74162		130
74163	92	78
74164	104	130
74165	105	
74167	20	
74169		200
74170	230	200
74172	625	
74174	87	120
74175	87	110
74176	75	
74177	78	
74181	165	350
74183		210
74184	135	
74185	134	
74188	275	
74190		92
74192	105	180
74193	105	180
74194	105	
74196	99	110
74197		110
74198	150	
74199	160	
74247		90
74253		105

	'LSN'
74257	108
74260	153
74273	124
74283	120
74293	95
74365	49
74366	49
74367	43
74368	49
74373	77
74374	77
74377	124
74379	130
74393	140

VOLTAGE REGS:

7800 series 1Amp pos	95p
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78LCP 100mA	35p
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723CN variable IC	65p
NE550	73p
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(BS etc approved types)

1 Amp in IEC chassis connector	4.83
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5 Amp wirein	3.87

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95H90DC divide by 10/11 to 320MHz	780p
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8629 divide by 100 to 175MHz min	420p
MSL2318 divide by 10/100 to 175MHz min	420p
ICM7216BIPI : 8 decade 10MHz DFM counter and full function timer, with direct drive for an LED display (mpx). Uses 10MHz xtal	1982p
ICM7217AIBI ; 4 decade programmable counter with direct LED drive	950p
ICM7207 clock pulse generator	495p
ICM7208 : 7 decade counter display	1495p
ICM7106CP : LCD DVM (3½ digit)	955p
ICM7106CPK : evaluation kit for 7106	24.80
ICM7107CP : LED DVM (3½ digit)	955p
ICM7107CPK : LED DVM kit for 7107	20.65
OKI MSM5523/4 : LED/Fluorescent display driver IC for time/timer/stopwatch/ AM/FM received frequency display and direct counter (use MSL2318 prescalar) inc Crystal	1400p
MSM5525 : AM/FM frequency only couner, for fluorescent displays (6LT06) inc xtal	1100p
MSM5526 : as MSM5525 but for LCD	1100p
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10 LED (2½x5mm) bar graph driver PCB for LOG or LIN (specify). Kit ex leds	300p

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4000	17	4522	149
4001	17	4528	102
4002	17	4529	141
4006	109	4532	125
4007	18	4538	150
4008	80	4539	110
4009	58	4543	174
4010	58	4549	399
4011	17	4554	153
4012	17	4558	117
4013	55	4560	218
4014	95	4562	530
4016	52	4566	159
4017	80	4568	281
4018	80	4569	303
4019	60	4572	25
4020	93	4584	63
4021	82	4585	100
4022	90		
4023	17		
4024	76		
4025	17		
4026	180		
4027	55		
4028	72		
4029	100		
4030	58		
4035	120		
4040	83		
4042	85		
4043	85		
4044	80		
4046	130		
4048	60		
4049	55		
4050	55		
4051	65		
4052	65		
4053	65		
4055	135		
4059	563		
4060	115		
4063	109		
4066	53		
4068	25		
4069	20		
4070	20		
4071	20		
4072	20		
4073	20		
4075	20		
4076	90		

LINEARS

CA3130E	84
CA3130T	90
CA3140E	
CA3140T	72
LM301AH	67
LM301AN	30
LM339N	66
LM348N	186
LM3900N	60
709HC	64
709PC	36
710HC	65
710PC	59
723CN	65
741CH	66
741CN	27
747CN	70
748CN	36
NE531N	105

7 SEG DISPLAYS

HP5082 series.......

Red	7650	233p
	7653	233p
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	7663	233p
Grn	7670	233p
	7673	233p
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KV1211	double matched	175p	26p vat
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MVAM115	single 15v	105p	16p vat
MVAM125	single 25v	105p	16p vat
MVAM2	double 25v	148p	22p vat
BB204/104	double FM	40p	6p vat
BA102	single AFC etc	30p	4p vat
BA121/ITT210	single afc	30p	4p vat
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should reach them. **Jim Edwards** (Wigan) also picked up R. Free Grenada and he reports that this station now calls itself the Voice of the Revolution.

In reply to **Trevor Goodenough,** Radio Australia is not on the 11m band so far as I know. **Joseph Pritchard** (Warsop) has an ITT CD108 with telescopic aerial which he used to pick up Delhi on 11 620 at 1808. **Bernard Hughes** (Worcester) reports hearing the Voice of Nigeria on 15 118 at 0920 with news in English. **R. Guest** (Braintree) has a Trio 9R59DS and Joystick and his log includes Lebanon on 21 610 at 1830 and Australia on 15 240 from 0615 to 0730 and again from 21 570 at 0800. **Julien Smith,** Seaford has a new SRX-30 which he is using with a 100ft long wire and he is constructing an a.t.u. He picked up ABC (Australian Domestic Service) on 9660 at 1215 and he would like to locate R. Pyongyang. K. Lewis reports hearing R. Pyongyang on 6576 at 2045 SIO 222.

S. Wilson, 26 Rectory Rd, Old Church, Warsop, Notts is looking for a mains transformer for his Codar CR70A and he has been unable to trace Codar. Can anyone help? **Roy Patrick** (Derby) has a Trio 9R59D, National RF1400 and Joystick and he reports hearing Radio Nacional Brasilia on 15 290 at 0200 in English, Radio Havana Cuba on 17 855 at 2110 in English and the Voice of Chile on 17 800 at 2230 in French. **Vic Dye,** Carshalton (National Panasonic DR28 and 60ft loft aerial) picked up Radio New Zealand on 17 860 at 0800, SIO 322 until the frequency closed at 0815. **P. R. Sixe** (Cambourne) reports hearing two separate programmes from Israel simultaneously on 17 565 at 1200. One was in English and the other a relay of the home service in Hebrew. Has anyone any ideas about this?

by Ron Ham BRS15744

As usual, the mid-summer period was full of interest for our TV DXers, and although this was mainly due to the seasonal sporadic-E disturbances, the prevailing fine weather improved v.h.f. conditions generally.

Solar

Several bursts of solar radio noise were recorded at 136 and 146MHz by **Cmdr Henry Hatfield,** Sevenoaks, and myself on June 24 and July 1, 3, 6, 7, 15 and 19, and mild noise storm conditions on June 25 and 30 and July 4 and 15. The most intense storm was, not unexpectedly, on the 4th. On the 3rd, Henry, using his spectrohelioscope, counted 29 sunspots and observed 7 active areas on the sun, and during the morning of the 4th he also recorded solar noise at 1296MHz.

Alan Smallwood, Birmingham, frequently studies the sun by projecting its image through his 60mm optical telescope and is planning to extend his activities by building a solar radio telescope. Keep me informed about this project Alan, because the more information I get the better my readers like it.

The 10 Metre Band

Both **Harold Brodribb,** St Leonards-On-Sea, and **David Rennison,** Horsham, commented about the quiet state of the 10m band between June 21 and July 22 and, although I received 599 signals from the German beacon DL0IGI, on June 21, 23, 26, 28, 29, and July 2, 3, 6, 10, 16 and 20, this was mainly due to sporadic-E. As for the others, I heard the Cyprus beacon 5B4CY, on June 26, Bahrain A9XC, on June 20 and Bermuda VP9BA, at midday on July 9. Short skip conditions and deep fading on European signals were reported by **Harold Goble,** Lancing, on June 21 and I noticed this again during the big sporadic-E disturbance on the 28th.

Sporadic-E

However many years I spend checking the lower v.h.f. bands during the sporadic-E season, I always marvel at the strength of the DX signals and the period from June 21 to July 22 was no exception. During the early mornings of June 22 and July 11 and 16, the middays of June 25 and July 2 and the early evenings of June 21, 25 and 28 and July 20, very strong signals were received from east European f.m. broadcast stations between 65 and 73MHz, as well as a multitude of continental radiotelephone signals between 40 and 47MHz. Although the average number of f.m. stations received at any one time was about 20, more than 40 were heard between 1700 and 2000 on the 28th and 35 at midday on July 2. The disturbance on June 28 extended its influence into the 2m band enabling **John Cleaton** G4GHA, Wareham, Dorset, to work a 9H1, five IT9s, two Is and one YU using 14 watts to a 6-element quad aerial at 30ft a.g.l.

DX TV

As in previous years, the frequency range of 48 to 68MHz has again proved to be the most vulnerable to a sporadic-E disturbance. For example, strong pictures from eastern Europe, Iceland, Italy, Russia and Scandinavia were received with only a dipole aerial feeding the receiver. On June 20, **Podney Sixe,** Camborne, Cornwall, using a JVC 3060 with its own rod aerial, received a strong test card from Austria, ORF FS1, and has seen RTVE, Spain several times. **Sam Faulkner,** Burton-on-Trent, using a JVC 3040 and a 4-ele beam, wrote on July 12: "Conditions have been really great here during the past week, with excellent video from many countries." These included: June 25, RAI Italy; 28th, Italy and RTVE, Spain; 30th Norway-Steigen; July 2 Norway-Hemnes, TV1-Sweden and RTP-Portugal; 6th Norway-Gamlem and Steigen, Sweden and Spain; 9th Czechoslovakia, Hungary, Italy and Portugal; and 10th, Italy and Spain.

Between June 20 and July 20, **Ian Rennison,** Horsham, using a JVC 3040 for vision and a Hallicrafters S27 for Band I sound and sync pulses, received pictures from Austria, Czechoslovakia, Hungary, Italy, Norway, Poland, Portugal, Spain, Sweden and Russia. Up in Fife, **John Branegan** GM4IHJ, received pictures from Spain on June 19, Austria, Czechoslovakia, Finland, Italy, Germany and Sweden on July 2, Spain again on the 5th and Finland, Norway-Melhus and Steigen and Sweden on the 6th.

I had similar results to my contributors, with the addition of Iceland at 1737 on the 6th, and we all noticed that a number of countries were using British programmes. Sam Faulkner saw *Peyton Place* on RAI, *George and Mildred* and *Dick Turpin* from Spain, and Wimbledon Tennis from Scandinavia. John Branegan watched a Continental-style *This is your Life,* and I saw *The Onedin*

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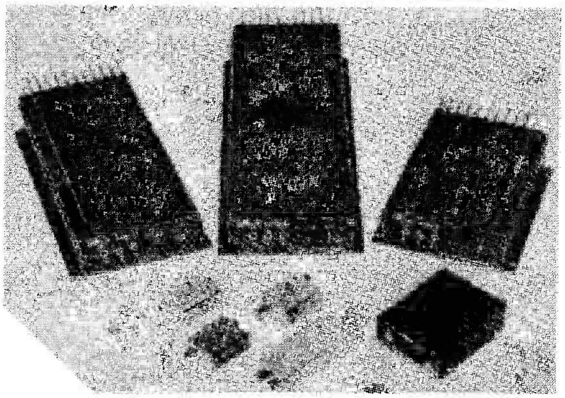

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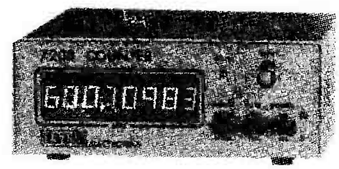

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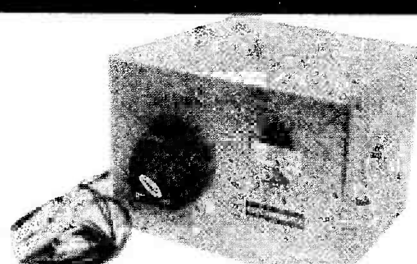

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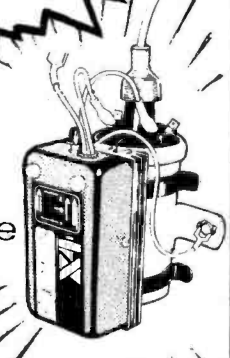

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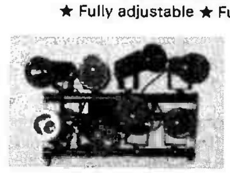

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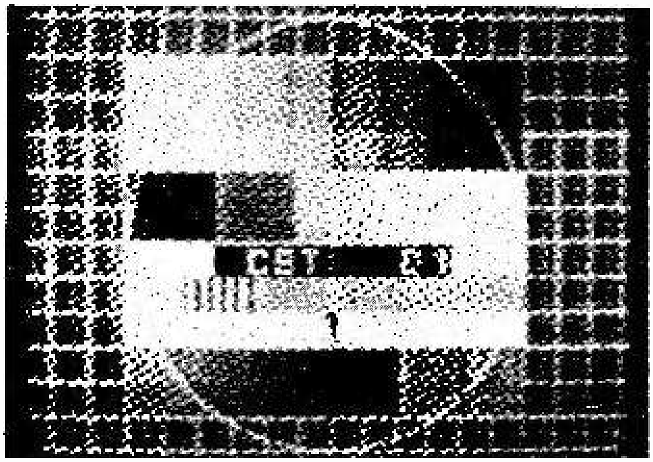

Fig. 3: Test card from Czechoslovakia TV, received on the author's JVC 3060 on 22 June 1979

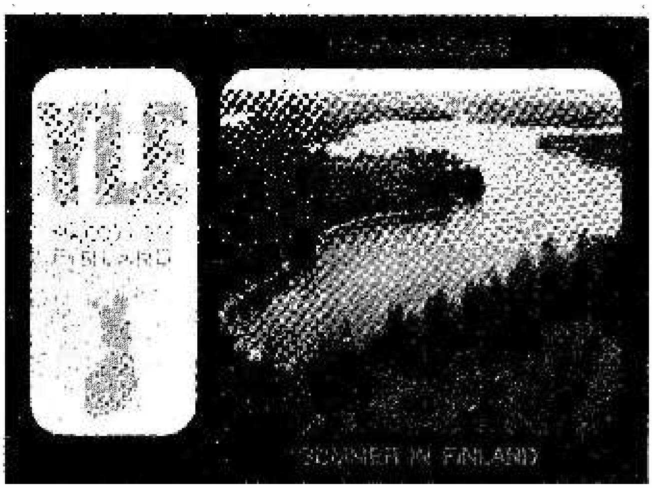

Fig. 4: The QSL card received by the author from Radio Finland

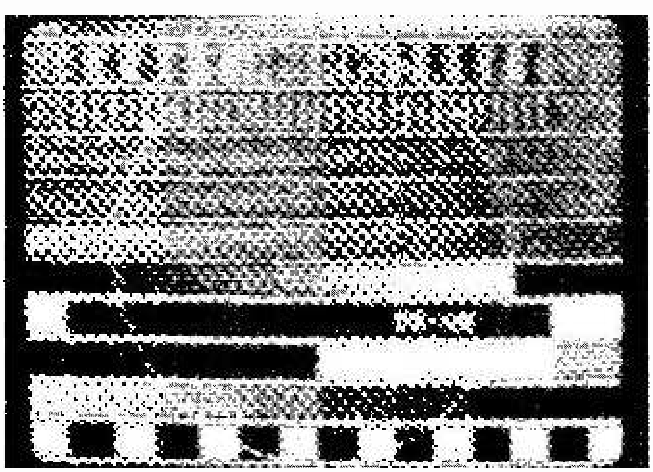

Fig. 5: A test card from Russia, received by the author in late June

Line, with English titles and the sound, on 56·25MHz, dubbed (I think) in Russian. I say, "I Think" because, during most of these sporadic-E events, pictures and sound from several countries fight for predominance on the same frequency, according to the changing intensity of the E layer. A good example of this occurred at 0645 on June 22. I had a steady test card from Czechoslovakia (Fig. 3), when suddenly it was blotted out by a test card from Poland. On July 2, **Guy Stanbury,** Reading, also using a JVC 3040, received strong pictures from Czechoslovakia with the sets own rod aerial. I received strong test cards from TV1-Sverige, at 1826 on July 20, and YLE-HLK-1, Finland. Earlier I sent a photograph of the YLE test card to Radio Finland and they replied with a fine QSL card, Fig. 4.

Satellites

"I took a portable OSCAR 8J rig in my car when I spent the last half of June in Lancashire", writes John Branegan. "I set it up on five days, on a site 350ft a.s.l., north of Blackburn and had 33 QSOs with 22 stations in 8 countries (DB, G, GM, I, PE, OZ, VE and W)." John's two aerials were mounted on his camera tripod, and the gear survived two heavy rain and thunderstorms. His best DX was W9KDR in Connecticut, and he was delighted with the performance of his narrow-band, u.h.f. MOSFET converter designed by JR1SWB and friends.

Up in Midlothian, at Bonnyrigg, **Alan Manning** is engaged in setting up a microwave and u.h.f. station for satellite tracking, possible astronomical use and for DXing. Let's hear more about this, Alan.

Microwaves

Talking of microwaves, on June 17, **Mitch Tribe** G8PMT, Lancing, Sussex, went to The Wrekin, 1300ft a.s.l. in Shropshire, for the second leg of the RSGB's 10GHz cumulative contest. He worked G3FNQ/P, G3FYX/P, G3NKL/P, G3YJH/P, G4HUP/P and G8ANZ/P, all at good strength with a best DX of 106km. On the 20th, Mitch worked F6DLA/P from Chanctonbury Ring, Sussex, to make his fifth QRA square needed to qualify for one RSGB microwave award, and the distance of 155km qualified him for another. Congratulations Mitch, I know the hard work and patience that you microwave men put in.

Tropospheric

As the deadline for the last issue's report arrived, a tropospheric disturbance was in progress and on June 18, John Cleaton made his first EI contact on 2m with EI9Q and went on to work DK, F, GW, ON, and northern G. During the evening of the 19th he heard several OZ stations, but they were too weak to contact. Harold Brodribb heard French f.m. stations in Band II on the 23rd, and on the 21st, **Alan Baker** G4GNX, Newhaven, and **John Brakespeare** G8RZP, Langley, worked F1EEM on 2m s.s.b.

Early on the 21st, I received strong pictures from the IBA transmitter at Lichfield on Channel 8, 189MHz, with only a dipole feeding the receiver. Pictures from Lichfield were again received during the early mornings of July 4, 5 and 13. Around 0800 on the 13th, I heard G3MUL/M on Epsom Downs have a QSO with GW8GPX/M in north Gwent via the Bristol Channel repeater GB3BC, R6.

On July 12, **John Tye** G4BYV, Dereham, Norfolk, worked LA6OI on 70cm and DC0HW, DC1XC and DC3UC on 23cm. During the evening of the 14th, **John**

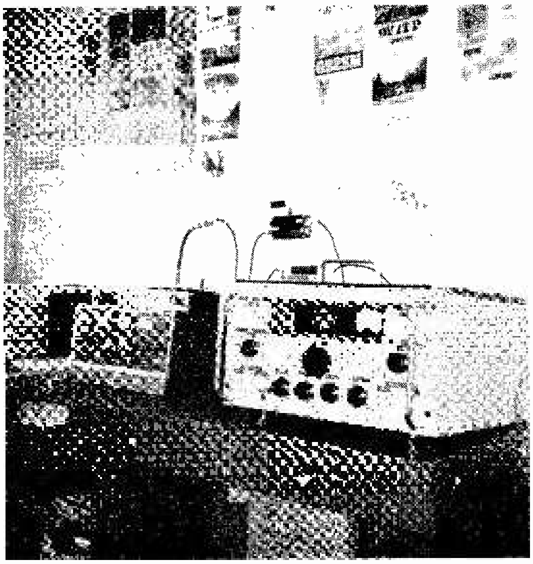

Fig. 6: The shack of Mr P. Moore in Cardiff, showing Trio 9R59DS (left) for broadcast listening, v.h.f. converter and AR88D which is used as a tunable i.f. for the converter

Swinnerton GJ2YS/M, past President of RSGB, worked G4GNX through the Brighton repeater GB3SR, R3, which is now working with a single colinear aerial and modified equipment. Later in the evening, G4GNX worked F1FSP, Paris and ON5UI on 2m s.s.b., and late on the 17th he had c.w. contacts with F9BO near Paris, and F1FIN/P in Tours. On the 19th, G8NXJ/M, Torbay, Devon, made contact through the Brighton repeater as did F0EJQ/P, Dieppe, on the 20th.

Another VHF Enthusiast

"I first became interested in Amateur radio about two and a half years ago, when I went to see GW4BJE", writes **P. Moore** from Cardiff, who is now equipped for listening on 10m, 2m and 70cm (Fig. 6) and is interested in f.m., s.s.b., c.w., SSTV and OSCAR 7.

VHF NFD

"A very good turn-out and a fine effort", was the way Alan Baker described the station entered jointly by the Brighton and District Radio Society and the Mid-Sussex Amateur Radio Society, for the RSGB's VHF NFD on July 7 and 8, on the South Downs, near Ditchling Beacon. While more than 20 amateurs and SWLs kept the station operating on 4 bands, several XYLs supplied them with good food throughout the event from a tent allocated for the cooking. They had 85 contacts on 4m, using the call G4GNX/P; 337 on 2m, G3ZMS/P; 105 on 70cm, G4GQR/P; and 12 on 23cm, G3RXJ/P. Their best DX on 4m was GM3WOJ/P, 513km; 2m, F1DYD, 738km; and 70cm, G4GBF, 413km. The station's aerials were mounted on four masts ranging between 20ft and 40ft high and their power was derived from two 3kW petrol generators.

"Conditions were fairly good on 23cm for VHF NFD", writes John Tye, who worked into Wales and Holland. John is also having problems getting QSL cards for 23cm contacts, out of 178 QSOs he has less than 100 replies, so, what about it lads, get those pens active.

David Wakefield

by Ron Ham

David Wakefield, a 17-year-old assembly worker at B and W Loudspeakers in his home town of Worthing, first became interested in radio when he joined the 45F Squadron of the Air Training Corps. In time he qualified as a cadet wireless operator and, after 3 years of service, now holds the rank of sergeant. He began listening, first on the h.f. bands with a broadcast receiver and then on v.h.f. with a domestic portable which covered the aircraft band, Band II and 2m. On one occasion he sent a 2m report to Mervyn Matthews G4EJV, who promptly called on David and gave him the gen about amateur radio. Another Worthing Club member, Nigel Stubbs G8LYA, loaned him a R1475 receiver which clinched his interest in the amateur bands and was encouraged to take the RAE course, run by G4FPM, at Worthing College of Technology, by his physics master, G8PTB. David passed the examination and has the callsign G8RVK, and is currently working on his c.w. in order to get a G4 call.

In his first five months operating on 2m he had more than 500 QSOs with 178 different stations. David is a member of Raynet and enjoys working mobile or portable and taking part in contests. His current equipment is an IC-245E transceiver, AR88 communications receiver, an 8-element Yagi for 2m s.s.b. and a home brew Slim Jim aerial for repeater working.

David is a regular reader of *Practical Wireless* and contributor to my column and by the end of the year hopes to be in the Royal Air Force as an Electronics Apprentice.

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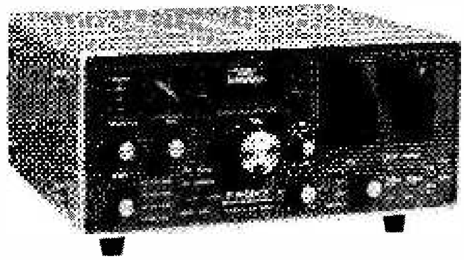

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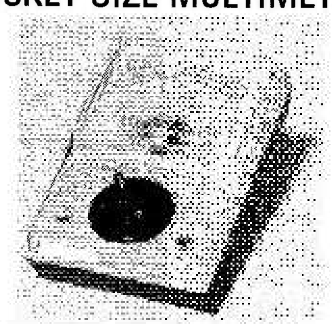

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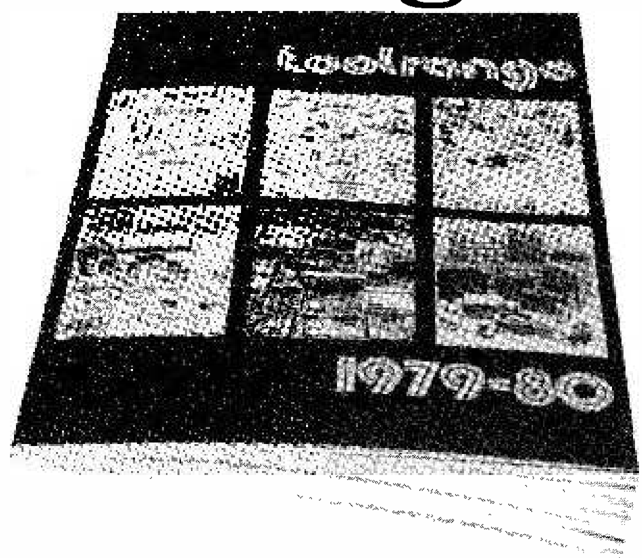

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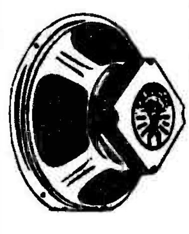

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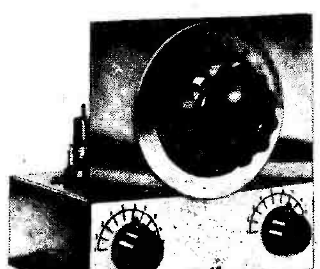

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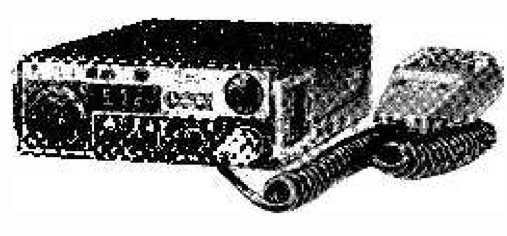

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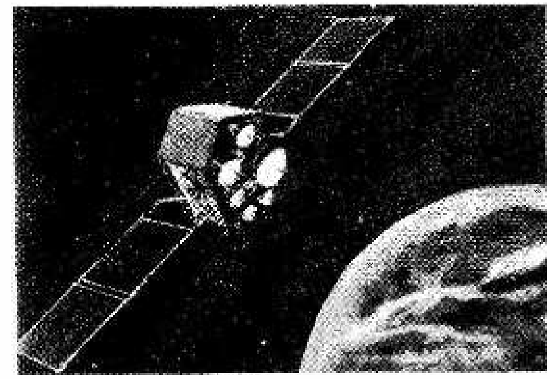

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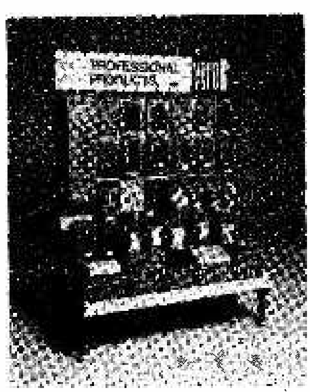

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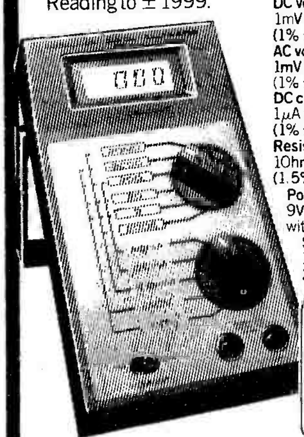
22–198



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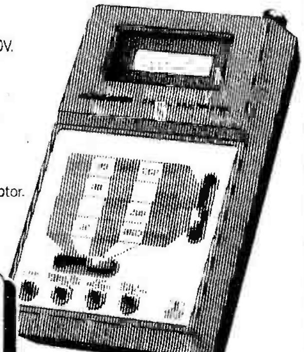

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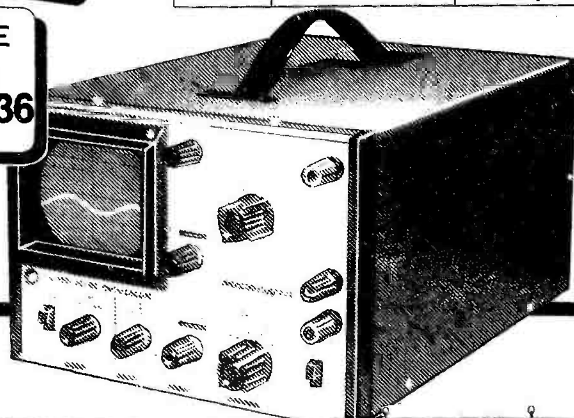

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OC35	1.73
OC36	1.73
OC41	0.92
OC42	0.86
OC43	2.59
OC44	0.69
OC45	0.63
OC71	0.63
OC72	0.63
OC73	1.15
OC74	0.74
OC75	0.74
OC76	0.63
OC77	1.38
OC81	0.74
OC81Z	1.38
OC82	0.74
OC83	0.74
OC84	0.74
OC122	1.73
OC123	2.02
OC139	2.59
OC140	3.16
OC141	3.74
OC170	1.15
OC171	1.15
OC200	1.73
OC201	2.02
OC202	2.02
OC203	2.02
OC204	2.88
OC205	2.88
OC206	2.88
OC207	2.02
OCP71	1.44
ORP12	1.15
R2008B	2.02
R2009	2.59
R2010B	2.02
T1C44	0.35
T1C226D	1.38
T1L209	0.23
T1P29A	0.47
T1P30A	0.48
T1P31A	0.51
T1P32A	0.55
T1P33A	0.79
T1P34A	0.84
T1P41A	0.72
T1P42A	0.81
T1P2955	0.77
T1P3055	0.64
T1S43	0.52
ZS140	0.29
ZS170	0.24
ZS178	0.62
ZS271	0.26
ZS278	0.65
ZTX107	0.13
ZTX108	0.12
ZTX109	0.14
ZTX300	0.14
ZTX301	0.15
ZTX302	0.17
ZTX303	0.20
ZTX304	0.22
ZTX311	0.14
ZTX314	0.23
ZTX500	0.15
ZTX501	0.16
ZTX502	0.18
ZTX503	0.20
ZTX504	0.23
ZTX531	0.23
ZTX550	0.18
1N914	0.06
1N916	0.08
1N4001	0.07
1N4002	0.07
1N4003	0.08
1N4004	0.08
1N4005	0.09
1N4006	0.09
1N4007	0.10
1N4009	0.07
1N4148	0.07
1N5400	0.15
1N5401	0.15
1S44	0.05
1S920	0.08
1S921	0.08
2G301	1.15
2G302	1.15
2G306	1.27
2N404	1.15
2N696	0.29
2N697	0.29
2N698	0.35
2N705	1.38
2N706	0.17
2N708	0.23
2N930	0.30
2N1131	0.30
2N1132	0.30
2N1302	0.40
2N1303	0.40
2N1304	0.52
2N1305	0.52
2N1306	0.58
2N1307	0.58
2N1308	0.63
2N1309	0.63
2N1613	0.29
2N1671	1.73
2N1893	0.29
2N2147	2.02
2N2148	1.89
2N2218	0.29
2N2219	0.28
2N2220	0.21
2N2221	0.21
2N2222	0.21
2N2223	3.16
2N2368	0.20
2N2369A	0.24
2N2484	0.23
2N2646	0.63
2N2904	0.29
2N2905	0.29
2N2906	0.24
2N2907	0.24
2N2924	0.24
2N2925	0.25
2N2926	0.16
2N3053	0.29
2N3054	0.58
2N3055	0.81
2N3440	0.69
2N3441	0.92
2N3442	1.26
2N3614	1.73
2N3702	0.13
2N3703	0.15
2N3704	0.15
2N3705	0.15
2N3706	0.15
2N3707	0.15
2N3708	0.12
2N3709	0.15
2N3710	0.12
2N3711	0.12
2N3771	2.02
2N3772	2.30
2N3773	3.45
2N3819	0.41
2N3820	0.52
2N3823	0.63
2N3866	0.83
2N3904	0.15
2N3905	0.15
2N3906	0.15
2N4058	0.16
2N4059	0.12
2N4060	0.14
2N4061	0.14
2N4062	0.15
2N4124	0.17
2N4126	0.17
2N4286	0.23
2N4288	0.25
2N4289	0.28
2N5457	0.40
2N5458	0.40
2N5459	0.40

VALVES

AZ31	1.26
CBL31	2.30
CL33	2.30
CY31	1.15
DAF91	0.46
DAF96	1.15
DF91	0.46
DF96	1.15
DK91	1.21
DK92	1.44
DK96	1.26
DL92	1.26
DL94	1.38
DL96	1.26
DY86/7	0.73
DY802	0.96
E80CC	9.27
EABC80	1.38
EAF42	1.44
EAF801	2.02
EB41	2.30
EB91	1.01
EBC33	2.02
EBC41	1.44
EBC81	1.26
EBC90	0.97
EBF80	0.58
EBF83	1.44
EBF89	0.97
EBL31	2.88
ECC40	1.44
ECC81	1.01
ECC82	0.82
ECC83	1.01
ECC84	1.36
ECC85	1.38
ECC88	2.07
ECC91	8.72
ECC189	1.90
ECF80	1.24
ECF82	1.38
ECH35	2.30
ECH42	1.32
ECH81	1.38
ECH83	1.44
ECH84	1.47
ECL82	1.15
ECL83	1.73
ECL86	1.38
EF37A	4.02
EF39	3.16
EF40	1.32
EF41	1.38
EF42	2.30
EF50	1.73
EF80	0.92
EF83	2.02
EF85	0.92
EF86	1.74
EF89	1.84
EF91	2.07
EF92	6.03
EF98	1.44
EF183	0.92
EF184	0.96
EH90	1.61
EL32	1.73
EL33	4.02
EL34 (Thorn)	2.53
EL34 (Mullard)	2.57
EL41	1.44
EL42	2.02
EL81	1.26
EL84	1.15
EL86	2.48
EL91	7.44
EL95	1.51
EL360	6.32
EM34	5.63
EM80	1.26
EM81	1.15
EM84	1.15
EM85	1.44
EM87	1.73
EN91	2.94
EY51	2.02
EY86	0.96
EZ40	1.44
EZ41	1.44
EZ80	0.96
EZ81	0.96
GZ30	1.38
GZ32	1.44
GZ33	4.60
GZ34	2.18
KT61	4.02
KT66	7.18
KT88	9.20
KTW61	2.02
KTW62	2.02
KTW63	2.02
MU14	1.73
N78	10.35
OA2	1.78
OB2	1.44
OC3	2.20
OD3	2.20
OZ4	1.84
PC86	1.61
PC88	1.61
PC97	1.38
PC900	1.38
PCC84	1.15
PCC88	1.38
PCC89	1.58
PCC189	1.61
PCF80	1.15
PCF82	1.15
PCF86	1.84
PCF87	1.84
PCF200	2.82
PCF201	2.45
PCF801	1.84
PCF802	1.82
PCF805	1.84
PCF806	1.84
PCF808	1.84
PCL82	1.15
PCL83	1.82
PCL84	1.15
PCL85	1.24
PCL86	1.24
PCL805/85	1.24
PD500	4.24
PFL200	2.07
PL36	1.38
PL81	1.38
PL81A	1.38
PL82	1.38
PL83	2.55
PL84	1.24
PL504/500	1.61
PL508	2.07
PL509	3.45
PL519	3.73
PL801	1.27
PL802	0.97
PY33	0.92
PY81	0.81
PY82	1.01
PY83	2.07
PY88	1.01
PY500A	2.07
PY800	0.97
PY801	0.97
QQV02-6	13.16
QQV03-10	5.44
QQV03-20A	20.13
QQV06-40A	40.25
R17	1.89
R19	1.38
R20	1.66
U18-20	2.88
U25	1.33
U26	1.66
UABC80	1.44
UAF42	1.44
UB41	1.44
UBC41	1.73
UBF89	1.38
UCC84	1.26
UCC85	1.38
UCF80	1.32
UCH42	1.38
UCH81	2.67
UCL82	1.20
UCL83	1.66
UF41	1.15
UF80	1.66
UF85	1.66
UF89	1.66
UL41	1.84
UL84	1.38
UM80	1.15
UY41	1.44
UY85	1.20
Z803U	9.09
1B3GT	2.58
1R5	1.21
1S5	0.46
1T4	0.46
2AS15	11.50
2D21	2.94
3A5	1.55
3CX100A5	23.00
3S4	1.26
4CX250B	28.53
5R4GY	2.30
5U4G	4.35
5U4GB	2.60
5V4G	1.75
5Y3GT	0.98
5Z3	1.73
5Z4G	1.75
5Z4GT	1.75
6-30L2	1.79
6AB7	1.73
6AC7	1.61
6AF4A	1.84
6AG7	2.30
6AH6	5.52
6AK5	3.98
6AK6	2.81
6AL5	1.01
6AM4	2.65
6AM5	4.43
6AM6	2.07
6AN5	6.12
6AN8A	3.30
6AQ5	1.10
6AR5	1.84
6AS6	6.42
6ASTGA	7.76
6AT6	0.98
6AU5G7	4.81
6AU6	1.24
6AV5GA	4.35
6AV6	0.98
6AX5GT	3.57
6B7	1.73
6B8	2.02
6BA6	1.15
6BA7	5.89
6BA8A	4.31
6BC4	4.27
6BE6	1.24
6BH6	1.75
6BJ6	1.24
6BK4	4.84
6BL6	97.25
6BL7GT	4.44
6BN6	1.89
6BQ7A	4.14
6BR7	4.60
6BR8	2.02
6BS7	4.60
6BW6	4.60
6BW7	1.75
6BX7GT	5.70
6BZ6	2.62
6C4	1.01
6CB6A	2.76
6CD6GA	5.64
6CG7	2.55
6CH6	7.48
6CL6	4.12
6CW4	8.33
6D2	1.01
6DK6	2.59
6DQ6B	4.49
6EA8	3.31
6EB8	2.44
6EW6	1.73
6F6	2.02
6F23	1.84
6F28	1.33
6H2N	1.21
6H3N	1.21
6H6	1.73
6J4	6.10
6J6	6.21
6J7	9.04
6K4N	1.44
6K6GT	1.50
6K7	1.73
6K8	2.02
6KD6	1.08
6L6G	2.88
6L6GA	1.73
6L6GT	2.24
6L6GC	2.24
6L7	2.30
6N2P	1.21
6N3P	1.21
6N7	1.73
6P25	4.14
6Q7	2.53
6R7	2.07
6SA7	1.67
6SC7	1.73
6SF7	1.84
6SH7	1.73
6SJ7	1.84
6SK7	1.50
6SL7GT	3.08
6SN7GT	1.84
6SQ7	1.50
6SR7	1.73
6SS7	2.07
6U5G	2.30
6U8	0.92
6U8A	3.24
6V6GT	1.84
6X4	1.38
6X5GT	0.97
7B7	1.96
7C5	2.02
7C6	1.44
7H7	2.30
7R7	1.73
7S7	2.59
7Y4	1.84
7Z4	2.13
12AT6	1.38
12At7	1.01
12AU6	2.83
12AU7	0.83
12AV6	2.30
12AV7	3.98
12AX7	1.01
12AY7	5.24
12B4A	3.50
12BA6	2.42
12BE6	2.55
12BH7	1.29
12BY7	3.01
12E1	8.17
19H4	28.75
30C15	1.84
30C17	1.84
30C18	1.84
30F5	1.93
30FL1/2	1.28
30FL12	2.07
30FL14	1.84
30L1	1.15
30L15	2.07
30L17	2.07
30P4	1.06
30P19	1.38
30PL1	1.52
30PL13	2.07
30PL14	1.93
30PL15	2.07
35W4	0.69
50C5	0.81
85A2	2.19
90AG	9.15
90AV	9.15
90C1	2.24
90CG	15.73
90CV	15.30
92AG	9.15
92AV	9.15
95A1	5.98
150B2	2.76
150B3	5.06
150C2	1.73
150C4	2.19
211	6.90
723AB	40.25
807	2.30
811A	9.78
812A	9.60
813	36.80
833A	86.25
866A	6.61
872A	15.81
931A	14.08
2050	8.00
5642	6.05
5654	4.05
5651	2.07
5670	5.29
5B14A	4.81
6080	7.88
6146A	5.89
6146B	6.42
6159	9.18
6973	4.05
7586	13.09
7587	22.54
7868	4.53
8068	6.33
8136	2.81
4CX250B	5.75

Tested ex equipment.

INTEGRATED CIRCUITS

7400	0.18
7401	0.18
7402	0.18
7403	0.18
7404	0.20
7405	0.18
7406	0.46
7407	0.46
7408	0.23
7409	0.23
7410	0.18
7412	0.30
7413	0.37
7416	0.37
7417	0.37
7420	0.20
7422	0.23
7423	0.37
7425	0.35
7427	0.35
7428	0.49
7430	0.20
7432	0.35
7433	0.41
7437	0.37
7438	0.37
7440	0.21
7441AN	0.97
7442	0.83
7447AN	1.04
7450	0.21
7451	0.21
7453	0.21
7454	0.21
7460	0.21
7470	0.40
7472	0.38
7473	0.41
7474	0.46
7475	0.62
7476	0.46
7480	0.63
7482	0.86
7483	1.04
7484	1.15
7486	0.40
7490	0.60
7491	0.92
7492	0.69
7493	0.69
7494	0.92
7495	0.83
7496	0.92
7497	3.45
74100	1.73
74107	0.52
74109	0.81
74110	0.58
74111	0.81
74116	2.02
74118	1.15
74119	1.73
74120	0.95
74121	0.46
74122	0.69
74123	1.15
74125	0.63
74126	0.63
74128	0.69
74132	0.81
74136	0.63
74141	0.92
74142	2.65
74143	2.88
74144	2.88
74145	1.04
74147	2.30
74148	2.02
74150	1.84
74151	0.97
74154	2.02
74155	0.97
74156	0.97
74157	0.86
74159	2.42
74170	2.65
74172	5.06
74173	1.61
74174	1.73
74175	1.04
74176	1.26
74178	1.44
74179	1.44
74180	1.32
74190	1.73
74191	1.73
74192	1.55
74193	1.55
74194	1.44
74195	1.15
74196	1.38
74197	1.26
74198	2.59
74199	2.59
76013N	2.02
LM309K	1.73
TAA570	2.65
TAA630S	4.02
TAA700	4.50
TBA480Q	2.12
TBA520Q	2.65
TBA530	2.28
TBA540Q	2.65
TBA550Q	3.70
TBA560CQ	3.70
TBA673	2.52
TBA700	1.75
TBA720Q	2.65
TBA750Q	2.38
TBA800	1.38
TBA920	3.34
TBA920Q	3.34
TBA990Q	3.34
TCA270Q	3.34
TCA760A	1.59

BASES

B7G unskirted	0.17
B7G skirted	0.35
B9A unskirted	0.17
B9A skirted	0.35
NUVISTOR	0.86
Int Octal	0.29
Loctal	0.63
8 pin DIL	0.17
14 pin DIL	0.17
16 pin DIL	0.20
Valve screening cans	0.35

CRT'S

1CP31	35.65
2AP1*	9.78
2BP1*	10.35
3BP1	9.20
3DP1*	5.75
3EG1*	8.05
3FP7	6.90
3GP1	6.90
3JP1*	9.20
3JP2*	9.20
3JP7*	11.50
3KP1*	17.25
3RP1*	40.25
5ADP1	40.25
5BP1*	11.50
5CP1*	11.50
5CP1A	46.00
5FP15A	17.25
5UP7	16.10
DG7-5	28.75
DG7-32	41.40
DH3-91	35.65
DH7-11	78.20
VCR97*	13.80
VCR138*	11.50
VCR138A*	14.38
VCR139A*	9.20
VCR517A*	11.50
VCR517B*	11.50
VCR517C*	11.50
3WP1	23.00
Tube Bases	0.86
Mu-Metal Screens	3.45

* = Surplus

REFERENCE BOOKS

BP1	First Book of Transistor Equivalents & Substitutes	0.60
BP2	Handbook of Radio, TV and Industrial & Transmitting Tube and Valve Equivalents	0.60
BP7	Radio and Electrical Colour Codes & Data Chart	0.25
BP14	Second Book of Transistor Equivalent & Substitutes	1.10
BP40	Digital I.C. Equivalents & Pin Connections	2.50
BP41	Linear I.C. Equivalents & Pin Connections	2.75
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