PRACTICAL WIRELESS

DECEMBER 1973

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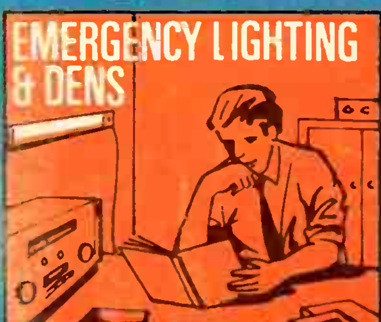
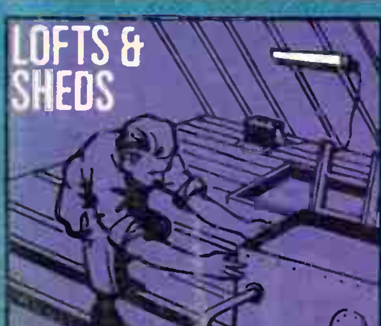
FLUORESCENT LAMP UNIT
-FROM YOUR 12V BATTERY





ALSO:- 3-BAND SHORT WAVE SUPERHET
USING THE LM380 I.C. AUDIO AMPLIFIER

PRACTICAL WIRELESS

VOL. 49 NO. 8
ISSUE 802
DECEMBER 1973

BRITAIN'S PREMIER MAGAZINE FOR THE DO-IT-YOURSELF RADIO AND ELECTRONICS CONSTRUCTOR

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We regret that we are unable to supply back numbers of Practical Wireless. Readers are recommended to enquire at a public library to see copies. Requests for specific back numbers of *Practical Wireless* and *Television* only can be published in our CQ Column.

● NEWS & COMMENT

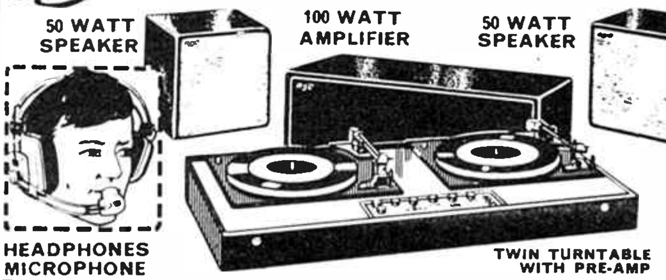
● CONSTRUCTIONAL

● OTHER FEATURES

● EXTRA WITH THIS ISSUE

INSET P.W. DATACARDS in COLOUR
No. 5 Resistance and Capacitance Calculator
No. 6 D.C. Circuits

RSC GROUP/DISCO UNITS



PACKAGE OFFER
Units listed below
(a) 100w POWER AMPLIFIER
(b) PAIR OF HI-FI HEAD-PHONES
(c) MATCHING DYNAMIC 'MIKE' (attached to h'phone)
(d) PAIR 50 WATT SPEAKERS Black Rexine covered Cabinets Size approx. 18" × 18" × 8"
(e) RSC TDI DISCO CONSOLE

(a) (b) (c) (d) & (e) **£149·95** Carr. £3·00

Terms Deposit £30 and 18 monthly payments of £8·33 (Total £179·94).

RSC TDI DISCO CONSOLE

Incorporating twin Garrard SP25 or BSR MP60 type turntables and Sonotone or Acos Cartridges with diamond stylii. Separate Vol. controls for each turntable. Also MONITORING FACILITIES, plus Treble and Bass Controls. Separate input for 'mike' with vol. control switch. Black Vynide covered Cabinet with lid. see illustration on left

Or Dep. £9·95 and 12 mthly pymts £5 85 (Total £80·15) **£69·95** Carr. £1·50

RSC DISCO MASTER

DISCOTHEQUE CONSOLE with integrated power supply. 100w OUTPUT TWIN JACK OUTPUT SOCKETS Inc. twin Garrard SP25 Mk111 or BSR Macdonald MP60 type turntables, Pick-ups with high compliance cartridges and diamond styli. Separate volume controls for each turntable. FULL MONITORING FACILITIES plus Treble and Bass controls. Separate input for mic. with vol. control switch. Rexine covered cabinet size approx. 32¼" x 16¼" x 7¼" with lid

Terms: Deposit £20 and 12 monthly payments £7·60 (Total £111·20). Carr. £2·50. **ONLY £99·75**

FANE ULTRA HIGH POWER LOUDSPEAKERS

All power ratings are R.M.S. continuous. 2 YEARS' GUARANTEE High flux ceramic magnets. ALL CARRIAGE FREE.

'POP' 100	'POP' 60	'POP' 50
18" 100 Watt	15" 60 Watt	12" 50 Watt
14,000 gauss 8/15Ω	14,000 gauss 8/15Ω	13,000 gauss 15Ω
£25·95	£14·75	£11·99
Dep: £5·95 and 9 mthly payments £2·56 (Total £28·99)	Dep. £3·75 and 9 monthly payments, £1·50 (Total £17·25)	Dep £2·99 and 9 monthly payments £1·28 (Total £14·51)

FOR BASS GUITAR, ELECT. ORGAN, ETC. PAIR SUITABLE ALL PURPOSES

R.S.C. COLUMN SPEAKERS

IDEAL FOR VOCALISTS AND PUBLIC ADDRESS

All types 15 Ohms covered in Rexine and Vynair
TYPE C4100 IS ALSO SUITABLE FOR BASS GUITAR OR ELECTRONIC ORGAN

TYPE C132 30-40 WATTS Fitted two exceptionally efficient, low feedback howl characteristic high flux 13" x 8" 20 watt speakers. Terms: Dep. £2·95 and 9 m'thly payments £2·43 (Total £24·82) Carr. 65p. **£21·95**

TYPE C313 50 WATTS Low feedback characteristic. Fitted three 13" × 8" deep cone high flux speakers with high power voice coils. Size approx. 54" × 14" × 11". Dep. £4·72 & 9 mthly pymts £3·58 (£36·94) Carr. 85p **£32·72**

TYPE C4100 100 WATTS inc. four 12" 50 watt speakers for conservative rating. Extra heavy construction. Size approx. 58 × 16 × 10" Acoustically filled and pressurised. Terms: Dep. £15·50 & 12 mthly. pyts. £5·48 (Total £81·02). Carr. £1·50 **£71·50**

FANE SPEAKERS 'POP' 25/2 12 in. 25 WATT

Dual Cone 15 Ω (for uses other than Bass Guitar or Electronic Organ). Carr. free **£7·95** or Dep. £1·25 and 9 mthly payments 89p (Total £9·26).

DISCO PACKAGE OFFER £45

Pair BSR MP60 T/tables GP91 PU Cartridges. FAL Disco Pre-amp. Totel Rec. Ret. Price £50·11 Carr. £1

F.A.L. DISCO PRE-AMPLIFIER £18·97

Designed for use with a pair of Player Units and Amplifier with Bass and Treble Controls. Incorporates MONITORING FACILITIES and Mic. input. The 4 inputs are ind. controlled. Selector switch Gram (1), (2), and Tape. 200-250v A.C. Mains 50Hz. Brush Silver finished fascia. Size approx 16½" × 3" × 4" deep. Fully enclosed but can mounted in cabinet.

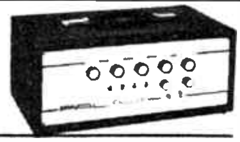
GROUP/DISCO EQUIPMENT PACKAGE OFFERS

F.A.L. PHASE 50 MK.III AMPLIFIER PR. FANE POP 25/2 25W L/SPEAKERS Terms: Deposit £7·50 and 12 monthly payments of £4·29 (Total £58·98)	£39·93 £15·90 £55·83	PACKAGE PRICE £51·50 carr. £1·10
F.A.L. PHASE 50 MK.III AMPLIFIER PR. FANE POP 50 L/SPEAKERS Terms: Deposit £9·50 and 12 monthly payments of £4·88 (Total £68·06)	£39·93 £23·98 £63·91	PACKAGE PRICE £59·50 carr. £1·10
F.A.L. PHASE 50 MK.III AMPLIFIER PAIR L12/20 25W L/S in cabinets Terms: Deposit £10 and 12 monthly payments of £5·17 (Total £72·04)	£39·93 £26·80 £66·23	PACKAGE PRICE £63 carr. £1 35
F.A.L. PHASE 100/2 AMPLIFIER 4 FANE POP 50 L/SPEAKERS Terms: Deposit £20 and 18 monthly payments of £8·35 (Total £134·30)	£69·85 £47·98 £117·81	PACKAGE PRICE £110 carr. £2

FANE "CRESCENDO" SPEAKERS

FULL RANGE AVAILABLE AT ALL BRANCHES

FAL PHASE 50 Mk.III AMPLIFIER 50 WATT.



Solid state. 4 Separately controlled inputs Plus master vol. control. Ind. Bass and Treble Controls. Protective circuit to guard against damage from accidental shorts. Output for Speaker/s 3 to 30 ohms. Size 17" × 7" × 7½". 200-250v. A.C. mains. Output 50 watts music rating.
Or deposit £6·93 & 9 monthly payments £4·22. Total £44·91. **£39·93** Carr. 85p.

HIGH QUALITY LOUDSPEAKER UNITS

ALL TWO TONE REXINE AND VYNAIR FINISH

L125 50 WATT Fitted pair of 12" 50 watt high flux speakers for conservative rating. Impedance 8-15 ohms. Carr. £1·50 **£37·95**
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L12/10 10-15 Watt veneer finish cabinet 12" unit 8-15 ohm. Size approx. 14" × 14" × 9". Carr. 50p. Dep. £1·25 & 9 mthly pymts £1·06 (Total £10·79) **£8·25**

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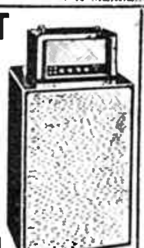
Combined 50W Amplifier and 12in. Loudspeaker.

For Lead Guitar, Mic., Gram, Radio, Tape (Not for use with Bass instruments). Inc. 3 inputs and 2 vol. controls plus Treble, Bass and Presence. Output Jack for additional 15 ohm Speaker. Attractively finished in black with silver-finished fascia and trimmings. Compact size. Fitted carrying handle. Terms: Deposit £8·95 and 12 monthly payments £4·97 (Total £68·59). Carr. Free UK Mainland
SAE for leaflet **ONLY £59·95**

CREDIT TERMS AVAILABLE ON PURCHASES OVER £10 (Kits Excepted) INTEREST CHARGES REFUNDED ON CREDIT SALES Settled in 3 months

RSC BASS-REGENT 50 WATT AMPLIFIER



A powerful high quality all-purpose unit for lead, rhythm, bass guitar, vocalists, gram, radio, tape. Peak Output rating. Loudspeaker unit either horizontal or vertical mounting.

★ Two extra heavy duty 12in. 50w Loudspeakers.

★ Four Jack inputs and two Volume Controls for instant use of up to four pick-ups or "mikes". Bass and Treble controls. Send S.A.E. for leaflet.

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RSC GP30 HI-FI AMPLIFIER

For Guitar, Vocal or Instrumental Group

A 4 input, 2 vol. control HI-FI 30 watt unit with Separate Bass and Treble controls. Current valves. Peak output rating. Strong Rexine covered cabinet with handles. Attractive black/silver P.V.C. fascia. Neon indicator. For 200-250v. A.C. mains. For 3 or 15 ohm speakers. Send S.A.E. for leaflet. Terms: Deposit £4·40 and 9 monthly payments of £2·75 (Total £29·15). **£25·85** Carr. 75p

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RSC HI-FI CENTRES LTD.

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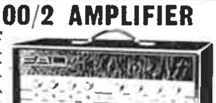
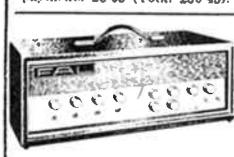
FAL PHASE 100/2 AMPLIFIER



100 WATTS MUSIC RATING. Solid State. Sep. Bass and Treble Controls. 4 separate controlled inputs plus master control. Output for speakers 3–30 ohms. Includes protective circuit against damage from short circuits.
Terms: Deposit £7·85 & 12 monthly payments £8·05 (Total £80·45). **£69·85** Carr. 82p

FAL TWIN CHANNEL AMPLIFIERS



Solid State. 4 sep. controlled inputs plus master volume control. Individual Bass and Treble controls. Output for speakers 3-30 ohms. Protective circuitry against damage from short circuits.

FAL 'SUPER 50' 50 WATTS MUSIC RATING **£59·50** Carr. 80p
Terms: Dep. £8·50 & 12 mthly. pymts. £4·97 (Total £68·14)

FAL 'SUPER 100' 100 WATTS MUSIC RATING **£79·95** Carr. 90p
Terms: Dep. £11·95 & 12 mthly. pymts. £6·63 (Total £91·51). Prices above include protective dust cover.

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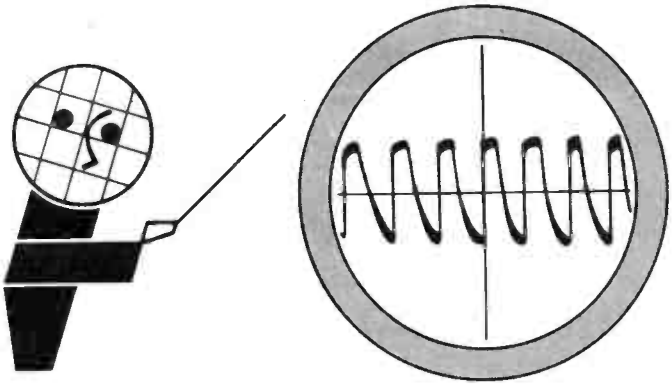

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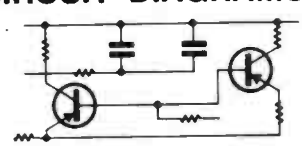

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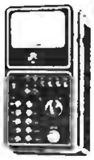

Model U437 10,000 o.p.v. A first class versatile instrument manufactured in U.S.S.R. to the highest standards. Ranges: 2·5/10/50/250/500/1000v D.C. 2·5/10/50/250/500/1000v A.C. DC Current 100wA/1/10/100mA/1A. Resistance 300 ohms/3/30/300K/3m Ω. Complete with batteries, test leads, instructions and sturdy steel carrying case. £4 95. P. & P. 25p

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20,000 O.P.V. Mirror scale, overload protection. 0/5/25/125/1,000V. D.C. 0/10/50/250/1,000V. A.C. 0/50 μA/250 mA. 0/60K/6 meg Ω. −20 to +62db. £4 95. P. & P. 15p.

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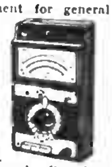
30,000 O.P.V. Mirror scale, overload protection 0/6/3/15/60/300/1,200V. D.C. 0/6/30/120/600/1,200V. A.C. 0/30μA/6mA/60mA/300mA/600mA. 0/8K/80K/800K/8 meg. ohm −20 to +63 db. £7 50. P. & P. 15p.

U4312 MULTIMETER

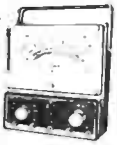


Extremely sturdy instrument for general electrical use. 667 o.p.v. 0/3/1·5/7·5/30/60/150/300/600/900 V DC and 75mV. 0/3/1·5/7·5/30/60/150/300 600/900 V AC. 0/300μA/1·5/6/15/60/150 600mA/1·5/6 AMP. D.C. 0/1·5/6/15/60/150/600mA/1·5/6 AMP. AC. 0/200 Ω/3K/30K Ω. Accuracy DC 1%. AC 1·5%. Knife edge pointer, mirror scale. Complete with sturdy metal carrying case, leads and instructions. £9 75. P. & P. 25p.

MODEL 500

30,000 O.P.V. with overload protection, mirror scale. 0/·5/2·5/10/25/100/250/500/1,000v. D.C. 0/2·5/10/25/100/250/500/1,000V. A.C. 0/50μA/5/50/500mA. 12 amp. D.C. 0/60/K/6 Meg./60 Meg Ω
£10 50. Post paid.
Leather Case £1·75

MODEL C-7080 EN



Giant 6" mirror scale. 20,000 o.p.v. 0 / ·25 / 1 / 2·5 / 10 / 50 / 250 / 1000 / 5000V. D.C. 0 / 2·5 / 10 / 50 / 250 / 1000 / 5000V. A.C. 0 / 50μA / 1 / 10 / 100 / 500mA / 10 amp. D.C. 0 / 2K / 200K / 20 meg −20 to +50 dB. £13 95. Post 35p.

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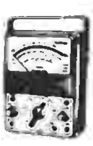
100,000 o.p.v. mirror scale/overload protection. 0/·12/·6/3/12/30/120/600 V DC. 0/6/30/120/600. V AC. 0/12/600μA/ 12/300mA/12 AMP DC. 0/10 K/1 MEG/100MEG. −20 to +50db. 0·01–2 MFD. Transistor tester measures Alpha, beta and Ico. Complete with batteries, instructions and leads. £14 95. P/P 25p.

KAMODEN 72 200 MULTITESTER



High sensitivity tester. 200,000 o.p.v. Overload protection. Mirror scale. Ranges: 0 / ·06 / ·3 / 3 / 30 / 120 / 600 / 1200V D.C.
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0 / 6μA / 1·2mA / 120mA / 600mA / 12A. D.C.
0 / 12A. A.C.
−20 to +63dB. 0 / 2K / 200K / 2 meg / 200 meg ohms. £16·95. Post 30p.

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100,000 O.P.V. 6½in Scale Buzzer Short Circuit Check. Sensitivity: 100,000 O.P.V. D.C. 5K/Volt A.C. D.C. Volts: ·5, 2·5, 10, 50, 250, 1,000 V. A.C. Volts: 3, 10, 50, 250, 500, 1,000V. D.C. Current: 10, 100μA, 10, 100, 500mA, 2·5, 10 amp. Resistance: 1K, 10K, 100K, 10MEG, 100MEG Ω. Decibels: −10 to +49 db. Plastic Case with Carrying Handle. Size: 7½in. × 6¾in. × 3¼in. £19 95. P. & P. 25p.

HIOKI MODEL 700X

100,000 O.P.V. Overload protection. Mirror scale. ·3/·6/1·2/1·5/3/6/12/30/60/120/300/600/1200V DC 1·5/3/6/12/30/60/150/300/600 1200 V. A.C. 15/30μA/3/6/30/60/150/300mA 6/12 AMP. DC. 2K/200K/2 Meg/20 Meg ohm −20 to +63dB. £14·95. P. & P. 20p

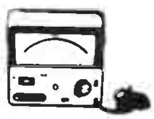
370 WTR MULTI-METER

Features A.C. current ranges. 20,000 o.p.v. 0/·5/2·5/10/50/250/500 1000 V. D.C. 0/2·5/10/50/250/500/1000V AC 0/50μA/1/10/100mA/1/10 Amp D.C. 0/100mA/1/10 Amp AC 0/5K/50K/500K/5 meg/ 50 meg. −20 +62db. £17 50. P. & P. 25p.

KAMODEN HM 350 TRANSISTOR TESTER

High quality instrument to test Reverse Leak current and DC current. Amplification factor of NPN, PNP, transistors, diodes, SCR's etc. 4" × 4½" clear scale meter. Operates from internal batteries. Complete with instructions, leads and carrying handle. £12·50. Post 30p.

MODEL 449A IN CIRCUIT TRANSISTOR TESTER



Checks true A.C. beta in / out. Checks Ico. Checks diodes in / out. Checks SCR, etc. Beta HI 10 – 500, LO 2 – 50. Icbo 0–5000μA. 220/240 V A.C. operation £17 50. Post 25p.

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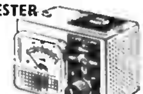

Tests ICO and B. PNP / NPN. Operates from 9v battery. Complete with all instructions, etc. £3·95. P. & P. 20p.

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Tests PNP or NPN transistors. Audio indication. Operates on two 1·5v batteries. Complete with all instructions, etc. £4·50. P. & P. 20p.

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10 meg. input 10 ranges: ·001/·03/·1/·3/1/3/10/30/100/300V. R.M.S. 5cps.-1·2 Mc/s. Decibels −40 to +50dB. Supplied brand new complete with leads and instructions. Operation 230V. A.C. £17·50. Carr. 25p.

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28 ranges D.C. volts 1·5–1,500v. A.C. volts 1·5–1,500v. Resistance up to 1,000 megohms. 200/240v. A.C. operation. Complete with probe and instructions. £17·50. P. & P. 30p. Additional probes available: R.F. £2·12; H.V. £2·50.

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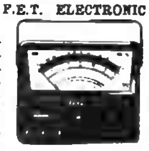
Input impedance 10 meg ohms. Ranges: 0 / ·25 / 1 / 2·5 / 10 / 50 / 250 / 1000V. D.C. 0 / 2·5 / 10 / 50 / 250 1000V. A.C. 0 / 25μA / 2·5 / 25 / 250 mA D.C. −20 to +62dB 0 / 5K / 50K / 500K / 5meg 500meg ohms. £14·95. Post 30p

TMK MODEL 117 F.E.T. ELECTRONIC VOLTMETER

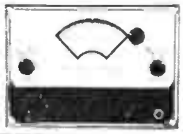


Battery operated, 11 meg input, 26 ranges. Large 4½" mirror scale. Size 5¼" × 4¾" × 2¼". DC VOLTS 0·3–1200V AC VOLTS 3–300V RMS. 8·0–800V P-P. DC CURRENT ·12–12mA. Resistance up to 2000M ohm. Decibels −20 to +51dB. Complete with leads/instructions. £17·50. P. & P. 20p.

KAMODEN HMG-500 INSULATION RESISTANCE TESTER

Range 0–1000 Megohms. 500 Volt. Battery operated. Wide range clear meter 4½" × 4". Complete with deluxe carrying case, batteries, instructions. £19·95. Post 30p

BELCO AF-5A SOLID STATE SINE SQUARE WAVE C.R. OSCILLATOR



Sine 18 × 200,000 Hz: Square 18 × 20,000 Hz Output max. +10 dB. (10 K ohms) Operation internal batteries Attractive 2-tone case 7¼" × 5" × 2". Price £17·50. Carr. 17p.

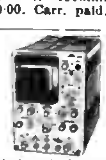
TO-3 PORTABLE OSCILLOSCOPE

3in. tube, Y amp. Sensitivity 0·1v p-p/CM. Bandwidth 1·5 cps-1·5 MHz. Input imp. 2 meg Ω 25pF X amp. sensitivity 0·9v. p-p/CM. Bandwidth 1·5cps–800kHz. Input imp. 2 meg Ω 20pF. Time base. 5 ranges 10 cps 300 kHz. Synchronization. Internal/external. Illuminated scale 140 × 215 × 330 mm. Weight 15½lb. 220/240V. A.C. Supplied brand new with handbook. £52·50. Carr. 50p.

CI-5 PULSE OSCILLOSCOPE

For display of pulsed and periodic waveforms in electronic circuits. VERT. AMP. Bandwidth 10MHz. Sensitivity at 100KHz VRMS/mm. 1·25; HOR. AMP. Bandwidth 500KHz. Sensitivity at 100KHz, V RMS/mm. ·3·25; Preset triggered sweep 1–3,000μsec.; free running 20–200,000Hz in nine ranges. Calibrator pips. 220 × 360 × 430mm. 115–230V. AC operation. £39·00. Carr. paid.

RUSSIAN CI-16 DOUBLE BEAM OSCILLOSCOPE



5 Mc/s Pass Band. Separate Y1 and Y2 amplifiers. Rectangular 5in. × 4in. C.R.T. Calibrated triggered sweep from ·2 μ/sec. to 100 milli-sec. per cm. Free running time base 50 c/s-1 mc/s. Built-in time base calibrator and amplitude calibrator. Supplied complete with all accessories and instruction manual £87. Carr. Paid.

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5 ranges 400kHz-30mHz. An inexpensive instrument for the handyman. Operates on 9v battery. Wide easy to read scale 800kHz modulation. 5¼ × 5¼ × 3½in. Complete with instructions and leads. £8·97. Post 25p.

MODEL U4311 SUB-STANDARD MULTI-RANGE VOLT AMMETER

Sensitivity 330 ohms/Volt AC and DC. Accuracy 0·5% D.C. 1% AC. Scale length 165mm. 0/300/750μA/1·5 / 3 / 7·5 / 15 / 30 / 75 / 150 / 300 / 750mA / 1·5 / 3 / 7·5AMP DC 0 / 3 / 7·5 / 15 / 30 / 75 / 150 / 300 / 750mA / 1·5 / 3 / 7·5 AMP AC 0 / 75 / 150 / 300 / 750mV / 1·5 / 3 / 7·5 / 15 / 30 / 75 / 150 / 300 / 750V DC 0/750mV / 1·5 / 3 / 7·5 / 15 / 30 / 75 / 150 / 300 /750V AC. Automatic cut out. Supplied complete with test leads, manual and test certificates. £49·00. Post 50p.

TMK MODEL TW-50K

46 ranges, mirror scale. 50K/Vol. D.C. 5K/Volt A.C. D.C.: Volts ·125, ·25, 1·25, 2·5, 5, 10, 25, 50, 125, 250, 500, 1000V, A.C. Volts: 1·5, 3, 5, 10, 25, 50, 125, 250, 500, 1000V. D.C. Current: 25, 50μA, 2·5, 5, 25, 50, 250, 500mA, 5, 10amp. Resistance: 10K, 100K, 1 MEG, 10 MEG Ω. Decibels: −20 to +81·5db £8·50. P. & P. 17½p.

MODEL TE.15 GRID DIP METER

Transistorised. Operates as Grid Dip, Oscillator, Absorption Wave Meter and Oscillating Detector. Frequency range 440Kc/s–280Mc/s in 6 coils. 500μA Meter. 9V battery operation. Size 180 × 80 × 40mm. £15·00. Post 20p.

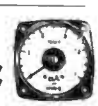
ARF-300 AF/RF SIGNAL GENERATOR

All transistorised, compact, fully portable. AF sine wave 18 Hz to 220 KHz. AF square wave 18 Hz to 100 KHz. Output sine / square 10v. P-P. RF 100 KHz to 200 MHz. Output 1v. maximum. Operation 220/240v. AC. Complete with instructions and leads. £29·95. Post 50p.

TE22 SINE SQUARE WAVE AUDIO GENERATORS

Sine: 20cps to 200 kc/s on 4 bands. Square: 20cps to 30 kc/s. Output impedance 5,000 ohms, 200/250V. A.C. operation. Supplied brand new and guaranteed with instruction manual and leads. £17·50. Carr. 37½p.

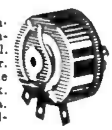
240° Wide Angle 1mA Meters



MW 1-6 60mm square	£3·97
MW 1-8 80mm square	£4·97

P. & P. 15p.

POWER RHEOSTATS



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50 WATT. 10/25/50/100/250/500/1000/2500 or 5000 ohms. £1·62. P. & P. 10p.
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0/115/250V. Step up or step down. Fully shrouded.

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500 W	£5·80	P. & P. 33p
1000 W	£8 25	P. & P. 38p
1500 W	£11 25	P. & P. 43p
2250 W	£19 00	P. & P. 50p
5000 W	£40·00	P. & P. £1

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AT30	Photo cell switching unit	£5·70
AT50	400W Triac light dimmer speed control	£4·80
AT55	1,300W Triac light dimmer speed control	£5·70
AT56	2,200W Triac light dimmer speed control	£6·90
AT60	Psychedelic light control single channel	£7·80
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HF75	FM transistor receiver	£2·88
HF310	FM tuner unit	£15·81
HF325	De luxe FM tuner unit	£24·12
HF330	Stereo decoder for HF310 HF325	£9·96
HF395	Aerial amplifier for AM FM bands	£1·77
GP310	Stereo pre amp for use with 2× AF310	£21·27
GU330	Tremolo unit for guitars etc	£7·50
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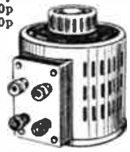
MODEL S-260 GENERAL PURPOSE BENCH MOUNTING

	£	P.&P.
1 Amp	8·75	30p
2·5 Amp	10·00	35p
5 Amp	14·70	37p
8 Amp	19·85	50p
10 Amp	28·10	75p
12 Amp	29·50	100p
20 Amp	61·25	125p
25 Amp	72·50	130p
40 Amp	103·10	150p

MODEL S-260B

Panel Mounting.



1 Amp	8·75	30p
2·5 Amp	10·00	35p

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REFLEX HORN SPEAKER RUH.6

Built in driver unit. Impedance 16 ohm. Power rating 10 watt. Response 380-7000Hz. Approx. size 6" × 6". Weatherproof and shock proof.

OUR PRICE £4·97 P. & P. 30p.

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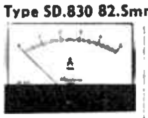
USED EXTENSIVELY BY INDUSTRY, GOVT. DEPTS., EDUCATIONAL AUTHORITIES, ETC.

Over 200 ranges in stock—other ranges to order. Quantity discounts available. Send for fully illustrated brochure.

Type SW.100 100 x 80 mm.

50μA	£4·15	5 amp. D.C.	£3·60
50-0-50μA	£3·95	300V. A.C.	£3·70
100μA	£3·95	VU Meter	£4·30
100-0-100μA	£3·90		
500μA	£3·70		
1mA	£3·60		
20V. D.C.	£3·60		
50V. D.C.	£3·60		
300V. D.C.	£3·60		
1 amp. D.C.	£3·60		

Type SD.830 82.5mm x 110mm Fronts



50μA	£3·40	10mA	£3·10
50-0-50μA	£3·40	50mA	£3·10
100μA	£3·35	100mA	£3·10
100-0-100μA	£3·35	500mA	£3·10
200μA	£3·30	1 amp.	£3·10
500μA	£3·15	5 amp.	£3·10
1mA	£3·10	10 amp.	£3·10
5mA	£3·10	5V. D.C.	£3·10
		10V. D.C.	£3·10
		20V. D.C.	£3·10
		50V. D.C.	£3·10
		300V. D.C.	£3·10
		15V. A.C.	£3·30
		300V. A.C.	£3·30
		VU Meter	£3·50

Type SD.640 63.5mm x 85mm Fronts

50uA	£3·05	500mA	£2·90
50-0-50μA	£3·05	1 amp.	£2·90
100μA	£3·00	5 amp.	£2·90
100-0-100μA	£3·00	10 amp	£2·90
200μA	£3·00	5V. D.C.	£2·90
500μA	£2·95	20V. D.C.	£2·90
1mA	£2·90	50V. D.C.	£2·90
5mA	£2·90	300V. D.C.	£2·90
10mA	£2·90	15V. A.C.	£3·00
50mA	£2·90	300V. A.C.	£3·00
100mA	£2·90	VU Meter	£3·15

Type MR.4SP. 2in. square fronts

50μA	£2·70	5 amp.	£2·40
50-0-50μA	£2·65	10V. D.C.	£2·40
100μA	£2·60	20V. D.C.	£2·40
100-0-100μA	£2·50	50V. D.C.	£2·40
200μA	£2·50	300V. D.C.	£2·40
500μA	£2·45	15V. A.C.	£2·40
500-0-500μA	£2·40	300V. A.C.	£2·40
1mA	£2·40	S Meter 1mA	£2·50
5mA	£2·40	VU Meter	£2·70
10mA	£2·40	1 amp. A.C. •	£2·40
50mA	£2·40	5 amp. A.C. •	£2·40
100mA	£2·40	10 amp. A.C. •	£2·40
500mA	£2·40	20 amp. A.C. •	£2·40
1 amp.	£2·40	30 amp. A.C. •	£2·40

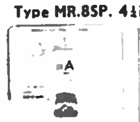
"SEW" EDUCATIONAL METERS

Type ED.107. Size overall 100mm x 90mm x 108mm

A new range of high quality moving coil instruments ideal for school experiments and other bench applications. 3" mirror scale. The meter movement is easily accessible to demonstrate internal working. Available in the following ranges:

50μA	£6·90	15V d.c.	£5·95
100μA	£6·40	20V. d.c.	£5·95
50-0-50μA	£6·40	50V. d.c.	£5·95
1mA	£5·95	300V. d.c.	£5·95
1-0-1mA	£5·95	Dual range	
1A d.c.	£5·95	500mA/5A d.c.	£7·00
5A d.c.	£5·95	1/15A d.c.	£7·00
5V d.c.	£5·95	5V/50V d.c.	£7·00
10V d.c.	£5·95	5/15V d.c.	£7·00

Type MR.8SP. 4¼in. x 4¼in. fronts



50μA	£4·40	100mA	£3·90
50-0-50μA	£4·25	500mA	£3·90
100μA	£4·25	1 amp.	£3·90
100-0-100μA	£4·05	5 amp.	£3·90
200μA	£4·05	15 amp.	£3·90
500μA	£3·90	30 amp.	£3·95
500-0-500μA	£3·90	10V D.C.	£3·90
1mA	£3·90	20V. D.C.	£3·90
1-0-1mA	£3·90	50V. D.C.	£3·90
5mA	£3·90	150V. D.C.	£3·90
10mA	£3·90	300V. D.C.	£3·90
50mA	£3·90	15V. A.C.	£3·95
		300V. A.C.	£3·95
		S Meter 1mA	£3·90
		VU Meter	£4·55
		1 amp. A.C.*	£3·90
		5 amp A.C.*	£3·90
		10 amp. A.C.*	£3·90
		20 amp. A.C.*	£3·90
		30 amp. A.C.*	£3·90

Type MR.52P. 2½in. square fronts

50μA	£2·50	10V. D.C.	£2·50
50-0-50μA	£3·05	20V. D.C.	£2·50
100μA	£3·00	50V. D.C.	£2·50
100-0-100μA	£2·95	300V. D.C.	£2·50
500μA	£2·65	15V. A.C.	£2·60
1mA	£2·50	300V. A.C.	£2·60
5mA	£2·50	S Meter 1mA	£2·60
10mA	£2·50	VU Meter	£3·60
50mA	£2·50	1 amp. A.C. •	£2·50
100mA	£2·50	5 amp. A.C. •	£2·50
500mA	£2·50	10 amp. A.C. •	£2·50
1 amp	£2·50	20 amp. A.C. •	£2·50
5 amp	£2·50	30 amp. A.C. •	£2·50

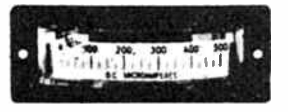
Type MR.6SP. 3½in. x 3¼in. fronts

50μA	£3·70	10V. D.C.	£2·60
50-0-50μA	£3·15	20V. D.C.	£2·60
100μA	£3·15	50V. D.C.	£2·60
100-0-100μA	£3·10	150V. D.C.	£2·60
200μA	£3·05	300V. D.C.	£2·60
500μA	£2·75	15V. A.C.	£2·80
500-0-500μA	£2·60	50V. A.C.	£2·80
1mA	£2·60	150V. A.C.	£2·80
5mA	£2·60	300V. A.C.	£2·80
10mA	£2·60	500V. A.C.	£2·80
50mA	£2·60	S Meter 1mA	£2·85
100mA	£2·60	VU Meter	£3·70
500mA	£2·60	50mA A.C. •	£2·60
1 amp.	£2·60	100mA A.C. •	£2·60
5 amp.	£2·60	200mA A.C. •	£2·60
10 amp.	£2·60	500mA A.C. •	£2·60
15 amp.	£2·60	1 amp. A.C. •	£2·60
20 amp.	£2·60	5 amp. A.C. •	£2·60
30 amp.	£2·80	10 amp. A.C. •	£2·60
50 amp.	£2·90	20 amp. A.C. •	£2·60
5V. D.C.	£2·60	30 amp. A.C. •	£2·60

"SEW" EDGWISE METERS

Type PE.70. 3 17/32in. x 1 15/32in. x 2¼in. deep

50μA	£3·75	500μA	£3·20
50-0-50μA	£3·60	1mA	£3·20
100μA	£3·60	300V. A.C.	£3·25
100-0-100μA	£3·50	VU Meter	£3·35
200μA	£3·40		



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Please add postage

Type MR.38P. 1 21/32in. square fronts

50μA	£2·55	200mA	£2·25
50-0-50μA	£2·50	300mA	£2·25
100μA	£2·45	500mA	£2·25
100-0-100μA	£2·40	750mA	£2·25
200μA	£2·25	1 amp.	£2·25
500μA	£2·25	2 amp.	£2·25
500-0-500μA	£2·25	5 amp.	£2·25
1mA	£2·25	10 amp.	£2·25
1-0-1mA	£2·25	3V. D.C.	£2·25
2mA	£2·25	10V. D.C.	£2·25
5mA	£2·25	15V. D.C.	£2·25
10mA	£2·25	20V. D.C.	£2·25
20mA	£2·25	50V. D.C.	£2·25
50mA	£2·25	100V. D.C.	£2·25
100mA	£2·25	150V. D.C.	£2·25
150mA	£2·25	300V. D.C.	£2·25
		500V. D.C.	£2·25
		750V. D.C.	£2·25
		15V. A.C.	£2·30
		50V. A.C.	£2·30
		150V. A.C.	£2·30
		300V. A.C.	£2·30
		500V. A.C.	£2·30
		S Meter 1mA	£2·30
		VU Meter	£2·65

Type SD.460 46mm x 59.5mm Fronts

50μA	£2·80	1 amp.	£2·60
50-0-50μA	£2·80	5 amp.	£2·60
100μA	£2·75	10 amp.	£2·60
100-0-100μA	£2·75	5V. D.C.	£2·60
200μA	£2·70	10V. D.C.	£2·60
500μA	£2·55	20V. D.C.	£2·60
1mA	£2·60	50V. D.C.	£2·60
5mA	£2·60	300V. D.C.	£2·60
10mA	£2·60	15V. A.C.	£2·70
50mA	£2·60	300V. A.C.	£2·70
100mA	£2·60	VU Meter	£2·90
500mA	£2·60		

"SEW" BAKELITE PANEL METERS

Type MR.65. 3½in. square fronts

25μA	£4·60	2 amp.	£2·60
50μA	£3·55	5 amp.	£2·60
50-0-50μA	£3·05	15 amp.	£2·60
100μA	£3·00	30 amp.	£2·60
100-0-100μA	£3·00	50 amp.	£2·60
500μA	£2·70	5V. D.C.	£2·60
500-0-500μA	£2·60	10V. D.C.	£2·60
1mA	£2·60	20V. D.C.	£2·60
1-0-1mA	£2·80	50V. D.C.	£2·60
5mA	£2·60	150V. D.C.	£2·60
10mA	£2·60	300V. D.C.	£2·60
50mA	£2·60	50mV. D.C.	£2·90
100mA	£2·60	100mV. D.C.	£2·90
500mA	£2·60	30V. A.C. •	£2·65
1 amp.	£2·60	50V. A.C. •	£2·65
		150V. A.C. •	£2·65
		300V. A.C. •	£2·65
		500V A.C.	£2·65
		500mA A.C. •	£2·60
		1 amp. A.C. •	£2·60
		5 amp. A.C. •	£2·60
		10 amp. A.C. •	£2·60
		20 amp. A.C. •	£2·60
		30 amp. A.C. •	£2·60
		50 amp. A.C. •	£2·60
		VU Meter	£3·65

Type S-80 80 mm. square fronts

50μA	£3·50	5 amp. D.C.	£3·00
50-0-50μA	£3·40	300V. A.C.	£3·00
100μA	£3·40	VU Meter	£3·70
100-0-100μA	£3·30		
500μA	£3·05		
1mA	£3·00		
20V. D.C.	£3·00		
50V. D.C.	£3·00		
300V. D.C.	£3·00		
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BVD.5 VERNIER TUNING DIAL

Approx. 7-1 ratio planetary drive vernier dials. Log scale 0-180 degrees. Blank scales 1 to 5. Scale width 4½". Dial size 5" × 3". Overall size 7½" × 4¾" × 1¾" deep including knob and coupling. ¼" dia. shaft.

OUR PRICE £1·62 P. & P. 15p.

MP7 MIXER PREAMPLIFIER

5 microphone inputs each with individual gain controls enabling complete mixing facilities. Battery operated. 9½" × 5" × 3". Inputs Mics: 3×3mV 50K; 2×3mV 600 ohm. Phono meg. 4mV 50K. Phono ceramic 100mV 1 meg. Output 250mV 100K.

Our Price £8·97 P. & P. 20p

PS.1000B REGULATED POWER SUPPLY

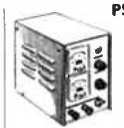
Solid state. Output 6, 9 or 12 volt DC up to 3 amps. Meter to monitor current. Input 220/240v AC. Size 4" × 3½" × 6½". £11·97. P. & P. 25p.

EA.41 REVERBERATION AMPLIFIER

Self contained, transistorised, battery operated. Simply plug in microphone, guitar, etc. and output into your amplifier. Volume control, depth of reverberation control. Beautiful walnut cabinet, 7½ × 3 × 4½in.

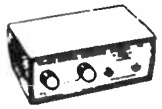
Our Price £7·50 P. & P. 15p

PS.200 REGULATED P.S.U.



Solid state. Variable output 5-20 volt D.C. up to 2 amp. Independent meters to monitor voltage and current. Output 220/240 V. A.C. Size 7½" × 5½" × 3½". £19·95. P. & P. 25p.

1021 STEREO LISTENING STATION



For balancing and gain selection of loudspeakers with additional facility for stereo headphone switching. 2 gain controls, speaker on-off slide switch, stereo headphone sockets. 6" × 3 × 2½".

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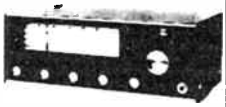

4 Bands covering 550Kc/s-30 Mc/s. FET. S Meter. Variable BFO for SSB. Built-in Speaker. Bandspread. Sensitivity Control. 220/240 v. A.C. or 12 v. D.C. Brand new with instructions.

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TRIO 9R59DS RECEIVER

4 bands covering 550 Kc/s to 30 Mc/s continuous and electrical bandspread on 10, 15, 20, 40 and 80 metres. 8 valve plus 7 diode circuit. 4/8 ohm output and phone jack. SSB-CW, ANL, Variable BFO. S meter. Sep. bandspread dial. IF frequency 445 kc/s, audio output 1·5w. Variable RF and AF gain controls 115/250 v. A.C. with instruction manual.

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TRIO JR599 RECEIVER

9 wavebands covering 1·8–29·7MHz 144–146MHz and 10·00MHz WWV. SSB, CW, AM and FM. AF output more than 1 watt. S Meter. Squelch control. BFO. Variable RF and AF controls. 4–16 ohm output and phone jack. Power requirements 100/240v. AC. 12–14v. DC. Size 270 × 140 × 310mm.

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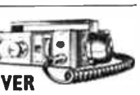
BELTEK W5400 CAR TRANSCEIVER



Solid state mobile transceiver for 12v DC neg. use. Transmits and Receives on any 12 of 28 channels between 144 and 146MHz. Power output 10w and 1w switchable. Controls: Volume/on/off, squelch channel selector Internal 3" speaker. Complete with dynamic mike, PTT switch, three sets of crystals for 144·48MHz, 144·60 MHz, 145·00MHz, mounting bracket and instructions. Size approx. 150 × 70 × 220mm.

Our Price £75·00 P & P 50p

TRIO JR310 SSB RECEIVER

Covers 3·5, 7, 14, 21, 28, 28·5 and 29·1 MHz bands and WWV 15MHz. SSB, AM and CW. AF output more than 1 watt. Crystal controlled BFO for SSB. S meter. ANL etc. AC 110/120–220/240v. Size 330 × 179 × 310mm.

Our Price £75·00 Carr. Paid

GWS

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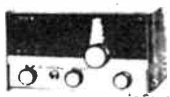
UNR 30 RECEIVER



4 Bands covering 550 Kc/s-30 Mc/s B.F.O. Built-in Speaker 220/240 v. A.C. Brand new with instructions.

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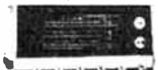

General coverage 150-400 Kc/s, 550 Kc/s-30 Mc/s, FET front end, 2 mech. filters, product detector, variable B.F.O., noise limiter, S Meter Bandspread. RF Gain. 220/240 v. A.C. or 12 v. D.C. Brand new with instructions.

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Fully transistorised portable VHF Transceiver. Will transmit and receive on 6 channels between 144–146MHz. 1 watt transmitter. 12v DC internal or external supply. Built in charger for ni-cad cells. Power/volume switch, squelch control, channel selector, mike socket, earphone/external speaker socket. Complete with microphone, 144·48, 144·72 and 145·32 crystals. Size 134 × 58 × 180mm.

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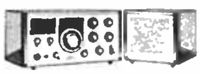

High quality TS515 SSB/CW amateur band receiver covering 80, 40, 20, 15 and 10 metre bands with PS515 power supply and speaker unit. Transmit/receive frequency 3·5–29·7MHz. Output 1·5 watts. Power requirements 110-120/220-240v. AC.
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Handy SWR Meter for transmitter antenna alignment, with built-in field strength meter. Accuracy: 5%. Impedance: 52. Indicator: 100μA DC, full scale 5 section collapsible antenna. Size: 145 × 50 × 60 mm.

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10 wavebands covering AM: 535–1605 kHz, LW: 150–380 kHz, MB 1·6–4·00 MHz, SW1: 4·0–8 MHz, SW2: 8·0–1·6 MHz, SW3: 16–24 MHz, PSB1: 30–50 MHz, PSB2: 148–174 MHz, FM 88–108 MHz, AIR: 108–136 MHz. Features time zone map and timing dial. Large clear scale. Telescopic aerial and built in aerial. AFC or FM. 6" × 4" speaker and personal earpiece. Battery/mains operation. Size: 345 × 133 × 305mm.

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Outstanding value. Soft ear-pads, adjustable headband. 8-16 ohms. 20-20,000 Hz. Complete with lead and stereo plug.

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Lightweight headphones with padded earpieces. 4-16 ohms. 20-20,000 Hz. Complete with 6 ft. cord and plug.

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All silicon transistor amplifier operates from magnetic, ceramic or tuner inputs with twin stereo headphone outputs and separate volume controls for each channel. Operates from 9v battery.
INPUTS: 5mV/100mV.
OUTPUT: 50mV per channel.

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5 wavebands covering AM 535 1065KHz FM 88–108MHz. AIR 108–135MHz. PB 147–174MHz. WB 162. 5MHz. Large horizontal slide dial with logging scale. Slider volume and squelch controls. 7 section telescopic aerial for FM and built in ferrite bar for AM. AFC. 3in. speaker. Earpiece socket. Size 152 × 79 × 219mm. Battery/mains operation.

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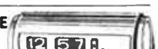

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12v neg. earth. Slider controls for Volume, Tone and Balance. Channel selector button with red pilot lamp, with speakers, mounting brackets and instructions.

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For use with semi-professional tape recorders. Freq. res. 30Hz–20KHz ± 2dB. S/N better than 70dB. Full source tape monitoring. Record/Replay metering. Switchable multiplex filter. Supplied with test tape.

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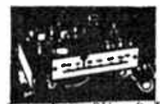
FM TUNER CHASSIS



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A1018 FM TUNER

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Stereo multiplex adaptor £4·97.

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4 wavebands covering FM 87 - 108 MHz, MW 510 - 1605 KHz, LW 145 - 285 KHz, SW 5·8 - 12·5 MHz. Push button wave change plus AFC and on/off. Thumbwheel tuning. Slider volume and tone controls. Earphone socket. Built-in and telescopic aerials. Car aerial socket. Battery/Mains operation.

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Manual tuning of Medium and Long waves. 12v pos. or neg. earth. Complete with speaker, mounting brackets and instructions.

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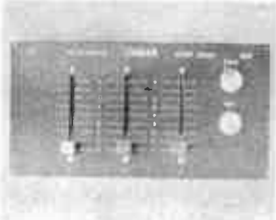
DABAR MN3 MIXER KIT

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BC169 11p BZY88C27V 10p MPF103(2N5457) W005 30p 2N3773 £2·50 40312 62p
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BC177 20p BZX61C7V5 28p
BC178 16p BZX61C8V2 28p MPF104(2N5458) W02 32p 2N3820 60p 40360 56p
BC179 20p BZX61C9V1 28p 49p W04 33p 2N3823E 20p 40361 45p
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BC182L 14p BZX61C11V 28p 46p W08 44p 2N3866 £1·10 40406 52p
BC183 13p BZX61C12V 28p NKT0033 96p ZTX107 12p 2N3904 28p 40407 40p
BC183L 14p BZX61C13V 28p NKT211 25p ZTX108 11p 2N3906 28p 40408 54p
BC184 17p BZX61C15V 28p NKT212 25p ZTX300 13p 2N4058 15p 40409 62p
BC184L 16p BZX61C16V 28p NKT213 25p ZTX302 18p 2N4060 13p 40410 62p
BC212 16p BZX61C18V 28p NKT216 46p ZTX303 15p 2N4061 13p 40430 £1·13
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BC257 11p BZX61C27V 28p NKT271 18p ZTX330 18p 2N4871 44p 40576 £1·46
BC258 10p BZX61C30V 28p NKT274 18p ZTX500 14p 2N4990 66p 40600 70p
BC259 12p CA3004 £2·03 NKT275 20p ZTX501 15p 2N4991 46p 40601 70p
BC307 12p CA3005 £1·35 NKT279A 12p ZTX502 18p 2N5245 45o 40602 45p
BC308 10p CA3011 83p NKT281 29p ZTX503 17p 2N5457(MPF103) 40603 70p
BCY30 25p CA3013 £1·17 NKT351 75p ZTX504 45p 49p 40669 £1·00
BCY31 48p CA3014 £1 37 NKT401 78p 1N914 4p 2N5458(MPF104) 40673 56p
BCY32 50p CA3018 72p NKT402 83p 1N3754 20p 49p 40739 £1·50
BCY33 20p CA3018A 83p NKT403 71p 1N4001 4p 2N5459(MPF105)
BCY34 25p CA3020 £1 39 NKT404 66p 1N4002 4p 46p
BCY38 30p CA3028A 79p NKT405 87p 1N4003 5p 2N5777 45p

CAPACITORS ELECTROLYTIC AXIAL LEADS

Mfd	Working Voltage	Price	Mfd	Working Voltage	Price
1 0	40v	10p	100	16v	9p
1 0	100v	8p	100	25v	9p
2 2	25v	10p	100	40v	10p
2 2	63v	8p	100	63v	13p
4 7	40v	8p	220	25v	11p
10	25v	8p	220	40v	12p
10	63v	9p	470	25v	14p
22	25v	9p	1000	25v	21p
22	40v	9p	2200	25v	39p
47	25v	9p	4700	16v	46p
47	40v	9p			

CAPACITORS—METALLISED POLYESTER

Stock values: MFO	Price each
0 01, 0 015, 0·022, 0·033	4p
0 047, 0 068, 0 10	5p
0 150, 0 220	6p
0·33	8p
0 47	9p
0 68	12p
1 0	15p
1·5	22p
2 2	26p

Order as "Polyesters" + Capacitance.

CAPACITORS—POLYSTYRENE

Axial leads, Clear encapsulation, 5% Tolerance. 160 volt working.

Stock values — Price each
10pF, 15pF, 22pF, 33pF, 47pF, 63pF, 100pF, 150pF,
220pF, 330pF, 470pF, 560pF, 680pF, 820pF, 1000pF, 1500pF,
2200pF, 3300pF, 4700pF, 5600pF, 6800pF — 4p

Order as: "Polystyrenes" + Capacitance.

NEW LOW PROFILE IC HOLDERS

14 pin Oil 18p, 16 pin DIl 26p, 8 pin Oil 16p.

NYLON NUTS AND BOLTS

Cheese head screw bolts. Nuts with integral washer. Moulded in high density nylon, ideal for mounting "live" assemblies, power transistors, etc.
Each pack consists of four nuts and four screw bolts.

Pack No	Thread	Length	Quantity	Pack Price
HSN1	6BA	[illegible]	4	10p
HSN3	6BA	[illegible]	4	10p

Order as "Nuts and Bolts" + Pack No.

OPTO ELECTRONICS—3 devices

from our range—OCP71—42p, ORP12—50p, TIL209 Red led 35p

ANTEX SOLDERING EQUIPMENT

X25/240v 25w Iron £1·75 — SK 2/240v 15w Kit £2·60
MLX 12v 25w Kit essential for car tool kit £2·05
X50 TC 240v 50w temp. controlled £5·95

OP. AMPS—NEW LOW PRICE!

741 8 PIN OIL 34p

RESISTORS—METAL OXIDE

Metal Oxide resistors by Electrosil. Ultra low noise. ½ Watt, 2%. Available in the range E24 between 10 ohms and 1 Meg.
E24 series 1 0, 1·1, 1·2, 1·3, 1·5, 1·6, 1·8, 2·0, 2·2, 2·4, 2 7, 3·0, 3·3, 3 6, 3·9, 4 3, 4 7, 5 1, 5 6, 6 2, 6 8, 7·5, 8·2, 9·1, and their decades.
Type No. TR5 — Price: 4p each
Order as "Metox" + value.

RESISTORS—CARBON FILM

A range of miniature high stability resistors with very low noise characteristics and long life. Tolerances, ranges and wattages as indicated. (Wattage ratings are at max. limiting voltage).

Type No.	Wattage	Tol.	Range	Series	Price
UPM050	0·5	5%	10E-1M	E12	1p each
UPM050	0·5	10%	1M -4·7M	E12	1p each
UPM075	0·75	5%	10E-1M	E12	1p each
UPM075	0·75	10%	1M -4·7M	E12	1p each
UPM100	1 00	10%	10E-1M	E12	2½p each

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COMPREHENSIVE CAT. →

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Exciting...the Stereo 21!

Can you really get sound quality like this FOR LESS THAN £19? YES, YOU CAN! WITH THE NEW

STEREO 21

Until now, richly satisfying sound has always cost a richly satisfying price. *But not any more!* For an almost unbelievable **£18·45**, you can have Stereo 21—audio for the connoisseur! Whatever your taste in music, you can hear it on STEREO 21 the way its composers heard it in their dreams! Beethoven or Mahler . . . Ellington or Jellyroll Morton . . . Das Nibelung or Jesus Christ Superstar . . . Carols from King's College Chapel or the return of a Beatle . . . everything from a prettily fluting baroque organ to the newest pop group at full throttle—STEREO 21 does them all justice!

And have you ever seen a handsomer audio installation? Compact enough to go in a university student's bedroom-study, elegant enough for the suavest penthouse pad in Town, STEREO 21 offers you all the pride of possession as well as a thrilling musical experience!

Top-quality amplifier, BSR turntable, matching speakers. Deck and speaker cabinets you simply wrap round and glue to build. Screw in the amplifier and connect up (all push fit no soldering whatsoever), so simple literally anyone can do it. Except for glue and panel pins all parts supplied including full instructions—all for £18·45 (plus the cost of post and packing if you buy by mail), and—to round it all off—a money refund if not satisfied if your pleasure in STEREO 21 is not complete!

Just think—in only a few days you could be giving your ears the treat of a lifetime—AND introducing your envious friends to STEREO 21 !

Personal shoppers and mail order price

£18·45 **INCLUDING VAT** plus £1·60 p + p.

Diamond stylii, if required, £1·37 extra

Specially selected pair of stereo headphones with individual level controls and padded earpieces to give optimum performance, if required £3·85.

Power Output 2·7 Watts per channel and headphone socket with automatic cut out provision for auxiliary inputs—radio, tape, etc. and output for taping discs. Overall Dimension: Speakers approx. 15½" × 8" × 4". Complete deck and cover enclosed position approx. 15½" × 12" × 6".

EMI SPEAKERS AT UNBELIEVABLE PRICES

950 Kit. Five matched speakers and crossover unit for handling up to 45 watts, from 20 to 20,000 Hz. Huge – 19" x 14" (approx.) high efficiency 16, 500-gauss bass unit built on a heavy diecast frame. The four 10,000 gauss tweeters, each 3¼" dia. approx., are fed by the crossover with a critically adjusted signal for maximum fidelity. Impedance at 1 kHz is 8 ohms. Bass coil 2", others 0·5". Recommended list price £44·00.

OUR PRICE £25·00 + £1·50 p & p

15" 14A/780. Bass unit on a rigid diecast chassis. Superior cone material handles up to 50 watts RMS, and is treated to give a smooth frequency response. Resonance 30 Hz. Fluse 360,000 Maxwells. Impedance at 1 kHz is 8 ohms. 3" voice coil.

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RTVC VISCOUNT III
a boost in the output,

VISCOUNT III now gives you an imposing 20 watts per channel—and the price quoted is actually INCLUSIVE OF VAT!
The money's important, of course, but not nearly so important as *value for money!* And that's something you get in abundance with VISCOUNT III. We design it . . . we make it . . . we sell it direct to you—passing on all the economies that come from cutting out middle-men! That's the only way you can get so much quality for so little money!
The unique VISCOUNT III amplifier, plus the Garrard SP25 Mk III deck, plus the magnificent Duo Type III matched speakers (or Duo Type II for a small room) give you an audio installation that will prove unbeatable for listening pleasure! And the teak finish will harmonise and enhance virtually any style of interior decor! On the brushed aluminium front panel of the amplifier you'll find all the facilities you need—volume, bass, treble and balance controls, plus switches for mono/stereo, on/off function and bass and treble filters. Plus headphone socket on the back.
The heart-stopping timbre of Tom Jones at his most virile . . . the last lingering harmonics of a solo performance by Heifetz or Menuhin. . . , the pathos and the panache of Liza Minelli . . the majestic sonorities of the brass band and the elfin subtleties of the virtuoso clavichordist—hear every nuance with a fidelity that you have never experienced before!
Come and hear VISCOUNT III! If it's inconvenient to travel, buy by post in the confidence that you won't be disappointed (and with a 24-carat Money-Back Guarantee to give you extra reassurance). Don't settle for second-best!
SPEAKERS: **Duo Type II** Size approx. 17in × 10½in × 6½in. Drive unit 13in × 8in with parasitic tweeter. Max. power 10 watts 8 ohms. Simulated Teak cabinet. £14·00 a pair + £2·20 p. & p. **Duo Type III** Size approx. 23½in × 11½in × 9½in. Drive unit approx 13½in × 8½in with HF speaker. Max. power 20 watts, 8 ohms. Freq. range 20Hz to 20kHz. Teak veneer cabinet. £32·00 a pair + £3·30 p. & p.

STILL ONLY £49 COMPLETE

PRICES : SYSTEM 1

Viscount III R102 amplifier	£24·20	+ £1 p & p
2 Duo Type II speakers	£14·00	+ £2·20 p & p
Garrard SP25 Mk III with MAG. cartridge /plinth & cover	£18·00	+ £1·75 p & p
total	£56·20	
Available complete for only	**£49·00**	+ £3·50 p & p

PRICES : SYSTEM 2

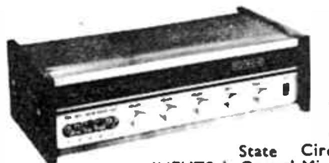
Viscount R102 amplifier	£24·20	+ £1 p & p
2 Duo Type III speakers	£32·00	+ £3·30 p & p
Garrard SP25 Mk III with MAG cartridge plinth & cover	£18·00	+ £1·75 p & p
total	£74·20	
Available complete for	**£65·00**	+ £4 p & p

THE TOURIST PUSH-BUTTON CAR RADIO KIT £6·60

The Tourist PB is suitable for 12 volt working on both negative and positive earth vehicles. It covers the full medium and long wave bands. It is permeability tuned and sturdily constructed. Output is a full 2·5 watts into an 8 ohms speaker. But the Tourist PB will operate into any loud-speaker from 8 to 15 ohms.
Apart from the output stage, which is an integrated circuit, the only other electronic components that need soldering are some capacitors, resistors, etc. The kit includes a pre-built RF tuner unit, and fully modulised IF stages which are pre-aligned before despatch. As well as electronic components this kit also contains 2 diamond-spun aluminium knobs, elegant matching front panel, dial, washers, screws and wire.
The Tourist PB can be mounted in any standard size dash panel and it has an illuminated tuning scale. Chassis size is: 7in wide, 2in high and 4$\frac{5}{16}$in deep. Circuit diagram and comprehensive instructions 55p free with parts.
Fully retractable and lockable car aerial £1·37 post paid.

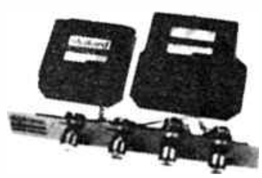
CAR RADIO KIT £6·60 p. and p. 55p. Speaker with baffle and fixing strips £1·65, + 23p p. & p. post free if bought with the kit. Send stamped addressed envelope for leaflet.
If you can solder on printed circuit board, you can build this push-button car radio kit. It's simple—just follow the step-by-step instructions.

RELIANT Mk IV
MONO AMPLIFIER



*5 Electrically Mixed inputs. *3 Individual Mixing controls. *Separate bass and treble controls common to all 5 inputs. *Mixer employing F.E.T. (Field Effect Transistors). *Solid State Circuitry. *Attractive Styling.
INPUTS 1. Crystal Mic or Guitar 9mV. 2. Moving coil Mic. or Guitar 8mV. Inputs 3, 4 & 5 are suitable for a wide range of medium output equipment (Gram, Tuner, Monitor, Organ, etc.) All 250mV sensitivity. Output 20 watts into 8 Ω (suitable for 15 Ω.) Size approx. 12½ x 6 x 3½ ins. **£13·50** p. & p. 60p

UNISOUND MODULES
ONLY £7·64 + 55p. p & p

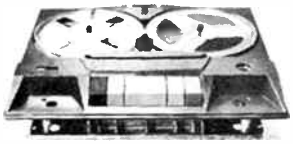


For the man who wants to design his own stereo—here's your chance to start, with Unisound—pre-amp, power amplifier and control panel. No soldering—just simply screw together. 4 watts per channel into 8 ohms. Inputs: 120mV (for ceramic cartridge). The heart of Unisound is high efficiency I.C. monolithic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

IN-CAR ENTERTAINMENT AT HOME

With this elegant stereo 8 track add on unit, audio enthusiasts now have the opportunity to extend their systems to include the playing of 8 track cartridges. Simply select your channel, by push button, four digital lamps indicate channel selected. The Viscount III, the fabulous Stereo 21 and the Unisound Modules will accept this unit, simply connect up. **£10·60** + 90p. p. & p.

PE TAPE LINK CONSTRUCTORS



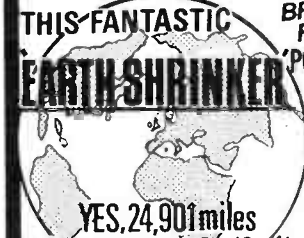
Suitable 3 speed tape deck, **less heads.** Caters up to 5¾ins. spools. 240V AC mains. Unused but store soiled hence no warranty. **£4.00** £1 p. & p.

SEE OPPOSITE PAGE FOR ADDRESS DETAILS

YES, "YOU'VE GOT THE WHOLE WIDE WORLD IN YOUR HANDS"! ALMOST UNBELIEVABLE! Think of the year 1984 and what might be produced then—now get the fantastic ASTRAD 17 and SEE for yourself that the incredible Russians have done it all NOW! It's the radio perfectionist's dream come true! THIS ONE SUPERSEDES ALL EARLIER MODELS! It will probably make your present radio seem like a "crystal set"! Complete with optional battery eliminator for both battery and mains use! We're almost giving them away at only £18·50—a mere fraction of even today's Russian miracle price! We challenge you to compare performance and value with £80 radios! ★Send quickly, from receipt of goods test on mail order 7 days approval, refund if not delighted. Or call. Volume controlled from a whisper to a roar that would fill a hall! Much wider band spread, for absolute "pin-point" station selection! Plus "MAGIC EYE" tuning level indicator for ultra perfect tuning sensitivity! Yes, the Russians have surpassed themselves, proving again their fantastic ability in the field of electronics and brilliantly reflecting their advanced micro-circuitry techniques in the field of spaceship and satellite communications. Yes, EVERY WAVEBAND instantly at your fingertips including Standard Long, Medium, Short and Ultra Short Waves to cover the four corners of the earth during 24 hours a day including all normal transmissions, VHF, FM/USW, AM:LW, MW, SW, gets, locally, local & new stations, not yet operational, and messages from all over the world! Expensive TURRET TUNER side control waveband selection unit (as used on expensive T.V.'s!). Every waveband clicks into position giving incredible ease of station tuning! Genuine push-pull output! ON-OFF volume and separate Treble and Bass tone controls for utter perfection of reproduction and tone! Press-button dial illumination! Take it anywhere—runs economically on standard batteries (obtainable everywhere) or direct through battery eliminator from 220/240V AC mains supply. Internal ferrite rod aerial plus built-in "rotatable" telescopic aerial extending to 39 in approx. It's also a fabulous CAR RADIO. Can also be used through extension amplifier, tape recorder or public address system. SIZE 13in x 10in x 4½in overall approx. Magnificently designed, in highly polished cases. Made to give years of perfect service. Purer & sweeter tone than ever. (U.K. service facilities & spares available for years & years to come, if ever necessary!). With WRITTEN GUARANTEE, manual with simple operating instructions & circuit diagram. PLUS ultra sensitive earphone for personal listening. ONLY £18·50 (with mains/battery eliminator £2·25 extra) BOX, POST, ETC. 45p. NO MORE TO PAY! ★BUT WAIT, for only 75p extra you get the sensational "COMPUTERISED" WORLD TUNING GUIDE (it enables you to zone & time in a flash for transmissions the whole world over—even a child can do it in a flash—it even lets you know when to tune into the U.K. when abroad. NO GUESSING! NO MESSING!) PLUS Standard 'longlife' batteries and Converter Plug. (Sorry—We cannot change these new radios for any earlier model purchased.) Send quickly to Uxbridge Road address, or call at either Store. But HURRY! SHOPERTUNITIES SAVE YOU £££'s and £££'s.

THOUSANDS of MILES REDUCED to INCHES?

1973 RUSSIAN RADIO TECHNOLOGY SHRINKS THE WORLD! *COMPUTERISED?



THIS FANTASTIC EARTH SHRINKER

YES, 24,901 miles SHRUNK TO ONLY 13 x 10 x 4½ inches approx?

BRAND NEW FABULOUS **ASTRAD 17** PORTABLE RADIO & COMMUNICATIONS RECEIVER

*MUST YOU PAY UP TO £80?

28 TRANSISTORS AND DIODES! WAVEBANDS:

STANDARD LONG and MEDIUM

Plus 5 SHORT WAVEBANDS

Plus ULTRA SHORT WAVES

(V.H.F. AM: FM. MW. LW. USW.)

BATTERY MODEL **£18·50** BOX POST ETC. 45p

MAINS/BATTERY ELIMINATOR £2·25 extra

FIRST TIME EVER!

*NOW AVAILABLE WITH fabulous "COMPUTERISED" WORLD TUNING GUIDE!

NO MORE GUESSWORK– INSTANT DATA at your fingertips – enables you to ZONE & TIME IN A FLASH for transmissions the world over!

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Combined V.H.F AM/FM RADIO and CASSETTE TAPE RECORDER & PLAYER

WITH REMOTE CONTROL MICROPHONE

RECOMMENDED RETAIL PRICE £44

OUR PRICE **£20·97** CARR ETC. 50p

Shopertunities "thunder" ahead with an offer that's FANTASTIC (even by our standards!). We've snapped up 500 magnificent machines. Latest sensation in the world of sound! First-class makers! Fabulous VHF, AM/FM Radio AND Cassette Tape Recorder & Player combined & it also runs off standard batteries or mains. (Simply plug in the 220/240V AC line cord.) Record and play back anything, anywhere! IMPORTERS RECOMMENDED RETAIL PRICE £44! WE OFFER AT UNDER HALF PRICE Wonderful features: ★ Press-button Keyboard Control Panel or latest MASTER SWITCH CONTROL! ★ "MAGIC EYE" Visual Battery check/recording level indicator or built-in automatic Leveller! ★ Separate ON/OFF and HI-LO volume controls! ★ Heavy duty built-in speaker! ★ Earphone (for personal listening or "monitoring") and extension speaker sockets! ★ Remote control microphone! ★ Built-in swivel telescopic extension aerial (24in. approx.)! Magnificently made case with carry handle. (DESIGNS VARY SLIGHTLY.) Takes standard 30, 60, 90 or 120-minute Cassette Tapes, obtainable everywhere. AND the amazing built-in full circuit VHF, AM/FM Radio gives you superb clarity of tone, incredible station selection. Unique rotating Station Selector Dial—gets, locally, local city and regional stations in every part of the country, plus B.B.C. National, VHF. Picks up dozens of foreign stations. Fabulous in your car! You could pay £££'s more for a Car Radio or Car Cassette player ALONE! £20·97, carr. etc., 50p—NO MORE TO PAY! Complete with simple instructions, remote control microphone with on/off switch and microphone stand. WITH WRITTEN GUARANTEE. Send quickly, test on mail order 7 day approval from receipt of goods, refund if not delighted. Or call. BONUS OFFER: Batteries and Cassette Tape 28p extra if required. Callers: ACCESS & BARCLAY CARDS ACCEPTED AT BOTH STORES.

FIRST TIME EVER! *SAVE £16·02!

BRAND NEW AC/DC BATTERY/MAINS

Cassette TAPE RECORDER & PLAYER

With remote control microphone.

FIRST CLASS MAKERS

WE COULD CHARGE UP TO £26·97! OUR PRICE **£10·95** POST ETC. 50p

THE ONE STEP FORWARD EVERYONE HAS WAITED FOR! NOW a superb de luxe portable BATTERY/MAINS tape recorder and player—and incredible Shopertunities bring it to you for ONLY £10·95. Due to our cut price we cannot name first-class makers—but rest assured you're getting one of the BEST! Expensive "PIANO KEYBOARD" CONTROL PANEL (or latest MASTER SWITCH control) AND AUTOMATIC LEVEL CONTROL. No fiddling with awkward tape and reels, just "slap-in" a cassette and off you go! (Takes 30, 60 or 90 minute standard cassette tapes obtainable everywhere.) Amazing performance ensures perfect tapings and superb reproduction! Remote control microphone. Rapid Rewind! Fast forward! Beautiful tone from a whisper to a roar! Complete—record anywhere, indoors or out! Runs on standard batteries AND 220/240V AC mains. Separate jacks for remote control microphone, etc. Size 9½in x 5in x 2½in approx. Design can vary slightly. With carry handle. WRITTEN GUARANTEE and full instructions. (Importers recommended selling price £26·971) OUR PRICE ONLY £10·95, post, etc. 50p. NO MORE TO PAY! ★Send quickly, test on mail order 7 days approval from receipt of goods—refund if not delighted. BONUS OFFER—Cassette tape, Standard batteries AND microphone stand 55p extra, if required.

Order by post to Uxbridge Road address or call at either store. Bargains galore at both stores. (COMMERCIAL TRAVELLERS PLEASE NOTE: Merchandising office at Holborn Store.)

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Dept. WP/NC/35, 164 UXBRIDGE RD. (facing Shepherds Bush Green), LONDON W12 8AQ. (Thurs. 1, Fri. 7). Also at 37/39 HIGH HOLBORN (opposite Chancery Lane), LONDON, W.C.1. (Thurs. 7 p.m.). BOTH OPEN MON. TO SAT. 9 A.M. TILL 6 P.M.

- the lowest prices!

BI-PAK *QUALITY* COMES TO AUDIO!

AL10/AL20/AL30 AUDIO AMPLIFIER MODULES

The AL10, AL20 and AL30 units are similar in their appearance and in their general specification. However, careful selection of the plastic power devices has resulted in a range of output powers from 3 to 10 watts R.M.S.
The versatility of their design makes them ideal for use in record players, tape recorders, stereo amplifiers and cassette and cartridge tape players in the car and at home.

Parameter	Conditions	Performance
HARMONIC DISTORTION	Po = 3 WATTS f = 1KHz	0·25%
LOAD IMPEDANCE	—	8 - 16 Ω
INPUT IMPEDANCE	f = 1KHz	100 kΩ
FREQUENCY RESPONSE Œ 3dB	Po = 2 WATTS	50 Hz - 25KHz
SENSITIVITY for RATED O/P	Vs = 25V. Rl = 8 Ω f = 1KHz	75mV. RMS
DIMENSIONS	—	3" × 2½" × 1"

The above table relates to the AL10, AL20 and AL30 modules. The following table outlines the differences in their working conditions.

Parameter	AL10	AL20	AL30
Maximum Supply Voltage	25	30	30
Power output for 2% T.H.D. (RL = 8 Ω f = 1 KHz)	3 watts RMS Min.	5 watts RMS Min.	10 watts RMS Min.

AUDIO AMPLIFIER MODULES

AL 10. 3 watts RMS £2·19
AL 20. 5 watts RMS £2·59
AL 30. 10 watts RMS £3·01

PRE-AMPLIFIERS

PA 12. (Use with AL10 & AL20) £4·35
PA 100. (Use with AL30 & AL50) £13·15

POWER SUPPLIES

PS 12. (Use with AL10 & AL20) 88p
SPM 80. (Use with also AL30 & AL50) £3·25
FRONT PANELS SP 12 with Knobs £1·10

TRANSFORMERS

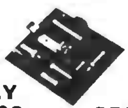
T461 (Use with AL10) £1·38 P & P 15p
T538 (Use with AL20) £1·93 P & P 15p
BMT80 (Use with AL30 & AL50) £2·15 P & P 25p

PA 12. PRE-AMPLIFIER SPECIFICATION

The PA 12 pre-amplifier has been designed to match into most budget stereo systems. It is compatible with the AL 10, AL 20 and AL 30 audio power amplifiers and it can be supplied from their associated power supplies. There are two stereo inputs, one has been designed for use with *Ceramic cartridges while the auxiliary input will suit most †Magnetic cartridges. Full details are given in the specification table. The four controls are, from left to right: Volume and on/off switch, balance, bass and treble. Size 152mm × 84mm × 35mm.

Frequency response—
20Hz - 50KHz (−3dB)
Bass control—
± 12dB at 60Hz
Treble control—
± 14dB at 14KHz
*Input 1. Impedance
1 Meg. ohm
Sensitivity 300mV
†Input 2. Impedance
30 K ohms
Sensitivity 4mV

EA1000 AUDIO AMP MODULE 3 WATTS R.M.S.



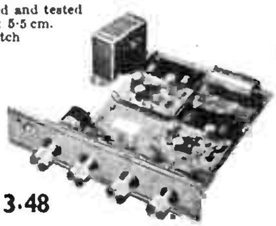
Module Tested and Guaranteed. Full hook-up diagrams and complete technical data supplied free with each module or available separately at 10p each.

ONLY
£2·89

SPECIAL OFFER £2 each while stores last

The STEREO 20

The 'Stereo 20' amplifier is mounted, ready wired and tested on a one-piece chassis measuring 20 cm × 14 cm × 5·5 cm. This compact unit comes complete with on/off switch volume control, balance, bass and treble controls, Transformer, Power supply and Power amps. Attractively printed front panel and matching control knobs. The 'Stereo 20' has been designed to fit into most turntable plinths without interfering with the mechanism or, alternatively, into a separate cabinet. Output power 20w peak. Input 1 (Cer.) 300mV into 1M. Freq. res. 25Hz-25kHz. Input 2 (Aux.) 4mV into 30K. Harmonic distortion. Bass control ± 12dB at 60Hz typically 0·25% at 1 watt. Treble con. ± 14dB at 14kHz

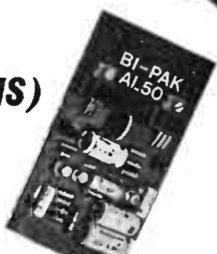


£13·48

50W pk 25w (RMS)

0·1% DISTORTION! HI-FI AUDIO AMPLIFIER

THE AL50



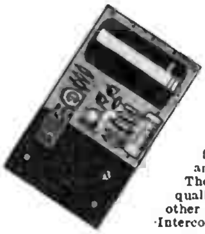
★ Frequency Response 15Hz to 100,000—1dB.
★ Load—3, 4, 8 or 16 ohms.
★ Distortion—better than ·1% at 1 KHz.
★ Signal to noise ratio 80dB.

ONLY
£3·58 each

★ Supply voltage 10–35 Volts.
★ Overall size 63mm 105mm × 13mm.

Tailor made to the most stringent specifications using top quality components and incorporating the latest solid state circuitry and AL50 was conceived to fill the need for all your A.F. amplification needs.
FULLY BUILT—TESTED—GUARANTEED.

STABILISED POWER MODULE SPM80

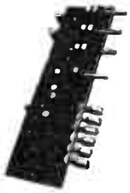


AP80 is especially designed to power 2 of the AL50 Amplifiers, up to 15 watt (r.m.s.) per channel simultaneously. This module embodies the latest components and circuit techniques incorporating complete short circuit protection. With the addition of the Mains Transformer MT80, the unit will provide outputs of up to 1·5 amps at 35 volts. Size: 63mm × 105mm × 30mm.
These units enable you to build Audio Systems of the highest quality at a hitherto unobtainable price. Also ideal for many other applications including:—Disco Systems, Public Address Intercom Units, etc. Handbook available 10p **PRICE £3·25**

TRANSFORMER BMT80 £2·15 p. & p. 28p

STEREO PRE-AMPLIFIER TYPE PA100

Built to a specification and NOT a price, and yet still the greatest value on the market, the PA100 stereo pre-amplifier has been conceived from the latest circuit techniques. Designed for use with the AL50 power amplifier system, this quality made unit incorporates no less than eight silicon planar transistors, two of these are specially selected low noise NPN devices for use in the input stages.
Three switched stereo inputs, and rumble and scratch filters are features of the PA100, which also has a STEREO/MONO switch, volume, balance and continuously variable bass and treble controls.



SPECIFICATION

Frequency Response	20Hz − 20KHz ± 1dB
Harmonic Distortion	better than 0·1%
Inputs: 1. Tape Head	1·25 mV into 50K Ω
2. Radio, Tuner	35 mV into 50K Ω
3. Magnetic P.U.	1·5 mV into 50K Ω

All input voltages are for an output of 250mV. Tape and P.U. inputs equalised to RIAA curve within ± 1dB. from 20Hz to 20KHz.

Bass Control	± 15dB at 20Hz
Treble Control	± 15dB at 20 KHz
Filters: Rumble (High Pass)	100Hz
Scratch (Low Pass)	8KHz
Signal/Noise Ratio	better than −65dB
Input overload	+ 26dB
Supply	+ 35 volts at 20mA
Dimensions	292mm × 82mm × 35mm

ONLY £13·15

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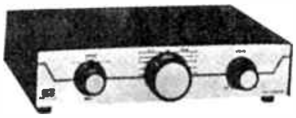

P.R.40

SOLID STATE R.F. PRESELECTOR

The PR40 R.F. Preselector is the solid state version of the world famous PR30 which is now supercedes.

It employs Silicon "N" Channel FET (Field Effect Transistor) front end, followed by silicon NPN Broad Band R.F. Amp., and will substantially improve receiver performance over the range 1·5 to 35 MHz, providing a considerable increase in gain up to an overall average of 30 dB, with improved image rejection and noise ratio.

Supplied complete with co-ax plug (less standard 9 volt PP6 Battery), 12 months Guarantee.

£10·12 V.A.T./Carr. Paid.

MULTIBAND—6

SOLID STATE SHORT WAVE RECEIVER KIT

All transistor T.R.F. Receiver tunes 550 KHz to 30 MHz (540 to 10 metres) complete coverage—no gaps. Medium waves—Trawlers—Ship/Shore Telephone—All Six Amateur Bands 160-10 metres—International Broadcast from Australia, Far East, Russia, USA etc. using 4 miniature plug in Coils.

Hi-Gain FET Regen, Det./AF/AF Module giving full loudspeaker output to any external 2/3 ohm speaker. Receives AM/CW/SSB.

Separate Electrical Bandspread, Calibrated Main Tuning.

A Quality CODAR-KIT with 12 months Guarantee. No technical knowledge required, simple to built, printed circuit and Pictorial Instruction Manual, fully detailed step by step.

Complete Kit with 4 Coils (less standard PP6 battery).

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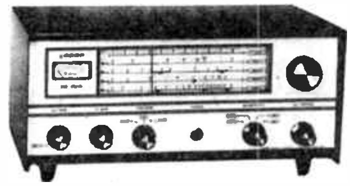

CR70A

COMMUNICATION RECEIVER

The CODAR CR70A is an outstanding general coverage communication receiver, ideal for the keen S.W.L.
It tunes from 540 metres medium through to 10 metres with no gaps. Covers shipping, coastguard and distress frequencies, all six amateur bands 160-10 metres, International broadcast, Met. stations etc. etc. giving world-wide reception, Exclusive features include Air-spaced CODAR-COIL Hi-"Q" Aerial input, illuminated Meter and Slide Rule Scale, Two Speed vernier tuning, Switched B.F.O. for CW/SSB signals. Separate output for Tape recorder.
Ready to plug in to 200/240 volts A.C. it only needs your aerial and a 2/3 ohm loudspeaker to bring the world to your finger tips. 12 months full guarantee. Complete ready built. £31·00 V.A.T. /Carr. Paid.

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It is illegal to make false claims or misleading statements in advertising. The following are just a few extracts from the many letters received from satisfied customers. All are unsolicited and can be inspected at any time.

Mr. S. Keightly, Southsea, Hants.
I am delighted with the CODAR equipment I am using . . . everything has come up to your specifications.

Dr. R. E. Wood, Louisiana State University, U.S.A.
Congratutlaions on an excellent product. The PR40 Preselector is the first preselector I have found to operate efficiently with ample gain, and without feedback or image problems.

Mr. W. R. Jones, Woy, N.S.W., Australia.
The PR40 peaked signals remarkably and performed as you claim. I am very satisfied.

M. G. Bennett, Bath, Somerset.
I am very pleased with my CR70A—results are excellent with many overseas stations I have not heard before and excellent results on the Amateur Bands.

Mr. J. Macdonald, Coningsby, Lincoln.
Received Multiband Kit OK. Assembled it in two hours, worked a treat first time.

Mr. E. Joy, Chesham, Bucks.
The performance of the CR70A is out of this world for its price, and its construction and design, great. I am really delighted . . . I cannot fault it.

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32/500V	35p	8+8/450V	22p	350+50/325V	55p
25/25V	10p	8+16/450V	25p	32+32+32/350V	55p
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FULL WAVE BRIDGE CHARGER RECTIFIERS: 6 or 12v. outputs. 1½ amp. 40p; 2 amp. 55p; 4 amp. 85p.

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Primary 0-110-240v. Secondary 0-240v. 3 amps. 720 watts. Insulated terminals. Varnish impregnated. Fully enclosed in steel case with fixing feet. Famous make. (Value £19) OUR PRICE **£10** Carr. 50p. Can be used as 800 watt auto transformers 240-110V.

SET OF 3 MOTORS FOR COLLARO STUDIO TAPE DECK £2·50 Post 50p.

VOLUME CONTROLS

Long spindles. Midget Size 5 K. ohms to 2 Meg. LOG or LIN. L/S 15p. D.P. 25p. STEREO L/S 55p. D.P. 75p. Edge 5K. S.P. Transistor 25p

80 Ohm Coax 4p yd.

BRITISH AERIALITE AERAXIAL-AIR SPACED 40 yd. £1·40; 60 yd. £2.

FRINGE LOW LOSS Ideal 625 and colour. **10p** per yd

Wirewound controls 1¼in. diam. 3 watts. 10 ohms to 100K British made with long spindles ¼in. dia 45p ea.

HELICAL POT 10k LIN List £3, Bargain 75p.

DUAL CONCENTRIC POT 500k LOG + 500k LIN D.P. switch. Inner spindle 3¼in; outer spindle 2¼in. 75p.

E.M.I. 13½ × 8 in. SPEAKER SALE!

With twin tweeters. And crossover. 10 watt. State 3 or 8 or 15 ohm. As illustrated. **£4·50** Post 25p

With flared tweeter cone and ceramic magnet. 10 watt. Bass res. 45-60 cps. Flux 10,000 gauss. State 3 or 8 or 15 ohm. **£2·75** Post 25p

Bookshelf Cabinet

16 × 10 × 9in. Teak Veneer **£5·50** Post 25p

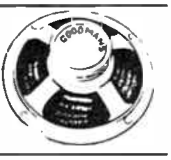
GOODMANS 6½in. HI-FI WOOFER

8 ohm, 10 watt. Large ceramic magnet Special Cambric cone surround. Frequency response 30-12,000 cps. Ideal P.A. Columns, Hi-Fi Enclosure Systems, etc. **£4** Suitable cabinet 12 × 8 × 6 £4·00. Suitable Tweeter £2·00.

ELAC CONE TWEETER

The moving coil diaphragm gives a good radiation pattern to the higher frequencies and a smooth extension of total response from 1,000 cps to 18,000 cps. Size 3½ × 3½ × 2in. deep. Rating 10 watt, 3 ohm or 15 ohm models. Crossover 95p. **£1·90** Post 20p

GOODMANS 8in. WOOFER



8 ohm 12 watt. Deep cone. Heavy ceramic magnet. Bass resonance 35 cps. Frequency response 30-8,000 cps. Ideal bass unit for Hi-Fi systems **£3·75**

LOUDSPEAKERS P.M. 3 OHMS. 7 × 4in. £1·25; 6½in. £1·50; 8 × 5in. £1·60; 8in. £1·75; 10 × 6in. £1·90; 10in. £2·00.

SPECIAL OFFER! 80 ohm, 2¾ in. 2¾in. 35 ohm, 2in.; 3in; 5in. 25 ohm, 2½in. dia.; 3in. dia; 15 ohm. 3½in. dia.; 5in. /6 × 4in.; 7 × 4in.; 8 × 5in. 8 ohm, 2½in, 2¾in., 3½in., 5in. dia. (6 × 4in., 8 ohm, £1·50). **£1** EACH TYPE

RICHARD ALLAN TWIN CONE LOUDSPEAKERS. 8in. diameter 4W £2·50, 10in. diameter 5W £2·50; Post 25p. 12in. diameter, 6W. £2·95; 3 or 8 or 15 ohm models.

SPEAKER COVERING MATERIALS. Samples Large S.A.E.

FERRITE ROD 8" × ⅜" 20p; 6 × ⅜" 20p; 3 × ⅜" 10p.

Horn Tweeters 2-16Kc/s. 8W 8 ohm or 15 ohm £1·95. De Luxe Horn Tweeters 2-18 Kc/s, 15W, 15 ohm £3·50.

TWO-WAY 3,000 c.p.s. CROSSOVERS 3, 8 or 15 ohm 95p.

TWO-WAY CROSSOVER NETWORK 3,000 c/s

With variable tweeter attenuator giving accurate high/low frequency balance. Mounted on panel 5½in. × 4in. with control knob, tweeter and woofer leads and input terminals. Suitable for 3 to 8 ohm impedance. **£2·20** Post 20p

VALVE OUTPUT TRANSFORMER 25p
MIKE TRANSFORMRT MU. metal 100-1 £1·25.
5 WATT MULTI RATIO. 3, 8 and 15 ohms, 80p.
PUSH-PULL VALVE OUTPUT TRANSFORMERS.
50 watt ...... £11·50 100 watt £14

ELECTRO MAGNETIC PENDULUM MECHANISM

1·5v d.c. operation over 100 hrs. continuous on SP2 battery. fully adjustable swing and speed. Ideal displays teaching electro magnetism or for metronome; strobe etc. 95p, Post 20p

BRITISH MADE STEREO MULTIPLEX DECODER

Brand New. 7 transistors plus integrated circuit. Fibre glass printed circuit board. Size 2¾ × 6¼ × ⅞in. Pre-aligned. Complete with stereo beacon indicator. 12V d.c. operation. 400mV output for 100MV input. Full instructions for any FM Tuner. Some technical experience essential. **£6·50** Post 15p

DIPOLE LOFT AERIAL £1·50.
80 OHM CABLE 4p yard.
300 OHM CABLE 5p yard.

COAXIAL PLUG 10p. PANEL SOCKETS 10p. LINE 18p OUTLET BOXES, SURFACE MOUNTING 25p.

BALANCED TWIN RIBBON FEEDER 300 ohms, 5p yd.

JACK SOCKET Std. open-circuit 14p, closed circuit 23p; Chrome Lead Socket 45p. Phono Plugs 5p. Phono Socket 5p

JACK PLUGS Std. Chrome 15p; 3·5mm Chrome 12p. DIN SOCKETS Chassis 3-pin 10p; 5-pin 10p. DIN SOCKETS Lead 3-pin 18p; 5-pin 15p. DIN PLUGS 3-pin 18p; 5-pin 25p.

VALVE HOLDERS 5p; CERAMIC 8p; CANS 5p.

BRITISH FM/VHF TUNING HEART

88 to 108 Mc/s British made. 2 Transistors ready aligned—requires 10.7 Mc/s IF. Complete with tuning gang. Connections supplied but some technical experience essential. Our Price **£3·95** Post 20p.

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E.M.I. WOOFER AND TWEETER KIT

£5·75 THE PAIR. Post 25p. (Available separately. Woofer £4·25; Tweeter £1·90).

Comprising a fine example of a Woofer 10¾ × 6¼in. with a massive Ceramic Magnet. 44oz. Gauss 13,000 lines. Aluminium Cone centre to improve middle and top response. Also the E.M.I. Tweeter 3¾in. square has a special lightweight paper cone and magnet flux 10,000 lines. Crossover condenser and full instructions supplied.

Impedance Standard 8 ohms
Maximum power 12 watts
Useful Response 25 to 18,000 cps
Bass Resonance 45 cps

SUITABLE ENCLOSURE 20 × 13 × 9in. MODERN DESIGN. TEAK WOOD FINISH. £9·90 Post 25p

8in. or 10in. ELAC HI-FI SPEAKER

Dual cone plasticised roll surround. Large ceramic magnet. 50-16,000 cps. Bass resonance 55 cps. 8 ohm impedance. 8in. 10 watts, 10in. 12 watts £3·75

TEAK VENEER HI-FI SPEAKER CABINETS
Fluted Wood Fronts

MODEL "A". 20 × 13 × 9in. For 12in. dia. or 10in. speaker. £9·90 Post 25p

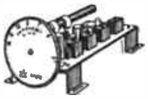
MODEL "B". 16 × 10 × 9in. For 13 × 8in. or 8in. speaker. £5·50 Post 25p

MODEL "B2" ditto. Triangular corner version.

MODEL "C". 16 × 8 × 6in. For 8 × 5in. speaker. £4·40 Post 25p

LOUDSPEAKER CABINET WADDING 18in. wide, 15p ft.

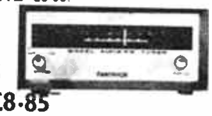
BARGAIN AM TUNER. Medium Wave. Transistor Superhet Ferrite aerial. 9 volt. £4·95



BARGAIN 4 CHANNEL TRANSISTOR MONO MIXER. Add musical highlights and sound effects to recordings. Will mix Microphone, records, tape and tuner with separate controls into single output. 9 volt battery operated. £3·95

STEREO VERSION OF ABOVE £5·95.

BARGAIN FM TUNER. 88-108 Mc/s Six Transistor. 9 volt. Printed circuit. Calibrated slide dial tuning. Walnut Cabinet. Size 7 × 5 × 4in. £12·85



BARGAIN FM TUNER. As above less cabinet. £8·85

BARGAIN 3 WATT AMPLIFIER. 4 Transistor Push-Pull Ready built with volume, treble and bass controls. 18 volt battery operated. £4·50

THE "INSTANT" BULK TAPE ERASER & HEAD DEMAGNETISER. Suitable for cassettes, and all sizes of tape reels. A.C. mains 200/250V. Leaflet S.A.E. £2·50 Post 20p

WAFER THIN HEATING ELEMENTS

OFFERING 1001 USES for every type of heating and drying applications in the home, garage, greenhouse, factory (available in manufacturing quantities). Approx. size 10¼ × 8¼ × $\frac{1}{16}$in. Operating voltage 200/250V. a.c. 250 watts approx. Printed circuit element enclosed in asbestos fitted with connecting wires. Completely flexible providing safe Black heat. British-made for use in photo-copiers and print drying equipment.

Ideal for home handymen and experimenters. Suitable for Heating Pads, Food Warmers, Convector Heaters, etc. Must be clamped between two sheets of metal or asbestos, etc., to make efficient clothes dryers, towel rails—ideal for airing cupboards. Ideal for anti-frost device for the garage—preventing frozen radiators or acting as oil sump heater. Use in the greenhouse for seed raising and plant protection. Invaluable aid for bird houses, incubators, etc., etc. Can be used in series for lower heat. Or in parallel for higher heat applications.

ONLY 40p EACH (FOUR FOR £1·50)

ALL POST PAID—Discounts for quantity.

BAKER MAJOR 12" £9·90

Post Free

30-14,500 c/s. 12in. double cone, woofer and tweeter cone together with a BAKER ceramic magnet assembly having a flux density of 14,000 gauss and a total flux of 145,000 Maxwells. Bass resonance 40 c/s Rated 20 watts. NOTE: 3 or 8 or 15 ohms must be stated.

Module kit, 30-17,000 c/s with tweeter, crossover, baffle and instructions. £12·50

Please state 3 or 8 or 15 ohms. Post Free

BAKER "BIG SOUND" SPEAKERS

Robustly constructed to stand up to long periods of electronic power. As used by leading groups. Useful response 30-13,000 cps. Bass Resonance 55 cps.

GROUP "25" 12in. 25 watt 3, 8 or 15 ohms. £8·80 Post Free

GROUP "35" 12in. 35 watt 3, 8 or 15 ohms. £9·90 Post Free

GROUP "50" 15in. 50 watt 8 or 15 ohms. £22·00

NEW 12" VERSION £17·60

MAJOR 100 WATT ALL PURPOSE TRANSISTOR AMPLIFIER

All purpose transistorised. Ideal for Groups, Disco and P.A. 4 inputs speech and music. 4 way mixing. Output 8/15 ohm. a.c. Mains. Separate treble and bass controls. Guaranteed. Details SAE. £49 Carr. £1·00

Q MAX CHASSIS CUTTERS
A die, punch and Allen Screw

Sizes
3/8" 74p
7/16" 83p
Key 'T' for above 6p
1/2", 9/16", 5/8" 90p
11/16", 3/4" 92p
13/16", 7/8" 99p
Key 'A' for above 6p
15/16", 1", 1 1/16", 1 1/8" £1·00
1 3/16", 1 7/32", 1 1/4" ... £1·15
1 5/16", 1 3/8" .... £1·20
1 1/2" .... £1·35
1 5/8" .... £1·70
1 3/4" .... £1·70
Key 'B' for above 10p
2" .... £2·25
2 5/32" .... £2·50
2 1/2" .... £3·30
Key 'C' for above 13p
2 5/8" .... £4·50
2 3/4" .... £5·75
3" .... £9·00
Key 'E' for above 20p
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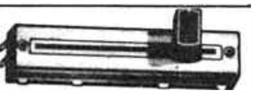
SLIDER VOLUME CONTROLS



Available in both LOG and LINEAR type. Size 3$\frac{5}{16}$ × ⅜ × $\frac{5}{16}$in. with knobs. 5K, 10K, 25K, 50K, 100K, 250K, 500K, 1 MEG, 2 MEG. 65p EACH

DELUXE 4 POLE MOTOR

1,400 r.p.m. Reversible 42 Watt, spindle 1¼" × $^{7}/_{32}$", size 3¼" × 3". As illustrated, 240v. AC mains. £1·95 Post 25p

E.M.I. GRAM MOTOR

120v. or 240v. A.C. 2,400 rpm. 2-pole 70mA. Size 2¾ × 2¼ × 2¼in. £1·00 Post 25p.

ONE RPM GEARED MOTOR

240v. A.C. mains. Ideal for displays/disco lightwheels. £1·25 Post 25p.

BAKER HI-FI SPEAKERS
HIGH QUALITY — BRITISH MADE

REGENT
12in. 15 watts

An inexpensive unit for the beginner in high fidelity and for general purposes. May be used to improve any Radio, Amplifier, Hi-Fi or Television receiver.

Bass Resonance 45cps
Flux Density 12,000gauss
Useful response 45-13,000cps
3 or 8 or 15 ohm models.

£8·80 Post Free

DE-LUXE Mk II
12in 15 watts

Especially designed to provide full range reproduction at an economical cost. Suitable for use with any high fidelity system. Built-in concentric tweeter cone.

Bass Resonance 30cps
Flux Density 14,000gauss
Useful response 25-16,000cps
8 or 15 ohms models.

£11 Post Free

SUPERB
12in. 20 watts

A high quality loudspeaker, its remarkable low cone resonance ensures clear reproduction of the deepest bass. Fitted with a special copper drive and concentric tweeter cone resulting in full range reproduction with remarkable efficiency in the upper register.

Bass Resonance 25cps
Flux Density 16,500gauss
Useful response 20-17,000cps
8 or 15 ohms models.

£16·50 Post Free

AUDITORIUM
12in. 25 watts

A full range reproducer for high power, Electric Guitars, public address, multi-speaker systems, electric organs. Ideal for Hi-Fi and Discotheques.

Bass Resonance 35cps
Flux Density 15,000gauss
Useful response 25-16,000cps
8 or 15 ohms models.

£15·40 Post Free

AUDITORIUM
15in. 35 watts

A high wattage loudspeaker of exceptional quality with a level response to above 8,000 cps. Ideal for Public Address, Discotheques, Electronic instruments and the home.

Bass Resonance 35cps
Flux Density 15,000gauss
Useful response 20-14,000cps
8 or 15 ohms models.

£22 Post Free

Hi-Fi Enclosure Manual containing 20 plans, designs, crossover data and cubic tables. 42p. Post Free.

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"STEAM" ROLLING

ANNUAL Reports and Accounts of major organisations do not usually make exciting reading, but the latest from the IBA is different because of the entries describing the planning of independent commercial radio under the IBA banner.

Most of the information we are either aware of already, or we took for granted as being necessary minimum standards that are laid down to match the existing performance by the BBC. However, one or two interesting points emerge that have an important bearing for the listening audience.

The IBA, with very good reason, intends to encourage the major proportion of listening on v.h.f. The International Telecommunication Union is due to review the allocation of m.f. bands, under the present Copenhagen Convention and Plan, in 1974-5. Any proposed revisions are expected to take effect from 1976 and both the BBC and the IBA are expecting a reduction in the m.f. allocation largely due to "overcrowding". In the meantime both organisations continue to operate sound broadcasting on m.f. as a back-up for v.h.f.

The crunch is in sight for the listeners because it looks as if they must expect, after nearly twenty years of v.h.f. broadcasting, to convert to v.h.f. reception or go without. We have heard the pros and cons of v.h.f. and m.f. so many times that we will not pursue the matter here. Suffice it to say that the IBA are looking ahead to the "day of judgement" by planning in force for circular polarised transmitting aerials to compromise between horizontal and vertical polarised receiving aerials.

The m.f. transmitting aerials will be directional systems using three or four mast radiators so that several stations can transmit over a restricted area on 1151kHz. The radiated power will vary from one station to another, depending on local conditions, but in London it will be 0·5 to 1kW; elsewhere up to 5kW, with an 8kW mf1 and 30kW mf2 signal from Saffron Green (not until later next year) for London, when the IBA have finished with the installations at Lots Road Power Station.

The method of m.f. transmission adopted is not commonly used in Europe and it makes one wonder why not, even if large sites are necessary.

The other disturbing thought is the increasing availability of stations broadcasting on v.h.f. With the undesirable side-effects (such as "birdies" and inter-modulation distortion) and the greater sensitivity of tuner front-ends, we forecast a congestion (or indigestion!) problem on v.h.f. in the U.K. within the next five years. Some serious thinking and re-appraisal is therefore going to be needed with a view to extending the broadcast v.h.f. range below 88MHz; although we understand that a clash has occurred in Hertfordshire and the police service is expected to be moved to another frequency, it would be wishful thinking to expect the emergency services to be transferred out of their present 97MHz-plus domain.

M. A. COLWELL—*Editor*

The January issue, on sale 7th December, will include an Ultrasonic Remote Control Unit to switch on the television, radio, lamps, or almost any electrical device or appliance, without moving out of your armchair; a practical way of housing plug-in circuit boards; a signal generator for testing and fault finding in radio and audio equipment; an article dealing with radio interference problems in audio equipment; and first details of our plans for some of the spring issues of Practical Wireless, including some superb new ideas to help you make the most of d.i.y. radio and electronics.

Further details on page 751.

NEWS...

Mid-Lanark A.R.C.

THE above club has sent us some details of the future programme. There will be a bring-and-buy sale on Nov. 9, a demonstration of stereo radio and quadraphonic sound by GM3UCI on the 23rd and the A.G.M. on December 7th. December 21st is called "Oklahoma" and GM3BVU will give a talk on Amateur radio in the U.S.

Meetings are held at 7.30 in the Wrangholm Hall Community Centre, Jerviston Road, Motherwell.

Sonex 74

THE venue for Sonex 74 European High Fidelity Exhibition will be The Post House Hotel, London Airport and the dates March 29th to March 31st.

WIRELESS TELEGRAPHY ACT

Readers and advertisers are reminded of the requirements laid down by the Wireless Telegraphy Act. It is an offence in the U.K. to install or operate wireless telegraphy apparatus except under the provisions of the Act and, except in the case of broadcast sound-only receivers, a licence must be obtained from the Minister of Posts and Telecommunications.

Included within the provisions of the Act are any apparatus transmitting deliberate signals for any purpose such as "walkie - talkies", radio-controlled models or servos and some types of metal detectors. Apparatus radiating interference signals are subject to controls which also come under the administration of the same Ministry. If you require full information, please write to the *Ministry of Posts and Telecommunications, Waterloo Bridge House, Waterloo Road, London, SE1 8UA.*

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

Open University Course

ELECTROMAGNETICS and Electronics, a Post-experience course by the Open University, aims to provide an understanding of the scientific basis of electronics and electronic circuit design.

The course is intended for those preparing for higher level university study in science and technology and for those who need a knowledge of electronics but who do intend to study at a higher level.

It assumes little prior knowledge of electronics or electromagnetics but does assume a background of scientific or technical education beyond GCE "O" Level.

The first part deals with the basic ideas of electricity, magnetism and electromagnetism, semiconductors and the properties of simple circuits. The remainder deals with electronic circuits, stressing the need to design circuits to meet specifications of noise, distortion, output voltage as well as gain and input and output impedance.

Applications are now invited for the course which starts next February and lasts until November. As with all Post-experience courses, no formal academic qualifications are needed. They are self-contained courses designed to teach new developments or update knowledge of a subject.

The course consists of 17 written correspondence units linked to 17 television and five radio programmes. Students are required to attend a one week residential summer school and encouraged to attend evening or Saturday tutorial sessions. There are 12 assignments to complete and an examination at the end of the course.

A home experiment kit, including a cathode-ray oscilloscope and a signal generator, is sent to students who are expected to design and build circuits for checking at summer school.

Some elementary mathematics is required for the course. Students should know elementary calculus, the meaning of sine, cosine and imaginary numbers. A preparatory booklet is issued at the beginning.

The course tuition fee is £45 plus £37 for the residential summer school. Application forms are available from *The Post-experience Student Office, P.O. Box 76, Milton Keynes, MK7 6AA.*

What of D.N.L.?

PHILIPS Ltd. will be using the Dolby-B noise reduction system!!

Scottish show cancelled

BECAUSE of lack of interest, the Scottish International Hi-Fi Exhibition has been cancelled. Only 12 of the expected 27 firms confirmed their bookings for the show.

The organisers feel that the reason for the lack of interest is that many companies have stretched their budgets by representation at the Harrogate and Olympia shows.

Tyne/Wear radio contract

AFTER interviewing the six applicant groups for the Tyne/Wear radio contract, and giving full consideration to the written applications, the Independent Broadcasting Authority has announced that it has formed the view that Metropolitan Broadcasting is the leading contender.

The Authority now proposes, subject to contract, to offer the franchise to Metropolitan, the chairman of which is Sir John Hunter.

The company's programme plans will be published when it begins broadcasting — probably during the summer of 1974.

Physics Exhibition

THE Council of the Institute of Physics has decided that the Physics Exhibition should now be discontinued, and the show arranged for 1975 will now not take place.

In recent years the number of visitors to the exhibition has decreased considerably as have the number of industrial firms and other concerns that used to have exhibits there.

The very first Physics exhibition was held by the Physical Society in 1905. The one held in 1973 was the fifty-seventh in this series.

More for SQ

MORE manufacturers are getting onto the quadraphonic bandwagon by building SQ decoders into their equipment. Companies like Braun, Grundig, Korting, Philips, Revox, Saba, Sharp, Siemens have taken out SQ licences with CBS.

New 4-channel system

A NEW quadraphonic sound system devised by Duane Cooper and developed by Nippon Columbia was demonstrated at the Berlin Radio Show. The new system is called New Discrete or Discrete Matrix. It is said to have certain advantages over other quadraphonic systems because of its dual nature. A typical set-up would use a two-channel matrix for surround sound named BMX. This involves 45° phase shifts between the speakers rather than conventional 90° ones.

If increased definition in image placement should be required, a demodulator for the carrier channels on the records would be added, giving the set-up a potential 20dB separation between channels at mid-frequencies.

The Discrete Matrix system allows the two extra channels contained on the gramophone record to be of a narrow bandwidth resulting with the maximum frequency of the record being 36kHz compared with 45kHz on the CD-4 records.

Noise reduction techniques are not employed with this system, so making demodulators potentially cheaper.

3 BAND SW RECEIVER

F. G. RAYER G3OGR

THIS receiver employs two transistors and two IC's, one of the latter in the intermediate frequency amplifier section and the second in the driver and output stages. It has band switching and covers all the important short wave ranges, including the low frequency bands, which are not included in some short wave or "all-wave" receivers.

The receiver has a very inexpensive but quite attractive cabinet and operates an internal loudspeaker, a jack allowing headphones to be plugged in when preferred.

MIXER STAGE

The mixer section is shown in Fig. 1 and uses six miniature coils, the appropriate coils being selected by the 3-way 6-pole rotary switch. Each range is separate from the others and two coils are in circuit for each range. L1, L2 and L3 are the aerial coils, and L4, L5 and L6 the oscillator coils.

The six poles of the switch are numbered from S1 to S6. Pole S1 takes the aerial circuit to the aerial coupling windings of the aerial coils and S2 transfers the aerial tuning section of the gang capacitor, VC1, to the correct coil, for aerial tuning purposes. Pole S3 connects the base of Tr1 to the base coupling windings, as necessary. The earthed ends of all aerial coupling windings (pin 9) and tuned windings (pin 1) are permanently connected to the chassis, while all the base coupling windings are returned to the base bias network R1/R2.

In a similar manner, switch section S4 selects the collector coupling windings of the oscillator coils L4, L5 or L6, while S5 connects the emitter of Tr1 to the appropriate emitter winding. S6 selects the tuned windings of the oscillator coils which are tuned by the second section of the ganged capacitor, VC2.

All the emitter windings (pin 7 of each coil) are returned to the emitter bias circuit, C2 and R3. In the same way, each collector winding (pin 8) goes to the IF amplifier.

In order to secure proper coverage and tracking, oscillator coil L5 has a padder capacitor CP1 of 3000pF from pin 4 to chassis. L6 has a 1000pF capacitor CP2 from pin 3 to chassis while L4 requires no padder, pin 6 being wired to the chassis.

If the circuit in Fig. 1 appears difficult to follow, it is suggested that the switch is set at its middle position and L2 and L5 wired in. The receiver can then be tested on this band. When it is found to be in order L1 and L4 can be added and wired and a check made that this works correctly, before adding L3 and L6. This is much better than wiring in all the coils, then perhaps finding that a mistake has been made with the switch contacts or the operation of the switch, so that some wiring error is difficult to locate and correct. To avoid any possible confusion here, the bands, approximate coverage, and maker's range numbers are as follows:—

Band	Coverage		Maker's Range No.
A	30—10·5MHz	10— 28m	5T
B	15— 5 MHz	20— 60m	4T
C	5— 1·7MHz	60—180m	3T

L1 and L4 are for Band A, L2 and L5 for Band B and L3 and L6 for Band C.

In order to avoid squegging, or spurious oscillation and hissing spoiling reception, resistors R4, R5 and R6 are included in the individual collector circuits to L4, L5 and L6. The best values for these resistors depend on Tr1. Gain is maximum when these resistors are of the lowest values which allow proper working of this stage. The values shown should certainly be satisfactory, but it is an easy matter to have on hand a few resistors of various values between about 100Ω and 1kΩ (say about half a dozen different values) and try these in series with the circuit to pin 9 of each range, while tuning over the range. Excess oscillation is most likely at the high frequency end of any one band (VC2 nearly fully open).

Trimmers TC1, TC2 and TC3 are for aerial circuit trimming and each is adjusted on the appropriate band.

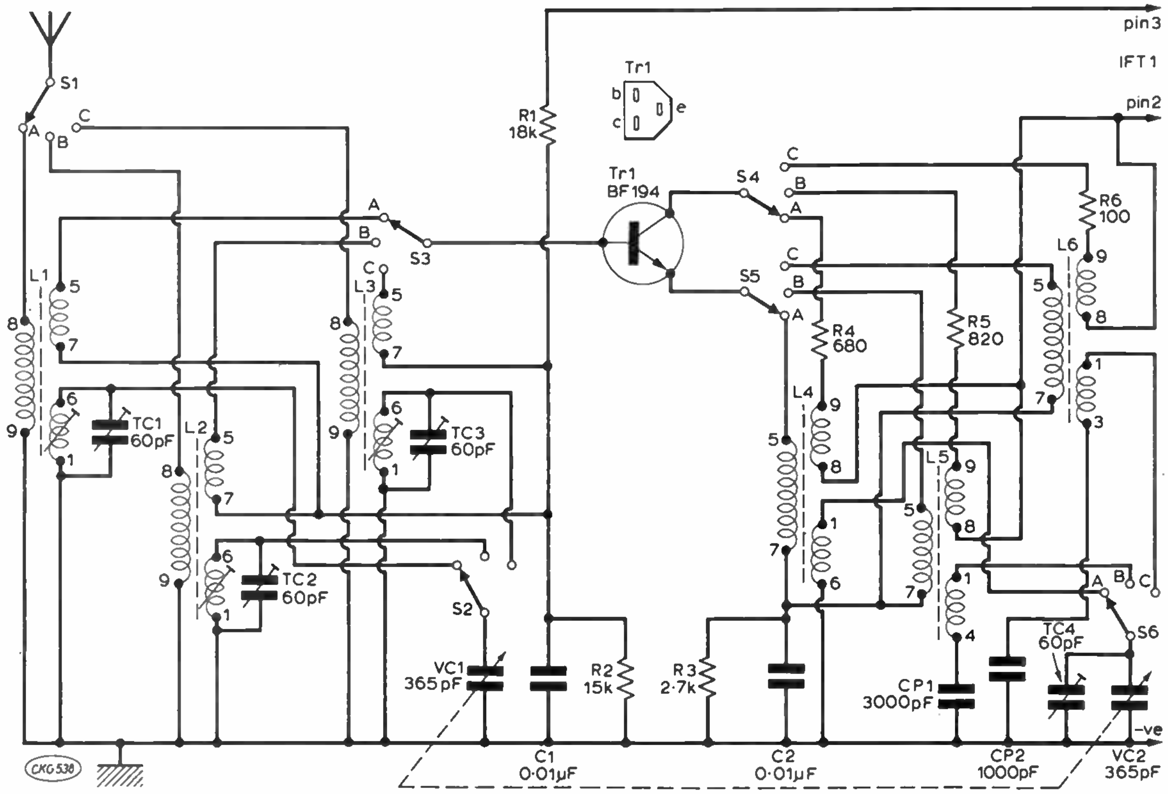
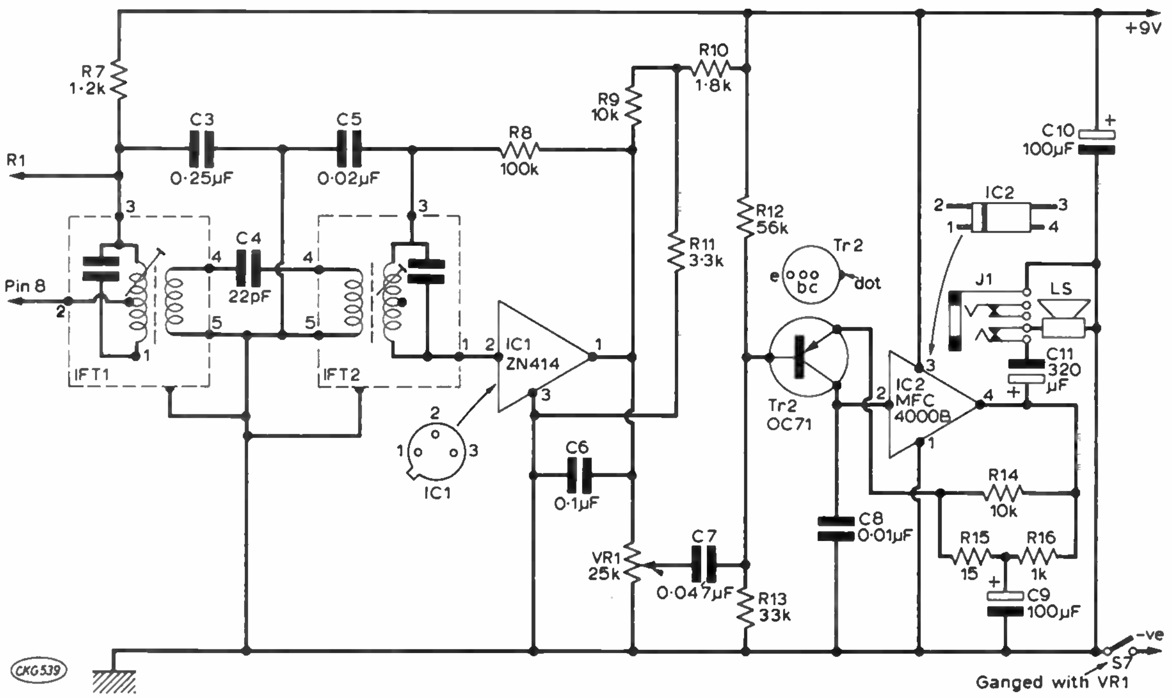


Fig 1, above, and Fig 2, below, give the complete circuit of the receiver.



IF AMPLIFIER

Fig. 2 is the circuit of the intermediate frequency amplifier and audio amplifier, which are constructed on one small circuit board. The IF filter consists of two loosely coupled units, IFT1 and IFT2, tuned to 470kHz.

Output from IFT2 goes to IC1 which provides three stages of amplification at 470kHz and includes automatic gain control and detection circuitry, giving an audio output which is taken to the volume control VR1.

Resistors R10 and R11 form a potential divider across the 9V supply and current is taken by IC1 and VR1 through R9. This means that the circuit should not be operated with VR1 disconnected and that this potentiometer should be of the value given.

The mixer stage is fed from its own positive supply point at the junction of C3 and R7.

AF AMPLIFIER

Tr2 is a high gain pre-amplifier, followed by IC2 which has 6 transistors and 3 diodes in a driver-push-pull output circuit which delivers approximately 250mW to a 16Ω speaker. This IC is very economical on battery current and the output is easily adequate for normal loudspeaker reception. The load impedance is not too critical, so that speakers of higher impedance may be used. R14, R15 and R16 provide direct current feedback to stabilise the whole audio amplifier.

CIRCUIT BOARDS

The mixer board is approximately $1\frac{1}{4}$ x $1\frac{3}{16}$in, Fig. 3, with a bracket fixed as shown and a tag serving as a return point for C1, C2, R2 and R3. This bracket must be bolted tightly to the metal chassis so that the board is connected to the negative line.

External connections will be required to a few points. These can be made by providing Veropins, or by leaving a projecting wire, so that leads can be soldered on as necessary.

The small pins of Tr1 project from the underside of the board and connecting wires are soldered directly to them which will run to the sections of the bandswitch, as indicated in Fig. 3.

Both sides of the IF/AF board are shown in Fig. 4 and it is approximately $3\frac{3}{4}$ x $1\frac{1}{4}$in. Holes should first be drilled to clear the pins and can tags of the two IF transformers. If any small error is made when drilling these, they can be enlarged or elongated as necessary with a very small round file. Drill holes for two 6BA bolts, one marked MC is fitted with a tag which forms the negative return

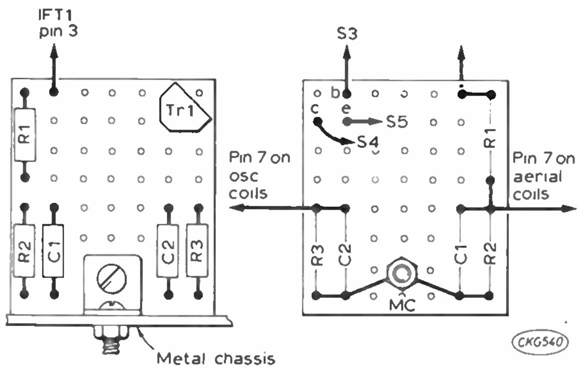


Fig. 3: Layout of components on the mixer board.

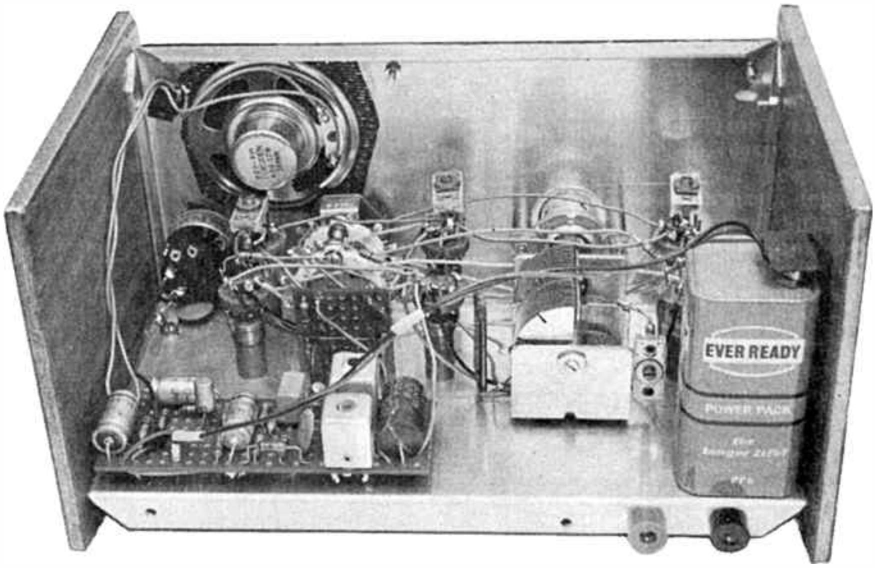
to the metal chassis. These bolts should be at least ½in. long so that spacers or extra nuts will allow the board to be clear of the metal chassis.

C4 is underneath, directly from pin 4 of IFT1 to pin 4 of IFT2, but all other items are on top of the board. Position these as shown, noting the polarity of electrolytic capacitors.

In most places the wire ends of the resistors and other items are long enough to reach the connecting points. Elsewhere, 24 s.w.g. tinned copper or similar connecting wire can be used. Sleeving is put on all leads which cross other wires and anywhere else where this appears necessary.

Two thin flexible leads are soldered on to connect to the speaker. A red flexible lead, with a positive battery clip, is also provided, as shown.

Colour coded leads also run from R9 and the base of Tr2. C7 is soldered directly on the centre tag of the volume control, VR1. Fit a colour-coded lead from C3, to run on to R1 on the mixer board. A further lead is taken from pin 2 of IFT1, up through the board as in Fig. 4, and will be soldered to the circuit which connects pins 8 on the oscillator coils.



Rear view of receiver showing position of IF/AF board at front left with mixer board immediately behind.

★ components list

Resistors

R1	18kΩ	R7	1·2kΩ	R13	33kΩ
R2	15kΩ	R8	100kΩ	R14	10kΩ
R3	2·7kΩ	R9	10kΩ	R15	15Ω
R4	680Ω*	R10	1·8kΩ	R16	1kΩ
R5	820Ω*	R11	3·3kΩ		
R6	100Ω*	R12	56kΩ	VR1	25kΩ log with switch, S7

Resistors ¼W 5%. * See text

Capacitors

C1	0·01μF	C9	100μF 10V
C2	0·01μF	C10	100μF 10V
C3	0·25μF	C11	320μF 10V
C4	22pF	CP1	3000pF
C5	0·02μF	CP2	1000pF
C6	0·1μF	VC1/2	2 x 365pF (Jackson Type O. Cat. No. 5250/2)
C7	0·047μF		
C8	0·01μF	TC1–4	60pF pre-set trimmers

Semiconductors

Tr1 BF194 IC1 ZN414 } S.C.S. Components
Tr2 OC71 IC2 MFC4000B } POB 26, Wembley, Middx.)

Miscellaneous

IFT1/2 (Denco IFT13). L1, Blue 5T. L2, Blue 4T. L3, Blue 3T. L4, Red 5T. L5, Red 4T. L6, Red 3T. (All Denco). Tuning drive (Jackson Type 6/36 Cat. No. 4103). S1–6, 2 wafer switch, each 3 pole 3 way. Speaker, 2¼in, 25 to 40Ω. Universal chassis members, 8 x 4in (2) (Home Radio). Switched output jack socket. Aerial and earth sockets. Veroboard 0·15in matrix, 1¼ x 1$^{3}/_{16}$in approx. and 3¾ x 1¼in approx. Wood for cabinet. Knobs.

IC1 has three leads, positioned as in the underside view of this component, in Fig. 4. IC2 has four spills, 2 and 3 being longer, as in Fig. 4. If this IC is located as shown, the tags will fit the Veroboard holes correctly and connections being soldered on underneath. Both ICs should be soldered without undue heating. It should only be necessary to keep the soldering iron in contact with the joint for a second or two. Lengthy heating may damage these items.

This circuit board should not be tested without VR1 and the loudspeaker being connected.

If a signal generator is to be used to adjust the circuits, couple this loosely to the lead running to pin 2 of IFT1. It is only necessary to place the generator lead near this lead with no actual connection. The cores of IFT1 and IFT2 should then be adjusted, with a proper tool, for best output.

When no generator is available, adjustment should prove quite easy as the IFTs are pre-aligned by the maker. It is then only necessary to tune in a stable signal and adjust each core for best volume. The cores should have a sharp resonance peak. Again, it should be stressed that a properly shaped tool must be used, as a wedge-shaped blade may easily break the cores so that they cannot be rotated, while inserting a steel or similar screwdriver will upset correct alignment.

The audio section should be found to provide good amplification and adequate loudspeaker volume. The small internal speaker will give quite reasonable audio quality, for SW listening purposes. A larger, external speaker may be plugged in (as well as phones) and this will naturally give some improvement. It should be of suitable impedance, about 16 to 25Ω. Though a small speaker can give satisfactory results, it cannot be expected to be quite as good as a larger unit operating with its own cabinet or baffle.

CONSTRUCTION

The chassis is a "universal chassis" flanged member 8 x 4in. with a second similar member used for the panel. The front edge of the chassis is set back ½in. from the panel, as in Fig. 5, using two ½in. spacers and two ¾in. countersunk 6BA

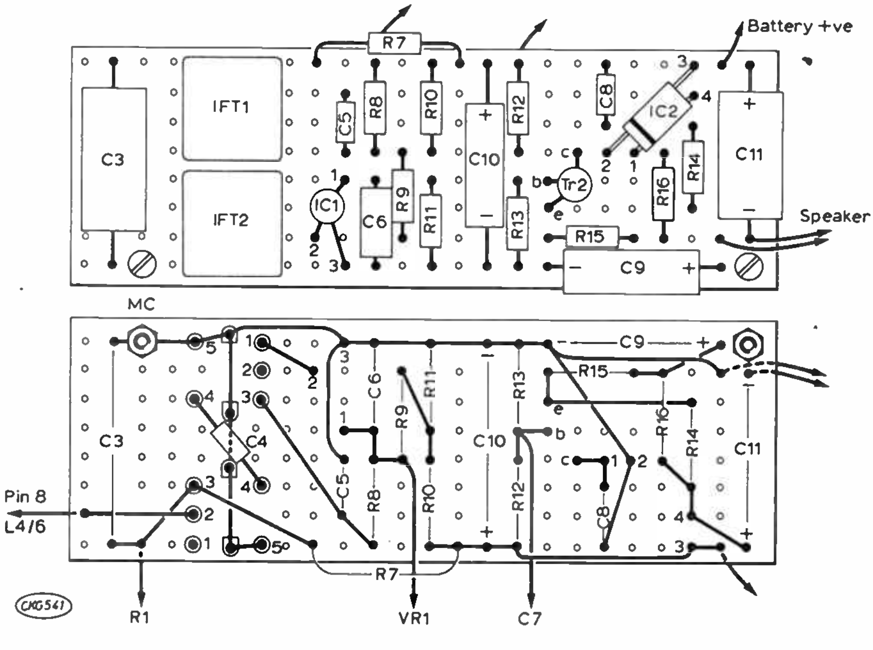


Fig. 4: The two sides of the IF/AF board and connections to the remainder of the circuit.

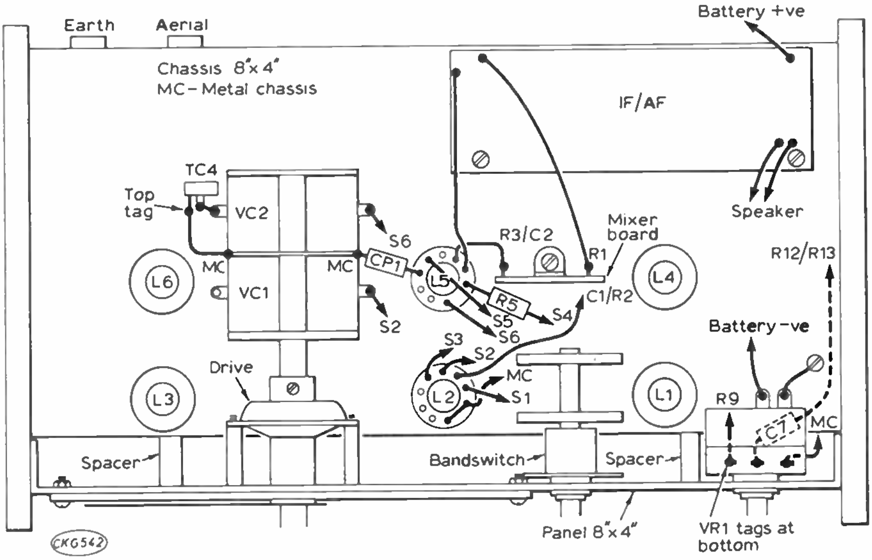


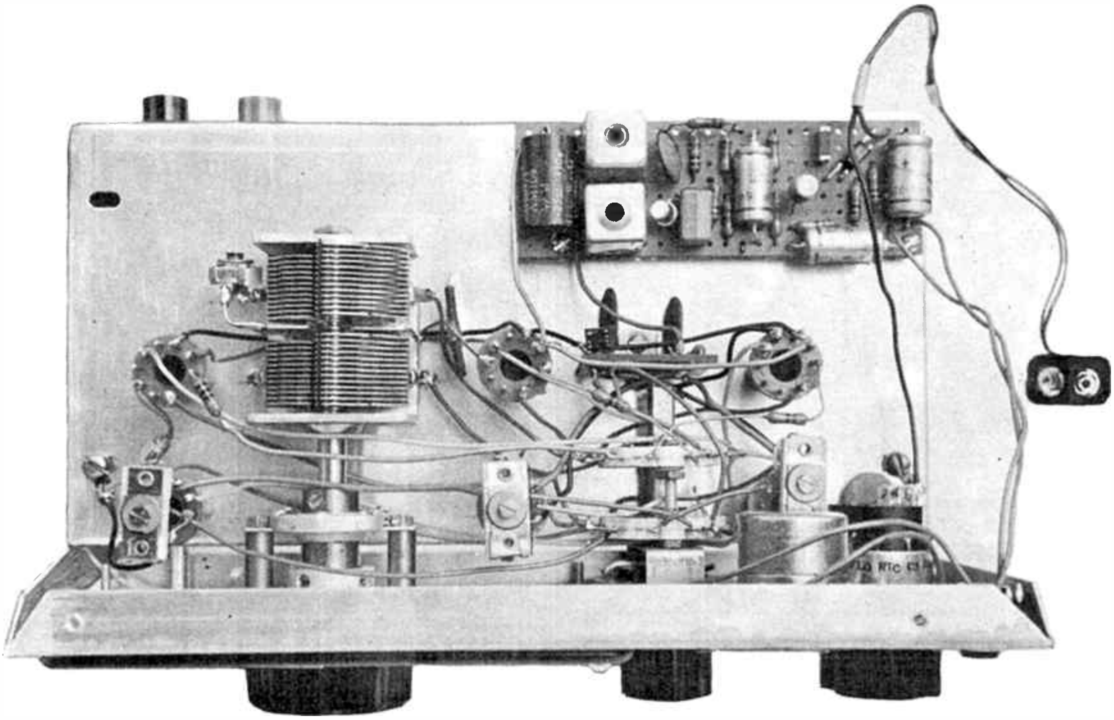
Fig. 5: Layout of major components on top of the chassis and interconnections.

bolts, which run through the panel and the front flange of the chassis. (These two bolts with spacers are not absolutely essential, as chassis and panel are held in position by the case sides. However, with the bolts securing these parts together, assembly and testing can be completed before fitting the sides in position, and wiring is thus more easily reached.)

Locate the drive template on the panel and drill the fixing holes for it and for the dual-speed ball drive. A large hole is also punched for the projecting part of the drive which carries the cursor.

Position the bandswitch and VR1 as in Fig. 5, keeping these as low as possible to leave room for the speaker. The speaker opening is made with a large chassis punch or adjustable washer or tank cutter, or by drilling a ring of small holes and clearing up the edge with a half-round file.

Check that the panel and chassis are correctly fixed and at right angles, then fit the ganged capacitor into the drive and drill the fixing holes for the capacitor. Washers are placed under the capacitor to bring it level with the drive. The position of the drive and capacitor should be carefully adjusted as necessary so that they are in line and turn smoothly.



General view of receiver from above to assist in locating components shown in Fig. 5.

Holes ¼in. in diameter are drilled for the six coils, which are located as in Fig. 5. Their fixing nuts should be tightened with the fingers only. Pins are counted in a clockwise direction from the space, from 1 to 9, and wiring is simplified if all the coils are positioned so that their pins are approximately in the same direction.

The IF/AF amplifier board and mixer board are fixed as in Fig. 5, but it is easier to leave these off until most of the wiring has been done to the lower tags of the switch, which are otherwise difficult to reach.

Pressure should not be imposed on the coil pins when these are hot, so a little care is required when soldering these to prevent them moving when the insulation softens.

The volume control is mounted as in Fig. 5. Connect the lower tag to S7 and to the metal chassis. Run a lead from the other outer tag, under the chassis and up through a hole near the AF amplifier, where it is soldered to R9, Fig. 4. Solder C7 to VR1 slider and take a further insulated lead under the chassis and up through to the junction of R12 and R13.

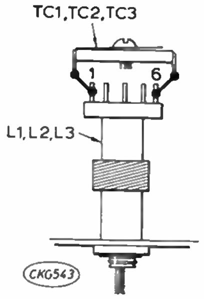


Fig. 6: Method of mounting trimmers on top of the coils.

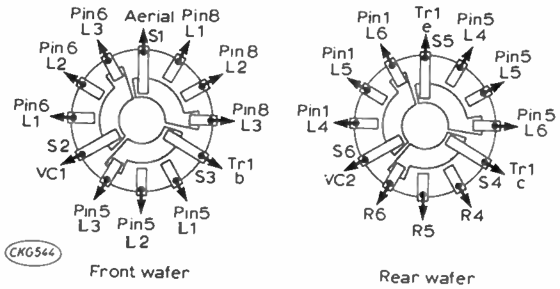


Fig. 7: Details of the wiring on the bandchange switch wafers.

Trimmers TC1, TC2 and TC3 are mounted directly across the coils L1, L2 and L3 as in Fig. 6. Short, stout wires are soldered to pins 1 and 6 of each coil, for this purpose, when wiring the receiver. It is preferable to take the upper plate tag of the trimmer to the earth side of the circuit (pin 1) in each case.

The single oscillator trimmer, TC4, is soldered to the ganged capacitor as in Fig. 5, the top tag being connected to the capacitor frame by a stout wire. A check should be made that the tuning capacitor fixing bolts are not too long, or they may touch the fixed plates of the capacitor.

A bandswitch with two wafers was used. The front wafer switches the aerial, base and VC1 circuits while the rear wafer is employed for the oscillator coils.

It is not essential to use a two-wafer switch provided the required number of poles are available and the switch is small enough to be accommodated.

Fig. 7 shows connections to the switch. It will be found very helpful to use colour-coded leads here. With the aerial coils, yellow may be used for aerial and S1 circuits, with red for base and S3 circuits, and green for S2, VC1 and associated circuits. For the back wafer, red can be used for S4, yellow for S5, and green for S6. Chassis returns to the coils can be black and the base bias circuit to C1/R2 may be blue. Whatever colours are used, employ them exclusively for one circuit.

It is also helpful to solder on lengths of wire, before mounting the switch, where the tags will be near the chassis, and hard to reach later. These wires can then be cut to length and taken to the various coils.

If the contacts of the switch cannot be seen, and its operation is not wholly clear, test it for continuity with a meter, in each position. Also it is advisable to wire in the coils for one band only, to confirm that no error is being introduced here, before proceeding with the other ranges.

ALIGNMENT

Alignment of the IFTs has been described. To align the aerial and oscillator coils, deal with one band at a time. Adjust the coil cores at a low frequency in the band (VC1/2 nearly closed) and the appropriate trimmer at a high frequency in the band (VC1/2 nearly open).

TC4 is initially set about half closed. If it is subsequently found that TC1, TC2 or TC3 is fully open for best volume, TC4 should be screwed down slightly. Provided TC1, TC2 and TC3 each have a definite peak giving best volume, there is no need for a separate trimmer for each oscillator coil.

Coverage is primarily determined by the settings of the oscillator coils and TC4. If a signal generator is available, set VC1/2 5° from the fully closed position and adjust the core of L4 for reception on 10·5MHz; similarly adjust L5 for reception on 5MHz, and L6 for reception on 1·67MHz.

L1 should then be adjusted at 11·5MHz for best volume. L2 is similarly adjusted at 5·5MHz, and L3 at 1·83MHz. VC1/2 is then opened to tune to 28·5MHz, and TC1 is adjusted. TC2 is adjusted at 13·5MHz, and TC3 at 4·5MHz.

These adjustments are repeated until no further improvement is possible. These frequencies are the most effective tracking points for the low frequency and high frequency end of each band and result in best tracking throughout the whole range.

CALIBRATION

The tuning drive listed has a scale marked 0-100°, in addition to scales for individual calibration. Set the cursor to 100° with the tuning capacitor fully closed. If calibrated as described the following points, read against the 0-100 scale, may be used as a guide to intermediate frequencies:—

Range A		Range B		Range C	
30MHz	12°	15MHz	7°	5·0MHz	8°
28MHz	15°	14MHz	10°	4·5MHz	12°
26MHz	17°	13MHz	13°	4·0MHz	17°
24MHz	19°	12MHz	16°	3·5MHz	22°
20MHz	27°	11MHz	19°	3·0MHz	29°
18MHz	32°	10MHz	23°	2·5MHz	41°
17MHz	36°	9MHz	28°	2·0MHz	62°
16MHz	40°	8MHz	35°	1·9MHz	70°
15MHz	45°	7MHz	44°	1·8MHz	79°
14MHz	52°	6MHz	59°	1·7MHz	89°
13MHz	60°	5·5MHz	71°		
12MHz	70°	5MHz	85°		
11MHz	81°				

CABINET

Each side of the cabinet is 6mm plywood, approximately 5¼in. deep, to give a front projection. The sides are 4½in. high at the back, and 5in. high at the front, to tilt the panel backwards slightly. (Note, however, that panel and chassis remain at right angles to each other.)

A strip of wood 8 x 1 x ½in. with a rounded front edge is fitted under the panel by means of two self-tapping screws run into the lower flange of the panel.

The cabinet top is 8 x 5¼in. and it is screwed to the back, which is 8 x 4in., by means of an inner strip about 8 x 1 x ½in. in size. This completed part (top and back) is secured with two self-tapping screws into the front flange, and two bolts at the back, so that it can be removed to renew the battery. The bottom of the chassis itself may be left open, or closed with a sheet of hardboard. ■

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■	M	■	11 E	R	A	■	■	R	■	P	■	U
12 P	U	L	L	■	Y	■	13 A	E	R	I	A	L
■	T	■	14 D	Y	E	D	■	E	■	■	■	U
15 O	H	M	S	■	R	■	16 T	■	17 F	I	18 G	S
V	■	■	■	19 G	■	20 F	R	E	E	■	A	■
21 E	X	22 C	E	L	S	■	A	■	23 R	I	N	G
R	■	H	■	O	■	■	24 C	U	R	■	G	■
25 F	E	E	D	B	A	26 C	K	■	27 I	R	I	S
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TBA120A	FM inc. det.	15uV-limiting begins-10·7MHz	23p	1-07
CA 3088E	AM inc. det.	200uV for 20 dB SN/N	16 p	1-50
CA 3089E	FM inc. det.	12uV for 3dB limiting AFC-SQUELCH-AGC-TUNING METER DRIVER.	25p	2-20

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MFH mechanical series		4,5 or 7 at –6dB ±5 at –50dB	ssb am nbfm	1-40
CFS 10·7	10·7 mHz	300 at –3dB 600 at –20dB	wbfm	40p
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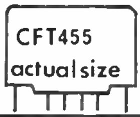

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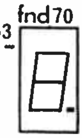

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The LM380N automatically 'centres' its output at one half of the power supply voltage. This eliminates the need for additional circuitry (including a pre-set potentiometer) which is required with some other types of amplifier for adjusting the bias so that maximum voltage swing (and hence a maximum power output) can be obtained.

The LM380N device also incorporates internal protective circuits. If the silicon chip becomes too hot (above about 150°C) owing to incorrect operation, the circuit automatically becomes inoperative for a time until the chip has cooled. Protection is also incorporated against excessive current in the output stage; such currents will occur if the output is accidentally short-circuited. The limiting current in the output stages is about 1·3A.

The LM380N can feed up to 2·5W to an 8Ω loudspeaker when operated from an 18V supply. The absolute maximum permissible supply voltage is 22V, but it is wise to use a somewhat lower value to allow a margin for error. The writer has found that satisfactory loudspeaker volume can be obtained using the minimum recommended supply voltage of 8V. The total harmonic distortion is 0·2% at 2W output using an 18V supply.

It is normally convenient to use the LM380N in a standard 14 pin dual-in-line socket so that it can be removed easily from the circuit. However, one can solder directly to the terminals of the device.

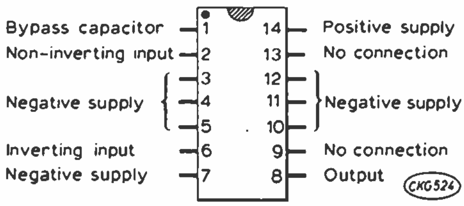


Fig. 1:

CONNECTIONS

The connections of the LM380N are shown in Fig. 1. The input signal can be fed either to the non-inverting input or to the inverting input. Generally it is more convenient to feed the signal to the non-inverting input and to leave the inverting input unconnected.

If, however, the signal is fed to the inverting input, the non-inverting input should be returned to earth through a capacitor or a resistor or directly earthed. This will prevent positive feedback from the output to the non-inverting input causing instability. A capacitor is preferable when the signal source has a high impedance, but with a source of moderate impedance a resistor approximately equal in value to this source impedance is preferable to maintain the balance of the differential stage. When the source impedance is low, the non-inverting input may be earthed.

GAIN

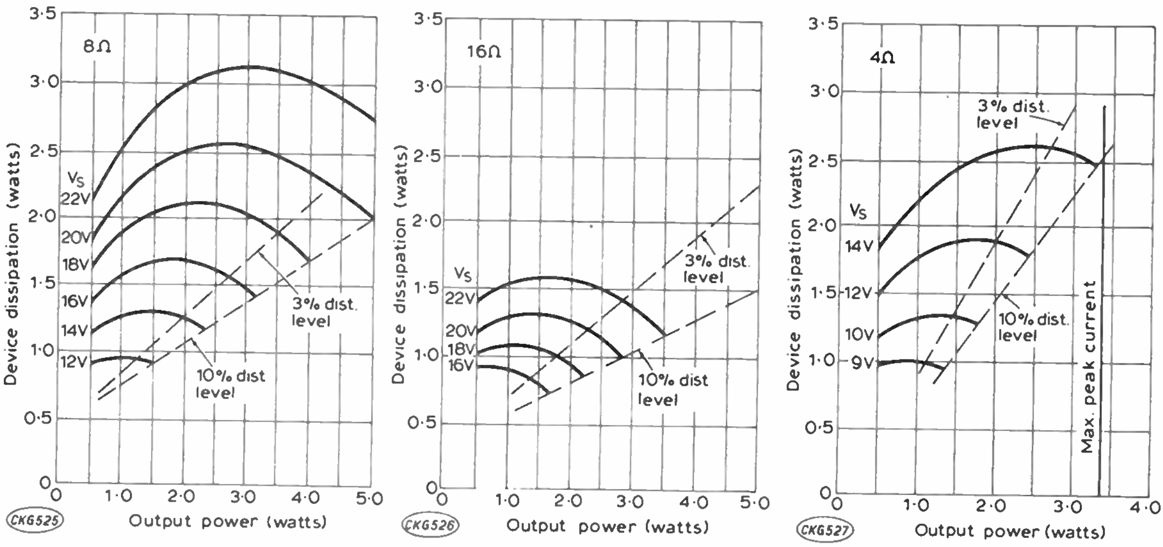
The voltage gain of the LM380N is fixed at 50 (or 34dB) by the internal circuitry of the device. Although this fixed gain limits the versatility of the amplifier, it does result in a minimum number of external components being required for its use.

HEAT SINK

The LM380N device itself can dissipate up to 1·25W when operated without any heat sink at ambient temperatures of up to 25°C; this is adequate for many applications. For example, Fig. 2 shows that the power does not exceed 1·25W at supply voltages up to 14V when an 8Ω speaker is employed. Even if a higher supply voltage is used, it is not likely that the dissipation will exceed 1·25W for an appreciable time.

Fig. 3 shows that there is still less chance of overheating when a 16Ω speaker is employed. In this case, the supply voltage would have to exceed 20V for the dissipation to exceed 1·25W.

In the case of a 4Ω speaker, however, Fig. 4 shows that the dissipation can reach 1·25W when a 10V supply is used. If a much higher supply voltage is employed, the pins 3, 4, 5, 10, 11 and 12 of the device should be soldered to a copper heat sink of



Figs. 2, 3 and 4: These graphs show dissipation of the LM380N against output power for various values of supply voltage and loudspeaker impedance

area about six square inches.

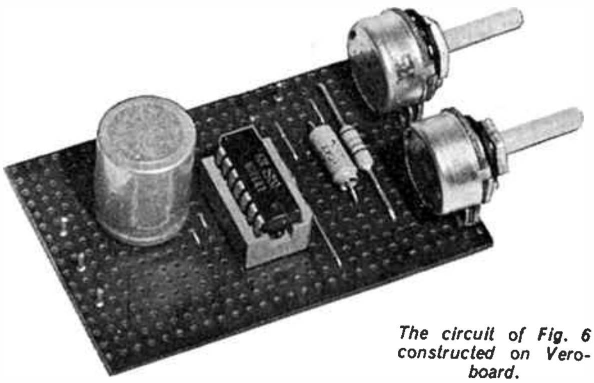
The three per cent total harmonic distortion line shown in Figs. 2 to 4 is approximately the onset of clipping.

POWER SUPPLY

If there is hum or noise on the power supply line, a hum rejection of about 38dB can be obtained by connecting a 5μF capacitor from pin 1 to earth. A smaller capacitor will also provide some measure of hum reduction.

If the power supply leads from a battery or filter capacitor are longer than two or three inches, a 0·1μF capacitor should be connected between pin 8 and earth to prevent oscillation.

In addition, a 2·7Ω resistor in series with a 0·1μF capacitor may be connected between pin 8 and earth to suppress any high frequency oscillations.



The circuit of Fig. 6 constructed on Veroboard.

The input pin operates with a mean potential equal to the earth potential. A capacitor in series with the input pin is therefore required only if the

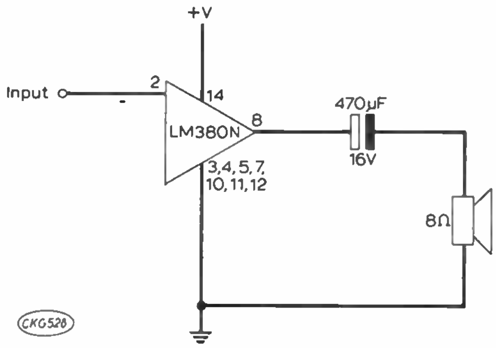


Fig. 5: A simple circuit using the LM380N.

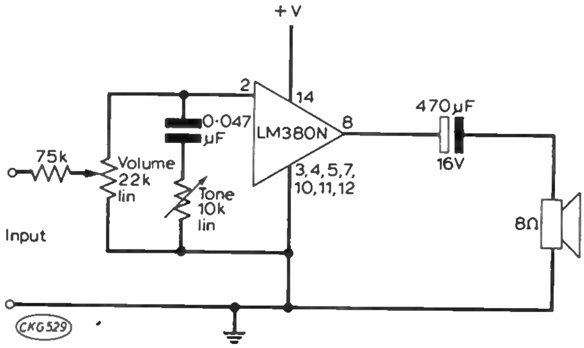


Fig. 6: A record player amplifier suitable for use with a crystal or ceramic pick-up cartridge.

SIMPLE CIRCUIT

The simplest circuit using the LM380N is shown in Fig. 5. The 470μF capacitor must be placed in series with the loudspeaker to prevent a steady current from flowing through the speaker from pin 8. A smaller capacitor than that shown will result in inferior bass response.

mean potential of the signal source is not also at earth potential.

The writer has used the circuit of Fig. 5 in a radio receiver. Fig. 6 shows how a similar circuit may be used as a record player amplifier with volume and tone controls. The input impedance of the LM380N is about 150kΩ.

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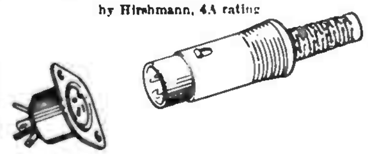

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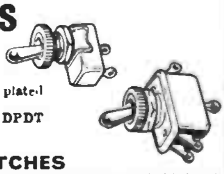

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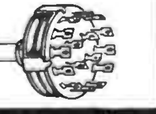

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1·0						10p		7p
2·2					10p		7p	8p
4·7				10p		7p	8p	7p
10					7p	8p	7p	8p
22			7p	7p		7p	7p	9p
47	7p		8p	7p	8p	7p	9p	12p
100	8p	7p	7p	7p	7p	9p	11p	19p
220	7p	8p	8p	8p	9p	10p	17p	27p
470	8p	9p	9p	10p	12p	17p	24p	43p
1000	10p	12p	12p	17p	20p	24p	40p	
2200	14p	17p	22p	25p	36p	40p		
4700	25p	28p	37p	41p	54p			
10,000	40p	43p						

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C	1/8W	5%	4·7 Ω–470K Ω	E24	1	0·9	0·75 nett
C	1/4W	5%	4·7 Ω–10M Ω	E12	1	0·9	0·75 nett
C	1/2W	5%	4·7 Ω–10M Ω	E24	1·2	1	0·9 nett
C	1W	5%	4·7 Ω–10M Ω	E12	2·5	2	1·5 nett
MO	1/2W	2%	10 Ω–1M Ω	E24	4	3	2 nett
WW	1W	10% ± 1/20 Ω	0·22 Ω–3·9 Ω	E12	7	7	6
WW	3W	5%	1 Ω–10K Ω	E12	7	7	6
WW	7W	5%	1 Ω–10K Ω	E12	9	9	8

Codes: C—carbon film, high stability, low noise.
MO—metal oxide, Electrosil TR5, ultra low noise.
WW—wire wound, Plessey.

Values:
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E24 denotes series: as E12 plus 11, 13, 16, 20, 24, 30, 36, 43, 51, 62, 75, 91 and their decades.

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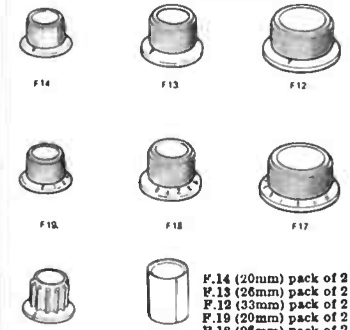

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K.30/3 (17mm) aluminium, each 24p

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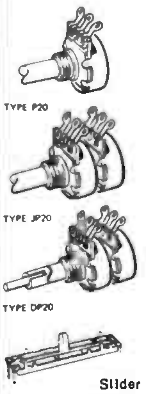

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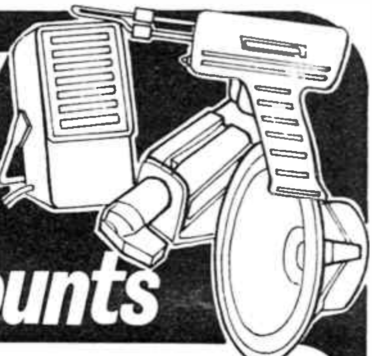

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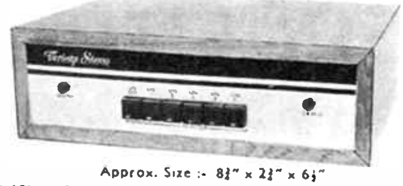

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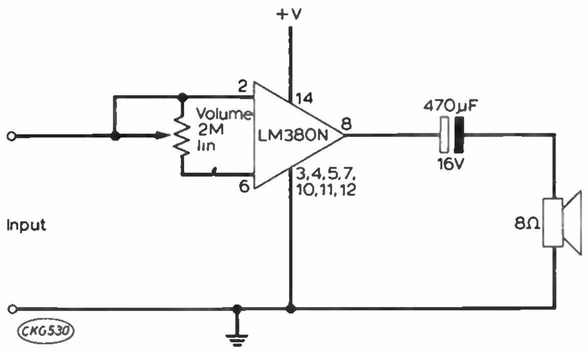


Fig. 7: A high input impedance achieved by use of a common-mode volume control.

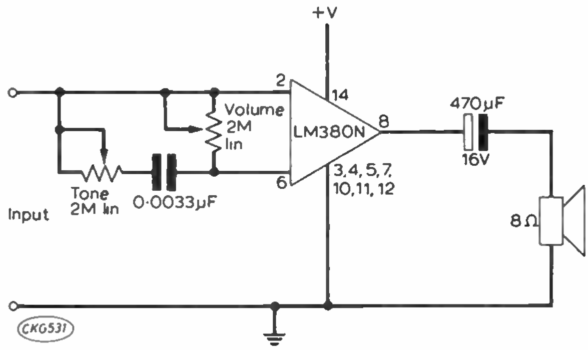


Fig. 8: This circuit features common-mode controls for both volume and tone.

HIGH IMPEDANCE INPUT CIRCUIT

An amplifier with a high impedance input is shown in Fig. 7; it is suitable for use with high impedance signal sources such as a crystal microphone. This circuit employs a 'common mode' volume control. When the potentiometer slider is at the bottom of its travel in Fig. 7, the input signal is fed to both the inverting and the non-inverting inputs. In this case the signals will almost cancel in the device and the output will be small. When the potentiometer is at the top of its travel, however, only pin 2 will receive an appreciable input voltage and maximum volume will be obtained.

The circuit of Fig. 8 shows how a common mode volume control circuit may be used with a common mode tone control to maintain the high input impedance.

A very high input impedance amplifier can be made using the field-effect transistor input circuit shown in Fig. 9. At low frequencies the input impedance is 22 megohms, but at high frequencies the input impedance is reduced by the gate to drain capacitance of the field effect transistor

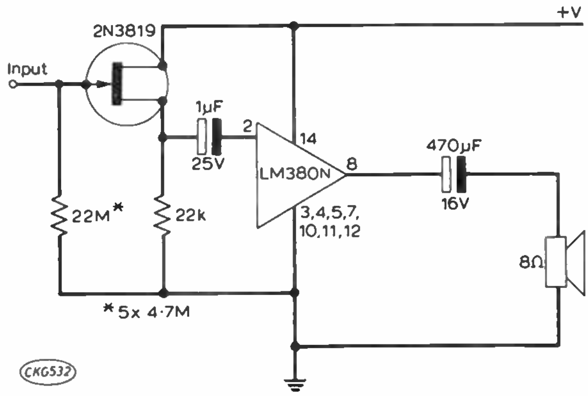
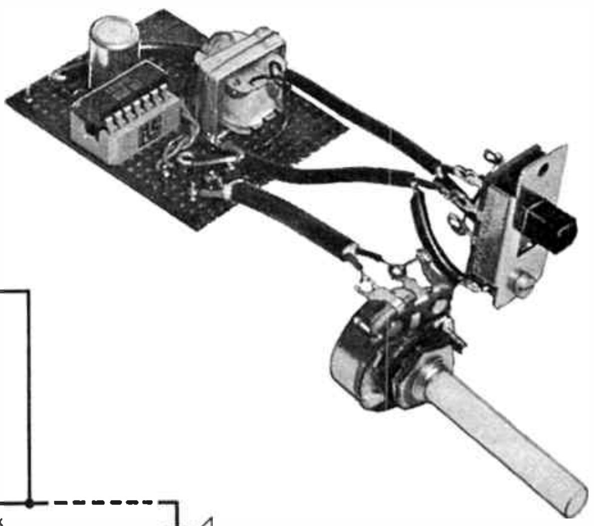


Fig. 9: The addition of a FET input stage gives a very high input impedance.

INTERCOM SYSTEM

A simple circuit for an intercom system is shown in Fig. 10. The transformer ratio of 25:1 multiplied by the gain of the LM380N produces a loop gain of 1250. The roles of the input and output speech transducers are reversed when the switch is operated.



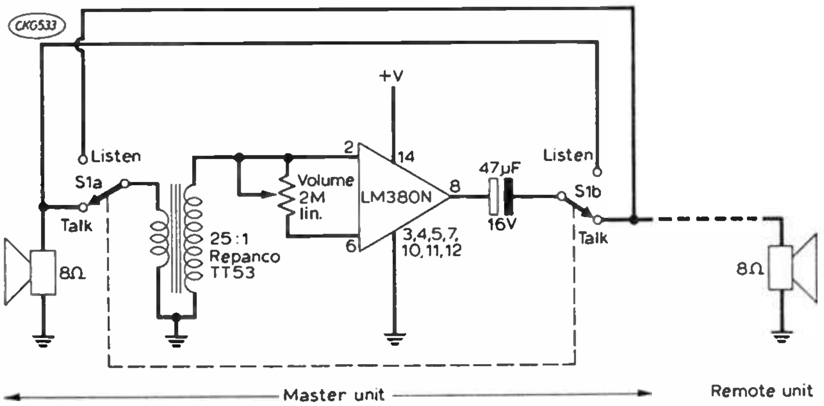


Fig. 10: An intercom system in which the loudspeakers double as microphones. The view above shows the amplifier with controls attached.

DUAL POWER SUPPLY

Another simple circuit using the LM380N is shown in Fig. 11; it provides a dual voltage supply balanced with respect to ground from a single supply. If the input is 20V, outputs of +10V and −10V can be obtained. The potentiometer can be used to balance the outputs relative to ground, but may be omitted if exact balance is not required.

An advantage of this circuit is that a high quiescent current is not taken when little current flows in the outputs.

EXTRA GAIN

Although the gain of the LM380N is fixed at 50 by the internal components, higher gain can be obtained by using additional positive feedback. For example, Fig. 12 shows how a gain of 200 can be obtained.

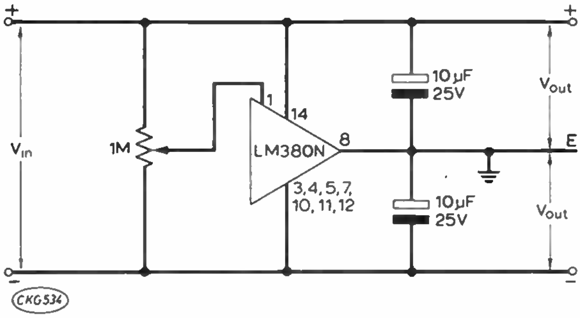


Fig. 11: A circuit to provide a split power supply from a single source.

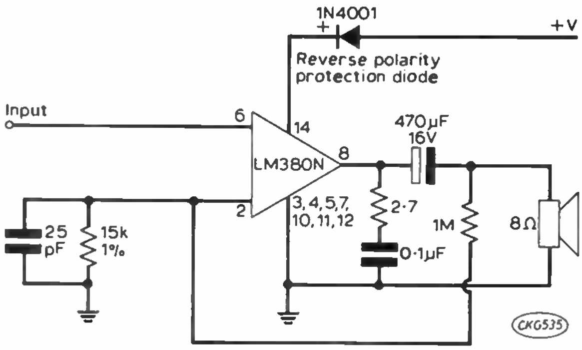


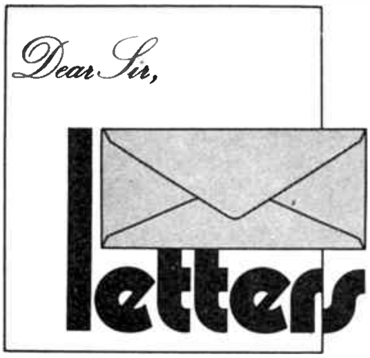
Fig. 12: Increased gain may be obtained by the use of positive feedback.

The maximum gain is around 300, since attempts to obtain still higher gain may merely result in oscillation.

SUPPLY POLARITY

As in the case of most integrated circuit audio amplifiers, if the power supply to the LM380N is applied with the polarity reversed, a large current will flow and the device will almost certainly be destroyed within a few milliseconds.

Readers may therefore wish to incorporate a diode in one of the power supply lines (normally the positive line). If a supply of reverse polarity is accidentally applied to the circuit at any time, the diode will prevent any appreciable current from flowing and will thus protect the LM380N. It is, of course, essential that the diode is connected with the correct polarity, see Fig. 12. ■



Microwave distance Record

On Thursday, 13th September a 3cm (10GHz) contact was made between GW8CKT/P on Snowdon and GM8AZU/P on the Cairnsmore of Fleet. We believe that, at 212·5km, this is a new British distance record.

Weather conditions were far from ideal, with gale force winds and both ends of the link well above the cloud base. Visibility on Snowdon at 3560 feet was only 15 yards, and on the Cairnsmore of Fleet at 2300 feet was only 20 yards. The high wind on Snowdon made it impossible to use a dish aerial and so a 10dB horn was used. At the Scottish end a 32in. dish was used, and a considerable amount of luck was in evidence when the beam heading, estimated using a cheap plastic compass, turned out to be correct to better than 0·5°. Earlier attempts to find a signal using a 10in. dish at the Scottish end had failed. Signal reports exchanged were readability 5 and strength 6/7.

Equipment used at GM8AZU/P: Tx, Mullard CXY19 Gunn device, output approximately 100mW; Rx, Mixer CS10B, Local Oscillator, Mullard CL8370; i.f., 70MHz; ANT, 32 inch dish with horn feed.

Equipment used at GW8CKT/P: TX, Mullard CXY19 Gunn device, output approximately 120mW; RX, Mixer, balanced pair of Mullard BAW95, Local Oscillator, Mullard CL8380; i.f., 70MHz; ANT, Small horn.

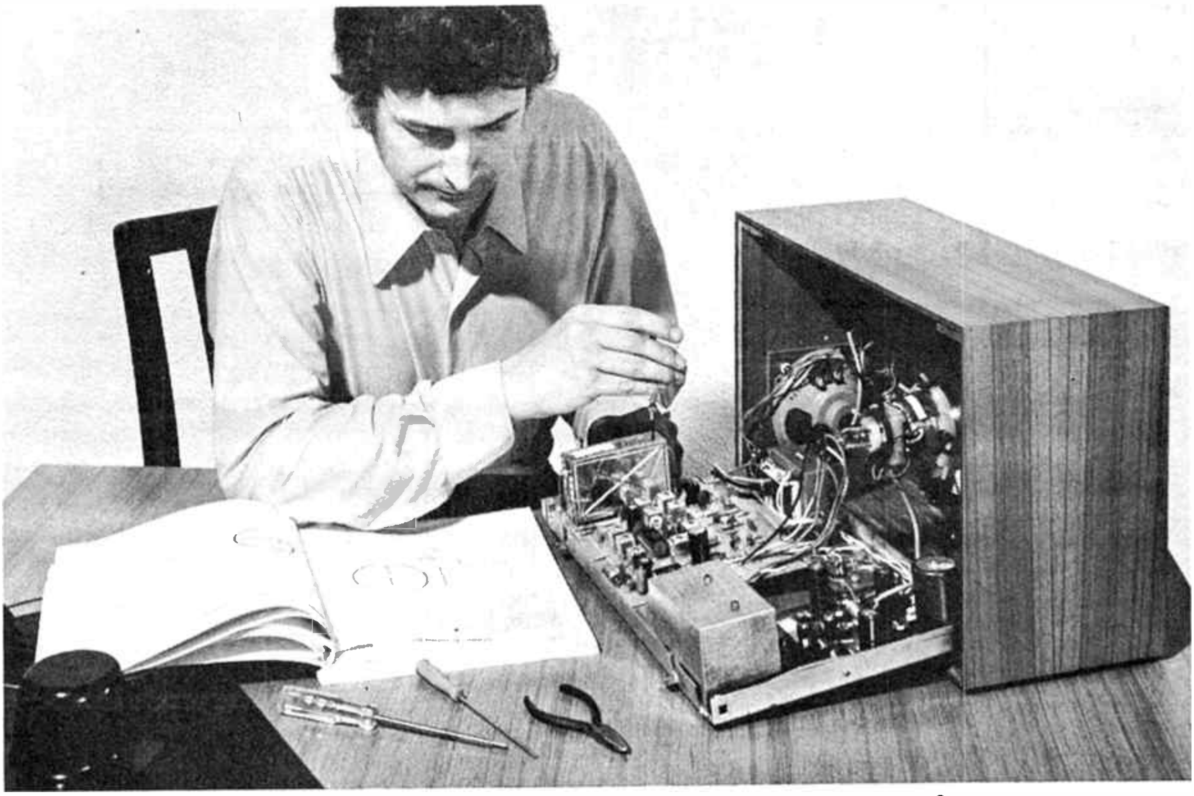
The equipment, which was all solid state, was carried to the summits of the two mountains concerned. Pundits who ask why the GW team did not use the train, may be interested to know that the train was not running due to the bad weather so it's just as well that they bargained on climbing!

80m talkback was used between the two base camps in order to co-ordinate the departure for the climb to the summit.

2m talkback was used from summit to summit.

Those involved were:—
At the GM end: G3VUQ, G3YCQ, G8AMG, G8APZ, G8AZU, G8DKK.
At the GW end: G3XSO, G3YMV, G8BPN, G8CKT, G8ENX, G8FTB, G8HCO.—**Michael H. Tooley, G8CKT**, (Weybridge, Surrey).

—continued on page 762



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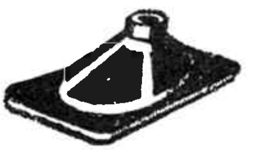

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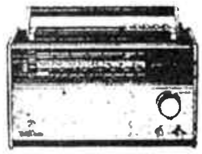

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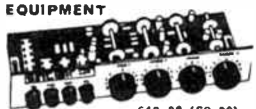

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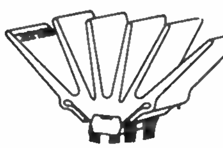

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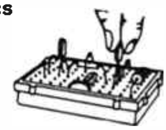

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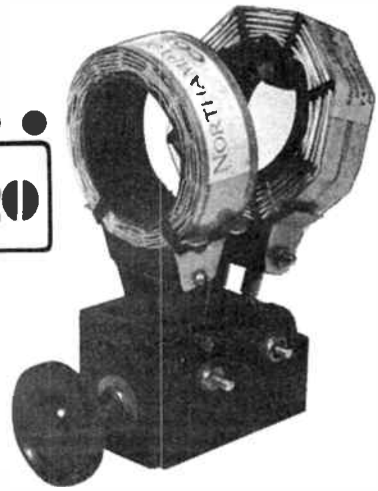


COLIN RICHES
ARTHUR DOW

Letter from America

FOR several years I have read your column religiously and at long last decided to write to you. Needless to say I have an avid interest in Vintage Radio. However, I have had to content myself with vintage parts, valves, radio books and magazines. Additionally I construct simple vintage radios out of antique parts using my own circuits or those from Hugo Gernsback publications from the early '30's. My valve collection fortunately contains many good useable valves. At present I am constructing a short wave receiver (semi-antique) using types '35 and '27 (U.S. tubes) and meant for mains operation.

I started my radio hobby in 1928 with a commercial crystal set (Vario Couple Type). I made crystal sets until 1932 when I started on valve short wave and medium wave receivers. My hobby continued through 1935 and 1936. It was interrupted in 1937 by my joining the U.S. Army. I did only occasional short wave listening thereafter until 1946 when I went back to radio construction.

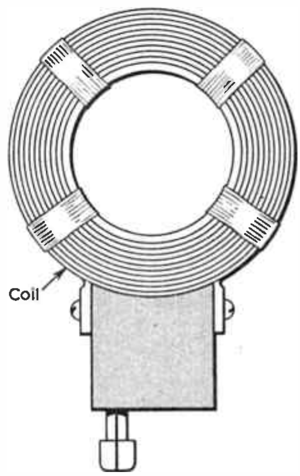
My recent vintage radio construction includes a one tube SW receiver (using a transmitting type '30). The coils (plug-in) are my originals from 1932. These are about the only parts surviving from that era. While I was in the army in pre-World War 2 days, a relative threw the rest away! I also have two surviving books.

The other receivers are a Short Wave Portable which is a good copy (including original vernier dial) from an article in a 1933 Short Wave Craft Magazine. I had been planning to build it for decades and only made it last year. Also I have a breadboard type Medium Wave receiver using a type '99. (A very good performer with one *modern* part—a ferrite rod aerial in it). I use it mostly for a quick test of old tubes. Much better than the tube tester!

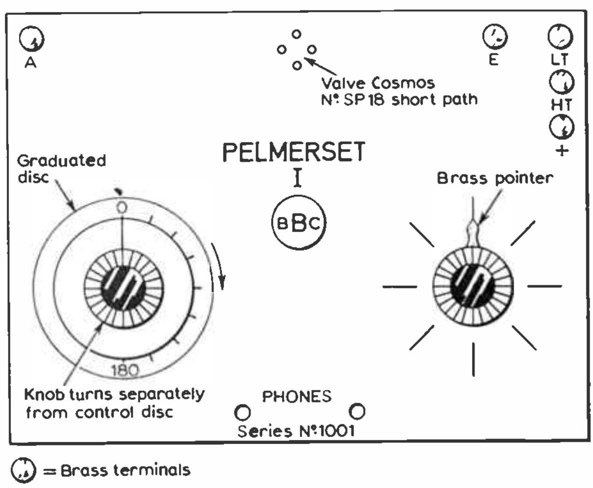
I possessed one vintage radio in recent years (an RCA Radiola) but an avid collector got it away from me. All I have at the moment is a vintage tube tester, Signal Generator and Output meter (Weston, circa 1929). The trouble is that some collectors in this country possess 100 to 300 radios leaving none for us pickers.—**Chester A. Beck, K6DFP,** *(9045 Margaret Street, Downey, California, 90241, U.S.A.)*

Mr. **W. H. Quick** tells us that he has been given an old one-valve radio which he would like to get going. He would like to know what the L.T. and H.T. voltages are. There is a 1·5A fuse fitted and we show in the diagram the front panel and a plug-in coil which fixes to the side of the set.

If anyone can help Mr. Quick, they can contact him at *15 Beechwood Grove, Horbury, Wakefield, Yorkshire.*



Mr. Quick's plug-in coil and the front panel of his vintage receiver.



EXPERIMENTAL WORKSHOP

M. J. HUGHES M.A.

LEARNING BY PRACTICAL PROJECT STEPS

PART 3—TRIGGER CIRCUITS

LAST month we saw that there is, at least, one circuit which is sensitive to the rate of voltage change, i.e. the divider circuit would only respond correctly if we caused rapid changes in lighting level at the photo cell; slow changes would not make the divider work. There are other circuits which like to see what are known as "fast going edges" to signals; as a result, a range of circuits has been developed which will accept slow changing inputs and convert these into signals having fast rise and fall times.

These circuits are called *triggers* because their

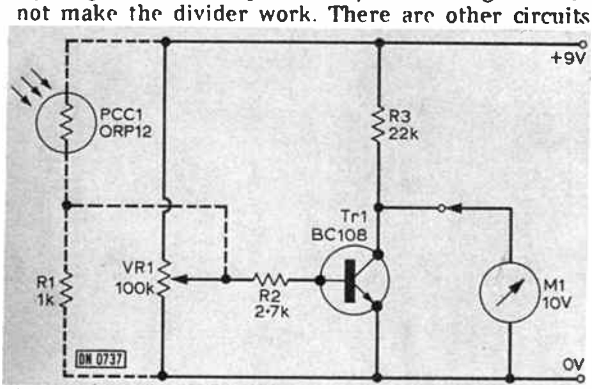


Fig. 14a. If PCC1 and R1 are used as alternatives, omit VR1 and link in PCC1 on the "left-hand" end of R2.

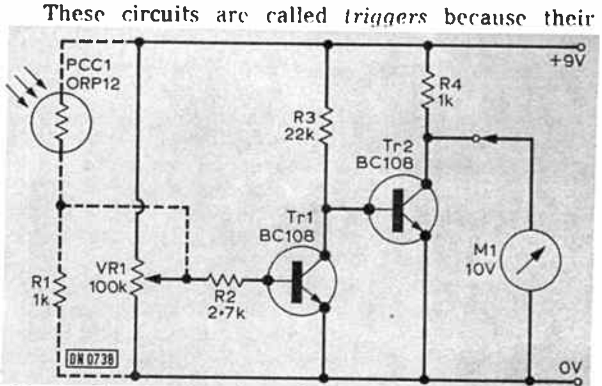


Fig. 15a: The extra stage of amplification effectively improves the rise time of the output signal between the power rail extreme voltages.

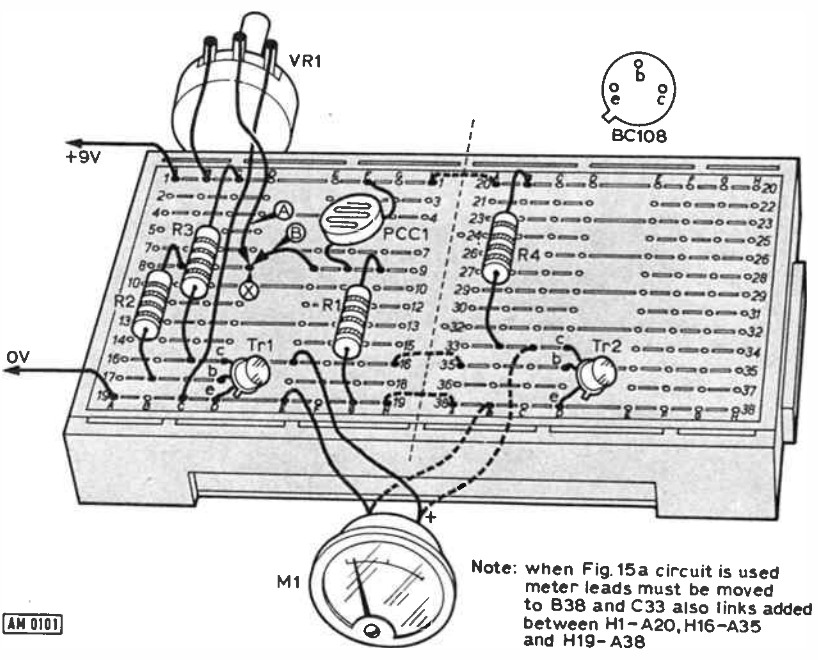


Fig. 14b: T-Dec layout for Fig. 14a.

Fig. 15b: T-Dec layout for Fig. 15a.

output will always be in a certain state (say zero volts) until the input signal rises to a certain level and, irrespective of the time it takes the input to get to this level, when the critical voltage has been reached the output changes to a higher level (say +9V) instantaneously.

In practice everything takes a certain amount of time to happen, so "instantaneously" is, perhaps, too strong a term to use. Nevertheless, as you will see if you do some of the following experiments, we can make extremely slow voltage changes trigger a circuit to give edges to waveforms that change from one level to another in a few millionths of a second.

Fast and slow "edges"

First of all we had better look at what we are calling an "edge" so that we can compare the difference between fast and slow edges. Fig. 14a is a very simple transistor amplifier stage which gives an output inversely proportional to the voltage at the wiper of VR1 (or, if you are using the photocell alternative, the junction of PCC1 and R1).

Measure the voltage at the collector of Tr1 with VR1 set to the bottom of the track (Alternatively completely shade PCC1). You should read about +9V because the transistor, in the absence of base current, is not conducting. Slowly increase the voltage at the wiper of the potentiometer by rotating it (or slowly increase the amount of light falling on PCC1); base current will start to flow and the voltage at the collector will start to fall.

The thing to notice is that you can control the level of the measured voltage quite easily and get any value you like by careful adjustment of VR1 or the amount of light falling on PCC1. Try and get a "feel" for the rate at which the measured voltage changes for given rates of moving the potentiometer or illuminating the cell.

You can use the wires A or B in the layout and transfer one, or other, of them to point X—depending on whether you were using the cell or the potentiometer. Fig. 15a shows an extra stage of amplification. Carry out the same experiment but now measure the voltage at the collector of Tr2. Obviously the extra stage gives us inversion so when the potentiometer is down the measured voltage is low.

Now slowly increase VR1 until the voltage starts to rise and then try and control it in the same way as before. It should be very apparent that, for the same rate of change in position of the wiper of

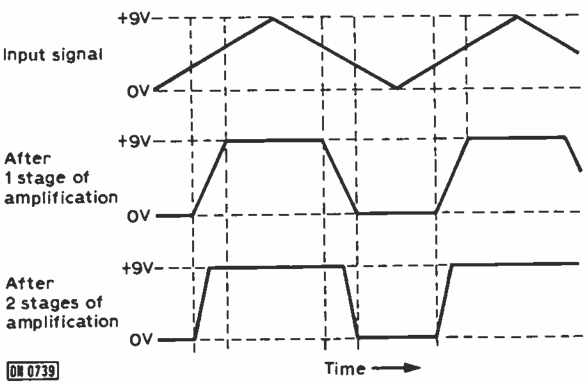


Fig. 16: Note the increased amplification appears to enhance the signal's rise time between the supply voltage limits.

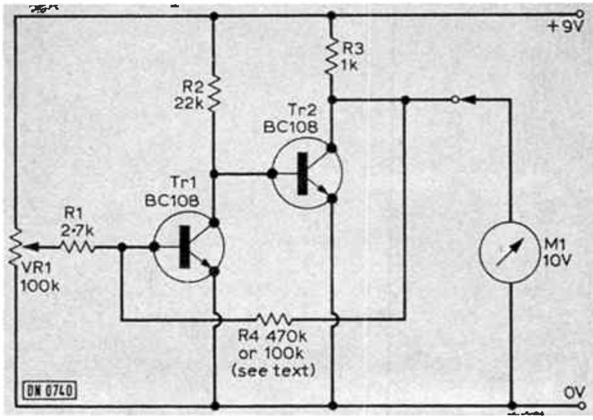


Fig. 17a. True trigger action is obtained by using positive feedback via R4.

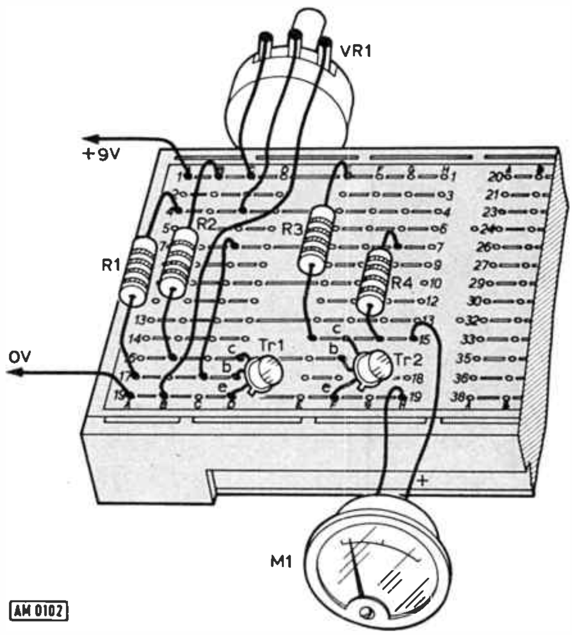


Fig. 17b: T-Dec layout for Fig. 17a.

the potentiometer, the voltage at Tr2 goes from zero to +9V very much quicker than it did before.

It is, however, still possible to set it mid-way between the two extremes by careful adjustment. The effect is even more pronounced using the photocell and you should start to appreciate the increase in the rate of change of the signal at the output.

Amplification

The signals we have been talking about can be described as waveforms as shown in Fig. 16. The portion of the signal between the low and high voltages of the output is called an edge and you can see that it has become much steeper with the extra amplification.

Simple amplification thus increases a signal's rise time but there is still the possibility of getting a mid-rail voltage during the transition—especially if the input signal was unusually slow. Ideally we

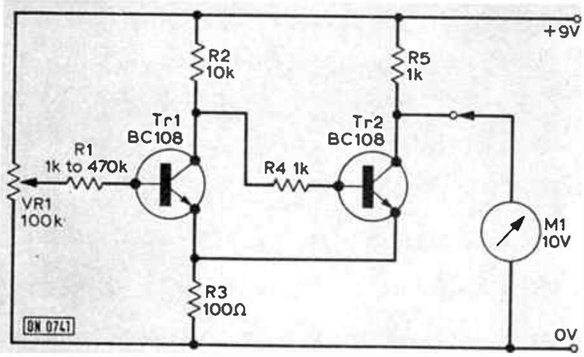


Fig. 18a: Schmitt trigger circuit. The trigger level can be controlled over small limits by changing R1 in the range 1kΩ to 470kΩ.

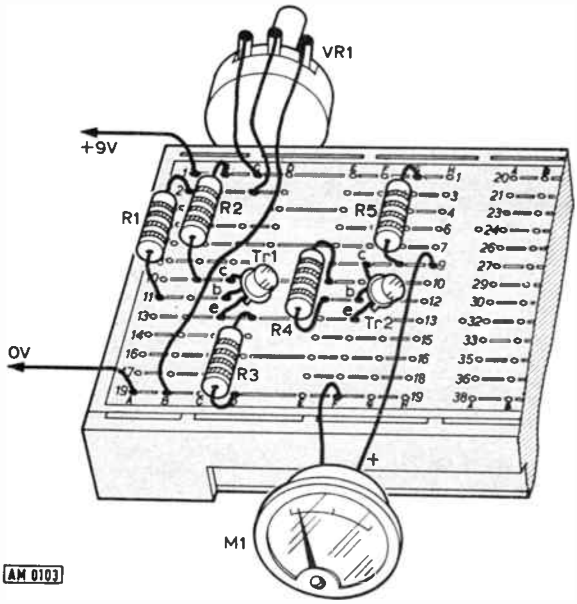


Fig. 18b: T-Dec layout for Fig. 18a.

would like to have a circuit that gives a fast change irrespective of the rate of change of input. The circuit in Fig. 15a has been modified in Fig. 17a with a resistor coupling the output back to the input. We have introduced a positive feedback loop.

If VR1 is slowly increased the voltage at Tr2 collector will, at some time start to rise; when this happens current starts to flow through R4 back into the base of Tr1 and effectively increases the base current we are already applying from the potentiometer. The effect is to make the voltage at Tr2 rise even more enhancing the effect until eventually Tr2 is totally non-conducting. All we needed to do was set the operation in motion by initiating base current into Tr1; once that was started the voltage at Tr2 collector would move from zero to +9V without any further movement of the potentiometer—the feedback loop did the rest.

The feedback cycle occurs extremely rapidly (the speed is limited only by certain internal parameters of the transistors) so the output changes level at a speed set by the circuit and no longer by the rate at which we turn the knob on VR1. Try it for yourself and you will find it impossible to set a mid rail voltage at the output.

When VR1 is at the limit of its travel, try turning it down; the same thing happens on the downward going edge of our input signal. Notice that there is a sort of "no-mans-land" between the positioning of the wiper for upward going triggering and downward triggering. This is known as "hysteresis" and is very useful in differentiating between the two levels we are considering.

Hysteresis

In this circuit, you can control the amount of hysteresis by means of the value for R4. A 470kΩ resistor will give the smallest differential between upward and downward triggering levels but by reducing it to 100kΩ you can widen the gap between the levels. This circuit is operating as a true trigger and the feature to take note of is the use of positive feedback to speed up the edge. If you think about the circuit a bit you will find it is not very different from the bistable described last month.

Schmitt trigger

Probably the best known trigger circuit is the Schmitt trigger shown in Fig. 18a. When the voltage

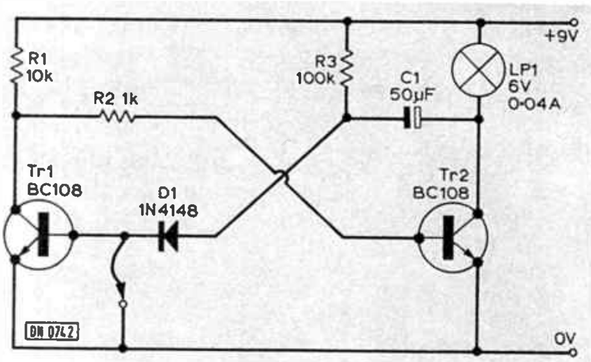


Fig. 19a: Basic monostable multivibrator. Capacitor C1 can be increased to 3,000μF to extend the dwell time.

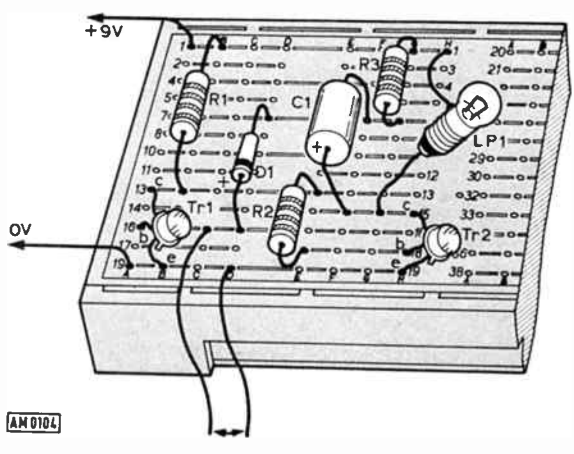


Fig. 19b: T-Dec layout for Fig. 19a.

at the wiper of VR1 has reached a certain level base current will start to flow in Tr1 and the voltage at its collector falls slightly; this reduces the base current into Tr2. The two emitters are, however, connected together and as Tr1 starts to conduct the voltage at the "top" end of R3 starts to rise.

Because this is connected to the emitter of Tr2 we reduce—even more—the potential difference between Tr1 collector and Tr2 emitter thus the base current into Tr2 becomes less. Here again we have a positive feedback loop caused by emitter coupling and the effect of this is to accelerate Tr2 going out of conduction and the output voltage drops very rapidly.

Again this occurs independently of the rate we are applying signal at the input and the speed is limited only by the transistors' parameters. Reduce the input voltage slowly and the opposite happens.

Monostable multivibrator

Another circuit which often comes into the category of trigger circuits is the "monostable multivibrator" shown in Fig. 19a. Unlike the Schmitt trigger it is a little bit more complicated to initiate triggering but it offers a useful bonus. It has a "short term memory". We can design it so that it will trigger rapidly on the receipt of a suitable signal but the output from it stays at the new level for a fixed period of time before rapidly returning to its original state.

Make up Fig. 19a on T-Dec and follow this brief description of how it works. Initially let us state that D1 serves no purpose in the circuit except to protect the emitter base junction of Tr1 from a high reverse voltage that is generated during the switching operation.

When the circuit is switched on the lamp may go on for a few moments until things have settled down. When the lamp has gone off we should arrive at a stable state of affairs in that base current is provided for Tr1 through R3—hence its collector is at near zero volts; because of this Tr2 will be cut off and the potential at its collector will be high (about +9V); consequently the lamp will be off.

If we deliberately knock Tr1 out of conduction, by rapidly short-circuiting its base to ground with the flying leads, we can momentarily establish base current in Tr2 and it conducts. The light goes on and the voltage at its collector drops to about zero. However the capacitor transmits this negative-going voltage excursion to the base of Tr1 and the potential at the junction of R3 and C1 falls to about −8V (it was previously +1·2V caused by the forward voltage drops of D1 and the base emitter junction of Tr1).

Assuming we have immediately removed our short-circuit link Tr1 will stay out of conduction because no base current can flow until the potential at the anode end of D1 has regained its level of +1·2V and this will take time because the negative end of C1 has to charge back to this value through R3. This takes quite a few seconds and during this period the lamp stays alight.

When this has been reached. Tr1 starts to go back into conduction and the potential at its collector falls giving rise to an increase in voltage at Tr2 collector; this is fed back momentarily through C1 and enhances the base current into Tr1 (positive feedback again). As a result of all this the lamp switches off very rapidly. If you have a 3,000μF capacitor you can substitute it for C1 and get a "dwell" time of about 3½ minutes. The dwell time can be calculated as $0{\cdot}7 \times C1 \times R3$ (C in Farads R in ohms and the time will be in seconds).

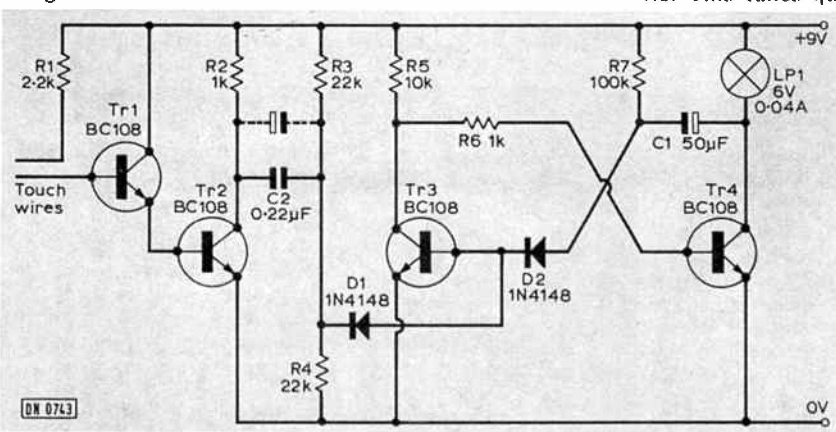


Fig. 20a: Touch-sensitive child's room-light. Supply current is approximately 1mA rising to about 80mA when the lamp is on. Duration of 3½ minutes can be obtained by making C1 3,000µF and C2 50µF. The capacitor shown dotted, across C2, indicates how it is connected—plus to R2.

Touch switch

The monostable thus gives us trigger action and a timing function which can be put to many uses. A novel circuit for a safe child's bedside light is shown in Fig. 20a. It is a touch sensitive switch coupled to a monostable that switches on a lamp for a pre-determined period of time (Warning: the novelty is more likely to keep a child awake than get him off to sleep!).

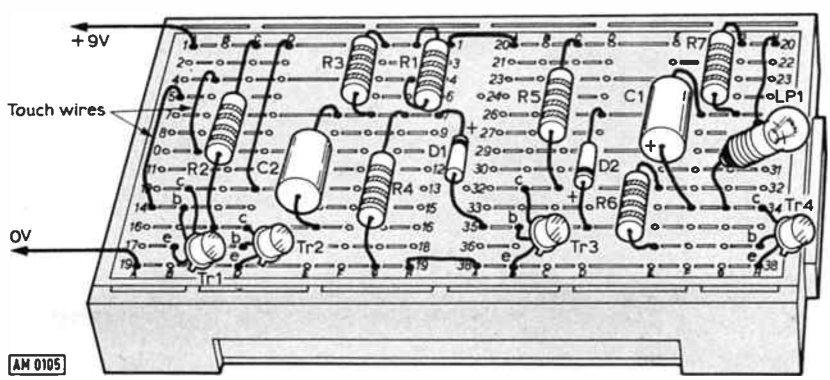


Fig. 20b: T-Dec layout for Fig. 20a.

continued on page 756

HOTLINES ON RECENT DEVELOPMENTS

THE YEN

HAVE you ever had a yen to do something?—the Japanese have. My ageing eyeballs have recently scanned a report which comes from the Orient from an "impeccable source". In February of this year, the Electronic Industries Association of Japan found that the total sales of electronic parts and components from Japan amounted to 101,079 million yen —which is a lot of yen for just one month's effort. It is interesting to see how this figure breaks down. For example, electron tubes (that's valves in English or Toobs in American) in February amounted to 17,841 million yen and showed an increase in February 1972 of over 10%. Integrated circuits accounted for 8,483 yen and showed an increase over the same month last year of a staggering 92%. On these figures, the Western comics who chant "Ha so?" might easily find the answer to be "Velly well thank you".

Other news from Japan is equally interesting. One snippit from spies is that Sony are to withdraw from the electronic calculator market altogether. Another is that Government approval (Japanese) has been given for the joint enterprise between Alps Electric and Motorola for the manufacture and sale of ICs. This American / Japanese Company is aiming to sell 3,000 million yen's worth of ICs in 1974.

KEEPING A WATCH!

Still in yen land, the Japanese watch industry is claiming that some 200,000 watches using piezo-electric crystals, will be produced there this year. Production lines are eagerly being set up to manufacture C-MOS ICs and there is a hive of activity in the liquid crystal readout sector. If all this activity goes through, then clearly now is the time to watch Japan.

MINI FREQ. COUNTER

What other interesting things are happening in Japan? Well, quite apart from the considerable amount of electronics business that's taking place (would you believe that this country sold 83,349 million yen's worth of communications equipment in 1972?) there is always the neatness, the preciseness of some of the products. Perhaps an excellent example is in the field of frequency counters—feed a signal in and the frequency is flashed up on a digital readout. Well, one Company (and I'm talking about a production item, not a prototype laboratory wonder) is marketing a miniature but professional standard frequency counter. It gives a digital readout of frequency from 15Hz to 50MHz although there is an optional pre-scaler which extends this to 220MHz at the upper limit. It's completely portable and uses internal rechargeable cells. The internal oscillator is accurate for the majority of applications having a stability of $\pm$ 0·0005 at 25°C. The size is particularly impressive—120 x 175 x 25 millimetres. Just grab yourself a ruler or do a quick mental conversion and you'll see that this slips into your pocket (there's 25·4 millimetres to the inch!).

LASER TELEVISION

One could hardly look at the Japanese electronics scene without taking in the television industry. Latest thing in this sector to catch my eye is a large screen laser colour television projector. This beasty is a considerable improvement over its younger sister which made a debut at the World Exposition in Osaka in 1970. The earlier model had a resolution of 525 lines. The latest version has a resolution of 1,125 scanning lines. A krypton ion laser is used to generate the red, while an argon ion laser emits the green and blue spectrums. Perhaps we're not at the home use stage yet, but maybe the time will come when an entire wall will light up with a full colour, 3D life-size TV screen—so real you'll be able to step through your kitchen wall and join in a quick romp with Noddy or a punch-up with Ena Sharples; the mind boggles.

In serious terms, the new laser colour television projector has some very real advantages. The image is very clear and sharp. It is also very bright and there is very little divergence, too. One feature which my Japanese contact did not highlight but which is of interest is that the polygonal mirror used for horizontal scanning rotates in magnetic bearings. These have certain advantages over conventional bearings, notably reductions in noise and vibration.

CHINESE PUZZLE?

How many characters or words do you think there are on this page? How about a page in a Chinese newspaper then? No, I haven't nipped across on the Kowloon ferry, I'm still in Japan where a leading electronics manufacturer has just launched a very high-speed printer which prints out the Chinese language. It will produce some 600 lines of Chinese in 60 seconds which, as I'm sure you know, works out at 12,000 Chinese characters every minute. A computer is used to hold information prior to printout but manual over-ride can be used. The printout can be in either lateral or vertical rows so it doesn't matter which way you want to read it—the machine can oblige. Damn clever, those Chinese, or should that be Japanese? I'll have to get myself properly orientated.

EARTH STATIONS

In the early days, the Japanese electronics industry suffered (rightly or wrongly) from a "cheap goods" brand. It is now no longer possible to regard all its products as in this category. An earth terminal is no small thing, neither is there any room for sub-standard effort. In this field, one Japanese Company alone has built, supplied and/or installed very nearly 50 (fifty) earth stations.

GET ORGANISED!

A little gem from England to finish with. In a church at the Royal Naval Air Station Yeovilton, Somerset, an electronic organ began to play itself—a radar beam was being picked up by some of the internal components. About time the Navy got itself organised!

Ginsberg

ARE YOU 'SWITCHED-ON'?

make this ULTRASONIC REMOTE CONTROLLER

By the flick of a switch from your armchair you can switch on the television, radio, lamps, intruder alarm, electric kettle, electrically operated curtains, operating rotating aerials, darkroom lights. For bedridden patients, handicapped and elderly people, there is a multitude of uses for this valuable tool, from remote signalling to opening electrically operated doors—without the need for them to go near the mains supply. Your son can have a lot of fun, too, if you make it for a Christmas gift.

IN NEXT MONTH'S PRACTICAL WIRELESS

AF/HF/VHF TROUBLE-TRACER

Our Trouble-Tracer will provide you with a test signal ranging from audio to VHF. Test probes pick up signals from the equipment under test and feed them into an amplifier and speaker. All in the one cabinet—What else could you want?

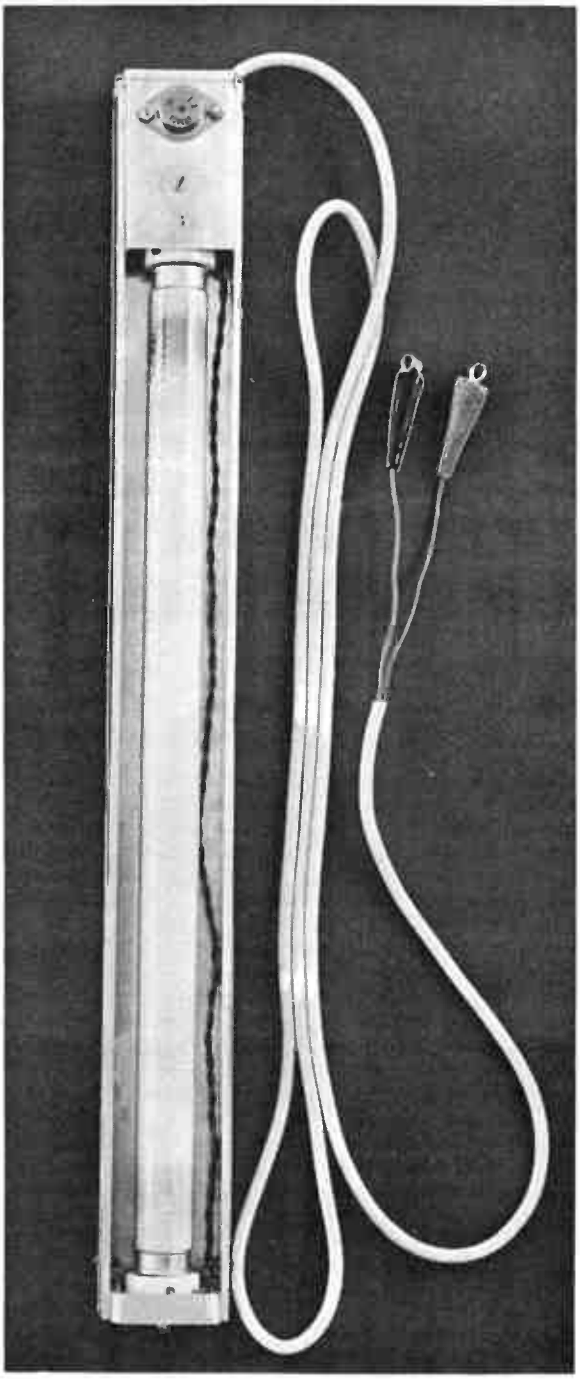
Curing Radio Interference in Audio Equipment

Do you suffer interference on your tape recorder or HI-FI from nearby radio transmitters? This feature tells you how to cope with this ever-increasing problem.

JANUARY ISSUE ON SALE 7th DECEMBER

PORTABLE FLUORESCENT LAMP UI

·FROM YOUR 12V BATT



FOR: EMERGENCY LIGHTING, CAR/

THE battery operated 15W fluorescent lamp unit described here is of simple construction, being designed around readily available components. The whole assembly is made up in aluminium, consisting of a framework which supports the tube and houses the oscillator module. A cover plate acts as reflector and dust cover.

CIRCUIT DESIGN

Fig. 1 shows the circuit. A 2N3055 silicon power transistor operates as a transformer coupled class 'C' oscillator. The fluorescent tube is supplied from a third winding on the transformer. Satisfactory operation is obtained from 10 to 15V.

A variable resistor provided in the base circuit of the transistor ensures correct operation with devices having any gain within normal spreads. The

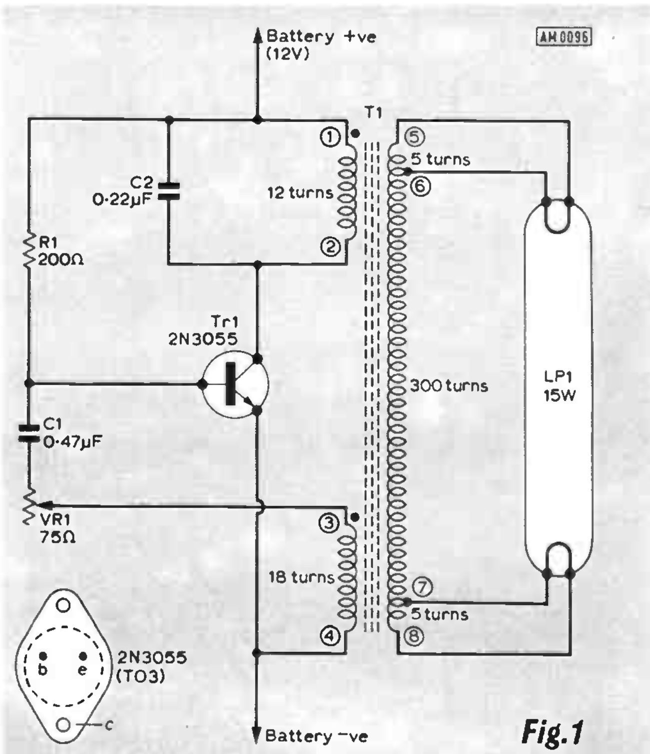


Fig.1

NIT
TERY

VANS & CARS, LOFTS, SHEDS, GARAGES, MOBILE RALLIES, ETC...

transformer is designed around Mullard FX2242 pot cores. The collector winding is tuned by a 0·22μF capacitor. Bias for the transistor is provided by a 200Ω resistor from the positive supply rail.

The operating frequency is determined by the 0·47μF base timing capacitor C1, the variable resistor, the tuning capacitor and the load conditions. Since the load (the fluorescent tube) is a high resistance until alight, the circuit has a "soft" start, the oscillations starting at low frequency and amplitude and building rapidly over a few seconds until settling down at steady amplitude and high frequency once the tube 'strikes'.

CONSTRUCTION

The tube and oscillator housing is made up from aluminium strip and sheet as shown in Fig. 2. This construction method allows assembly with the tools normally available in a small workshop. The cover plate is the most complicated piece, but being fabricated from 1/32in. sheet this makes the work quite easy. Cutting is accomplished with a Stanley knife using a laminate cutting blade (Stanley No. 5194). The cut edges should be filed smooth. The original cover plate made by the author was bent up in a normal small metalwork vice, extra long 'jaws' being made up from 2 x 1in. hardwood.

The oscillator housing is bent up from 1/16in. sheet as is the tube mounting bracket. The power transistor is mounted on the oscillator housing so that the base and emitter pins are inside the casing, directly above the circuit board. One bi-pin tube connector is also firmly mounted to a bracket bent up from this housing. Two side struts are bolted on to this oscillator housing. The smaller 'U' bracket supports them at the far end and also holds the

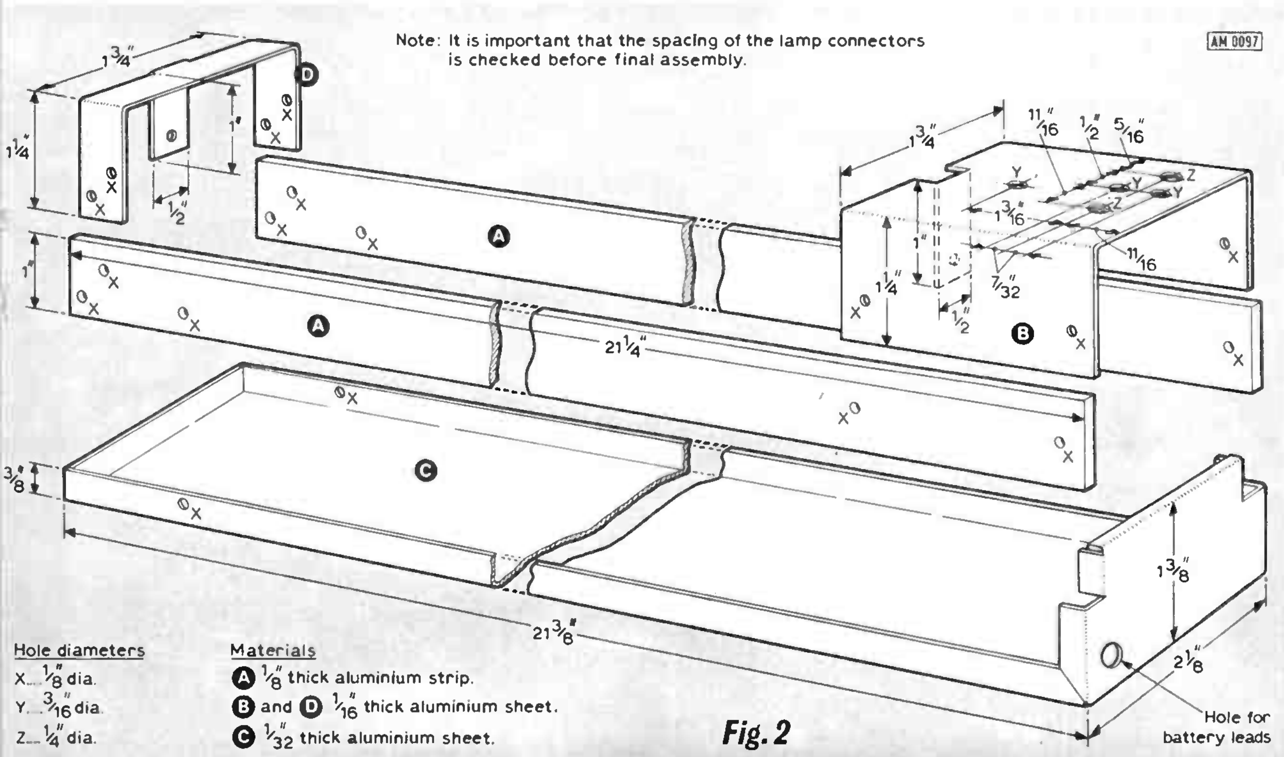


Fig. 2

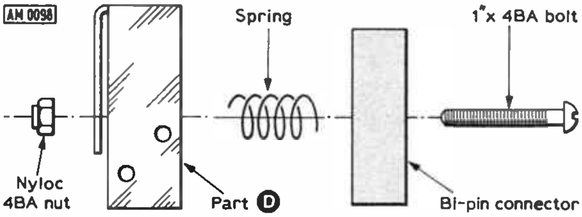


Fig. 3: Details of the spring-loaded tube connector.

other bi-pin tube connector. This connector is mounted on a 1in. 4BA bolt and spring, Fig. 3, to facilitate easy fitting of the fluorescent tube by pulling back the connector and then pushing it over the tube pins.

OSCILLATOR PCB

Fig. 4 shows full size layouts for both the component and the copper side of the circuit board. The board can be made by laying the drawing over a piece of copper clad board ready cut to size, and drilling through all the holes. It is essential that the drawing does not move during this operation. The layout can then be copied on to the board using a fine brush or mapping pen and cellulose paint. The board can then be etched off in ferric chloride (strong) solution. (A 500ml bottle is adequate and may be obtained from most chemists to order.) After etching the board should be washed thoroughly in warm water. The paint can be removed with thinners or rubbed off with scouring powder. The components can them be mounted in place and soldered. Flying leads are required for the three transistor connections. Veroboard terminal pins are used for the four connections to the fluorescent tube.

VARIABLE RESISTOR

The variable resistor VR1 used here is primarily intended for use as a convergence control in Colour TV receivers. If difficulty is experienced in obtaining this control, it should be ordered from a TV dealer as a spare part (e.g. Decca CTV25 Part No. 535167). This control is mounted near the edge of the board so that adjustment may be made by turning the knob edge with a forefinger from the end of the lamp unit.

THE TRANSFORMER

The transformer is wound on a Mullard DT2180 bobbin. Enamelled copper wire is used throughout and all windings are wound in the same direction.

The collector winding is put on first and consists of 12 turns of 28SWG wire, the start labelled (1) and the finish (2). The turns should be wound close together. The base winding is wound directly on top of the collector winding and consists of 18 turns of 28SWG wire, also closely wound. Label the start (3) and the finish (4). Next a single turn of insulating tape is put round the bobbin to isolate the low voltage windings from the tube supply winding.

Finally the high voltage winding is put on consisting of 310 turns of 32SWG wire with taps brought out after 5 and 305 turns. This winding is layer

★ components list

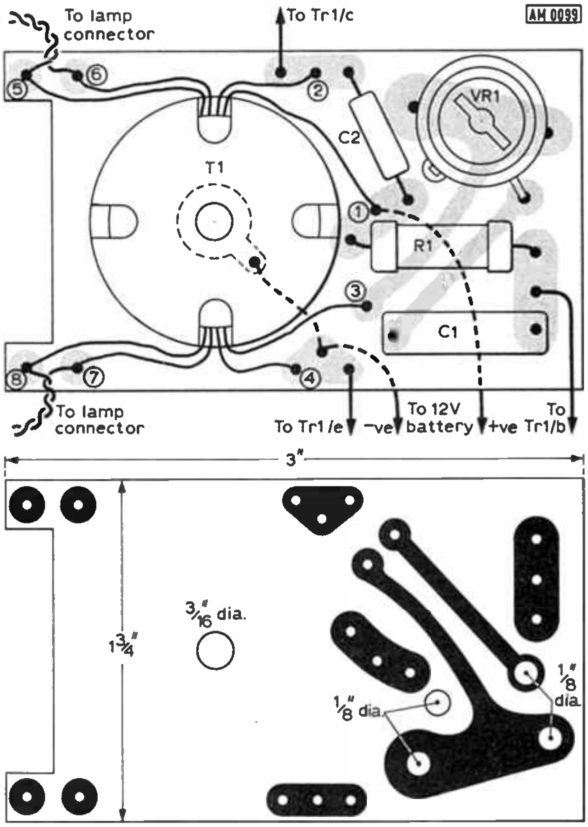
C1	0·47μF 250V polyester
C2	0·22μF 250V polyester
R1	200Ω 5W wire-wound
VR17	5Ω pot. wire-wound (see text)
Tr1	2N3055 with insulating kit
LP1	15W fluorescent tube

Miscellaneous

Pot core (2 x half cores) Mullard FX2242 and bobbin DT2180 (available complete from Hawnt Electronics Ltd., 112 Pritchett St., Birmingham, B6 4EN for £1·20 inc.).
Bi-pin tube connectors (2). 28 and 32SWG enamelled copper wire. PCB, 3 x 1¾in. Length of twin 5A wire, as required, with two large crocodile clips.
Aluminium: 4ft of 1 x ⅛in. strip (Part A), 6 x 5in. of 1/16in. sheet (Part B), 24 x 3in. of 1/32in. sheet (Part C).

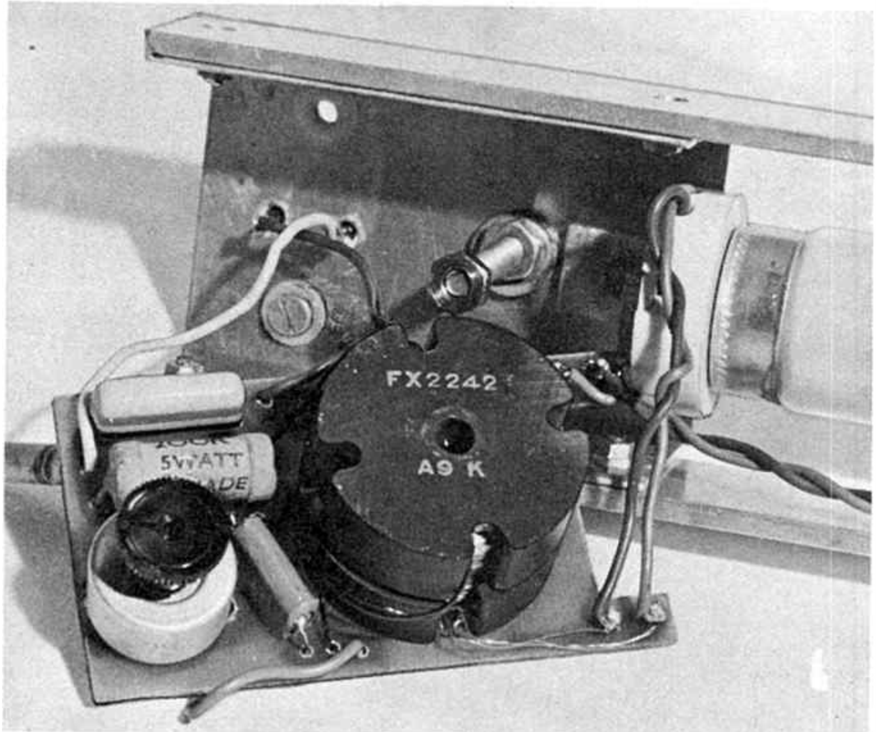
wound, with a turn of insulation put right round the finished bobbin. The start, tap 1, tap 2 and finish should be labelled (5) (6) (7) and (8) respectively. The two ferrite cores can then be placed around the bobbin and the transformer loosely bolted on to the circuit board.

The leadouts can now be cut to length, scraped clean at the ends and soldered to their respective points on the circuit board. Once this has been



All holes drill No.55 unless otherwise stated.

Fig. 4: Full size layout of printed circuit board and component location on board.



A view of the oscillator assembly at one end of the lamp unit.

done, the fixing bolt may be removed and the top ferrite core taken off. A small piece of Sellotape should be stuck on to the centre pole-piece of the core. This provides a small gap which ensures that the core cannot be saturated by the primary magnetic flux. The upper core is then replaced and held into place with a further piece of Sellotape around the join (the cores are finally held together by the module mounting bolt).

An 'exploded' view of the transformer is shown in Fig. 5 which also shows the method of mounting the module.

TESTING

The power transistor should be mounted on the module housing with a mica washer and two nylon bushes, usually supplied with the transistor. A smear of silicone grease should be applied to each side of the mica washer to ensure good thermal contact. The flying leads should be connected to the transistor, ensuring that the base and emitter leads are not reversed. The supply lead should also be connected to the copper side of the circuit board. Do not fit the tube or module into the framework yet.

Connect the power leads to a 12V supply, ensuring correct polarity. The oscillator should 'whistle' loudly, since without a load the operating frequency is lower. If the circuit does not oscillate it is probable that the phasing between the collector and base windings is incorrect. Reversing either winding should ensure correct operation.

ASSEMBLY

Once it is established that the oscillator is functioning correctly, the fluorescent tube connectors

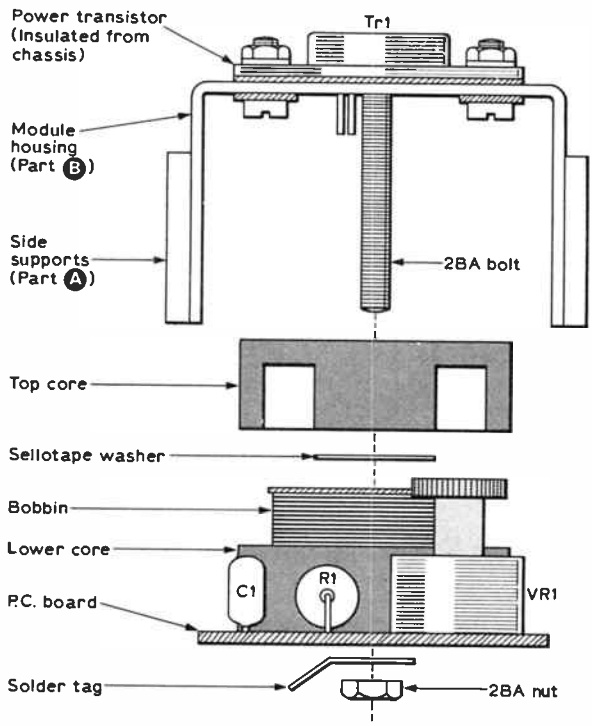


Fig. 5: An exploded diagram of the oscillator transformer and mounting.

may be wired up and the module bolted into the framework. Care must be taken not to overtighten the mounting bolt as the ferrite cores are very brittle and easily fractured. The nut can be sealed with a drop of paint or varnish. The tube can now be fitted into place and final adjustments made.

Reconnect the 12V supply, ensuring correct polarity. The oscillator should start up at a medium frequency, increasing rapidly in pitch until the tube strikes and lights. The oscillator should then be inaudible. Adjust VR1 for maximum brightness. At one end of its travel the light will be dim and at the other extreme excessive base drive will cause squegging with consequent flickering of the lamp. Once the oscillator is correctly set operation should be satisfactory over the range 10 to 15V. The current consumption should be between 1·3 and 1·5A at 12V input.

The cover plate should now be clipped on at the oscillator end and pressed home. Two self tapping screws hold the cover in place.

NOTE 1 Connecting the lamp to the battery with reverse polarity will not cause any damage since the transistor is reverse biased and cut-off, resulting in practically zero current flow.

NOTE 2 The metal framework has been left completely isolated. Slight radio interference may be caused in the immediate vicinity of the lamp unit. To reduce this interference to a negligible level (field localised to within 4ft.) the frame should be connected to either the positive or the negative supply line. Connect a short lead from either to the soldering tag on the module mounting bolt. ■

EXPERIMENTAL WORKSHOP—Part 3—
Trigger Circuits—*continued from page 749*

If the gap between the touch wires is bridged with the fingers a minute current flows into the base of emitter follower Tr1. This produces a considerably larger current into Tr2 and its collector falls to zero. The junction of R3 and R4 is momentarily pulled down by C2 from about +4·5V to −4·5V. This negative going signal is coupled to the base of Tr3 of the monostable through D1 and this switches off Tr3 starting the monostable cycle.

The lamp goes on for the period set by C1 and R7. Capacitively coupling the touch-sensitive switch with C2 allows the user to keep his finger on the touch wires without interfering with the monostable action.

The values shown in the circuit only give a dwell time of a few seconds—for experimental purposes—but a reasonable period of time of 3½ minutes can be arrived at by increasing C1 to 3,000μF, and C2 must be increased to about 50μF.

Next month we shall look at a development of the monostable; the astable multivibrator.

Multimeter Competition RESULT

In our June "Multimeter" Competition readers were invited to place eight features of the new Sinclair Radionics multimeter DM1 in order of appeal to the average P.W. reader.

Having considered all entries, the judges decided that the best received were a large number of identical attempts which had placed features in the following order:

1st-E; 2nd-D; 3rd-L; 4th-J; 5th-K; 6th-B; 7th-A; 8th-C.

In accordance with the rules, these tying competitors then participated in a postal eliminating contest from which the eventual winners were judged to be Mr. J. Bertram, of Fenham, Newcastle-upon-Tyne; Mr. R. Harris, Knowle, Bristol; Mr. J. R. Mann, Knaresborough, and Mr. G. Rider, Hythe, Southampton.

These four readers each win a Sinclair digital multimeter and 12 months' free copies of Practical Wireless.

The tying competitors who entered the final postal eliminating contest, and were subsequently unsuccessful, each receive a consolation prize and 12 months' free copies of Practical Wireless.

Successful Soldering

V. CAPEL

WITHOUT a doubt one of the most important tools for either professional engineer or amateur hobbyist is the soldering iron. Nearly every component has to be soldered, so whether constructional work or repairs are being carried out, the iron has to be called into use. There are a considerable number of soldering instruments of all sorts and sizes available, so in this article we will take a look at some of them to see which are most suitable for particular applications, and their respective advantages and disadvantages.

BASIC REQUIREMENTS

We will start off with what could be called the basic workshop instrument. This is an iron with the element operating at mains voltage and a wattage of between 25 and 40 watts. The size allows for most printed-circuit and general component soldering, but the bit may be rather large for some of the finer printed boards. For this reason, most irons have a variety of interchangeable bits so that a thinner one can be fitted for fine work.

In practice though, bits are not often changed according to the requirements of the job. For one thing they have a habit of getting seized-up and difficult to remove. They should really be loosened from time to time to facilitate changing, but in practice this precaution is usually neglected. Also, most workshop irons are kept on continually in order to be instantly available, so to change the bit for a particular job would mean allowing the iron to cool down and waiting for it to warm up again after the change, plus of course a repeat performance for the re-fitting of the normal bit. Going to the other extreme, irons of this type and wattage have a limited heat output and so cannot tackle large jobs.

The difference between temperature and heat-volume must be noted here. All soldering irons attain a temperature which exceeds the melting point of solder (168°C for the high-quality 60/40 grade) otherwise they would be useless for their purpose, but some deliver a greater quantity or volume of heat than others. This is determined largely by the wattage of the instrument. Hence, a soldered joint to a punched-out chassis tag may be impossible with some smaller irons because the chassis conducts the heat away faster than the element can produce it, and so the bit cools rapidly to below the required temperature. Any large area of metal will have the same effect.

Another factor is the size of the bit. The bit effectively stores heat and so acts as a reservoir. Heat flows out of the bit when the iron is used and more heat is supplied by the element. However, the outflow can be greater than the input for a short period until the stored heat is exhausted. Thus larger areas can often be soldered than would be feasible with a particular element-wattage, if the iron is fitted with a large bit. When the iron has been thus used, it will take longer for the bit to return to correct operating temperature than would a smaller bit because it has what is termed, a slow heat recovery time.

IDLING TEMPERATURE

A further consideration is the heat loss when the iron is switched on but is not in use, as is the case in most workshops for the greater part of the time. While the iron may get hotter than needed because there is no heat conduction by application to a work area, it must not get so hot as to damage the element or cause premature deterioration of the bit. Hence the physical size of the iron barrel and bit must not be too small for the element size so that heat losses by convection and radiation are insufficient to keep the temperature to a safe limit. It follows then, that physical size is closely related to element rating and should not be too small or too large.

Stiron 20W and 60W irons, made in Sweden and featuring iron-coated bits.

In order to keep the temperature of an iron down when it is not being used for long periods, it is the practice in some workshops to operate a half-heat arrangement, whereby a lamp is switched in series with the iron. The temperature will gradually rise to not far short of the correct operating level, then when the iron is needed, the lamp is switched out and the temperature comes up within a few seconds. Another method is to stand the iron on a large chunk of metal which keeps it from overheating by conduction. An old speaker magnet is sometimes used for the purpose, as this also attracts the iron and keeps it in place.

The Sinclair Cambridge... no other calculator is so powerful and so compact.

Complete kit – £24·95! (PLUS VAT)

The Cambridge – new from Sinclair
The Cambridge is a new electronic calculator from Sinclair, Europe's largest calculator manufacturer. It offers the power to handle the most complex calculations, in a compact, reliable package. No other calculator can approach the specification below at anything like the price – and by building it yourself you can save a further £5·50!

Truly pocket-sized
With all its calculating capability, the Cambridge still measures just $4\frac{1}{2}'' \times 2'' \times \frac{11}{16}''$. That means you can carry the Cambridge wherever you go without inconvenience – it fits in your pocket with barely a bulge. It runs on ordinary U16-type batteries which give weeks of life before replacement.

Easy to assemble
All parts are supplied – all you need provide is a soldering iron and a pair of cutters. Complete step-by-step instructions are provided, and our service department will back you throughout if you've any queries or problems.

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The Sinclair Cambridge kit is supplied to you direct from the manufacturer. Ready assembled, it costs £32·95 – so you're saving £5·50! Of course we'll be happy to supply you with one ready-assembled if you prefer – it's still far and away the best calculator value on the market.

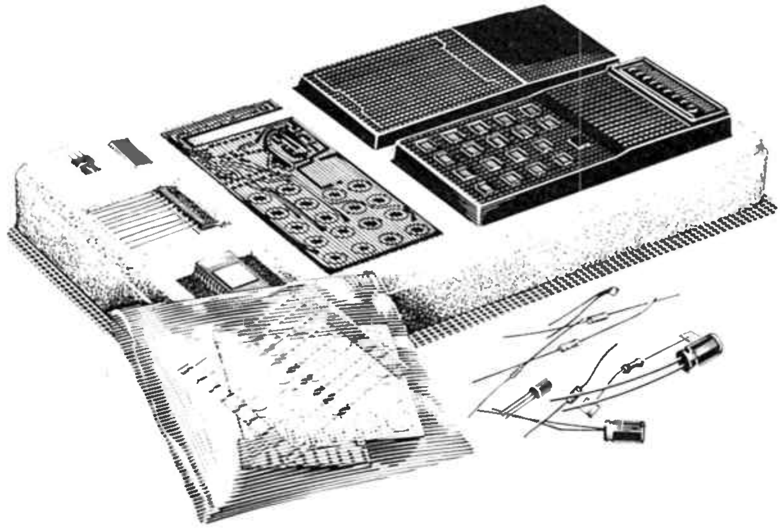
Features of the Sinclair Cambridge

* Uniquely handy package. $4\frac{1}{2}'' \times 2'' \times \frac{11}{16}''$, weight $3\frac{1}{2}$ oz.
* Standard keyboard. All you need for complex calculations.
* Clear-last-entry feature.
* Fully-floating decimal point.
* Algebraic logic.
* Four operators (+, −, x, ÷), with constant on all four.
* Constant acts as last entry in a calculation.
* Constant and algebraic logic combine to act as a limited memory, allowing complex calculations on a calculator costing less than £30.
* Calculates to 8 significant digits, with exponent range from 10^{-20} to 10^{79}.
* Clear, bright 8-digit display.
* Operates for weeks on four U16-type batteries. (MN 2400 recommended.)

A complete kit!

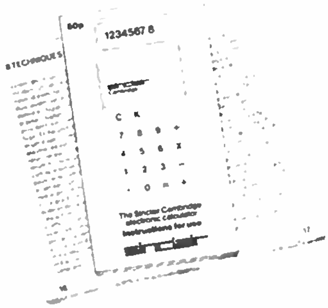
The kit comes to you packaged in a heavy-duty polystyrene container. It contains all you need to assemble your Sinclair Cambridge.
Assembly time is about 3 hours.

Contents:
1. Coil.
2. Large-scale integrated circuit.
3. Interface chip.
4. Thick-film resistor pack.
5. Case mouldings, with buttons, window and light-up display in position.
6. Printed circuit board.
7. Keyboard panel.
8. Electronic components pack (diodes, resistors, capacitors, transistor).
9. Battery clips and on/off switch.
10. Soft wallet.



This valuable book – free!
If you just use your Sinclair Cambridge for routine arithmetic – for shopping, conversions, percentages, accounting, tallying, and so on – then you'll get more than your money's worth.

But if you want to get even more out of it, you can go one step further and learn how to unlock the full potential of this piece of electronic technology.



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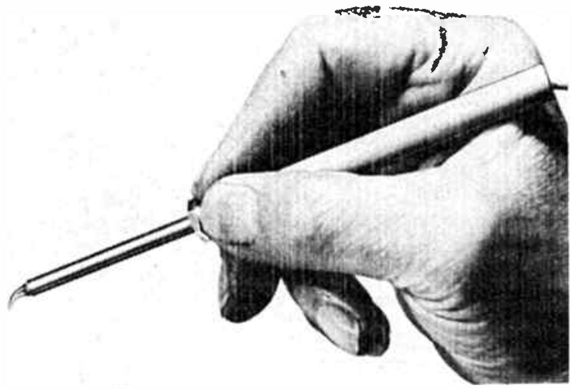
PLEASE PRINT

Because of the limitations of the 25 to 40 watt iron, most workshops have at least one or two other types and sizes of iron available. For larger jobs, an iron with a rating of 60 to 100 watts is required. These irons are similar to their smaller counterparts in general construction and appearance except for the size and element rating. The bit may be square instead of the usual pencil-type. As only occasional use would be expected, the iron would not normally be left on for long periods, so there would be no overheating problems.



Work on integrated circuits requires a very small iron such as the Micro Soldering Pencil, shown here.

For the smaller and more intricate jobs, there are irons that are little bigger than pencils with element ratings of 10 to 15 watts. These are ideal for some of the tiny printed circuits that are now encountered and for the wiring of I.C.'s where the connections are close and damage could be caused by excessive heat. Heat output is obviously limited and many larger jobs could not be tackled. The element wire for these mains-operated low-wattage irons is necessarily very fine and so they are less reliable than the higher-rated ones. They should not be run continuously but only when a particular job calls for their use. Because of their small bit size, they are usually quite fast in warming up. This and their size also makes them suitable for outside service work.

LOW VOLTAGE IRONS

Another type which has achieved a measure of popularity is the low-voltage iron. While these can be run from a low-voltage source such as a car battery, the more common method is to operate them from a mains transformer. The main feature is a very quick heating time, just a matter of seconds, and a rapid heat-recovery time. This means that the iron can be used for outside service work where delays waiting for a conventional iron to warm up are thus eliminated.

One type of low-voltage iron is constructed very similarly to the normal iron and fed from a separate transformer, which also serves as an iron-rest. Other types have the transformer built-in, either over the top of a pistol-grip handle, or in one make, actually inside the handle. With these the element is also the bit, consisting of a loop of wire connected across the transformer secondary, Fig. 1.

In either of these low-voltage types, the bit can very quickly become overheated, even when being used on large areas, so a switch is incorporated in the iron so that the operator can keep switching it on and off and thereby maintain the tool at about the

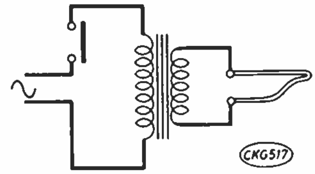


Fig. 1: Circuit of a transformer iron with element/bit consisting of a wire loop.

right temperature. In one make that uses a separate transformer, a thumb ring is used as a switch on the handle; while most of the built-in types, being pistol-like in construction, use a trigger switch.

This need for constant switching can be a drawback, especially if the switches are stiff as some are, and need considerable finger pressure. The danger of overheating due to switching on for too long can also be a hazard for transistors and other semiconductor devices.

A yet further drawback of the built-in transformer type is their weight. This is of little consequence for occasional use, but when used continuously, as in the professional workshop, they can be very tiring. The wire-loop bits are not very durable and need frequent replacement; while owing to their flexibility they cannot be used to unpick joints as can the conventional bit.

A pistol-grip soldering gun with integral transformer. The Welwyn KL3000.

The separate transformer type of low-voltage iron is therefore the more convenient, but for outside work the built-in type is probably the best. Neither though, really is as suitable as the mains-voltage type for workshop use.

CONTROLLED TEMPERATURE

Of recent years we have seen several thermostatically controlled irons which overcome some of the snags inherent with the uncontrolled types, whether high or low voltage. One, rather ingeniously, uses the Curie effect of iron. Iron, when it is heated beyond a certain point loses its magnetic properties. A small iron disc is fixed to the base of the soldering-iron bit and this has an attraction for a bar magnet which holds a switch in the 'on' position by means of a push-rod, Fig. 2. When the iron temperature reaches the Curie point of the disc, it loses its attraction, the magnet is released and the switch is opened. As the temperature drops to below the Curie point, attraction is re-established and the switch returns to the 'on' position.

Each bit has its own iron disc, which can be made with different Curie points, hence with its own temperature setting. This particular iron is a low voltage model and is operated from a separate transformer. It has a very rapid warm-up time and good heat recovery, but, because of being thermostatically controlled, does not overheat nor need switching attention by the operator. The barrel is a little short though, for some types of work.

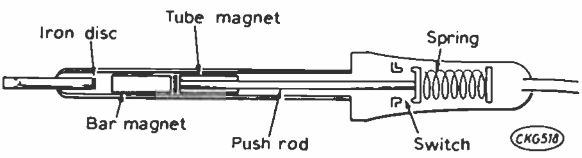


Fig. 2: Mechanism of a heat-controlled iron using the Curie effect.

Another thermostat iron is called the 'Litestat.' This is a mains-operated instrument, hence it is not encumbered with a transformer, either built-in or attached by lead. It has a 70 watt rating, but is only little larger than the average 25 to 40 watt instrument, the thermostat preventing it overheating. As with other thermostat irons, when there is a heavy outflow of heat from the bit due to working on a large heat conductive area, any loss of temperature is compensated by the switch remaining on longer than usual, and the larger element quickly supplies the extra heat volume. Thus we have the best of both worlds, a moderate sized iron that will handle reasonably small jobs (quite small if the extra-small bit is used) and will also tackle the big ones. Although the occasional user will probably get on quite well with a normal uncontrolled iron, the advantages of the thermostat control really make this type of iron a 'must' for professional workshops.

These then are the basic types of soldering instrument and their respective features. Within each category there are many makes and models and engineers and hobbyists alike often have a particular favourite that handles well and seems to produce good work for them.

SOLDERING BITS

Bits are available in several types. There are of course the various shapes and sizes that are produced for specific applications, most irons having a number of alternative bits obtainable as extras. There are though, differences in material. The most common is copper, which because of its high heat conduction is the best material (excluding precious metals) for the purpose. When clean it can be tinned quickly and easily, another great advantage. A disadvantage with copper bits is their deterioration with use. Prolonged periods of operation at high temperatures causes oxidization and flaking of the metal. In addition, at the bit face where the solder is melted, cavities begin to form due to the chemical affinity of solder for copper, which absorbs it each time the bit is used.

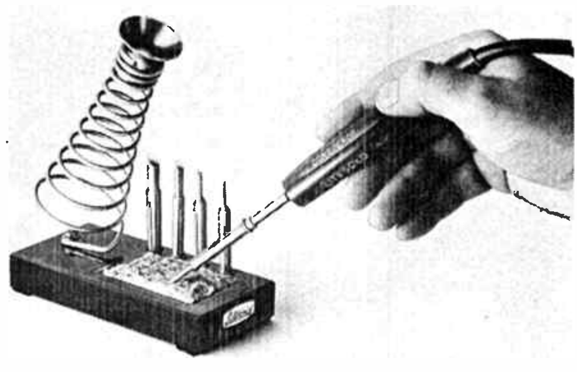
Little can be done to stop the flaking other than running the iron at a lower temperature during standby periods, but the cavities can be almost eliminated by using the Savbit solder developed by Multicore. This contains minute traces of copper which satisfies the affinity of the solder without it taking more from the bit.

Other types of bit are made from alloys, or are nickel or chromium plated to achieve longer life. One method used by some manufacturers is to clad the copper bit with iron which is harder and more durable than copper, yet has the copper core for its thermal properties. A disadvantage with all these bits is that they cannot be filed without ruining them, thus once the plating or cladding has gone the bit must be discarded, whereas a copper bit can be filed flat at its face many times before filing and flaking reduces the size to inoperative proportions.

The superior thermal qualities and ease of tinning make the copper bit still the favourite, especially since its life can be prolonged with special solders.

USING THE IRON

Now just a point or two on using the iron. It is surprising the number of people who are technically well qualified, professional engineers included, who cannot seem to produce a good soldered joint. It is very important to do so, as all sorts of faults can arise from poor soldering. It is noteworthy that all candidates for the RTEB servicing exams had to undergo soldering tests and failure led to automatic disqualification for the whole of the practical and theoretical examinations.



Litesold Conqueror iron and stand with bit-cleaning sponge and range of interchangeable bits.

There is nothing really difficult in making a good joint, just observing a few straightforward rules. The first one is to make sure that both surfaces are clean. In the case of wires, this can be done by pulling the wire a couple of times through the blades of a pair of side-cutters, as though one were stripping insulation. Terminals and tags can be scraped with a screwdriver blade. In most cases wires and terminals will be already tinned, but do not rely too much on it. Next both surfaces should be tinned. This is done by applying the iron to the surface for a few seconds, and then introducing the solder to bit and

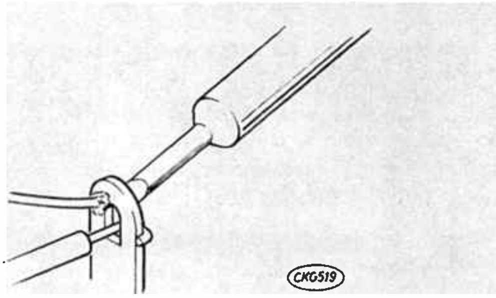


Fig. 3: The iron should heal the whole joint—not just the solder.

surface so that it runs easily over it, Fig. 3. If the solder is thick and slow to run, the bit temperature is too low, either because the iron has not been switched on long enough, or the iron is too small for the work. The solder may not run over the surface readily at first because insufficient heat has been transferred from the bit, and it is just not hot enough to melt the solder. This could be due to poor contact between bit and surface, but a little solder introduced at the junction of the two, will give a good thermal conduction, and the surface should then quickly attain sufficient temperature to itself melt solder when applied.

When both surfaces have been thus tinned, they are brought together in mechanical contact, and the iron applied again to both. More solder is then introduced so that it runs freely over both surfaces, then the iron is withdrawn. Do not move the work until the solder has solidified otherwise a weak joint will result; this will take only a second or two. Where possible the joint should be mechanically sound before soldering. No external flux should be used as these are often corrosive and will give trouble in the future. Sufficient of the correct type of flux is contained in the cores of solders intended for electronic wiring, to do the job.

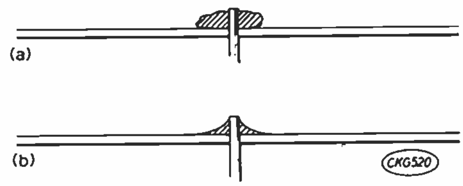


Fig. 4: (a) A 'dry' joint, showing the blob of solder due to insufficient heat or dirty surfaces.
(b) A good joint, showing smooth flow of solder over joined surfaces.

Do not use too much solder as this is not only unnecessary but could form a short to adjacent terminals. In appearance, the joint should be bright and smooth. A lumpy or pitted appearance shows the solder was not hot enough. It should also appear as a 'mound' rather than a blob. The illustration Fig. 4 shows what is meant by this. If the solder surface comes down and curls under as shown, it has not taken to the surface and we have a 'dry' joint. By observation of these points and a little practice, perfect joints can be made every time. ■

LETTERS—*continued from page 742*

Value for money

I greatly appreciated the article on 'Going Back' as it is full of nostalgia. I have taken *P.W.* off and on since the early beginnings, but only since 1967 have I bought it every month and I only started then because a free record of audio faults was given away, but on reading the articles on transistorised equipment, and particularly details of a transistor SW receiver by F. G. Rayer, I was astonished at the transformation in building techniques (being brought up on $^3/_8$" thick breadboards and $^1/_{16}$" dia. connecting wire!) and plunged up to the neck in transistor circuits and have been building them from *P.W.* projects ever since.

Though the price of *P.W.* has greatly increased, the contents have kept in step and I think it is still good value for money. It is improving all the time, as reference back to only a few years ago will show, and even in the last few months there have been detailed improvements, such as better layout and the contents page being put on the first page. Long may you continue!

Incidentally, radio parts seem to be one of the few things which have not greatly increased in price, and some, like transistors and i.c.s, have actually gone down.—**R. A. Read** *(Salisbury)*.

A Fly in the Ointment?

Do any readers know how to build an electronic fly-catcher? We are driven crazy with flies in the summer and we are sure that it is the sheep that bring them in.

I was born in the UK and lived many years in Africa but the flies were never as bad as here. I have taken P.W. for over 20 years now but have not seen any details of fly catchers. Also, we are a bit lost out here for getting components especially as we can only get a £2 British P.O. here on demand at the Post Office.—**J. S. Skeels** *(One Tree Point, Rukaka, Northland, New Zealand)*.

Short Wave Converter

I have built the Radio Nederland converter, *Practical Wireless*, September 1973, and am very pleased with the results, however, I should like to point out an error in publication which would result in disappointment to those to quote your preamble—"with little experience in electronics."

Reference page 409 figure 1 circuit diagram oscillator Tr2 AF 124 and page 410 drawing AM0022. Note the emitter and base connections are shown reversed so there could be no conduction in the collector circuit due to reverse polarity at the base.

As a note of interest I used Wearite P coils either PA4 or PHF4 which very nearly approximate the coil data given for L1 and L2, a similar coil was slightly modified to make up L3. A PHF6 coil tuned by a 200pF silver mica in parallel with a 250pF trimmer was used for L4. The unit is used with a BUSH TR130 receiver tuned to the extreme h.f. end of the m.w. band.—**A. J. Birkinshaw** (Telford, TF2 6RA).

GOING QUADRAPHONIC

PW **Q4 PROJECT**

- QS recordings
- SQ recordings
- Discrete CD-4 recordings
- SURROUND SOUND

PART 3 D. BOLLEN

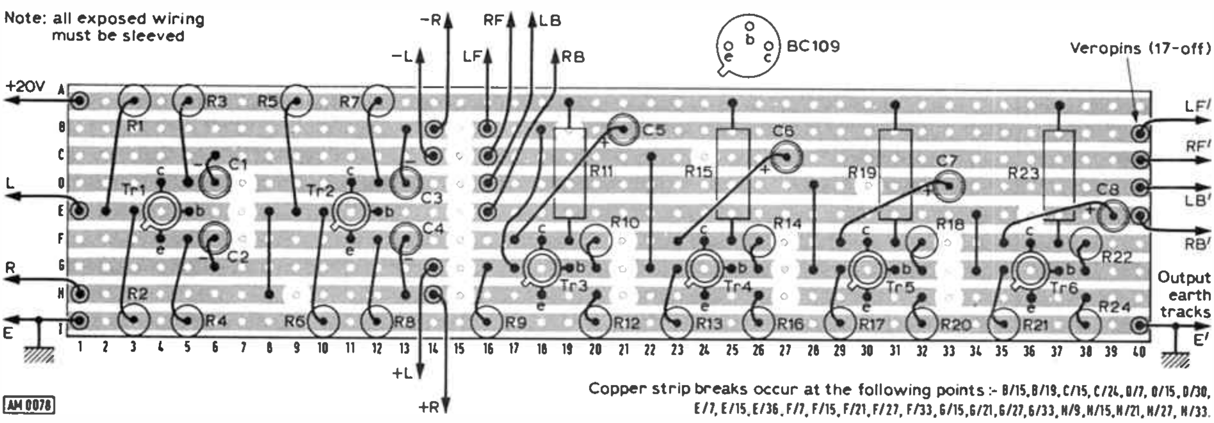
THE article last month gave circuit descriptions of single and multi-system matrix decoders based on two circuit modules, Units A and B. There now follows constructional details of these two units, and of the additional units and components needed to build a multi-system decoder with infinitely variable front and back separation.

Readers are reminded that they will require, in addition to the decoder, a stereo outfit plus a pair of back amplifiers and speakers for quadraphonic reproduction from discs and tapes.

Unit A construction

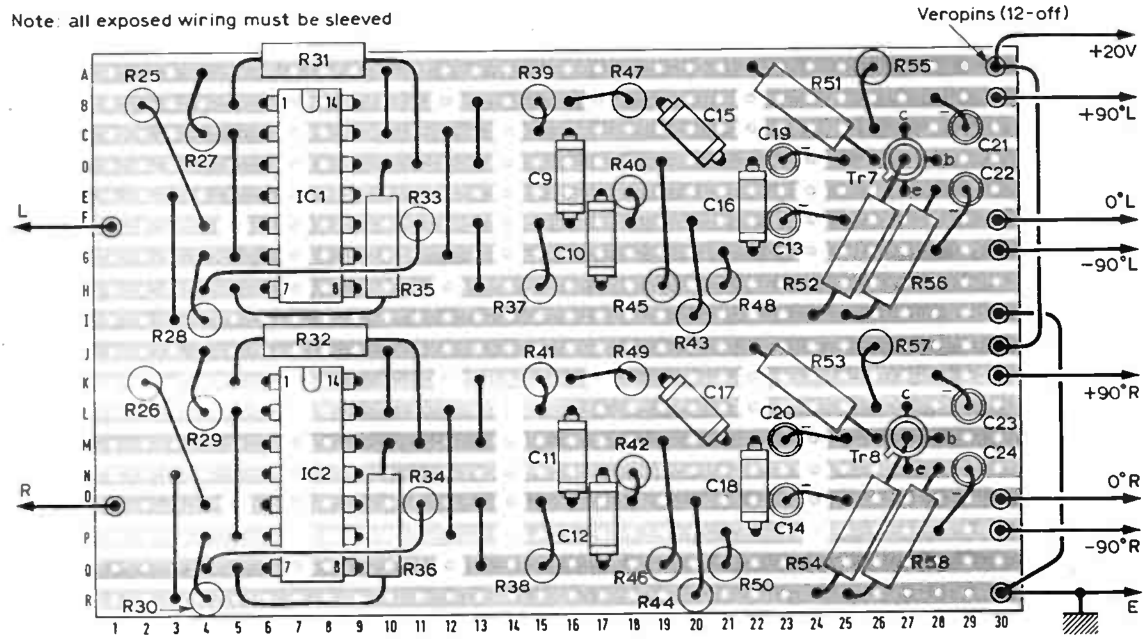
Unit A is assembled on a piece of 0·1in. pitch Veroboard 0·9in. wide by 4in. long, see Fig. 16. Begin by making breaks in the copper strips, where shown, with a spot face cutter, and then insert and solder the terminal pins.

During assembly, it is important to ensure that the transistors are not overheated as this could have a detrimental effect on noise performance. A clip made of aluminium sheet should serve to conduct away heat when placed around the transistor can during soldering. Constructors who are not accustomed to 0·1in. Veroboard should also make sure that solder blobs do not bridge between the copper strips. It is a good idea to run a sharp knife blade along the gaps between strips to remove excess flux and any particles of solder. When inserting capacitors in the unit A circuit board, check that the polarity is as shown in Fig. 16.



Copper strip breaks occur at the following points :- B/15, B/19, C/15, C/24, D/7, D/15, D/30, E/7, E/15, E/36, F/7, F/15, F/21, F/27, F/33, G/15, G/21, G/27, G/33, H/9, H/15, H/21, H/27, H/33.

Fig. 16: Component layout of unit A circuit board. Note breaks in copper strips.



AM 0079

Copper strip breaks occur at the following points:-
B/7, B/12, B/17, B/22, C/7, C/14, C/22, D/7, D/14, D/24, E/7, E/14, E/24, F/5, F/7, F/14, F/24, G/7, G/14, G/24, H/7, H/12, K/7, K/12, K/17, K/22, L/7, L/14, L/22, M/7, M/14, M/24, N/7, N/14, N/24, O/5, O/7, O/14, O/24, P/7, P/14, P/24, Q/7, Q/12.

Fig. 17. Component layout of unit B circuit board. Note breaks in copper strips.

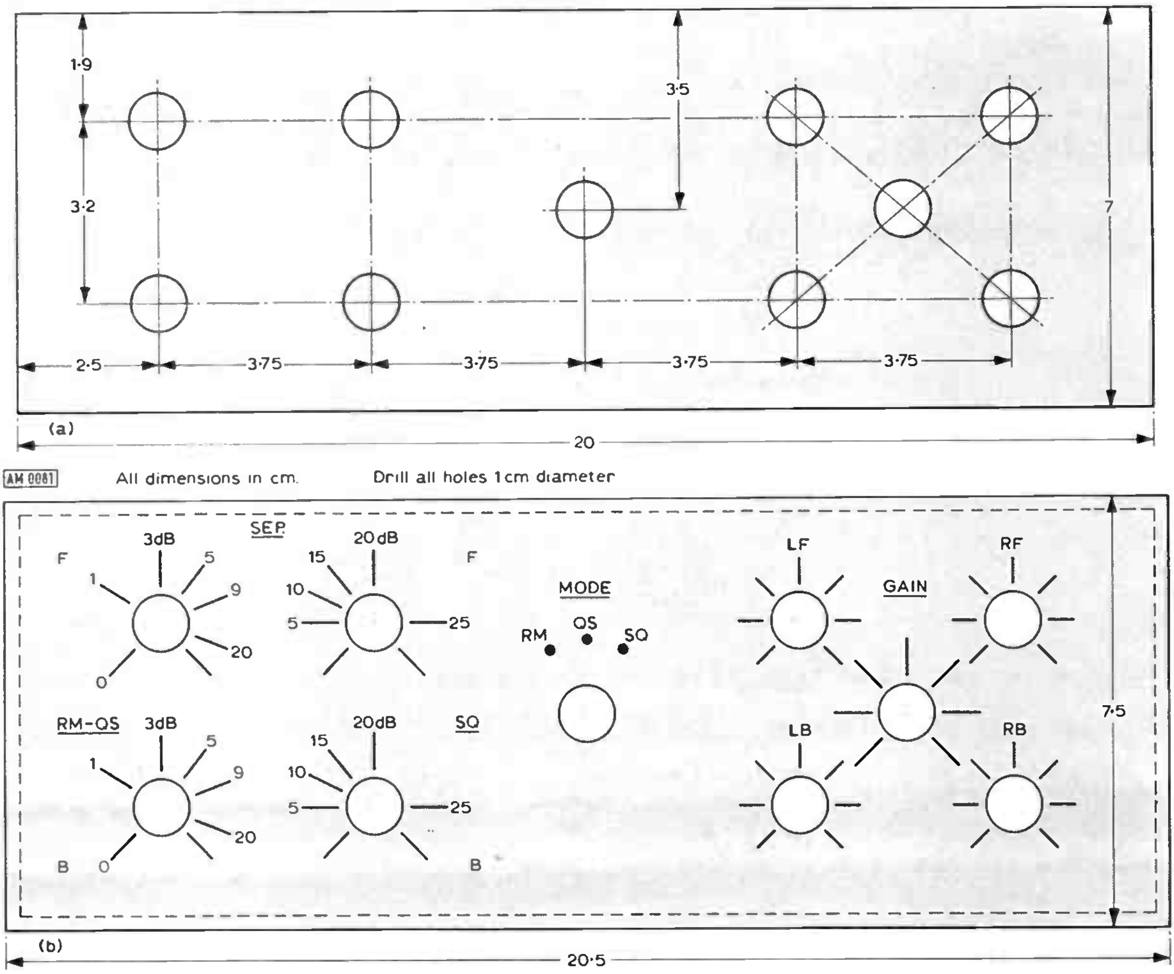


Fig. 18(a): Drilling details of front of chassis tray. Fig. 18(b): Front panel layout.

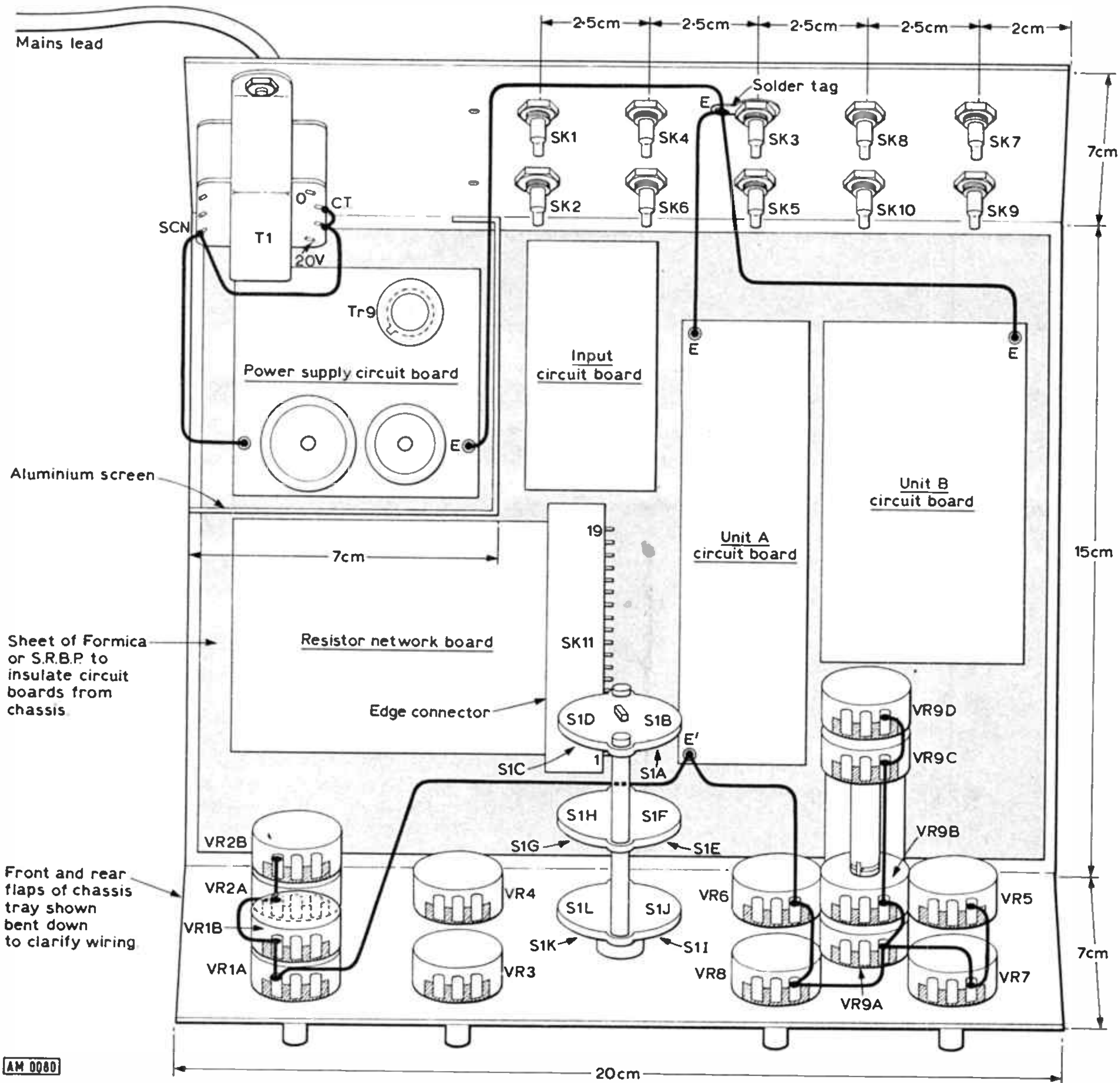


Fig. 19: Multi-system decoder layout showing earth wiring.

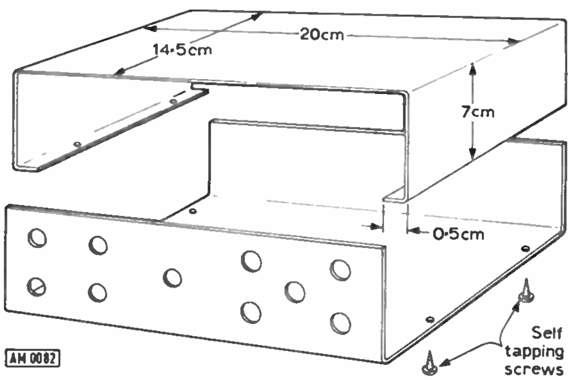


Fig. 20: Dimensions and fixing details of the chassis cover.

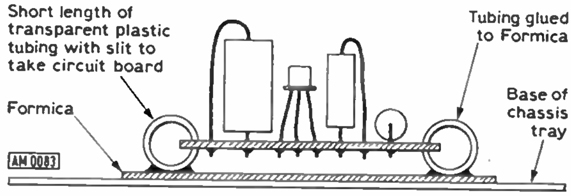


Fig. 21: A method of securing the circuit boards.

Unit B construction

A piece of 0·1in. pitch Veroboard 1·8in. wide by 3in. long is employed for unit B, and the layout is shown in Fig. 17. Left and right hand channels are identical and are arranged one above the other on the circuit board.

Make breaks in the copper strips according to the diagram of Fig. 17 and insert and solder all terminal pins. Commence with the ICs, leaving pins 3, 5, 8, 11, and 14 unsoldered, and then position and solder the remaining components. Use a heat clip on Tr7 and Tr8 and ensure that the polarity of the electrolytic capacitors is correct.

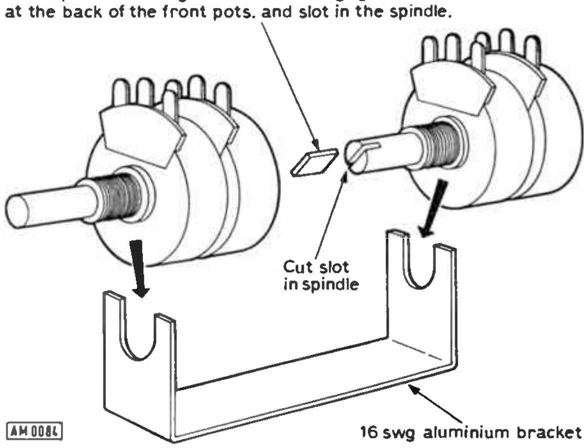


Fig. 22: VR9 assembly utilising two dual-gang potentiometers.

Checking units A and B

As a preliminary check, wire the earth and +20V terminal pins of unit A circuit board to an 18V battery (two PP9s in series) and with a testmeter measure the voltages between the earth terminal and the transistor cans. Tr1 and Tr2 should show a voltage of about 14V, and Tr3-Tr6 a voltage of 9V. If there is a serious discrepancy, look for a short circuit between the copper strips on the underside of the circuit board, or an error in component positioning.

To check unit B, connect the 18V battery to earth and +20V terminals and measure the voltage at IC1 and IC2 pins 10 and 12, which should be at 9V relative to the earth terminal pins. The can voltage of Tr7 and Tr8 will be about 14V if there are no constructional faults.

If the user intends to experiment with a single-system decoder, units A and B can be employed with an 18V battery, or the power supply of Fig. 15, with 22kΩ balance controls (VR5-VR8 Fig. 14) wired to the LF, RF, LB, and RB outputs of unit A. It is advisable to connect a 1000μF 25V electrolytic capacitor across the supply rails when operating units A and B from a battery.

Where an oscilloscope with X-Y facilities is available, unit B can be tested for 90° phase shifting by injecting a signal of 2kHz into the left input, with the X input of the scope linked to the 0°L output, and the Y scope input connected to each of the 90°L outputs in turn. The resulting display should be a near perfect circular trace. Repeat the test for the right hand channel.

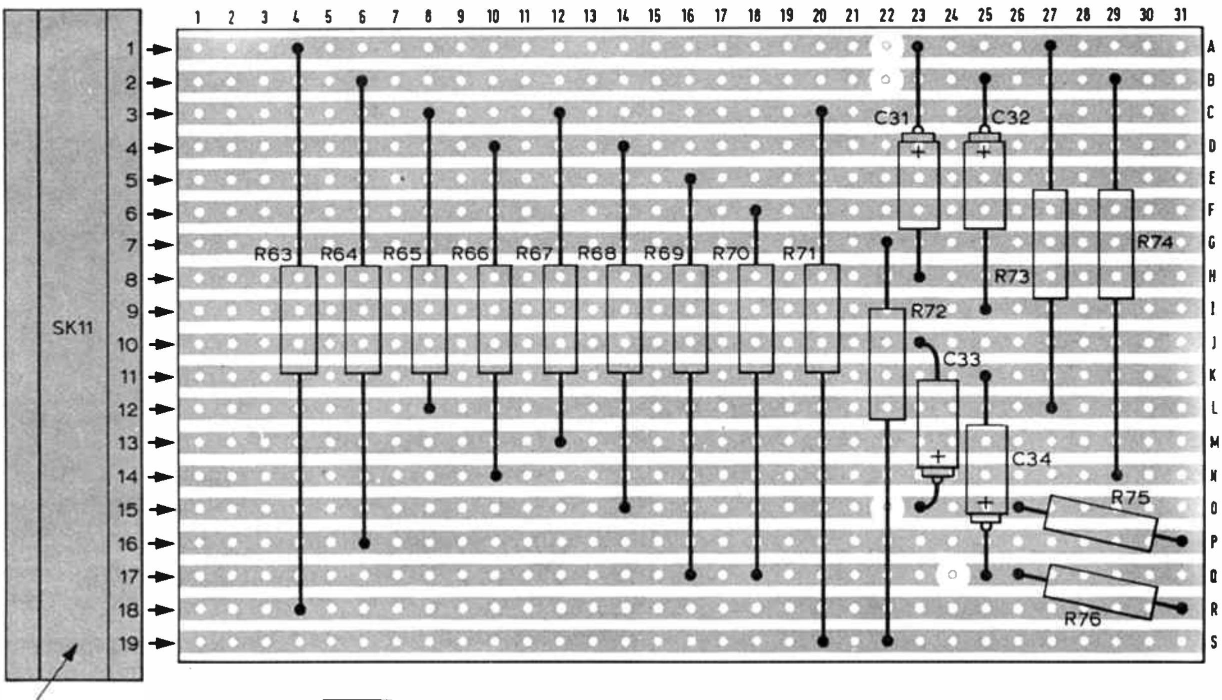


Fig. 23: Component layout of resistor network board.

Multi-system decoder construction

Fig. 19 shows the layout of a multi-system decoder based on the circuit of Fig. 14. Additional circuit boards serve to accommodate the resistor network, input capacitors and resistors, and power supply components; these will be described later.

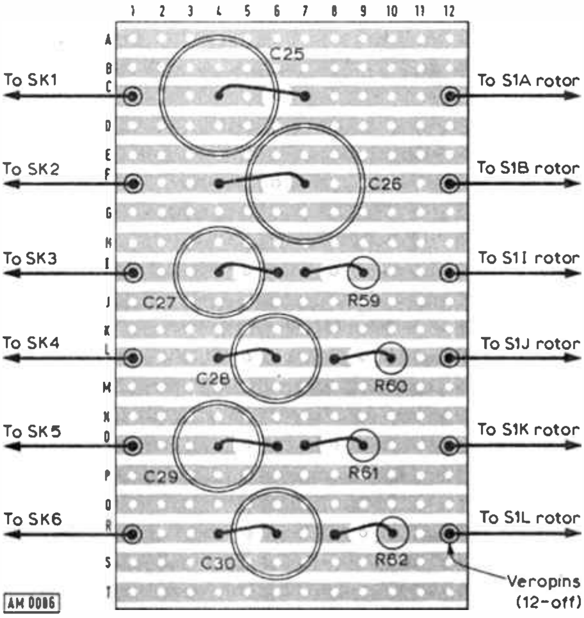
A start can be made by making up the chassis tray from 16s.w.g. aluminium sheet, to the measurements shown in Fig. 19. Allow 7cm of space for the power supply, and mark out and drill the rear of the chassis tray to take sockets SK1-SK10. Next, mark out and drill the holes to mount transformer T1, the power supply screen, and mains lead grommet.

Drilling details for the front of the chassis tray are given in Fig. 18a, and Fig. 18b shows a front panel made of 20·5cm by 7·5cm brushed aluminium or white Formica, which is drilled to match the holes in the chassis tray. The dimensions and fixing details of the chassis cover are shown in Fig. 20.

Glue a sheet of Formica or s.r.b.p. inside the base of the chassis tray to insulate the circuit boards from the chassis; this should measure 19cm by 14·5cm. A method of securing the circuit boards is shown in Fig. 21.

Make up switch S1 from three 4-pole 3-way wafers, with a three spacer gap between wafers. Mount the assembled switch on the front of the chassis tray, along with controls VR1-VR8.

In the absence of a four-gang component for VR9, this can be made up from two dual-gang potentiometers, as shown in Fig. 22. A small piece of sheet aluminium engages with the spindle slot at the rear of the front pair of pots, and with a slot in the spindle of the back pots. To align VR9, set the front pots to mid-track and measure the resistance between a slider and the earthed end of its track. Rotate the body of the rear pots to give a similar resistance reading on a rear pot slider and its track end, and then tighten the mounting nuts. VR9 can now be mounted on the chassis.



Copper strip breaks occur at the following points:- C/6, F/6, I/5, I/8, L/5, L/9, O/5, O/8, R/5, R/9.

Fig. 24: Component layout of Input circuit board.

Resistor network board

The resistor network components are assembled on a piece of 0·1in. pitch Veroboard 1·9in. wide by 3·1in. long, and this is designed to plug into a 19-way edge connector (SK11) to facilitate easy modification of matrix parameters. The layout of the resistor network board is shown in Fig. 23.

A suitable edge connector, such as the RS Components 0·1in. 25-way, may be cut down to 19 ways with a small saw. When the resistor network board is completed it can be inserted in SK11, and the latter glued to the insulating board on the chassis tray.

Input circuit board

Fig. 24 shows the input circuit board with components mounted on 0·1in. Veroboard, which measures 2in. wide by 1·2in. long.

In Fig. 14 (last month) the lower unit board should have been designated unit B. We regret, that due to pressure on space, final constructional details, wiring and setting up, have had to be held over until next month.

TO BE CONTINUED

TAKE 20

DAVID ANDREWS

No. 55
TRIPLEX SIGNALLING UNIT

A series of simple transistor projects, using not more than twenty components.

THIS project can be used as quite a useful gadget for signalling between the house and a shed or to illuminate signs outside an office door. Signals are produced by two lamps either, or both, of which can be switched on and off. This does not, in itself, sound very clever but the circuit to be described enables one to do this with a single pair of wires. Thus, over two wires one can display three separate codes on the two lamps.

Circuit

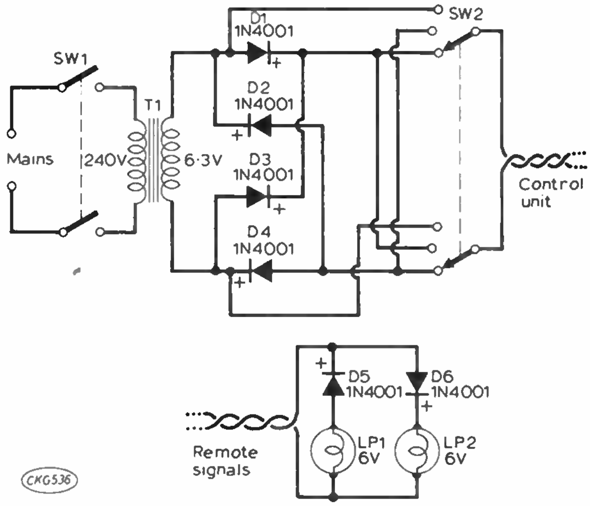
The trick is to make use of positive going half cycles of the mains supply to switch on one lamp. In Fig.1 D6 is forward biased for positive going cycles and LP2 will light but when SW2 is switched to the centre position the polarity of these half cycles is reversed and D5 becomes forward biased, turning on LP1 (D6 becomes reverse biased and LP2 goes out).

The third code, having both lamps on at the same time, is obtained by turning SW2 into the third position which applies a.c. to the signal wire pair direct from the transformer. LP1 and LP2 will now each light up, LP2 on positive and LP1 on negative half cycles.

Variations

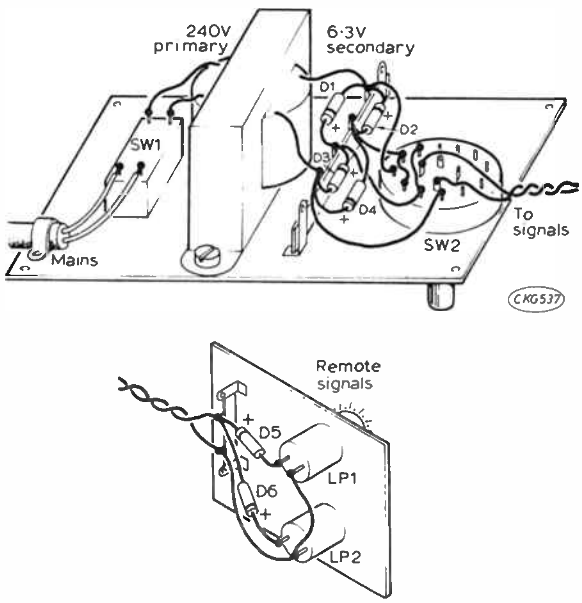
There are many variations to this circuit, and relays could be used instead of the lamps. Provided limiting resistors were inserted into the lines and the voltage reduced to below the reverse breakdown level, light emitting diodes could be used instead of the lamps, diodes D5 and D6 being omitted. For those who do not wish to bother with a.c. and a transformer one can still transmit two codes down the pair of wires by dispensing with the control unit. All that is needed in its place is a suitable battery and a reversing switch on the control end of the signal wires. One polarity will turn on one of the lamps, reverse the polarity of the supply and the other lamp will light. Apart from the diodes most of the components can be salvaged from old equipment. Any 6·3V transformer will do for T1 and probably the best source is an old valved radio.

Fig. 2 shows a suggested layout for the unit, on a metal or insulating material panel, which can be the lid of a box.



▲ *Fig. 1. Circuits of Control Unit and Remote Signals*

▼ *Fig. 2. Author's suggested layout for the two units.*



★ components list

D1–6	Diodes 1N4001
LP1–2	6V Lamps
SW1	2 pole mains switch
SW2	2 pole 3 way wafer switch
T1	Mains transformer, 240/6·3V
	Mounting box, tag strip, etc.

ON THE AIR

BROADCAST BANDS

SHORT WAVE DX
by MALCOLM CONNAH

As many of you will know, propagation conditions vary according to the time of day, the time of year and the position in the 11-year sunspot cycle; as well as other minor factors. This means that, at any particular time, there is an optimum band for reception from any part of the world.

Forecasting these optimum bands is a relatively simple matter once one has collected all the necessary information. The following forecast is for reception in Western Europe and is listed by transmitter site.

North America During the late afternoon the most suitable band will be 25 metres, by 1900 GMT this will have changed to 19 metres but will return to 25 metres by 2300. During the early hours of the morning the most useful frequency will drop still further reaching 31 metres by 0300.

Central & South America The optimum frequency during the late afternoon will be 16 metres and this will drop gradually during the evening to be 19 metres at 1900; 25 metres at 2300 and 49 & 60 metres at 0300.

Middle East The late afternoon finds 19 metres as the best band dropping to 31 metres at 1900 and 41 metres at 2300.

Far East & Australasia Reception for this area will be much the same as the Middle East except that the best band will not drop below 31 metres.

Africa Late afternoon reception will be best on 16 metres dropping to 25 metres at 2000 and 31 metres at 2300.

DX News

COSTA RICA: Radio Capital de Costa Rica has been heard on 4832kHz at 0130 GMT. Reception is poor due to the low power of 1 kW.

ECUADOR: Radio Nacional del Ecuador has been noted with a programme of news and Latin-American music on 6170kHz at 0500 GMT.

EL SALVADOR: La Voz del Comercio, Colonial Sta. Lucia, Santa Ana, is asking for reception reports on 9545kHz. The best time for reception being 1600 GMT.

MEXICO: XERMX has been heard in Spanish on 15195kHz at 0330 GMT, this is a change from the usual frequency of 15125kHz.

TUNISIA: Radio Tunis has been noted on 15226 kHz at 2345 GMT and at 0910 GMT on 11970kHz. (Some of the above items by courtesy of Sweden calling DXers.)

Readers' Logs

John D. Porter of Bakewell (No jokes about Bakewell tarts—please) in Derbyshire has nine transistors and a few other components built into his superhet receiver. This, in combination with a 45 metre long-wire and some attention to the higher frequency bands, produced the following results:

11710 *R. Nacional d'Espana* at 0005.
15110 *R. Grenada, Windward Is.*, English at 2100.
15150 *R. Pyongyang, N. Korea* noted at 2030.
15375 *HCJB, Quito, Ecuador* at 2210.
15415 *R. Kuwait* in English at 1850.
15450 *R. Nacional de Brasilia* in English at 2355.
17820 *R. Canada Int.*, in Polish at 1540.
17885 *HCJB, Quito, Ecuador* noted at 2250.

Andrew Brown of Maidenhead in Berkshire is fourteen years of age so both his National HRO and R107 receivers are older than he is. The connection of a 10 metre long-wire antenna enabled the following stations to penetrate Andrew's shack:

7275 *RAI, Italy* in English at 1936.
9005 *Tehran, Iran* in English at 2000.
9560 *R. Jordan, Amman* in English at 1600.
9655 *R. Damascus, Syria* in English at 1930.
9745 *R. Baghdad, Iraq* in English at 1930.
11765 *Radio Australia* noted at 0710.
15165 *R. Denmark* in Danish at 0945.
15325 *R. Pakistan, Karachi* in English at 1530.
15520 *R. Bangladesh* in English at 1715.
17825 *NHK, Japan* in English at 0800.
21520 *RSA, South Africa* noted at 0755.
21655 *R. Norway*, Oslo in English at 2000.

David Thornley of Dukinfield, Cheshire has a Trio 9R59DS receiver and a Joystick antenna with ATU; which enabled him to hear:

7125 *R. Peking* in English at 0120.
9020 *R. Iran* in English at 2000.
9610 *R. Kiev* in English at 0030.
11672 *R. Pakistan* with news in English at 2000.
11880 *Voice of Turkey* in English at 2000.
15425 *Israel* with news in English at 1200.
17735 *R. Havana, Cuba* in English 2035.
21605 *RSA, South Africa* with quiz show at 1305.

ON THE AIR

MEDIUM WAVE BROADCASTS
by CHARLES MOLLOY

ROY PATRICK (Derby) has been busy with his National 1400 receiver on the medium waves. He reports good reception of Radio London on 1457kHz and the two IBA London transmitters on 557kHz and 719kHz. While on a visit to Farnborough (Hants) Roy logged Radio Brighton 1484kHz, Radio London and Radio Solent on 998kHz.

Richard Livesey (Guildford) has used his Audiotronic multiband receiver with internal ferrite aerial to hear Radio Portugal 755kHz at 2310hrs; Radio Prague 1286kHz; Trans World Radio Monte Carlo 1466kHz at 2230hrs; Radio Moscow 1493kHz at 2230hrs; Radio Warsaw 1502kHz at 2230hrs. All of these broadcast in English.

Ian Gordon (Birmingham) has a Codar CR70A receiver, a 25 metre longwire antenna and an aerial tuning unit (ATU). He reports hearing Radio Tirana 1394kHz with sign-on at 2000hrs; Radio Blackburn 854kHz; R. Leeds 1106kHz; R. Stoke 1502kHz; R. Nottingham 1520kHz; R. Bristol 1546kHz plus the American Forces Network in Germany on 611kHz (Grafenwohr / Kaiserslautern / Nürnberg), 872kHz (Frankfurt), 935kHz (Berlin), 1106kHz (Munich), 1142kHz (Bremerhaven/Stuttgart). The AFN can also be heard on 1034kHz (Karlsruhe), 1304kHz (Heidelberg), 1394kHz (Augsburg).

M. Laugharne (Didcot, Berks) reports hearing R. Solent 998kHz, R. London 1457kHz, R. Oxford 1484kHz and R. Bristol 1546kHz on his Philips portable receiver. T. D. Wilson (Hemel Hempstead) used a Grundig Mariner to hear R. Sweden 1178kHz and R. Portugal 755kHz, both in English at 2300hrs. He mentions receiving WINS, New York City on 1010kHz last February. Gary Celand (Southall, Middlesex) would like to listen to North American stations on the medium waves and when reception is possible. A path of darkness between transmitter and receiver is required for medium wave propagation. Listen for North Americans some five to six hours after sunset in the UK. From November to February they can be logged as early as 2330hrs when conditions are favourable. Those most frequently heard are CJON St. John's in Newfoundland on 930kHz; CHER Sydney, Nova Scotia on 950kHz; WINS New York City on 1010kHz; CBA Moncton, New Brunswick on 1070kHz and WNEW 1130kHz New York City.

The BBC have announced the location of the first four low power medium wave stations which will improve the Radio 4 service to the south-west of England. Torquay 854kHz (351m), Barnstaple 683kHz (439m), Plymouth 1457kHz (206m) should come into service before the end of 1973 and Redruth 755kHz (397m) by the Spring of 1974. The Barnstaple service will replace the present one on 692kHz (434m) while the others will be additional to the existing Radio 4 medium wave service.

VHF/FM DXING
by SIMON DAVID

T. J. Clamp of Cranbrook in Kent lists among other stations in the U.K., Markelo 2 on 98·4MHz and Roermond 1 on 88·3MHz, both from Holland, as well as Aalter, Belgium on 98·5MHz. He uses a Grundig Melody Boy 1,000 receiver and the in-built 86cm telescopic aerial. He also says "How about a list of BBC local radio station frequencies on f.m?" Other readers have also asked for this information, so I have included it in this month's column. The BBC Engineering Information Department issues complete lists with frequencies, powers, and polarization on Information Sheets 1034(24) and 1919(21) for any one with a technical interest. In the not too distant future I shall be giving details of some of the European frequency allocations. Details on Radio Telefis Eireann were given last month.

Igor Hájek has given me some very interesting gen on East European bands. With reference to my comments in the September issue, he points out that East European countries (including U.S.S.R.) use the 65-73MHz band, possibly with a view to making it difficult for their local population to have access to Western broadcasts. In spite of this, Czechoslovakia have tuners that cover West Europe (CCIR) and East Europe (OIRT). How long before we have this facility as commonplace in the U.K.? (see Leader article—Ed.).

This lower frequency band is in the 4 metre area of the dial and does lend itself very well to DX reception, as my colleague David Gibson will testify.

Future plans for stereo on v.h.f./f.m. include Wenvoe and Kirk O'Shotts next year, Pontop Pike and Sandale (near Carlisle) in 1975. It is surprising that Norfolk and Huntingdon areas are not yet planned, especially in view of the flat terrain.

The following is a list of BBC Local Radio stations. Birmingham, Blackburn, Manchester and Teesside will have transmission powers increased. Slant polarisation is employed at Blackburn, Derby, Leeds, Leicester, Manchester, Nottingham, and Sheffield (main). All others use horizontal polarisation. Medium wave shown in brackets.

Birmingham 95·6MHz (206m)
Blackburn 96·4MHz (351m)
Brighton 95·3MHz (202m)
Bristol 95·5MHz (194m)
Carlisle 95·6MHz (397m, 206m)
Derby 96·5, 94·2MHz (269m)
Humberside 96·9MHz (202m)
Leeds 92·4MHz (271m)
Leicester 95·1MHz (188m)
London 94·9MHz (206m)
Manchester 95·1MHz (206m)
Medway 96·7MHz (290m)
Merseyside 95·8MHz (202m)
Newcastle 95·4MHz (206m)
Nottingham 95·4MHz (197m)
Oxford 95·2MHz (202m)
Sheffield 97·4, 88·6MHz (290m)
Solent 96·1MHz (301, 188m)
Stoke-on-Trent 96·1MHz (200m)
Teesside 96·6MHz (194m)

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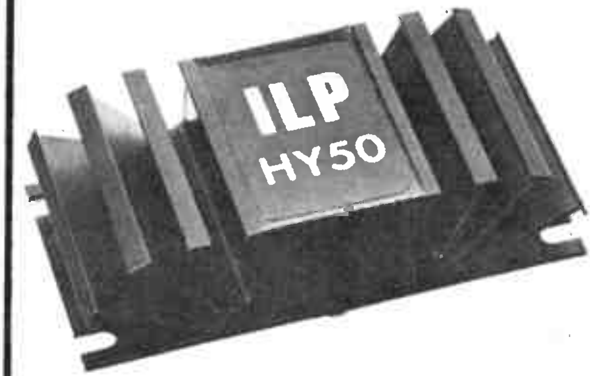

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INPUT IMPEDANCE:	47KΩ
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SIGNAL/NOISE RATIO:	better than 75db
FREQUENCY RESPONSE:	10Hz-50KHz ± 1db
SUPPLY VOLTAGE:	± 25 volts
SIZE:	105 x 50 x 25 mm

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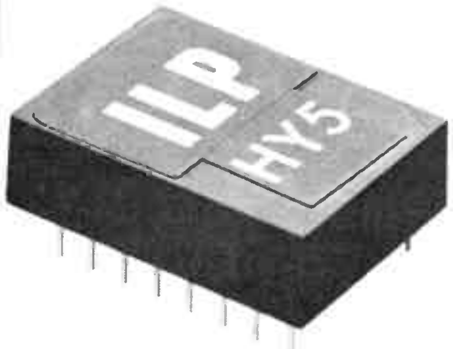

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ON THE AIR

AMATEUR BANDS

SHORT WAVES

by DAVID GIBSON, G3JDG

IT'S an interesting period for Amateur Radio. The sunspot count continues to creep lower and the longer, darker (colder) nights are making 14/21MHz less favourite for DX working. For the s.w.l. who reckons he's up to tackling something a little more difficult, then I suggest a serious DX assault on 7MHz. This will assume more and more the role of the major DX band. Further down, on 3·5MHz, more DX is becoming apparent so it could well be an l.f. DX winter.

On 3·5MHz this past month, goodies like OA4OS, ZS6TE and 9J2DT have been heard while up on 7MHz the air has been buzzing with c.w. offerings from calls like CM2JA, CR6AI, FG7XC, VK3MR, ZS5AN and 8P6DR.

Hair-raising happenings on top band. Several G stations have worked VP8KF in the Falklands. A few years back, this station would never have been thought about on 1·8MHz. Even now, a VP8 would cause excited s.w.l. squeaks if heard on 14MHz. Top-band sleuths are invited to lay in wait for r.f. travellers like ZL1MQ and a few JA stations who are known to be loitering. One station in Japan (JA7AO) has worked all continents (WAC) except Europe so it would be a safe bet to reckon his signal is there somewhere—who'll be first to report it?

Up on ten metres things seem to be fairly static. Long periods when one hears a noise like frying eggs (cheaper variety) and then, suddenly, an S9 plus five million dB's (well, it sounds like it) comes out of nowhere. South African stations are logged without too much effort and the South American continents comes romping in at times. Don't forget to listen first for the beacon stations since these will give a useful indication of what the bands are doing.

Before we take a peep at the logs sent in this month, let's open up the JDG little black book for contests in November. According to my crystal ball, the following are on: November 10-11, OK DX contest (c.w./phone); 10-11, topband contest; 11, four metre contest; 24-25, CQ WW (c.w./phone) contest.

First event in December is on the 9th and is a two metre contest for fixed stations—you've just got time to tie that 40-element Yagi beam to the chimney pot and switch on!

Readers' Logs

Dave Gregory (Plymouth) confesses, "I have been a Broadcast Bands maniac (is there any other kind?) for some months now". Brethren will be pleased to know that my Brother Gregory has seen the light and cleansed his sins by purchasing a 9R-59DS, RA-1 and CR100. With a homebrew a.t.u. and "DX processing unit" Dave repents on 14MHz with the following log; A51PN, A6XP, AR1RSP, EA7PS (an XYL—O'lay); WA5FW, ZB2BL, 3A2EE, 4Z4MQ, 5Z4GB, 5Z4GK.

A. McNeill (Newbury), comments on the many eastern europeans loose on 14MHz. He also praises the DX'ers processing unit which was featured in P.W. and queries the callsign NI3A who keeps popping up. Are there NI takers to answer this?

Derek Harding (Godstone) says he's 23 years old and has been an s.w.l. for four days (What a waste of 22 years, 361 days). Derek asks how he can filter out the various loud whistles which beset him? Anyone got any thoughts other than the on/off switch?

John Turner sends in a 21MHz selection from a log made during his school holidays (think of all the conkers you missed). Gear in his bedroom at Doncaster includes a Pye Cambridge receiver with an 85ft end fed supplying the microvolts to the tune of; A2CCY, CE3OE, CN8CG, CP1HL, CR6AD, CT1BY, CX2CS, CX7BM, DU1FE, EA8CS, EA8HH/M, EL1G, ET3USA, HK3CDW, HS4AJL, JA4PE, JA6PIC, JA7KHZ, JH1DEV, KP4AD, KZ5EK, LU5MAO, M1C, PZ1DR, TI2IO, TR8VT, TU2DO, VK4PU, VP2MF, VP8ML, VP9CB, VQ9BP, YN1AZ, YV5EED, ZD3D, ZD8MH, ZS4JW, 4Z4LM, 7X0WW, 8R1J, 9G1AF, 9H1DP, 9M2DQ, 9U5CR, 9X5VA.

Tam Large (Hassocks) lives on a farm in Sussex. His favourite animal is a 9R-59DE. Feed it a staple diet of mains electricity and put it on a 200ft. end fed lead and it yields the following twenty metre tweets; CR6LX, HP1TG, K2LZQ/OH0, M1C, PZ1DR, 4W1AF. Similar treatment brought forth the following from 21MHz; TG9CQ, XE1GR, ZD3D, 9M2CX.

Paul Davies (Blackpool) is learning to read c.w. (good lad). Meanwhile, he listens with baited breath on 14MHz to the following juicy jingle; CR6GA, EL8J, EP2SP, ET3GA, HR2WTA, IB0PV, JA4JUV/MM, JY6HCT, KA6HQ, 9H1CQ, 9H4B, 9K2AL, 9M2DW, 9X5NA, all on s.s.b. Gear used is a Heath HR-10B, Joystick antenna and an a.t.u.

S. Eldridge (Crawley), has a CR70A, 132ft. end-fed looped round the bedroom and a yen to listen on 15 metres. Here's the gen on his yen; A6XB, CE3PY, CR6AG, CR6HZ, CT2AB, HI8LC, JA8ISK, JE1MUM, JF1IUA, JH3EXI, JR1TAM, KA2PJ, LU6FEP, PT2JB, TI2STI, TR8VE, VQ9M, VU2DK, ZP5VO, ZS1J, ZS4JW, 5N2ESH, 5U7BA, 9X5VA.

BROADCAST BANDS

Short Wave Reports by 15th of the month to Malcolm Connah, 59 Windrush, Highworth, Swindon, Wiltshire, SN6 7DT.

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

VHF/FM Reports to Simon David, c/o Practical Wireless, Fleetway House, Farringdon Street, London, EC4A 4AD.

AMATEUR BANDS

Short Wave/VHF

Logs in alphabetical order please by 15th of the month to David Gibson, G3JDG, 12 Cross Way, Harpenden, Hertfordshire.

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AC127	15p	AF178	32p	BF177	28p	OC45	12p	2N3709	11p
AC128	15p	AF180	40p	BF178	32p	OC70	12p	2N3710	11p
AC131	12p	AF181	40p	BF179	32p	OC71	12p	2N3711	11p
AC132	12p	BC107	12p	BF180	32p	OC72	12p	2N3819	32p
AC176	15p	BC108	12p	BF181	32p	OC81	12p	2N4062	12p
AC187	22p	BC109	12p	BF194	14p	OC82D	12p	2N4286	20p
AC188	22p	BC147	12p	BF195	14p	2N2646	60p	2N4289	20p
AD140	50p	BC148	12p	BF197	15p	2N2904	20p	40360	35p
AD149	45p	BC149	12p	BF200	32p	2N2926	10p	40361	35p
AD161	33p	BC157	14p	BFY50	20p	2N3054	58p	40362	40p
AD162	36p	BC158	14p	BFY51	20p	2N3055	60p	40408	40p
AF114	20p	BC159	14p	BFY52	20p	2N3702	13p	ZTX108	15p
AF115	20p	BC187	22p	BUY105	225p	2N3703	12p	ZTX300	15p
AF116	20p	BD131	75p	OC26	45p	2N3704	13p	ZTX302	20p
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7406	50	45	40	35
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7408	36	30	27	23
7409	36	30	27	33
7410	18	16	14	13
7411	23	21	20	18
7412	36	30	27	23
7413	34	28	26	22
7416	45	43	39	34
7420	18	16	14	13
7421	36	30	27	23
7426	32	29	23	20
7430	20	18	16	14
7432	40	36	32	28
7440	20	18	16	14
7441	80	75	70	65
7442	80	75	70	65
7443	125	120	115	115
7447	175	165	150	120
7448	185	175	170	165
7450	18	16	14	13
7451	18	16	14	13
7453	18	16	14	13
7454	18	16	14	13
7460	18	16	14	13
7470	30	28	25	24
7472	30	28	27	23
7473	40	38	36	30
7474	40	36	32	28
7475	55	52	50	49
7476	40	36	32	30
7480	100	95	90	85
7481	125	115	110	105
7482	100	96	90	85
7483	100	97	95	92
7484	120	115	110	105
7485	250	245	240	230
7486	45	42	37	33
7490	75	67	60	52
7491A	100	92	85	79
7492	75	70	65	60
7493	75	68	60	52
7494	95	90	85	80
7495	105	100	95	90
7496	100	95	90	85
74100	250	240	235	230
74118	100	82	73	64
74121	43	40	38	36
74141	100	95	90	85
74145	150	140	135	130
74150	330	280	250	220
74151	110	100	95	89
74153	120	110	105	95
74154	200	180	170	160
74155	150	120	100	86
74156	130	120	100	96
74180	155	136	112	105
74190	195	190	185	180
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6F1	.70
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6F13	.45
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6F18	.55
6F23	.65
6F24	.60
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6F28	.60
6F32	.30
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6SK7GT	.44
6SQ7GT	.38
6U4GT	.70
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6V6GT	.27
6X4	.27
6X5GT	.28
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7H7	.55
7R7	1.50
7Y4	.65
7Z4	.80
9D7	.40
10C2	.65
10DE7	.55
10F1	·50
10F9	.65
10F18	.55
10LD11	.70
10P13	.54
10P14	2.00
12A6	1.00
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12AD6	.60
12AE6	.60
12AT6	.28
12AU6	.38
12AV6	.28
12BA6	.30
12BE6	.30
12BH7	.27
12J7GT	.55
12K5	.53
12K7GT	.38
12Q7GT	·45
12SC7	.50
12SG7	.38

12SH7	.35
12SJ7	.44
12SK7	.55
12SQ7	·55
14H7	.55
14S7	.75
19AQ5	.42
19G6	1.40
20D4	2.00
20F2	.67
20L1	.80
20P1	.55
20P3	.75
20P4	.80
20P5	.95
25A6G	.38
25L6G	.20
25Y5G	.70
25Z4G	.33
25Z5	.60
25Z6G	.70
28D7	1·00
30A5	.65
30C15	.58
30C17	.76
30C18	.70
30F5	.61
30FL1	.58
30FL2	.60
30FL12	.69
30FL13	.50
30FL14	.66
30L15	.55
30L17	.65
30P4MR	.95
30P12	.69
30P19/30P4	.65
30PL1	.57
30PL13	.75
30PL14	.75
30PL15	.87
35A3	.48
35D5	·70
35L6GT	.42
35W4	.23
35Z4GT	.24
35Z5GT	.30
50B5	·35

50C5	·32
50CD6G	2·17
50EH5	·55
50L6GT	.45
85A2	.43
85A3	·40
90C1	.59
90CG	1·70
150B2	.58
807	.59
5702	·80
5763	.50
7475	·70
AC/PEN	·98
AC2/PEN/DD	.98
AC6PEN	.38
AC/TH1	·50
AC/TP	.98
AL60	.78
ATP4	.40
AZ1	.40
AZ31	.46
AZ41	.53
CL33	.90
CV63	.53
CY1C	.55
CY31	.29
DAF91	.22
DAF96	.36
DC90	.60
DF91	.16
DF96	.36
DH63	.44
DH76	.45
DK40	.55
DK92	.50
DK96	.45
DL92	·26
DL96	.38
DM70	.30
DM71	.50
DY87/6	.22
DY802	.30
E80CC	1·65
E80F	1.20
E83F	1.20
E88CC	.60
E92CC	.40
E180F	.90

E182CC	1.00
E1148	.53
EA50	.27
EA76	.88
EABC80	.30
EAC91	.38
EAF42	.48
EAF801	.50
EB34	.25
EB91	.12
EBC41	.48
EBC81	.29
EBF80	.30
EBF83	.38
EBF89	.26
EBL21	.60
EC86	.59
EC88	.59
EC92	.34
ECC33	1.50
ECC35	·95
ECC40	.68
ECC81	.20
ECC82	.21
ECC83	.22
ECC84	·30
ECC85	.34
ECC86	·40
ECC88	.35
ECC189	.48
ECC804	.55
ECC807	1·00
ECF80	.27
ECF82	.25
ECF86	.64
ECF804	2.10
ECH21	.63
ECH35	.50
ECH42	.59
ECH81	.28
ECH83	.38
ECH84	.34
ECL80	.28
ECL82	.28
ECL83	.52
ECL84	.54
ECL85	.54
ECL86	.38
EF22	.63

EF40	.49
EF41	.58
EF42	.33
EF73	·75
EF80	.23
EF83	.54
EF85	.28
EF86	.30
EF89	.23
EF91	.17
EF92	.30
EF97	·55
EF98	.65
EF183	.25
EF184	.27
EF804	1.20
EH90	.34
EL32	·50
EL34	.48
EL35	1.00
EL37	·74
EL41	.53
EL81	.50
EL83	.38
EL84	.23
EL85	.40
EL86	.35
EL91	.38
EL95	.32
EL360	1.20
ELL80	·75
EM80	.37
EM81	.37
EM83	.75
EM84	.31
EM85	1.00
EM87	.49
EY51	.35
EY81	.35
EY83	.54
EY84	.50
EY87/6	.27
EY88	.40
EZ40	.40
EZ41	.42
EZ80	.19
EZ81	.20
GY501	.75
GZ32	.39
GZ33	.70
GZ34	.57

GZ37	.67
HABC80	.44
HL23DD	.40
HL41DD	.98
HL42DD	.50
HN309	1·40
HVR2	.53
HVR2A	.53
KT2	.25
KT41	.98
KT44	1.00
KT66	.80
KT81	2.00
KTW61	.63
KTW62	.63
KTW63	.50
MHLD6	.75
P61	.40
PABC80	.32
PC86	.44
PC88	.44
PC95	.53
PC97	.36
PC900	.29
PCC84	.29
PCC85	.24
PCC88	.39
PCC89	.42
PCC189	.46
PCF80	.26
PCF82	.30
PCF84	.40
PCF86	.44
PCF200	.67
PCF801	.40
PCF802	.37
PCF806	.55
PCH200	.62
PCL82	.29
PCL83	.54
PCL84	.32
PCL805/85	.55
PCL86	.36
PD500	1.44
PEN4DD	1.38
PEN45	.80
PEN45DD	.80
PEN46	.20

PEN453DD	.98
PENDD-4020	.88
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PL33	.38
PL36	.46
PL81	.48
PL81A	.48
PL82	.31
PL83	.30
PL84	.28
PL504/500	·60
PL508	.90
PL509	1.00
PL802	.85
PY33/2	.50
PY81	.25
PY82	.25
PY83	.26
PY88	.31
PY500	.80
PY500A	.80
PY800	.31
PY801	.31
PZ30	.48
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Q895/10	.49
QV04/7	.63
R19	.28
TH233	.98
TP2620	.98
UABC80	.30
UAF42	.49
UBC41	.45
UBC81	.40
UBF80	.33
UBF89	.33
UBL21	.55
UC92	.35
UCC84	.33
UCC85	.33
UCF80	.31
UCH21	.60
UCH42	.57
UCH81	.29
UCL82	.30
UCL83	.54

UF41	.50
UF42	.60
UF80	.35
UF85	.34
UF86	.63
UF89	.27
UL41	.54
UL84	.28
UM80	.33
UY41	.38
UY85	.23
U10	.45
U12/14	.38
U19	1.73
U25	.65
U26	.60
U191	65
U251	.62
U301	·40
U403	.33
U404	.38
U801	.76
U4020	.55
VP23	.40
VP41	.38
VT61A	.35
VU111	.44
VU120	.60
VU120A	.60
VU133	.35
W107	.50
W729	.60
X65	.50
X66	.50
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2N2369	·24
2N2613	·43
2N3053	·36
2N3121	2·75
2N3703	·21
2N3709	·22
2N3988	·55
28323	·55
AA119	·17
AA120	·17

AA129	·17
AAZ13	·20
AC107	·17
AC113	·28
AC126	·14
AC127	·19
AC128	·22
AC132	·22
AC154	·28
AC156	·22
AC157	·28
AC165	·28
AC166	·28
AC168	·42
AC176	·61
AC177	·31
ACY17	·28
ACY18	·22
ACY19	21
ACY20	·20
ACY21	·21
ACY22	·17
ACY28	·20
AD140	·40
AD149	·55
AD161	·50
AD162	·50
ADT140	·69
AF106	·55
AF114	·28
AF115	·17
AF117	·21
AF121	.33
AF124	·28
AF125	·19
AF126	·20
AF139	·72
AF178	·75
AF180	·53
AF186	·61
BA115	·15
BA116	·28
BA129	·14
BA130	·11
BA153	·17
BC107	·14

BC108	·14
BC113	·28
BC115	·17
BC116	·28
BC118	·25
BCY10	·50
BCY12	·55
BCY33	·22
BCY34	·25
BCY38	·25
BCY39	·28
BCZ11	·42
BF158	32
BF159	·28
BF163	·22
BF173	·42
BF180	·38
BF181	·44
BF185	·44
BF194	·17
BFY50	·25
BFY51	·21
BFY52	·22
BY100	·20
BY105	·20
BY114	·20
BY126	·17
BY127	·20
BYZ10	·28
BYZ11	·28
BYZ12	·28
BYZ13	·28
CG12E	·22
FSY11A	·25
FSY41A	·25
GD9	·22
GET113	·22
GET118	22
GET119	·27
GET587	·47
GET873	·17
GET887	·25
GET897	·25
GET898	·25
M1	·17
OA5	·31

OA9	·14
OA10	·47
OA47	·11
OA70	·17
OA73	·17
OA79	·10
OA81	·10
OA85	·09
OA90	·14
OA91	·10
OA95	·10
OA200	·10
OA202	·11
OC22	·42
OC23	·42
OC24	·42
OC25	·42
OC35	·35
OC36	·47
OC44	·11
OC45	·12
OC46	17
OC70	·14
OC71	·12
OC72	·12
OC74	·25
OC75	·12
OC76	·17
OC77	·30
OC78	·17
OC78D	·17
OC81	·12
OC81D	·12
OC82	·12
OC82D	·12
OC83	·22
OC84	·26
OC123	·25
OC139	·25
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OC172	·39
OC200	·24
OC201	·42
OC203	·33
OC204	·33
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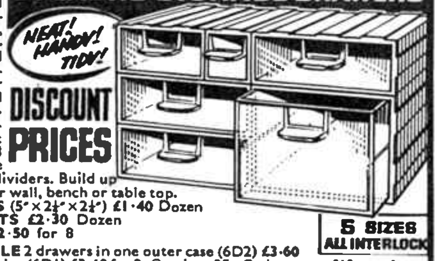

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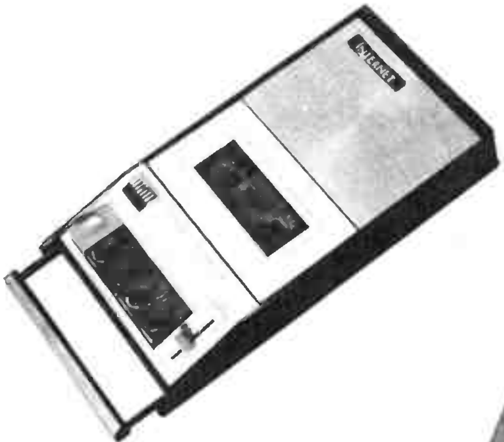

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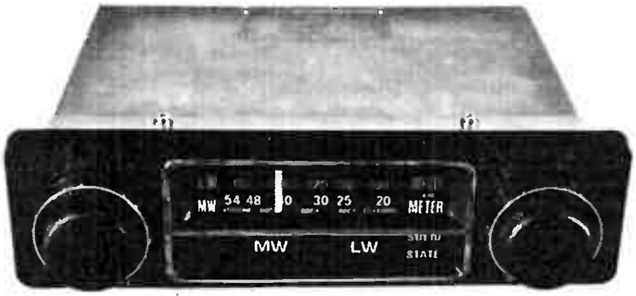

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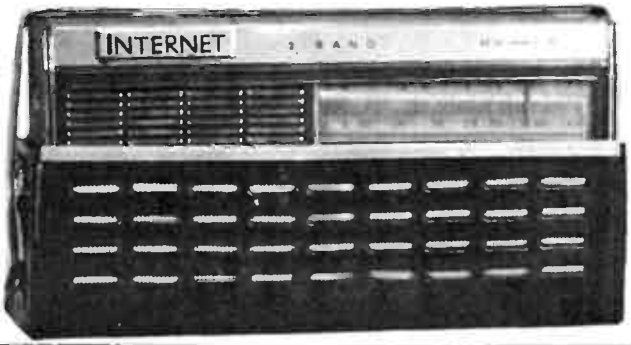

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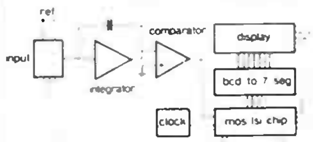

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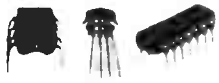

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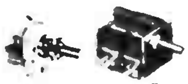

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2.2							6½p	
3.3							6½p	
4.7							6½p	8p
6.8						6½p	6½p	
10					6½p		6½p	9p
15				6½p		6½p		
22			6½p		6½p		6½p	11p
33		6½p		6½p		6½p		
47	6½p		6½p		6½p	6½p	8p	
68		6½p		6½p			10p	
100	6½p		6½p		6½p	8p	11p	23p
150		6½p		6½p	6½p	10p	13p	
220	6½p		6½p	8p	10p	11p	19p	31p
330	6½p		8p				22p	39p
470		6½p	10p		13p	19p	26p	48p
680		10p		13p	20p	23p		59p
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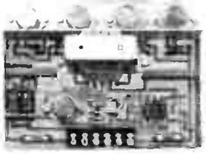
TUAC



NEW TUAC POWER MODULES. Now in their second successful year offering more power and quality than ever before.

TP100 Illustrated **£15·25**
- ★ 125 Watts RMS continuous sine wave output
- ★ 4 RCA 150 Watt 15 Amp output transistors
- ★ Special layer wound driver transformer
- ★ Short, open, and thermal overload protection
- ★ Compact size: 7 x 6½ x 3 in.

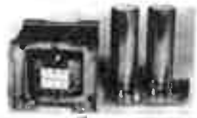
TL100 Illustrated **£11·50**
- ★100 Watts RMS sine wave
- ★2 RCA 15 Amp output transistors
- ★Rugged transformer driver
- ★Full thermal overload protection
- ★Compact size: 5 x 5 x 3 in.

TL60 **£9·75**
- ★ 60 Watts RMS sine wave
- ★RCA 115 Watt output transistors
- ★Only six connections to make
- ★Same size as TL100

Specification on all three power modules :
All output power ratings ±1dB. Output impedance 8–15 Ohms. THD at full power 1% typically 0·5%.
Input sensitivity 60mV into 10kΩ. Frequency response 10Hz–25kHz ±2dB. Hum and noise better than −75dB.

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

PS 125	±50 volts for one TP100	£8·75
PS 100	±45 volts for one TL100	£8·00
PS 60	±40 volts for one TL60	£6·75
PSU 2	For supplying Disco Mixer	£3·50



PRE AMPLIFIERS

All Tuac audio modules are constructed on glass fibre P.C. board, are ready assembled and fully tested. Low noise silicon and FET transistors together with H.S. carbon film resistors are used throughout. Extensive research has gone into the various wide range tone control circuits, producing superb sound quality from any signal. Previous range still available. 40V d.c.; 60mV o/p.

VA08 Vol. Treb. Mid and Bass Controls. HI IMP. FET I/P. Suitable Mic. Guitar, Radio. Crystal/Ceramic P.U. Sensitivity 4mV. Treb +35dB at 16kHz, Mid +20–15dB at 1kHz, Bass +20–10bB at 40Hz. **£4·22**

VA06 Vol. Treb and Bass Controls. 8mV sensitivity. Treb +28–15dB at 12kHz, Bass ±18dB at 40Hz. **£3·72**

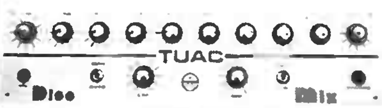
AMF01 Tuac Auto Fade Unit fades music when you speak. Auto Mic Over-ride for Disco use. Feed Deck and Mic Pre-amps in. Auto fade O/P to main Amp. 30mV operating level. Depth and Vol. Controls. **£4·40**

VA08 ILLUSTRATED

SIZE 6½" x 2" x 1"

ALL PRICES INCLUDE V.A.T. AND POSTAGE AND PACKING

ACCESS & BARCLAY CARDS ACCEPTED, JUST SEND US YOUR NUMBER. H.P. ARRANGED THROUGH PAYBONDS.



TUAC DISCOTHEQUE MIXER WITH AUTO FADE **£22·50**
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. Treb. & Bass. H. Phon Vol, Selector. Master Vol, on/off sw. Max. output 1V RMS. Specification as VA06. **PANEL SIZE 18" x 4½" DEPTH 3"**

TUAC HIGH POWER AMPLIFICATION—built to high standards, and built to last

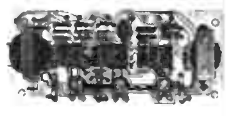
50 WATT RMS SINE WAVE ALL PURPOSE AMPLIFIER
Suitable for Disco, PA, Guitar. 4 inputs, 2 volume controls. Master volume, treble, middle and bass controls. Rugged circuit, rugged leather-cloth covered case, short and open circuit protection. Tone control specification as VA08 pre-amp. FULLY FUSED.

50 WATT £42·25

100 WATT £61·50

TUAC LIGHT MODULATORS

Constructed on glass fibre P.C. board, individually tested.
Three channel light modulator will control three separate sets of lights, up to 1000 Watts each set. One channel responds to the bass, one to the middle, and one to the high frequencies. Input sensitivity only 0·5 Watt ! Three individual controls allow for adjustment of the three channels, and a master sensitivity control allows for input levels up to 100 Watts to be safely accommodated. Full interference suppression. Full wave control. Isolating input transformer does not affect Amplifier operation. Fully Fused.



3 Channel SILMB illus.

SILMB 3 Channel £17·45

SINGLE CHANNEL VERSION S2LMB
Increased capacity of 1800 Watts. Sensitivity control. Isolating input transformer does not affect amplifier operation.

S2LMB 1 Channel £6·47

MANUFACTURERS OF ELECTRONIC AND AMPLIFICATION EQUIPMENT
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TRANSISTORS IN STOCK

We hold a very large range of fully marked, tested and guaranteed transistors, power transistors, diodes and rectifiers at very competitive prices. Please send for free catalogue.

Silicon planar plastic transistors. Unmarked, untested factory clearance. A random sampling showed these to be of remarkably high quality.

Audio PNP, similar to ZTX500, 2N3702/3, BCY70 etc.

Audio NPN, similar to ZTX300, 2N3708/9, BC107/8/9, BC168/9 etc.

Please state Audio NPN or Audio PNP when ordering.

ALL AT 500 for £3·30, 1,000 for £5·50, 10,000 for £44 P. & P. 11p/1,000.

OUR VERY POPULAR 4p TRANSISTORS

TYPE "A" PNP Silicon alloy, TO-5 can.
TYPE "B" PNP Silicon, plastic encapsulation.
TYPE "E" PNP Germanium AF or RF.
TYPE "F" NPN Silicon plastic encapsulation.
TYPE "G" NPN silicon similar ZTX 300 range
TYPE "H" PNP silicon similar ZTX 500 range

8 RELAYS FOR VARIOUS TYPES P & P 27½ £1·10

FREE CATALOGUE FOR

TRANSISTORS, RECTIFIERS, DIODES, INTEGRATED CIRCUITS, FULL PRE-PAK LISTS

TESTED AND GUARANTEED PAKS

B79	4	IN4007 Sil. Rec. diodes. 1,000 PIV lamp plastic	55p
B81	10	Reed Switches, 1" long, ⅛" dia. High Speed P.O. type	55p
B99	200	Mixed Capacitors. Approx. quantity, counted by weight P & P 15p	55p
H4	250	Mixed Resistors. Approx. quantity counted by weight P & P 15p	55p
H7	40	Wirewound Resistors. Mixed types and values.	55p
H9	2	OCP71 Light Sensitive Photo Transistor	55p
H28	20	OC200/1/2/3 PNP Silicon uncoded TO-5 can	55p
H30	20	1 Watt Zener Diodes. Mixed Voltages 6.8 – 43V.	55p
H35	100	Mixed Diodes, Germ. Gold bonded, etc. Marked and Unmarked.	55p
H36	30	Short lead Transistors, NPN Silicon Planar types.	55p
H39	6	Integrated Circuits. 4 Gates BMC 962, 2 Flip Flops BMC 945	55p
H40	20	BFY50/2, 2N696, 2N1613 NPN Silicon uncoded TO-5	55p
H41	2	Sil Power transistors comp pair BD131/132	55p

UNMARKED UNTESTED PACKS

B1	50	Germanium Transistors PNP, AF and RF	55p
B66	150	Germanium Diodes Min. glass type	55p
B83	200	Trans. manufacturers' rejects all types NPN, PNP, Sil. and Germ.	55p
B84	100	Silicon Diodes DO-7 glass equiv. to OA200, OA202	55p
B86	100	Sil. Diodes sub. min. IN914 and IN916 types	55p
H6	40	250mW. Zener Diodes DO-7 Min. Glass Type	55p
H15	30	Top Hat Silicon Rectifiers, 750mA. Mixed volts	55p
H16	15	Experimenters' Pak of Integrated Circuits. Data supplied	55p
H17	20	3 amp. Silicon Stud Rectifiers, mixed volts	55p
H20	20	BY126/7 Type Silicon Rectifiers 1 amp plastic. Mixed volts.	55p
H34	15	Power Transistors, PNP, Germ. NPN Silicon TO-3 Can.	55p

Our famous PI Pak is still leading in value for money.

Full of Short Lead Semiconductors & Electronic Components, approx. 170. We guarantee at least 30 really high quality factory marked Transistors PNP & NPN, and a host of Diodes & Rectifiers mounted on Printed Circuit Panels. Identification Chart supplied to give some information on the Transistors. Please ask for Pak P.I. Only 55p. 11p P & P on this Pak.

PLASTIC POWER TRANSISTORS

NOW IN TWO RANGES

These are 40W and 90W Silicon Plastic Power Transistors of the very latest design, available in NPN or PNP at the most shatteringly low prices of all time. We have been selling these successfully in quantity to all parts of the world and we are proud to offer them under our Tested and Guaranteed terms.

Range 1. VCE. Min 15. HFE Min 15.

	1–12	13–25	26–50
40 Watt	22p	20p	18p
90 Watt	26½p	24½p	22p

Range 2. VCE. Min 40. HFE Min 40.

	1–12	13–25	26–50
40 Watt	33p	31p	29p
90 Watt	38½p	36½p	33p

Complementary pairs matched for gain at 3 amps. 11p extra per pair. Please state NPN or PNP on order.

INTEGRATED CIRCUITS

We stock a large range of I.Cs at very competitive prices (from 11p each). These are all listed in our FREE Catalogue, see coupon below.

METRICATION CHARTS now available

This fantastically detailed conversion calculator carries thousands of classified references between metric and British (and U.S.A.) measurements of length, area, volume, liquid measure, weights etc. Pocket Size 15p. Wall Chart 18p.

LOW COST DUAL IN LINE I.C. SOCKETS

14 pin type at 16½p each } Now new low profile
16 pin type at 18p each } type

BOOKS

We have a large selection of Reference and Technical Books in stock.
These are just two of our popular lines:

B.P.1 Transistor Equivalents and Substitutes; 40p
This includes many thousands of British U.S.A., European and C.V. equivalents.

The Iliffe Radio Valve & Transistor Data Book 9th Edition; p. & p. 23½p. 75p
Characteristics of 3,000 valves and tubes, 4,500 Transistors, Diodes, Rectifiers and Integrated Circuits.

Send for lists of publications
N.B. Books are void of V.A.T.

A CROSS HATCH GENERATOR FOR £3.85 ! ! !

YES, a complete kit of parts including Printed Circuit Board. A four position switch gives X-hatch, Dots, Vertical or Horizontal lines. Integrated Circuit design for easy construction and reliability. This was a project in the September 1972 edition of Television.

This complete kit of parts costs £3·85, post paid.

A MUST for Colour T.V. Alignment.

ELECTRONIC TRANSISTOR IGNITION

Now in kit form, we offer this "up to the minute" electronic ignition system. Simple to make, full instructions supplied with these outstanding features:—
Transistor and conventional switchability, burglar proof lock up and automatic alarm, negative and positive compatability. This project was a "star" feature in the September edition of "Electronics Today International" magazine. Our kit is recommended by the ETI magazine.

Complete kit including p & p £7·92
Ready built and tested unit £3·02 extra.

MAKE A REV COUNTER FOR YOUR CAR

The 'TACHO BLOCK'. This encapsulated block will turn any 0-1mA meter into a linear and accurate rev. counter for any car with normal coil ignition system.

£1·10 each

Please send me the FREE Bi-Pre-Pak Catalogue.

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RECORD PLAYBACK HEADS (TRUVOX)

Individual prices of these are:—
2 track record playback heads 50p each
4 track record playback heads 72p each
Erase heads are also available separately—2 track 33p—4 track 55p
MU-metal mounting shields 39p each.
2 track-heads already fixed on heavy mounting plate with shield £1·22.

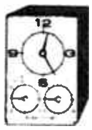
DRILL CONTROLLER

NEW 1KW MODEL

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. £1·95. Made up model also available. £2·95.

MIGHTY MIDGET

Probably the finest possible radio, as described in *Practical Wireless*, January 73. All electronic parts £2·20 post paid.



TIME SWITCH

Smith's mains driven clock with 15 amp switch, also notes showing how you can wake up with music playing, kettle boiling or come home to a warm house, warn off burglars, keep pets warm, halve your heating bill, etc. £1·95.

I CHIP RADIO

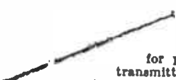
Ferranti's latest device ZN414—gives results better than superhet. Supplied complete with technical notes and circuits. £1·38 each. 10 for £11·11.

HI-Q TUNER COMPONENTS

For experimenting with the ZN414.
KIT NO. 1. Plessey Miniature Tuning Condenser with built-in LW switch and 3" Ferrite slab and litz wound MW coil, 72p.
KIT NO. 2. Air spaced tuning condenser 6" ferrite rod litz wound MW and LW coils, 94p.
KIT NO. 3. Air spaced TC with slow motion drive 8" ferrite rod, with litz wound LW and MW coils, £1·10.
KIT No. 4. Permeability tuner with fast and slow motion drive and LW loading coils, 50p.

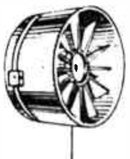
AUTO—ELECTRIC CAR AERIAL

with dashboard control switch—fully extendable to 40in or fully retractable. Suitable for 12V positive or negative earth. Supplied complete with fitting instructions and ready wired dashboard switch. £6·35 plus 25p post and insurance.



TELESCOPIC AERIAL

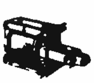
for portable, car radio or transmitter. Chrome plated—six sections, extends from 7½ to 47in. Hole in bottom for 6BA screw, 42p. KNUCKLED MODEL FOR F.M. 55p.



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, 5½" casing with 5½" fan blades. Kit comprises motor, fan blades, sheet steel casing, pull switch, mains connector, and fixing brackets, £3·75 plus 20p post and ins.

MAINS OPERATED SOLENOIDS



Model 772 — small but powerful 1in. pull— approx size 1½ × 1¼ × 1¼in. 66p. Model 4001/—½in. pull. Size 2½ × 2 × 14in. 83p. Model TT1—1½in. pull. Size 3 × 2½ × 2in £1·98 plus 20p post and insurance

MAINS TRANSISTOR POWER PACK

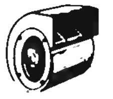
Designed to operate transistor sets and amplifiers. Adjustable output 6v., 9v., 12 volts for up to 500mA (class B working). Takes the place of any of the following batteries: PP1, PP3, PP4, PP6, PP7, PP9, and others. Kit comprises: mains transformer rectifier, smoothing and load resistor condensers and instructions. Real snip at only £1·10 plus 20p postage.

DESK TELEPHONES

Ex G.P.O. Black standard model with dialling dial but no internal bell. Supplied with connection diagram £1 each. Ditto with bell but without dialling dial £1·25 model as illustrated with bell and dial £1·50 each plus 50p post for single then 65p per pair.

SMOKE WILL KILL—GAS WILL KILL—FIRE WILL KILL

But, if you install SAGA (our smoke and gas alarm) your family will have the latest electronic protection against these killers.
Saga uses a fantastic electronic sensor which "smells" smoke and gas and sounds the alarm immediately. In a neat case measuring approx. 5" × 3½" × 2½", it has its own internal alarm, also a connector for additional bells. You just plug it in to the mains and hang it near the ceiling. Saga uses so little electricity that it will hardly move the meter, leave it on always to give night and day protection. £6·99 plus 30p post or Kit of Parts £5·99. Battery Model Kit only £4·99.



CENTRIFUGAL FAN

Mains operated, turbo blower type. Pressed steel housing contains motor and impeller. Motor is 1/10th h.p. giving considerable air flow but virtually no noise. Approx. dimensions 10½ in. wide × 12 in. dia. outlet into trunking 10½ × 4½ in. £6·55 plus £1 post and insurance.

STANDARD WAFER SWITCHES

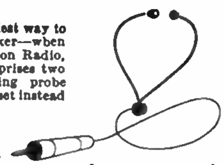
Standard size 1½" wafer—silver-plated 5 amp contact, standard ¼" spindle 2" long—with locking washer and nut.

No. of Poles	2way	3way	4way	5way	6way	8way	9way	10way	12way
1 pole	44p	44p	44p	44p	44p	44p	44p	44p	44p
2 poles	44p	44p	44p	44p	44p	44p	44p	77p	77p
3 poles	44p	44p	44p	44p	77p	77p	77p	£1·04	£1·04
4 poles	44p	44p	44p	77p	77p	77p	77p	£1·32	£1·32
5 poles	44p	44p	77p	77p	£1·04	£1·04	£1·04	£1·60	£1·60
6 poles	44p	77p	77p	77p	£1·04	£1·04	£1·04	£1·87	£1·87
7 poles	77p	77p	77p	£1·04	£1·32	£1·32	£1·32	£2·15	£2·15
8 poles	77p	77p	77p	£1·04	£1·32	£1·32	£1·32	£2·42	£2·42
9 poles	77p	77p	£1·04	£1·04	£1·60	£1·60	£1·60	£2·70	£2·70
10 poles	77p	77p	£1·04	£1·32	£1·60	£1·60	£1·60	£3·00	£3·00
11 poles	77p	£1·04	£1·04	£1·32	£1·87	£1·87	£1·87	£3·25	£3·25
12 poles	77p	£1·04	£1·04	£1·32	£1·87	£1·87	£1·87	£3·52	£3·52

TWENTYLITE

Fluorescent lighting units with polyester choke and finished white enamel. 2ft. model. Ideal kitchen, bedroom, hallway, porch, lift, etc., with tube. Assembled ready to install. Price £2·50 + 25p p. & p.

RADIO STETHOSCOPE



Easiest way to fault find—traces signal from aerial to speaker—when signal stops you've found the fault. Use it on Radio, TV, amplifier, anything—complete kit comprises two special transistors and all parts including probe tube and crystal earpiece. £2·20—twin stethoset instead of earpiece 83p. extra—post and ins. 20p

TANGENTIAL HEATER UNIT

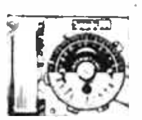
This heater unit is the very latest type, most efficient, and quiet running. Is as fitted in Hoover and blower heaters costing £15 and more. We have a few only. Comprises motor, impeller, 2kW, element and 1kW. element allowing switching 1, 2 and 3kW, and with thermal safety cut-out. Can be fitted into any metal line case or cabinet. Only needs control switch. £3·85. 2kW. Model as above except 2kW. £2·75. Don't miss this. Control Switch 39p, P. & P. 40p.

ROOM THERMOSTAT. Made by the famous Smiths Company. 15 amp. at 250v. Elegant white and beige case, size 4½ inches long by 1½ square approx. Adjustment is by slider (lockable) adjusts through range 30°—90°F. Special Snip price £1·65

CAPACITOR DISCHARGE CAR IGNITION

This system which has proved to be amazingly efficient and reliable was first described in the *Wireless World* about a year ago. We can supply kit of parts for an improved and even more efficient version (*Practical Wireless*, June). Price £6·55 plus 20p post. When ordering please state whether for positive or negative systems. De-luxe model including printed circuit board, etc. £7·95.

24-HOUR TIME SWITCH

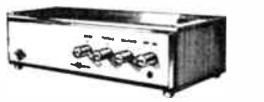


Made by Smiths, these are AC mains operated, NOT CLOCKWORK. Ideal for mounting on rack or shelf or can be built into box with 13A socket. Two completely adjustable time periods per 24 hours, 5A changeover contacts will switch circuit on or off during these periods. £2·75 post and ins. 25p. Additional time contacts 55p pair.

PHOTO ELECTRIC KIT

Contains photo cell, relay, transistor and all parts to make light operated switch. £1·75 plus 20p post and ins.

MULLARD UNILEX STEREO AMPLIFIER



We demonstrate these daily and almost always a sale results; it really is a cracking amplifier. Only Mullard with their know how could have made it possible at this low price. SPEC.: Mains operated. 4 watts music or speech per channel. Double wired power supply eliminates cross talk. Harmonic distortion less than 2%. Frequency response 50hz–16Khz. Input suitable for pick-up tuner or microphone. 6 month guarantee. Only £11·30 post paid, pair of ohm speakers £3·30.

NEW ITEMS THIS MONTH

White Rocker Switches. Four types available, all snap in fixing through oblong hole approx. 1" × ⅜", all rated at 10 amps AC. All have white rocker except 83, which is amber.
Our ref RS 81, push to make, spring return, 14p.
Our ref RS 82, push to break, spring return to on, 14p.
Our ref RS 83, change over contacts, luminous rocker, 28p.
Our ref RS 84, change over contacts, normal rocker, 16p.

Rocker Switches. 15 amp Britmac panel mounting, hole size 1½ × ⅞. Our ref RS 85 price 11p each. 5 amps made by Mem, their type ref 1600, our ref RS 86, price 11p each.

Miniature Hand Microphone. Dynamic, for tape recorders but equally suitable for amplifiers, good quality with lead and plug, price £1·37.

Open Coil Relays. All with 10 amp change over contacts, all brand new.
Our ref REL 81, 12 volt DC coil, double pole, 44p.
Our ref REL 82, 110 volt AC coil, treble pole, 44p.
Our ref REL 83, 250 volt AC coil, treble pole, 55p.

Photo Transistor Bargain. First class maker but slightly reject, covered, however, by our normal six month guarantee, these respond to light or infra red. Will work a burglar alarm system, make detector counter etc. Price 22p complete with three circuits.

Mains Flex. Padded, circular, cotton covered overall. Six amp (23-36) 100 yard coils. Price £2·75 plus 50p post.

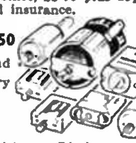
Screened Cable. 70076 core suitable for pick up or mike lead or for inter-connecting amplifiers, 10 metres, 33p.

Stereo Pre-amp Module. Mullard ref LP 7182/2—transistors and all ancillary components mounted on PC board, £1·32 with connection dig.

GOOD COMPANION I.C. VERSION

We can now offer these again in I.C. version using Ferranti ZN414 and Mullard AF Module 1172. Cabinet size approx. 11" wide × 8" high × 3" deep. Complete assembly instruction. Excellent tone wood cabinet, £5·75 plus 25p post and insurance.

MOTORS FOR £1·50



As used in racing cars and power models. All battery operated and reversible.

RESISTANCE WIRE

Mainly Nickel Chrome. (Resistances 74 ohms per metre down to 1 ohm per metre). Price 15p per oz. on catch weight reels—so please send an open cheque—we will send the smallest reel over the quantity you want and your cheque out for the quantity sent. You return the "over" amount within 1 month and we will refund for the amount you return. 25p returnable charge for reel.
Special Offer. 1 yard of 1·1mm wire. This is almost exactly 1 ohm. 10p.

PC BOARD MARKER

Valve action fire tipped marking pen filled with black etch resist—it's easy with this to make a perfect PC board, just draw straight on to the copper—allow 15 mins. to dry, then immerse in ferric chloride or other etchant on removal the circuit stands in high relief, 99p.

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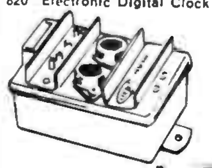

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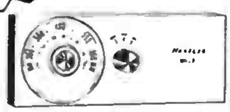

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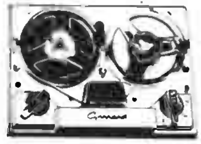

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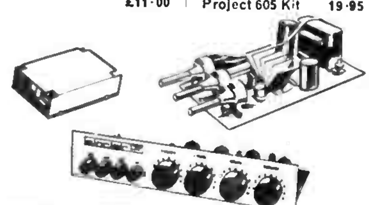

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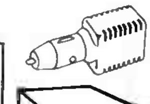

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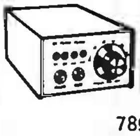

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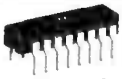

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7440	16p	14p	74105	97p	95p	74194	£2·77	£2·66
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7443	£1·30	£1·25	74111	£1·25	£1·18	74197	£1·83	£1·75
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307	DIL	69p	748c	DIL	39p
307	TO99	69p	748c	TO99	41p
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330µF	6½p
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33µF	6½p
68µF	6½p
150µF	6½p
470µF	11p
680µF	13p
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100µF	6½p
220µF	8p
330µF	10p
470µF	10p
1000µF	11p
1500µF	20p
2200µF	24p

16 VOLT

15µF	6½p
33µF	6½p
150µF	6½p
150µF	8p
220µF	9p
680µF	17p
1000µF	17p
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25 VOLT

10µF	6½p
22µF	6½p
47µF	6½p
100µF	8p
150µF	8p
220µF	10p
470µF	13p
680µF	20p
1000µF	22p
2200µF	39p
5000µF	68p

40 VOLT

6·8µF	6½p
15µF	6½p
33µF	6½p

40 VOLT

47µF	6½p
100µF	9p
68µF	10p
220µF	11p
470µF	19p
680µF	25p
1000µF	25p
2200µF	44p

63 VOLT

1µF	6½p
2·2µF	6½p
4·7µF	6½p
6·8µF	6½p
10µF	6½p
22µF	6½p
68µF	10p
100µF	11p
150µF	13p
220µF	19p
330µF	22p
470µF	26p
1000µF	44p

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Potentiometers
Carbon track 500 Ω to 2·2M Ω. Log or Linear. Single 13p. Dual gang (stereo) 44p. Single type with D.P. switch 13p extra.

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UK300 Four channel radio control transmitter	£6·55
UK310 Radio control Receiver	£3·28
UK325 'GCX2' channel splitting unit 1000 and 2000 Hz	£7·86
UK330 'GCX2' channel splitting unit 1500 and 2500 Hz	£7·86
UK345 Superheterdyne radio control receiver	£6·55
UK515 mW Radio Receiver	£7·86
UK525 VHF Tuner 120 to 160 mHz	£12·44
UK705 Windscreen Wiper timer	£7·48
UK715 Photoelectric cell switch	£8·49
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Specifications

Frequency:	500 Hz
Harmonics:	up to approx. 30 MHz
Output voltage:	1 V peak-to-peak
Maximum voltage applicable to the probe:	500 V DC
Power supply:	1·4 V DC
Transistors:	(2) BC208B

£2·57

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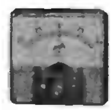

MR38P 1 21/32" Square fronts

	Normal Price	Our Price
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¼ watt 5% carbon	1p
½ watt 5% carbon	1p
1 watt 10% carbon	2½p
range 10 ohms to 4·7 megohms.	
½ watt m/o 2%	3p
range 10 ohms to 1 megohms.	

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AC126	14p
AC127	13p
AC128	13p
AC142K	22p
AC141K	20p
AC176	15p
AC187	18p
AC187K	20p
AC188	18p
AC188K	20p
ACY17	24p
ACY18	21p
ACY19	25p
ACY20	22p
ACY21	23p
ACY22	18p
ACY39	68p
AD140	40p
AD142	44p
AD143	39p
AD149	38p
AD150	60p
AD161	29p
AD162	29p
AF114	18p
AF115	18p
AF116	18p
AF117	18p
AF118	92p
AF124	27p
AF139	39p
AF239	41p
AL100	77p
AL102	66p
AL103	65p
BC107	9p
BC108	9p

BC109	9p
BC113	15½p
BC116	16p
BC125	16p
BC126	25p
BC132	16p
BC134	16p
BC135	16p
BC137	16p
BC138	36p
BC142	33p
BC143	33p
BC144	30p
BC145	26p
BC147	9p
BC148	9p
BC149	9p
BC153	16p
BC154	17p
BC157	13p
BC158	12p
BC159	14p
BC167	13p
BC168	11p
BC169	11p
BC177	15p
BC179	15p
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BC183L	11p
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2N3053	26p
2N3054	55p
2N3055	52p
2N3702	11p
2N3703	11p
2N3704	11p
2N3705	11p
2N3706	11p
2N3707	11p
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BA145	22p
BA154	14p
BAX13	14p
BAX16	14p
BAY18	19p
BAY31	9p
BY100	19p
BY126	16p
BY127	18p
BYX10	24p
OA5	19p
OA10	24p
OA47	9p
OA70	8p
OA73	11p
OA79	8p
OA81	9p
OA85	11p
OA90	8p
OA91	8p
OA95	8p
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6SA7GT	25p
6SC7GT	20p
6SG7	40p
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6SJ7GT	28p
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6SL7GT	35p
6SN7GT	35p
6SQ7	45p
6SQ7GT	32p
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NEW & SECONDHAND MUSICAL INSTRUMENTS.
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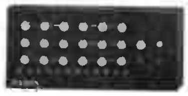
P/A MULTI-CHANNEL SAXON MIXER CONTROL UNITS



Using grouped pairs of inputs and outputs (high Z and low Z inputs) with individual bass, treble and volume controls on each pair, plus master control. These low-noise units will feed all makes of amplifiers, making them ideal for clubs, discos etc. Standard jack sockets. Compact design, in strong metal cases. All units guaranteed for 8 years.

- HIGH & LOW IMP. INPUTS
- BASS/TREBLE/VOLUME ON EACH PAIR
- MASTER CONTROL OUT

● M.4H
4 high Z, 4 low Z inputs, 4 sets of controls. Case 14" x 8" x 2½" Carr. pd. + V.A.T. **£18·50**

● M.6HL Case 18" x 8" x 2½"
12 inputs (6 high Z, 6 low Z). Carr. pd. + V.A.T. **£27·50**

● Channel section modules, for building your own mixer. Gain—16 x (24dB). Tone controls—18dB swing. Carr. pd. £3·50 + V.A.T.

SAXON CONTROL UNITS

Mono (as shown)
For 9v battery operation. As stereo unit but less mic. input **£6·50**

20p

Stereo. Carr. 30p **£15·80**

Two decks, and full headphone monitoring. The unit is mains operated and measures 17½" x 3" x 4" deep and is finished with a smart white on black facia. The controls are: Left/Right deck fader, volume, bass treble. Headphone Selector and volume. Microphone volume, bass, treble, mains on/off.
COMPARABLE TO UNITS AT OVER TWICE THE PRICE.

120 WATT HEAVY DUTY MODULE

Rugged class A driver stage, this module will run from all our mixers, etc., and most other makes. Delivers 120 watts into an eight ohm load and employs 4 T03 can (115 watt) output transistors. These are the modules where extra power is demanded.

Power output	120 watts on 8 ohms
Freq. response	20-20,000 Hz ± 2dB
Input sensitivity	200 mV into 10K
Construction	Fibreglass board
Size	8" x 4" x 4" (5" with supply)

Low distortion parallel push-pull output stage.

£18·95
Module & power supply (Carr. 40p)

160 watt version £37·90
with power supply **£27·50**
(Carr. 50p)

SOUND AND LIGHT UNITS

Our popular 3 channel model handles up to 3kW (3000 watts) of lighting and incorporates versatile sound control arrangement to enable professional standards to be achieved. Both units are excellent examples of Saxon quality and value.

3 CHANNEL UNIT
Includes bass, middle and treble as well as master controls. 2 amplifier sockets eliminate need for split leads. Up to 3KW lighting load. Smartly finished steel case. Carr. 30p. **£19·75**

SINGLE CHANNEL UNIT
Operates from 5 to 100 watt amplifiers. Supplied for bass note operation, is easily adapted for treble or mid-range at a cost of about 5p. Carr. pd. **£8·90**

COMPLETE AMPLIFIERS

CSE 100 £34·90 carr. free
The versatile unit is now available in a black vynide case and so represents even better value than ever delivering speech and music powers of up to 100 watts RMS and continuous signal outputs of 70 watts. Two individually controlled inputs with wide range bass and treble controls.

SAXON 100 £48·50 carr. free

With an RMS output of 120 watts speech and music, 100 watts continuous power, four individually controlled FET input stages and wide range base and treble controls, this amplifier has established itself as a unit offering quality and reliability at low cost.

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12" 25 watt 8/15 ohms £5·95 carr. 30p 15" 50 watt 8/15 ohm £14·50 carr. 50p.
12" 40 watt 15,000 gauss magnet system 8/15 ohm £11·50 carr. 40p.

600 watt 3 colour Light Boxes Smart Rexine finish £15 carr free.

A.K.G. D.190C MICROPHONES **£18·45**
A true professional mic at a bargain price.

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Prices quoted do NOT include V.A.T. 10% must be added on to total value of order for V.A.T.

S A E. for special price list

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These superbly designed & engineered Saxon power amplifiers use 3A 'Mastic' Power' Driver Transistors. To meet demand, we have included a more powerful module in our well-established and proven range, the SA.50. These power amplifiers are expertly assembled, tested and guaranteed. By buying direct from us, you save appreciably, and the modules offer superb value for reliability and versatility.

DESIGNED AND MADE IN OUR OWN FACTORY

SA35 35 watts RMS. Uses 7 transistors and 7 diodes Carr. paid. **£4·45**

SA50 50 watts RMS. 7 transistors, 7 diodes. Carr. paid. **£5·65**

SA100 makes an ideal unit in disco assemblies. A real glutton for work. **£10·90**
Reliable, tough and compact, 11 transistors, 6 diodes. Carr. paid.

BRIEF SPEC. FOR ALL THREE MODULES

All modules incorporate OPEN AND SHORT CIRCUIT PROTECTION, plus proof against over-dissipation and faulty inductive loads in the SA.100.

Freq. response	15–40,000 Hz ± 1dB
Distortion	0·2% at 1kHz
Loads	4 to 16 ohms
Quiescent current	15 mA
Noise	Better than −75dB
Supply voltage	SA35 25–45 volts SA50/SA100 40-70 volts
Size	4½" x 4" x 1" (SA 100) 4" x 3" x 1" (SA35/SA50)

Circuits, connecting instruction and application data are supplied free with all modules.

ALL SAXON MODULES ARE BUILT ON GLASS FIBRE P.C. BOARD AND SUPPLIED FULLY TESTED AND GUARANTEED

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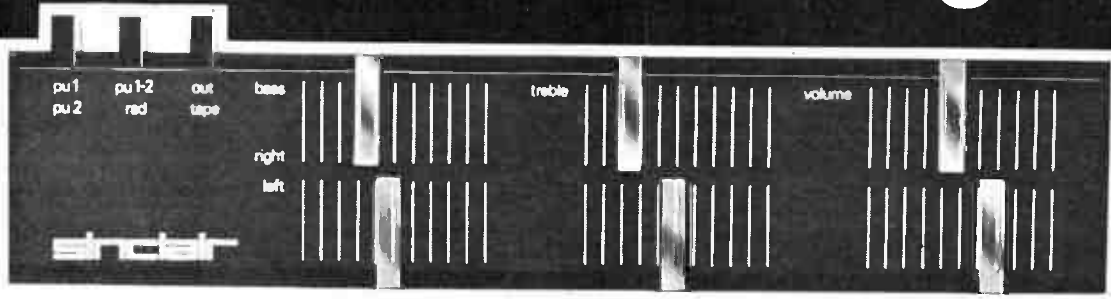
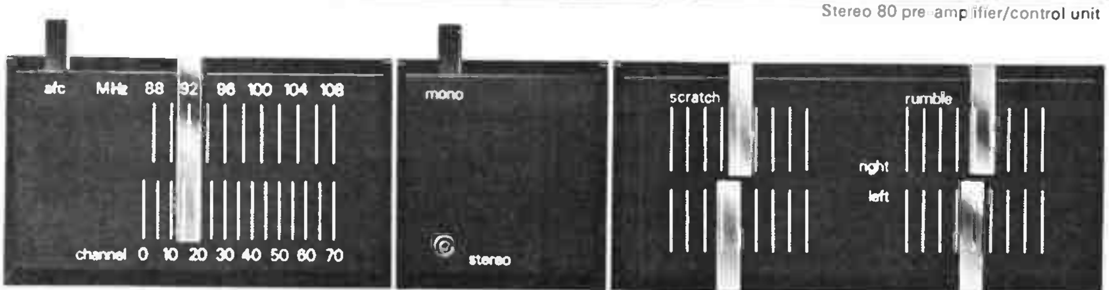
Project 80

...exciting new thinking in modular hi-fi design



Stereo 80 pre amplifier/control unit

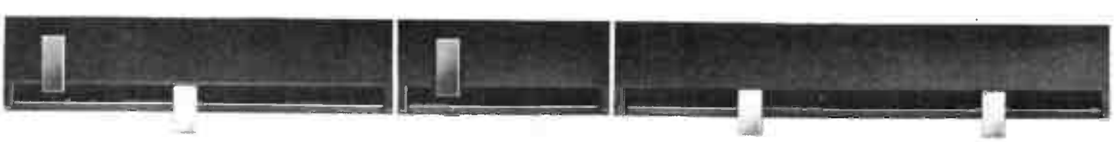


Project 80 tuner

Stereo decoder

Project 80 Active Filter Unit (AFU)

the slimmest, most elegant hi-fi modules ever made



Living with hi-fi takes on new meaning now that Project 80 is here. These amazing new modules mark a brilliant technical advance all round; their size and presentation bring exciting new opportunities to install systems in ways hitherto only dreamed about but never before made practical. You can build a Project 80 system virtually anywhere and it is unbelievably simple to install and connect up. Everything that could possibly be wanted in a top quality do-it-yourself domestic hi-fi system will be found in Project 80 – compactness, elegantly ultra-modern styling, ease of fixing and operation, new control methods, and above all superb performance. New as well as popular established ideas on installation are featured on page four of this announcement to provide just a few examples of the system's fantastic versatility.

sinclair

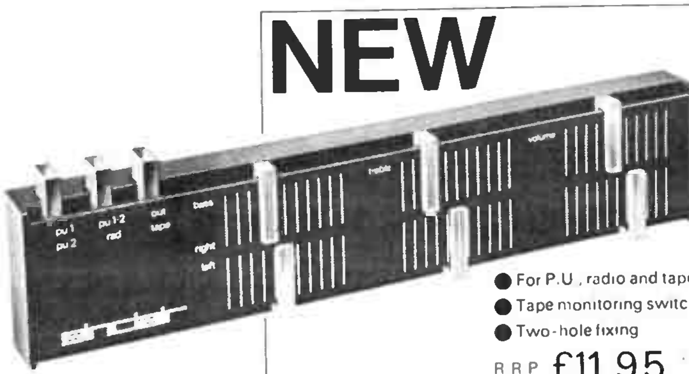
Project 80 new modules

Stereo 80 pre-amplifier and control unit

As with other Project 80 units, the Stereo 80 is mounted by means of two bolts fixed at the rear which pass through holes drilled in the wood or plastic on which modules are to be mounted. *All the electronics are contained within the ¾" deep front panel!* Connecting leads are taken away similarly out of sight. Each channel in the Stereo 80 has its own independent tone and volume controls operated by sliders. This enables exceptionally good environmental matching to be obtained. Provision is made for magnetic and ceramic pick-ups, radio and tape in and out. A virtual earth input stage forms part of the up-dated circuitry of the Stereo 80 to ensure the finest possible quality from all signal sources. Generous overload margins are allowed on all inputs. Clear instructions with template are supplied.

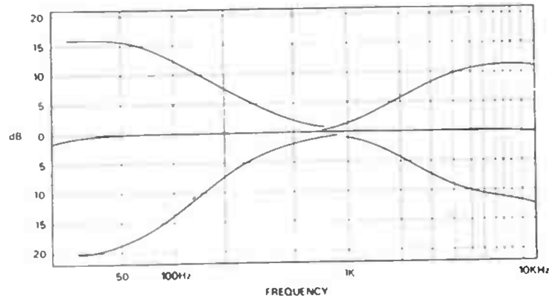
TECHNICAL SPECIFICATIONS
Size – 260 × 50 × 20mm (10¼ × 2 × ¾ins)
Finish – Black, with white markings
Inputs – Mag. P.U. 3mV RIAA corrected; Ceramic P.U. 300 mV
Radio 300 mV; Tape 30 mV
S/N ratio – 60db
Frequency range – 20Hz to 15KHz ± 1dB. 10Hz to 25KHz ± 3dB
Power requirements – 20 to 35 volts
Outputs – 100mV + AB monitoring for tape
Controls – Press button for tape, radio and P.U. selection Volume. Bass + 12dB to – 14dB at 100Hz. Treble + 11dB to – 12dB at 10KHz

NEW



- For P.U., radio and tape
- Tape monitoring switch
- Two-hole fixing

RRP £11.95 + £1.19 VAT

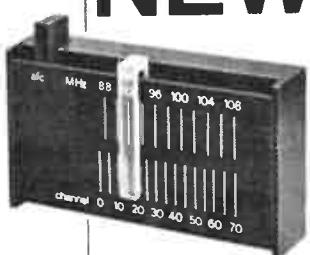


Project 80 FM tuner smaller, more efficient

A truly remarkable tuner in every way – its unbelievably compact size – its original circuitry – its dependable performance – all this in a boldly designed modern case measuring 85 × 50 × 20mm (3⅜ × 2 × ¾ins). Greater adaptability (and possibly financial convenience) results from the tuner and stereo decoder section being made available separately.

TECHNICAL SPECIFICATIONS
Size – 85 × 50 × 20mm (approx. 3⅜ × 2 × ¾ins)
Tuning range – 87 to 108 MHz
Detector – I.C. balanced coincidence, for good A.M. rejection
AFC – Switchable, with thermistor control to prevent from drift
One 26 transistor I.C.
Twin dual varicap tuning
Distortion – 0.3% at 1KHz for 75KHz deviation
Ceramic filter in I.F. section
Aerial impedance – 75 Ω or 240-300 Ω
Sensitivity – 4 microvolts for 30dB quieting
Power requirements – 12 to 45 volts

NEW



- AFC switch
- Twin dual varicap tuning
- 4-hole ceramic filter
- Slider tuning

RRP £11.95 + £1.19 VAT

Project 80 stereo decoder

Making the Project 80 decoder separate from the F.M. tuner gives the constructor a wider choice of systems as well as saving money in cases where stereo reception may not be required. This unit gives a 40dB channel separation with an output of 150mV per channel. The gallium arsenide light emitting beacon automatically lights up to show when a stereo transmission is tuned in. Designed essentially as an integral part of Project 80 systems, this multiplex stereo demodulator may be used in many cases with existing single channel frequency modulated tuners to provide stereo reception.
Size – 47 × 50 × 20mm (1⅞ × 2 × ¾ins)
One 19 transistor I.C.

NEW

- Solid-state stereo indicating beacon
- Readily adaptable for use with other tuners

RRP £7.45 + 0.74p VAT

new constructional techniques

. . .and again Sinclair leads the world

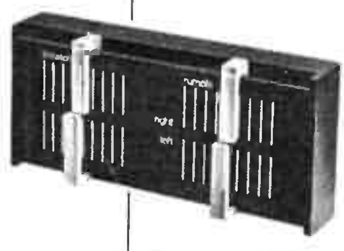
1962 Micro-miniature power amp small enough to stand on a 10p. piece. Slimline pocket receiver smaller than a 20 cigarette pack
1963 Micro-6 receiver, smaller than a matchbox
1964 Pocket F.M. receiver. PWM amp.
1965 Z.12 power amplifier module. PZ.3 power supply
1966 Stereo 25 pre-amp/control unit
1967 Micromatic Q.14 loudspeaker, the first Neoteric
1968 IC.10, the first ever integrated circuit for constructors use
1969 Q.16 – improved version of Q.14 Systems 2000 and 3000 Project 60 launched
1970 IC 12 Project 605
1971 Project 60 stereo FM tuner. Z.50 PZ 8
1972 Improvements to Project 60 with Z.50 MK.2 and PZ 8 Mk.3 The Executive Calculator. Digital multi-meter Q.30 speaker
1973 Cambridge Calculator
PROJECT 80 LAUNCHED

. . . and next ?

Project 80 active filter unit

This efficiently designed unit makes a highly desirable part of any worthwhile system where inputs may be from record, radio or tape. As with Stereo 80, separate controls are applied to each channel thereby making it easier to obtain ideal stereo balance in any kind of indoor environment

TECHNICAL SPECIFICATIONS
Size – 108 × 50 × 20mm (4¼ × 2 × ¾ins)
Voltage gain – minus 0 2dB
Frequency response – 36Hz to 22KHz, controls minimum
Distortion – at 1KHz – 0 03% using 30V supply
HF cut off (scratch) – 22KHz to 5 5KHz, 12dB/oct slope
L.F. cut off (rumble) – 28dB at 20Hz, 9dB/oct slope



NEW

- For scratch and rumble control
- Transistorised active circuitry

RRP £6.95 + 0 69p V.A.T

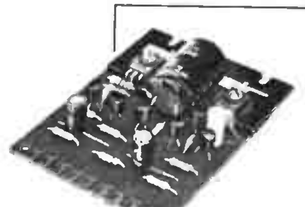
Z.40 & Z.60 power amplifiers
totally short-circuit proof

Either of these entirely new power amplifiers is intended for use in Project 80 installations although, of course, they are readily adaptable to an even wider range of applications Both Z 40 and Z 60 incorporate built-in protection against shortcircuiting and risk of damage arising from mis-use is greatly reduced Comprehensive instructions are supplied with each of the modules.

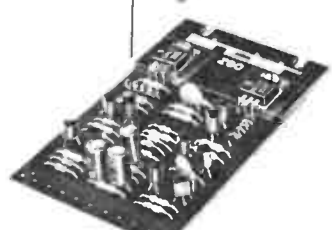
Z.40 Technical Specifications
Size – 55 × 80 × 20mm
(2⅛ × 3⅛ × ¾ins) 9 transistors
Input sensitivity – 100mV
Output – 15 watts RMS continuous into 8 Ω (35V) 30 watts music power into 4 Ω (30V)
Frequency response – 10Hz–100KHz ± 1dB
Signal to noise ratio – 64dB
Distortion – at 10 watts into 8 Ω less than 0 1%
Power requirements – 12-35 volts

Z 60 Technical Specifications
Size – 55 × 98 × 20mm
(2⅛ × 3¾ × ¾ins) 12 transistors
Input sensitivity – 100-250mV
Output – 25 watts RMS into 8 Ω (45V) 50 watts music power into 4 Ω (50V)
Distortion – typically 0 03%
Frequency response – 10Hz to more than 200KHz ± 1dB
Signal to noise ratio – better than 70dB
Built-in protection against transient overload and short circuit
Load impedance – 4Ω min. max. safe on open circuit

NEW



Z.40
RRP £5.45 + 0 54p V.A.T



Z.60
RRP £6.95 + 0 69p V.A.T.

Sinclair power supply units PZ.8

the worlds most advanced unit in its class

Stabilised power supply unit Re-entrant current limiting makes damage from overload or even direct shorting impossible, a principle never before inorporated in a commercially available constructor module Normal working voltage (adjustable) 45V
R R P £7.98+0 79p V A T
Without mains transformer
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PZ.6 35V stabilised
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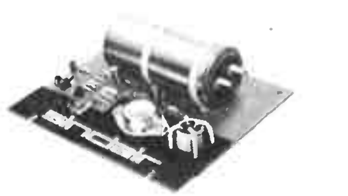

Recommended Project 80 applications

System	The Units to use	Units cost
Simple battery record player	Z.40	£5.45 +54p V A T
Mains powered record player	Z.40, PZ.5	£10.43 +£1 04 V A T.
30W. RMS continuous sine wave stereo amp.	2 × Z.40s, Stereo 80; PZ.6	£30.83 +£3 08 V A.T.
50W (8 Ω) RMS continuous sine wave de luxe stereo	2 × Z.60s, Stereo 80; PZ.8	£33.83 +£3 38 V A T
amplifier Indoor P.A	Z.60, PZ.8	£14.93 +£1 49 V A T
Car Radio	F.M. tuner, Z.40	£16.40 +£1 64 V A T

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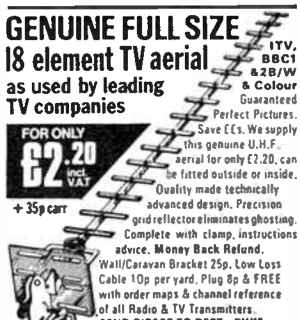

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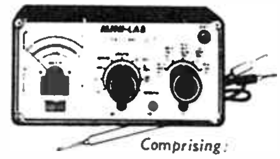

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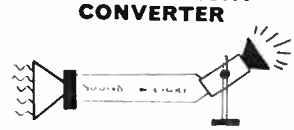

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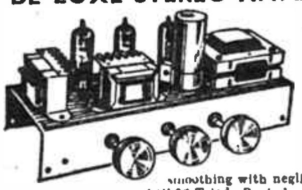

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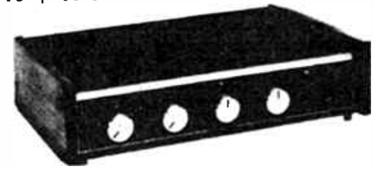

NEW FURTHER IMPROVED MODEL WITH HIGHER OUTPUT AND INCORPORATING HIGH QUALITY READY DRILLED PRINTED CIRCUIT BOARD WITH COMPONENT IDENTIFICATION CLEARLY MARKED FOR EVEN EASIER CONSTRUCTION

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 5 to 15 ohms. Compact design, all parts supplied including drilled metal work, high quality ready drilled printed circuit board, 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 ±3dB 12-30,000 Hz Sensitivity: better than 80mV into 1M Ω. Full power bandwidth: ±3dB 12-15,000 Hz. Bass boost approx. to ±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 2½"h.
Fully detailed 7 page construction manual and parts list free with kit or send 18p plus large S.A.E.

AMPLIFIER KIT	£11·55	P. & P. 25p
(Magnetic input components 33p extra)		
POWER PACK KIT	£3·30	P. & P. 35p
CABINET	£3·30	P. & P. 35p

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Full after sales service
Also available ready built and tested £23·10. Post Free.
Note: The above amplifier is suitable for feeding two mono sources into inputs (e.g. mike, radio, twin record decks, etc.) and will then provide mixing and fading facilities for medium powered Hi Fi Discotheque use, etc.

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Designed for Hi-Fi reproduction of records. A.C. Mains operation. Ready built on plated heavy gauge metal chassis, size 7½" w. × 4" d. × 4½" h. Incorporates ECC83, EL84, EZ80 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 4½ watts. Front panel can be detached and leads extended for remote mounting of controls. Complete with knobs, valves, etc., wired and tested for only £5·50. P. & P. 45p.
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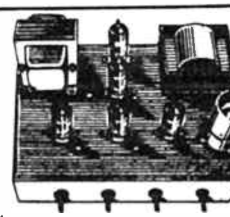
10/14 WATT HI-FI AMPLIFIER KIT



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 base and treble controls are provided giving good lift and cut. Valve line-up 2 EL84s, ECC83, EF86 and EZ80 rectifier. Simple instruction booklet 15p + SAE (Free with parts). All parts sold separately. ONLY £6·80 P. & P. 60p. Also available ready built and tested £12·10 P. & P. 70p.

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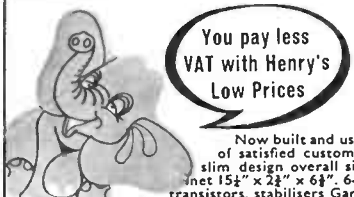

BUILD THE TEXAN

20 + 20 WATT IC STEREO AMPLIFIER

As featured by Practical Wireless 1972

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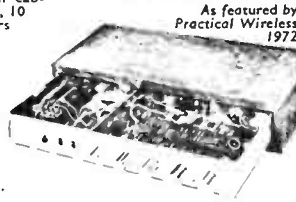

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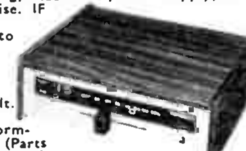

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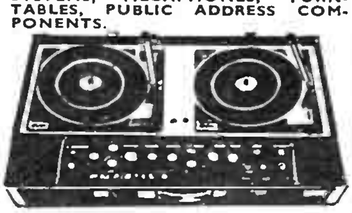

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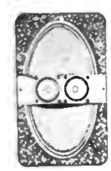

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