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JULY
1976

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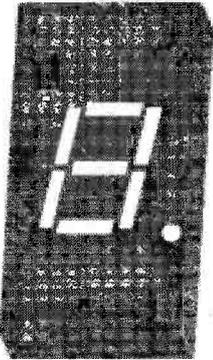
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PRACTICAL WIRELESS

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PW/7/76

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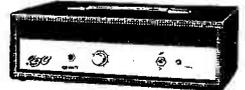


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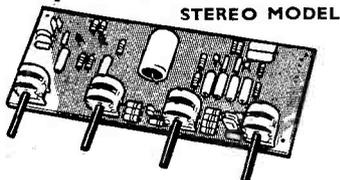
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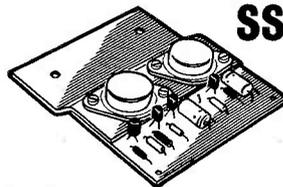
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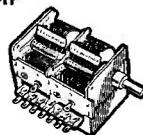
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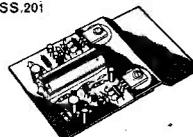
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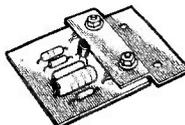
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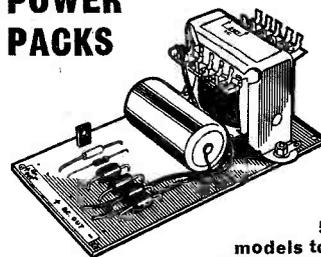
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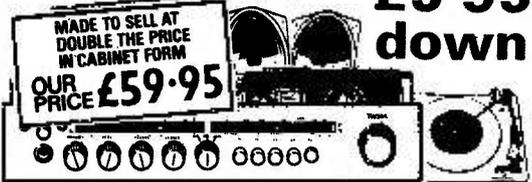
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All individually boxed and guaranteed. Full trade discounts to bona fide companies. Price and availability lists on application.

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12p for 1 Valve.
Each additional Valve add 2p in UK

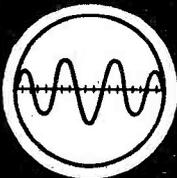
DM70	0-69	EF80	0-68	PC84	0-84	PL504	1-40	30C15/	
DY86/7	0-70	EF83	1-10	PC85	1-02	PL508	1-73	PCF800	1-22
DY802	0-52	EF85	0-70	PC88	0-88	PL509	2-23	30C17	1-29
EABCB80	1-16	EF86	1-73	PC89	0-97	PL502	2-23	30C18	
EB91	0-97	EF89	1-78	PCL189	1-22	PY33	0-73	PCF805	1-29
EBC81	0-38	EF91	1-35	PCF80	0-84	PY81/800	0-72	30F5/PP818	
EBF80	0-63	EF92	1-51	PCF82	1-37	PY82	0-70		1-35
EBF85	0-66	EF95	1-63	PCF86	0-97	PY86/7	70P	30FL1/	
EBF89	0-50	EF188	0-88	PCF200	1-50	PY88	0-84	PCF800	0-98
EC86	0-82	EF184	0-83	PCF201	1-50	PY90A	1-80	30FL2	1-03
EC88	0-86	EF190	1-22	PCF801	0-97	PY90	0-86	30FL12	1-44
EC89	0-94	EL34	1-40	PCF802	1-02	PY91	0-72	30FL14	1-20
EC97	0-89	EL36	0-50	PCF803	0-97	U26	1-22	30LL/PC84	
EC981	0-70	EL84	0-70	PCL82	1-78	U191	1-12		0-63
EC982	0-70	EL86	1-40	PCL83	1-84	U193	0-56	30LL15/	
EC983	0-70	EL95	1-02	PCF83	0-97	UABC80	1-01	PCF805	1-35
EC984	0-63	EM81	1-24	PCL84	0-88	UBC81	0-80	30LL17	1-12
EC985	1-02	EY61	0-85	PCL85	0-72	UBF89	0-45	30FLMR	1-33
EC986	1-22	EY88	0-85	PCL86	0-72	UC48	0-66	30P1Z	
EC989	0-77	EY86/87	0-70	PCL86	0-97	UC81	1-73	PC801	1-22
EC990	0-63	EY88	0-81	PCL805/800-97		UCL82	1-02	30P19/	
EC992	0-90	EZ80	0-84	PD500	2-28	UCL83	1-02	PC802	1-06
EC996	0-76	EZ81	0-70	PL200	1-23	UL84	1-23	30P1L/	
EC998	1-73	EY501	1-73	PL1	1-23	UY85	0-73	PCL801	1-35
EC999	0-66	EY88	0-85	PL1A	1-23	6/30LZ/		PC1800	1-47
EC999A	1-00	EC83	0-78	PL51A	1-40	EC804	1-20	30FL14/	
EC999B	1-02	PC88	1-40	PL62	0-43	6P28/EF812		30FL14/	
EC999C	0-69	PC88	1-40	PL63	1-78	PCL88	1-16	30FL15	1-44
EC999D	0-83	PC97	0-70	PL84	1-02	30C1/PCF80			
EC999E	0-82	PC900	0-84	PL500	1-40		0-84		

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A21	1-00	EF37A	1-50	N78	5-00
AZ21	1-00	EF39	1-25	OA2	0-45
CB131	1-40	EF80	0-85	OB2	0-45
CL33	1-80	EF86	0-45	PC86	0-65
CT31	1-00	EF86	0-65	PC88	0-65
DAF91	0-40	EF89	0-85	PC97	0-55
DAF98	0-80	EF91	0-40	PC900	0-55
DC900	1-85	EF92	0-50	PC84	0-45
DF91	0-40	EF95	0-45	PC88	0-68
DF96	0-60	EF98	0-80	PC89	0-60
DK91	0-50	EF183	0-60	PCL189	0-55
DK92	1-00	EF184	0-65	PCF80	0-40
DK96	0-75	EL32	0-60	PCF82	0-42
DL92	0-50	EL33	3-00	PCF86	0-65
DL94	0-48	EL34	0-70	PCF801	0-60
DL96	0-55	EL36	0-60	PCF802	0-55
DY86	0-45	EL37	3-40	PCF805	0-90
DY87	0-45	EL41	0-90	PCF806	0-90
DY802	0-47	EL42	0-85	PCF808	1-00
EABCB80	0-38	EL84	0-85	PCL82	0-45
EA472	0-70	EL95	0-60	PCL83	0-70
EB91	0-30	EM80	0-55	PCL84	0-50
EBC38	1-00	EM81	0-60	PCL85	0-60
EBC41	0-75	EM84	0-40	PCL86	0-50
EB981	0-40	EM87	1-00	PCL805/86	
EBF80	0-40	EY81	0-45	PD500	1-50
EBF83	0-45	EY86	0-65	PEN45	0-85
EBF89	0-38	EY88	0-60	PL86	0-62
EBL31	2-00	EZ40	0-60	PL81	0-55
EC981	0-45	EZ41	0-75	PL81	0-55
EC982	0-38	EZ80	0-80	PL82	0-50
EC983	0-38	EZ81	0-81	PL83	0-50
EC984	0-35	EY001	0-90	PL84	0-50
EC985	0-45	EZ80	0-60	PCF80	0-55
EC988	0-50	GZ22	0-45	PL504	0-35
EC989	0-50	GZ24	0-75	PL508	0-80
EC942	0-85	HN309	1-50	PL509	1-55
EC981	0-35	KT61	3-00	PL502	2-00
EC983	0-50	KT66	3-40	PX25	8-50
EC980	0-60	KT81(7C5)2-00		YF33	0-63
EC982	0-42	KT91	1-75	YF81	0-65
EC983	0-45	KT93	3-45	YF82	0-45
EC986	0-55	KTW61	1-50	YF83	0-80
ECLL800	3-50	MU14	1-00	YF88	0-83

PY500	1-10	GJ5M	0-85
PY81/800	0-50	GJ6G	0-45
PY801	0-55	GJ8	0-35
ST41	0-55	GJ7G	0-80
SP91	0-85	GJ7M	0-80
T41	1-50	GK6GT	0-50
U14	0-75	GK7G	0-85
U26	1-00	GK7M	0-45
U26	0-85	GK8G	0-45
U191	0-75	GK8M	0-70
UABC80	0-40	GK26	1-00
UAF42	0-75	GL6G	1-25
UBC41	0-40	GL6CC	0-80
UBC81	0-50	GQ7G	0-40
UBF80	0-50	GQ7M	0-60
UBF89	0-50	68L7GT	0-55
UC086	0-50	68N7GT	0-55
UC48	0-50	68Q7GT	0-50
UC81	0-80	GUBG	1-40
UC92	0-40	6V6G	0-80
UCL83	0-70	6V6GT	0-80
UF41	0-75	6X4	0-45
UF89	0-50	6X5G	0-45
UL41	0-85	6X5GT	0-55
UL84	0-50	7B6	0-80
UBC41	0-55	7B7	0-80
UY86	0-45	7C5	2-00
VR105/30	0-40	7C6	1-00
VR160/30	0-45	7H7	0-80
1R5	0-50	7R7	1-80
1R5	0-40	7R7	2-25
1T4	0-40	7Y4	0-80
884	0-55	12A7	0-45
8A5	0-45	12A7	0-45
6A87G	1-00	12A7	0-45
6A76	0-60	30PFL1	1-00
6A76	0-60	30PFL2	1-00
6A76	0-60	30PFL14	1-00
6A76	0-60	30PFL15	0-95
6A76	0-60	30PFL17	0-95
6A76	0-60	30PFL19	0-95
6A76	0-60	30PFL21	0-95
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6A76	0-60	30PFL191	0-95
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6A76	0-60	30PFL199	0-95
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6A76	0-60	30PFL203	0-95
6A76	0-60	30PFL205	0-95
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6A76	0-60	30PFL209	0-95
6A76	0-60	30PFL211	0-95
6A76	0-60	30PFL213	0-95
6A76	0-60	30PFL215	0-95
6A76	0-60	30PFL217	0-95
6A76	0-60	30PFL219	0-95
6A76	0-60	30PFL221	0-95
6A76	0-60	30PFL223	0-95
6A76	0-60	30PFL225	0-95
6A76	0-60	30PFL227	0-95
6A76	0-60	30PFL229	0-95
6A76	0-60	30PFL231	0-95
6A76	0-60	30PFL233	0-95
6A76	0-60	30PFL235	0-95
6A76	0-60	30PFL237	0-95
6A76	0-60	30PFL239	0-95
6A76	0-60	30PFL241	0-95
6A76	0-60	30PFL243	0-95
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VAO8

Designed for use with TUAC power amplifier modules. Extensive research has gone into various wide range tone control circuits to produce superb sound quality. Thousands are already in use in high quality professional amplification systems.

VAO8 Vol. Treb, Mid and Bass controls. HI. IMP. FET. I/P suitable Mid. Guitar, Radio, Crystal/Ceramic P.U. Sensitivity 4mV. Treble +35dB at 16kHz. Mid +20 -15dB at 1kHz Bass +20 -10dB at 40Hz.

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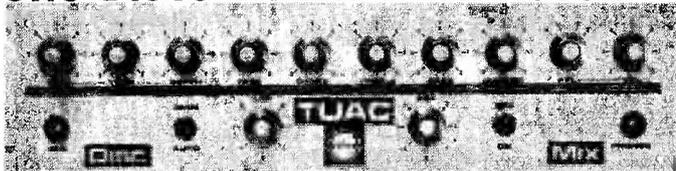
VAO6 Vol, Treb, and Bass controls. Sensitivity 8mV. Treb +28 -15dB at 12kHz, Bass ±18dB at 40 Hz.

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SVAO8 STEREO PRE AMP VqI, Treb, Mid and Bass controls, I/P suitable, Guitar, Radio, Crystal/Ceramic P.U. Sensitivity 4mV. Treble +35dB at 16kHz. Mid +20 -15dB at 4kHz. Bass +20 -10dB at 40Hz Plus Full Balance Control. Full I/C operation supply voltage ± 15VDC.

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MONO DISCO MIXER WITH AUTO FADE



Designed for the discerning D.J. of professional standard. Offering a vast variety of functions. Controls: Mic Vol; Tone, over-ride depth, auto/Manual Sw; Tape Vol; L & R Deck Faders; Deck Volume; Treble and Bass; H. Phon Vol Selector; Master Vol on/Off Sw. Max output 3V RMS.

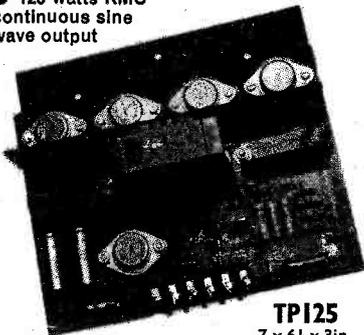
Specification: Deck Inputs—50mV into 1MΩ; Deck tone controls—Treble total range 36dB at 15kHz—Bass total range 36dB at 50Hz. Mic input—200 ohms upwards 2mV into 22kΩ. Mic tone control—Total range 40dB at 15kHz. Tape input—100mV into 200 ohms. Power requirements 20-50 volts D.C. at 50mA. (R.I.A.A. Comp mag inputs available 75p.)

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PANEL SIZE
18 x 4 1/2 in.
DEPTH 3 in.

★ TUAC AMPLIFIER MODULES ★ POWER AND QUALITY ★

- 125 watts RMS continuous sine wave output



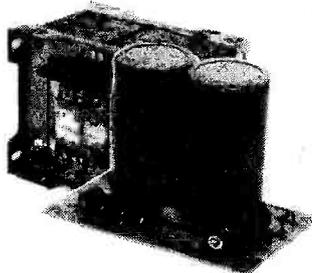
TP125
7 x 6 1/2 x 3 in

£23.25

- 4 R.C.A. 150 watt 15 amp output transistors

- Rugged layer wound driver transformer
- Short—Open—and Thermal overload protection
- Only 6 connections

Power supplies vacuum impregnated. Transformers with supply board incorporating pre-amp supply.



PS 250 for supplying 2 TP125s

£28.00

PS 60/60 for supplying 2 TL60s

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PS 125 ± 45 volts for TP125

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PS 100 ± 43 volts for TL100

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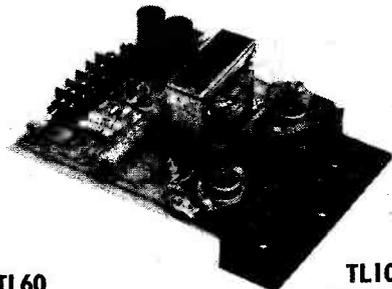
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PS 30 ± 25 volts for TL30

£9.75

PSU 2 for supplying disco mixer

£6.50



TL60

5 x 5 x 3 in

- 60 watts RMS continuous sine wave output
- 2 R.C.A. 110 watt 15 amp transistors

£16.75

TL100

5 x 5 x 3 in

- 100 watts RMS continuous sine wave output
- 2 R.C.A. 150 watt 15 amp transistors

£18.75

Specification on all power modules. All output power ratings ± 0.5dB; Output impedance 8-15 ohms; THD at full power 2% typically 1%; Input sensitivity 60mV into 10kΩ; Frequency response 20Hz-20kHz ±2dB; Hum and noise better than -70dB.

STOCKISTS—CALLERS ONLY

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Socodi, 9 The Friars (Tel. Canterbury 60948)

Cookies, Disco Centre, 132 West St. (Tel. Crewe 4739)

H.B. Electronics, 54 Montagu Street (Tel. Kettering 83922)

Leighton Electronics Centre, 59 North Street (Tel. Leighton Buzzard 2316)

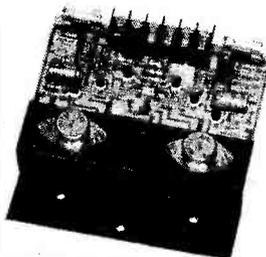
Al Music Centre, 88 Oxford Street, Manchester (Tel. 061-236 0340)

Damon Electronics, 89 Carrington Street (Tel. Nottingham 53880)

Electra Centre, 58 Lancaster Road (Tel. Preston 58488)

Mitchell Electronics, 64 Winchester Street (Tel. Salisbury 23689)

Mitchell Electronics for Southampton area



SIZE 5" x 5" x 1 1/2"

TL30 New from TUAC TL30 D.C. coupled power amplifier module.

- OUTPUT POWER 30 WATTS RMS CONTINUOUS SINE WAVE
- OUTPUT IMPEDANCE 8-15 OHMS
- T.H.D. AT FULL POWER 0.5%
- SIGNAL TO NOISE RATIO -85dB
- INPUT SENSITIVITY 60mV INTO 50K OHMS
- FREQUENCY RESPONSE 25Hz-50kHz
- 8 TRANSISTORS
- 4 DIODES
- ONLY SIX CONNECTIONS

£12.50

Send large stamped addressed envelope with all enquiries or send £1 (refundable against purchase) for fully illustrated 20 page catalogue.

FUZZ LIGHTS



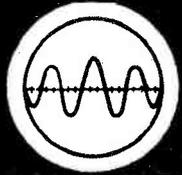
RED GREEN
BLUE AMBER

240 volt a.c. Long Life Candle Bulb, Revolving Reflector, adds a new dimension to disco lighting effects.

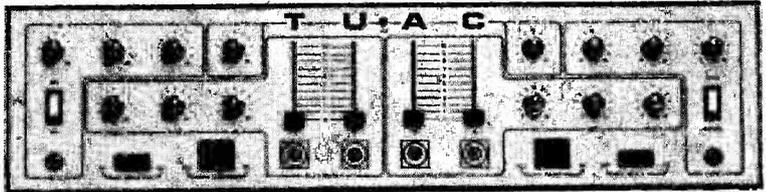
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PERSONAL SHOPPERS MON. TUES. THURS. FRI and SAT
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TUAC STEREO DISCO MIXER



INPUTS. Four identical stereo inputs available with any equalisation. Two magnetic and two flat supplied as standard. High quality slider control on each channel. Volume treble, and bass controls for each pair of sliders. Sensitivity mag., 3mV (R.I.A.A. comp.). Flat 50mV at 1kHz. Bass controls $\pm 18\text{dB}$ at 60Hz. Treble controls $\pm 18\text{dB}$ at 15kHz.

OUTPUTS. Up to 3 volts (+12dB) available. Attenuated output for TUAC Power Modules. Rotary Master and Balance controls. Band width 15Hz-25kHz $\pm 1\text{dB}$.

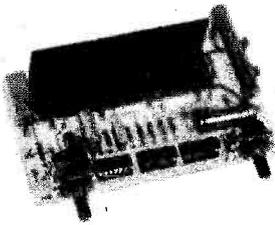
P.F.L. Output 250mV into 8 ohms. Rotary Volume Control. Monitoring facility for all 4 channels. Selection via touch sensitive illuminated switches. Switched visual cue indicator.

MISCELLANEOUS FACILITIES. Two illuminated deck on/off switches. Mains illuminated on/off switch. Auto fade illuminated on/off switch. Mains powered with integral screen and back cover. Complete with full instructions.

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Size: 25in long x 6in high x 3in deep

4 CHANNEL SOUND TO LIGHT SEQUENCE CHASER—4LSMI



- RCA 8A Triacs
- 1000W per channel
- Fully suppressed and fused
- Switched master control for sound operation from 1W to 125W
- Speed control for fixed rate sequence from 8 per minute to 50 per second
- Full logic integrated circuitry with optical isolation for amplifier protection
- Full wave control
- 13 easy connections

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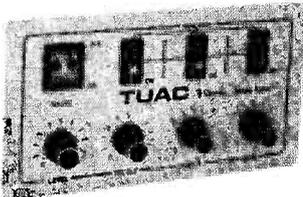
SILMB

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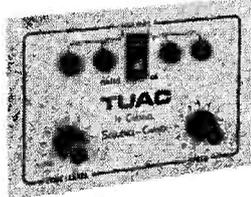
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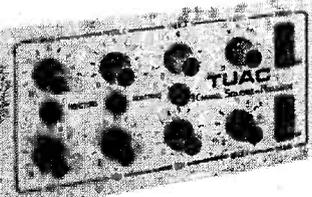
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7413	22p*	22p*	20p*
7414	22p*	22p*	20p*
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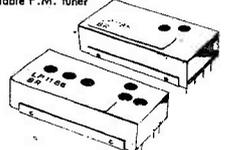
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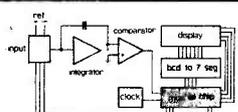
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T-DeC £4.05

U-DeC A £4.45

U-DeC B £7.85

N-DeC £10.45

IC carriers:—

16 dil: plain £1.07

with socket £2.21

10 TO5: plain 99p, with socket £1.95.

SST1 60p. SSU1 60p. SSM1 80p.



BATTERY ELIMINATOR BARGAINS

35 WAY SUPER

New switched model. 3 to 30V in 1V steps. Fully stabilized. 1A output. Kit £7.95. Assembled £10.95. 2 Amp model. Kit £9.95. Built £12.95.



6-WAY SPECIAL

Switched output of 3/4, 6/7 1/2, 9/12V at 500mA with 4-way multi-jack plug and free matching socket £5.20.

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Similar to above, but with press-stud battery connectors. 3 + 3/4 + 4 1/2 + 6 1/2 + 7 1/2 + 9/12 + 12V at 250mA. Also gives 15/18/24V single.

3-WAY MODEL

Switched output of 6 1/2/9V at 250mA with 4-way multi-jack plug and free matching socket £2.95*.

RADIO MODELS

50m with press-stud battery connectors for radios etc. 9V £3.25. 6V £3.45. 9 + 9V £4.45. 6+6V £4.45. 4 1/2 + 4 1/2V £4.45. Also 9V 300mA £3.95.

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7 1/2V output to run cassette recorders from the mains. Complete with 5 pin DIN plug. 50mA model £3.45. 300mA model £3.95.

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Input 12V DC. Output 6 1/2/9V DC 1A regulated £3.95*.

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4008/14008	0.75	4036/	1.80	4067/	—	2.95	14505/	3.30	14543/	1.50
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4010/14010	0.45	4038/14038	0.85	4069/14069	0.15	14508/4508	2.35	14552/	8.05	
4011/14011	0.15	4039/	2.85	4070/14070	0.15	14510/4510	1.10	14553/	3.50	
4012/14012	0.15	4040/14040	0.85	4071/14071	0.15	14511/4511	1.25	14554/	1.20	
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4014/14014	0.80	4042/14042	0.65	4073/14073	0.15	14514/4514	2.55	14556/4556	0.70	
4015/14015	0.80	4043/14043	0.80	4075/14075	0.15	14515/4515	2.55	14557/	3.20	
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4022/14022	0.75	4050/14050	0.45	4086/	—	0.55	14524/	N/S	14566/	1.20
4023/14023	0.15	4051/14051	0.75	4089/	—	0.65	14526/	1.50	14572/	0.35
4024/14024	0.60	4052/14052	0.75	4093/14093	0.65	14527/4527	1.20	14580/4018	6.00	
4025/14025	0.15	4053/14053	0.75	4094/	—	1.50	14528/4098	0.85	14581/40181	3.05
4026/	—	4054/	0.95	4095/	—	0.85	14529/	1.30	14582/40182	1.15
4027/14027	0.45	4055/	1.05	4096/	—	0.85	14530/	0.65	14583/	0.71
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- Ready to plug in—no soldering at all
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- Individual deck controls AND left/right fader
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MODULAR PCB with all electronics
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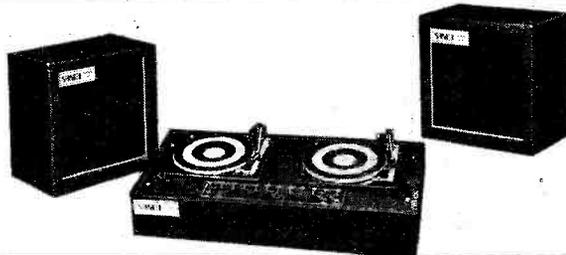
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Today's most challenging value—with sound-light converter, synchronous motor twin turntables, and features that give you professional levels of operation, it still costs under £200 (V.A.T. extra). With full-range heavy duty speakers which pack to make a single complete transportable unit. ABSOLUTELY COMPLETE INC. HEADPHONES, CONDENSER MIC. & CONNECTING CABLES.

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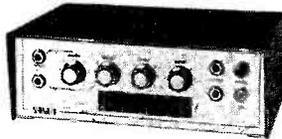


MINOTAUR 100

100 WATT RMS TOTAL
RANGE AMPLIFIER

Compatible with all Saxon System 7000 units, this is a superb amplifier readily adaptable to a wide range of applications

- 100W r.m.s. into 8 Ω.
- Two mixed inputs, wide range bass and treble controls
- May be operated as a slave amplifier
- Extremely compact (27cm x 16cm x 10cm)



- Fully protected against all incorrect loads and short circuits
- Plug isolated terminals
- Silver anodised fascia

£49.50

SYSTEM 7000 LIGHTING CONTROL

- Full control of 3kW of lights (1kW/channel)
- Audio control plus sequence plus override
- Variable speed sequence
- Stainless steel two tone panel—matches mixer
- Operates from any amplifier
- Attractive Bondene case—free standing or panel mounting
- Inc. case and plug—ready to use

£38.00



SUPERFECT MODULE
On P.C.B. panel mounting £27.75

SOUNDLITE 3KW
CONVERTER
Use with any amp. £15.50

SYSTEM 7000 MODULAR MIXING

- Inputs for all sources inc. mag. cartridge
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- ½W monitor power outlet
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- With front panels, ready to use
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INPUT		MIXER	
Mono	£8.50	Mono	£8.50
Stereo	£12.00	Stereo	£12.00

PCB Modules only		PCB Modules only	
Mono	£5.50	Mono	£5.50
Stereo	£9.00	Stereo	£9.00



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SUPERSTROBE AT NEW LOW PRICE
 ■ 1 flash/2 secs.—up to 20/sec.
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 ■ Ideal for mobile disco or smaller club
 NOW ONLY £17.50

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 ■ Giant 80 watt tube
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150 WATT LIQUID WHEEL PROJECTOR
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Loudspeakers 12"/50W high grade chassis units: 14000 gauss: presence dome: £14.50

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Sparkrite mk2

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- * Smoother running
- * Instant all-weather starting
- * Continual peak performance
- * Longer coil/battery/plug life
- * Improved acceleration/top speeds
- * Up to 20% better fuel consumption

Sparkrite Mk. 2 is a high performance, high quality capacitive discharge, electronic ignition system in kit form. Tried, tested, proven, reliable and complete. It can be assembled in two or three hours and fitted in 15/30 mins.

Because of the superb design of the Sparkrite circuit it completely eliminates problems of the contact breaker. There is no misfire due to contact breaker bounce which is eliminated electronically by a pulse suppression circuit which prevents the unit firing if the points bounce open at high R.P.M. Contact breaker burn is eliminated by reducing the current to about 1/50th of the norm. It will perform equally well with new, old, or even badly pitted points and is not dependent upon the dwell time of the contact breakers for recharging the system. Sparkrite incorporates a short circuit protected inverter which eliminates the problems of SCR lock on and, therefore, eliminates the possibility of blowing the transistors or the SCR. (Most capacitive discharge ignitions are not completely foolproof in this respect). All kits fit vehicles with coil/distributor ignition up to 8 cylinders.

THE KIT COMPRISES EVERYTHING NEEDED

Ready drilled pressed steel case coated in matt black epoxy resin, ready drilled base and heat-sink, top quality 5 year guaranteed transformer and components, cables, coil connectors, printed circuit board, nuts, bolts, silicon grease, full instructions to make the kit negative or positive earth, and 10 page installation instructions.

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Electronic/conventional ignition switch. Gives instant changeover from "Sparkrite" ignition to conventional ignition for performance comparisons, static timing etc., and will also switch the ignition off completely as a security device, includes: switch connectors, mounting bracket and instructions. Cables excluded. Also available RPM limiting control for dashboard mounting (fitted in case on ready built unit).

CALLERS WELCOME. For Crypton tuning and fitting service - phone (0922) 33008.

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Quick installation
No engine modification
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Mk. 2 DIY Ass. Kit @ £11.80	QUANTITY NEEDED	I enclose cheque/PO's for £
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Wired ready for use
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that flash independently
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TWIN BANK 6 LIGHT UNIT
(less lamps) LENGTH
14 1/2 inches **UNIT**
B.C. Fitting **£9.55**
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Sound to Light MASTER UNIT 600 WATTS PER CHANNEL
£30.95
INCLUDING CHANNEL
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(less lamp)
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Length 31 1/2
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CLEAR **£1.18** each
Minimum 3 lamps
£3.54
B.C. or E.S. Fitting

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Power capability: 40 watts peak. Frequency range: 40 Hz-20 KHz
Sensitivity: 85 dB/M for 1 watt electrical input. Input Impedance:
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£8.50 each Stereo pair £16.50
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(Nov. 75 article by A. C. Ainslie)

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15-240 Watts!

HY5 Pre-amplifier

The HY5 is a mono hybrid amplifier ideally suited for all applications. All common input functions (mag Cartridge, tuner, etc) are catered for internally. The desired function is achieved either by a multi-way switch or direct connection to the appropriate pins. The internal volume and tone circuits merely require connecting to external potentiometers (not included). The HY5 is compatible with all I.L.P. power amplifiers and power supplies. To ease construction and mounting a P.C. connector is supplied with each pre-amplifier.

FEATURES: Complete pre-amplifier in single pack—Multi-function equalization—Low noise—Low distortion—High overload—Two simply combined for stereo.

APPLICATIONS: Hi-Fi—Mixers—Disco—Guitar and Organ—Public address

SPECIFICATIONS:

INPUTS: Magnetic Pick-up 3mV; Ceramic Pick-up 30mV; Tuner 100mV; Microphone 10mV; Auxiliary 3-100mV; Input impedance 4-7kΩ at 1kHz.

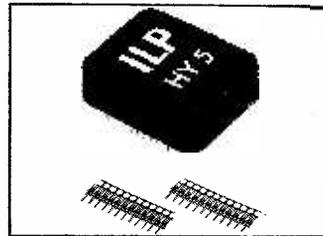
OUTPUTS: Tape 100mV; Main output 500mV R.M.S.

ACTIVE TONE CONTROLS: Treble ± 12dB at 10kHz; Bass ± at 100Hz.

DISTORTION: 0-1% at 1kHz. Signal/Noise Ratio 68dB.

OVERLOAD: 38dB on Magnetic Pick-up. SUPPLY VOLTAGE ± 16-50V.

Price £4.75 + £1.19 VAT P&P free.



HY30 15 Watts into 8Ω

The HY30 is an exciting New kit from I.L.P. It features a virtually indestructible I.C. with short circuit and thermal protection. The kit consists of I.C., heatsink, P.C. board, 4 resistors, 6 capacitors, mounting kit, together with easy to follow construction and operating instructions. This amplifier is ideally suited to the beginner in audio who wishes to use the most up-to-date technology available.

FEATURES: Complete Kit—Low Distortion—Short, Open and Thermal Protection—Easy to Build.

APPLICATIONS: Updating audio equipment—Guitar practice amplifier—Test amplifier—audio oscillator.

SPECIFICATIONS:

OUTPUT POWER 15W R.M.S. into 8Ω; **DISTORTION** 0-1% at 1-5W.

INPUT SENSITIVITY 500mV. **FREQUENCY RESPONSE** 10Hz-16kHz—3dB.

SUPPLY VOLTAGE ± 18V.

Price £4.75 + £1.19 VAT P&P free.

**Available
June '76**

HY50 25 Watts into 8Ω

The HY50 leads I.L.P.'s total integration approach to power amplifier design. The amplifier features an integral heatsink together with the simplicity of no external components. During the past three years the amplifier has been refined to the extent that it must be one of the most reliable and robust High Fidelity modules in the World.

FEATURES: Low Distortion—Integral Heatsink—Only five connections—7 amp output transistors—No external components

APPLICATIONS: Medium Power Hi-Fi systems—Low power disco—Guitar amplifier

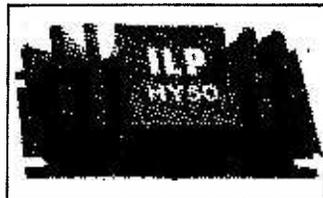
SPECIFICATIONS: INPUT SENSITIVITY 500mV

OUTPUT POWER 25W RMS into 8Ω **LOAD IMPEDANCE** 4-16Ω **DISTORTION** 0-04% at 25W

at 1kHz **SIGNAL/NOISE RATIO** 75dB **FREQUENCY RESPONSE** 10Hz-45kHz—3dB.

SUPPLY VOLTAGE ±25V **SIZE** 105 50 25mm

Price £6.20+£1.55 VAT P&P free.



HY120 60 Watts into 8Ω

The HY120 is the baby of I.L.P.'s new high power range. Designed to meet the most exacting requirements including load line and thermal protection this amplifier sets a new standard in modular design.

FEATURES: Very low distortion—Integral heatsink—Load line protection—Thermal protection—Five connections—No external components

APPLICATIONS: Hi-Fi—High quality disco—Public address—Monitor amplifier—Guitar and organ

SPECIFICATIONS

INPUT SENSITIVITY 500mV.

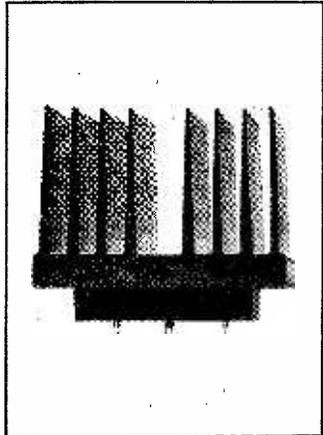
OUTPUT POWER 60W RMS into 8Ω **LOAD IMPEDANCE** 4-16Ω **DISTORTION** 0-04% at 60W

at 1kHz **SIGNAL/NOISE RATIO** 90dB **FREQUENCY RESPONSE** 10Hz-45kHz—3dB

SUPPLY VOLTAGE ±35V

SIZE 114 50 85mm

Price £14.40+£1.16 VAT P&P free.



HY200 120 Watts into 8Ω

The HY200 now improved to give an output of 120 Watts has been designed to stand the most rugged conditions such as disco or group while still retaining true Hi-Fi performance.

FEATURES: Thermal shutdown—Very low distortion—Load line protection—Integral heatsink—No external components

APPLICATIONS: Hi-Fi—Disco—Monitor—Power slave—Industrial—Public Address

SPECIFICATIONS

INPUT SENSITIVITY 500mV

OUTPUT POWER 120W RMS into 8Ω **LOAD IMPEDANCE** 4-16Ω **DISTORTION** 0-05% at

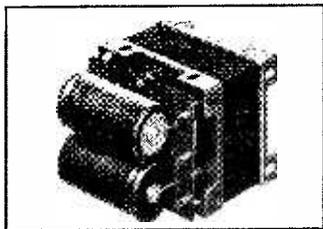
100W at 1kHz.

SIGNAL/NOISE RATIO 96 dB **FREQUENCY RESPONSE** 10Hz-45kHz—3dB **SUPPLY VOLTAGE**

±45V

SIZE 114 100 85mm

Price £21.20+£1.70 VAT P&P free.



HY400 240 Watts into 4Ω

The HY400 is I.L.P.'s "Big Daddy" of the range producing 240W into 4Ω! It has been designed for high power disco address applications. If the amplifier is to be used at continuous high power levels a cooling fan is recommended. The amplifier includes all the qualities of the rest of the family to lead the market as a true high power hi-fidelity power module.

FEATURES: Thermal shutdown—Very low distortion—Load line protection—No external components.

APPLICATIONS: Public address—Disco—Power slave—Industrial

SPECIFICATIONS

OUTPUT POWER 240W RMS into 4Ω **LOAD IMPEDANCE** 4-16Ω **DISTORTION** 0-1% at

240W at 1kHz

SIGNAL NOISE RATIO 94dB **FREQUENCY RESPONSE** 10Hz-45kHz—3dB **SUPPLY VOLTAGE**

±45V

INPUT SENSITIVITY 500mV **SIZE** 114 x 100 x 85mm

Price £29.25+£2.34 VAT P&P free.

POWER SUPPLIES

PSU36 suitable for two HY30's £4.75 plus £1.19 VAT. P/P free.

PSU50 suitable for two HY50's £6.20 plus £1.55 VAT. P/P free.

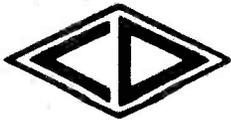
PSU70 suitable for two HY120's £12.50 plus £1.00 VAT. P/P free.

PSU90 suitable for one HY200 £11.50 plus £0.92 VAT. P/P free.

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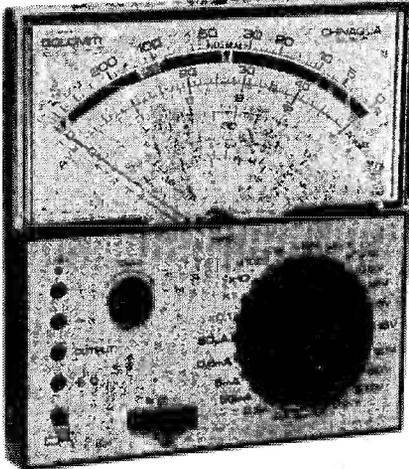
Accuracy: D.C. ranges, ± 2.0%, A.C. & Ω ranges ± 2.5%.

39 ranges: d.c.V, 0-150mV, 500mV, 1.5V, 5V, 15V, 50V, 150V, 500V, 1.5kV; d.c.I. 0-50μA, 500μA, 5mA, 50mA, 0.5A, 5A; a.c.V, 5V, 15V, 50V, 150V, 500V, 1.5kV; a.c.I, 5mA, 50mA, 0.5A, 5A; dB -10 to +65 in 6 ranges; Ω 0-0.5kΩ, 5kΩ, 50kΩ, 500kΩ, 5MΩ, 50MΩ; pf 50kpf, 500kpf.

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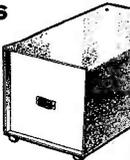
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VA (Watts)	REF	PRICE CASED	PLUGS 2 Pin+Earth	PRICE OPEN	POST
60	149	9.45	0.98	5.02	0.72
200	151	12.87	0.85	9.07	0.97
250	152	14.47	0.98	10.81	1.18

AUTO TRANSFORMERS

See catalogue for full range.

VA (Watts)	REF	PRICE CASED	PLUGS 2 & 3 pin	PRICE OPEN	POST
1500	93	24.37	0.95	20.13	O/A

MINIATURE & EQUIPMENT

Primary 240V with screen. See catalogue for full range.

VOLTS	MILLIAMPS	REF	PRICE	POST		
3-0-3	2	200	2.85	1.75	0.34	
0-6	0-6	500	500	2.84	1.75	0.34
0-8	0-6	1000	1000	2.12	2.32	0.46
0-9	—	100	13	1.75	0.34	
0-9	0-9	330	330	2.55	1.75	0.34

12 & 24 VOLTS

Primary 200-240 Volts. See catalogue for full range.

AMPS	24V	REF	PRICE	POST
12V	1	71	2.64	0.61
4	2	18	3.17	0.62
6	3	70	4.82	0.72
8	4	108	5.65	0.85

30 VOLTS

Primary 200/240V
Secondary 12, 15, 20, 24, 30V

AMPS	REF	PRICE	POST
0.5	112	2.17	0.61
1	79	2.74	0.66
2	3	4.32	0.72
3	20	5.05	0.85
4	21	5.98	0.85
5	51	7.05	0.95
6	117	7.88	0.97
8	88	10.31	1.18
10	89	10.87	1.18

50 VOLTS

Primary 200/240V
Secondary 19, 25, 33, 40, 50V

AMPS	REF	PRICE	POST
0.5	102	2.33	0.61
1	103	3.67	0.76
2	104	5.57	0.85
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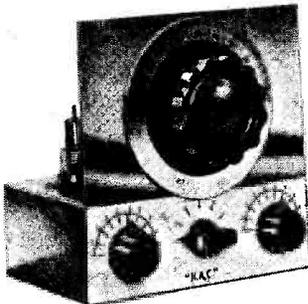
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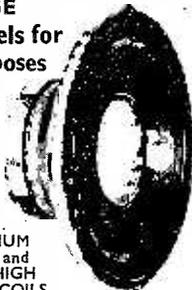
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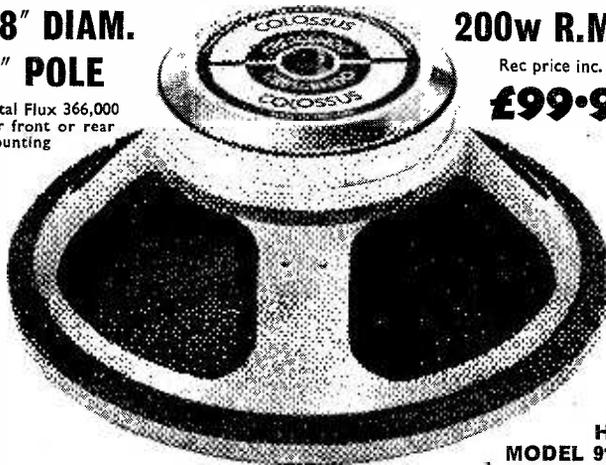
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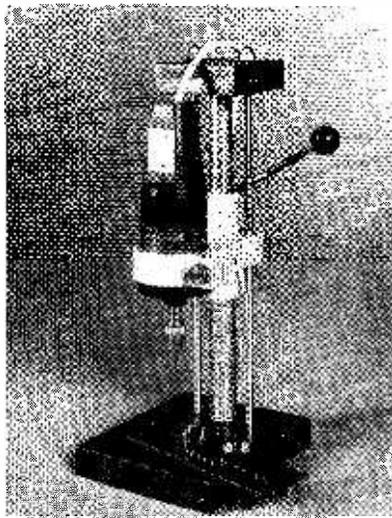
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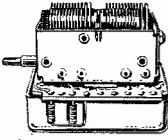
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Push Button Switch bank. 8 Buttons giving 16 S/C C/O interlocked switches plus 1 Cancel Button Plus 3 d/p c/o. Overall size 5" x 2 1/2" x 1 1/2". Supplied complete with chrome finished switch buttons. 2 for **£1.50 + 10p P. & P.**

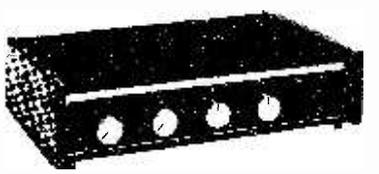
HI-FI LOUDSPEAKER SYSTEM MK II

Beautifully made, simulated teak finish enclosure with attractive slatted front. Size 16 1/2" high x 16 1/2" wide x 9" deep (approx.). Fitted with E.M.I. Ceramic Magnet 13" x 8" bass unit, H.F. tweeter unit and crossover. **AVAILABLE IN NOMINAL 4 Ohm, 8 Ohm or 16 Ohm impedance (state which).**
OUR PRICE £12.00 each Carr. £1.60.
Cabinet Available Separately £7.25, Carr. £1.20.
Also available in 8 ohms with EMI 13" x 8" bass speaker with parasitic tweeter £10.25, Carr. £1.60.

LOUDSPEAKER BARGAINS
5in. 3 ohm £1.45, P. & P. 30p. 7 x 4in. 3 ohm £1.60, P. & P. 45p. 10 x 6in. 3 or 16 ohm £2.50, P. & P. 70p. E.M.I. 6 x 5in. 3 ohm with high flux magnet £2.06, P. & P. 50p. E.M.I. tweeter. Approx. 3 1/2". Available 3 or 8 or 15 ohms. **£2.00 + 25p. P. & P.**

"POLY PLANAR" WAFER-TYPE, WIDE RANGE ELECTRO-DYNAMIC SPEAKER
Size 11 1/2" x 14 1/2" x 1 1/2" deep. Weight 19oz. Power handling 20W r.m.s. (40W peak). Impedance 8 ohm only. Response 40Hz-20KHz. Can be mounted on ceilings, walls, doors, under tables, etc., and used with or without baffle. Send S.A.E. for full details.
Only **£7.25** each + P. & P. (one 60p, two 80p).
Now also available 8" - 8 ohm 10 watts, r.m.s. 20 watt peak 40 Hz-20,000 Hz. Overall depth 1 1/2". Ideal for Hi-Fi or for use in cars **£4.90 + p. & p.** (one 35p, two 65p).

HARVERSONIC SUPERSOUND 10 + 10 STEREO AMPLIFIER KIT



A really first-class Hi-Fi Stereo Amplifier Kit. Uses 14 transistors including Silicon Transistors in the first five stages on each channel resulting in even lower noise, level with improved sensitivity. Integrated pre-amp with Bass, Treble and two Volume Controls. Suitable for use with Ceramic or Crystal cartridges. Very simple to modify to suit magnetic cartridge—Instructions included. Output stage for any speakers from 8 to 15 ohms. Compact design, all parts supplied including drilled metalwork high quality ready drilled printed circuit board with component identification clearly marked, smart brushed anodised aluminium front panel with matching knobs, wire, solder, nuts, bolts—no extras to buy. Simple step by step instructions enable any constructor to build an amplifier to be proud of. Brief specification: Power output: 14 watts r.m.s. per channel into 5 ohms. Frequency response \pm 3dB 12-30,000 Hz Sensitivity: better than 80mV into 1M Ω . Full power bandwidth: \pm 3dB 12-15,000 Hz. Bass boost approx. to \pm 12dB. Treble cut approx. to -16dB. Negative feedback 18dB over main amp. Power requirements 35v, at 1.0 amp. Overall Size 12" w x 8" d. x 2 1/2" h.

Fully detailed 7 page construction manual and parts list free with kit or send 25p plus large S.A.E.

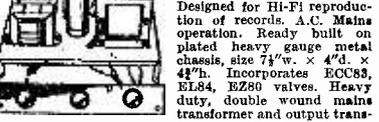
AMPLIFIER KIT **£13.50 P. & P. 55p** (Magnetic input components 35p extra)

POWER PACK KIT **£4.85 P. & P. 85p**
CABINET **£4.85 P. & P. 75p**

SPECIAL OFFER—only £22.50 if all 3 items ordered at one time including P. & p.

Full after sales service
Also available ready built and tested **£29.25. P. & P. £1.**

Note: The above amplifier is suitable for feeding two mono sources into inputs (e.g. mike, radio, twin record deck), etc. and will then provide mixing and fading facilities for medium powered Hi-Fi Discotheque use, etc.

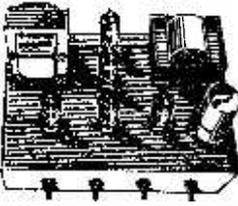


3-VALVE AUDIO AMPLIFIER HA34 MK II
Designed for Hi-Fi reproduction of records. A.C. Mains operation. Ready built on plated heavy gauge metal chassis, size 7 1/2" w. x 4" d. x 4 1/2" h. Incorporates ECC83, EL84, 3Z80 valves. Heavy duty, double wound mains transformer and output transformer matched for 3 ohm speaker. Separate volume control and now with improved wide range tone controls giving bass and treble lift and cut. Negative feedback line. Output 4 1/2 watts. Front panel can be detached and leads extended for remote mounting of controls. Complete with knobs, valves, etc., wired and tested for only **£7.80. P. & P. 85p.**

HSL "FOUR" AMPLIFIER KIT. Similar in appearance to HA34 above but employs entirely different and advanced circuitry. Complete set of parts, etc **£7.00 P. & P. 85p.**

10/14 WATT HI-FI AMPLIFIER KIT

A stylishly finished monaural amplifier with an output of 14 watts from 2 EL84s in push-pull. Super reproduction of both music and speech, with negligible hum. Separate inputs for mike and gram allow records and announcements to follow each other. Fully shrouded section wound output transformer to match 3-15 Ω speaker and 2 independent volume controls, and separate bass and treble controls are provided giving good lift and cut. Valve line-up 2 EL84s, ECC83, EF86 and E280 rectifier. Simple instruction booklet 25p + S.A.E. (Free with parts) All parts sold separately. **ONLY £11.25 P. & P. £1.25.** Also available ready built and tested **£15.20 P. & P. £1.20.**



SPECIAL OFFER Limited number of the latest BSR C141RI Auto/Manual changer de-luxe. Lightweight tubular arm, cueing lever bias compensator **£12.60 + £1.10 p. & p.**

Prices include VAT at Current Rate

(Please write clearly)
PLEASE NOTE: P. & P. CHARGES QUOTED APPLY TO U.K. ONLY. P. & P. ON OVERSEAS ORDERS CHARGED EXTRA.

SEMI-CONDUCTORS

TRANSISTORS

BRAND NEW FULLY GUARANTEED

Type	Price	Type	Price	Type	Price	Type	Price	Type	Price	Type	Price	Type	Price	Type	Price	Type	Price	Type	Price	Type	Price
AC117K	*0.18	AF175	*0.51	BC159C	*0.10	BC440	*0.31	BF117	*0.46	BFY53	*0.13	OC75	*0.16	2N705	*0.08	2N2646	*0.34	2N3703	*0.09		
AC126	*0.14	AF179	*0.51	BC170	*0.10	BC450	*0.37	BF119	*0.71	BFY59	*0.16	OC76	*0.16	2N706A	*0.09	2N2646	*0.34	2N3704	*0.09		
AC127	*0.11	AF181	*0.51	BC171	*0.09	BD115	*0.63	BF152	*0.56	BSX30	*0.16	OC77	*0.26	2N708	*0.11	2N2650	*0.18	2N3705	*0.08		
AC128	*0.11	AF186	*0.51	BC172	*0.09	BD116	*0.81	BF153	*0.48	BSY25	*0.16	OC81	*0.16	2N718	*0.15	2N2650A	*0.18	2N3706	*0.08		
AC128K	*0.26	AF239	*0.38	BC173	*0.09	BD123	*0.87	BF154	*0.46	BSY26	*0.16	OC81D	*0.16	2M918	*0.18	2N2905A	*0.18	2N3707	*0.08		
AC141	*0.19	AL102	*0.75	BC174	*0.15	BD124	*0.79	BF155	*0.71	BSY27	*0.16	OC82	*0.16	2N1131	*0.18	2N2905A	*0.18	2N3708	*0.08		
AC142	*0.18	AL103	*0.75	BC175	*0.22	BD131	*0.38	BF156	*0.49	BSY28	*0.16	OC82D	*0.16	2N1132	*0.18	2N2906A	*0.14	2N3709	*0.08		
AC142K	*0.26	BC107	*0.08	BC176	*0.18	BD132	*0.40	BF157	*0.31	BSY29	*0.16	OC83	*0.20	2N1302	*0.15	2N2907	*0.15	2N3710	*0.09		
AC153K	*0.24	BC109	*0.08	BC178	*0.16	BD133	*0.67	BF158	*0.56	BSY30	*0.19	OC83	*0.20	2N1303	*0.15	2N2907A	*0.16	2N3711	*0.09		
AC176	*0.11	BC113	*0.10	BC179	*0.16	BD135	*0.41	BF159	*0.61	BSY31	*0.19	OC84	*0.20	2N1304	*0.18	2N2923	*0.15	2N3719	*0.14		
AC176K	*0.26	BC114	*0.16	BC180	*0.25	BD136	*0.41	BF173	*0.15	BSY41	*0.29	OC170	*0.26	2N1305	*0.18	2N2924	*0.15	2N3850	*0.40		
AC180	*0.20	BC115	*0.16	BC181	*0.25	BD137	*0.46	BF176	*0.36	BSY95A	*0.13	OC171	*0.26	2N1306	*0.21	2N2925	*0.15	2N3823	*0.16		
AC180K	*0.30	BC116	*0.16	BC182L	*0.09	BD138	*0.51	BF179	*0.31	BU105	*0.90	OC200	*0.26	2N1307	*0.21	2N2926G	*0.09	2N3903	*0.12		
AC181	*0.20	BC117	*0.19	BC183	*0.09	BD140	*0.61	BF180	*0.31	MJE255	*0.88	OC201	*0.29	2N1308	*0.24	2N2926R	*0.07	2N3904	*0.12		
AC181K	*0.30	BC118	*0.09	BC183L	*0.09	BD145	*0.81	BF181	*0.31	MJE255S	*0.88	OC202	*0.29	2N1309	*0.24	2N2926R	*0.07	2N3905	*0.14		
AC187	*0.17	BC119	*0.31	BC184	*0.09	BD155	*0.61	BF182	*0.31	MJE3055	*0.57	OC203	*0.26	2N1615	*0.16	2N2926B	*0.07	2N4287	*0.18		
AC187K	*0.23	BC120	*0.31	BC184L	*0.09	BD176	*0.61	BF195	*0.15	MJE3055S	*0.57	OC204	*0.26	2N2147	*0.73	2N3053	*0.15	2N4288	*0.18		
AC188	*0.19	BC137	*0.16	BC186	*0.29	BD177	*0.67	BF197	*0.12	MJE3440	*0.51	OC205	*0.38	2N2148	*0.58	2N3054	*0.40	2N4289	*0.18		
AC188K	*0.23	BC139	*0.41	BC187	*0.29	BD178	*0.67	BF198	*0.12	MPF104	*0.28	ORP12/	*0.44	2N2218	*0.18	2N3055	*0.40	2N4290	*0.18		
AD140	*0.49	BC140	*0.31	BC207	*0.11	BD179	*0.67	BF199	*0.12	MPF105	*0.56	ORP12	*0.44	2N2219	*0.18	2N3403	*0.21	2N4291	*0.18		
AD142	*0.55	BC141	*0.31	BC208	*0.11	BD180	*0.71	BF257	*0.28	OC19	*0.36	ORP60	*0.41	2N2219A	*0.18	2N3403	*0.21	2N4292	*0.18		
AD143	*0.49	BC142	*0.31	BC209	*0.12	BD185	*0.67	BF258	*0.36	OC20	*0.36	ORP61	*0.41	2N2220	*0.22	2N3405	*0.43	2N5172	*1.12		
AD149	*0.45	BC143	*0.31	BC212	*0.10	BD186	*0.67	BF259	*0.46	OC22	*0.47	TIP29	*0.40	2N2221	*0.18	2N3614	*0.69	2N5457	*0.28		
AD150	*0.63	BC145	*0.46	BC212L	*0.10	BD187	*0.71	BF262	*0.56	OC23	*0.49	TIP30	*0.45	2N2222	*0.18	2N3615	*0.78	2N5458	*0.28		
AD161	*0.36	BC147	*0.08	BC213	*0.10	BD188	*0.71	BF263	*0.58	OC24	*0.57	TIP31A	*0.52	2N2368	*0.18	2N3616	*0.76	2N5459	*0.28		
AD162	*0.36	BC148	*0.09	BC213L	*0.10	BD189	*0.71	BF270	*0.56	OC25	*0.39	TIP32A	*0.66	2N2369	*0.12	2N3646	*0.09	40361	*0.30		
AD161 & AD162(WP)		BC149	*0.09	BC214	*0.10	BD190	*0.77	BF271	*0.31	OC26	*0.31	TIP41A	*0.65	2N2369A	*0.12	2N3702	*0.09	40362	*0.35		
		BC150	*0.19	BC214L	*0.16	BD195	*0.67	BF272	*0.81	OC28	*0.60	TIP42A	*0.72								
		BC151	*0.20	BC225	*0.28	BD196	*0.87	BF273	*0.36	OC29	*0.60	TIS43	*0.25								
		BC152	*0.28	BC226	*0.36	BD197	*0.92	BF274	*0.36	OC35	*0.45	UT46	*0.20								
		BC153	*0.28	BC251	*0.10	BD198	*0.92	BFX29	*0.25	OC36	*0.51	ZTX107	*0.07								
		BC154	*0.29	BC301	*0.28	BD199	*0.98	BFX24	*0.19	OC41	*0.25	ZTX108	*0.07								
		BC157	*0.11	BC302	*0.25	BD200	*0.98	BFX25	*0.25	OC42	*0.25	ZTX300	*0.07								
		BC158	*0.11	BC303	*0.31	BD205	*0.81	BFX26	*0.22	OC44	*0.16	ZTX300	*0.07								
		BC159	*0.11	BC304	*0.37	BD206	*0.81	BFX27	*0.22	OC45	*0.13	ZTX500	*0.09								
		BC160	*0.48	BC327	*0.12	BD207	*0.98	BFX28	*0.22	OC70	*0.10	2N696	*0.10								
		BC161	*0.51	BC328	*0.12	BD208	*0.98	BFY50	*0.13	OC71	*0.10	2N697	*0.11								
		BC167	*0.10	BC337	*0.12	BD120	*1.02	BFY51	*0.13	OC72	*0.15	2N698	*0.20								
		BC168	*0.10	BC338	*0.12	BF115	*0.15	BFY52	*0.13	OC74	*0.15	2N699	*0.36								

VAT CHAT

Please add 8% to prices marked *
Remainder add 12 1/2%. Do not add V.A.T. to prices marked †.

SUPER UNTESTED PAKS

Pak No.	Description	Price
U 1	120 Glass Sub-min. General purpose Germ. diodes	*0.60
U 4	30 Germanium transistors like OC31, AC128	*0.60
U 5	60 200mA Sub-min. silicon diodes	*0.60
U11	20 PNP Sil. planar trans. TO-5 like 2N1132, 2N2904	*0.60
U15	20 NPN Sil. planar trans. TO-5 like 2N696, 2N697	*0.60
U19	20 Silicon NPN transistors like BC108	*0.60
U25	30 Fast switching silicon diodes like 1N914 Micro-Min.	*0.60
U29	10 1 Amp SCR's TO-5 can. up to 600 CRS/25-600	*£1.20
U32	25 Zener diodes 400mW DO-7 case 3-18 volts mixed	*0.60
U38	20 Silicon planar NPN transistors TO-5 BFY50/51/52	*0.60
U45	7 3A SCR's up to 600V	*£1.20
U46	20 Unijunction transistors similar to TIS43	*0.60
U48	9 NPN Sil. Power transistors like 2N3055	*£1.20

Code No's mentioned above are given as a guide to the type of device in the Pak. The devices themselves are normally unmarked.

DIODES

Type	Price	Type	Price	Type	Price	Type	Price
BA100	*0.10	OA11	*0.14	OA51	*0.37	OA95	*0.37
BA116	*0.21	BY100	*0.16	OA47	*0.07	OA85	*0.07
BA126	*0.22	BY126	*0.15	OA70	*0.07	OA200	*0.07
BA143	*0.15	BY127	*0.16	OA79	*0.07	OA202	*0.07
BA154	*0.12	BY128	*0.16	OA81	*0.07	1N914	*0.06
BA156	*0.14	BY164	*0.51	OA85	*0.09	1N916	*0.06
BA173	*0.15	BYX3830	*0.43	OA90	*0.07	1N4148	*0.06

THYRISTORS

PIV	0.6A	0.8A	1A	3A	5A	5A	7A	10A	16A	30A
TO18	TO92	TO5	TO66	TO66	TO64	TO48	TO48	TO48	TO48	TO48
10	*0.13	*0.15	—	—	—	—	—	—	—	—
20	*0.15	*0.13	—	—	—	—	—	—	—	—
30	*0.19	*0.22	—	—	—	—	—	—	—	—
50	*0.22	*0.28	*0.20	*0.25	*0.36	*0.35	*0.48	*0.51	*0.54	*1.18
100	*0.25	*0.30	*0.25	*0.25	*0.48	*0.48	*0.51	*0.57	*0.58	*1.43
150	*0.31	*0.38	—	—	—	—	—	—	—	—
200	*0.38	*0.44	*0.25	*0.30	*0.50	*0.50	*0.57	*0.62	*0.62	*1.63
400	—	—	*0.30	*0.39	*0.55	*0.57	*0.62	*0.71	*0.77	*1.79
600	—	—	*0.39	*0.48	*0.69	*0.69	*0.78	*0.89	*0.90	—
800	—	—	*0.58	*0.65	*0.81	*0.81	*0.92	*1.22	*1.39	*4.07

SILICON RECTIFIERS

PIV	300mA (DO 7)	750mA (SO 16)	1 Amp Plastic (SO 10)	1.5 Amp (SO 10)	3 Amp (SO 10)	10 Amp (SO 10)	30 Amp (TO 48)	
50	*0.05	*0.06	IN4001	*0.05	*0.07	0.14	*0.13*	*0.56*
100	*0.05	*0.07	IN4002	*0.06	*0.09	0.16	*0.21*	*0.69*
200	*0.06	*0.09	IN4003	*0.07	*0.12	0.20	*0.23*	*0.93*
400	*0.07	*0.14	IN4004	*0.08	*0.14	0.28	*0.35*	*1.25*
600	*0.08	*0.16	IN4005	*0.09	*0.18	0.33	*0.45*	*1.78*
800	*0.11	*0.18	IN4006	*0.10	*0.18	0.35	*0.51*	*1.94*
1000	*0.13	*0.22	IN4007	*0.11	*0.23	0.44	*0.60*	*2.31*
1200	—	*0.32	—	—	*0.28	0.54	*0.69*	*2.88*

SIL.G.P. DIODES

300mW 400 PIV (min) SUB-MIN FULLY TESTED
Ideal for Organ builders
30 for 50p. 100 for £1.50. 500 for £5. 1,000 for £9.

TRIACS

2 Amp	Case TO5	100V	200V	400V
8 Amp	TO66	*0.51	*0.61	*0.77
10 Amp	TO48	*0.77	*0.92	*1.12

GP300

115 WATT SILICON TO3 METAL CASE
Vcbo 100V. Vceo 60V. IC 15A. Hfe, 20-100 suitable replacement for 2N3055, BDY11 or BDY20
1-24 *50p 25-39 *48p 100+ *48p

GP Switching Trans

TO18 SIM. TO 2N706/8 BSY27/28/95A
All usable devices. No open and shorts. ALSO AVAILABLE IN PNP similar to 2N2906, BCY70. 20 for *50p. 50 for *£1. 100 for *£1.80. 500 for *£8. 1,000 for *£14.
When ordering please state NPN or PNP

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JUMBO SEMICONDUCTOR PAK
Transistors-Germ. and Silicon.
Rectifiers-Diodes. Triacs-Thyristors-I.C.'s and Zeners. ALL NEW AND CODED.
Approx. 100 pieces only *1.85p.

ZENER DIODES

FULL RANGE IN STOCK, 2-33 Volts
400mW 5p 1.5W 17p 10W *50p

HANDBOOKS

TRANSISTOR DATA BOOK
DTE 1 227 Pages. packed with information on European Transistors. Full specification including outlines. Price £2.85 each

TRANSISTOR EQUIVALENT BOOK
BPE 75 256 Pages of cross references and equivalents for European, American and Japanese Transistors. This is the most comprehensive equivalents book on the market today and has an introduction in 13 languages. Price £2.68 each

DIODE EQUIVALENT BOOK
DE 74 144 Pages of cross references and equivalents for European, American and Japanese diodes, Zeners, Thyristors, Triacs, Diacs and L.E.D.'s. Price £1.98 each

THE WORLD'S BROADCASTING STATIONS
WBS 75 An up to the minute guide for those interested in DX-ing. Contains all the world's broadcasters on SW, MW and LW, as well as European FM

COMPONENTS

ALUMINIUM BOXES

No.	Length	Width	Height	Price
BA1	5 1/2"	2 1/2"	1 1/2"	*0.45
BA2	4"	4"	1 1/2"	*0.45
BA3	4"	2 1/2"	1 1/2"	*0.45
BA4	5 1/2"	4"	1 1/2"	*0.54
BA5	3"	2 1/2"	1 1/2"	*0.45
BAG	3"	2 1/2"	1 1/2"	*0.39
BA7	7"	5"	2 1/2"	*0.79
BA8	8"	6"	3"	*£1.02
BA9	6"	4"	2"	*0.65

(Each complete with 1/2" deep lid and screws). PLEASE ADD 20p POSTAGE AND PACKING FOR EACH BOX.

COMPONENTS

CARBON RESISTOR PAKS
These Paks contain a range of Carbon Resistors, assorted into the following groups:

R1	50 Mixed	100 ohms-820	ohms
R2	50 Mixed	1K ohms-8.2K	ohms
R3	50 Mixed	10K ohms-82K	ohms
R4	50 Mixed	100K ohms-820K	ohms
R5	30 Mixed	100 ohms-820	ohms
R6	30 Mixed	1K ohms-8.2K	ohms
R7	30 Mixed	10K ohms-82K	ohms
R8	30 Mixed	100K ohms-820K	ohms

THESE ARE UNREPEATABLE PRICES

REPANCO CHOKES & COILS

RF Chokes	CH1	2.5mH	0.27
	CH3	7.5mH	0.29
	CH5	1.5mH	0.26
	CH2	5.0mH	0.28
	CH4	10mH	0.31

COILS	DRX1	Crystal set	0.29
Dual range	DRR2		0.42

CARBON POTENTIOMETERS

Log and Lin	4-7K, 10K, 22K, 47K, 100K, 220K, 470K, 1M, 2M	
VC1	Single Less Switch	0.20
VC2	Single D.P. Switch	0.40
VC3	Tandem Less Switch	0.60
VC4	1K Less Switch	0.20
VC5	100K Log anti-Log	0.60

HORIZONTAL CARBON PRESETS

0-1 Watt	0.09 each
100, 220, 470, 1K, 2.2K, 4.7K, 10K, 22K, 47K, 100K, 220K, 470K, 1M, 2M, 4.7M.	

REPANCO TRANSFORMERS

240V Primary. Secondary voltages available from selected tapings 4V, 7V, 8V, 10V, 40V, 50V and 25V-0-25V.			
Type	Amps	Price	p & p
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S474	3.5mm Jack to 3.5mm Jack length 1.5m	68p
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Postage and Packing add 25p unless otherwise shown. Add extra for airmail. Minimum order £1.00.

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REF 43	Record Care Kit	*£2.76
REF 45	Auto Changer Groov-Kleen	*98p
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REF 53	Hi-Fi Stereo Test Cassette	*£2.40
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Model 60	Groov-Kleen	*£1.72
REF 60/5	Replacement Brush Velvet Pad and Base Sticker for Model 60	*24p
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PLUGS	Price
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PS2 D.I.N. 3 Pin	0.10
PS3 D.I.N. 4 Pin	0.14
PS4 D.I.N. 5 Pin 180°	0.15
PS5 D.I.N. 5 Pin 240°	0.15
PS6 D.I.N. 6 Pin	0.16
PS7 D.I.N. 7 Pin	0.17
PS8 Jack 2.5mm Screened	0.17
PS9 Jack 3.5mm Plastic	0.11
PS10 Jack 3.5mm Screened	0.17
PS11 Jack 4" Plastic	0.14
PS12 Jack 4" Screened	0.16
PS13 Jack Stereo Screened	0.33
PS14 Phono	0.09
PS15 Car Aerial	0.14
PS16 Co-Axial	0.14

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PS21 D.I.N. 2 Pin (Speaker)	0.13
PS22 D.I.N. 3 Pin	0.19
PS23 D.I.N. 5 Pin 180°	0.19
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PS25 Jack 2.5mm Plastic	0.15
PS26 Jack 3.5mm Plastic	0.15
PS27 Jack 4" Plastic	0.28
PS28 Jack 4" Screened	0.32
PS29 Jack Stereo Plastic	0.28
PS30 Jack Stereo Screened	0.35
PS31 Phono Screened	0.17
PS32 Car Aerial	0.20
PS33 Co-Axial	0.20

SOCKETS

PS35 D.I.N. 2 Pin (Speaker)	0.07
PS36 D.I.N. 3 Pin	0.09
PS37 D.I.N. 5 Pin 180°	0.09
PS38 D.I.N. 5 Pin 240°	0.10
PS39 Jack 2.5mm Switched	0.11
PS40 Jack 3.5mm Switched	0.11
PS41 Jack 4" Switched	0.19
PS42 Jack Stereo Switched	0.28
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BV4	6" x 5 1/2" x 2 1/2"	*£1.39

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7 in. E.P. 18 1/2" x 7" x 8"	(50 records)	*£2.48
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BI-PAK

P.O. BOX 6, WARE, HERTS

One flew over the Citizen's band

THERE is a decidedly bad odour in the air. It is interpreted by some semi-knowing nostrils as "Citizen's Band" (CB) and it is growing markedly stronger in the UK. However, a little thought reveals that this evil aroma emanates not from the idea of a Citizen's Band, but from the approach being made in implementing it.

Let us be realistic; there will be a Citizen's Band in the UK. The problems include when, where and how? Which frequencies are to be involved, what power allowed, the cost, types of emission, what equipment? Interference considerations also give cause for concern. This has reached very serious proportions in both Germany and the USA.

What about overcrowding? If one takes a crude rule of thumb by comparing the USA with the UK, somewhat alarming figures result. In America there are approximately 10,000,000 (ten million) CB users and some 250,000 to 270,000 fully licensed Amateurs or Hams. Thus the ratio of CB users to Amateurs is 40:1. If that same ratio were projected for the UK, it would mean 800,000 CB users all packed into a 0.25MHz bandwidth. The situation would become a radio frequency madhouse—unless we act and plan now.

Other problems are even more serious and could affect British workers, people not even interested in CB.

Think; when a CB opens in the UK there will be a huge demand for low-priced walkie talkie type equipment. Imagine the sheer volume of sets required. Now think of all the individual components needed to manufacture those sets. Good, this means more work for Britain in producing the goods, more work more jobs, right?

Wrong! The Japanese for one have already proved themselves masters in the areas of marketing this type of equipment and the design and manufacture of it in large volume. Thus a CB in the UK could offer big business to overseas manufacturers, no increase in employment for Britain, but a big increase in our import bills.

Before you say it couldn't happen, consider the colour television tube dumping allegations made against the Japanese. If these do not convince you, go talk to the ex-workers who *used* to work in the Thorn factory which *used* to produce colour TV tubes, or people who *used* to work at the Pilkington factory which *used* to produce colour TV tubes.

Citizen's Band will come. Will we learn from the mistakes of other countries or will we, through lack of sensible preparation, blunder in and make exactly the same mistakes all over again?

The Government has lent weight to compulsory membership of a Trades Union so a principle has been established—we have a precedent as the legal profession would say. Why not compulsory membership of the Radio Society of Great Britain (RSGB) before any kind of licence is issued?

Why the RSGB? Because here, Government would have a fully organised, fully qualified, tailor made watch-dog and one which genuinely has the interests of both ether and Amateur at heart. It is the only organisation which is so admirably equipped to handle the situation.

Making would-be CB operators become members would at least ensure that they were under the guidance and influence of a responsible and experienced organisation. The Society could steer these operatives along the lines of sensible band useage and behaviour, perhaps through its literature, and by encouraging them to attend meetings of their local Amateur radio clubs where expert advice on virtually any radio/electrical/electronic subject or topic can invariably be found.

Let a proper committee be set up now which includes the RSGB. Priorities should be (a) the frequencies involved and (b) the minimal specifications for equipment.

There should also be very stiff penalties for pirate stations but, more importantly, there should be even stiffer penalties for any person or shop which sells CB transmission equipment to another party which does not produce a valid licence at the time of purchase (try getting a road fund disc without the necessary documentation).

Further, all equipment should, by law, have a unique letter/number combination so that it, like a car registration number and log book, can enable the owner/vendor to be found.

This leader article is not aimed at popularising the RSGB nor at "knocking" Government departments. It is aimed at putting a critical spotlight on a situation which could fester into bedlam, and it has made positive suggestions. Bureaucracy has no excuse, it is now well aware of the dangers.

Citizen's Band is coming. Let us make sound preparations now and let the Government of the day and its relative departments recognise that they have a clear duty to plan the event properly. Isn't that why we voted these people into Parliament—or have I got democracy all wrong?

LIONEL E. HOWES—*Editor*

Bi-Pak Competition

MR. M. S. BLUNT, 3 Woodbury Street, Tooting London SW17 9RP, accepts the 1st prize of a 22in colour television from Mr. Roger Powell of Bi-Pak Semiconductors.

Other winners in the competition held in Bi-Pak's adverts were: 2nd Prize (Legionaire Stereo Amplifier, Deck and E.M.I. Speakers): Mr. William J. B. Atrill, 97 Sandringham Road, Barking, Essex, IG11 9AF. 3rd Prize (Black and White Portable TV): Mr. I. A. Barton, 31 Linton Road, Loose, Maidstone, Kent, ME15 0AG. 4th Prize (Electronic Calculator): Mr. R. Attwood, Dept. Electrical Engineering, Imperial College, London, S.W.7.

Forty-nine consolation prizes of Electronic Slide Rules have also been sent and Bi-Pak Semiconductors wish to thank all participants. If you were unlucky this time, perhaps it will be your turn next year! Watch for the date.

A full list of winners is available on request from: *Bi-Pak Semiconductors, P.O. Box 6, Ware.*

Xciton lightin'

CHROMASONIC ELECTRONICS have signed their first franchise agreement for the supply of Xciton Opto-Electronic products. In addition to the items already stocked Chromasonic can now supply Xciton 0.3 in. and 0.6 in. High Brightness LED displays in red, green and yellow. *Chromasonic Electronics, 56 Fortis Road, London, N10 3NH.*

Practical Wireless, July 1976

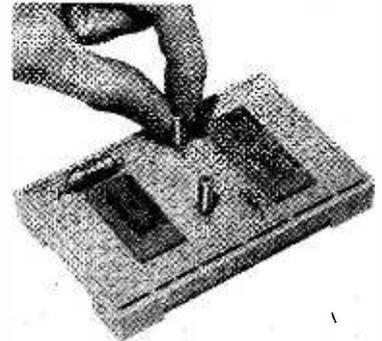
Official recommendation for DECS

THE DEC solderless breadboards and Super Solder Boards have now been officially recommended for teaching electronics in Britain's 5,000 schools.

Designed and manufactured by P.B. Electronics (Scotland) Limited, the system facilitates the easy design, testing and production of prototype and custom PCBs without the use of chemicals.

Response to the official recommendation has been almost immediate. P.B. Electronics is currently marketing a complete CSE electronics educational system comprising all five text books, six S-DECS, six Super Solder Boards plus discrete components for only £25.

Peter Brownlie, managing director of P.B. Electronics said, "With 5,000 schools in the UK as potential buyers the growth for DECS and SSBs in this area is obvious but it doesn't stop there. We are currently discussing similar accep-



tance and recommendation in other countries. The ultimate growth for these products in the education markets alone is enormous."

Officially recommended for the CSE electronics course by the National Centre for Schools Technology, it is virtually certain that DEC/SSB approval will include it in the GCE electronics course slated for next year. Further information on DECS, etc., can be obtained from *P.B. Electronics (Scotland) Limited, (Dept. P.W.), 57 High Street, Saffron Walden, Essex (s.a.e. appreciated).*

Barclay Electronics

DUE to an error in the Barclay Electronics advert on page 255 of this issue, calculator prices were quoted wrongly. The Casio FX20 should be priced at £15.65 and the Rockwell 63R should be priced at £25.60. Further information may be obtained from *Barclay Electronics (Dept. PW) 1115 Finchley Road, Temple Fortune, London, N.W.1.*

Goldring move

GOLDRING announce the move of their Sales and Technical Service Department to new premises at: *Anglian Lane, Bury St. Edmunds, Suffolk, IP32 6SS. Tel. (0284) 64011 (8 lines). Tlx. 817110.*

All correspondence concerning Sales and Service of Goldring/Lenco Record Playing Equipment must now be made to the above address.

BBC Radio Bristol

SINCE Friday, 19 March, Radio Bristol's mf service on 1546kHz (194 metres) has been transmitted from a new site at Mangotsfield and the old transmitter at Clevedon has closed down.

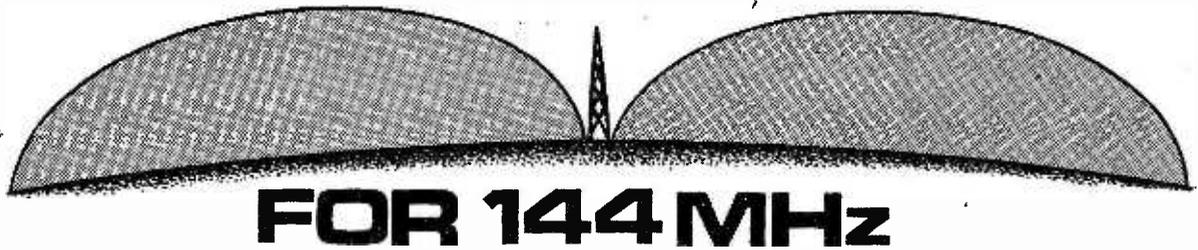
The vhf service is not affected by this change.

Welsh Convention

THE 1976 Welsh Amateur Radio Convention will be held on Sunday, 26th September, 1976, at its usual venue, Oakdale Community College, Blackwood in Gwent, South Wales.

Last year's attendance clearly established the Convention as the major amateur radio event in Wales. This year's programme will enable visitors to attend both the technical lectures and film/slide shows. Further gen from: *R. B. Davies, GW3KYA, 16 Vancouver Drive, Penmain, Blackwood, Gwent, NP2 0UQ.*

VERTICAL AERIALS



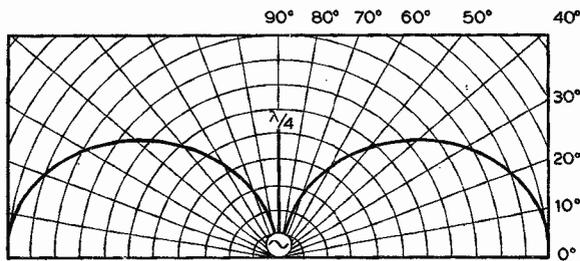
FOR 144 MHz

F. C. JUDD G2BCX

MOBILE and repeater station operation on the 2 metre (144-146MHz) and 70 centimetre (430-440MHz) bands has brought about increasing use of vertically polarised transmitting aerials with omnidirectional radiation at low angles. Such aerials range from simple quarter-wavelength pull-out rods used on hand-held portable transceivers to multiple half-wave element colinear systems which provide a worthwhile gain over a single half-wave dipole. Probably the most popular aerial in use is the so-called "5/8 wavelength" vertical and for fixed station operation this usually consists of the aerial mounted above a system of metal radials which form an "artificial earth" or "ground plane". This aerial is also used extensively for mobile operation in which case it is mounted on the roof, or some part of the car body, which acts as the ground plane.

Much the same reasoning applies to the $\frac{1}{2}\lambda$ aerial. It has a relatively low impedance feed point at its centre and when operated vertically at ground level, the radiation is also at a low angle, assuming perfectly conducting earth. The problem of high attenuation of the radiated signal, due to surrounding structures and ground losses, still remains. However, if this aerial is elevated to several wavelengths above ground it behaves as a "free space" aerial. Ground losses are eliminated, attenuation due to nearby buildings, etc., is reduced and, again, the higher the aerial the greater the working range.

These two useful basic aerials are capable of providing the all-important low-angle radiation equally in all directions. The simple quarter-wave ground plane can, however, be modified to provide increased radiation whilst the effectively "free space" dipole can be used in a configuration popularly known as a "colinear" aerial to provide a worthwhile degree of gain over a single element.

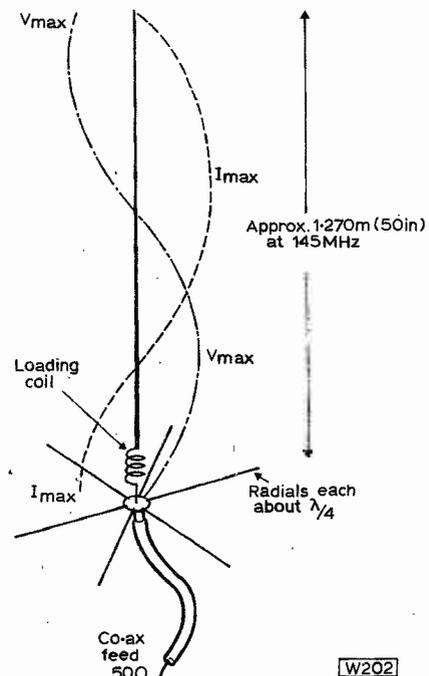


W201

Fig. 1: Theoretical radiation pattern in the vertical plane for a quarter-wave vertical aerial near to earth.

The quarter-wave vertical

A vertical aerial, a quarter-wavelength long, has a relatively low impedance feed point at the end nearest earth. Such an aerial radiates equally well in all horizontal directions and, assuming a perfectly conducting earth, the vertical radiation angle is quite low, as in Fig. 1. However, at VHF such an aerial would be at a considerable disadvantage because at ground level and even with perfectly conducting earth beneath it, the radiated signal would be quickly absorbed by surrounding structures, buildings and walls, etc. In any case real earth is far from being a perfect conductor so a considerable loss in radiated power would also occur. The only answer is to provide an artificial earth of high conductivity material beneath the aerial, to reduce otherwise high ground losses. This still permits the aerial to radiate at a low vertical angle when the whole system can be elevated. Attenuation by surrounding structures is largely overcome and the horizon raised and the useful working distance increased.



W202

Fig. 2: Basic configuration of a vertical aerial five-eighths of wavelength long.

The " $\frac{5}{8}\lambda$ " ground plane

Called a " $\frac{5}{8}\lambda$ wavelength" aerial because this is approximately its physical length, electrically it is $\frac{3}{4}\lambda$ but as the current and voltage distribution along the aerial shows, Fig. 2, the first section is electrically a $\frac{1}{4}\lambda$ because of the loading coil. The aerial requires a ground plane for efficient operation and the feed point impedance is about 50Ω . Construction is not difficult and both the aerial and its radial section can be made from thin copper or aluminium tubing, or stiff wire such as welding rod, or even from wire coathangers straightened out. The rib frame of an old umbrella also makes a very efficient folding ground plane as will be shown later! The loading coil consists of 4 turns of 16 SWG wire 19mm (0.75in) diameter on a paxolin or PTFE former. The top portion of the aerial is made adjustable to achieve resonance. An outline of the construction is given in Fig. 3.

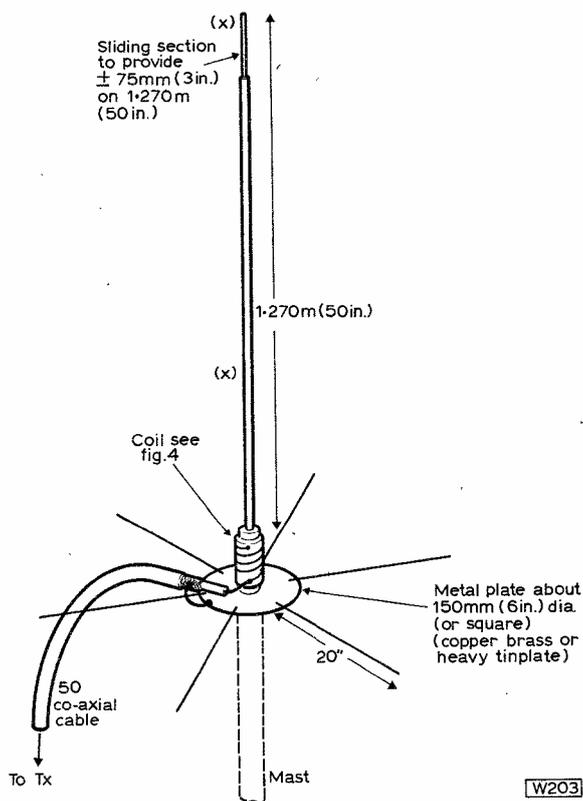


Fig. 3: A practical method of constructing the aerial of Fig. 2.

There should be absolutely no need to trim the 50Ω feed line, however long this might be as with the radiator properly adjusted for resonance the standing wave ratio (SWR) should be not more than 1 to 1.1 or 1.2. With 10W going into the aerial it should be possible to light fully a 6W fluorescent tube (240V) as used for cabinet lights, etc., at the voltage points marked "X" in Fig. 3.

A method of constructing the loading coil is given in Fig. 4. The radials should be not less than about 510mm (20in) long and whilst four are essential, six should be used for preference. The base mounting plate may be copper, brass or tinfoil, thick enough

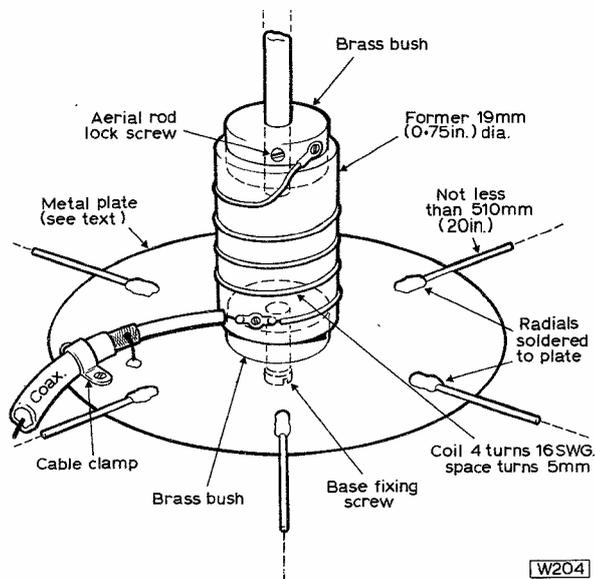


Fig. 4: Details of the loading coil and radial assembly.

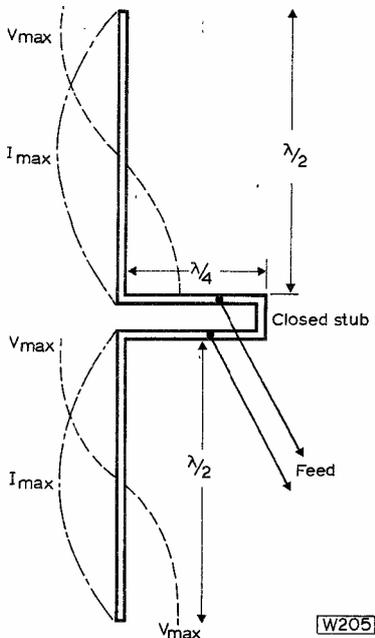
to support the radials which are bolted or soldered to it. Do not bend the radials down to achieve low SWR. If this cannot be obtained by adjusting the radiator to resonance, as described, there may be another reason such as wrong feeder impedance or a mismatch at the transmitter end, etc. Adjustment for resonance can be carried out with the aerial at a low height but clear of other conductors. If it is to be used outdoors make sure that water cannot enter the open end of the coaxial feeder where it joins the coil and where the screening braid ends. Seal with Sealastic or similar non-conducting sealer. The coil can be covered with PVC tape and the whole aerial, including the taped coil, may be given a coat of polyurethane varnish for protection against the weather.

This aerial is also suitable for mobile operation using the car body as the ground plane. Centre rooftop mounting is best and the loading coil is insulated from the car metal work as with the ground plane version. The coaxial feed is the same except that the screening braid is connected to the car metalwork as close to the loading coil as possible.

Colinear aerial

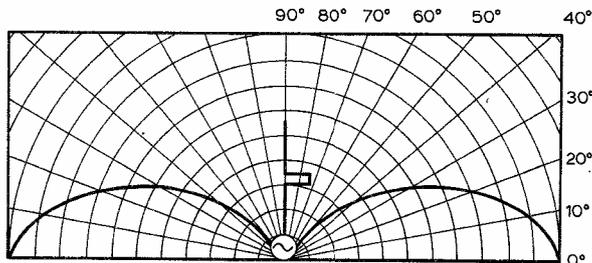
This aerial is also omnidirectional, can be made to provide a useful degree of gain over a dipole and is not too difficult to construct. There is now a number of commercially made colinears available for 2 metre operation but the claims made for gain should be viewed with some suspicion. Specifications often quote "10db gain" which is meaningless unless a reference level is given but which may be related, as are other seemingly high gain figures, to that obtained from a quarter-wave aerial, the efficiency of which is much lower than that of a dipole. The standard 0dB reference aerial for gain measurements is the dipole in free space.

A simple colinear array consists of two (half-wave) dipoles made to radiate 'in phase' so the total radiated power is about 1.5 times that of a single dipole, i.e., the power gain is about 2dB, Fig. 5. More elements can be used to achieve higher



W205

Fig. 5: above, simple colinear vertical aerial with voltage and current distribution shown. Fig. 6: below, is the radiation pattern of the aerial in the vertical plane.



W206

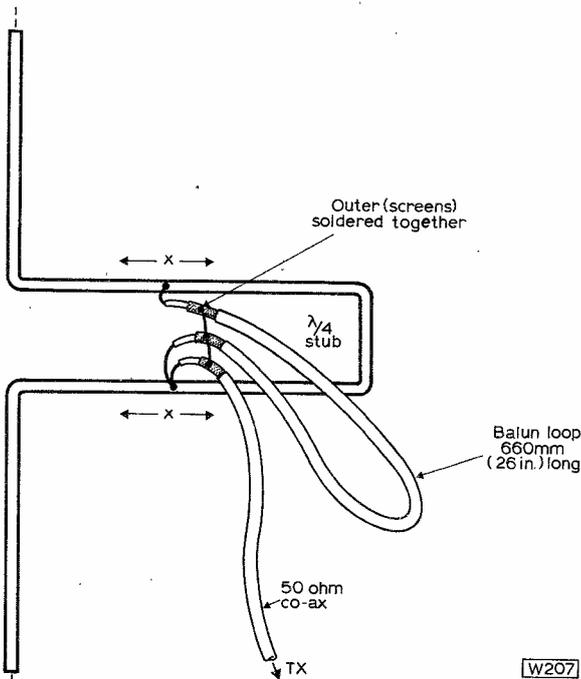
gain and with the conventional close-spaced element system this will be about 3.2dB from a three-element system and about 4.3dB from a four-element system. More than four elements are rarely used as the increase in gain is not worthwhile. Gain could be increased by spacing the elements wider apart. For example, with a spacing of about 0.4λ a gain of more than 3dB can be obtained with only two elements, but then it becomes very difficult to achieve a suitable feed match and phasing with 50Ω or 75Ω cable. (Note: gain figures quoted in this article are with reference to that of a dipole as 0dB.) The close spaced element system is better from the constructional and feed point of view.

The vertical angle of radiation from a two element colinear is shown in Fig. 6 but like all VHF vertical aeriels it needs to be high, the higher the better.

Construction

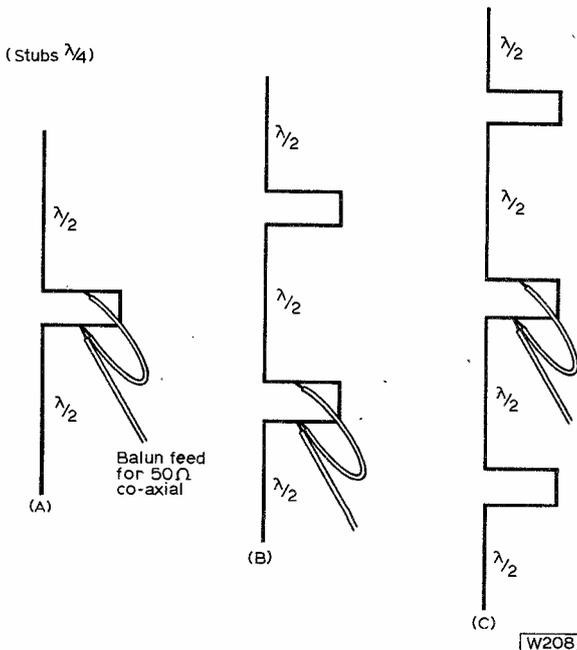
The whole aerial must be well insulated from the mast or other support, because the ends of the elements are at high RF potential which means that insulation between elements must also be good. The elements and matching stubs can be made from large diameter copper wire but this would require extra insulating support. Copper, brass or aluminium tubing is better and more or less self-supporting.

Insulating material may be PVC wastepipe which is very strong and best for heavy tubular elements. Paxolin or PTFE tubing can be used for light-weight elements or a "plumbing" job with copper water pipe for the elements and stubs using appropriate fittings to join them together. The writer has built quite a number of colinears using all the materials mentioned but successful construction depends largely on the ingenious use of readily available materials.



W207

Fig. 7: above, A balun being used to match the unbalanced coaxial feeder to the balanced stub on the aerial. Fig. 8: below, the colinear may be expanded to three or four half wave elements as shown here.



W208

Feeding and matching

The radiating elements are "in phase", connected by means of quarter-wave stubs and the whole system can be fed at a suitable point on one of the stubs. Coaxial cable provides an unbalanced feed but by using a balun as shown in Fig. 7 an impedance step-up of about 4 to 1 can be obtained to about 200 ohms, as well as a balanced connection. Providing the elements are resonant and the stubs properly constructed, good matching and low SWR can be obtained by finding the right tapping points along the stub for the feeder/balun connection. The configurations for two, three and four element colinears are shown in Fig. 8.

Practical colinears

One colinear used by the writer is shown in Fig. 9 and is a "plumbing" job as the elements and stub are made from copper water pipe joined with appropriate fittings. Note that a blow-lamp is needed to soft-solder the fittings. The aerial is self-supporting and can be mounted on the top of a metal mast as shown by means of a "T" junction let into the lower leg of the stub and coupled to a section of PVC waste pipe. Suitable couplers for this can be obtained from builders merchants.

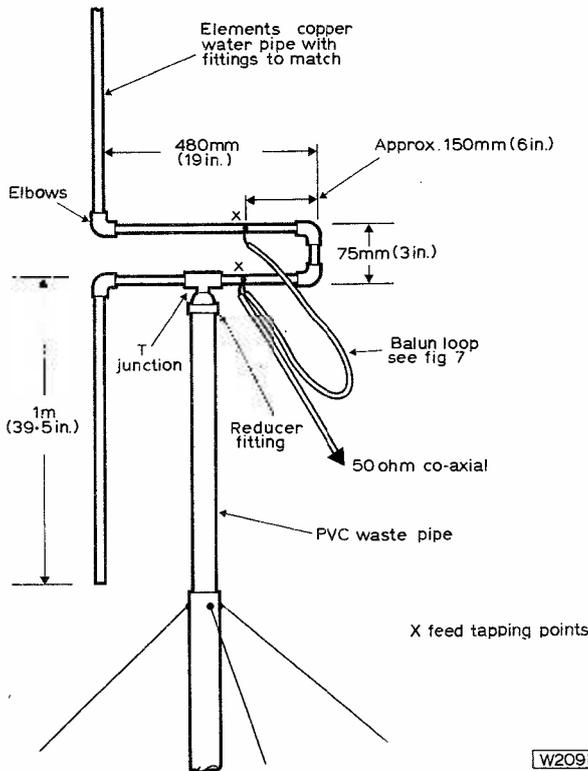


Fig. 9: Use of copper water pipe and fittings in constructing a colinear aerial.

All dimensions are given in Fig. 9 and details for the balun feed will be found in Fig. 7. Adjust the tapping points (X) for maximum radiation (field strength meter, power meter, neon or fluorescent tube at voltage points, etc.) and low SWR which

Practical Wireless, July 1976

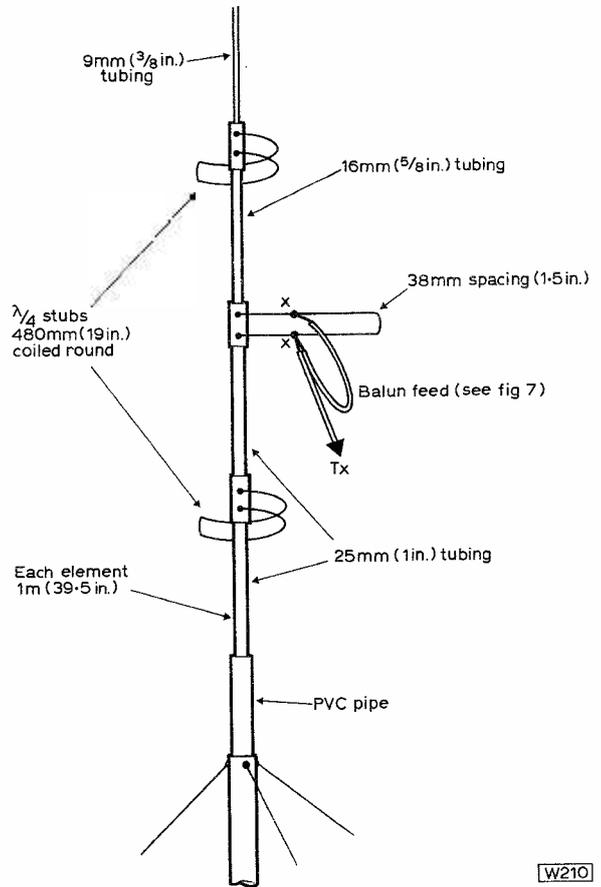


Fig. 10: A four element colinear can be built as shown here, with shorted stubs between elements.

should not be greater than 1 to 1.2. Adjustment can also be made on a steady signal by adjusting for maximum signal meter reading.

The colinear shown in Fig. 10 is a four-element version, also in use, made from copper tubing, sections of waste pipe and stiff wire for the stubs. The feeder line may require some support to prevent drag on the stub and the upper and lower stubs can be coiled up to about 150mm (6 in) diameter to reduce windage. All the elements are 1m (39.5 in) long. Again the only adjustment is for maximum radiation and low SWR by finding the correct tapping points (X) for the balun feed.

The umbrella ground plane

As mentioned earlier, an old umbrella frame, shorn of its cover, makes an excellent 2 metre ground plane. The ribs will need to be soldered together (old coaxial outer braid), as electrical contact between them is rather poor. Using the $5_8\lambda$ radiator and loading coil as described in Figs. 3 and 4, the umbrella ground plane makes a useful portable aerial particularly if the radiator is made detachable when the ground plane can be folded up. For portable use, all that is required is a light sectional mast. The arrangement used by the writer is shown in Fig. 11 and with a 4m (12ft) mast in clear surroundings quite long distances have been covered including continental DX with tropospheric lift.

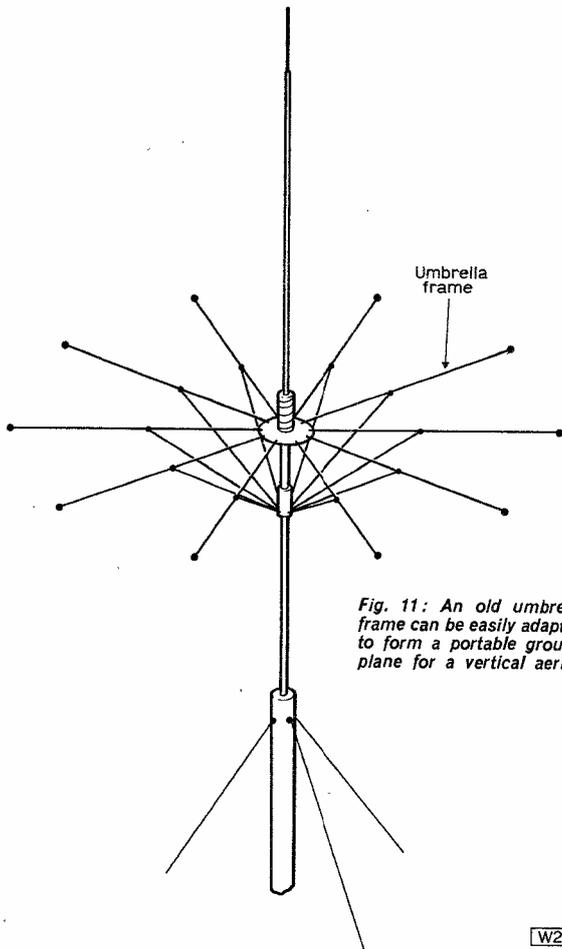


Fig. 11: An old umbrella frame can be easily adapted to form a portable ground plane for a vertical aerial.

W211

Conclusion

The aerials described can be adapted for the 70cm band with proportional dimensions but, as with all aerials at UHF/VHF, siting is important. They should be well clear of other metal structures such as water pipes, guttering, metal roofs, etc. and mounted as high as possible. When using a new aerial don't rely on the report of the first contact made as one may get an S9+ or an S1 depending upon the path over which the signal travels. Make lots of contacts and plot the signal reports on a map with distance circles from your QTH drawn in. The signal path can introduce some peculiar effects on transmission and reception and even a small change in operating conditions can bring an S9+ signal down to zero, or vice versa.

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TELEVISION

IN THE JULY ISSUE

OPTOCOUPLED AUDIO EXTRACTOR

Taking an audio signal from a mains-powered TV set for hi-fi or recording purposes presents safety problems due to the set's live chassis. There is a new, simple method: using an optoelectronic coupler to provide the required isolation. Full constructional details of a simple unit using one of these devices will be given.

THORN 1500 CHASSIS

Probably more of these sets than any others have been produced during the eight year and still continuing production run. John Law provides a detailed guide to stock faults.

PATCHING PCBs

Printed board burn-ups due to component overheating are a common problem. The most reliable repair method consists of inserting a new board patch. E. Trundle describes how to go about this.

MORE ABOUT TV ICs

Since we last surveyed the TV IC scene three years ago many new devices have come into use and a number of interesting ones using some novel techniques are about to appear. So it's time to review the position again.

TELEFUNKEN 711 CHASSIS

The solid-state 110' colour chassis has been available in the UK for several years; stock faults are now known and standard servicing procedures have become established. These will be described along with the workings of some of the less usual circuits. Part 1 deals with the power supplies.

SOLID-STATE FIELD OSCILLATORS

Most solid-state chassis use a silicon controlled switch (SCS) or its discrete component counterpart the complementary relaxation oscillator to initiate discharge of the field charging capacitor. The operation of these circuits will be thoroughly explored.

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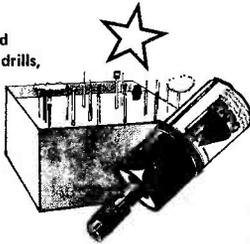
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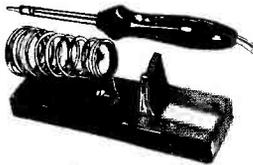
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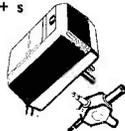
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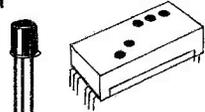
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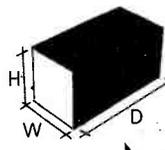
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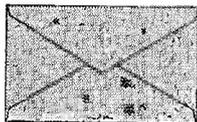


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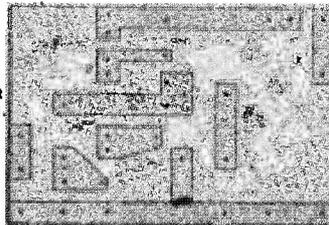
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HOTLINES

ON RECENT DEVELOPMENTS

SOLAR CELL COSTS

Japanese interest and capability in electronics is now well known. A quick look at what these Easterners are up to proves very interesting. Toshiba, for example, has issued a statement which is truly staggering; they intend to cut the cost of solar cells by 99 (ninety nine) per cent! The company has discovered a new method of producing the silicon cells. Instead of making each one separately, the silicon material is pulled in a long strip from a melt. Aply described as the Sunshine Project it appears to be showing great promise as a method of fabrication. To date, ribbons of solar cell have been pulled which are about 300 μm thick and some 30mm wide. The longest "pull" so far is 800mm.

ELECTRONIC ENGRAVING

Elsewhere in Japan the mighty Matsushita has been concentrating its efforts in another direction; electronic engraving. One application is in identity cards or credit cards, etc. The image is picked up by a vidicon camera and then fed into a memory. This can then be held and/or fed to an engraving head. This takes the form of a stylus which cuts into the "card". The latter is a black (or dark) surfaced plastic which has a lighter colour immediately beneath it. The stylus pricks into the surface of the card exposing the lighter areas. The greater the signal from the memory the further the stylus bites into the plastic and so the whiter that part of the image becomes. Some 32 degrees of tone are possible and the engraver operates at a resolution of 5 lines/millimetres.

Securitywise it appears very useful since the photograph cannot be removed nor another inserted in its place. Also, since the plastic isn't laminated, it isn't possible for would-be baddies to erase magnetic stripes by heating the cards until the temperature is above the curie point of the material. Already two chains of petrol stations are using the system.

32" COLOUR TELLY

Our last port of call in Japan is the Sony Corporation which just launched a 32in. colour television set. Neck of the tube is 36.5mm in diameter and it has a deflection angle of 114°. Perhaps big is beautiful?

SPECIAL TUBE

Speaking of displays reminds me of the new high-resolution crt unit which has a spot diameter of one fifth of a millimetre. Resolution is 193,354 separate picture elements on its 8 x 10cm screen face and it is aimed at rather specialised markets such as nuclear and X-ray scanning, etc.

SUN POWER

Earlier I talked about Toshiba making solar cells in ribbon form. In the United States an American company has opted for a different idea. It intends to market a hand-held unit which will collect and convert solar energy. One market option is to use the units to power calculators and portable radio receivers. A special technique is employed which enables the company to claim that it's units only need 30% the number of silicon cells required by more conventional approaches. Not available here and no further information as yet, but it looks promising.

GOT IT TAPED!

Know what happens when you speed up a tape recorder? The voice goes higher and higher as the speed increases and, of course, more words per minute are transmitted. One enterprising company has launched what it calls a "Pitch Control microcomputer". Using this device enables the speed of speech to be altered without altering it's pitch. Using a digital technique it samples the speech from a tape running at normal speed but it does this sampling at a rate of 16kHz. The

tape speed is controlled by the user who can slow it down or speed it up. But as it slows (or speeds up) so the sampling rate slows or increases accordingly in step with the tape.

In many analog methods of attempting to do this a problem is encountered; the splice noises and other pops are noticeable. In this digital approach a special intelligent splicing algorithm is employed. The voice input is sampled and digitized, and this data is then stored in a RAM (random access memory). The data entering the memory is, of course, always a function of the tape speed but when it comes out of the RAM it always does so at the basic centre frequency of 16kHz which thus ensures that the pitch remains unchanged.

C.B. FOR U.K.?

Shortwave listeners and others who have tuned into the American 27MHz Citizens Band will know that it makes for hours of fascinating listening although sometimes it can be baffling. A storm is brewing in the US over this band and it will be interesting to see just how it is all resolved. To operate on the Citizens Band in the US is comparatively simple and it has an avid collection of users. It has been estimated that in the US alone there are some 10 million Citizen Band enthusiasts—all transmitting at one time or another. Now this does tend to make the band just a tiny bit crowded and, as some tyros point out, ten million Citizen Band users are packed into 250kHz while only 250,000 Hams are allowed to use some 42MHz of r.f. space all the way up to 450MHz. The problem is compounded because many feel that expansion around 27MHz is not the answer and are eagerly looking to other frequencies. Trouble is that there just isn't any area in the r.f.

CONTINUED ON NEXT PAGE

The logo for Ginsberg, featuring the name in a stylized, cursive script with a horizontal line underneath.

HOTLINES

ON RECENT DEVELOPMENTS

spectrum from 27MHz right up to 1GHz that is free and the only way a slice would be available would be by taking it away from other users. Would it be too dramatic a thing to suggest that Hams should be very vigilant indeed—it could be their pieces of the ether which are taken or, even worse, shared with 10 million CB users—and that's only in the US!

A 'HOLY' BUSINESS

Just to keep a sense of proportion when you think of small things, how about an American company which "drills" a 0.001in. hole in a metal cap. The hole is then electro-polished to smooth out irregularities around its diameter. Then, it is electroplated with gold to prevent corrosion closing it up. The plating reduces

the size of the hole to something like 0.00001in. in diameter. The object of the exercise is to test hermetically sealed packages for leakage and with the hole and pressures involved, the leakage rate is something of the order of 10^{-8} atmosphere cubic centimeters/second. I understand that the method works very well on the whole.

MINI RELAY

For the builder of miniature things, a tiny relay from the US will doubtless be of interest. Measuring only 0.64in² by 0.4in deep, its contacts are capable of switching 2A at 28V d.c. Contact resistance is given as less than 50 milliohms and the 2 pole double throw unit I saw was rated to keep going for over 100,000 operations.

CHIP 'C's'

The last item is really a kind of rehash. Chip capacitors called Vee Cals were launched and were novel in that along their sides they had a series of adjustment points. By rubbing a pencil and forming a conducting bridge between two of these points, the capacitance of the otherwise "fixed" capacitor could be altered. The company has now altered the range of values and also brought out the adjustment points so that they lie on the top face of the chip thus permitting easier adjustment. Nominal capacitance values range from 1 to 55pF and the capacitors measure only 0.12 x 0.1 x 0.03in.

LAST MONTH

In the item 1k CQ's the final paragraph should have been included under "Creditable".

Ginsberg

RSGB RADIO COMMUNICATION EXHIBITION Alexandra Palace July 30/31st and August 1st 1976

Alexandra Palace is situated in the Muswell Hill area of North London—easily reached along the North Circular road (A) and easily accessible from A1, A10, A11, A41, M1, M3, M4 etc. London transport bus services 29, 41, 102, 123, 134, 212, 221 and 244 are within easy walking distance and bus No. W9 connects with the London Underground service at Wood Green on the Piccadilly line and Finsbury Park, served by both Piccadilly and Victoria lines. The buildings and mast are easily seen from the east and south of London and form a visible landmark.

Talk-in Talk-in facilities will be provided on 2-80-160 metres.

Family interest There are many facilities provided free which members of the family not interested in the exhibition may use:—18-hole pitch and putt golf course, boating lake, park trail, ski slope, children's playground, open-air roller skating rink (bring your own skates), rose garden (open through exhibition).

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Coaches Adequate free parking.

BBC Ceefax demonstrations.

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Caravans will be permitted on the race-course car park, but are not to be used for living in.

Creche will be provided for children, supervised by full qualified staff.

Raffle A portable TV to be won every day!

Additional attraction It is hoped that a local radio station will be broadcasting direct from the exhibition.

International Night There will be a reception at 6pm on Friday evening for our overseas visitors, for which 75p will be charged.

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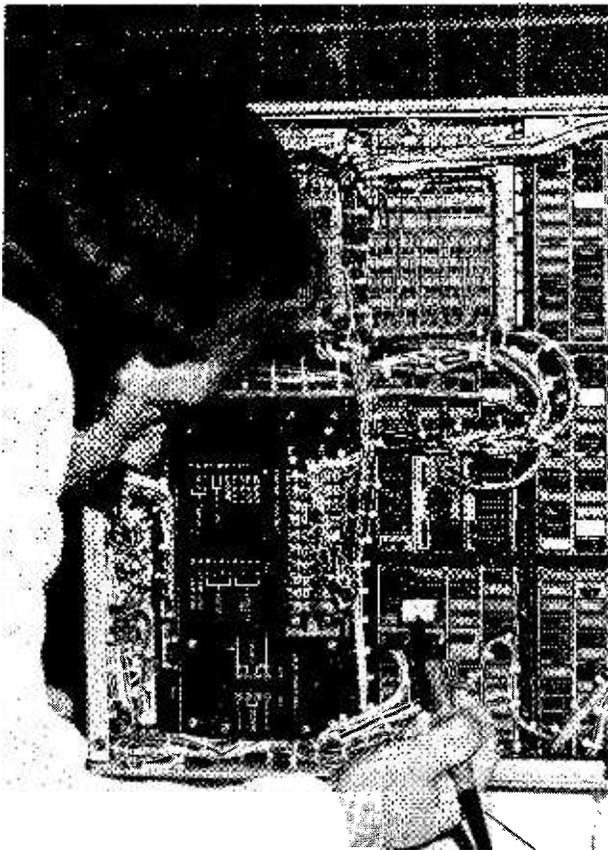
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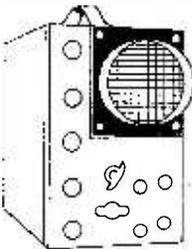
This hobby brings big rewards.

A soldering iron and a screwdriver. If you know how to use them, or at least know one end from the other, you know enough to enrol in our unique home electronics course.

This new style course will enable anyone to have a real understanding of electronics by a modern, practical and visual method. No previous knowledge is required, no maths, and an absolute minimum of theory.

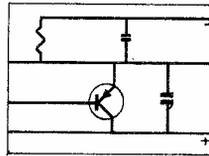
You build, see and learn as, step by step, we take you through all the fundamentals of electronics and show you how easily the subject can be mastered and add a new dimension not only to your hobby but also to your earning capacity.

All the training can be carried out in the comfort of your own home and at your own pace. A tutor is available to whom you can write, at any time, for advice or help during your work. A certificate is given at the end of every course.



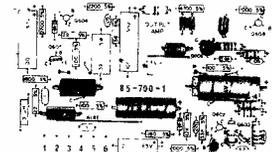
1 Build an oscilloscope.

As the first stage of your training, you actually build your own Cathode ray oscilloscope! This is no toy, but a test instrument that you will need not only for the course's practical experiments, but also later if you decide to develop your knowledge and enter the profession. It remains your property and represents a very large saving over buying a similar piece of essential equipment.



2 Read, draw and understand circuit diagrams.

In a short time you will be able to read and draw circuit diagrams, understand the very fundamentals of television, radio, computers and countless other electronic devices and their servicing procedures.



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Brochure without obligation to:
**BRITISH NATIONAL RADIO
 & ELECTRONICS SCHOOL, Dept WH76**
P.O. Box 156, Jersey, Channel Islands.

NAME _____

ADDRESS _____

(Block caps please)

preamplifier

for the PW DISCO SYSTEM

C.TOMS

FOLLOWING the publication of the PW Stereo Disco System in the December 1975 and January/February 1976 issues of PW some correspondence was received commenting on the lack of bass when using some of the recommended ceramic pick-up cartridges. It was therefore decided to design a simple stereo equalisation preamplifier to cater for two turntables.

Since the amplifier response is linear, within the usual audio limits, and most disc recordings follow the standard Radio Industries Association of America (RIAA) curve, it follows that if a pick-up cartridge is used which has an output that is pro-

response that takes into consideration the disc recording characteristic, the deficiencies of the pick-up cartridge used, and the amplifier loading. Resistor R1 and capacitor C1 provide correction but since the value of these components will vary with the make of cartridge a table is given for the more popular types of cartridge in use. Where no information is available experiments with values of R1 and C1 should provide satisfactory results.

As well as correcting the loss incurred by the matching procedure the preamplifiers will provide some extra gain for the low output type of cartridge, such as the Sonotone 9TAHC.

★ components list

Resistors

R1-4	1MΩ*	R13-16	15kΩ
R5-8	470kΩ	R17-20	15kΩ
R9-12	68kΩ	R21-24	270Ω

All $\frac{1}{2}$ W 5% carbon film. * see text and table.

Capacitors

C1-4	47pF* miniature ceramic (plaquette)
C5-8	10 μ F 30V minimum WV
C9-12	10 μ F 30V
C13-16	10 μ F 30V

Miscellaneous

Tr 1-4, BC184 or similar low-noise NPN. Printed circuit board (Readers PCB Service, see ads). Screened connecting wire.

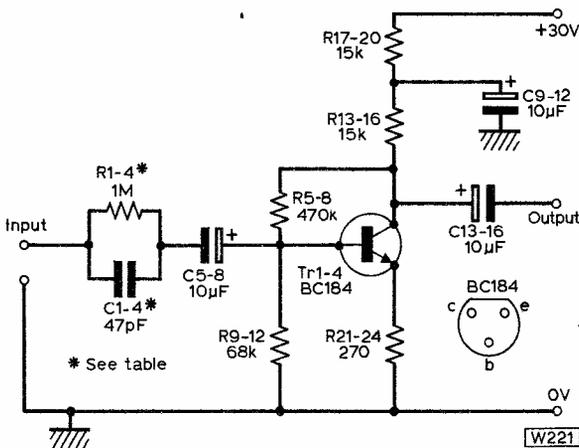


Fig. 1: The circuit of one of the four preamplifiers required for the two turntable stereo system.

portional to the velocity of the recording then the result will be attenuated low frequencies and accentuated high frequencies.

In the case of magnetic pick-up cartridges the RIAA correction is usually incorporated in the preamplifier circuitry. In the case of the PW Disco System any such correction would be most undesirable as it would affect all the mixer inputs. The use of a magnetic pick-up cartridge would also bring hum problems.

THE CIRCUIT

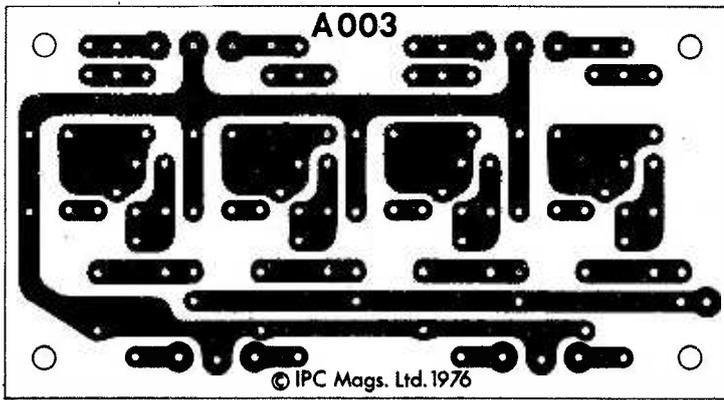
The matching unit comprises four separate preamplifiers, one of which is shown in Fig. 1, and calls for an equalising circuit which has a frequency

The component list above is for all four preamplifiers. If any other form of BC184 is used check leadout connections against those shown.

CONSTRUCTION

The printed circuit board is shown full size in Fig. 2 together with the layout of the components on the board. The prototype board is mounted on the rear right of the Disco control panel, next to the pick-up inputs. The turntable screened leads

CARTRIDGE	R1-4	C1-4
Sonotone 9TAHC	1MΩ	47pF
Coloring CS96	100kΩ	150pF
Aeos ceramic	680kΩ	100pF
BSR ceramic	1.2mΩ	None



are disconnected from the mixer inputs and connected to the corresponding inputs on the matching unit. The screen of each pick-up lead is connected to the respective centre pin of each input, as indicated on the PCB.

The output of each preamplifier is connected to the respective mixer input in a similar manner, using short lengths of screened lead ensuring that the screens of these are connected to BOTH the matching unit and the mixer's copper plane. This also provides the negative side of the supply voltage. The supply for the unit is obtained from the 30V positive stabilised supply which feeds the main preamplifier board in the Disco.

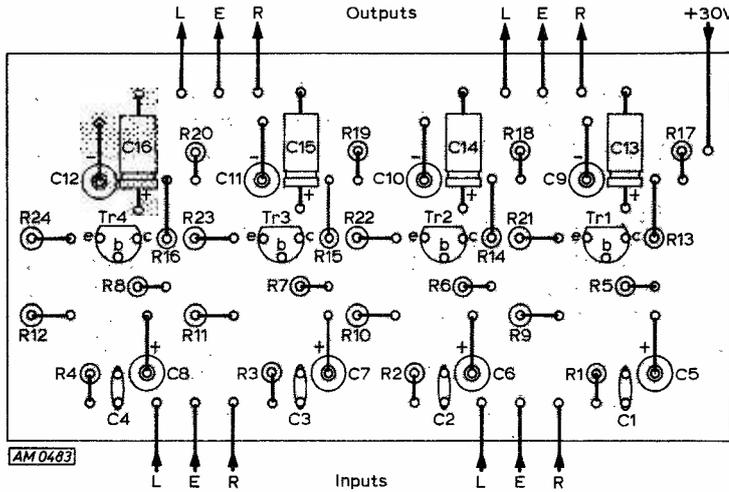
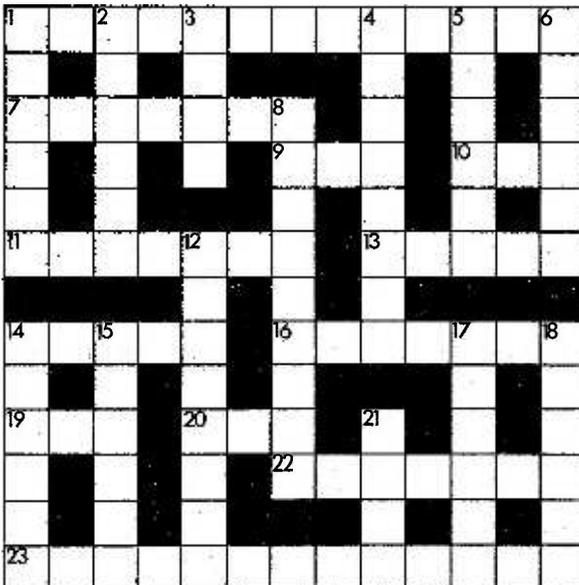


Fig. 2: The PCB is shown here full size for the four preamplifiers, together with the component layout.

MONO OPERATION

The matching unit may also be used for a mono pick-up but it must be appreciated that a stereo cartridge connected for mono will require slightly different values for the resistor R1 and capacitor C1, which will have to be found by trial and error. On mono only two of the matching amplifiers need be wired up on the printed circuit board. Pw

TECHNICROSS No. 14



ACROSS

- 1 Signal success with this cleaner type? (3-4, 6)
- 7 Lace used in 14 Down? (7)
- 9 Oscillator badly installed? (3)
- 10 Little senior citizen starts O.A. Peru (3)
- 11 Onions and rice but no ham in it (7)
- 13 Soothe media about one subject (5)
- 14 His receiver is in the loft (5)
- 16 He arranges aerial exhibitions (7)
- 19 Army power unit on 2 Down? (3)
- 20 Drop of spirit around tone-nut? (3)
- 22 A case of over-charging? (7)
- 23 Hear them as substitutes for letters (8, 5)

DOWN

- 1 Undistorted in real modulation? (6)
- 2 Radio sisters at the spa? (6)
- 3 Power unit with split infusion (4)
- 4 There's no interfering with this! (8)
- 5 Do tire of adapting such valves ... (6)
- 6 ... and smoothing over such voltage problems? (6)
- 8 Thousands of burn-outs! (9)
- 12 It's opened up at full power (8)
- 14 Addiction to the relay system? (4-2)
- 15 It gets woolly reception from Spain (6)
- 17 Linked with the 007 programme? (6)
- 18 Fiddlers in the radio business? (6)
- 21 C.I.D.'s distortion is a record? (4)

FOR AMUSEMENT ONLY
ANSWERS NEXT MONTH

Dear Sir,



letters

Unjust comment?

I have just bought a Sinclair Oxford 300 calculator, and consider your comments in the "Special Product Report" on this calculator, completely unjustified.

First, I would not describe the case as "dull" but rather plain; it is functional rather than "flashy", and the on/off switch is, contrary to your opinion, perfectly acceptable. I find it exceptionally good for hand-held operation, and no worse than most, for desk-top use.

I would therefore like to congratulate Sinclair for producing an extremely able calculator at a very modest price, and in my opinion stands up very well when compared with more expensive models.—Sean Kelly (Nottingham)

Speedy valve

After fruitless weeks searching my local dealers in Eastbourne for a 6BR7 valve, and obtaining comments like "No sir, never heard of that before", or "you won't get one of those these days", I wrote to RST Valve Co.

I posted the order on the 15th March and got my valve on the 17th March. As you can imagine I was amazed at this type of service. Thank you RST and PW.
Brian Ward (Eastbourne)

Save it!

When using the PW Tuner Cassette in a tape machine with a remote control facility, it is possible to save on batteries by simply plugging in the micro-

phone and moving the mic. switch to OFF. This switch is usually wired as a pause control, and turns off the power to the motor only, leaving the electronics supplied with power. This is for setting-up purposes, such as obtaining a correct recording level.

An alternative to this, if the microphone has no ON/OFF switch, or to obviate the need for carrying the microphone, is to insert a suitably wired spare plug in the 'remote' or possibly the 'mic' socket depending upon the type of connection used. The problem of dents in the pinch wheel, is eliminated by a small stiff strip in the tuner cassette, which occupies the same position as the tape would in a normal cassette. This prevents the capstan coming into contact with the wheel whilst not running.—Peter Rostgaard (Broxbourn)

Good work, Robin!

The Geography teacher at Codsall Comprehensive School wanted to build the PW Music Box electronic organ for his children and, knowing my enthusiasm for electronics, asked me to help him, although I am at another school. We only worked for about an hour a week but managed to finish it and to tune it with the aid of a piano. Another teacher, Mr. Simkin has a commercial version of the organ but prefers ours to his own! The Headmaster Mr. Bates, and teachers Messrs Price, Mincher and Mansell were all impressed with a demonstration so all I can say is that it is a very good design.

I hope that you can publish my letter.—Robin Bayley (Kingswood School, Allrighton, near Wolverhampton)

What? No rumba

The Rhythm Generator project featured in May '76 PW undoubtedly created great interest among constructors who are musically inclined and tribute must be paid to the skill of SGS-ATES in designing the M252 device which is the basis of the project. Musical readers may at

the same time share my curiosity why given a capability of 15 rhythms, SGS-ATES elected to include the rarely used Jazz Waltz and Shuffle at the expense of the much more common Rumba.

This is perhaps even more puzzling when one observes that the companion device M253 (which provides for 12 rhythms) actually includes the Rumba but excludes not only the Jazz Waltz, Mambo and Bajon—but also the ubiquitous Foxtrot.

Unless there is an electronic explanation—and I can think of none—one is tempted to conclude that SGS-ATES know a great deal more about IC technology than they do about contemporary dance rhythms! D G Daverson (Brentwood)

Wake-up PW

I understand from your company that you have cancelled your subscription service. Could this possibly be true? If so, this must surely mean one more nail in the proverbial coffin of yet another well established, and, I gather, profitable magazine.

I know many people, including myself, who took PW by subscription, who will now think twice about taking PW on a regular basis, especially as recent price increases have pushed the price out of all proportion. True, it's a good magazine, but when you have to go out of your way to obtain a copy, its logical that you'll only do it if there is something published that really captures the imagination.

This action possibly affects your foreign readers even more so than your UK readers. They have no way of obtaining a copy, except by subscription.

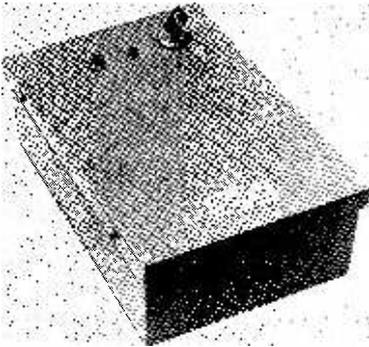
How many readers can you afford to lose by such moves? Another point that I would like to grouse about is the subject of back editions of PW. Many times since taking PW, I have been told of an interesting project that was published in months gone by. I would gladly pay the cover price plus a little extra to get my hands on that particular issue. But can I?—not on your life!

So come on PW, wake-up, and lets have a bit of good old-fashioned service for your faithful readers.—T. McCahill (Barrow-in-Furness).

PRODUCTION LINES

colin riches

ANTEX ALARMS



Antex (the soldering iron people) have launched what is believed to be the first D.I.Y. burglar alarm kit which complies with the BS 4737 Standards.

The picture shows the control box of the battery-operated version (model A1 B). The kit comprises the control box with instructions, 6in. (15cm) alarm bell, heat sensor, exit/entry switch, 6 magnetic contacts, 30 metres twin and 15 metres 4-core cable, 100 cable clips, screws, rawlplugs, terminal block. Price is £50 plus 25% VAT and batteries.

A mains/battery version is also available for £74.

The control box is a strong steel box of pleasing appearance. It houses the electronic circuit necessary to ensure reliable operation and to reduce the chances of false alarms to a minimum. Magnetically operated switches are fitted to doors and windows where an intruder is likely to attempt gaining access to the property. These switches are connected to the control box by "double pole wire". The control box is fitted with a key-operated ON/OFF switch. When the key switch is set to the ON position, any of the door or window switches being opened will cause the alarm to sound. Closing the door or window again will not stop the alarm sounding. Cutting either or both of the double pole wires or shorting them together will also cause the alarm to sound. The only way to stop the bell ringing under any of these conditions is to turn the ON/OFF key switch on the control box to the OFF position.

Further information from *Antex Electronics Limited (Dept. P.W.), Mayflower House, Plymouth, Devon. Telephone: 0752 67377/8.*

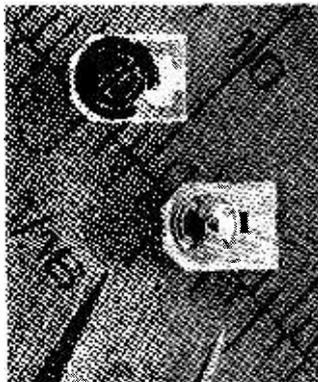
TRIMMING POTS

Lemo (UK) have announced a range of minilinear and exponential trimming potentiometers: the Siegert cermet TPO C range. Measuring 4 by 5 by 2.6mm, they are ideal for p.c.b. and hybrid circuit work. Values offered are from 470Ω to 1MΩ (exponential), or 100Ω to 1MΩ (linear), at a power rating of 150mW at 70°C.

The exponential effect is achieved by joining two tracks of differing characteristics, at a point between 125° and 165° of function angle. Total angle of travel is about 260°. Resistance tolerance is ± 30%. Siegert say that the potentiometers comply with DIN 41 450 when used as trimmer resistors.

Applications suggested for these micro potentiometers include car and pocket radios, paging devices, com-

puters, hearing aids, calculators, electronic watches and defence circuitry. Further gen from: *Lemo (UK) Ltd., (Dept. P.W.) 6 South Street, Worthing, Sussex BN11 3AE. Telephone: 0903 204651.*



CABLE METER



Electronic Services & Products Limited announce a new instrument for accurately determining the length of coaxial cables and the location of open faults.

Its circuit incorporates ICs; it is completely portable and its small size makes it an ideal piece of test equipment for Service Engineers, TV Service Departments and Engineers concerned with the location of open faults.

Measurement is made by connecting the cable to the instrument and reading the length directly in metres off a linear scale. Lengths of coax from less than 10cm up to 100metres of either 50Ω or 75Ω cable can be accurately measured simply by selecting one of the four ranges.

Power is provided by a 9V PP3 battery or similar type and a LED battery monitor is incorporated which does not light when the battery voltage drops below a certain value thus preventing a false reading being made.

Price of the instrument is £45.00 inclusive of batteries. For further details contact: *E & L (Dept. P.W.) Cross Lane, Braunston, Nr. Daventry, Northants. Telephone Rugby 890672.*

TRANSFORMERS GALORE

S. G. Wright Ltd. of Burnley inform us that as transformer suppliers their boast is that they have a transformer for almost every application required in P.W. projects. In fact, they have their own winding equipment and will wind to readers' specs. at very keen prices.

If you send them a stamped, addressed envelope, they will be pleased to forward a free copy of their catalogue/price list. *S. G. Wright's Ltd., (Dept. P.W.) Bishop House Works, Rylands Street, Burnley, Lancs. Tel: 26934.*

TAPE-SLIDE SYNCHRONISER

Square M Electronix inform us that they market a "Mark III" tape-slide synchroniser for £20 plus 90p for postage and packing.

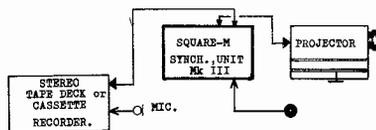
It is designed for use with automatic slide projectors and reel-to-reel or cassette stereo tape recorders. The 1kHz pulse signal duration is pre-timed to make it suitable for use with any automatic projector. Connecting leads are suitably terminated to suit standard DIN configurations.

In order to achieve the maximum economic use of a cassette tape, the recording of the pulse is on the left-hand channel and the commentary or music on the right-hand channel. This facility enables the use of cassettes in both directions (side 1 and side 2). This selection of tracks offers greater flexibility with commercially available cassette recorders. At the same time, however, the possibility of the recorded 1kHz pulse interaction between channels is minimised. Due to the track allocation for cassettes, the LH channels are well separated when the recording is made on side 1 and side 2.

Although the selection of tracks is not compatible with the Philips system, which restricts the cassette to unidirectional use requiring a special record-replay tapehead, the Square-M Electronix method offers bi-directional use of either cassette or reel-to-reel recording and reproduction facilities of any commercial unit.

By special request, the wiring of the pulse record and replay DIN socket can be made in accordance with CET'S, USPEC 2 or IEC proposals for international pulse standardisation.

Further information on this very interesting piece of equipment may be obtained by sending a stamped, addressed envelope to Square M Electronix (Dept. P.W.) 34 Rippleside, Portishead, Bristol, BS20 9NB. Telephone: 0272 844595.



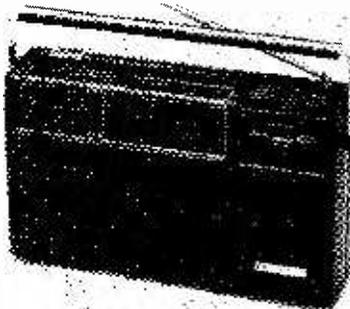
The diagram above shows how the synchroniser is connected to an automatic projector and stereo recorder. The photograph shows the unit together with a typical recorder and projector.

PYE PORTABLE

Pye Ltd. have launched a new portable receiver called the 1650. It has a power output in excess of 1 watt, has four wavebands, long, medium, VHF and a 49 metres shortwave band. There is also a push-button wave change together with a slider volume control.

An internal ferrite rod aerial is provided for long and medium wavebands, while for shortwave or VHF listening there is an external hinged telescopic aerial.

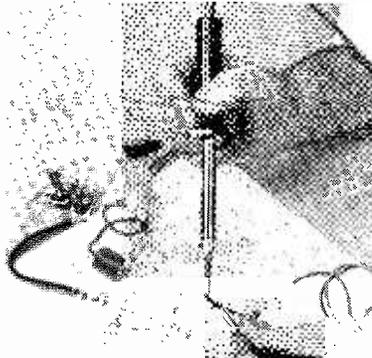
The 1650 can be mains or battery operated, each set being supplied with a detachable mains lead. Should battery operation be preferred the power source is four standard 1.5



volt batteries. There is a separate on/off switch which allows controls to be pre-set and a two position tone control—high and low. Should the use of an earphone be required there is an earpiece socket suitable for 3mm plug.

Housed in a scratch resistant black Abstrene cabinet with silver carrying handle, the 1650 is equally suitable in the home or in a 'knock about' situation. It measures 267mm x 153mm x 60mm, and the recommended retail price is £37.50.

BURGESS SOLDERING IRON



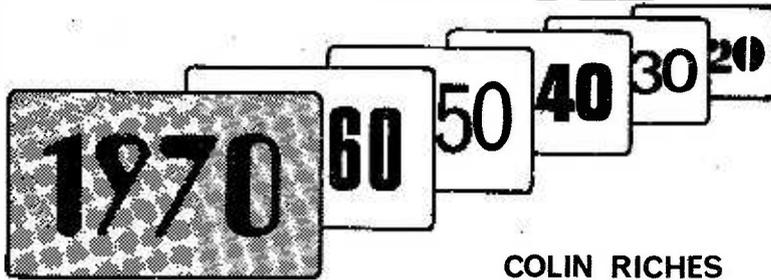
Burgess Power Tools Limited have introduced a new Soldering Iron and a complete soldering kit. Both are available through tool stores and DIY shops.

The Model 25 Powerline 25 watt Electric Soldering Iron is balanced to allow it to be laid on the bench or worktable without the soldering tip resting on the working surface. It has a long-life copper/cobalt tip which is easily exchangeable, 6ft. (1.9m) of cable, and is guaranteed for twelve months. Recommended retail price is £3.25 plus 8% VAT.

The Powerline soldering iron is also contained in the Model 25K kit which also includes a supply of resin-cored solder, a heat dissipator, a locating and positioning probe, tweezers, and an interchangeable 2.30mm (3/32in) cobalt/copper tip for intricate work. This kit is also guaranteed for twelve months and full working instructions are included with both models. The cost of the Model 25K is £4.50 (r.r.p.) + 8% VAT. Burgess Power Tools Limited, (Dept. PW), Sapcote, Leics. LE9 6JW. Tel: 045.527.2292.



GOING BACK...



Dynatron info.

THIS month, I wonder if readers could help me a little. I am searching for information on the Dynatron company together with photographs of some of their earlier receivers. I hope to compile a "Going Back" on this firm some time in the future and any help would be mightily appreciated!

Vintage meeting

REMEMBER from time to time we mention Tudor Rees' vintage wireless emporium? Well, if any readers are interested, Tudor is holding a meeting on July 4th at 64 Broad Street, Staple Hill, Bristol BS16 5NL. Anyone interested in vintage radio is cordially invited to attend and take along a piece of vintage gear or a component to show around and have a general chin-wag about the "good old days". I'm afraid it's rather short notice but Tudor's on the phone if anyone wants to get in touch (Bristol 565472). Should be well-worth attending! Whilst on the point, Tudor tells me that his 1976 full catalogue is ready. Apart from equipment for sale, the catalogue includes some photographs of early gear, period adverts (my favourite) and technical tips. Price is 50p post paid or for our colleagues across the pond, \$2 airmail, post paid.

Sir William Preece

SIR William Preece, F.R.S. was without doubt one of the country's most outstanding engineers at the end of the Victorian era. He influenced the course of Victorian telecommuni-

COLIN RICHES

cations development in the United Kingdom more than any other man. As Preece grew to manhood (he was born three years before Victoria came to the throne) electricity began to be utilised for signalling and silver plating. With the discovery of more about the qualities of electricity, physicists had to amend their hypotheses. That process of revising theories was bound up in the Victorian way of life. It is therefore rather apt that a record of Preece's life should be published in the year that marks Alexander Graham Bell's invention of the telephone.

The record comes in the form of a book entitled "*Sir William Preece, F.R.S., Victorian Engineer Extraordinary*". Author is E. C. Baker and there is an introduction written by Professor J. H. H. Merriman of the Post Office.

Preece said once of Marconi, at a Royal Institution lecture in 1897, "He has not discovered any



Sir William Preece, F.R.S.

new rays. His receiver is based on Branly's coherer. Columbus did not invent the egg, but he showed how to make it stand on its end. Marconi has produced from known means a new electric eye more delicate than any known electrical instrument, and a new system of telegraphy that will reach into places hitherto inaccessible..."

This book has been written with great charm and erudition. It is a volume which will be welcomed by all those interested, or engaged in, all fields of telecommunication. As today's prices go, you get very good value for £6.50 with this book. Publishers are: Hutchinson & Co. Ltd., 3 Fitzroy Square, London, W.1.

Vintage CC

BOOKS FOR DISPOSAL

Would sell or swap the following for an SX28 or AR88, condition unimportant so long as it's complete. Wireless Telegraphy and Telephony by W. H. Eccles (c1915). Newnes Everyman's Wireless Book by F. J. Camm (c1937). Newnes Chronicle Wireless Constructors Encyclopaedia by F. J. Camm (c1938). The Book of Practical Radio by J. Scott-Taggart (c1933). The Elementary Principles of Wireless Telegraphy by R. D. Bangay (c1918). Admiralty Handbook of Wireless Telegraphy (c1925) and R.S.G.B. Handbook and Supplement 2nd. Edition (c1941).—R. W. Sharp, 77 Cloche Way, Upper Stratton, Swindon, Wiltshire.

WANTED

Valves VY2 and VCL11 for pre-war German Peoples Set. I have crystal sets for exchange. H. H. Journeaux, 7 Blair Avenue, Parkstone, Poole, Dorset. Tel. Parkstone 748072.

... Any gen on Admiralty Pattern M361 receiver, serial number 5708. It has 4 valves—two HF stages, either SG or HF pentodes. Detector is an SP2 with a PM22A as output. Tuning ranges: 235-100kHz, 510-215kHz, 1080-460kHz, 2250-1000kHz, 4500-2000kHz. When tuned to the last range, a 6th range can be obtained by moving a plug on each of the 3 coils from a socket marked "out" to "in", when the range changes to 8500-3500kHz.—Dr. H. S. Brodribb, 8 Brittany Road. St. Leonards-on-Sea, TN38 0RA.

write your own
messages on
the tv screen!

pw 'Easybuild'

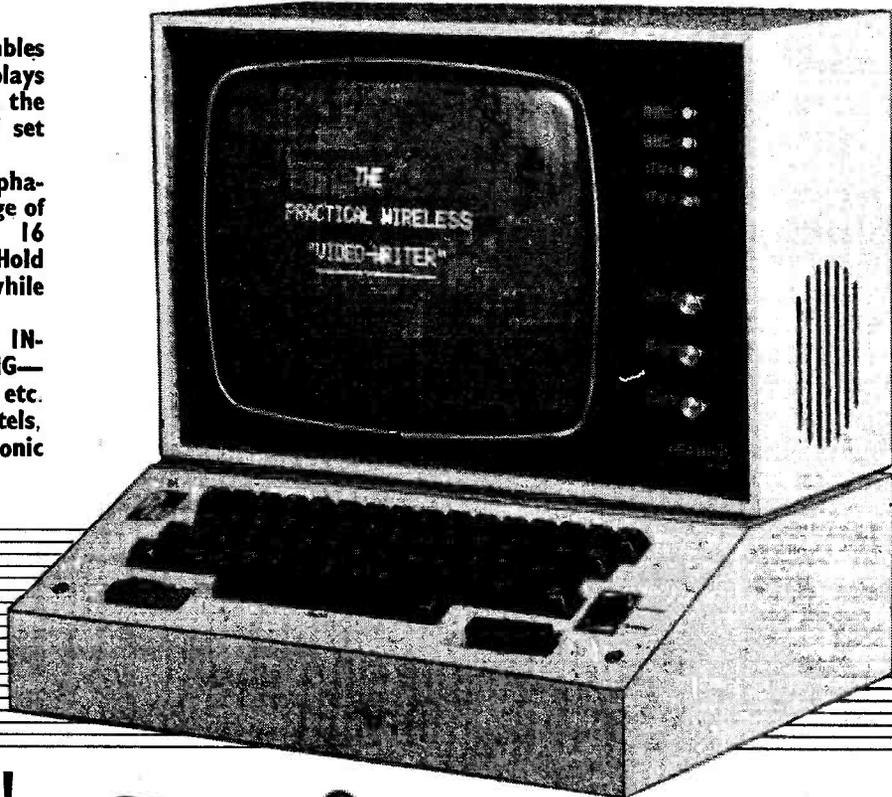
VIDEO-WRITER

IN NEXT MONTH'S
**PRACTICAL
WIRELESS**

The Video-Writer resembles a typewriter but it displays the text directly on the screen of a domestic TV set or a video monitor.

A page of text, which is alphanumeric with a wide range of punctuation, comprises 16 lines of 32 characters. Hold one page in memory while composing the second!

USE IT for DISPLAYING INFORMATION—ADVERTISING—SCORING for darts, bowls etc.—silent PAGING in hotels, clubs, libraries — electronic SCRABBLE.



BOAT OWNERS!
DON'T BE A SLAVE TO
YOUR ECHO SOUNDER
FIT THIS SIMPLE

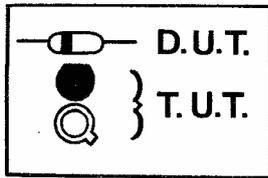
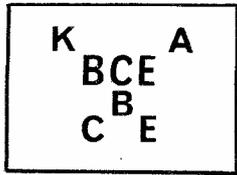
**AUDIO
DEPTH
ALARM**



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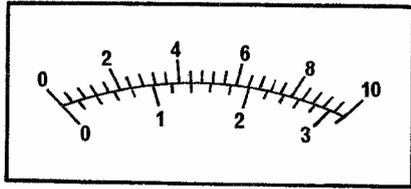
**Cassette
POWER SUPPLY
for Cars**

ON SALE IN JULY



A VERSATILE TRANSISTOR TESTER

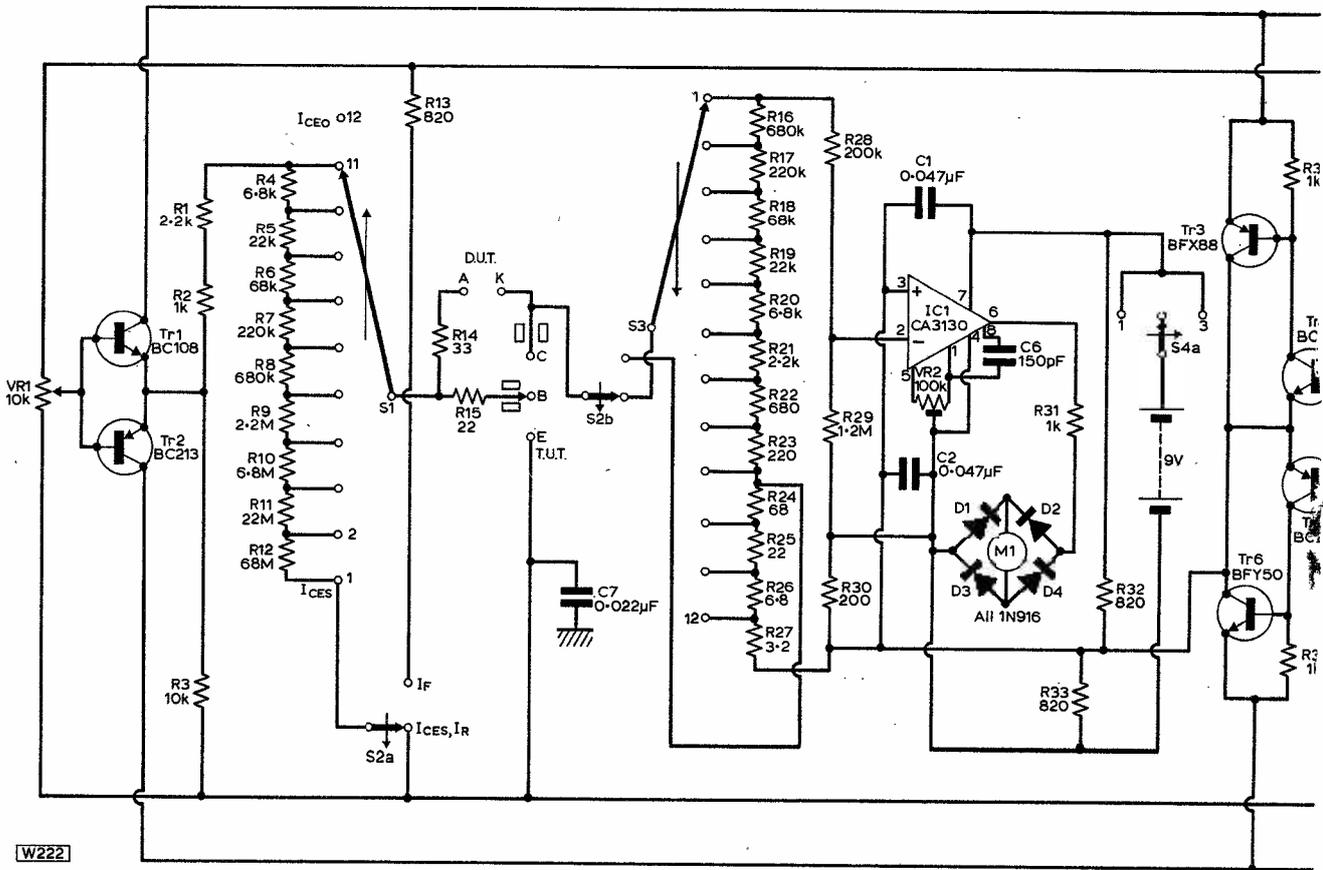
Ian HICKMAN



Parameters

- h_{FE} Direct Current Gain.
- h_{fe} Dynamic Current Gain.
- I_{CES} Collector Current Flowing With Base Short Circuit To Emitter.
- I_{CEO} Collector Current Flowing With Base Open Circuit.
- r_{dON} Drain/Source Slope Resistance At Zero Gate Voltage.
- V_G Gate Voltage Of FET's.
- I_{DSS} Drain Saturation Of FET's.

VERY useful adjunct to any electronic laboratory, home or professional, is a versatile transistor tester, especially if it will also test diodes, zeners, FET's, light-emitting diodes etc. In the nature of things, a transistor tester comes in for intermittent use, rather than the longer periods of use typical for signal generators, level meters and test instruments generally. Thus, if power transistors are excluded, a transistor tester can be conveniently designed to run from internal batteries. The freedom from a mains lead greatly enhances



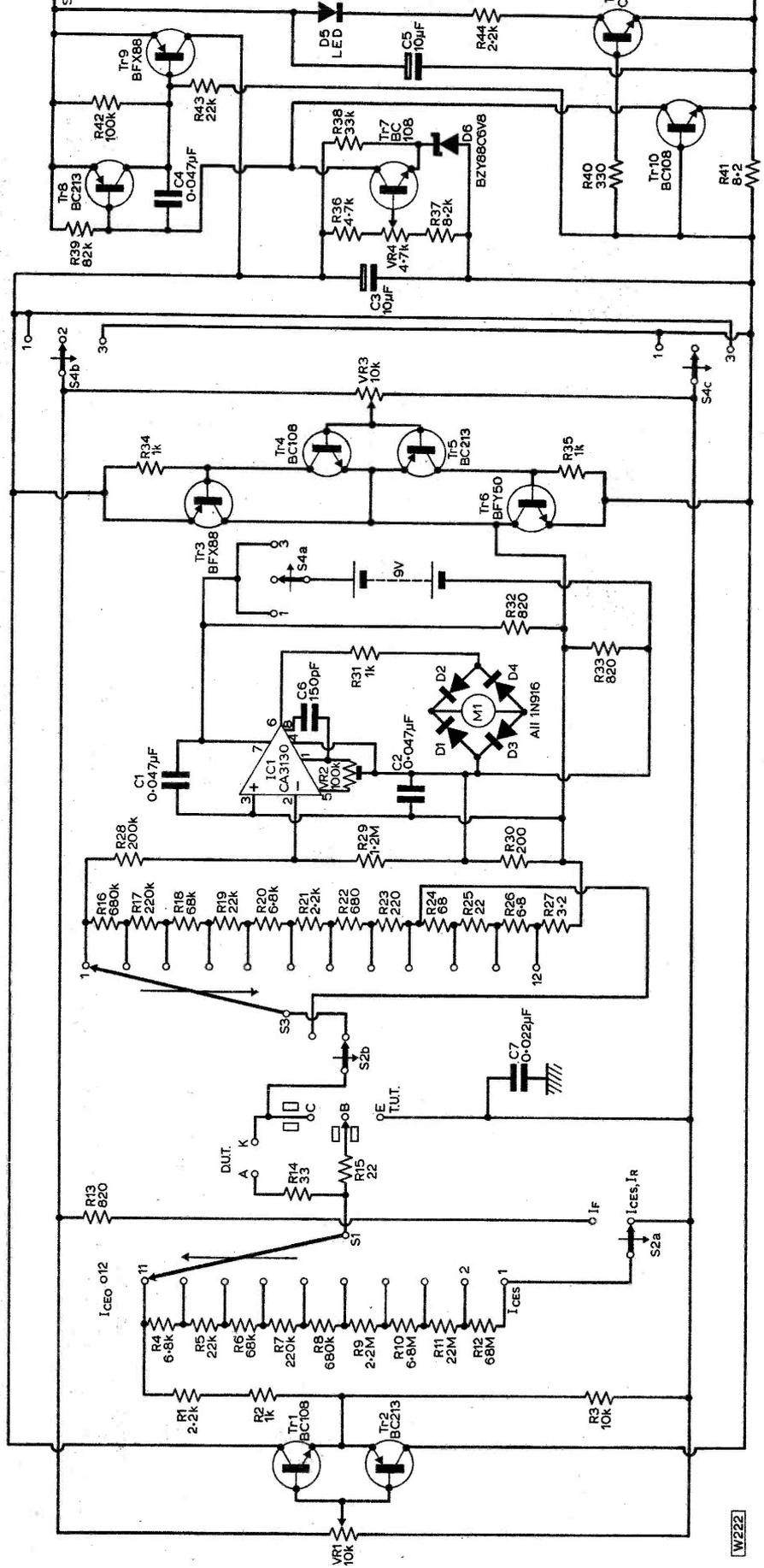
W222

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A VERY useful adjunct to any electronic laboratory, home or professional, is a versatile transistor tester, especially if it will also test diodes, zeners, FETs, light-emitting diodes etc. In the nature of things, a transistor tester comes in for intermittent use, rather than the longer periods of use typical for signal generators, level meters and test instruments generally. Thus, if power transistors are excluded, a transistor tester can be conveniently designed to run from internal batteries. The freedom from a mains lead greatly enhances

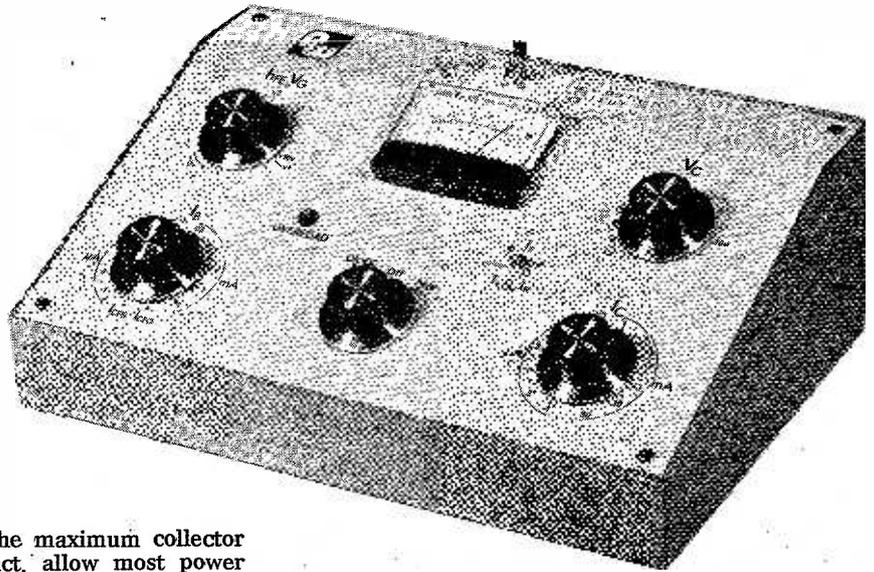
the instrument's utility and the maximum current of 30mA does, in fact, allow transistors to be tested satisfactorily, explained later. At the other end of the instrument allows transistors to be tested at collector currents down to a few nanoamperes whilst leakage currents of a few nanoamperes are indicated on the 500µA FSD meter. When an earlier version of this transistor tester was designed, the provision of direct



W222

Part 1

TRANSISTOR TESTER



the instrument's utility and the maximum collector current of 30mA does, in fact, allow most power transistors to be tested satisfactorily, as will be explained later. At the other end of the range, the instrument allows transistors to be tested for h_{FE} at collector currents down to a micro-amp or less, whilst leakage currents of a few nanoamps are indicated on the 500 μ A FSD meter.

When an earlier version of this transistor tester was designed, the provision of direct reading scales

for h_{FE} at given collector currents was considered and rejected, as it was felt that defined values of base current in conjunction with a meter scaled in collector current were more convenient (the method of use is dealt with later) and the arrangement has been retained in the present design. However, the design still permits the measurement of h_{FE} at a given collector current if required. Also rejected was the inclusion of facilities for measuring h_{fe} since circuits depending on a transistor having a particular value of this parameter should be avoided wherever possible.

The result is a notably simple design, without the plethora of switching usually employed to cope with measurements on both NPN and PNP types, and which also tests J FETS, MOS FETS (enhancement and depletion types), diodes and zeners etc.

CIRCUIT DETAILS

As mentioned above, to measure the h_{FE} of a transistor the instrument injects a defined base current and displays the collector current. Referring to Fig. 1., assume that the NPN/PNP selector switch S4 has been set to NPN and an NPN transistor has been connected to the correct "transistor under test" TUT terminals. In this position, transistors Tr2, Tr5 and Tr6 are not used and the emitter of Tr1 is at a voltage with respect to the lower end of R3, determined by the setting of VR1. When the latter is set to the scale indication denoting $h_{FE} \times 1$, this is 10.5V. The odd 0.5V is a compromise allowance for the V_{be} of the transistor under test, be it silicon or germanium, and hence there is 10.0V across the base current resistor chain. The resistance in circuit, selected by the BASE CURRENT switch S1, may be set at 3.2K ($R1+R2$) in position 11 to 100M Ω in position 2. Thus the base current can be set in 10 steps from 3.16mA down to 0.1 μ A. At the lower currents, the V_{be} of Tr1 tends to fall some-

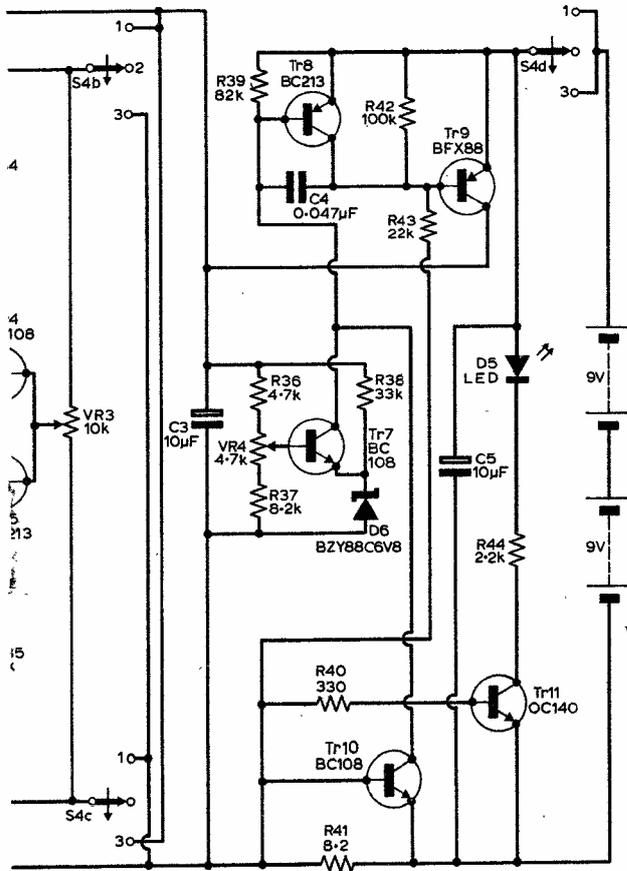


Fig. 1. Circuit diagram including inter-component wiring on the P.C.B. For clarity most of the functions performed by switches and variable resistors have not been shown. Note, suitable cut-outs for the meter scale and the D.U.T./T.U.T. panel are incorporated in the heading.

★ components list

Resistors

R1	2.2kΩ 1%	R25	22Ω 1%
R2	1kΩ 1%	R26	6.8Ω 1%
R3	10kΩ	R27A*	6.8Ω 1%
R4	6.8kΩ 1%	R27B*	6.8Ω 1%
R5	22kΩ 1%	R27C*	47Ω 1%
R6	68kΩ 1%	R28	200kΩ
R7	220kΩ 1%	R29	1.2MΩ
R8	680kΩ 1%	R30	200Ω
R9	2.2MΩ 1%	R31	1kΩ
R10	6.8MΩ	R32	820Ω
R11	22MΩ	R33	820Ω
R12	68MΩ	R34	1kΩ
R13	820Ω	R35	1kΩ
R14	33Ω	R36	4.7kΩ
R15	22Ω	R37	8.2kΩ
R16	680kΩ 1%	R38	33kΩ
R17	220kΩ 1%	R39	82kΩ
R18	68kΩ 1%	R40	330Ω
R19	22kΩ 1%	R41	8.2Ω
R20	6.8kΩ 1%	R42	100kΩ
R21	2.2kΩ 1%	R43	22kΩ
R22	680Ω 1%	R44	2.2kΩ
R23	220Ω 1%		
R24	68Ω 1%		

* These three in parallel equal 3.2Ω

All resistors are 5% 1W carbon film unless otherwise stated. TR5 Metal Oxide resistors in 2% tolerance range are usually nearer 1% and could be used instead of 1% as specified without appreciable loss of accuracy.

Variable resistors

VR1	10kΩ Panel Mounting
VR2	100kΩ Skeleton Vertical
VR3	10kΩ Panel Mounting
VR4	4.7kΩ Skeleton Vertical

Semiconductors

Tr1	BC108
Tr2	BC213
Tr3	BFX88
Tr4	BC108
Tr5	BC213
Tr6	BFY50
Tr7	BC108
Tr8	BC213
Tr9	BFX88
Tr10	BC108
Tr11	OC140

IC1 CA3130

D1	1N916
D2	1N916
D3	1N916
D4	1N916
D5	Any LED
D6	BZY88C6V8

Switches

S1	1 Pole, 12 Way, Rotary.
S2	2 Pole, 2 Way, Biased Toggle, Miniature
S3	1 Pole, 12 Way, Rotary.
S4	4 Pole, 3 Way, Rotary.

Miscellaneous

Meter, 500μA FSD Watford Electronics, type T23. Batteries, 2 off type PP7, 1 off type PP3, Connectors to suit. Case, 10½" x 7½" x 3½", Watford Electronics type W.E.1. Knobs, 4 off to suit switches and variable resistors. P.C.B., Readers PCB Services Ltd., see advert. Ferrite beads, 2 off 3/16" x 1/4" dia. Veroboard 2" x 1" approx., 0.15" Matrox.

what, resulting in more than 10V being applied across the S1 resistor chain. By drawing a 1mA standing current, R3 reduces this effect.

Alternatively, the base of the TUT can be earthed (via S2a and position 1 of S1) to measure the short circuit collector current I_{CES} or left open circuit (position 12 of S1) to measure the open circuit collector current I_{CEO} .

The base stopper resistor R15 and the anti-parasitic ferrite beads on the base and collector leads ensure that when the TUT is a very high frequency type it does not oscillate.

The collector current passes through a current shunt selected by the COLLECTOR CURRENT RANGE switch S3. The voltage drop across the shunt is always 100mV at full scale, thus a 3.2Ω shunt is used for the 30mA range (position 1 of S3) and 1MΩ (total) for the 100nA range (position 12 of S3). As resistors are only readily available down to 4.7Ω, the p.c. layout allows for three resistors in parallel, see Fig. 5. Two resistors of 6.8Ω and one of 47Ω provide the right value.

Note that the meter is so scaled that 1mA (FSD) on the 0-1mA range corresponds to 3.15mA on the "0.3mA" range, which is actually calibrated up to 3.2mA. This is important as will appear in the section on using the instrument.

The drop across the selected part of the collector current shunt, applied to the operational amplifier IC1 via the remaining shunts plus R28, is equivalent to a voltage source applied through a 1.2MΩ total. Since R29 is also 1.2MΩ the amplifier produces 100mV at the junction of R29 and R30 at FSD. Thus R30 defines the current through the meter. After passing through the current shunt the collector current is absorbed by the augmented emitter follower Tr4 and Tr3. This stage sets the collector voltage of the TUT, as determined by the setting of the COLLECTOR VOLTAGE control VR3.

When testing a PNP transistor, S4b and S4c invert the polarity applied to the TUT and also to VR1 and VR3. Thus the base current and collector voltage are now provided by Tr2, Tr5 and Tr6, but the scale calibration of the h_{FE} MULTIPLIER control VR1 and COLLECTOR VOLTAGE control VR3 still apply. The direction of collector current flow through the current shunt is reversed but this is of no consequence as the meter is in a bridge rectifier circuit. This arrangement results in less wiring and a neater layout compared to reversing the meter with extra poles on S4 and also simplifies testing of diodes for both forward and reverse current.

The meter amplifier is powered by a single 9V battery type PP3 and a stabiliser is not provided. The offset voltage of IC1 is adjusted by VR2 and, after initial setting to give zero reading on the meter, no further adjustment is required over a long period. An offset of either polarity will, of course, cause the meter to read due to the bridge rectifier action. To ensure meter protection the maximum overload current is limited to about four times full scale by R31 and the $r_{d(on)}$ of the output stage of IC1.

The TUT circuit is powered by 2 PP7 batteries, via a current limited stabiliser. This is so arranged that a 12V output can be obtained with only a few hundred millivolts drop across the regulator transistor Tr9, permitting the batteries to be used almost down to 1V per cell. On an intermittent use basis, the batteries would therefore provide many hours' use at 30mA drain and, of course, even longer

board blank by placing it over the board with a piece of carbon paper in between and then going over the p.c. tracks firmly with an HB pencil. Provided the copper has been well cleaned beforehand, the carbon paper will mark the copper clearly enough to be easily visible in an oblique light. For cleaning the copper, a piece of well-used "Scotch" green kitchen scouring cloth, used wet, is ideal. (When new it is a little **too** scratchy!) The tracks should next be marked in with a suitable ferric chloride resist using one of the fibre pens available for this purpose. The author used a brushing cellulose as sold for touching-up car paintwork. The p.c. pads were all marked in first, by applying a blob of the paint with a fine brush. Practice on an odd piece of copper clad board soon shows the right amount to apply; the paint will then spread out into a neat circle. Finally the shaded areas were filled in, using a paint brush. These areas not only reduce the supply rail impedance, they save a fair amount of ferric chloride!

After etching, which takes about half an hour, wash the board well. If cellulose paint has been used, it can be removed with "Polystrippa" paint

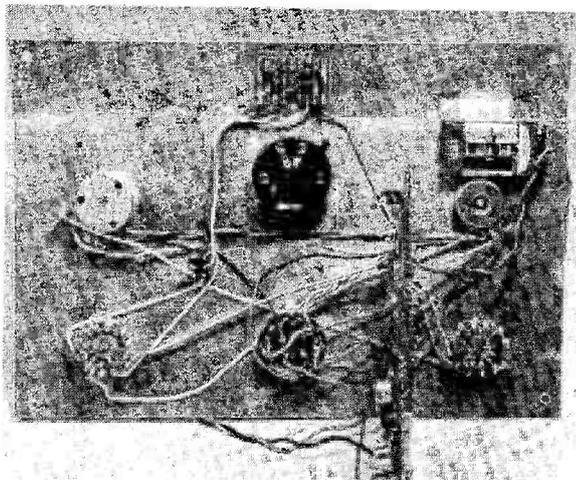
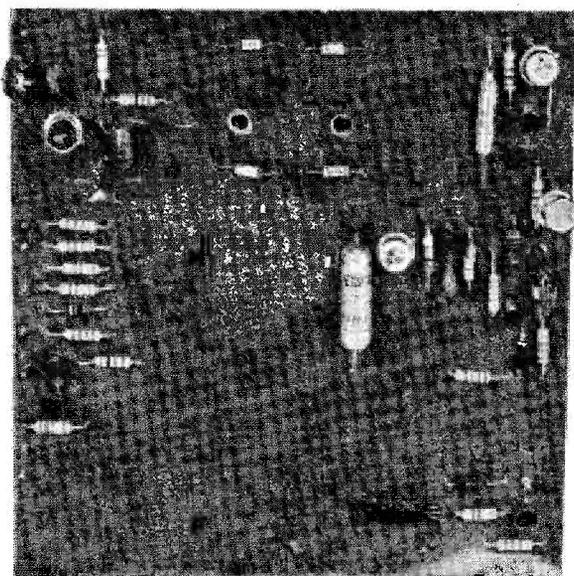


Fig. 4. Printed wiring pattern designed for minimum etch. This pattern is full size and may be traced directly onto single sided clad board.

Photo of reverse of front panel, with P.C.B. removed, showing main component positions.





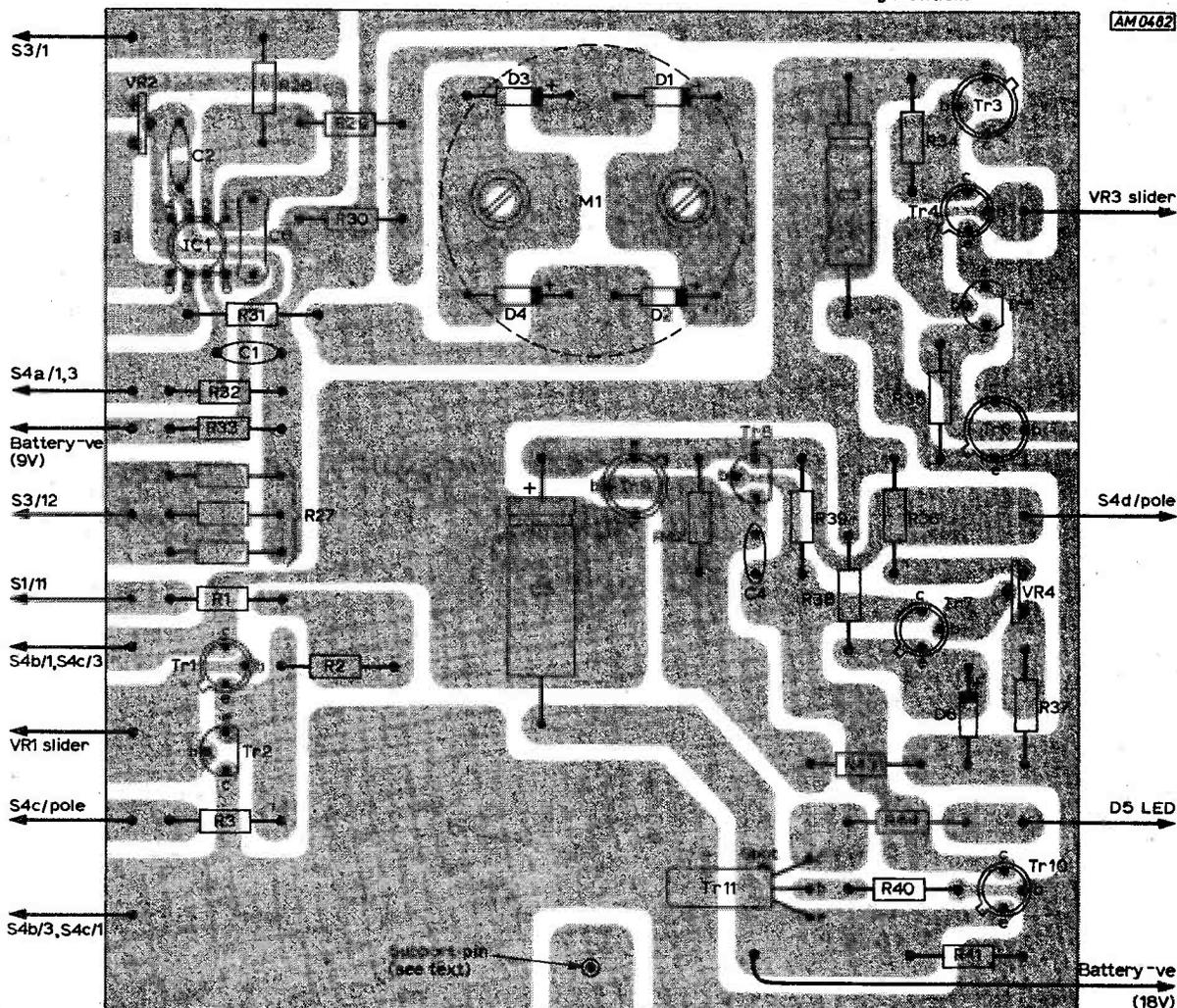
stripper. Wash the board well again and dry. It is best to drill the board and assemble all the components and pins straight away. The track side of the board can then be lightly varnished to prevent the copper tarnishing—a purely aesthetic point this. If available, "Letracote" spray is suitable, hair spray might even do at a pinch!

Having completed the p.c. board, assemble the controls, the meter and the test socket to the drilled front panel. Wire up as per the circuit diagram, noting that in Fig. 1 the arrows on the switch wipers indicate clockwise direction of rotation viewed from the front. The holder for the 9V PP3 battery powering the meter circuit is simply a strip of tinplate cut to size and stuck to the front panel with Araldite. Assemble the p.c. board to the meter and connect the pins to the front panel controls and battery leads as appropriate.

Part 2, to be published in our August issue, will describe the calibration and operation of the equipment.

Photo of the author's board. (Compare with Fig. 5.). Note the short component leads.

Fig. 5. Component side of the board with component locations identified. The track pattern is shown to eliminate the possibility of wrong insertion.



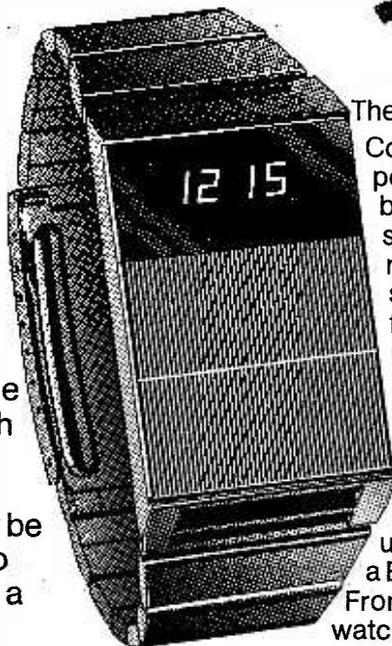
The Black Watch kit

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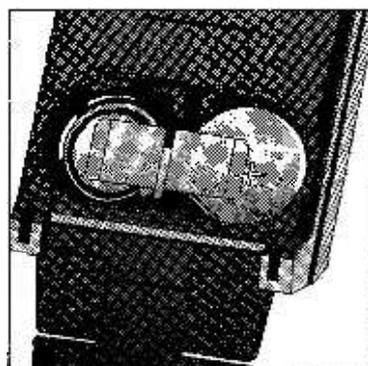
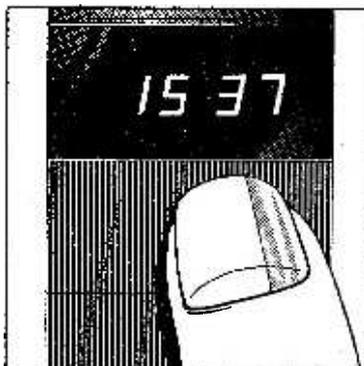
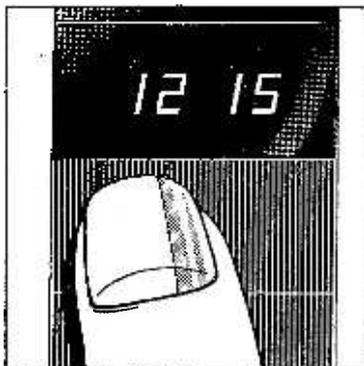
The Black Watch by Sinclair is unique. Controlled by a quartz crystal, and powered by two hearing aid batteries, it uses bright red LEDs to show hours and minutes, and minutes and seconds. And it's styled in the cool prestige Sinclair fashion: no knobs, no buttons, no flash.

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Touch and tell

Press here for hours and minutes... here for minutes and seconds.

Batteries easily replaced at home.



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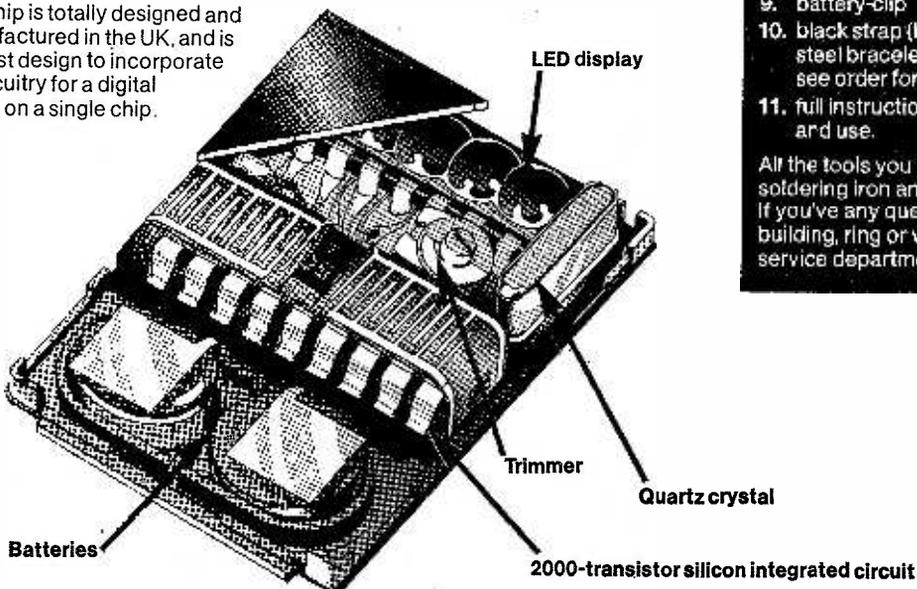
This chip of silicon measures only 3 mm x 3 mm and contains over 2000 transistors. The circuit includes

- a) reference oscillator
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- c) decoder circuits
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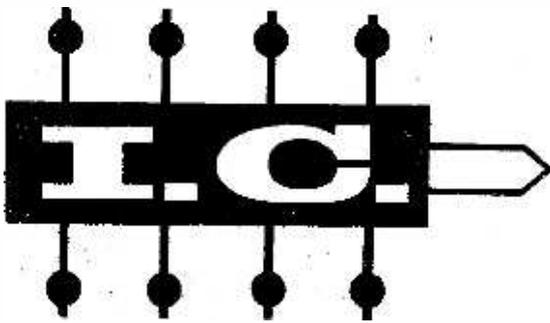
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FREEPOST—no stamp required.

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OF THE MONTH

by BRIAN DANCE

Number 59 LM1808 IF AMPLIFIER/FM DET/AUDIO PACKAGE

THE AVAILABILITY of modern integrated circuits specifically designed for radio applications has enormously simplified the design of modern receivers. Nevertheless, we are still some way from the time at which a radio receiver can be made by connecting an IC to a tuning control, a volume control and a loudspeaker without the use of any other components. However, the recent release of the National Semiconductor LM1808 device has moved us a step nearer to this ideal, since it contains an IF amplifier/limiter, FM detector, electronic volume control and a 2W audio power amplifier in a single package.

Although the LM1808 has been primarily developed as a television sound system the IF amplifier circuit is very similar to that of the LM3065 device (equivalent to the RCA CA3065 and the Fairchild 3065) which is intended for television sound IF use. These devices are rather similar to the 3075 types intended for FM IF radio applications. The LM1808 has a better volume control circuit than the 3065.

In addition, the LM1808 contains an audio power amplifier similar to the well-known LM380N. This power amplifier can be used with simpler circuitry than is possible with many other types and it is fully protected against shorting of the output and against thermal overloads.

CIRCUIT

The LM1808 is a dual-in-line device with 18 pins; this unusual number of connections makes it rather difficult to obtain a ready made socket for the device. The connections are shown in Fig. 1 together with the internal circuitry in block form.

A typical circuit for the use of the LM1808 is shown in Fig. 2. The IF input is fed to pin 13 via C5. Pin 12 is the other input of the differential amplifier; it is necessary to keep pins 12 and 13 at almost the same steady potential by means of a resistor R2. The input impedance is about 17k Ω , whilst an input of about 200 μ V is required to cause limiting of the input amplifier. The output of the amplifier is fed to the demodulator circuit, the tuned circuit connected to pins 9 and 10 forming part of the demodulator. The Toko tuned circuit type KACS-K-586HM has been found very suitable for use as a 10.7MHz tuned circuit in this application; it is available from Ambit International, 25 High St.,

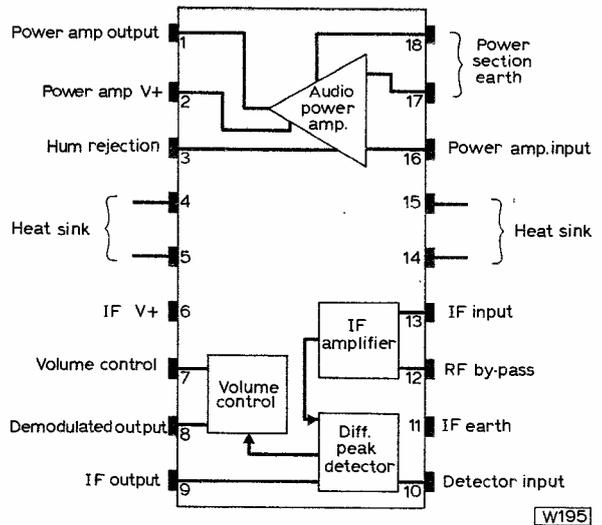


Fig. 1: Top view of the pin connections for the LM1808 with the internal stages shown in block form.

Brentwood, Essex, CM14 4RH. The Toko type 94AES 30465N should also be suitable.

The detector output is fed to the volume control circuit. Variation of VR1 of Fig. 2 will provide a linear variation of the output over a very wide range, typically 75dB. When pin 7 is earthed, the residual feed-through signal at pin 1 does not exceed 15mV RMS. The connection to pin 7 controls the volume by its steady DC potential; no signal voltages are present across VR1. A long unscreened lead can therefore normally be used to connect VR1 to the LM1808, since any hum or noise picked up by this lead can be bypassed and will not appear at the output. The rejection of amplitude modulated signals, including car ignition noise, is over 40dB for inputs of 1mV to 100mV RMS.

POWER STAGE

The audio output from pin 8 is fed via C7 to the input of the power amplifier at pin 16 where the input impedance is typically 200k Ω . C6 is an optional capacitor which will provide about 38dB rejection of any hum on the power supply line; a smaller value of this capacitor will also provide a useful amount of hum rejection.

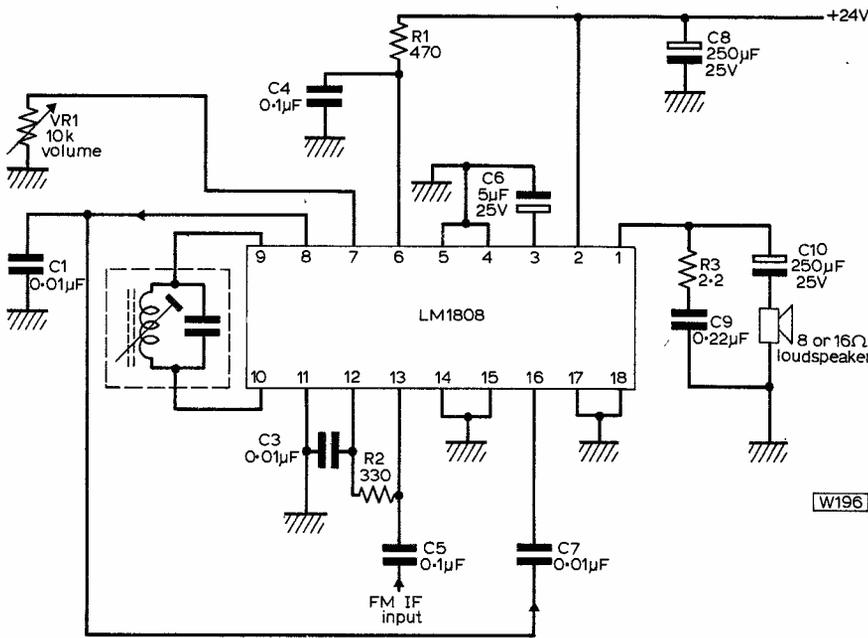


Fig. 2: Typical circuit providing IF amplifier, FM detector and audio output stage. The circuit across pins 9 and 10 is tuned to 10.7MHz. The volume control VR1 may be some distance from the associated circuitry.

The components R3 and C9 across the loudspeaker are used to prevent a 5 to 10MHz oscillation from occurring; this oscillation can appear during the negative swing into a load which takes a fairly high current if these two components are omitted. The distortion at the output is of the order of 1.2 per cent at 2W output power. The voltage gain of the output stage is fixed at 50 times (34dB); this enables the simplest possible circuits to be used.

POWER SUPPLY

The power supply voltage is connected directly to the power amplifier at pin 2; if the capacitor C8 is further than about 8cm from pin 2, an additional 0.1µF capacitor should be connected from pin 2 to earth to provide good decoupling at radio frequencies. The power supply to the IF section of the IC flows through R1 to pin 6; the internal regulator circuit in the LM1808 adjusts the pin 6 voltage to between 10.5 and 12.5V.

A 24V supply is shown in Fig. 2 (as suggested in the device data sheet), but a somewhat lower supply voltage may be used if R1 is reduced to keep the current to pin 6 to a suitable value. However, the supply voltage must be considerably greater than the maximum value of the stabilised voltage at pin 6 or the stabiliser circuit will not be able to function correctly. The absolute maximum permissible supply voltage is 30V. The current to pin 6 is 7 to 15mA, whilst the quiescent current to pin 1 is 2 to 20mA; obviously this latter current increases greatly when the device delivers power into a load.

The input to the circuit of Fig. 2 may be conveniently obtained by using a commercially manufactured front-end unit and feeding the output through a 10.7MHz ceramic filter to a Fairchild µA753 amplifier, as described in *Practical Wireless*, October 1974. The output from the µA753 can be fed directly to C5 of Fig. 2 or through a second ceramic filter to C5. However, any 10.7MHz input which is at a level greater than about 200µV may be fed to C5.

In conclusion, it may be mentioned that the writer has also used the LM1808 to amplify the signal from an ultrasonic transducer; the power amplifier in the LM1808 was used to close a large relay when the ultrasonic waves fell on the transducer. However, this is another story!

This device is now available from: D.T.V. Group Ltd., 126 Hamilton Road, West Norwood, London, S.E.27. at £1.86 inc VAT, post and packing.

PW

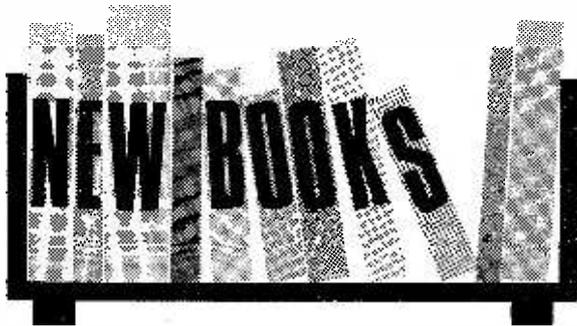


EQUIPMENT WANTED

- ..active filter unit Sinclair Project 60—R. W. Sheppard, 48 Grindstone Crescent, Knaphill, Woking, Surrey.
- ..a TAA960 integrated circuit (Mullard).—G. Singh, 250 St. Pauls Road, Highbury Corner, London, N.1.
- ..stereo tuner (250mV output) for use with PW (Jan/Feb 1973) 10W + 10W amplifier.—F. Southworth, 58 Sheephill Lane, New Longton, Preston, PR4 4YN.
- ..Perdio transistor receivers 'Caralux' or 'Town & Country' for spares.—W. Pearce, 32 Wathen Road, Dorking, Surrey.
- ..FL50B transmitter in good condition. All offers acknowledged.—R. J. Wallace, 26 Broadheath Drive, Chislehurst, Kent.

ISSUES FOR DISPOSAL

- ..Oct 1968, Aug 1968, May and June 1967, Jan 1968 to Mar 1969 inclusive, Television. Would like to swap for Television July and Aug 1974 and Wireless World Sept and Oct 1971.—E. T. Robins, 1 Old Kingston Road, Worcester Park, Surrey, KT4 7QH.
- ..volumes PW/TV issues (bound) to be disposed of in 1 lot. SAE for details.—N. Stevens, 48 Eversley Avenue, Barnehurst, Kent.
- ..Practical Electronics Aug 1970 to Jan 1975.—M. V. Pedersen, 19 Belgrave Street, Brighton, BN2 2NS.



AUDIO ON WHEELS

By Vivian Capel
Published by Newnes-Butterworths,
Borough Green, Sevenoaks, Kent, TN15 8PH
199 pages 22.5cms × 14cms
Price £6

A fair amount to pay for a book of this size, but worth every penny or 'P'. Audio on Wheels covers all aspects of 'in-car entertainment', detailing how to choose and install mobile audio equipment. Basic principles of radio and tape recording are given and the book also explains how to set-up complete systems. Many types of radio, cassette and cartridge players are discussed—including of course, stereo and 4-channel systems.

The book caters for the radio engineer, motor mechanic and DIY man. For readers with little or no knowledge of audio, Part 1 outlines the basic principles of receivers and sound recording. Part 2 deals with practical applications and covers such things as: power supplies, speakers, car aerials, car radios, stereo and multi speaker systems, cassette players, cartridge players, motor control circuits, disc systems, installation, interference suppression, mobile public address, setting up a workshop and repairs and maintenance.

FOUNDATIONS OF WIRELESS AND ELECTRONICS (9th Edition)

by M. G. Scroggie
Published by Newnes Technical Books, Butterworths,
Borough Green, Sevenoaks, Kent, TN15 8PH
521 pages 21.5cms × 13.5cms
Price £3.75

SINCE this book was first published in 1936, over ¼ million copies have been sold. This new edition, like the previous ones, covers the whole basic theory starting with a sound exposition of the elementary principles needed in all branches of radio and electronics. No previous technical knowledge is assumed and the author has only used maths where he deems it absolutely essential. The first chapters are not greatly changed from previous editions but those that follow, on applications, were almost completely re-written in the 8th edition to take in more on semiconductors. In this 9th edition, more attention has been given to ICs and printed circuits and information on ceramic filters, SSB radio and photoelectric devices is included.

Without a doubt, this book is really excellent value and the following contents list gives some idea of what you get for your money: General View of a System, Electricity and Circuits, Capacitance, Inductance, Alternating Currents, Capacitance in AC Circuits, The Triode at Work, Transistor Equivalent Circuits, The Working Point, Oscillation, Radio Senders, Inductance in AC Circuits, The Tuned Circuit, Diodes, Triodes, Transmission Lines, Radiation and Aerials, Detection, Low Frequency Amplification, Selectivity and Tuning, The Superhet Receiver, HF Amplification, CRTs, TV and Radar, Electronic Waveform Generators and Switches, Computers, Power Supplies, Appendix.

ELECTRONIC COMPONENTS (A Newnes Constructors Guide)

by M. A. Colwell
Published by Butterworth & Co. (Publishers) Ltd.,
88 Kingsway, London WC2B 6AB.
104 pages 21.5cms × 13.5cms
Price £1.80

USEFUL hints that one acquires through experience of handling components are provided and the book sets out to tell the reader—in somewhat verbose terms—what components look like, what they do and where they could be employed.

PRINTED CIRCUIT ASSEMBLY (A Newnes Constructors Guide)

By M. J. Hughes & M. A. Colwell
Published by Butterworth & Co. (Publishers) Ltd.,
88 Kingsway, London WC2B 6AB.
88 pages 21.5cms × 13.5cms
Price £1.80

CHAPTERS are headed, "How and Why PCB's are Used," "Board Materials and their Characteristics", "Planning a Printed Circuit Layout", "Processing Techniques", "Component Assembly", "Manufacturing Techniques" and "Alternative Proprietary Boards".

The book guides the reader through the stages of translating circuit diagrams into PCB layouts. Image transference, etching, milling, and trimming methods are described.

TRANSISTOR ELECTRONIC ORGANS FOR THE AMATEUR (3rd Revised Edition)

by Alan Douglas and S. Astley
Published by Pitman Publishing Limited,
39 Parker Street, London WC2B 5PB.
119 pages 14.5cms × 22.5cms
Price £4.25

THE construction of inexpensive compact electronic organs is now well within the capabilities of the home constructor as our readers will know. ICs are used in some of the designs in this book but readily-available transistors are employed in the majority of circuits.

A point of interest is that a design for a Leslie-type rotating curtain speaker is included—a useful design and one for which we on P.W. often have enquiries. Once again, this is an expensive book but one which will appeal to the home-constructor organ enthusiast for it contains some useful little circuits for experimentation.

ELECTRONICS AND THE PHOTOGRAPHER

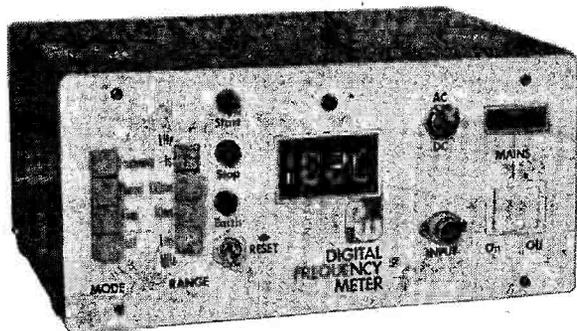
by T. D. Towers, MBE, MA, B.Sc., C.Eng., MIERE
Published by Focal Press Limited,
31 Fitzroy Square, London, W.1.
316 pages 22.5cms × 14.5cms
Price £6.50

This book describes in detail the electronic content of photographic equipment. It sets out to serve all those interested in electronics or camera mechanisms. Using a minimum of technical jargon, the text sets out precisely all the areas of photography where electricity is used. Its explanation of electronic fundamentals forms the basis from which non-technical readers can approach subsequent chapters. The discussion is extended to include separate exposure meters and their calculators. In the area of lighting, the author covers the functioning of electronic flash-guns and 'computerised' flash units. Photographic processing is covered and the book describes automatic timing, darkroom equipment, print exposure and process control systems (B & W and colour). The author finishes the book by looking into the "future", and covers automatic focusing, and micro-circuit technology which can compress the works of a camera 'computer' into a pin-head sized chip of silicon.

DIGITAL FREQUENCY METER

PART 2

T. J. JOHNSON

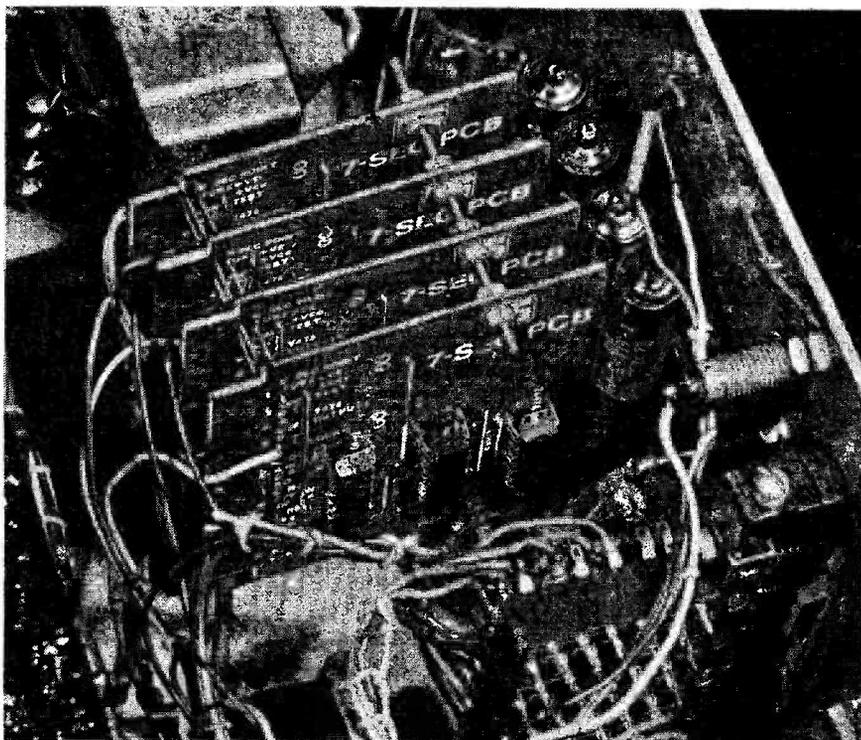


THE function of S5 is not so obvious and can be explained as follows: When S5b is in the position shown, the store pulse is allowed to pass through. When the switch is put in the opposite position, the condition presented to the inverters is logic '1', the store pulse thus effectively cut off. This means the actual condition presented to the stores is again '1'. The stores thus follow the data at their inputs. This is useful when in the time mode, since the counting may actually be seen. The second part of the switch S5a applies a logic '0' to the reset lines, thus preventing the counters from being reset, and forming a useful hold facility. The second function of the switch is to produce a low-to-high transition which is used to reset the counter

when first switched on and when in the time mode. This is achieved by placing the switch in one position and then the other, fairly rapidly.

COUNTER/STORE/DECODER/ DISPLAY

The four counters IC11 to IC14, Fig. 8, receive the incoming signal from the Gate, IC10. The reset terminals of each IC are connected together and



Detailed photograph of the Doram PCB's, specifically designed for use with the 7-segment filament tubes. All boards are identical except for connections to the 'decimal point' contact on boards 3 and 4.

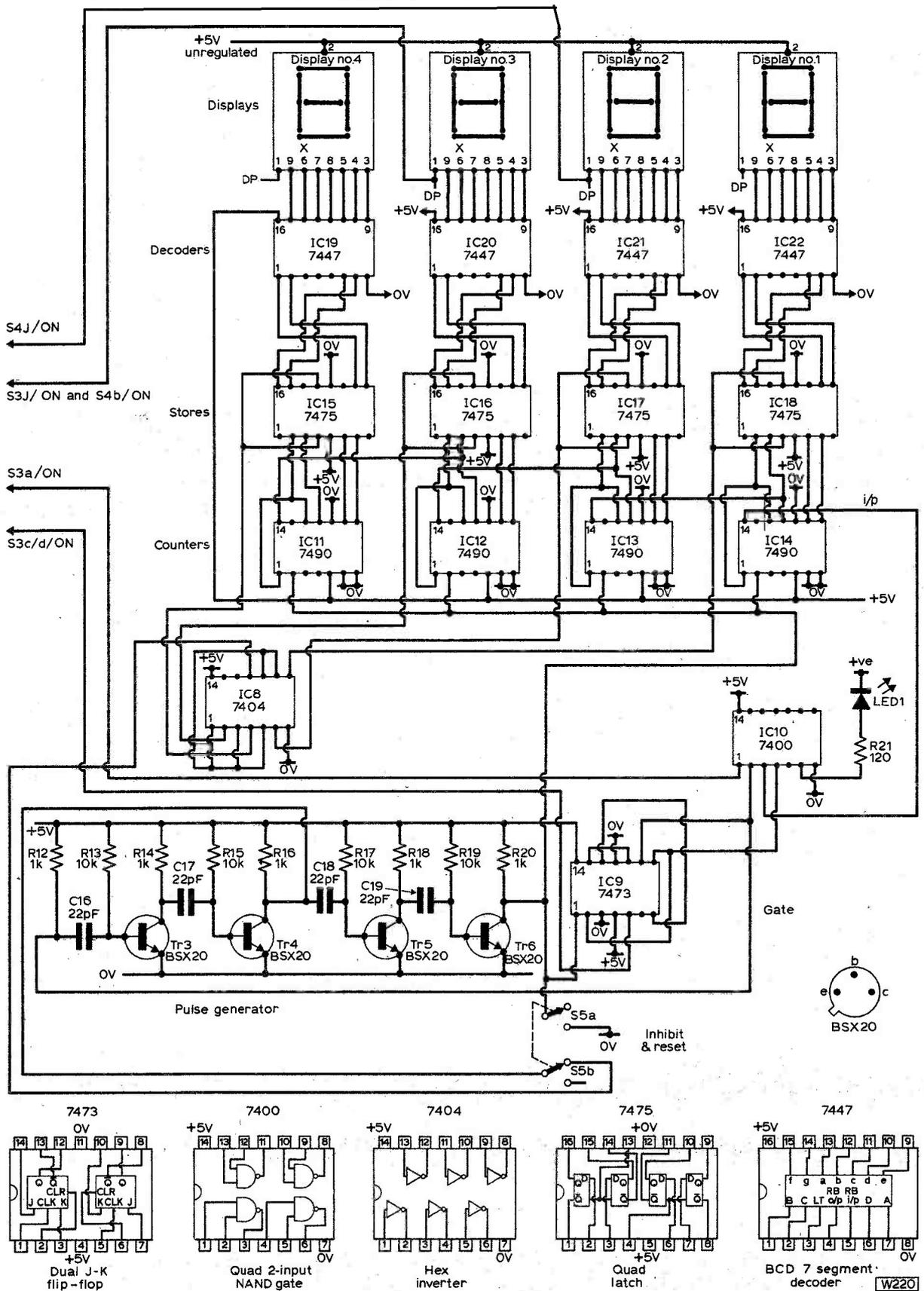


Fig. 8: Diagram of the remainder of the circuit. This should be used in conjunction with Fig. 7 part 1. IC's 11 to 22 are all housed on the filament tube PCB's.

taken to the collector of Tr6. Four four-bit latches are used as the store, these are IC's 15 to 18. The store command signal comes from Tr4 in the pulse generator, via S5b and the inverters in IC8. The inverters are required to present a pulse of correct positive going shape to enable the stores. One inverter per IC is used, so as not to load the pulse generator too greatly.

Four decoders IC19 to IC22 type 7447's are used in the present design, since the displays chosen require these types. Alternatively, the 74141 IC may be used to drive cold cathode tubes although since a vast amount of modification is required to the circuit and PCB's this was not considered a viable proposition. (There is no reason however, why the type of display could not be changed. For example LED's may be used with no change in the circuit. However, an alternative method of mounting the LED's must be found.) The displays used in this design, are the Doram 7 segment indicators. These are incandescent types, working off a supply of 5V, and are ideally suited to the present application.

CONTROL LOGIC

As was explained earlier the signal needs to be applied to the counter for a certain gate time, this is achieved by using the gate IC10. It is possible to apply the gate times direct to the gate, but unreliable operation would result. Instead the gate is controlled by a signal from FF2 IC9, this has the

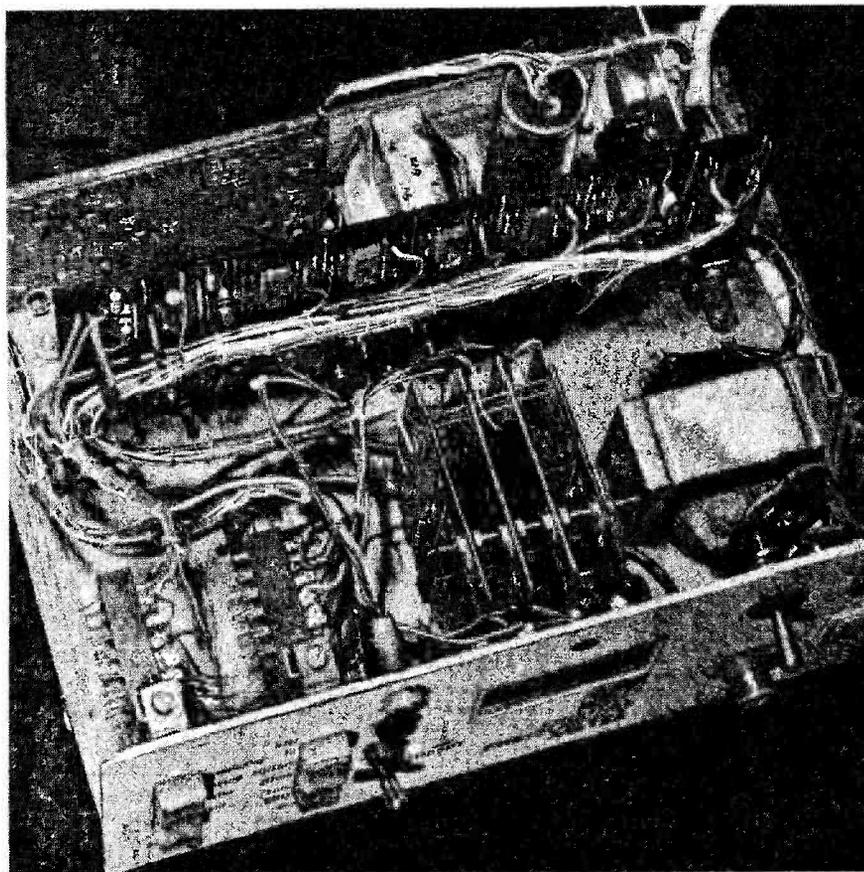
advantage of isolating the signal and the gate times (this may also be referred to, as the Clock pulse).

It is obvious that if the counters are not reset after each count, the frequency being measured will add to itself each time and cause an incorrect count. There are various methods of achieving this reset condition, and luckily the counters require a positive going pulse at either of their reset terminals. One method is to use a free running multivibrator to produce such a pulse, at the same time it may be used to display the count for a certain time, thus having a certain display time. Also in this design, a complication is added with the inclusion of the 7475 stores in order to achieve a stable display.

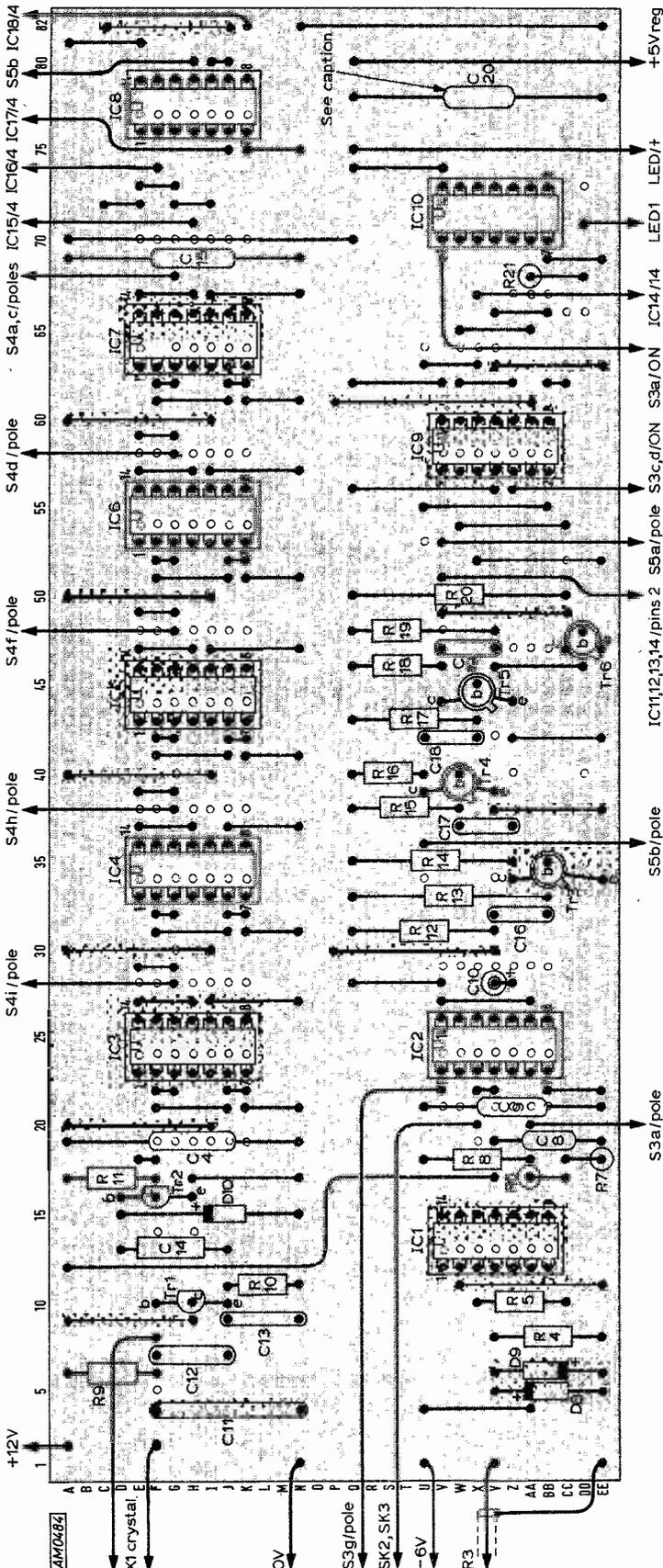
We now have to produce two separate pulses, one to reset the counters, and the other to enable the stores. The second pulse is needed to allow data at the 'D' inputs to be transferred to the 'Q' outputs of IC15 to IC18, this is accomplished when the Clock is high (7475 operation condition). It follows then, that if the clock inputs are low then no further data can arrive at the decoders to be displayed, thus for a steady signal the numbers displayed would be the same.

PULSE GENERATOR

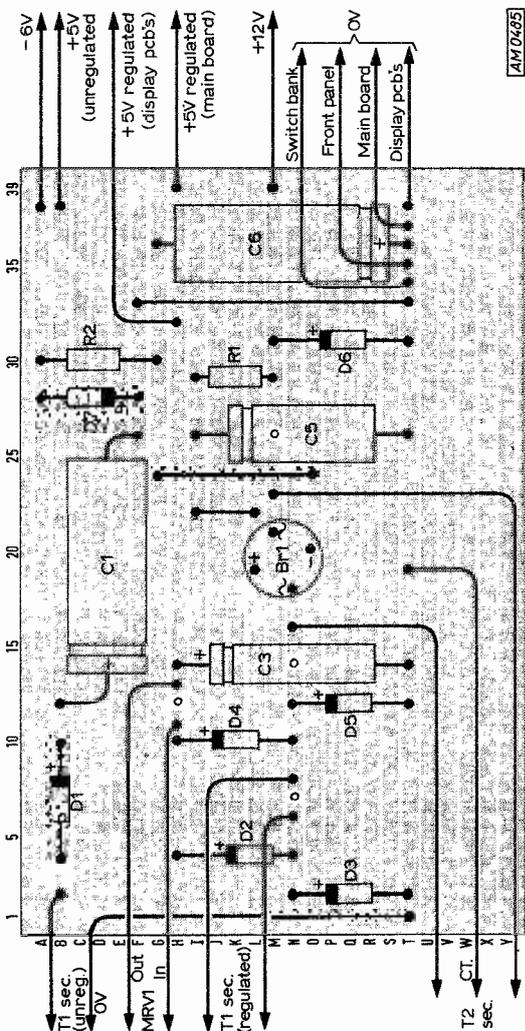
The important point to notice, is that the stores must be enabled before the counters are reset, since if the counters are reset first, the stores will pass this data to the decoders, and the resultant display would



Overall plan view photograph of the DFM. Note the general component layout and inter-board wiring.



▲ Fig. 11: Main veroboard shown actual size, containing IC's for crystal clock, dividers, timer, pulse generator, gate and inverter. The width of this board should be 80mm and not 95mm as printed in the component list. Additional decoupling may be required for the regulated supply at IC10, in which case connect a 10nF capacitor (C20) across the 5V supply.



▲ Fig. 12: Power supply veroboard on 0.1in matrix showing layout of rectifiers and smoothing components.

a problem, if the layouts shown in Figs. 11 and 12 are followed. Construction of the display boards are simplified by the use of ready made PCB's. The display boards should be joined together using

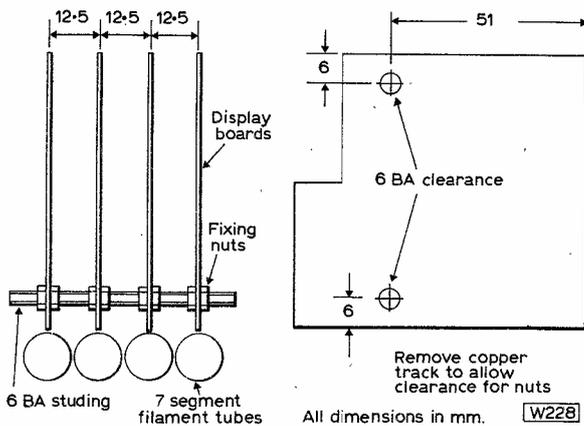


Fig. 13: Connect all four display boards together with a length of 6BA studding. Don't forget to remove any copper track that might short to the studding.

lengths of 6BA studding, as shown in Fig. 13.

The mounting bracket for the regulator and fuse holder is made from aluminium, and shown in Fig. 14.

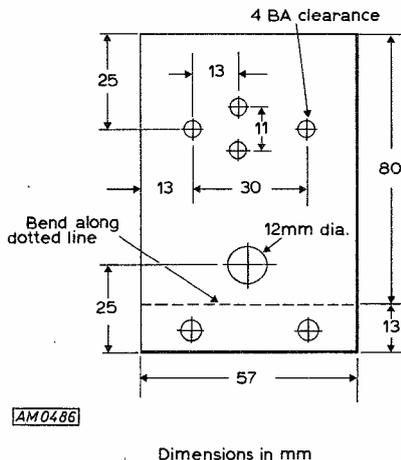


Fig. 14: Aluminium bracket for mounting the voltage regulator MVR1 and fuse holder. The fuse was omitted in Fig. 6 and should be connected between mains live and S1.

TESTING

It is preferable that the power supply be tested first, since the remaining circuits require to be set up using the power supply. Testing of the power supply should present no problems, since all that is required, is to ensure the correct voltages are obtained.

The display boards should be tested in turn by connecting each to the power supply, and connecting the reset line to 0V. The store line shouldn't be connected, and a 1Hz square wave of approx 5V should be applied to the input. The display should advance one digit per second. This should be done

to each display, any faults being cleared before construction commences.

It may at this point be worth trying to find the board with the highest operating frequency, and using this in the first position. This may be done by applying a continually higher frequency to all the boards (all the boards must be connected in series) and noting when the display ceases. Using this method the fastest display board can be used thus extending the operating frequency of the counter. This is because the first board must operate at the maximum frequency of 30MHz. Thus the first board divides by 10 presenting a frequency of 3MHz to the second, well within the capability of the IC's.

The input stage is the next to be tested and involves applying a variety of frequencies and amplitudes to ensure that IC1 converts the waveform into a good square wave. The effectiveness of the input protection may also be tested, but be careful!

The crystal clock and dividers can now be tested, it is advisable to check each divider IC before inserting it into the circuit since a 'dud' can upset the entire clock generator. It will be noticed that no adjustment is provided for the crystal oscillator, since the crystal itself is very accurate. The timer control is tested to ensure that only a single pulse is generated when the input is earthed. It is recommended that a micro-switch be used to eliminate the contact bounce associated with normal press type switches. The remainder of the circuit, ie the control logic can only be tested when the other units are fully connected.

After construction is completed a final check should be made in the case of any shorts etc, and power applied. If all is well, the instrument can then be tested to ensure correct operation, after which the counter is ready for use.

FAULT FINDING

With a complicated circuit such as this, the possibility of a 'dud' IC is not uncommon, it is therefore important that the IC be eliminated as faulty, as far as possible. The removal of an IC from a circuit board, can, more often than not, cause other damage. The use of IC sockets can eliminate this, but due to the expense, were not used in the prototype.

KINDLY NOTE!

Rhythm Generator, June 1976

It has been brought to our attention that pins one and two of IC5 (PCB3, Fig. 11) were connected together. This is incorrect, pin one should be bent clear and not soldered.

stray signals

by **POINT CONTACT**

A fit of nostalgia was sparked off by a find whilst browsing through secondhand books one Sunday afternoon in a market town in rural Hampshire. Rural Hampshire being peopled by honest folk, there are racks of books outside the shop under a covered forecourt, even a notice saying "OAP's Take One Free". There I came across a copy, in excellent condition, of "A Manual of Modern Radio", by J. Scott-Taggart. As Point Contact is not yet quite old enough to benefit from that notice, I duly put the price marked inside the front cover—30p—through the slot by the door and that evening walked through the covers of the book into a long-lost Arcadia, full of differential reaction condensers (reduces the effect of hand capacity), basket weave coils and of course egg-shaped insulators.

But don't get the idea that Point Contact is a boring old man who lives entirely in the past. As a practising chartered engineer I am also involved with the latest techniques of information transmission, both line and wireless (sorry, radio!). And like any good engineer, I like to know what is going on in other fields of engineering. Some of the developments are fascinating—take Optical Computing, for instance, I had always assumed that if a photograph was taken out of

focus, the fine detail was irretrievably lost; certainly putting the negative in the enlarger equally out of focus in the other direction won't help! Nevertheless, the way the blurring on the negative takes place is uniquely determined by the lens and the degree of out-of-focus. Imagine the blurred negative from an out of focus picture of a point of light on a black background. If we could process the information on the negative through a system with a transfer function equivalent to the inverse of the "point spreading function" of the out of focus lens, the negative could be made to yield a print showing the original point.

Exactly this has in fact been done, using holographic techniques, for real photographs full of detail. A minor snag is that certain "spatial frequencies" (number of lines-per-mm on the negative) depending on the original lens and degree of out of focus are missing from the "sharpened" picture. On normal subjects this is not noticeable any more than a narrow bandstop filter causing a 'hole' in the audio spectrum, on ordinary programme material like a full orchestra. There are numerous other applications of the technique, which is called "optical computing" because the holographic system is in fact processing vast amounts of information in parallel in real time.

Of course, not everyone is interested in science and technology; take Mrs. Point Contact for example—although I was surprised to find that even she can (usually) tell the difference between a resistor and a capacitor. And the little Point Contacts don't really show any interest in electronics at all, perhaps because they have been threatened with dire consequences if they grunch anything in my "laboratory". I am fortunate enough to have a corner of the spare bedroom for my work bench; well,



Clearing up when we have visitors.

most of the spare room, actually, so a certain amount of clearing up is called for when we have visitors. How much depends on the visitor.

In the 20's, for most people, components were very expensive, but ready-made sets just prohibitive. Later on, as volume production of all-mains sets got under way, prices came down considerably and just before the war I bought a Cossor 365 Superheterodyne Receiver for the princely sum of £7.19.6. Of course, in real terms, that was equivalent to the present day price of a good television set, and as a receiver it had a remarkably good performance. "Excellent bass radiation and good crisp treble" was the verdict of the Wireless & Electrical Trader. In practice this meant 6dB per octave top cut from about middle C upwards, aided beyond a Kc or two by heavy RF filtering at the detector and 'High Q' IF transformers. Nevertheless, it did have a tuned RF stage and Long, Medium and Short Wavebands and with a long aerial and a following wind would pick up plenty of American and the odd Australian station. Years later, when servicing it, I found out the hard way that whilst the top cap of the RF pentode was grid 1, that on the pentode in the IF stage was anode!



Threatened with dire consequences.

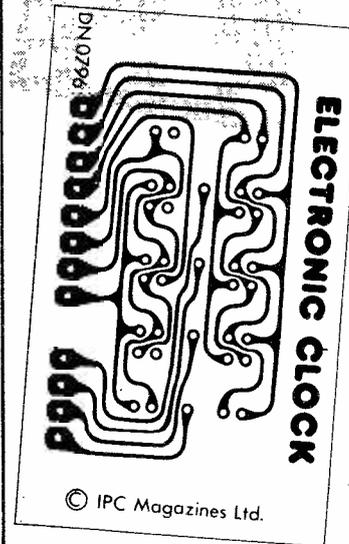
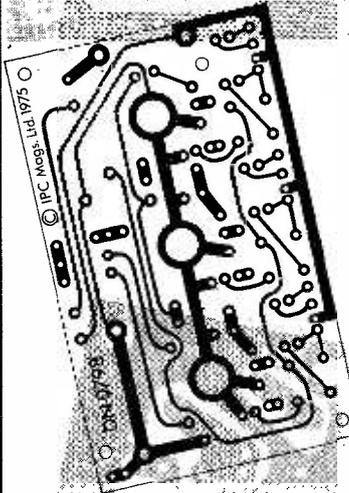
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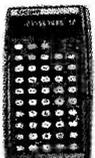
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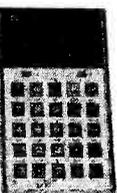


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6	3	3-76	62	0-9 x 2	1A	2-60	52
8	4	4-30	85	0-15 x 2	200	1-30	25
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AMATEUR BANDS

by Eric Dowdeswell G4AR

I HAVE had an interesting letter from **J. Watson** of Bolton in which he says he has written to the RSGB to propose that they run a course for beginners, in **Radiocommunication**, which would complement the **Guide to Amateur Radio** and the **Radio Amateur's Examination Manual**. Personally speaking I would have thought that the **Guide** would have been enough but, as **JW** says, once into ones fifties and things get a bit more difficult! **JW** would like to learn just enough to pass the **RAE** but in the event one could hardly avoid learning quite a lot more. Not much point in just acquiring a lot of isolated facts even though that could be enough to pass the examination which, in all conscience, could hardly be simpler! **JW** did try a night school class at a technical college but found the hour or so a week a waste of time and very protracted. Unfortunately, **JW** still awaits a reply to his suggestion, written on March 4th.

Paul Turner (Bishops Stortford) found 15m a good and improving band during the month, as did several other correspondents. Only to be expected with the summer coming on, I suppose. Paul's main problem is the seemingly eternal **QRM** from the timebases of local colour TV sets but with the rise in the usable frequencies as we get further into the year this trouble ought to tend to diminish, being worse on the **LF** bands. Paul also noted an improvement in the 20m band especially in the afternoons when central and south African stations were prominent.

Steve Cottis G15294/A8961 (Harrogate) queried a station signing /P/4U which would appear to be an amateur with one of the **UN** forces, such as those on the **Golan Heights**, although the **4U** prefix is generally used by stations in Geneva, under the aegis of the **ITU**. Steve also noted **4J6A** operating in a contest which turned out to be a **UG6** station! To forestall any enquiries Steve's "call" G15294 is an identification issued on joining the **International Short Wave League**. I am glad to know that Steve has now made an audio oscillator so as to get on with the task of learning Morse. Don't try to do it all by yourself Steve, try and find an experienced op to assist or you will get into some bad habits!

Neil Whiteside (Hitchin) sent in a brief log for 20m but has in fact been mainly listening on the 2m

band but reports that nothing has happened there recently to be worthy of mention. On 70cms Neil has a Microwave Modules converter fed from two 6-element yagis with matching harness. He is looking forward to the operation of the 70cms Bedford repeater **GB3BD** which has been carrying out **QRP** tests apparently. **Paul Flatman** (Ipswich) decided to fix his **HRO** after all and as he says "when it is working properly it is really pulling them in" on an "old bit of bent wire" as he puts it. Paul is another to comment on the up and coming 15m band. On 40m he caught **YV40W/P/7** on **SSB**. Could this be a new country in the offing? **QTH** said to be **Margarita Island**.

Another **Paul**, of the **Barker** clan (Sunderland) always sends in two log sheets, one for **SSB** and the other for **SSTV** in which mode he got **PY4AP** for a new country. Paul is wondering if an article on **SSTV** would be of interest in the magazine. I think it would so he is being duly encouraged by me! I am sure a lot of people would take up **SSTV** if they could only get some practical advice to put them on the right track. As well as studying for the **RAE** **Robin Bayley** (Nr. Wolverhampton) has managed to complete a converter for 2m and to put in some listening time in the **HF** bands with his ex-**RAF** **R1475** and long wire aerial.

L. Thompson (Reading) mentions the very much improved results obtained when his 350ft long wire at 35ft up had to be bent back to form a vee when the old elm at the far end had to come down. "Could this be some sort of beam"? he asks. It is, more or less, but if he feeds it with open feeder at the apex and uses an **ATU** he will have a very effective beam indeed and usable on all the **HF** bands. Seems it has around 200ft per side now. I know a lot of licensed chaps who'd be glad to get that sort of aerial up in their gardens!

Alan Doherty (Portrush, Co. Antrim) didn't find the bands particularly good and apologises for the poor log covering 20, 40 and 80m **SSB**. Don't know if his move to the spare bedroom, out of everybody's way, has got anything to do with it! Still has his **PR40/FR400SDX** set-up and 120ft of wire. Being only 100 yards from the sea he bemoans the fate of some of his aerials due to the Atlantic gales, but adds "I wouldn't change it for the world". He also comments on the lack of activity by yours truly on the bands. My head is duly bowed in shame! However I do have a rig which I am endeavouring to get on to the 80m band as soon as possible. It was a commercial rig with four switched crystal channels but by the time I have finished with it it ought to qualify for the appellation "home-brew"!

Stan Hunt (Wigan) **BRS36555** finally dragged himself away from his studies to write to us for the first time. Thank you Stan but don't let amateur



radio deter you until you have passed everything you have to pass. There will be plenty of time later. He has a Trio 9R59DS with a dipole for 40m which is also very effective on 15m. This is in the loft but he hopes to get a 14AVQ vertical up on a pole in the garden very shortly. Stan surprised me by asking how he can send cards through the Bureau. Presuming you mean the RSGB Bureau, Stan. I should have thought you would have been supplied with all the relevant info on this when you "joined up"! Briefly, all outgoing cards are sent to Arthur Milne G2MI, long time manager of the Society's QSL Bureau but incoming cards are received by means of SAE's, from your own Sub-Manager whose QTH you can find by reading Rad-Com or contacting RSGB HQ.

From **Bernard Hughes** in Worcester comes a nice log courtesy of his FR500SDX plus 20m dipole and 66ft of wire on other bands. Having a few days off work he took the chance to look at 20m in the afternoons and was pleasantly surprised to find plenty of VK's coming through. **Martin Chapple** (Leamington Spa) A9090 gets best results on all bands when he connects half his 20m dipole with his 100ft wire. If you look at the total length of all the wire in use OM you will probably find a multiple of 66ft somewhere! Like 132ft?. A half wave on 80m and excellent on all the higher frequency bands. Martin also queries the lack of G4AR on the air but I hope my notes above will explain all.

M. P. Bennett BRS 36644 just sent a log but, looking at the excellence of the entries, obviously had no time to write a letter! Back to **Steve Cottis** who was very impressed with the course on short wave propagation obtainable from Radio Nederland, PO Box 222, Hilversum, Holland, free of charge. Meant for the broadcast band boys but very useful still when they advance to the amateur bands! 9K2DT was so pleased with his report from Steve that he not only returned the IRC's but put seven stamps on the envelope including a set of five featuring birds. Feathered ones, naturally, which incidentally, is my second hobby when I have the

time! Wonder if 9K2DT should read 9J2DT?

Phew! Who said everyone is on holiday now and that I wouldn't get any reports! Seem to be more than ever! Following on from my remarks on **Tim Charles** A8927 last month he was kind enough to telephone me to say he is now G4EZA and, as we both remarked together, that's not too bad on CW! Tim was one of the few who regularly sent in logs of stations heard on CW, and now he's lost to us, boo-hoo! SOS—will **Paul Cowburn** who wrote me a long letter please let me have his QTH? I have an envelope here with an answer and some goodies but no address to which to send it. Unfortunately I can't find a previous letter from you, Paul.

Log extracts

P. Turner:— 15m ZS6U 9G1JX CX5BF 2m ON5UN PA0YZ (via aurora)

S. Cottis:— 80m A2CJP CT3AB JH0BQU VP2KF YB0ABV ZB2CJ 20m CR9AJ JR1UHM (Guam Is) KG6JBX HL9TX TU2GA VS6DO VR8A 7P8AC 15m CT3BK JA4JUJ UK0AAC

N. Whiteside:— 20m CP5DT HP1XMU KV4AB VP5MA

P. Flatman:— 40m YV4OW/P/7 20m HR3JRR VQ9DF (Mahé Is) YB0ABV ZS4BP 5N2NAS 9V1NR 15m EL2FW JA3MPT PZ9AB VS6DO ZD8RD ZP5WU

P. Barker:— SSTV 20m CT1JI HA5KFZ I0FZW K4QPR OE1HNW PY4AP 9K2DO 20m AD7ZJD/AG6 (Guam Is) CT7BC KG6JBX TJ1AF

R. Bayley:— 80m FP8DH 40m EA6DA VP8AA 20m A2CGO KH6PP

A. Doherty:— 80m PY7HS ZE6JL 40m 5T5AR 6W8DY 20m AL7CSX(KL7) FG0GE TG9HW VP2LCG YJ8DE

S. Hunt:— 80m ZB2CJ 20m FG7AN HR6SWA (Swan Is) VE8NS 8P6CG 15m 5T5ZR 9J2GJ

B. Hughes:— 20m DU1DBT KG6JBX TJ1AF YB0ACG 3D6BD 5R8BL 9M6MA

M. Chapple:— 80m EA8CR ZL3FA 40m VK2AVA 20m VP8HZ 9X5SP

M. Bennett:— 80m AP2AD 20m A35AM (JA1XFB) HM2JM KG6AA TR8JCV VK2PA/LH (Lord Howe Is) 8R7X 15m FY0PHI TI2WX

P. Cowburn:— 80m HK0COP KZ5HP ZL1JC 3B4AJ 40m CE3BGL VK5PV 20m HI8AB KV4IJ VP2KF 5N2NAS



SHORT WAVE BROADCASTS

by **Derek Bell**

OR what to do with an egg insulator! **John Curtis** of Beaminster in Dorset, after reading the recent comments in this column on the problems of securing aerials to trees, passes along a tip first used by him in the '20s. This involves fastening a length of stout rope to the tree sufficient to clear the tree branches, on the end of which is fastened a pulley wheel with the aerial wire running through it. From the pulley wheel the aerial runs to a bucket

or similar container filled with something heavy to keep the aerial wire taut.

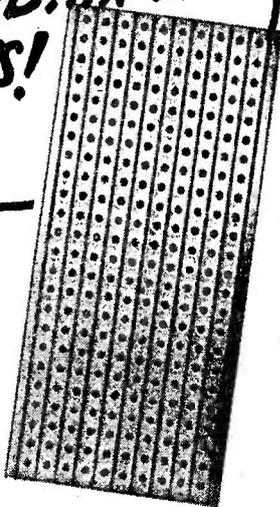
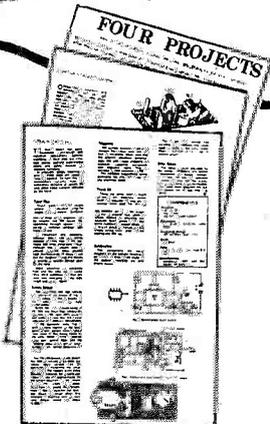
Pulley wheels can be expensive, so why not substitute an egg insulator? This, as its name suggests, is in the shape of an egg and is made of a ceramic substance for good insulation. Through it are two holes at right angles to each other so one hole can take the securing line while the other has the wire running free through it. This then runs down to the ground and is held taught by a suitable weight. The cost is mainly for the eggs, one for the tree end and one for the building end. This one is secured to an appropriate point by another lashing with the aerial running through or tied off to it, if you prefer the lead-in away from the house wall.

David Birch of Trowbridge has another sort of aerial, this is a Yagi coupled to a Wien Multi-Five set and was enough to pull the following goodies:

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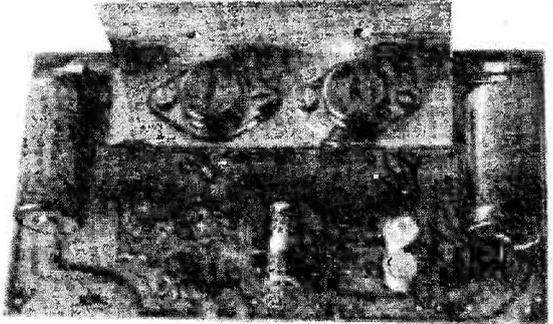
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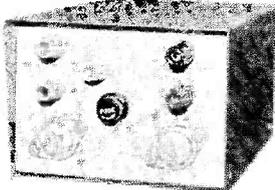
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This is a power amplifier of superb quality incorporating the very latest design features. Professional hi-fi enthusiasts have classed it as fantastic and real value for money. The CCT incorporates a low flux transformer and inputs for disc, tape, tuner, etc.

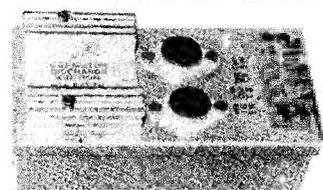
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Radio Kuwait on 11940 at 1745
HCJB Quito on 9760 at 0800

a sure sign that summer is on its way when Kuwait is heard after tea. Can anyone tell us if the pop show is still going on this slot?

A Joystick package is used by **Lawrence Bennet**, tagged on the front of his Trio 9R59DS. There have been varying claims made for this system and it seems that there is some justification for them since Lawrence logged the following:

AIR Delhi on 3255 at 1730
Radio Chad on 4904 at 1910
Ghana National service on 4915 at 1915
Ghana Commercial service on 4980 at 1920
Radio Mauritania on 4850 at 1930
Benin 'Voix de Revolution' on 4870 at 2015
Radio Togo on 5047 at 2055

Recently in this column there appeared a comment by **Ian Walker** on the fact that Radio Peace and Progress was popping up at an odd spot on the dial of his rig. This and other remarks on this station so moved **Alan Potter** of Bristol that he provided a long screed on the mathematics of intermediate frequencies to prove that this signal was a spurious one. In words of one syllable and numbers under ten, that my poor enfeebled brain can cope with, Alan proved that many receivers have an IF of 450-470kHz and thus the indicated freq was, in fact, spurious. Were it to be put through the mathematical mill it would show one of Radio P&Ps true frequencies. Working the proper way round Alan shows that if one takes the true freq, it is possible to calculate the probable freqs that spurii will inhabit.

Radio Pakistan, Alan tells us, are asking listeners in the UK to report to them on the quality of the evening signal on 7375 and 9465 between 1915 and 2145, so if you care to co-operate the address is: 82a Satellite Town, Rawalpindi, Pakistan. For the benefit of Radio Pakistan I have a report that 7375 is usually a good signal while 9465 is drowned in QRM.

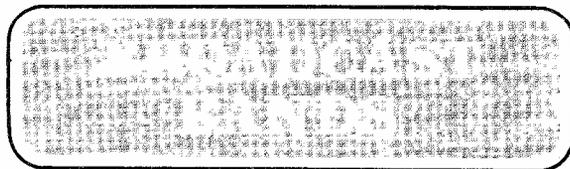
I also have in front of me the scheds for "Peace and Progress" up to October of this year. This, although sent to the UK, only deals with the Asian portion of our globe and is in Chinese and English, is shown in "metres" only and the air time is from 0800 to 1600 with gaps into which the Chinese broadcasts are inserted.

The Principality of Wales comes next in station news with **John Higginbotham's** letter passing on the tip that dear old Radio Nederland is starting to include propagation predictions in its "DX Jukebox" show. This seems to me to be one of the best ways of getting up-to-date information and I would like to see more propagation spots in DX shows. While on the subject of Radio Nederland it is with sadness that I pass on the news that they announced during March, the death of Eddy Startz at the age of seventy-seven. Many long-time DXers will remember Eddy who created the Happy Station shows and who was associated with them for over forty years. While he had retired it was not in Eddy's make-up to sit back and vegetate, and only four or so years

ago he was travelling the world lecturing and writing his memoirs. I suggest that any gathering of DXers should lift a glass to Eddy's memory.

From **Les Waldron**, in Stoke-on-Trent, comes a plea for information on a set that he rescued from a junk yard and thinks is an ex-Service rig. The set has four bands from 1.4 to 20MHz and has on the back a plate stating "Vancouver Radio Labs Inc". So, if you can help, contact Les at 60 Cathanne Road, Chell Heath, Stoke-on-Trent.

Our final word this month is once more on aerials. **J. Watson** from Bolton enquires about an aerial for a loft that he saw ages ago. The thing about this set-up was that it was in the form of a square. This form of aerial is perhaps not very common but one advantage is that the sides can be formed to the length desired. Maximum directivity is generally at right angles to the line of a wire thus by forming a square one can achieve equal input from all points of the compass. A download of low impedance coax from the centre of the wire can be fed out through the eaves and down the wall and back in through the shack window. The wire of course should be suspended from the roof joists with insulators. With that I will declare the innings closed and wish you best 73s.



MEDIUM WAVE DX

by **CHARLES MOLLOY**

READER **J. M. Kracinski** reports from Newcastle-on-Tyne with an interesting log of DX from south east Europe and the Middle East. He uses a Philips 10RL59D transistor portable with internal aerial and in spite of the limitations of this type of receiver for DXing he picked-up Bucharest on 603kHz (after Lyons had signed off) the BBC Eastern Mediterranean Relay in Cyprus on 638kHz and 1322kHz; Belgrade on 683kHz; Baghdad on 760kHz; the Voice of America relay at Kavalla in Greece on 791kHz; Dyakabir, Turkey on 1061kHz and Sofia, Bulgaria on 1223kHz. He also asks about a Middle East station on 200kHz on the long waves, behind Radio 2. This is Ankara in Turkey which has been on this channel since early last year when it moved from 181kHz.

The internal aerial in a transistor portable is directional. Maximum pick-up is at right angles to the ferrite rod or slab and there are two nulls, directions of minimum pick-up, along the length of the rod. These nulls enable the DXer to reduce or even eliminate interference simply by rotating the receiver. A ferrite rod aerial could be connected to a communications receiver but DXers have developed the medium wave loop, which is based on the frame aerial used in the early days of radio. The directional properties of a loop together with the sensitivity and selectivity of a communications receiver provide the DXer with a powerful tool with which to explore the medium waves.

A medium wave loop has similar properties to a ferrite rod aerial; it is directional and tunable, but on account of its greater size its pick-up is much



greater. The type of loop in use by many DXers consists of a main winding of seven turns of plastic-covered wire of about 22SWG wound in the shape of a square of 40in. side. A one turn coupling winding is wound parallel to and centrally on the main winding. The two windings are supported by a frame made out of two pieces of lin. square wood which are joined at right angles to make a shape like the letter X. The turns are supported by four paxolin spacers fitted to the ends of the arms. These spacers have saw cuts $\frac{1}{4}$ in. apart along one edge to keep the windings in place.

The main winding is connected across a 500pF variable capacitor which is mounted at the centre of the loop and is used to tune the loop. The coupling winding goes to a small terminal block mounted on the loop from which a length of twin feeder (or twin lighting flex) is taken to the aerial and earth terminals of the receiver. The loop is mounted on a stand in such a way that it can be rotated around its vertical axis. When using a loop, tune-in a station on the receiver, peak-up the signal with the loop tuning control and then rotate the loop for minimum interference.

J. Watson (Bolton) and **M. J. Watson** (Enfield) are constructing loops. So is **F. T. Shortridge** of Llandudno who remarks that he had better results on the medium waves in the 1930s when using a "straight" set than he has now with his AR88. Interference (QRM) was a lot less in the '30s hence the need for a loop! Some DXers claim that a loop gives a "cleaner" signal than a longwire. The reduction in overloading and cross modulation would no doubt give this impression. An improvement in signal-to-noise ratio is nearly always obtained with a loop while, in summer, atmospheric caused by thunderstorms in the southern hemisphere can be considerably reduced when the DXer is listening towards the west or the east.

Glyn Morgan (Tredegar, Gwent) who has been using an Astrad VEF17 portable temporarily for his DXing has at last succeeded in repairing his HA230 communications receiver. The middle wafer of the wavechange switch had developed a "short" on the rotary section. The coil unit had to be stripped, the wafer removed and the carbon scraped away and filled-in with Araldite! A truly remarkable repair by a determined DXer. Glyn used to be a service engineer before an illness deprived him of the full use of his hands and forced him into early retirement. Since the repair he has logged the BBC Eastern Relay on Masirah Island, Oman on 1421kHz and Algiers on 1421kHz (with Saarbrücken, which is on the same channel, off the air). Glyn uses a 40ft long wire fastened to a tree in the garden but a loop is now under construction!

News of another repair comes from **Harold Emblem** of Mirfield in Yorkshire. His Eddystone 730 developed a high noise level and poor sensitivity which was cured when the frequency changer valve, which had worked loose, was pressed fully into its holder. It is always worth while keeping a spare of each type of valve in the receiver so that one can

be replaced should a fault develop. With his receiver back in service again Harold pulled in All-India Radio at Lucknow on 760kHz and Radio Pakistan in Hyderabad on 1010kHz, both stations being heard after 0130 GMT.

Broadcasting in Spain is complex. Radio Nacional Espana, which is state owned, operates a number of high power regional outlets, many of which can be heard easily by the listener in the UK. Local radio, too, is well established. Chains of low power commercial stations operate across the country under the callsign prefixes EAJ, EAK, ECS and EFE each belonging to a different network. Over a hundred are on 1106kHz, 1133kHz, 1385kHz, 1394kHz, 1412kHz, 1430kHz, 1475kHz, 1520kHz and 1570kHz. Picking out these stations can be a real challenge to the DXer as well as being a source of interest. Listen at midnight when many sign off, usually with a full identification. These locals are good verifiers if an International Reply Coupon is enclosed with the report. Many will send the listener a QSL card, pennant or picture postcard of the locality. Listen on 1133kHz for Radio Juventud Murcia (EFJ19) and La Voz de Malaga (EFJ56); on 1385kHz for Radio Centro Madrid (ECS11); on 1394kHz for Radio Popular Vigo (EAK33) and RP Santander (EAK78); on 1412kHz for Radio Tarrasa (EAJ25) and on 1570kHz for La Voz de Alicante (EFE8). A full list of Spanish locals is contained in the World Radio TV Handbook 1976, obtainable now for £4.50 from Argus Books Ltd, Station Road, King's Langley, Herts.

BROADCAST BANDS

Short Wave reports by the 15th of the month to Derek Bell c/o Practical Wireless, Fleetway House, Farringdon Street, London, EC4A 4AD.

Medium Wave Logs to Charles Molloy, 132 Segars Lane, Southport, PR8 3JG.

AMATEUR BANDS

Logs covering any Amateur band/s in band/alphabetical order by the 25th of the month to Eric Dowdeswell G4AR, Silver Firs, Leatherhead Road, Ashtead, Surrey, KT21 2TW.

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"PRACTICAL WIRELESS" - "TELEVISION"

We are still receiving letters requesting subscriptions to *Practical Wireless* and *Television* magazines. For those readers who are not aware, we regret that our magazines can no longer be supplied on direct subscription by IPC Limited due to escalating costs.

This action is very much regretted, but it should not mean that any reader is deprived of his/her regular copies of *Practical Wireless* or *Television*. Readers should order direct from their local newsagents. Any readers outside the UK who have difficulty in locating a supplier should write to the Editor, PRACTICAL WIRELESS, FLEETWAY HOUSE, FARRINGDON STREET, LONDON EC4A 4AD, ENGLAND.

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7403 12p	7417 30p	7440 15p	7472 25p	7493 40p	74125 30p	74143 270p	74161 90p	74177 100p	74192 120p
7404 12p	7420 15p	7441 65p	7473 30p	7495 60p	74126 50p	74144 270p	74162 90p	74178 140p	74193 120p
7405 12p	7422 20p	7442 65p	7474 30p	7496 70p	74130 130p	74145 75p	74163 90p	74179 140p	74194 160p
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7409 15p	7427 25p	7448 70p	7485 100p	74107 30p	74136 80p	74151 85p	74167 325p	74184 150p	74198 185p
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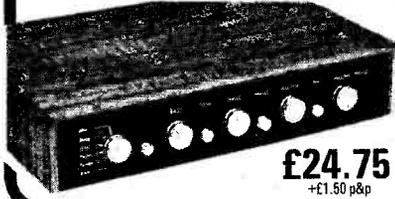
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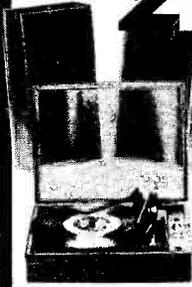
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The VISCOUNT IV has a comprehensive range of controls - volume, bass, treble, balance mono/stereo, mode selector, and scratch filter.

Front panel socket for stereo headphones. And a host of sockets at the rear - for left and right speakers, tape recorder, auxiliary, tuner, disc and microphone.

SPECIFICATION: 20 watts RMS per channel 40 watts peak. Suitable 8-15 ohms speakers. Total distortion at 10 watts better than 0.2%. Six switched inputs: 1. Magnetic PU. - 3 millivolts at 47 K ohms (R.I.A.A.), 2. Crystal/ceramic PU. - 50 millivolts at 50 K ohms (R.I.A.A.), 3, 4, 6. Tape Tuner/Aux. - 140 millivolts at 50 K ohms (flat frequency response); 5. Microphone - 3 millivolts at 50 K ohms (flat frequency response).

CONTROLS: Push button ON/OFF, stereo/mono, scratch filter, 6 position rotary selector. Individual rotary controls for treble, bass, balance and volume. Headphone socket, tape out socket. Aux. mains output. Frequency response: 25 Hz to 25 kHz at full rated output. Signal to noise ratio: better than -50 dB on all inputs. Tone control range: Bass ±15 dB at 50 Hz; Treble ±12 dB at 10 KHz. Power requirements: 250V A.C. mains at 60 watts.

Approx size: 15 1/2" x 3" x 10". **MP60 type deck** with magnetic cartridge, de luxe plinth and cover. **Two Duo Type II B matched speakers** - Enclosure size 18 1/2" x 13 1/2" x 7 1/4" approx. in veneer teak. Drive unit 10" with 2 1/2" tweeter. 12 watts handling 24 watts peak.

Complete System with these speakers
£65.00
+ £6.50 p&p.

SYSTEM 2 £80.00

Viscount IV amplifier (As System 1a)
MP60 type deck (As System 1a)

Two Duo Type III matched speakers - Enclosure size approx. 27" x 13" x 11 1/2". Finished in teak simulate. Drive units 13" x 8" bass driver, and two 3" (approx.) tweeters. 20 watts RMS, 8 ohms frequency range - 20 Hz to 18,000 Hz.

Complete System with these speakers **£80.00** + £7.60 p & p.

PRICES: SYSTEM 1a
Viscount IV amplifier £24.75 + £1.90 p & p.
2 Duo Type II B speakers £27.00 + £8.50 p & p.
MP60 type deck with Mag. cartridge de luxe plinth and cover £19.80 + £3.30 p & p.
Total if purchased separately: £71.55
Available complete for only: **£65.00** + £6.50 p & p.

PRICES: SYSTEM 2
Viscount IV amplifier £24.75 + £1.90 p & p.
2 Duo Type III speakers £41.40 + £7.50 p & p.
MP60 type deck with Mag. cartridge de luxe plinth and cover £19.80 + £3.30 p & p.
Total if purchased separately: £86.95
Available complete for only: **£80.00** + £7.60 p & p.



20x20 SYSTEM

Scotland P & P Surcharge + £1.75 System 1a £1.75 System 2 £3.50

Note: 30 x 30 kit available only as a separate item.

PUSH BUTTON CAR RADIO KIT— THE TOURIST TT



IF YOU CAN SOLDER CORRECTLY ON A PRINTED CIRCUIT BOARD YOU CAN BUILD THIS KIT CORRECTLY

NOW YOU CAN BUILD YOUR OWN PUSH BUTTON CAR RADIO!

This construction kit comprises a fully built and aligned R.F.I.F. module: Printed circuit board, with ready mounted integrated circuit output stage and all other components. The push button tuning mechanism is fully built and tested ready to mate with the printed circuit board. (once it is assembled).
NOTE: No test equipment is required for alignment, but remember you must have the ability to solder on a printed circuit board.

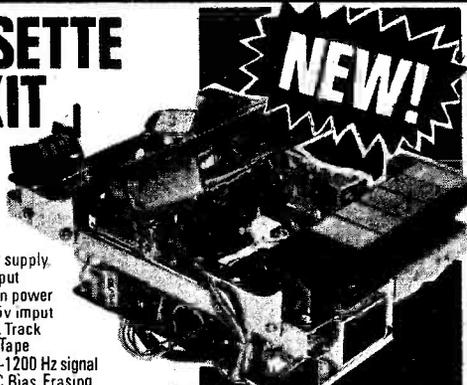
TECHNICAL SPECIFICATION

(1) Output 4 watts RMS output. For 12 volt operation on negative or positive earth. (2) Integrated circuit output stage, pre-built three stage IF Module. Controls volume manual tuning and five push buttons for station selection, illuminated tuning scale covering full, medium and long wave bands. Size chassis 7" wide, 2" high and 4 3/4" deep approx. Speaker including baffle and fixing strip £1.80+45p. p&p. Car Aerial Recommended—fully retractable £7.40 +£1.05 p&p. £1.45+40p. p&p.

STEREO CASSETTE TAPE DECK KIT

Kit comprises of ready built cassette tape transport mechanism. Featuring pause control, solenoid assisted auto-stop, 3 digit tape counter, belt-driven balanced fly wheel, DC motor with electronic speed control, ready built and mounted record/replay PC board, and two VU meters, power supply, PC board, mains transformer. Input and output sockets and two level controls. Specification power source 240 AC 50Hz. Output more than 0.5v input mike -65dB. 10KΩ. DIN -47dB. 100KΩ. Track system 2 channel stereo record play-back. Tape speed, 4.8CM/SEC. Frequency response 50-12000 Hz signal to noise ratio -42dB. Recording system AC Bias. Erasing system AC erase. Bias frequency 57KHz. Size of mechanism 8" x 5" x 3 1/2" approx. unit easy to mount into your cabinet 3" required to clear base of mechanism approx.

* This is an advanced kit not suitable for those without electrical knowledge and those unable to solder.



£29.25
+ p&p £1.50
or send SAE for complete details.

NEW PRODUCT DISCO 35 MONO AMPLIFIER

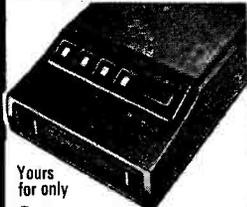
An ideal general purpose 35 watt mono amplifier with full mixing facilities. Suitable for DISCO, PUBLIC ADDRESS & GUITAR/MUSICAL INSTRUMENTS. Unit housed in an attractively styled teak veneered cabinet. 4 Inputs: DISC 1 & DISC 2 (BOTH FOR CERAMIC CARTRIDGES), tape and microphone. CONTROLS: All level mixing controls are fitted with integral switches, push button type. DISC 1 & DISC 2: Volume combined treble filter. TAPE: Volume combined bass booster switch. MASTER: Volume control combined on/off. MIC: Volume combined bass booster switch. INDEPENDENT BASS AND TREBLE CONTROLS.

TECHNICAL SPECIFICATION

Power output: 35RMS into 4 ohms. Speaker: (Suitable for 4 to 15 ohms speakers). Sensitivities: DISC 1 & DISC 2: 30 mv (into 120k RIAA). Treble Filter Switch: 12 db@ 10 KHz. Tape: 100 mv (into 120k Flat). Bass Booster Switch=18 db@ 60 Hz. Mic: 2 mv (equilised for dynamic). Bass Booster Switch=20 db@ 60 Hz. Bass Control: ±15 db@ 60 Hz. Treble Control: ±12 db@ 10 KHz. £25.00 +£1.40 p&p

8 TRACK HOME CARTRIDGE PLAYER

Elegant self selector push button player for use with your stereo system. Compatible with Viscount IV system, Unisound module and the Stereo 21. Technical specification Mains input, 240V. Output sensitivity 125mV.



Yours for only **£12.60** +£1.70 p & p.

SPECIAL OFFER

As above but complete with build yourself Unisound Amplifier Kit (see opposite Panel) + 2 'Compact' easy to build speaker kits (see opposite page) **£24.50** + p & p £2.00

BUILD YOUR OWN STEREO AMPLIFIER



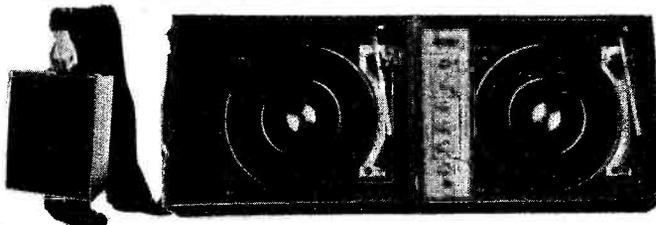
For the man who wants to design his own stereo — here's your chance to start, with Unisound — pre-amp, power amplifier and control panel. No soldering — just simply screw together. 4 watts per channel into 8 ohms. Inputs: 120mV (for ceramic cartridge). The heart of Unisound is high efficiency I.C. monolithic power chips which ensure very low distortion over the audio spectrum. 240V. AC only.

£8.00 £1.05 p & p.

Also available with the 'Compact' (see opposite page) easy build speaker kit £14.50 + £2 p & p

INCORPORATES: Pre-Amp with full mixing facilities, including switched input for mic with volume control, switched input for auxiliary with volume control, bass and treble controls, volume control and blend control for turntables. Two B.S.R. MP60 type single play professional series decks, fitted with crystal cartridges.

PORTABLE DISCO CONSOLE



TECHNICAL SPECIFICATION:

Pre-amp — Output — 200mV.
Auxiliary inputs — 200mV and 750mV into 1 meg. Mic input — 6mV into 100K. 240 volt operation.
Turntables capacity — 7", 10" or 12" records. Rumble, wow and flutter Rumble Better than —35dB. Wow Better than 0.2%. Flutter Better than 0.06% (Gaumont kalee meter).
Finish — Satin black mainplate with black turntable mat inlaid with brushed aluminium trim. Tonearm and controls in black and brushed aluminium.

Console size —

Unit Closed — 17 1/4" x 13 1/4" x 8 1/4" (app.)
Unit Open — 35 1/4" x 13 1/4" x 4 1/4" (app.)
This disco console is ideally matched for the Reliant IV and Disco 50 or any other quality amplifier.
The unit is finished in black PVC with contrasting simulated teak edge, diamond spun control knobs with matching control panel.

Yours for only **£49.00** +£6.50 p & p.

All prices include VAT at current rates

Mail orders to Acton. Terms C.W.O. All enquiries stamped addressed envelopes. Goods not despatched outside U.K.

All items subject to availability. Prices correct at 1st May 1976, and subject to change without notice.

Minimum order on ACCESS/BARCLAYCARD—£11.



DO NOT SEND CARD
Just write your order giving your credit card number



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323 EDGWARE ROAD, LONDON W2

Personal Shoppers EDGWARE RD: 9 a.m.—5.30p.m. Half day Thurs
ACTON: 9.30a.m.—5p.m. Closed all day Wed.

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ALL EX-STOCK—SAME DAY DESPATCH

NO HIDDEN EXTRAS—Prices include VAT and P & P. EXCEPT WHERE CARRIAGE WILL BE ACCORDING TO WEIGHT & DISTANCE—BRS. Widerange of Audio accessories, semiconductors, Panel Meters & Multi-Meters

CALLERS WELCOME (MON.-FRI.) OR SEND STAMP FOR LISTS.

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Sec. 120/240V CENTRE TAP WITH SCREEN Ref. VA (Watts) £

07*	20	3-97
149	60	5-84
153	100	6-67
151	200	10-43
152	250	12-67
153	350	14-99
154	500	17-21
155	750	23-69†
156	1000	33-01†
157	1500	37-68†
158	2000	42-03†
159	3000	66-40†

*115V or 240V Sec. only.

12 and or 24 Volt PRIMARY 240-250 VOLTS

Ref. VA Amps £

111	12v	0-5	1-97
023	1-0	0-5	2-24
71	2	1	2-80
68	3	1	4-60
18	4	2	3-98
85	5	3	4-91
108	6	4	5-56
108	8	4	6-41
116	12	6	7-42
17	16	8	9-13
115	20	10	13-52
187	30	15	16-86
226	60	30	19-08†

HIGH VOLTAGE Mains Isolating

Sec. 100/120 or 200/240 P & P VA Ref. £

60	243	5-77
350	247	13-33
1000	250	28-41†
2000	252	47-65†

AUTO TRANSFORMERS

Ref. VA (Watts) £

113	20	0-115-120-240	2-44
64	75	0-115-200-220-240	4-07
4	150	0-115-200-220-240	5-45
66	300	"	7-51
67	500	"	11-46
84	1000	"	17-25
93	1500	"	20-54†
95	2000	"	27-44†
73	3000	"	39-46†

CASED AUTO TRANSFORMERS

240V mains feed input & USA 2 pin outlets. Ref. VA £

44	33	Ref 113V
150VA	47-80	Ref 4W
500VA	£13-37	Ref 67W
1000VA	£19-85†	Ref 84W
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ON SITE TOOL ISOLATORS

240 to 110V · 500VA to 2KVA (to BS3535) Send for details

50 VOLT RANGE

Prim. 200-240V Sec. 0-19-25-33-40-50V Ref. No. Amps £

102	0-5	3-46
103	1-0	4-61
104	2-0	6-61
105	3-0	7-63
106	4-0	9-83
107	6-0	15-08
118	8-0	16-46
119	10-0	19-17†

SCREENED MINIATURES

Ref. mA Volts £

238	200	3-0-3	1-98
212	1A, 1A	0-6-0-6	2-71
13	100	0-9-0	1-96
235	330, 330	0-9-0-9	2-04
207	500, 500	0-8-9-0-8-9	2-73
208	1A, 1A	0-8-9-0-8-9	3-94
236	200, 200	0-15-0-15	1-94
214	300, 300	0-20-0-20	2-82
221	700 (DC)	20-12-0-12-20	4-28
206	1A, 1A	0-15-20-0-15-20	4-70
203	500, 500	0-15-27-0-15-27	4-18
204	1A, 1A	0-15-27-0-15-27	5-14
5112	500	12, 15, 20, 24, 30	2-68

BRIDGE RECTIFIERS

Ref. VA £

50V	2A	0-55
100V	2A	0-61
100V	6A	0-95
200V	1A	0-85
200V	2A	0-67
400V	2A	0-72
400V	4A	0-89
600V	2A	0-78
1000V	2A	0-89
500V	10A(P17A6)	2-70

TEST METERS

Ref. £

AVO 8 MK5	£67-17
AVO 72	£26-78
AVO 1M5	£23-40
AVO T169	£27-26

AVO Cases and Accessories.

POWER UNIT

CC12-05 Output Switched 3-4-5-6-7-5-9-12V at 500mA. £5-03.

SWITCHES

SPST TOGGLE 3 FOR 0-97 DPDT TOGGLE 3 FOR 1-18 DPDT SLIDE 6 FOR 0-97 Ref. £

ANTEX SOLDERING IRONS	15W £3-40 18W £3-19 25W £2-92
SOLDERING IRON KIT	£4-48 STAND FOR ABOVE £1-49

MAGNETIC TO CERAMIC CARTRIDGE CONVERTER

OPERATING VOLTAGE 20-45V ONLY £3-17.

COMPONENT PAKS

- 200 Mixed value resistors (count by weight)
 - 150 Mixed value capacitors (count by weight)
 - 30 Mixed value precision resistors ½ 2%
 - 15 Assorted pots & pre-sets
 - 10 Reed switches
 - 3 Micro Switches
 - 20 Assorted tag strips
- PLEASE STATE PAK REQUIRED 87p PER PAK.

AUDIO KIT 25W

- 2+25W Amplifiers
- 1+Pre-Amp
- 1+Power supply
- 1+Transformer
- 1+Front Panel
- 1+Kit of parts to include on/off switch, neon ind. Stereo headphone socket. Plus instructions book £32-07.

TEAK AUDIO KIT 25W

- Teak veneered cabinet
- 162+113+32+, aluminium chassis, heat sink and front panel, brackets plus back panel and sockets etc. £11-00

NEW STEREO 30

- Complete Stereo Chassis inc. 7+7w RMS, 5amp, Pre-amp, Power Supply, Front Panel, Knobs (only needs Mains Trans.).
- Stereo 30 £18-67. Mains Trans £3-15. Teak veneered cab. £4-51.

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- fitting with Phase-lock Loop
- 4 Pre-selected stations supply 20-35V, 90mA Max. £22-71

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FREE WELLER 25W (SP25) SOLDERING IRON (worth £3-24 inc. VAT) with all orders over £20 Limited period only. Send now.

HEAVY DUTY RELAYS, 24V d.c. operated (will work on 18V) 3 heavy duty make contacts (around 10A rating) & 4 change over contacts + 1 break contact. New, complete with mounting bracket (ideal for switching HT on Lines). Many uses for this high quality unit. £1-50 each.

Good Quality Pressure Gauges, 2 1/2 in dia. flange mounting, 3 models avail. 0-60 lb/sq in., 0-100 lb/sq in., 0-200 lb/sq in., state which £1-25 each.

2N3855 type Transistors, O.K. but unmarked, 5 for £1.

ALU-SOL ALUMINIUM SOLDER (made by Mull-core). Solders aluminium, 10 itself or copper, brass, steel, nickel or tinplate. 16 w.e.g. with multicore flux, with instructions. Approx. 1 metre coil 30p each. Large reel (approx. 12 metres) £2-75.

MIXED COMPONENT PAKS, containing resistors, capacitors, switches, pots, etc. All new (random sample bag, revealed approx. 700 items), £2 per pack, while stocks last.

TUNED COILS, 2 section coils, around 1MHz, with a black smart tuning knob, which moves an internal core to vary the inductance. many uses, easily rewound, 3 for 50p.

SMALL MAINS SUPPRESSORS (small chokes, ideal for radio, Hi-Fi inputs, etc.) approx. 3/4 x 1 1/2 in., 3 for 50p.

PERSPEX TUNER PANELS (for FM Band 2 tuners) marked 88-108 MHz and Channels 0-70, clear numbers, rest blacked out, smart modern appearance, size approx. 9 1/2 x 1 1/2 in., 2 for 35p.

Multiturn Pots, 10 turns, 1/4 in spindle (ax-equip), following values available, 2kohm, 5kohm, 20kohm, £1 each.

Lead suppressors (10kohm) for mobile plug leads, 4 for 50p.

1MA Meters, 2 in square, plastic fronts (these have a paper scale stuck over the original marked 0-1mA which is easily peeled off and an internal 18K resistor which is easily removed), £1-75 each or 2 for £3.

R/S Midget 3 pole 4 way, rotary switches, 40p each.

HIGH QUALITY SPEAKERS, 8 1/2 in x 6 in elliptical, only 2in deep. Inverse magnet, 4 ohms, rated up available @ 125p each or 2 for £2-75 (qty discount available @ 125p VAT)

TV PLUGS AND SOCKETS TV Plugs (metal type), 5 for 50p. TV Sockets (metal type), 4 for 50p. TV Line Connectors (back-to-back sockets), 4 for 50p. Please add 12 1/2% VAT.

PLUGS AND SOCKETS N-Type Plugs 50 ohm, 60p each, 3 for £1-50. N-Type Sockets (4-hole chassis mounting, 50 ohms (6 small coax lead type), 50p each. P1239 Plugs (P7FE), brand new, packed with reducers, 65p or 5 for £3.

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25-way ISEP Plugs and Sockets, 40p set (1 plug + 1skt).

Plugs and sockets sold separately at 25p each Bulk/Innord Free Skts, 3 pin, for mains input on test equipment, etc., 25p each.

Mobile Converters, 24V DC input 13-8V at approx 3-4A DC output, fully stabilised, £3-50 each (ideal for running 12V car radio from 24V lorry battery).

Pkts. of 2BA Nuts (the self-locking ones with the nylon insert) 100 for 50p.

We now stock Spiralax Tools for the electronic enthusiast. Screwdrivers, Nut Spanners, BA and Metric sizes, pop rivet guns, etc. S.A.E. for list.

I.F. Cans, 1in square, suitable for rewind, 6 for 30p + 12 1/2% VAT.

Miniature earphones with min. jack plug, 2 for 50p + 12 1/2% VAT.

TWIN I.F. CANS, approx. 1in x 1/2 in x 1in high, around 3-5MHz, 2 separate transformers in 1 can, internally screened, 5 for 50p + 12 1/2% VAT.

Dubilier Electrolytics, 50uF, 450V, 2 for 50p.

Dubilier Electrolytics, 100uF, 275V, 2 for 50p.

Plessey Electrolytics, 470uF, 63V, 3 for 50p.

TCC Electrolytics, 1000uF, 50V, 3 for 60p.

Plessey Electrolytics, 1000uF, 180V, 40p each (3 for £1).

Dubilier Electrolytics, 5000uF, 35V, 50p each.

Dubilier Electrolytics, 5000uF, 50V, 60p each.

PLEASE ADD 8% VAT UNLESS OTHERWISE STATED

Dubilier Electrolytics, 5000uF, 70V, 65p each.

ITT Electrolytics, 880uF, 25V, high grade, screw terminals, with mounting clips, 50p each.

Plessey Electrolytics, 10,000uF at 63V, 75p each.

Plessey Cathodray Capacitors, 0-0-40 at 12-5kV DC, Screw terminals, £1-50 each.

PLEASE ADD 12 1/2% VAT TO ALL CAPACITORS

A LARGE RANGE OF CAPACITORS AVAILABLE AT BARGAIN PRICES, S.A.E. FOR LIST.

SPECIAL OFFER! MAINS TRANSFORMER, TYPE 14/4, 14V at 4A, £2-50.

TO3 transistor insulator sets, 10 for 50p.

MINIATURE 2 PIN PLUGS AND SOCKETS (fit into 3in hole, pins enclosed, with covers for chassis mounting, or can be used for in-line connectors). Bargain pack of 3 plugs + 3 sockets + covers, 50p.

PROGRAMMERS (magnetic devices). Contain 9 microswitches (suitable for mains operation) with 9 rotating cams, all individually adjustable, ideal for switching diode lights, displays, etc. or industrial machine programming. (Need slow motion motor to drive cams, not supplied)

9 switch version £1-50, or 16 switch version £2.

HEAVY DUTY HEAT-SINK BLOCKS, undrilled, base area 2 1/2 in x 2 in, with 6 fins, total height 2 1/2 in 50p each.

RUBBER MAGNETS 1/2 in square, with mounting hole, 20 for 30p.

SPERRY 7-SEGMENT P.G.D. DISPLAYS, digit height 0.3in, red, with decimal points, 150V to 200V (nominal 180V) operation. These are high-volt industrial type and therefore brighter than normal displays. All brand new. At THE BARGAIN PRICE OF 50p PER DIGIT, TYPE 332 (two digits in one mount) £1 each, Type 333 (three digits in one mount) £1 50p. (Sorry, no single digit available.) Data Supplied.

BSX20 (VHF Osc/Mult), 3 for 50p.

BC108 (metal can), 4 for 50p.

PBC 108 (plastic BC108), 5 for 50p.

OC200 Transistors, 6 for 50p.

BFY51 Transistors, 4 for 60p.

BCY72 Transistors, 4 for 50p.

HEAVY DUTY TRANSISTORS, 12 for 25p.

BF125 (UHF amp/lexer), 3 for 50p.

BA121 Varicap Diodes, 4 for 50p.

1N914 diodes, 10 for 25p.

1 1/2 in polythene chassis mounting fuseholders, 6 for 30p.

Mulard Tubular ceramic trimmers, 1-16pF, 6 for 50p.

I.C.s, some coded, 14 DIL type, untested, mixed, 20 for 25p.

DIACBAT BOXES (approx size in inches)

4.3 x 2.3 x 1.2 85p

4.8 x 2.3 x 1.5 95p

4.8 x 3.6 x 1 1-00

4.8 x 3.8 x 2 1-25

6.8 x 4.8 x 2 1-75

4.8 x 3.8 x 3 2-85

6.8 x 4.8 x 4 2-75

8.6 x 5.8 x 2 2-25

10.6 x 6.8 x 2 2-85

Please add 8% VAT

WELLER SOLDERING IRONS EXPERT. Built-in spotlight illuminates work. Pistol grip with fingertip trigger. High efficiency copper soldering tip.

EXPERT SOLDER GUN, £8-80 + VAT, (54p)

EXPERT SOLDER GUN KIT (spare bits case, etc.), £9-80 + VAT (78p)

SPARE BITS, PAIR, 25p + VAT (2p)

MARKSMAN SOLDERING IRONS

SP15D 15W £3 + VAT (24p)

SP25D 25W £3 + VAT (24p)

SP25K 25W + bits, etc. kit £3-85 + VAT (31p)

SP40D 40W £3-44 + VAT (28p)

BENCH STAND with spring for Marksmen Irons, £2-22 + VAT (18p)

SPARE BITS

MT8 for 15W, 44p + VAT (4p)

MT4 for 25W, 34p + VAT (3p)

MT10 for 40W, 42p + VAT (3p)

TCPI TEMPERATURE CONTROLLED IRON, Temperature controlled iron & PSU, £20 + VAT (£1-60)

SPARE TIPS

Type C single flat tip, Type K double flat fine tip, Type P - very fine, £1 each + VAT (8p).

ALL SPARES AVAILABLE

MULTICORE SOLDER

Size 5 Savbit 18 w.s.g. in alloy dispenser, 32p + VAT (3p)

Size C15AV18 Savbit 18a.w.g., 56p + VAT (4p)

Size 12 SAVBIT 18a.w.g. on plastic reel £1-80 + VAT (15p)

Terms of Business: CASH WITH ORDER. MINIMUM ORDER £1. ALL PRICES INCLUDE POST & PACKING (UK ONLY). SAE WITH ALL ENQUIRIES Please. PLEASE ADD VAT AS SHOWN. ALL GOODS IN STOCK DESPATCHED BY RETURN. CALLERS SATURDAYS ONLY 9.30-10.00, 1.30-5.00.



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. £2-50 plus 45p post and VAT. Made up model £1-25 extra.

PERMEABILITY TUNERS

M.W. two stage ideal for use with ZN414 or similar circuit. Price 15p each + post and VAT 15p.

MAINS TRANSISTOR PACK

Designed to operate transistor sets and amplifiers. Adjustable output 6v., 9v., 12 volts for up to 500mA (class B working). Takes the place of any of the following batteries: PP1, PP3, PP4, PP6, PP7, PP9 and others. Kit comprises: main transformer rectifier, smoothing and load resistor, condensers and instructions. Real snip at only £1-50. VAT + postage 60p.



NUNICATOR TUBES

For digital instruments, counters, timers, clocks, etc. Hi-vac XN11. Price £1-25 each, 20p Post and VAT.

DC HIGH CURRENT PANEL METERS

3 1/2" wound wide angle 240 movement meters, flush mounting fitted with external shunts, made by Crompton Parkinson, brand new, still in maker's cartons. These are a real bargain at £5-50 each. Reasonable quantities available in the following ranges 0-15 amps, 0-20 amps, 0-30 amps, 0-40 amps, Post and VAT 80p each.



WINDSCREEN WIPER CONTROL

Very speed of your wiper to suit conditions. All parts and instructions to make. £2-75 plus 80p post and VAT.



SOUND TO LIGHT UNIT

Add colour or white light to your amplifier. Will operate 1, 2 or 3 lamps (maximum 450w) Unit in box all ready to work. £7-95 plus 90p VAT and postage.



SPIT MOTOR

200-250V Induction motor, driving a Carter gearbox with a 1 1/2" output drive shaft running at 5 revs p.m for roasting chickens, also for driving mills—winemills, coloured disc lighting effects, etc. £2-50 plus 50p post and VAT.



OVEN THERMOSTAT

Made by the famous Diamond H Company, this has a sensor joined by a capillary to a variable control and when fitted with a knob is ideal for many ovens or processes, 50p each + post and VAT 15p.



MAINS TRANSFORMERS

All standard 230-250 volt primaries	£ p
1v.....	1 amp (special) 1-78
2-4v.....	5 amp 8-85
6-3v.....	2 amp 1-25
6-3v.....	3 amp 1-75
9v.....	1 amp 8-95
9v.....	2-5 amp 2-50
12v.....	1 1/2 amp 1-50
12v.....	1 amp 1-00
6-3v-0-6v.....	2 amp 5-50
18v.....	1 amp 1-50
24v.....	2 amp 2-25
24v.....	3 amp 3-60
12-0-12v.....	50mA 1-20
6-0-6v.....	50mA 1-20
3-0-3v.....	3 amp 1-50
25-0-25v.....	2 amp 5-50
25v.....	1 1/2 amp 1-95
40v tapped 10 20 30.....	250 watts 3-50
60v 2 amp & 6-3v.....	1 amp 4-50
60v 5 amp & 5v.....	1 amp 7-50
27v.....	8 amp 4-50
30v.....	37 amp 22-00
60v tapped 7v & 70v.....	2 amp 5-50
230v-60mA & 6-3v.....	1-5 amp 1-75
275-0-275v at 90mA & 604v 3 amp.....	2-25
EHT Transformer 5000v 25mA.....	(intermittent) 5-60
Charge Transformers	
6v and 12v.....	2 amp 1-50
6v and 12v.....	3 amp 2-25
6v and 12v.....	5 amp 3-50

Add 30p per £1 to cover postage and VAT

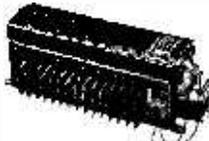
LIGHT PIPE

A mains operated travelling light array 24ft. long it uses 130 miniature bulbs which flash in sequences to make bands of light move along the tube.—The tube can be draped around a particular item or set and cannot fail to attract attention—complete kit consists of—24ft. of translucent tubing—140 miniature bulbs—8 yards multicore cable—motorised switch—taps for quick connections and full wiring instructions, £15-00 for the complete kit. Post and V.A.T. paid.



HONEYWELL PROGRAMMER

This is a drum timing device, the drum being calibrated to equal divisions for switch-setting purposes with trips which are infinitely adjustable for position. They are also arranged to allow 2 operations per switch per rotation. There are 15 changeover micro switches each of 10 amp type operated by the trips, thus 15 circuits may be changed per revolution. Drive motor is mains operated 5 revs per min. Some of the many uses of this timer are Machinery control. Boiler firing. Dispensing and Vending machines. Display lighting animated and signs. Signalling, etc. Price from makers probably over £20 each. Special snip price £9-96. £1-00 Post and VAT. Don't miss this terrific bargain.



BREAK-DOWN UNIT

Contains hundreds of useful parts some of which are as follows—68 silicon diodes equivalent OA91, 68 resistors, mostly 1/2 watt 5% covering a wide range of values 4 x .1 mfd 400v condensers, 15 x .01 mfd 100v condensers, 2 RF chokes 8 x B9 valve holders, 1 x 4H choke, 1 x 115v transformer, 1 boxed unit containing 4 delay lines also tag panels, trimmer condensers, suppressors, etc., on a useful chassis sized approx 9" x 5" x 7". Only 75p (the 66 diodes would cost at least 10 times this time) This is a snip not to be missed. Post and VAT 75p.



THIS MONTH'S SNIP

POWER SUPPLY MADE BY BUSH RADIO

A PP3/PP9 battery illuminator in casing with input and output leads. Original price over £6-00. Offered at this month's snip £2-68. Post and VAT paid.

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 Goodmans 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 £14-00 including VAT and postage.



HIGH POWERED TRANSFORMER

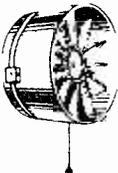
Rated at 250 Watts, upright mounting varnish impregnated. Its primary is for 230/240 volts 50 cycles, it has four secondaries each 10v very high current windings. Just a few of the circuits it can power are: 10-0-10v at up to 12 amps; 20-0-20v at up to 6 amps; single 10v at 25 amps; single 20v at 12 1/2 amps; single 30v at 9 amps; single 40v at 6-5 amps. This can be used for charging or for amplifiers, etc., there being an earth screen between primary and secondaries. A transformer like this today would cost at least £15 from the makers; however, we are making a special offer at £3-50 + 25p post £1 + 8p each. Grab some while you can, our stock may not last long.

TWIN OUTPUT POWER PACKS

These have two separately R.C. smoothed outputs so can operate two battery radios on a stereo amp without cross modulation (they will of course operate one radio-tape-cassette-calculator in fact any battery appliance and will save their cost in a few months' service). Full wave rectification, double insulated mains transformer—total enclosed in a hard P.V.C. case—three core mains lead—terminal output—when ordering please state output voltage 41v, 6v, 7 1/2v, 9v, 12v or 24v. Price £3-95. Post and VAT included.

ONLY £1-50 FOR SEVEN ELECTRIC MOTORS

7 powerful batt. motors as used in racing cars and power models. Output and types vary for use in hundreds of projects—Toots, toys, models, etc. All brand new reversible and for 1 1/2-12v batts. Wiring diag. inc. VAT + Post 40p. FREE plan for min. power station.



EXTRACTOR FAN

Cleans the air at the rate of 10,000 cubic ft. per hour Suitable for kitchens, bathrooms, factories, changing rooms, etc., it's so quiet it can hardly be heard. Compact, 5 1/2" casing with 5 1/2" fan blades. Kit comprises motor, fan blades, sheet steel casing, pull switch, mains connector and fixing brackets. £4-75 including post & VAT.



Monthly list available free; send long stamped envelope.

TERMS: Where order is under £5 please add 30p surcharge to offset packing expenses.

J. BULL (ELECTRICAL) LTD.
(Dept. P.W.), 103 TAMWORTH ROAD,
CROYDON CRO IXX

ITS 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—its an interesting list and its free—just send S.A.E. Below are a few of the Bargains still available from previous lists.

Stereo timing lights generally need a 50 mA bulb. We have these in plastic encapsulations suitable for panel mounting with output leads. Price 40p + 10p. Available in 6v or 12v.

12v. Blower. Complete unit ready to install into car or caravan, etc., size approx 3" diameter by 3" long—made for services so good quality, quiet in operation—low current consumption. Price £2-00 + 16p. Post 40p + 4p.

30 amp D.P. Changeover Switch. These are very heavy duty in solid cast iron boxes sprayed silver and intended for switching from mains to emergency supply or from one transformer or generator to another for maintenance. Hand-operated by lever on the side. Price £9-75 + 22p each, plus carriage £1-50 + 12p. £1-50. Note. These are ex-equipment. Ditto but 60 amp £3-75 + 30p. Carriage £2-00 + 16p.

More Disco Switches. These are similar to the Honeywells, which are regularly stocked, except that they are by a Swiss maker and not new but in good working order, covered by our normal ex-equipment guarantee. Two models available, 2 switch driven by mains-operated motor with gear box giving 20 rpm. Price £2 + 16p. Post 30p + 3p. Other is 12 changeover switch model driven by motor in plastic enclosure of 15 rpm. Price £3-50 + 25p. Post 40p + 4p.

Panel Meter 0-1 mA, full vision flush mounting. Each. Regular price over £3. Our price £2 each plus 10p. Post 15p.

Camping Lights. Two new 12v camping lights have arrived this week. All made up ready to join to your car battery. 2 models—2 1/2" 13w. Price £3-75 + 30p. Post 85p + 7p. And 1 1/2" 8w. Price £2-50 + 24p. Post 75p + 6p.

Tuner Cassette as described in March "Practical Wireless". Please note we can supply the ferrite slab and the ZN 414 IC. Price for these two items £2-25 including post and VAT. Copy of the circuit supplied on request.

Burglar Alarms. More and more burglars seem to be thriving on the properties of people who cannot be bothered to install burglar alarms. We can offer the intruder alarm as described in "Everyday Electronics" September issue. This is a good circuit and not too expensive. Price is £3-83 + 81p. Post 40p + 10p.

Thermally protected motor. American made 1" stack. This revs. at 2400 RPM, suitable for fan or similar application. Special feature is the trip which cuts off the mains should the motor overheat. Price £1-60 + 15p. Post 25p + 2p.

Amplifier in case with speaker, marketed by British Relay. This is in good quality cabinet with back and elliptical speaker. The amplifier is the Newmarket PC 4 module, together with your own control, £4 + £1. Post 40p + 10p.

Teak veneered double cabinet. We believe that this was made from one of the Leak systems. It is 25" x 4 1/2" high x 8" deep made of thick board with sound/vent holes and should be ideal to house amplifier and tuner, or amplifier and one speaker. Very high quality cabinet which would cost £4 or £5 to make today. Price £2 + 60p + 80p + 20p.

Disco Dimmers made by Ultra Electronics, this is a variable controller which can be fitted behind a panel or into a standard switch box and it will control by 1250 watts along your similar non-inductive load. Very special price only £3 + 24p + 30p + 3p.

Disco Black Light Lamp 175 watts—230/240v pear-shaped back out glass which obscures all visible radiation but emits long wave ultra violet (black light). This lamp provides a convenient way of fluorescing a discotheque, club, dance hall, party, etc., and being a direct plug in replacement of a tungsten lamp it is very convenient for temporary usage anywhere. Price £6-50 + 60p. Post 60p + 4p.

Some more Relay bargains. Miniature plug-in type with perspex dust cover 700 ohm 12v DC working. 4 sets of gold-plated changeover contacts 1/2 amps. Normally an expensive relay. Our price £1 + 8p.

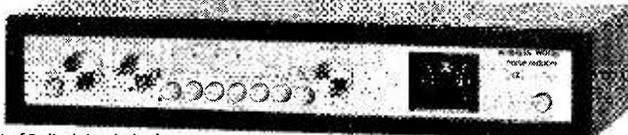
Mains Relays 230/240v. AC operated with 10 amp changeover contacts, open type, one screw fixing 3 sets changeover contacts £1 + 8p each.

Three Changeover perspex covers—plug-in types £1-25 + 10p each for same 30p + 2p each. Available with following coil voltages 12v AC. 50v AC 230/240 AC. Also still available the most versatile type 800 relay which, having a double wound coil, is suitable for working off 6, 12 or 24v. DC or mains through series resistor. This has multiple contacts and the price is 40p + 3p each.

Sound Transducer balanced armature type, 800 ohm imp. In capsule, size diameter 1 1/2" by 1 1/2" thick. Useful in digital equipment or for auto monitoring or as a microphone or speaker, good quantities available. Basic price 50p + 4p less our usual quality discounts.

Special Instrument offer is a Russian made Galvo, very sensitive precision instrument, full scale deflection 7-0-7A. This is a bench mounting instrument of extremely high sensitivity (3/2A per division) size approx. 6 1/2" x 2 1/2" x 2". Price £9-50 each + 75p. Post 50p + 4p.

Dolby™ Noise Reducer Kit



PRICE: £34.40 + VAT

'Wireless World'
May, June, July '75

Trademark of Dolby Laboratories Inc.

The latest addition to our exclusive range of matching high fidelity units.

The Dolby Noise Reduction System is designed to reduce background noise on open reel or cassette tape recorders. Used in the signal path to and from the tape recorder, the unit will encode (Dolbyse) signals during recording, and, during playback, may be used to decode either your own encoded material, or commercially available Dolby encoded cassettes.

Featuring:

- switching for both encoding (low-level h.f. compression) and decoding
- a switchable f.m. stereo multiplex and bias filter
- provision for decoding Dolby f.m. radio transmissions (as in USA)
- no equipment needed for alignment
- suitability for both open-reel and cassette tape machines
- check tape switch for encoded monitoring in three-head machines

The kit includes:

- complete set of components for stereo processor
- regulated power supply components
- board-mounted DIN sockets and push-button switches
- fibreglass board designed for minimum wiring
- solid mahogany cabinet, chassis, twin meters, front panel, knobs, mounting screws and nuts

Typical performance

Noise reduction better than 9dB weighted

Clipping level: 16.5dB above Dolby level (measured at 1% third harmonic content)

Harmonic distortion 0.1% at Dolby level (typically 0.05% over most of band, rising to a maximum of 0.12%)

Signal-to-noise ratio: 75dB (20Hz to 20kHz, signal at Dolby level) at Monitor output

Dynamic Range > 90dB

30mV sensitivity

Calibration tapes are available for open-reel use and for cassette (specify which) PRICE £1.80 + VAT*

S-2020TA STEREO TUNER/AMPLIFIER KIT

PRICE: £48.95 + VAT

SOLID MAHOGANY CABINET

A high-quality push-button FM Varicap Stereo Tuner with Intersteram mute combined with 20W r.m.s. per channel Stereo Amplifier.



THD < 0.1% @ 20W
Tuner S/N 30dB @ 1.8µV (mono)
Toroidal Transformer

Please add VAT at 12½% unless marked thus * when 8% applies
We guarantee full after sales technical and servicing facilities on all our kits

Please send SAE for complete lists and specifications
Portwood Industrial Estate, Church Gresley,
Burton-on-Trent, Staffs DE11 9PT
Tel. Burton-on-Trent (0283) 215432. Telex 377106

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7a GLOUCESTER ROAD, LITTLEHAMPTON, SUSSEX
All prices inclusive of V.A.T. at 12½% Telephone 6743

QB2	-40	6BA6	-80	6KT7	-85	12E1	8-50	95A3	-80	DF91	-80	PCF88	-65	PZ30	-50	U301	-55	AC168	-44	BF185	-47
OZ4	-55	6RC8	-90	6KR8	-90	12J7GT	-70	35C5	-85	DF96	-80	PCF89	-50	QQV03/10	U403	90	AC175	-54	BF190	-28	
LA3	-60	6BB6	-40	6L1	2-50	12K5	1-50	35D5	-90	DK40	-70	PCCL89	-80	U404	75	AC177	-32	BF761	-23		
1A5GT	-65	6BB6	-70	6L6GC	-70	12K7GT	-50	35L6GT	-80	DK92	1-00	PCF82	-50	Q875/20	U801	-80	AC178	-30	BFY52	-23	
1A7GT	-60	6BJ6	-65	6L7	-60	12K8	-75	35W4	-55	DK96	-70	PCF82	-50	U400	75	AC179	-23	BY100	-21		
1B9GT	-65	6BK7A	-85	6L18	-80	12Q7GT	-50	36Z3	-80	DL96	-65	PCF84	-70	Q895/10	VP23	-65	AC179	-23	BY114	-21	
1H9GT	-59	6BQ7A	-80	6L19	2-00	12R7	-50	36Z4CT	-70	DM70	-80	PCF200/1-00	U400	75	VP41	-90	AC180	-21	BY127	-21	
1L4	-25	6BR7	-100	6LD90	-80	12R8GT	-55	35Z5GT	-80	DM71	1-75	PCF201/1-00	U400	75	VP41	-90	AC181	-23	BY127	-21	
1N6GT	-75	6BR8	1-25	6N7GT	-70	12S7H	-50	42	-1-50	DY87/6	-40	PCF801	-55	QV160/15	U111	1-00	AC182	-13	BY210	-30	
LR5	-50	6BS7	1-70	6Q7G	-60	12S7	-60	43	-1-25	DY802	-45	PCF801	-55	U1120	1-00	AC182	-13	BY211	-30		
LS4	-40	6BW6	1-00	6Q7GT	-60	12S8Q	-60	50B5	1-00	E80CC	2-50	PCF802	-55	U120A	AD140	-42	AC183	-18	BY212	-30	
LU4	-70	6BW7	-85	6Q7(M)	-65	12S8T	-75	90C5	-75	E80CC	2-50	PCF806	-60	R19	75	AD149	-58	BY213	-30		
LV6	-85	6BZ6	-80	6R7G	-70	12H7	-75	60CD6G	-70	E80F	2-50	PCF806	-60	TP2630/1-00	W107	-75	AD162	-53	FBY41A	-26	
2D21	-55	6C4	-40	6S4T	-55	14S7	-1-10	1-20	E80D	2-50	E80F	2-50	PCF806	-60	UABC80-45	W729	1-20	AD114	-30	OA9	-14
2GK5	-75	6C5G	-60	6S7GT	-75	19A05	-65	60H5E	-75	E82C	1-00	PCF806	-60	UAF42	-70	X41	1-00	AD115	-13	OA47	-12
2X2	-70	6C6	-45	6S8T	-60	19G6	6-50	60L6GT	-70	E82E	1-00	PCF806	-60	UBC41	-60	X66	1-60	AD117	-23	OA70	-13
3A4	-55	6C9	2-00	6S8T	-55	20D1	-70	1-00	E182CC	EF89	-35	PCF806	-60	UBC81	-60	Z759	5-85	AD121	-35	OA73	-18
3D6	-40	6C8A	-60	6S17	-60	20F2	-85	85A2	-75	EF91	-50	PCF806	-60	UBC81	-60	Z759	5-85	AD121	-35	OA73	-18
3Q4	-80	6C8DG	1-80	6S7GT	-65	20L1	1-20	85A3	-75	EF188CC	2-50	PCF806	-60	UBC81	-60	Z759	5-85	AD121	-35	OA73	-18
3Q5GT	-70	6C8GA	-90	6S7GT	-60	20P1	1-00	90A9	3-00	EF92	-50	PCF806	-60	UBC81	-60	Z759	5-85	AD121	-35	OA73	-18
3S4	-45	6C8B	-90	6V6G	-80	20P3	1-00	90C1	-85	E1148	-60	PCF806	-60	UBC81	-60	Z759	5-85	AD121	-35	OA73	-18
3V4	-80	6C8LA	-95	6V8GT	-55	20P5	1-00	90CG	2-80	EA50	-40	PCF806	-60	UBC81	-60	Z759	5-85	AD121	-35	OA73	-18
4CB6	-75	6CM7	1-00	6X4	-45	20P5	1-50	150B2	1-00	EA76	1-30	PCF806	-60	UBC81	-60	Z759	5-85	AD121	-35	OA73	-18
5C08	-75	6C05	-90	6X5GT	-60	25A6G	-70	21S8G	-60	EABC80	-60	PCF806	-60	UBC81	-60	Z759	5-85	AD121	-35	OA73	-18
5R4GY	1-00	6G04	1-17	7B6	-80	25L6G	-80	807	1-10	EAC91	-55	PCF806	-60	UBC81	-60	Z759	5-85	AD121	-35	OA73	-18
5U4G	-60	6D3	-75	7B7	-80	25Y6G	-80	5702	1-20	EAF42	-75	PCF806	-60	UBC81	-60	Z759	5-85	AD121	-35	OA73	-18
5V4G	-60	6D7	-90	7H7	-80	25Z4G	-50	5783	1-65	EAP01	-55	PCF806	-60	UBC81	-60	Z759	5-85	AD121	-35	OA73	-18
5Y3GT	-55	6D7GA	-85	7Y7	2-00	25Z6G	-75	8067	1-00	EB34	-30	PCF806	-60	UBC81	-60	Z759	5-85	AD121	-35	OA73	-18
5Z3	1-00	6E76A	-85	7Y4	-80	25Z6G	-80	8060	1-00	EB91	-20	PCF806	-60	UBC81	-60	Z759	5-85	AD121	-35	OA73	-18
5Z4G	-55	6E5	1-00	7Z4	-80	28D7	2-00	6067	1-00	EB41	-75	PCF806	-60	UBC81	-60	Z759	5-85	AD121	-35	OA73	-18
5Z4GT	-55	6F1	-80	9D7	-70	30A5	-75	7193	-60	EB81	-45	PCF806	-60	UBC81	-60	Z759	5-85	AD121	-35	OA73	-18
6/30L2	-80	6F6G	-80	10C2	-70	30C15	1-00	90E2	-55	EBF80	-40	PCF806	-60	UBC81	-60	Z759	5-85	AD121	-35	OA73	-18
6R3GT	1-40	6F13	-80	10DE7	-80	30C17	1-00	9006	-45	EBF83	-45	PCF806	-60	UBC81	-60	Z759	5-85	AD121	-35	OA73	-18
6AC7	-55	6F14	-90	10E7	-75	30C15	1-00	AC9N	1-20	EBF83	-45	PCF806	-60	UBC81	-60	Z759	5-85	AD121	-35	OA73	-18
6AG5	-55	6F15	-75	10F9	-65	30F25	-75	AC9EN	1-20	EBF83	-45	PCF806	-60	UBC81	-60	Z759	5-85	AD121	-35	OA73	-18
6AH6	-70	6F18	-80	10F13	-65	30FL1	1-10	-80	EC86	-90	PCF806	-60	UBC81	-60	Z759	5-85	AD121	-35	OA73	-18	
6AJ5	-75	6F23	-80	10LD11	-75	30FL2	1-10	AL60	1-20	EC88	-90	PCF806	-60	UBC81	-60	Z759	5-85	AD121	-35	OA73	-18
6AK5	-45	6F24	-80	10P13	-80	30FL3	-70	ARP3	-60	EC92	-55	PCF806	-60	UBC81	-60	Z759	5-85	AD121	-35	OA73	-18
6AK6	-70	6F25	1-00	10P14	2-50	30FL4	1-10	ATP4	-60	EC93	-30	PCF806	-60	UBC81	-60	Z759	5-85	AD121	-35	OA73	-18
6AK5A	-70	6F25	-75	12A6	-85	30L15	-80	AZ1	-60	EC93	-30	PCF806	-60	UBC81	-60	Z759	5-85	AD121	-35	OA73	-18
6AN5	-70	6F32	-70	12AC6	-80	30PL13	1-20	DAF91	-35	EC93	-30	PCF806	-60	UBC81	-60	Z759	5-85	AD121	-35	OA73	-18
6AQ5	-50	6G6G	-80	12AD6	-80	30P4MR	-75	AZ41	-50	EC93	-30	PCF806	-60	UBC81	-60	Z759	5-85	AD121	-35	OA73	-18
6AR5	-80	6G8A	-80	12AE6	-80	30P4MR	-75	B36	-75	EC93	-30	PCF806	-60	UBC81	-60	Z759	5-85	AD121	-35	OA73	-18
6AS7	1-00	6GK5	-75	12AT6	-45	30P12	-80	BL63	2-00	EC93	-30	PCF806	-60	UBC81	-60	Z759	5-85	AD121	-35	OA73	-18
6AT6	-50	6G77	-80	12AU6	-60	30P19/	-75	CL33	1-75	EC93	-30	PCF806	-60	UBC81	-60	Z759	5-85	AD121	-35	OA73	-18
6AU6	-40	6H9GT	-80	12AV6	-80	30P4	-90	CT1C	1-00	EC93	-30	PCF806	-60	UBC81	-60	Z759	5-85	AD121	-35	OA73	-18
6AV6	-50	6J5GT	-50	12BA6	-50	30PL1	-95	CT31	-70	EC93	-30	PCF806	-60	UBC81	-60	Z759	5-85	AD121	-35	OA73	-18
6AW8A	-90	6J6	-35	12BB6	-55	30PL13	1-20	DAF91	-35	EC93	-30	PCF806	-60	UBC81	-60	Z759	5-85	AD121	-35	OA73	-18
6AX4	-75	6J7G	-85	12BH7	-55	30PL14	1-30	DAF96	-60	EC93	-30	PCF806	-60	UBC81	-60	Z759	5-85	AD121	-35	OA73	-18
6BR6	-35	6J8A	-90	12B77	-85	30PL15	0-90	DD90	-60	EC93	-30	PCF806	-60	UBC81	-60	Z759	5-85	AD121	-35	OA73	-18

VALVES ALSO REQUIRED TO PURCHASE. LOOSE OR BOXED, BUT MUST BE NEW. OFFERS MADE BY RETURN.

All goods are unused, tested, and guaranteed. Despatch charges:—25p on all orders below £10 in value. Orders over £10 post free. Orders despatched same day as received. Any parcel insured against damage in transit for 5p per parcel extra. Terms of business available on request. Many others in stock too numerous to list. Please enclose S.A.E. for reply to any correspondence.

RETURN OF POST MAIL-ORDER SERVICE

JUST RELEASED

R.C.S. 100 watt VALVE AMPLIFIER



Four inputs. Four way mixing, master volume, treble and bass controls. Suits all speakers. This professional quality amplifier chassis is suitable for all groups, disco, P.A. where high quality power is required. 5 speaker outputs. A/C mains operated. Slave output. Produced by demand for a quality valve amplifier.
Suitable carrying cabinet £14. Price **£85** carr. £2.50

ANOTHER R.S.C. BARGAIN!

ELAC 9 + 5in. HI-FI SPEAKER TYPE 59RM
This famous unit now available, 10 watts, 8 ohm.

Price **£3.25** Post 40p



8" or 10" x 6" ELAC HI-FI SPEAKER

Dual cone plasticised roll surround. Large ceramic magnet. 50-18,000 cps. Bass resonance 55 cps. 8 ohm impedance. 10 watts.

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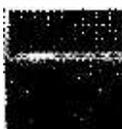
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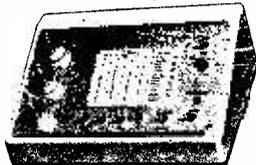
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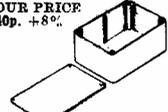
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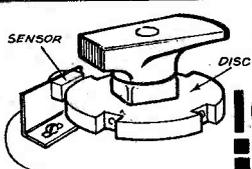
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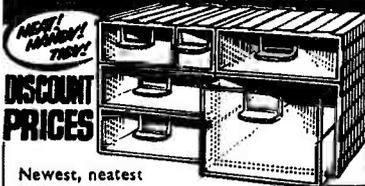
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DIGITAL ICs		7400		7401		7402		7403		7404		7405		7406		7407		7408		7409		7410		7411		7412		7413		7414		7415		7416		7417		7418		7419		7420		7421		7422		7423		7424		7425		7426		7427		7428		7429		7430		7431		7432		7433		7434		7435		7436		7437		7438		7439		7440		7441		7442		7443		7444		7445		7446		7447		7448		7449		7450		7451		7452		7453		7454		7455		7456		7457		7458		7459		7460		7461		7462	
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DIODES		AEY11		BA100		BY126		BY127		IN916		OA9		OA10		OA17		OA70		OA71		OA81		OA85		OA86		OA87		OA88		OA89		OA90		OA91		OA92		OA93		OA94		OA95		OA96		OA97		OA98		OA99		OA100	
AEY11	70p	BA100	10p	BY126	12p	BY127	12p	IN916	12p	OA9	9p	OA10	40p	OA17	9p	OA70	10p	OA71	10p	OA81	8p	OA85	10p	OA86	10p	OA87	10p	OA88	10p	OA89	10p	OA90	10p	OA91	10p	OA92	10p	OA93	10p	OA94	10p	OA95	10p	OA96	10p	OA97	10p	OA98	10p	OA99	10p	OA100	10p		

BRIDGE RECTIFIERS		1A50V		1A100V		1A200V		1A400V		1A600V		1A800V		1A1000V		1A1500V		1A2000V		1A2500V		1A3000V		1A3500V		1A4000V		1A4500V		1A5000V		1A5500V		1A6000V		1A6500V		1A7000V		1A7500V		1A8000V		1A8500V		1A9000V		1A9500V	
1A50V	20p	1A100V	42p	1A200V	47p	1A400V	26p	1A600V	27p	1A800V	28p	1A1000V	29p	1A1500V	30p	1A2000V	31p	1A2500V	32p	1A3000V	33p	1A3500V	34p	1A4000V	35p	1A4500V	36p	1A5000V	37p	1A5500V	38p	1A6000V																	

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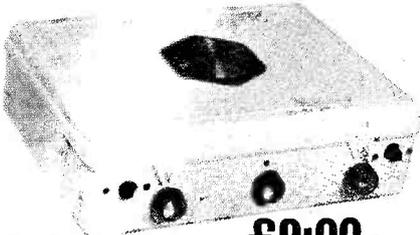
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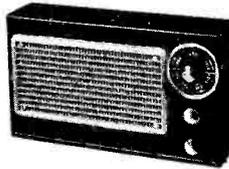
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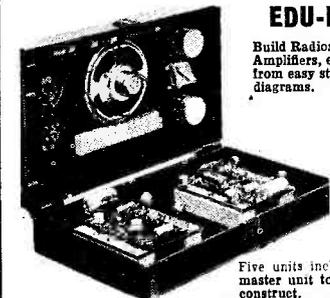
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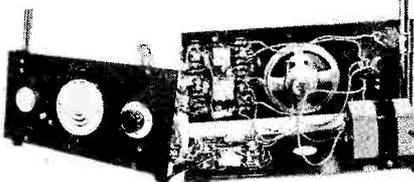


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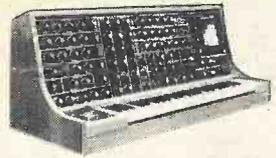
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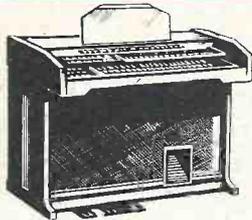
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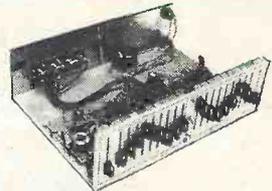
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