

PRACTICAL WIRELESS

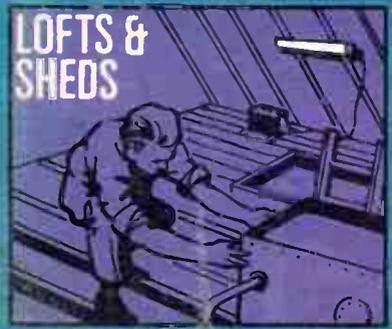
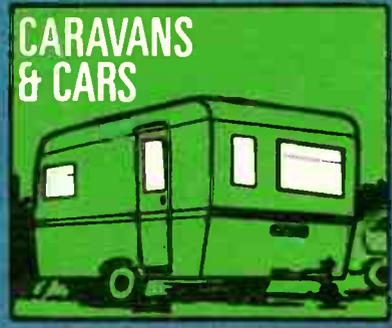
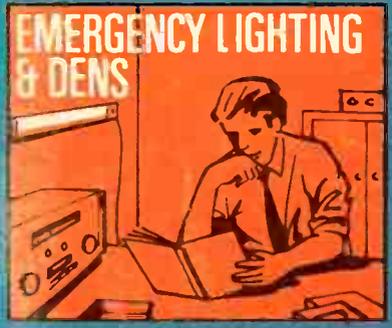
DECEMBER
1973

20p

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inside
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New Zealand 50c
South Africa 45c
Rhodesia 45c
Nigeria K10
Malaysia S1.80
Sweden Kr 3.50
Malta 22c
Norway Kr 5.10

PORTABLE FLUORESCENT LAMP UNIT -FROM YOUR 12V BATTERY



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

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if your imagination stops at cigars...

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MODEL X25 Soldering Iron
220-240 Volts or 100-120 Volts. The leakage current of the NEW X25 is only a few microamps and cannot harm the most delicate equipment even when soldered "live". Tested at 1500v. A.C. This 25 watt iron with its truly remarkable heat-capacity will easily "out-solder" any conventionally-made 40 and 60 watt soldering irons, due to its unique construction advantages. Fitted long-life iron-coated bit 1/8". 2 other bits available 3/32" and 3/16". Totally enclosed element ceramic and steel shaft. Bits do not "freeze" and can easily be removed. **PRICE £1-93** (rec. retail) P & P 8p. Suitable for production work and as a general purpose iron.



MODEL CCN
220 volts or 240 volts. The 15 watt miniature model CCN also has negligible leakage. Test voltage 4000v. A.C. Totally enclosed element in ceramic shaft. Fitted long-life iron-coated bit 3/32". 4 other bits available 1/8", 3/16", 1/4" and 3/64". **PRICE £2-15** (rec. retail) P & P 5p.

MODEL G 18 watt miniature iron, fitted with long-life iron-coated bit 3/32". Voltage 240, 220 or 110. **PRICE £2-15.** (rec. retail) P & P 5p.



MODEL CN Miniature 15 watt soldering iron fitted 3/32" iron coated bit. Many other bits available from 3/64", to 3/16". Voltages 240, 220, 110, 50 or 24. **PRICE £1-93.** (rec. retail) P & P 5p.



all prices include VAT at 10%



MODEL SK.2 KIT
Contains 15 watt miniature iron fitted with 3/16" bit, 2 spare bits 5/32" and 3/32" heat sink, solder, stand and "How to Solder" booklet. **PRICE: £2-87.** (rec. retail) P & P 8p.



MODEL SK.1 KIT
Contains 15 watt miniature iron fitted with 3/16" bit, 2 spare bits 5/32" and 3/32", heat sink, solder, stand and "How to Solder" booklet. **PRICE £3-25** (rec. retail) P & P 12p.



MODEL MLX KIT
Battery operated 12v. 25 watt iron fitted with 15" lead and 2 heavy clips for connection to car battery. Packed in strong plastic wallet with booklet "How to Solder". **PRICE £2-27** (rec. retail) P & P 12p.



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PRACTICAL WIRELESS

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DECEMBER 1973

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

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BACK NUMBERS

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.

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We regret that we cannot answer technical queries by telephone nor can we provide information or advice on manufacturers' products other than that given in the magazine. We will endeavour to assist readers who have queries relating to articles published but we cannot offer advice on modifications to our published designs. All correspondents expecting a reply should enclose a stamped addressed envelope.

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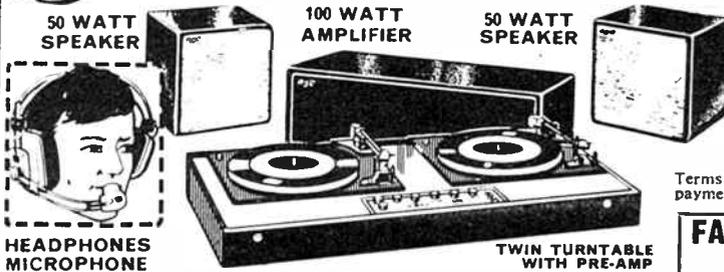
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- No. 6 D.C. Circuits

RSC GROUP/DISCO UNITS



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 styl. Separate volume controls for each turntable. Bass controls, Separate input for mic. with vol. control switch. Rexine covered cabinet size approx. 32" x 16" x 7" with lid Terms: Deposit £20 and 12 monthly payments £7-60 (Total £111-20). Carr. £2-50. **ONLY £99-75**

PACKAGE OFFER

- Units listed below
 (a) 100w POWER AMPLIFIER
 (b) PAIR OF HI-FI HEADPHONES
 (c) MATCHING DYNAMIC 'MIKE' (attached to hi'phone)
 (d) PAIR 50 WATT SPEAKERS
 Black Rexine covered Cabinets Size approx. 18" x 18" x 8"
 (e) RSC TDI DISCO CONSOLE
 (a) (b) (c) (d) **£149-95**
 (e) 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 Sonolone or Accos Cartridges with diamond styl. 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. £2-95 and 12 mthly pymts £5 85 (Total £80-15) **£69-95**
 Carr. £1-50

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 14,000 gauss 8/15"	15" 60 Watt 14,000 gauss 8/15"	12" 50 Watt 13,000 gauss 15"
£25-95	£14-75	£11-99
Dep: £5-95 and 9 mthly payments £2-58 (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.

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. Total Rec. Ret. Price £50-11 Carr. £1

GROUP/DISCO EQUIPMENT PACKAGE OFFERS

F.A.L. PHASE 60 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)	£59-83 £15-90 £55-83	PACKAGE PRICE £51-50 carr. £1-10
F.A.L. PHASE 50 MK.III AMPLIFIER PR. FANE POP 60 L/SPEAKERS Terms: Deposit £9-50 and 12 monthly payments of £4-88 (Total £68-06)	£59-93 £28-98 £83-91	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)	£59-93 £26-80 £86-23	PACKAGE PRICE £63 carr. £1-25
F.A.L. PHASE 100/2 AMPLIFIER 4 FANE POP 60 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

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 mthly payments £2-48 (Total £24-82) Carr. 65p. **£21-95**

TYPE C313 50 WATTS Low feedback characteristic. Fitted three 13" x 8" deep cone high flux speakers with high power voice coils. Size approx. 54" x 14" x 11". Dep. £4-72 & 9 mthly pymts **£32-72** £3-58 (£38-94) Carr. 85p

TYPE C4100 100 WATTS inc. four 12" 60 watt speakers for conservative rating. Extra heavy construction. Size approx. 58 x 16 x 10" Acoustically filled and pressurised. Terms: Dep. £15-50 & 12 mthly. pymts. £5-48 (Total £81-02). Carr. £1-50 **£71-50**

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 16" x 3" x 4" deep. Fully enclosed but can mounted in cabinet.

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" x 7" x 7". 200-250v. A.C. mains. Output 50 watts music rating. Or deposit £8-93 & 9 monthly payments £4-22. Total £44-91. **£39-93** Carr. 85p.

RSC PHANTOM '50' 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 £88-59). Carr. Free-MAR for leaflet. **ONLY £59-95** U.K. Mainland

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. Credit Terms: Deposit £16-50 & 12 monthly payments of £6-68. (Total £82-12). Carr. £2-50 **£72-50**

RSC GP30 HI-FI AMPLIFIER

For Guitar, Vocal or Instrumental Group
 3 input, 2 vol. control Hi-Fi 30 watt unit with Separate Bass and Treble controls. Current values. Peak output rating. Strong Rexine covered cabinet with handles. Attractive black/alter 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 £2-76 (Total £29-15). **£25-85** Carr. 75p

NOW SIX NEW BRANCHES

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- COVENTRY 17 SHELTON SQUARE
- DONCASTER 3 QUEENSGATE
- WATERDALE CENTRE
- NOTTINGHAM 19/19A MARKET ST
- STOCKPORT 8 LITTLE UNDERBANK
- SUNDERLAND 5 MARKET SQUARE
- NEW LARGER PREMISES AT HULL, DARLINGTON, NEWCASTLE & DERBY See Addresses

RSC
 All items subject to availability. Prices correct at 25.10.73 £. s. d.
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 MAIL ORDERS & EXPORT ENQUIRIES TO:
 AUDIO HOUSE, BENCONNER LANE, LEEDS, 13.
 Tel: Pudsey 09735 77681.
 TERMS C.W.O. or C.O.D. No C.O.D. under £1.
 POSTAGE 28p EXTRA UNDER £2. 33p EXTRA OVER £2 OR AS QUOTED. TRADE SUPPLIED.
 S.A.E. PLEASE WITH ENQUIRIES.
 SUPPLIERS TO GOVT. DEPTS. H.M. FORCES. EDUCATION AUTHORITIES & HOSPITALS. Etc.
 MAIL ORDERS MUST NOT BE SENT TO SHOPS

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 speaker/s 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 speaker/s 3-30 ohms. Protective circuitry against damage from short circuits.
FAL 'SUPER 50' **£59-50** Carr. 80p
 Terms: Dep. £8-50 & 12 mthly. pymts. £1-97 (Total £68-14)
FAL 'SUPER 100' **£79-95** Carr. 90p
 Terms: Dep. £11-95 & 12 mthly. pymts. £6-63 (Total £81-51). Prices above include protective dust cover.

HUGE DISCOUNTS ON LEADING BRAND TAPE AND TURNTABLE UNITS

CREDIT TERMS AVAILABLE
Minimum Deposit 10%

DISCOUNT WAREHOUSE PRICES ON LEAK, WHARFEDALE etc. etc.—visit your nearest RSC Hi Fi Centre

AKAI GXC 40D Tape Unit £62.95 (Rec. Price £89.74) Carr. £1
AKAI 4000DS Tape Unit £68.95 (Rec. Price £97.50) Carr. £1
AKAI 1721L Tape Unit £66.95 (Rec. Price £104.50) Carr. £1
AKAI CR81D Tape Unit £58.95 (Rec. Price £84.10) Carr. £1
GOLDRING GL72 T/Table & P.U. £29.95 (Rec. Price £37.29) Carr. £1
 Also FREE with above GL72 Goldring G800 cartridge worth over £10
B.S.R. MACDONALD MP60 TYPE T/Table & P.U. £10.95 (Rec. Price £14.95) Carr. 40p

Prices shown correct at time of going to press (24/10/73)

FANE 'MODE ONE' HIGH FIDELITY SPEAKER KIT



Incorporating a model 803 8" 13,000 Gauss Bass Speaker with ultra low resonance. P.V.C. surround cone. Printed circuit cross-over assembly with ferrite cored coils. Model 303 Pressure Tweeter, Acoustic damping material, Screws, Panels etc. and instructive diagrams. Frequency £10.98 post free Response 25 Hz-20 kHz. 8-15Ω

Price per pair £19.99 Or Dep. £1.99 & 9 monthly payments of 23 Ctot. £13.50

RSC G66 MkII 6+6 WATT high quality STEREO AMPLIFIER

Individual Ganged Controls. Bass, Treble, Volume and Balance. Printed circuit construction employing 10 Transistors plus Diodes. Output rating I.H.F.M. Frequency range 20.20.000 c.p.s. Bass Control ± 12db.

Treble Control ± 13db. Selector switch for P.U. or Tape/Radio. For loudspeaker output impedances of 3 to 15 ohms. For standard 200-250v. A.C. mains operation. Attractive Black and Silver finished metal fascia plate and matching control knobs. COMPLETE KIT OF PARTS INCLUDING FULLY WIRED PRINTED CIRCUIT and COMPREHENSIVE WIRING DIAGRAMS & INSTRUCTIONS £12.65 Carr. 40p

OR FACTORY BUILT IN TEAK VENEERED CABINET as illustrated £16.50 or dep. £2.50 and 9 monthly payments £1.83 (Total £18.97)



AUDIOTRINE HIGH FIDELITY SPEAKERS

Heavy construction. Latest high efficiency ceramic magnets. Plasticised Cone surround. "D" indicates Tweeter Cone providing extended frequency range up to 16,000 c.p.s. Impedance 3 or 8-15 ohms. PLEASE STATE CHOICE.

Exceptional performance at low cost.
HF080T 8" 10W £2.98 **HF120D** 12" 15W £6.50
HF102D 10" 10W £3.30 **HF126** 12" 15W £6.35
HF120 12" 15W £4.95 **HF128D** 12" 15W £6.85

FANE 807T HIGH FIDELITY SPEAKER

A full range 8in. 10 watt unit for excellent sound quality, in suitable enclosure. Cast chassis Roll P.V.C. cone surround and long throw voice coil to achieve very low fundamental resonance of 30 c.p.s. Tweeter cone is fitted to extend high note response. Frequency range 25 Hz to 15 KHz. Gauss 10,000. Impedance 3 or 8-15Ω Post Free £3.99
 PLEASE STATE IMPEDANCE REQUIRED R.P.F. 64-99
MODEL 803T 8" 15w. with parallel Tweeter. Post Free £5.50
 Response 25 Hz to 15 KHz. Gauss 13,000 Imp 3 or 8-15Ω. H.R.P. £6-99

R.S.C. TRANSFORMERS, L.F. CHOKES & RECTIFIERS FULLY GUARANTEED.

Impregnated and interleaved where necessary. Primaries 200-250v. 500/s. Screened

MIDGET CLAMPED TYPE 2 1/2" x 2 1/2" x 2 1/2"
 250v., 60mA, 6-3v. 2a £1.10
 250-0-250v., 60mA 6-3v. 2a £1.16

FULLY SHROUDED UPRIGHT MOUNTING
 250-0-250v. 80mA, 6-3v. 2a., 0-6-6-3v. 2a. £1.55
 250-0-250v. 100mA, 6-3v. 4a., 0-6-6-3v. 2a. £2.15
 300-0-300v. 100mA, 6-3v. 4a., 0-6-6-3v. 2a. £2.45
 300-0-300v. 130mA, 6-3v. 4a., ct., 6-3v. 1a. £2.45
 For Mullard 510 Amplifier £2.95
 350-0-350v. 100mA, 6-3v. 4a., 0-6-6-3v. 2a. £2.45
 350-0-350v. 150mA, 6-3v. 4a., 0-6-6-3v. 2a. £2.45

FLAMENT or TRANSISTOR POWER PACK
 Types 6-3v. 1.5a. 55p; 6-3v. 2a. 60p; 6-3v. 3a. 85p;
 6-3v. 6a. £1.46; 12v. 1a. 61p; 12v. 3a. or 24v. 1.5a £1.50; 0-9-18v 1 1/2a £1.25; 0-12-25-42v 2a £1.95.

ALL R.S.C. PRICES INCLUDE VAT FULL LABOUR AND MATERIAL GUARANTEES FOR 12 MONTHS

HI-FI SPEAKER ENCLOSURES MODERN DESIGN

Teak veneer finish. Acoustically lined. Sizes approx. Carr. 35p per unit
JES Size 16" x 11" x 9". SE8 For optimum performance with any 8in. Hi-Fi speaker. £6.50
 Size 19 x 10 1/2 x 9in. SE12 For excellent performance with 12in. Hi-Fi speaker and tweeter £7.95
 Size 25 1/2 x 16 x 9in. SE10 For outstanding results with 10in. Hi-Fi spkr. Size 25 1/2 x 16 x 9in. Ported £6.75



AUDIOTRINE HI-FI SPEAKER SYSTEMS

Consisting of matched 12in. 11,000 line 15 Watt 15 ohm high quality speaker, cross-over unit and tweeter. Smooth response and extended frequency range £6.50 Carr. 33p
 ensure surprisingly realistic reproduction. OR SENIOR 15 WATT INCLUDING HF126 15,000 LINE SPEAKER £7.65 Carr. 39p

R.S.C. TA6 6 Watt HI-FI AMPLIFIER

200-250v. AC mains operated. Frequency Response 30-20,000 c.p.s. -2db. Harmonic Distortion 0.3% at 1,000 c.p.s. Separate Bass and Treble 'lift and cut' controls. 3 input sockets for Mike, Gram, Radio or Tape. Input selector switch. Output for 3-15 ohm spkrs. Max. sensitivity 50mV Output rating I.H.F.M. Fully enclosed enamelled case, 9 1/2" x 2 1/2" x 6 1/2". Attractive brushed silver finish fascia plate 10 1/2" x 3 1/2". and matching knobs. Complete kit of parts with full wiring diagrams and instructions £8.50 Carr. 40p



R.S.C. BATTERY/MAINS CONVERSION UNITS

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 50c/s is available. ASSEMBLED READY FOR USE £4.15



R.S.C. MkIII SUPER 30 HIGH FIDELITY STEREO AMPLIFIER

BUILD AN AMPLIFIER WORTH APPROXIMATELY DOUBLE THE KIT PRICE INCLUDING CABINET

- Push Button Selector Switching
 - Jack Socket for Headphones
 - Neon Indicator
 - Satin Silver Finish Metal Fascia
 - Solid State Circuitry
 - Twenty Silicon Transistors
 - Four Diodes, Four Rectifiers
- Send S.A.E. for full descriptive leaflet.



For Magnetic or Ceramic Pick-Ups regardless of Price. Output (per channel) 15 watts RMS into 8Ω. Frequency Response 7 Hz to 70 KHz ± 1 1/2 dB.

COMPLETE KIT (less cabinet). Carr. 70p. Cabinet if req. £5 extra.

R.S.C. STEREO FM III TUNER. in cabinet. Visually matches Super 30 Mk. III £37.50

FACTORY BUILT UNIT INC. CABINET with 12 months' guarantee. Or Dep. £7 and 9 monthly payments £4.54 (Total £47.86).

'YORK' HIGH-FIDELITY 3 SPEAKER SYSTEM

- ★ Moderate size only 25 x 14 x 10in. approx.
- ★ Response 30-20,000 c.p.s. Impedance 15 ohms
- ★ Performance comparable with units costing considerably more Carr. 65p



Consists of (1) 12in. 15 watt Bass unit with cast chassis, Roll rubber cone surround for ultra low resonance, and ceramic magnet. (2) 3-way quarter section series cross-over system. (3) 8 x 5in. high flux middle range speaker. (4) High efficiency tweeter. (5) Appropriate quantity acoustic damping material. (6) Handsome Teak veneered cabinet. (7) Circuit and full instructions. Terms: Deposit £5.25 and 9 monthly payments £2.56 (Total £28.29).

R.S.C. BRANCHES OPERATE A 5-DAY WEEK OPEN ALL DAY SATURDAY

- BRADFORD 10 North Parade (Closed Wed.). Tel. 25349
- BOLTON 23 Deans (Closed Wed.). Tel. 35512
- BIRMINGHAM 30/31 Great Western Arcade. Tel. 021-236 1279 (Closed Wed.)
- COVENTRY 17 Shelton Square, The Precinct.
- DERBY 97 St. Peter's Street. (Closed Wed.). Tel. 41361
- DARLINGTON 19 Northgate (Closed Wed.). Tel. 68043

- DONCASTER 3 Queensgate, Waterdale Centre. (Closed Thurs)
- EDINBURGH 101 Lothian Rd. (Closed Wed.). Tel. 229 9501
- GLASGOW 326 Argyle St. (Closed Tues.). Tel. 248 4158
- HULL 7 Whitefriargate (Closed Thurs.). Tel. 20505
- LEICESTER 32 High Street (Closed Thurs.). Tel. 56420
- LEEDS 5-7 County (Mecca) Arcade, Briggate (Closed Wed.). Tel. 28252
- LIVERPOOL 73 Dale St. (Closed Wed.). Tel. 236 3573
- LONDON 238 Edgware Road, W.2. (Closed Thurs.). Tel. 723 1629

- MANCHESTER 60A Oldham Street (Closed Wed.). Tel. 236 2778
- MIDDLESBROUGH 106 Newport Rd. (Closed Wed.). Tel. 47696
- NEWCASTLE UPON TYNE 24 Newgate Shopping Centre (Closed Wed.). Tel. 21469
- NOTTINGHAM 19/19A Market Street (Closed Thurs.). Tel. 48068
- SHEFFIELD 13 Exchange Street (Castle Mkt. Blds. (Closed Thurs.). Tel. 20716
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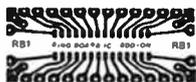
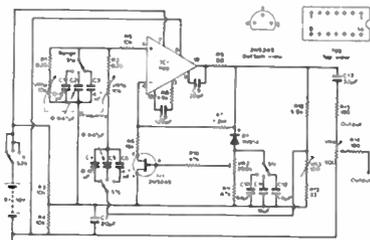
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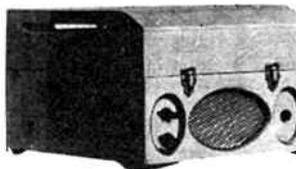
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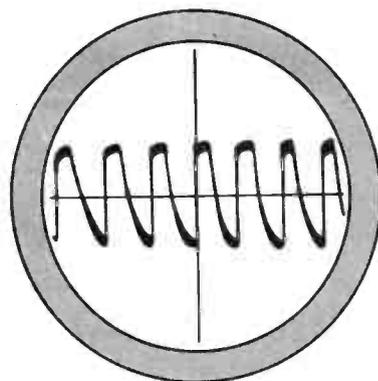
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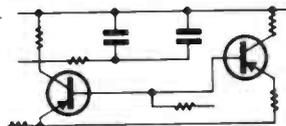
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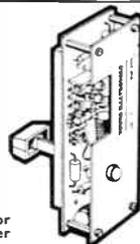
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Top value 1000 o.p.v. pocket multimeter. Ranges: 0/10/50/250/1000V. AC and DC. DC Current 0-1mA/100mA. Resistance 0/150K ohms. Decibels -10 to +24dB. Size 90 x 60 x 28mm. Complete with test leads. £2.95. Post 15p.



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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: 2.5/10/50/250/1000V D.C. 2.5/10/50/250/1000V A.C. DC Current 100µA/1/10/100mA/1A. Resistance 300 ohms/3/30/300K 3Ω. Complete with batteries, test leads, instructions and sturdy metal carrying case. £4.95. P. & P. 25p.



MODEL TE-200

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. 0/50K/6 meg Ω. -20 to +62dB. £4.95. P. & P. 15p.



MODEL TE-300

30,000 O.P.V. Mirror scale, overload protection. 0/5/25/150/300/1,200V. D.C. 0/10/50/250/1,000V. A.C. 0/30µA/60mA/600mA/300mA/600mA. 0/5K/80K/600K/6 meg. ohm -20 to +61db. £7.50. P. & P. 15p.



UA312 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 A.C. 0/200µA/1.5/15/60/150/600mA/1.5/6 AMP. D.C. 0/1/5/15/60/150/600mA/1.5/6 AMP. A.C. 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. 0/5/25/10/25/100/500/1,000V. D.C. 0/2/5/10/25/100/250/500/1,000V. A.C. 0/50µA/15/50/500mA. 12 amp. D.C. 0/60K/6 Meg. 0/50 Meg Ω. £10.50. Post paid. Leather Case £1.75.



MODEL CT-7080 EN

Giant 6" mirror scale. 20,000 o.p.v. 0/1/2.5/10/50/100/1,000V. D.C. 0/2.5/10/50/100/1,000V. 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.



Model S-100TR MULTIMETER/TRANSISTOR TESTER

100,000 o.p.v. mirror scale/overload protection. 0/12/6/3/12/30/120/600 V DC. 0/6/30/120/600V. A.C. 0/12/600µA/12/300mA/12 AMP. DC 0/10 K/1 M/100M/50K -20 to +50dB. 0-0.1 MF. Transistor tester measures Alpha, beta and Ico. Complete with batteries, instructions and leads. £14.95. 1/1 P. 25p.



KAMODEN 72 200 MULTITESTER

High sensitivity tester. 200,000 o.p.v. Overload protection. Mirror scale. Ranges: 0/5/10/3/3/30/120/600/1,200V D.C. 0/3/12/60/300/11,200V. A.C. 0/5µA/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.



ALL PRICES ARE SUBJECT TO 10% VAT

TMK LAB TESTER

10,100 O.P.V. 6 1/2in Scale Buzzer Short Circuit Check. Sensitivity: 100,000 O.P.V. D.C. 5K/10V A.C. D.C. Volts: 2.5/2.5/10/50/250/1,000V. A.C. Volts: 3/10/50/250/500/1,000V. D.C. Current: 10, 100µA, 100, 100mA, 2.5, 10 amp. Resistance: 1K, 10K, 100K, 10MEG, 100MEG Ω. Details: 10 to 49 db. Plastic Case with Carrying Handle. Size: 7 1/2in x 6 1/2in x 3 1/2in. £19.95. P. & P. 25p.



HIKIOI MODEL 700X

100,000 O.P.V. Overload protection. Mirror scale. 0/3/6/12/15/30/60/120/300/600/1,200V D.C. 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 Ω. Neg. ohm -20 to +63dB. £14.95. P. & P. 20p.



370 WSTR MULTI-METER

Features A.C. current ranges. 20,000 o.p.v. 0/5/25/150/500/250/500 1000 V. D.C. 0/25/10/50/250/500/1000V A.C. 0/50µA/1/10/100mA/1/10 Amp D.C. 0/100mA/1/10 Amp AC 0/5K/50K/500K/5 meg/60 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" x 4" 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's, etc. Beta HI 1000 LO 2-50. Ico 0-5000µA. 220/240 V A.C. operation £17.50. Post 25p.



LB3 TRANSISTOR TESTER

Tests Ico and B. PNP/NPN. Operates from 9v battery. Complete with all instructions, etc. £3.95. P. & P. 20p.



LB4 TRANSISTOR TESTER

Tests PNP or NPN transistors. Audio indication. Operates on two 1.5v batteries. Complete with all instructions, etc. £4.50. P. & P. 20p.



TE-40 HIGH SENSITIVITY A.C. VOLT-METER

10 meg. input 10 ranges: 0.01/0.1/1/3/10/30/100/300V. R.M.S. 5cps-1.2 Mc/s. Decibels -40 to +40dB. Supplied brand new complete with leads and instructions. Operation 230V. A.C. £17.50. Carr. 25p.



TE-65 VALVE VOLTMETER

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.



MODEL AT201 DECADE ATTENUATOR

Frequency range 0-200KHz. Attenuator 0-114db. 0.1db step. Impedance 600 ohms. Max. input power 30dBm. Size 180 x 90 x 55mm. £12.50. Post 37p.



KAMODEN HM 720B F.T.E. O.M.

Input impedance 10 meg ohms. Ranges: 0/25/1/2.5/10/50/250/1000V. D.C. 0/1/2.5/10/50/250/1000V. D.C. 0/25mA/2.5/25/250 mA D.C. -20 to +62dB 0/5K/50K/500K/5meg 500meg ohms. £14.95. Post 30p.



TMK MODEL 117 P.E.T. ELECTRONIC VOLTMETER

Battery operated, 11 meg input, 26 ranges. Large 4 1/2" mirror scale. Size 4 1/2" x 4 1/2" x 2 1/2". DC VOLTS 0.3-1200V AC VOLTS 3-300V RMS. 0-9 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 Meg. ohms. 500 Volt. Battery operated. Wide range clear meter 4 1/2" x 4". Complete with carrying case, batteries, instructions. £19.95. Post 30p.



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

Sine 18 x 20,000 Hz; Square 18 x 20,000 Hz Output max. 10 dB. (10 K ohms) Internal batteries Attractive 2-tone case 7 1/2" x 5" x 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: 6 ranges 10 cps-300 kHz. Synchronization. Internal/external. Illuminated scale 140 x 216 x 330 mm. Weight 15 1/2lb. 220/240V. A.C. Supplied brand new with handbook. £52.50. Carr. 60p.



CI-5 PULSE OSCILLOSCOPE

For display of pulsed and periodic waveforms in electronic circuits. VERT. AMP. Bandwidth 10MHz. Sensitivity at 100KHz V RMS/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 pulse 220 x 360 x 430mm. 115-230V. AC operation. £89.00. Carr. paid.



RUSSIAN CI-16 DOUBLE BEAM OSCILLOSCOPE

5 Mc/s Pass Band. Separate Y1 and Y2 amplifiers. Rectangular 6in. x 4in. C.R.T. Calibrated triggered sweep from 2 µsec. to 100 mill-sec. per cm. Free running time base 50 cps-1 mc/s. Built-in time base calibrator and amplitude calibrator. Supplied complete with all accessories and instruction manual £87. Carr. Paid.



TE-16A TRANSISTORISED SIGNAL GENERATOR

3 ranges 400KHz-30MHz. An inexpensive instrument for the handyman. Operates on 9v battery. Wide easy to read scale. 800KHz modulation. 5 1/2 x 3 1/2 in. 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. 0/30/750µA 1.5/3/7.5/15/30/75/150/300/750mA 1.5/3/7.5/15/30/75/150/300/750V 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 60p.



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, 500µA, 2.5, 5, 25, 50, 250, 500mA, 5, 10amp. Resistance: 10K, 100K, 1 MEG, 10 MEG Ω. Decibels: -20 to +51-5db £28.50. P. & P. 17p.



MODEL TE.15 GRID DIP METER

Transistorised. Operates as Grid Dip, Oscillator, Absorption Wave Meter and Oscillating Detector. Frequency range 440Kcs-250Kcs in 6 coils. 500µA Meter. 9V battery operation. Size 180 x 80 x 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. A.C. Complete with instructions and leads. £29.95. Post 60p.



TE22 SINE SQUARE WAVE AUDIO GENERATORS

Sine: 20cps to 200 kc/s on 4 bands. Square: 20cps to 30 kc/s. Output impedance 6,000 ohms. 200/250V. A.C. operation. Supplied brand new and guaranteed with instruction manual and leads. £17.50. Carr. 37p.



240° Wide Angle ImA Meters

MW 1.6-60mm square £3.97
MW 1-8 80mm square £4.97
P. & P. 15p.



POWER RHEOSTATS

High quality ceramic construction. Windings embedded in vitreous enamel. Heavy duty brush wiper. Continuous rating. Wide range available ex-stock. Single hole fixing. In. dia. shrou. Bulk quantities available. 25 WATT. 10/25/50/100/250/500/1000 ohms. £1-15 P. & P. 10p. 50 WATT. 10/25/50/100/250/500/1000/2500 or 5000 ohms. £1.82 P. & P. 10p. 100 WATT. 1/5/10/25/50/100/250/500/1000 or 2500 ohms. £2.34. P. & P. 15p.



AUTO TRANSFORMERS

0/115/250V. Step up or step down. Fully shrouded. 80 W £2.35 P. & P. 18p
150 W £3.00 P. & P. 18p
300 W £4.00 P. & P. 23p
500 W £5.30 P. & P. 33p
1000 W £8.25 P. & P. 43p
1500 W £11.25 P. & P. 43p
2250 W £19.00 P. & P. 60p
6000 W £40.00 P. & P. 81



HIGH QUALITY CONSTRUCTION KITS
Appointed stockists at all branches
Compatible with comprehensive parts for
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Full guarantee
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- HF325 Deluxe FM tuner unit £24.12
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- HF395 Aerial amplifier for AM FM bands £11.77
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- NT10 Power supply 100 mA 9V std. 12V unreg. 16.15
- NT200 Professional stabilized power supply 2 x 20 Volt 7.2 Amp £12.51
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NEW FROM JOSTY KIT!

'Amateur Electronics'—The professional book for the amateur—covers the subject from basic principles to advanced electronic techniques.

OUR PRICE £3.80, complete with circuit board for making the kite listed below.

- AE1 100mV output stage £1.65
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230 VOLT A.C. 50 CYCLES RELAYS

3 sets of changeover contacts at 5 amp rating, 40p each, P. & P. 12p (100 lots \$80. Quantities available.



"YAMABISHI" VARIABLE VOLTAGE TRANSFORMERS

Excellent quality at low cost. All models—Input 230V, 50/60 c/s. Variable output 0-280V.

MODEL S-260 GENERAL PURPOSE BENCH MOUNTING

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| 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, 30p
- 1 Amp 8-75
- 2-5 Amp 10-00 35p



Carriage and Packing Extra

REFLEX HORN SPEAKER RH.6



Built in driver unit. Impedance 16 ohm. Power rating 10 watt. Response 380-7000Hz. Approx. size 8" x 6". Weatherproof and shock proof.

OUR PRICE £4.97 P. & P. 30p.

BVD.5 VERNIER TUNING DIAL



Approx. 7-1 ratio planetary drive vernier dial. Log scale 0-180 degrees. Blank scales 1 to 5. Scale width 4 1/2". Dial size 5 1/2" x 3 1/2". Overall size 7 1/2" x 4 1/2" x 1 1/2" deep including knob and coupling. 1 1/2" dia. shaft.

MP7 MIXER PREAMPLIFIER



5 microphone inputs each with individual gain controls enabling complete mixing facilities. Battery operated. 9 1/2" x 5" x 3". Inputs Mics: 3 x 3mV 50K, 2 x 3mV 600 ohm. Phono meg. 4mV 50K. Phono ceramic 100mV 1 meg. Output 250mV 100K.

Our Price £8.97 P. & P. 20p

SEW CLEAR PLASTIC PANEL METERS

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 5W.100 100 x 80 mm.

50µA	£4.15
50-0-50µA	£3.95
100µA	£3.95
100-0-100µA	£3.90
500µA	£3.70
1mA	£3.60
5mA	£3.60
10mA	£3.60
50V. D.C.	£3.60
300V. D.C.	£3.60
1 amp. D.C.	£3.60

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10V. D.C. £3.70
VU Meter £4.80

Type SD.830 82.5mm x 110mm Fronts

10mA	£3.10
50µA	£3.10
100µA	£3.10
500µA	£3.10
1mA	£3.10
5 amp.	£3.10
10 amp.	£3.10
5V. D.C.	£3.10
10V. D.C.	£3.10
20V. D.C.	£3.10
50V. D.C.	£3.10
15V. A.C.	£3.80
300V. A.C.	£3.80
1mA	£3.10
5mA	£3.10
10mA	£3.10
50µA	£3.40
50-0-50µA	£3.40
100µA	£3.35
100-0-100µA	£3.35
200µA	£3.30
500µA	£3.15
1mA	£3.10
5mA	£3.10

Type SD.640 63.5mm x 85mm Fronts

50µA	£3.05
50-0-50µA	£3.05
100µA	£3.00
100-0-100µA	£3.00
200µA	£3.00
500µA	£3.00
1mA	£3.00
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10mA	£3.00
50µA	£3.00
50-0-50µA	£3.00
100µA	£3.00
100-0-100µA	£3.00
200µA	£3.00
500µA	£3.00
1mA	£3.00
5mA	£3.00
10mA	£3.00
50µA	£3.00
50-0-50µA	£3.00
100µA	£3.00
100-0-100µA	£3.00
200µA	£3.00
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200µA	£3.00
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100µA	£3.00
100-0-100µA	£3.00
200µA	£3.00
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10mA	£3.00
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100-0-100µA	£3.00
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50-0-50µA	£3.00
100µA	£3.00
100-0-100µA	£3.00
200µA	£3.00
500µA	£3.00
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5mA	£3.00
10mA	£3.00
50µA	£3.00
50-0-50µA	£3.00
100µA	£3.00
100-0-100µA	£3.00
200µA	£3.00
500µA	£3.00
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5mA	£3.00
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50µA	£3.00
50-0-50µA	£3.00
100µA	£3.00
100-0-100µA	£3.00
200µA	£3.00
500µA	£3.00
1mA	£3.00
5mA	£3.00
10mA</	

UR-1A RECEIVER



4 Bands covering 550 Kc/s-30 Mc/s. P.E.T. 8 Meter. Variable BFO for 88B. Built-in Speaker. Bandspread. Sensitivity Control. 220/240 v. A.C. or 12 v. D.C. Brand new with instructions.

Our Price £25.00 Carr. 37p

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. 88B-CW, ANL, Variable BFO. 8 meter. Sep. bandspread dial. IF frequency 440 kc/s, audio output 1-w. Variable RF and AF gain controls 115/250 v. A.C. with instruction manual.

Our Price £49.50 Carr. Paid

TRIO JR599 RECEIVER



9 wavebands covering 1.8-29.7MHz 144-146MHz and 10-60MHz V.W.V. 88B, CW, AM and FM. AF output more than 1 watt. 8 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 x 140 x 310mm.

Our Price £155.00 Carr. Paid

BELTEK W5400 CAR TRANSCIEVER



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 144-146MHz, 144-60 MHz, 145-90MHz, mounting bracket and instructions. Size approx. 150 x 70 x 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 V.W.V. 15MHz. 88B, AM and CW. AF output more than 1 watt. Crystal controlled BFO for 88B. 8 meter. ANL etc. AC 110/120-220/240v. Size 330 x 179 x 310mm.

Our Price £75.00 Carr. Paid

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.

Our Price £15.75 Carr. 37p

LAFAYETTE HA-600 RECEIVER

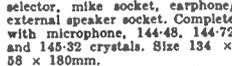
General coverage 150-400 Kc/s, 550 Kc/s-30 Mc/s, P.E.T front end, 2 mech. filters, product detector, variable B.F.O., noise limiter, 8 Meter Bandspread. RF Gain. 220/240 v. A.C. or 12 v. D.C. Brand new with instructions.

Our Price £50.00 Carr. 50p

TRIO TR2000 TRANSCIEVER

Fully transistorised portable VHF Transciever. 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, carphone/external speaker socket. Complete with microphone, 144-48, 144-72 and 145-32 crystals. Size 134 x 55 x 180mm.

Our Price £79.50 Carr. Paid



High quality T8515 88B/CW amateur band receiver covering 80, 40, 20, 15 and 10 metre bands with P8515 power supply and speaker unit. Transmits/receive frequency 3.5-29.7MHz. Output 1.5 watts. Power requirements 110-120/220-240v. AC. Sizes: T8515 300 x 185 x 340mm. P8515 200 x 168 x 340mm.

Our Price £120.00 Carr. Paid

SWR METER—Model SWR-3

Handy SWR Meter for transmitter antenna alignment, with built-in field strength meter. Accuracy: 5%. Impedance: 50. Indicator: 100µA DC, full scale 5 section collapsible antenna. Size: 145 x 50 x 60 mm.

Our Price £4.25 P & P 25p

AUDIOTRONIC AMR-900 GLOBAL AM/FM PORTABLE RADIO

10 wavebands covering AM: 535-1605 kHz, LW: 150-380 kHz, MB: 1-6 MHz, 4-00 MHz, SW1: 4-0-8 MHz, SW2: 8-0-1.6 MHz, SW3: 16-24 MHz, PBB1: 30-60 MHz, PBB2: 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" x 4" speaker and personal earpiece. Battery/mains operation. Size: 845 x 133 x 306mm.

Our Price £36.00 P & P 50p.

SH628 STEREO HEADPHONES



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

Our Price £1.87 P & P 30p

LHO2S STEREO HEADPHONES



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

Our Price £1.97 P & P 30p

TE1018 DE-LUXE MONO HIGH IMPEDANCE HEADSET



Sensitive magnetic headset with soft earpads. Impedance 2,500 ohms (d.c. 600 ohms). Frequency response 200-4,000 Hz.

Our Price £2.25 P & P 30p

BH.001 HEAD SET AND BOOM MICROPHONE



Moving Coil. Ideal for language teaching, communications. Headphone imp. 16 ohms. Microphone imp. 200 ohms.

Our Price £4.95 P & P 30p

DH02S STEREO HEADPHONES



Wonderful value and excellent performance combined. Adjustable headband. 8 ohm impedance. 20-12,000 cps. Complete with lead and plug.

Our Price £2.25 P & P 30p

HAND-HELD 2-WAY WALKIE-TALKIES



SKYFON—100MW. £24.95 pair. PS02—2 CHANNEL 300MW. £32.50 pair. P1003—3 CHANNEL 1 Watt £71.95 pair. LICENCE REQUIRED FOR OPERATION IN U.K.

AUDIOTRONIC DIGITAL CLOCK RADIO ADC.1



Covers AM 540 - 1600 KHz. FM 88 - 108 MHz with AFC illuminated dial. 24 hour alarm setting. Wake up to the sound of music or loud buzzer. Sleep switch will automatically turn off radio etc. Internal speaker plus socket for earpiece or pillow speaker. AC 240v. Size 254 x 92 x 178mm. Complete with earpiece, and operating instructions.

Our Price £12.50 P & P 50p.

SPECIAL BARGAIN! PHONIC 10 TWO WAY SPEAKER SYSTEM

Matched pair of compact bookshelf speakers of unique design incorporating 2" high frequency tweeter and 6" woofer. 8 ohms impedance. 10 watts power handling. Size 348 x 228 x 110mm.

GWS SPECIAL PRICE £9.95 per pair. P & P 50p plus VAT.

AUDIOTRONIC AHA101 STEREO HEADPHONE AMPLIFIER

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.

Our Price £7.50 P & P 20p

AUDIOTRONIC AR.1000 SPORTSMAN AM/FM POLE BTRARADIO

5 wavebands covering AM 535 1065KHz FM 88-108MHz. AIR 108-136MHz. PB 147-174MHz. WB 162.5MHz. Large horizontal middle 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 x 79 x 210mm. Battery/mains operation.

Our Price £11.50 P & P 35p.

AUDIOTRONIC AMB.500 MULTIBAND RADIO

5 wavebands covering MW 535-1605KHz and FM 88-175MHz. All transistor. Battery or mains operation. Built in aerial and 8 section telescopic aerial.

Our Price £6.95 P & P 35p

BINATONE DS100 DIGITAL CLOCK

240v. mains operation. Compact case with large clear numbers for hours, minutes and seconds. Approx. size 61" x 3" x 31".

Our Price £4.50 P & P 30p.

AUDIOTRONIC ACP.8 8 TRACK CAR PLAYER

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

Our Price £12.50 P & P 40p

AUDIOTRONIC DOLBY 'B' NOISE REDUCTION UNITS

Reduce tape hiss by 3dB at 600Hz, 6dB at 1200Hz and 10dB for all frequencies above 3000Hz. Size 161" x 8" x 31". AC 200/250v



PROCESS FOUR

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

Our Price £50.00 P & P 50p

PROCESS TWO

For use with cassette and tape recorders. Freq. res. 30Hz-20KHz ± 2dB. OF tape monitoring. Switchable multiplex filter. Two Dooby calibration meters. 8/N better than 70dB. Supplied with test cassette or tape as required.

Our Price £34.50 P & P 50p

FM TUNER CHASSIS

6 TRANSISTOR HIGH QUALITY TUNER. 8 I Z E O N L Y stages. Double tuned discriminator. Ample output to feed most amplifiers. Operates on 9V battery. Coverage 88-108Kc/s. Ready built ready for use. Fantastic value for money.

Our Price £5.95 P & P 20p

A1018 FM TUNER

Specification as above chassis but complete in cabinet with on/off switch. Size 72" x 31" x 5".

Our Price £9.65 P & P 30p

AUDIOTRONIC AM/FM Portable Radio AR3000

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. Thumb wheel tuning. Slider volume and tone controls. Earphone socket. Built-in and telescopic aerials. Car aerial socket. Battery/Mains operation.

Our Price £14.95 P & P 50p

AUDIOTRONIC ACR3500 CAR RADIO

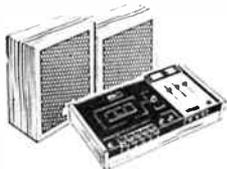
Manual tuning of Medium and Long waves. 12v pos. or neg. earth. Complete with speaker, mounting brackets and instructions.

Our Price £6.50 P & P 50p



SAVE UP TO 33 1/3% OR MORE! GWS

SUPER AKAI HI-FI BARGAINS CS35 Stereo Cassette Recorder



For conventional or Chromium Dioxide tape. 4 track record/playback. Volume and tone controls. Frequency response 40-16kHz (using CrO2 tape), distortion better than 2%, wow and flutter better than 0.2% RMS. Complete with pair of matching Akai CS88 speakers.

Rec. Price £98-10 **OUR PRICE £56-50** P. & P. 50p
MICROPHONES (P. & P. 50p)
 ADM Dynamic (pair) £7-50

AUDIOTRONIC AHP-8D 8 Track Stereo Tape Deck

Can be used with most hi-fi amplifiers. Push button track selector and illuminated track indicator. Attractive cabinet with black and silver trim. Output level 750mV, AC 220/240v.

OUR PRICE £11-95 P. & P. 50p.

AUDIOTRONIC AHP-8A 8 Track Stereo Tape Player



Incorporates built in amplifiers giving 2 1/2 + 21 watts rms output. Push button track selector, illuminated track indicators, slider controls for volume, balance and tone. Attractive cabinet with black and silver trim. Output impedance 8 ohms. AC 220/240v.

OUR PRICE £17-25 P. & P. 50p.

SPECIAL PURCHASE! BSR 8 TRACK PLAYER CHASSIS

Famous BSR 8 track chassis as used in Model TD88 complete with silver and black escutcheon ready to fit into cabinet. Output 125mV. AC 240v. Overall size approx. 185 x 215 x 90mm.

OUR PRICE £8-95 P. & P. 50p.

AUDIOTRONIC ACD.660 Stereo Cassette Deck



A beautifully styled 4 track stereo deck with an outstanding specification offered at a remarkably low price. Incorporates a host of features including switchable noise filter normal/chrome tape selector, twin VU meter, slider record/playback level controls, front panel headphone socket, recording indicator lamp, phono/Din line input sockets, 3.5mm mike input sockets etc. etc. Frequency response 100-8kHz (100-12kHz CrO2) 8/1-45dB. Crosstalk 46dB. Separation -35dB. Noise limiter -6dB at 10kHz. Complete with phono connecting leads.

OUR PRICE £39-50 Carr. & Ins. 50p

AUDIOTRONIC ACR.14 Battery Mains Cassette Recorder

Portable twin track mono recorder with automatic recording level control. Built in speaker. Earpiece socket. Input for radio or record player. Fast forward and rewind. Output 500mW. AC 220/240v or 6V DC operation. Complete with remote control microphone, mains lead, earpiece and batteries.

OUR PRICE £10-50 P. & P. 50p.

PORTABLE CASSETTE RECORDER

Instant recording and playing. Piano key controls. Automatic level control. Built in speaker. Complete with remote control microphone, carrying case and shoulder strap.

OUR PRICE £8-50 P. & P. 50p.

AUDIOTRONIC LOW NOISE CASSETTES

Top Hi-Fi quality in library cases

TYPE	5	10	25
C60	£1-29	£2-53	£5-99
C90	£1-55	£2-68	£5-59
C120	£2-29	£4-48	£10-63

P. & P. 15p.
 Cassette Tape Head Cleaner 80p

3-STATION INTERCOM KE.630

Master and two sub stations. Can be used on desk or wall mounted. Complete with cable and batteries.

Our Price £5-25 P & P 50p

MINUTEMAN MM3 POCKET CALCULATOR

Size only 4 1/4" x 3" x 1". 8 digit display with overflow and error indicators. Floating decimal. Adds, subtracts, multiplies and divides. Chain and mixed calculations. Constant factor for series multiplication or division. Complete with batteries, instructions and case.

OUR PRICE £23-95 P. & P. 25p

MINUTEMAN MM3M

as above with addition of memory key, per cent key and a fixed or floating decimal. Complete with rechargeable batteries, AC adaptor, instructions and case.

OUR PRICE £28-50 P. & P. 25p

NEW! SINCLAIR CAMBRIDGE CALCULATOR

To build up your Complete kit of parts with step by step instructions to build a full specification calculator.

OUR PRICE £24-95 P. & P. 50p.

(Also available ready built Rec. Price £29-95)

OUR PRICE £27-20 P. & P. 25p

AUDIOTRONIC Stereo Headphones

LSH.80 Individual volume controls Stereo mono switch. 8 ohms. 40-19,000 Hz. £3-50 P & P 30p

LSH.80 Open back type. Individual tone and volume controls. 8 ohms. 30-20,000 Hz. £5-50 P & P 30p

LSH.40 Two way stereo system. Individual volume controls. 8 ohms. 20-20,000 Hz. £6-95 P & P 30p

LSH.60 3" speaker units. 8 ohms. 20-20,000 Hz. Complete with zipped carrying case. £8-50 P. & P. 30p

LQH.400 4-channel dynamic headphones. Each earpiece has individual drive units. 4-32 ohms. 20-20,000 Hz. £9-95 P. & P. 30p

LSH.50 Electrostatic with self powered amplifier and control unit with head/phone/earpiece selector. 4-32 ohms. 20-24,000 Hz. £15-95 P. & P. 30p

RECORD DECKS

Carriage and Packing 50p

B.S.R. McDONALD
 C114 Mini £3-95
 C129 Mono £5-50
 C137 £7-00
 510/TPD1 £13-95
 610 £11-25
 610/TPD1 £21-15
 710 £22-80
 810 £28-30
 MP60 £28-25
 MP60/G800 £10-90
 MP60/TPD1 £13-20
 MP60/TPD2 £11-80
 MP60/TPD1 £11-80
 HT70/G800 £14-25
 HT70/TPD1 £16-55

CONNOISSEUR
 BD1 Kit £9-10
 B1 Chassis £11-85
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 G101P/C £22-50
 GL29/2 £17-75
 GL72 £25-45
 GL72P £28-75
 GL75 £22-20
 GL75P £41-65
 GL78P/C £27-00
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RECORD DECK PACKAGES

Complete units with Stereo cartridge ready wired in plinth cover.

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 2025 TC/PTAHCD £11-35
 SP25 111/G800 £16-50
 SP25 111/M44E £17-95
 SP25 111/M44-7 £17-50
 SP25 111/M55E £18-50
 SP25 111 Module/M75-6 £19-45
 AP76/G800 £28-45
 AP76/M44E £27-70
 AP76/M44-7 £27-20
 AP76/M55E £28-30
 AP76/M75ED £24-90
 AP76/M75E £20-90
 AP76 Module/M75-6 £29-10
 868B Module/M75-6 £28-50
 AP96 Module/M75-6 £33-20
 ZERO 100B Module/M93E £44-15
 Zero 100B Module/M75-6 £24-20

B.S.R. McDONALD
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 MP60/G800 £18-50
 MP60/TPD1/G800 £15-80
 MP60/M44-7 £17-50
 HT70/TPD1/G800 £19-20

GOLDRING
 GL72/G800 £24-90
 GL75/G800 £29-10
 GL75/G800E £41-55
 GL78/G800 £42-45
 GL78/G800E £44-95

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 AFU £5-50
 P-5 £2-95
 P-28 £3-30
 P-28 £8-30
 P-28 Mains transformer £4-05
 Project 605 £20-97

DIGITAL CLOCK MECHANISM DT.55B



Features 24 hour alarm setting with built-in buzzer. On/off and auto alarm 'sleep' switch. Illuminated rotary dial with hours, minutes and seconds. Automatically turns off TV, radio, light, etc. and with auto setting will switch on again when required. AC 240v. operation. Switch rating 250v. 3A.
OUR PRICE £5-95 P. & P. 30p.

EMI LOUDSPEAKERS

Model 350. 15" x 8" with single tweeter/crossover. 20-20,000 Hz. 15 watt RMS. Available 8 or 15 ohms. £7-25 each. P. & P. 37p.
 Model 400. 13" x 8" with twin tweeter/crossover. 55-13,000 Hz. 8 watt RMS. Available 8 or 15 ohms. £3-62 each. P. & P. 25p.

SPECIAL OFFER! STEREO SPEAKERS

Matched pair of stereo bookshelf speakers. Deluxe teak veneered finish. Size 14 1/2" x 9" x 7 1/2". 8 ohms. 8 watt RMS. 16 watt peak. Complete with DIN lead.
Our Price £12-95 Carr. 50p

SPECIAL OFFER! FRUITSTRATED EXPORT ORDER PHILCO FORD MODEL 8248 MAINS TAPE RECORDER

2 track BSR deck with push button controls for easy operation. Tape counter and volume control. Complete with hand microphone. Direct recording lead, 1200' reel of tape & spare pool. 500/250V AC operation. Fully guaranteed. **OUR PRICE £17-50.** C & P 75p.

PHILCO FORD MODEL 8248 MAINS TAPE RECORDER

4 track. 2 speeds (3 1/2 i.p.s. & 1 1/2 i.p.s.). Piano key type controls. Tape counter, recording level meter, volume & tone controls etc. Complete with hand microphone, direct recording lead, 1800' of tape with spare pool. 200/250V AC operation fully guaranteed. **OUR PRICE £27-50.** C & P 75p.

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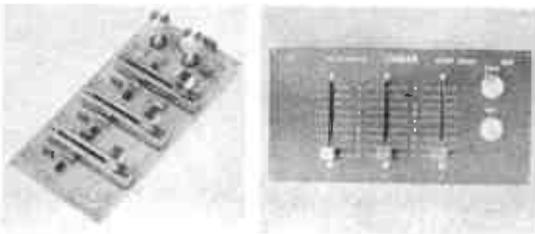
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DABAR MN3 MIXER KIT



INTRODUCING THE NEW DABAR MINI THREE CHANNEL MIXER KIT WITH THE FOLLOWING FEATURES:

- ★ Three inputs easily adjustable to suit users input requirements, e.g., Mic., Tape, Disc., etc.
- ★ Uses advanced design with five integrated circuits.
- ★ Slider fader volume controls mount directly on P.C. board.
- ★ Full range bass and treble controls.
- ★ Guaranteed top grade components with fibreglass printed circuit board, ready-drilled and tinned.
- ★ Battery operated (2 x PP3) not supplied with kit.
- ★ Easy to follow assembly instructions (available separately 25p).
- ★ Attractive ready punched fascia plate, available at extra cost, gives that professional finish to the unit.
- ★ Size: 9.5" x 4.8" x 2".

PRICE: KIT ONLY £11.00
 FACIA PLATE £1.50
 MANUAL AND ASSEMBLY INSTRUCTIONS 25p
 AVAILABLE READY BUILT WITH FACIA £15.00

ALL PRICES INCLUDE V.A.T. & POSTAGE IN U.K.
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DABAR ELECTRONIC PRODUCTS

98, LICHFIELD STREET, WALSALL, STAFFS, WS1 1UZ.

TRANSISTORISED F.M. tuner head with A.M. gang, slow motion drive. 88—108Mcs, with circuit diagram. £2.30p.

P-C BOARDS (not computer panels)

- 1 off 6 transistors single wave band
- 1 off 4 transistor audio
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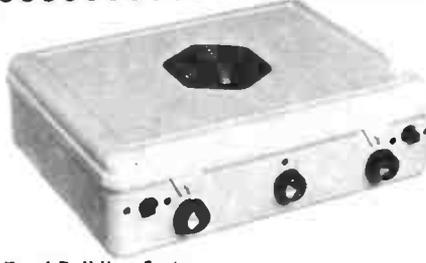
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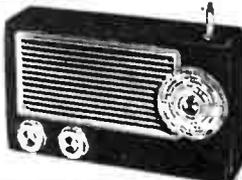
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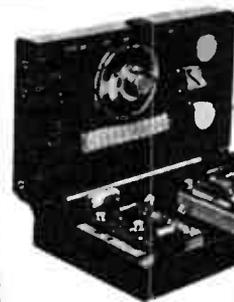
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AO162	44p BFX34	25p CRS3 40AF	OC75	25p 2N1132	24p 7443	
AO181/162	44p BFX85	34p	£1 53 OC76	25p 2N1302	17p 7445	
AF106	32p BFX86	25p C26	17p OC77	40p 2N1303	17p 7446	
AF114	27p BFX87	30p O10 (NTG010)	OC81	20p 2N1304	24p 7447	
AF115	27p BFX88	24p	40p OC81O	20p 2N1305	24p 7450	
AF116	25p BFY50	22p IRT84	£2 90 OC83	23p 2N1306	30p 7451	
AF117	25p BFY51	19p IRT260	95p OC84	25p 2N1307	30p 7453	
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AF129	47p BPX66	£1 50 LIC723C5	£1 02 ORP12	50p 2N1711	15p 7473	
AF186	40p BRY39	45p LIC723C14	£1 02 ORP60	50p 2N1711	15p 7474	
AF239	52p BSX19	16p LIC741C5	£1 45 ORP61	50p 2N1893	54p 7475	
AF279	58p BSX20	18p LIC741C8	34p ORP69	50p 2N218A	33p 7476	
ASV26	20p BSX21	20p MC1303L	£1 75 PN70	10p 2N218A	44p 7480	
ASV27	20p BSX27	20p MC1305P	£2 80 PN71	10p 2N219	38p 7482	
ASV28	22p BSX29	25p MC1307P	£1 65 PN107	8p 2N219A	53p 7483	
ASV29	30p BSX95A	12p MC1310P	£2 95 PN108	8p 2N2368	17p 7486	
BA138	15p BY100	20p MC1330P	80p PN109	8p 2N2369	17p 7490	
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BC109	13p BZY88C4V7	10p MFC6040	£1 15 SL803A	£1 12 2N2925	22p 74121	
BC109/BC179	BZY88C5V1	10p MFC8010	£1 24 TAA293	97p 2N2926	10p 74141	
	BZY88C5V6	10p MFC8040	£1 24 TAA310	£1 25 2N3053	24p 74150	
	BZY88C6V2	10p MJE371	68p TAA320	75p 2N3054	65p 74151	
BC109C	14p BZY88C6V8	10p MJE520	85p TAA861	45p 2N3055	65p 74153	
BC117	15p BZY88C7V3	10p MJE521	82p TAO100	£1 97 2N3228	£1 10 74154	
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BC147	12p BZY88C9V1	10p MJC3055	86p TIL209	£2 00 2N3325	£1 04 74156	
BC148	11p BZY88C10V	10p MJ480	97p TIL209	97p 2N3702	14p 74190	
BC149	12p BZY88C11V	10p MJ481	£1 25 TIP31A	60p 2N3703	12p 74191	
BC157	13p BZY88C12V	10p MJ491	£1 35 TIP32A	70p 2N3704	12p 74192	
BC158	12p BZY88C13V	10p MJ802	£4 12 TIP41A	85p 2N3705	12p 74193	
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BC168	10p BZY88C24V	10p MPF102	37p VA1077	15p 2N3711	12p 40311	
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BC177	29p BZX61C7V5	28p	49p W01	31p 2N3819	28p 40320	
BC178	18p BZX61C8V2	28p	MPF104(2N5458)	W02	60p 40360	
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BC183L	15p BZX61C13V	28p	NKT212	25p ZTX300	13p 2N4058	15p 40409
BC184	17p BZX61C15V	28p	NKT213	25p ZTX303	18p 2N4058	13p 40410
BC184L	18p BZX61C16V	28p	NKT216	46p ZTX303	15p 2N4061	13p 40410
BC212	16p BZX61C18V	28p	NKT217	50p ZTX304	23p 2N4062	13p 40438A
BC212L	16p BZX61C20V	28p	NKT218	25p ZTX314	11p 2N4441	70p 40511
BC238	10p BZX61C22V	28p	NKT223	27p ZTX320	30p 2N4444	£2 20 40575
BC238/308	20p BZX61C24V	28p	NKT221	18p ZTX330	18p 2N4871	44p 40576
BC257	11p BZX61C27V	28p	NKT274	18p ZTX500	14p 2N4990	66p 40600
BC258	10p BZX61C30V	28p	£2 03 NKT275	20p ZTX501	15p 2N4991	48p 40601
BC259	12p CA3004	£2 03 NKT279A	20p ZTX502	18p 2N5245	45p 40602	
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BCY31	48p CA3014	£1 37 NKT402	83p ZTX506	20p	49p 40739	
BCY32	50p CA3018	72p NKT403	83p NKT403	4p 2N5459(MPF105)	46p	
BCY33	20p CA3018A	83p NKT404	85p NKT404	5p	46p	
BCY34	25p CA3020	£1 39 NKT405	79p NKT405	2p 2N5777	45p	
BCY38	30p CA3028A					

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Mld	Working Voltage	Price	Mld	Working Voltage	Price
1 0	100v	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
20	63v	9p	1000	25v	14p
22	40v	9p	1000	25v	21p
47	25v	9p	2200	16v	39p
47	40v	9p	4700	25v	46p

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	8p
0 33	8p
0 47	9p
0 68	12p
£1 18	10
1 5	25p
2 2	22p
£2 06	22p
£1 45	22p
£1 25	22p

Order as "Polyesters" + Capacitance.

CAPACITORS—POLYSTYRENE

Axial leads, Clear encapsulation, 5% Tolerance, 160 volt working, Stock values Price each

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220pF, 330pF, 470pF, 560pF, 680pF, 820pF, 1000pF, 1500pF	5p
2200pF, 3300pF, 4700pF, 5600pF, 6800pF	4p

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14 pin Oil 18p, 16 pin DII 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	1/2"	4	10p
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HSN3	6BA	1"	4	10p

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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		
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OP. AMPS—NEW LOW PRICE!

741 8 PIN OIL 34p

RESISTORS—METAL OXIDE

Metal Oxide resistors by Electrofil. Ultra low noise, 1/2 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	2ip each

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10% DISCOUNT OVER £4. NO POSTAGE AND PACKING. TOP QUALITY PRODUCTS ALWAYS BY RETURN 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!

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. $15\frac{1}{2}'' \times 8'' \times 4''$. Complete deck and cover enclosed position approx. $15\frac{1}{2}'' \times 12'' \times 6''$.

Personal shoppers and mail order price

£18.45 INCLUDING VAT plus £1.60 p & p.

Diamond styli, 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.

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— $19'' \times 14''$ (approx.) high efficiency 16, 500-gauss bass unit built on a heavy diecast frame. The four 10,000 gauss tweeters, each $3\frac{1}{4}''$ 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. Flux 360,000 Maxwells. Impedance at 1 kHz is 8 ohms. 3" voice coil.

Recommended retail price £40.80.

OUR PRICE £18.70
+ £1.50 p & p



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Edgware: 9 a.m. to 5.30 p.m., half day Thurs.
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Mail orders to Acton. Terms C.W.O. All enquiries Stamped Addressed Envelope Goods not despatched outside U.K.



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 x 10½in x 6½in. Drive unit 13in x 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 x 11½in x 9½in. Drive unit approx 13½in x 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.

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**

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STILL ONLY **£49 COMPLETE**



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 modulated 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 4½in deep. Circuit diagram and comprehensive instructions SSP free with parts. Fully retractable and lockable car aerial £1.37 post paid.

CAR RADIO KIT £6.60 p. and p. SSp. 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.



PE TAPE LINK CONSTRUCTORS

Suitable 3 speed tape deck, less heads. Caters up to 5½ins. spools. 240V AC mains. Unused but store soiled hence no warranty. **£4.00** £1 p. & p.

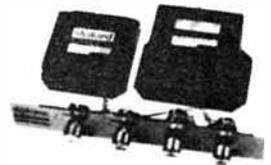
RELIANT MK IV MONO AMPLIFIER

*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.



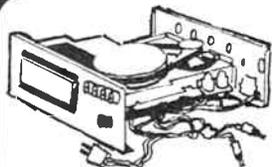
IN-CAR ENTERTAINMENT AT HOME

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 **£10.60** + 90p. p. & p. will accept this unit, simply connect up.



SEE OPPOSITE PAGE FOR ADDRESS DETAILS

BI-PRE-PAK AUDIO BARGAINS



**8 TRACK
ONLY £11**

incl. P. & P. and VAT

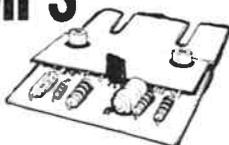
The latest B.S.R. 8 Track cartridge Replay Deck. Ready to install in your Hi-Fi Stereo System. This unit comes complete with Hi Gain Stereo Pre-Amplifier, 4-Programme Indicator Lamps, Track Selector Switch, all leads and plugs, etc. for 230 volt A.C. mains operation.

5W & 10W AMPS

5W ONLY £1.98

10W ONLY £2.49

incl. P. & P. and V.A.T.



Specification:—

	5 Watt	10 Watt
Nominal Volts	12-14V	25-30V
Into 8 Ohms	5W	10W
Into 15 Ohms	2W	10W
Typical Distortion	1W	5W
Freq. response at 3dB	-5%	-5%
Sensitivity (Typically)	10Hz to 30KHz	10Hz to 30KHz
Full power consumption (30 Ohms)	20mV	20mV
Size	650mA	580mA
	2 1/2" x 1 1/2"	2 1/2" x 1 1/2"

The 5W matchbox sized amplifier will run satisfactorily from a 12V car battery. Can also be used for portable voice reinforcement such as public functions where mains supply is not accessible. A small mains unit kit is available.

Two amplifiers are ideal for Stereo. Complete connection details and treble, bass, volume and balance control circuit diagrams are supplied with each unit.

Discounts are available for quantity orders.

Cheapest in the U.K. Built and tested

STEREO DECODER
£4.95



incl. P. & P. and VAT

A ready built unit, ready for connection to the I.F. stages of your existing FM Radio or Tuner. A tell tale light can be connected to show the presence of a Stereo transmission and correct operation.

The Unit is in the form of a small printed circuit, and no further alignment is necessary, as all preset adjustments have already been carried out at the factory.

It is recommended that a L.E.D. is used as the indicating light and a suitable device is available from us at 36p. Supplied with all necessary instructions.

I enclose £..... for 8 Tracks/..... 5W Amps./.....10W Amps./..... Decoders (Please insert quantities and delete those not applicable.)

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Co. Regn No.820919

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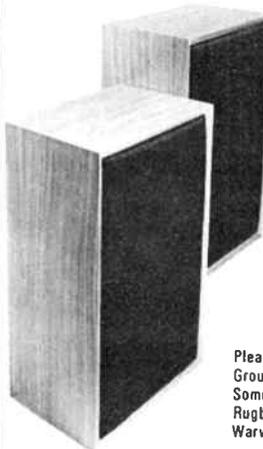
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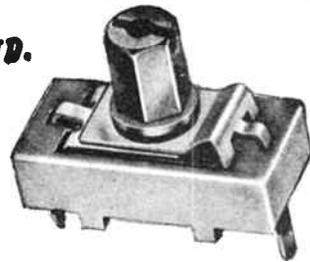
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Here's a page from our Catalogue showing a few typical types

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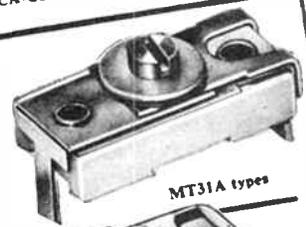
Maker: CYLDON

Cat. No.	Maker's No.	Size inches	Capacity	Price
VC29D	CBB/30	$\frac{3}{4} \times \frac{3}{8} \times \frac{1}{2}$	3-30 pF	10p
VC29E	CAA/40		3-40 pF	10p
VC29F	CAA/80		10-80 pF	10p
VC29H	CAA/180		60-180 pF	12p



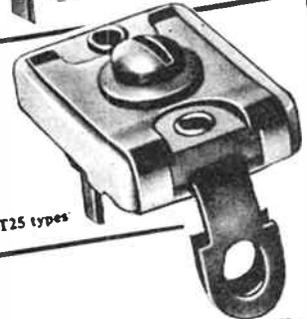
CA-CB types

VC29J	MT31A/9	$\frac{3}{8} \times \frac{7}{8} \times \frac{3}{8}$	1.5-20 pF	8p
VC29LA	MT31A/3		3-40 pF	8p
VC29LC	MT31A/12		7-60 pF	10p
VC29K	MT31A/4		10-80 pF	9p
VC29LB	MT31A/5		30-140 pF	10p
VC29L	MT31A/13		60-180 pF	11p



MT31A types

VC29M	MT25/18	$\frac{5}{8} \times \frac{7}{8} \times \frac{3}{8}$	1.5-25 pF	11p
VC29MA	MT25/1		2.5-40 pF	11p
VC29MB	MT25/2		3.5-70 pF	11p
VC29N	MT25/3		20-150 pF	12p
VC29P	MT25/4		45-250 pF	12p



MT25 types

VC29PA	TP1	$\frac{5}{8} \times \frac{7}{8} \times \frac{3}{8}$	10-110 pF	12p
VC29Q	TP4		20-250 pF	11p
VC29R	TP12		50-450 pF	14p
VC29RB	TP11		150-750 pF	17p
VC29S	TP7		300-1000 pF	18p
VC29SA	TP10		400-1250 pF	19p
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VA (watts)	Ref. No.	Price £	P & P £
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150	150	3.15	0.52
200	151	5.30	0.52
250	152	7.05	0.65
350	153	9.40	0.80
500	154	13.55	1.00
1000	155	24.97	1.20
2000	158	41.25	*
3000	159	64.54	*

LOW VOLTAGE

Prim. 200-240V. Sec. 12 & 24V.

Volts	Type	Price £	P & P £
12V 24V	No.	£	£
0.5	0-25	1.11	0.22
1	0.5	2.13	0.22
2	1	7.1	0.22
4	2	18	0.38
6	3	7.0	0.42
8	4	10.8	0.52
10	5	7.2	0.52
12	6	11.6	0.52
16	8	17	0.52
20	10	11.5	0.69
30	15	18.7	0.97
40	20	23.2	1.00
60	30	22.6	1.10

30 Volts

Prim. 200-240V. Sec. 12, 15, 20, 24, 30V.

Amps	Type	Price £	P & P £
0.5	112	1.20	0.22
1	79	1.64	0.38
2	3	2.45	0.38
3	20	3.00	0.42
4	21	3.55	0.52
5	51	4.40	0.52
6	117	5.25	0.52
8	88	6.20	0.67
10	89	8.36	0.67

50 Volts

Prim. 200-240V.

Amps	Type	Price £	P & P £
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1	103	2.35	0.38
2	104	3.25	0.42
3	105	4.40	0.52
4	106	5.48	0.52
6	107	8.65	0.67
8	118	11.27	0.97
10	119	14.15	0.97

60 Volts

Prim. 200-240V.

Amps	Type	Price £	P & P £
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1	126	2.25	0.38
2	127	3.55	0.42
3	125	6.40	0.52
4	123	6.98	0.67
5	40	8.46	0.67
6	120	9.20	0.82
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10	122	15.25	1.00
12	129	16.48	1.10

MINIATURE AND EQUIPMENT

Prim 240V with screen

Volts	Sec. 1	Sec. 2	Milliamps	Type	Price £	P & P £
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0-6	0-6	---	500	500	234	1.18
0-6	0-6	---	1000	1000	212	1.28
9-0-9	---	---	100	---	13	0.95
0-9	0-9	---	350	330	235	1.28
0-8-9	0-8-9	---	500	500	207	1.70
0-8-9	0-8-4	---	1000	1000	208	2.30
15-0-15	---	---	40	---	240	1.28
0-15	0-15	---	200	200	236	1.28
20-0-20	---	---	30	---	241	1.09
0-20	0-20	---	150	150	237	1.28
0-15-20	0-15-20	---	500	500	205	2.16
0-20	0-20	---	300	300	214	1.36
20-12-0-12-20	---	---	700(D/C)	---	221	1.21
0-15-20	0-15-20	---	1000	1000	206	3.10
0-15-27	0-15-27	---	500	500	203	2.38
0-15-27	0-15-27	---	1000	1000	204	2.40

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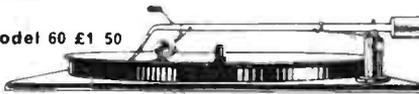
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PS 40 Jack 3.5mm Switched 0-10
PS 41 Jack 1" Switched 0-17
PS 42 Jack Stereo Switched 0-26
PS 43 Phono Single 0-06
PS 44 Phono Double 0-10
PS 45 Car Aerial 0-09
PS 46 Co-Axial Surface 0-09
PS 47 Co-Axial Flush 0-14

INLINE SOCKETS

PS 21 D.I.N. 2 Pin (Speaker) 0-13
PS 22 D.I.N. 3 Pin 0-17
PS 23 D.I.N. 5 Pin 180° 0-17
PS 24 D.I.N. 5 Pin 240° 0-17
PS 25 Jack 2.5mm Plastic 0-10
PS 26 Jack 3.5mm Plastic 0-12
PS 27 Jack 1" Plastic 0-24
PS 28 Jack 1" Screened 0-28
PS 29 Jack Stereo Plastic 0-22
PS 30 Jack Stereo Screened 0-32
PS 31 Phono Screened 0-14
PS 32 Car Aerial 0-16
PS 33 Co-Axial 0-17

PLUGS

PS 1 D.I.N. 2 Pin (Speaker) 0-11
PS 2 D.I.N. 3 Pin 0-12
PS 3 D.I.N. 4 Pin 0-15
PS 4 D.I.N. 5 Pin 180° 0-14
PS 5 D.I.N. 5 Pin 240° 0-15
PS 6 D.I.N. 6 Pin 0-15
PS 7 S.I.N. 7 Pin 0-15
PS 8 Jack 2.5mm Screened 0-10
PS 9 Jack 3.5mm Plastic 0-09
PS 10 Jack 3.5mm Screened 0-12
PS 11 Jack 1" Plastic 0-18
PS 12 Jack 1" Screened 0-18
PS 13 Jack Stereo Screened 0-29
PS 14 Phono 0-06
PS 15 Car Aerial 0-16
PS 16 Co-Axial 0-10

CABLES

CP 1 Single Lapped Screen 0-06
CP 2 Twin Common Screen 0-08
CP 3 Stereo Screened 0-08
CP 4 Four Core Common Screen 0-23
CP 5 Four Core Individually Screened 0-30
CP 6 Microphone Fully Braided Cable 0-10
CP 7 Three Core Mains Cable 0-07
CP 8 Twin Oval Mains Cable 0-06
CP 9 Speaker Cable 0-04
CP 10 Low Loss Co-Axial 0-10

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47K, 10K, 22K, 47K, 100K, 220K, 470K, 1M, 2M
VC 1 Single Less Switch 0-14
VC 2 Single D.P. Switch 0-26
VC 3 Tandem Less Switch 0-08
VC 4 1K Lin Less Switch 0-14
VC 5 100K Log anti-Log 0-14

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0-1 watt 0-06 each
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R3 50 Mixed 10K ohms-82K ohms 40p
R4 50 Mixed 100K ohms-1 Meg. ohms 40p
THESE ARE UNBEATABLE PRICES—LESS THAN 1p EACH INCL. V.A.T.

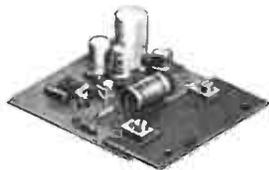
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AL10/AL20/AL30 AUDIO AMPLIFIER MODULES



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 k Ω
FREQUENCY RESPONSE @ 3dB	Po = 2 WATTS	50 Hz - 25KHz
SENSITIVITY for RATED O/P	Vs = 25V. Ri = 8 Ω f = 1KHz	75mV. RMS
DIMENSIONS	—	3" x 2 1/2" x 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

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

PRE-AMPLIFIERS

PA 12. (Use with AL10 & AL20)	£4.35
PA 100. (Use with AL30 & AL50)	£13.15

TRANSFORMERS

T461 (Use with AL10)	£1.38 P & P 15p
T338 (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 162mm x 84mm x 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 book-up diagrams and complete technical data supplied free with each module or available separately at 10p each.

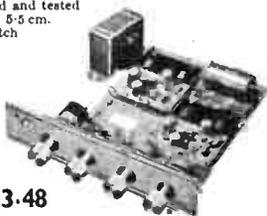
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£2.89

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 x 14 cm x 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 x 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.
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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 x 105mm x 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 x 82mm x 35mm

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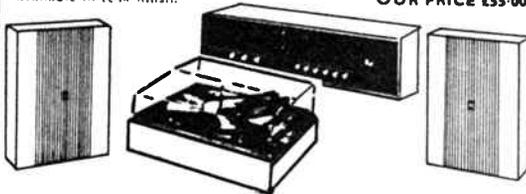
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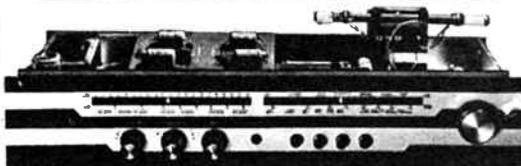
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High performance Stereo Amplifier designed for home entertainment at economical cost. Represents a considerable advance in solid state, high fidelity stereo amplifiers. Outstanding performance is allied to meticulous construction, comprehensive facilities, installation simplicity and attractive styling. 10 watt RMS per channel; push button selectors; tone controls; balance control; tape record and replay facilities. Stereo headphone socket on front panel with automatic speaker muting; Teak finish. **Our price £75-00 + £2-00 p. & p.** Credit Terms £7-50 deposit + £2-00 p. & p. 18 monthly payments of £4-75 (total £93-00) SEND £9-50 TODAY.

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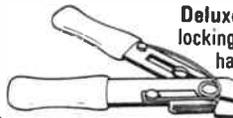
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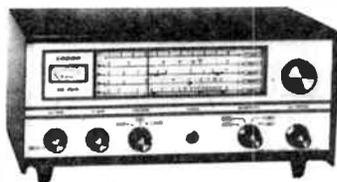
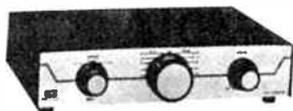
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I am delighted with the CODAR equipment I am using . . . everything has come up to your specifications.

Dr. R. E. Wood, Louisiana State University, U.S.A.
Congratulations 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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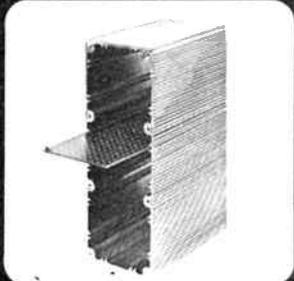
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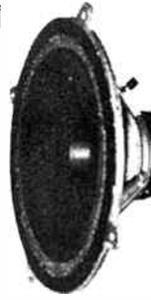
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Bass Resonance 30cps
Flux Density 14,000gauss
Useful response 25-18,000cps
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A high wattage loudspeaker of exceptional quality with a level response to above 8,000 cps. Ideal for Public Address, Discotheques, Electronic instruments and the home.

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"STEAM" ROLLING

ANUAL 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 quadrasonic 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.*

CRATA IS COMING

Watch P.W. for details

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, semi-conductors 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.*

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.

What of D.N.L.?

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

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.

More for SQ

MORE manufacturers are getting onto the quadrasonic 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

ANEW quadrasonic 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 quadrasonic 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.

Physics Exhibition

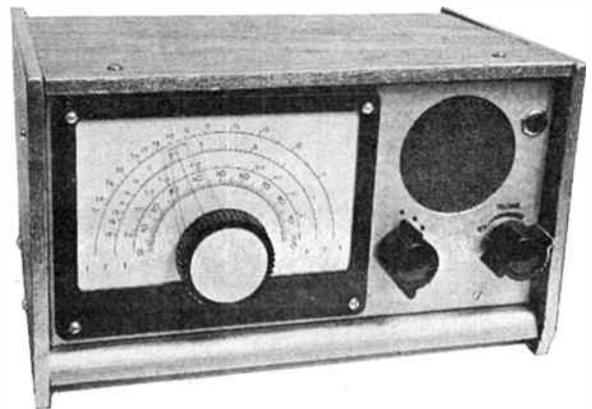
THE Council of the Institute of Physics has decided that the Physics Exhibition should now be discontinued, and the show arranged for 1975 will now not take place.

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.

BAND SWP RECEIVER

F. G. RAYER G30GR



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 loud-speaker, 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 100 Ω and 1k Ω (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.

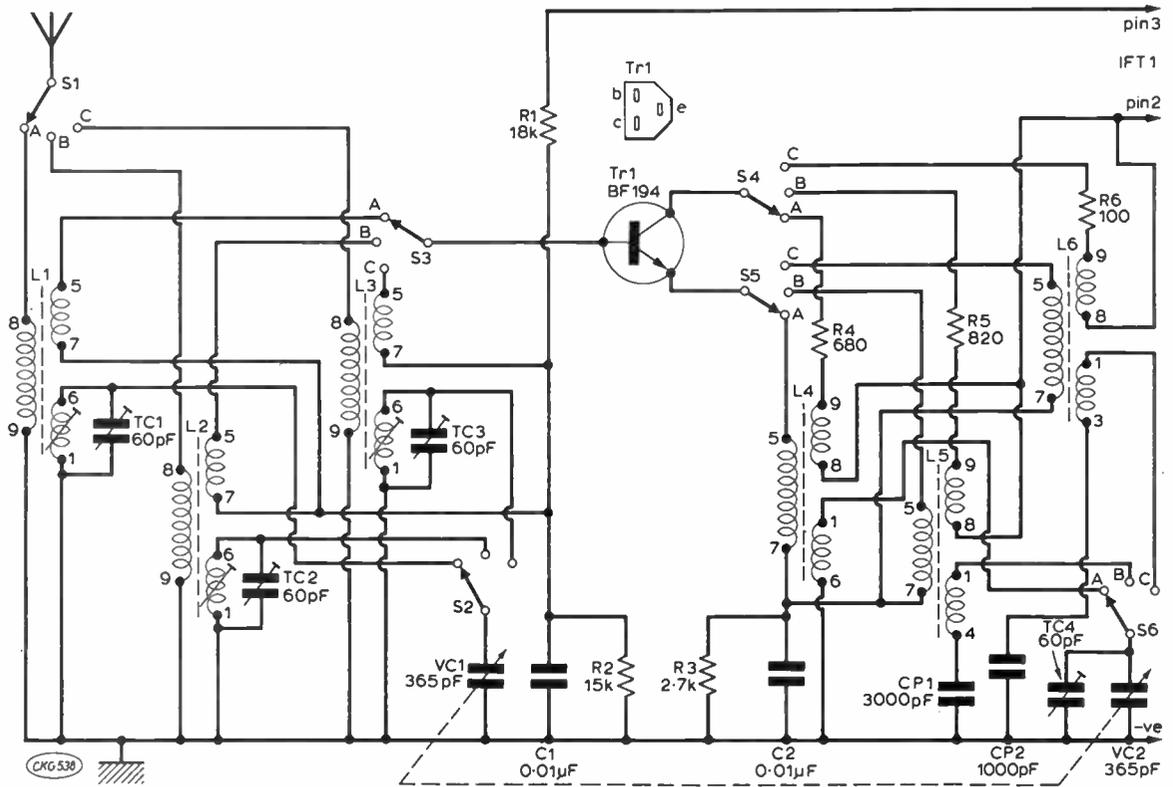
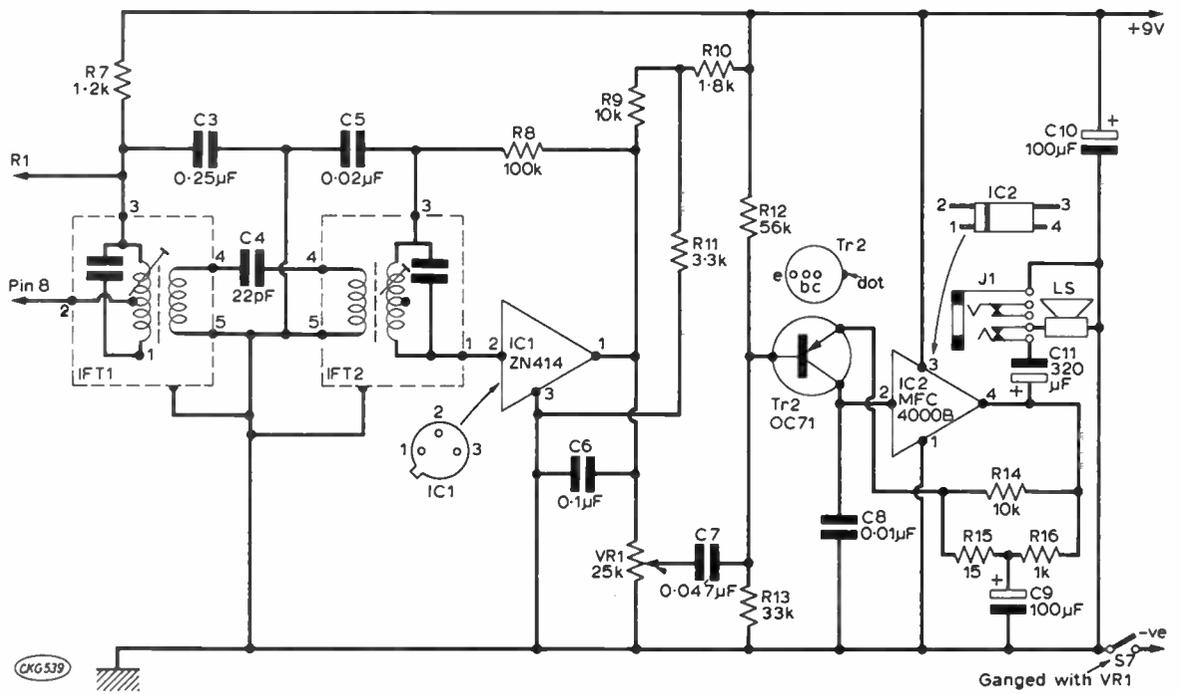


Fig 1, above, and Fig 2, below, give the complete circuit of the receiver.



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 1¼ x 1½in, 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 3¾ x 1¼in. 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

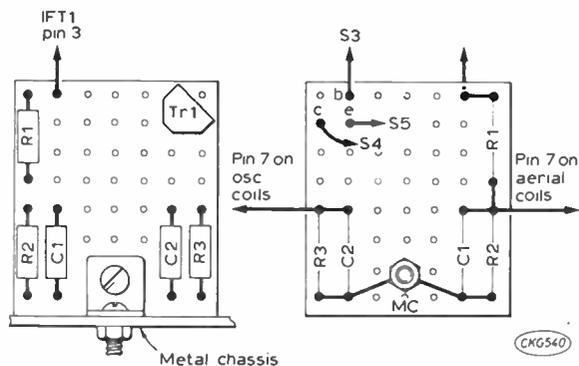


Fig. 3: Layout of components on the mixer board.

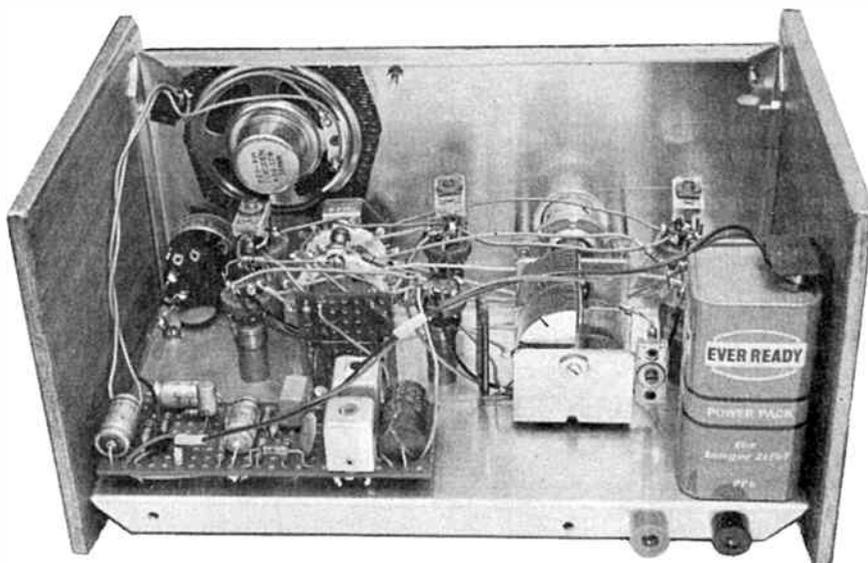
to the metal chassis. These bolts should be at least ½in. long so that spacers or extra nuts will allow the board to be clear of the metal chassis.

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 ½W 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	TC1-4 60pF pre-set trimmers
C8 0.01μF	

Semiconductors

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

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, 2½in, 25 to 40Ω. Universal chassis members, 8 x 4in (2) (Home Radio). Switched output jack socket. Aerial and earth sockets. Veroboard 0.15in matrix, 1½ x 1³⁄₁₆in approx. and 3½ x 1¼in approx. Wood for cabinet. Knobs.

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

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

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

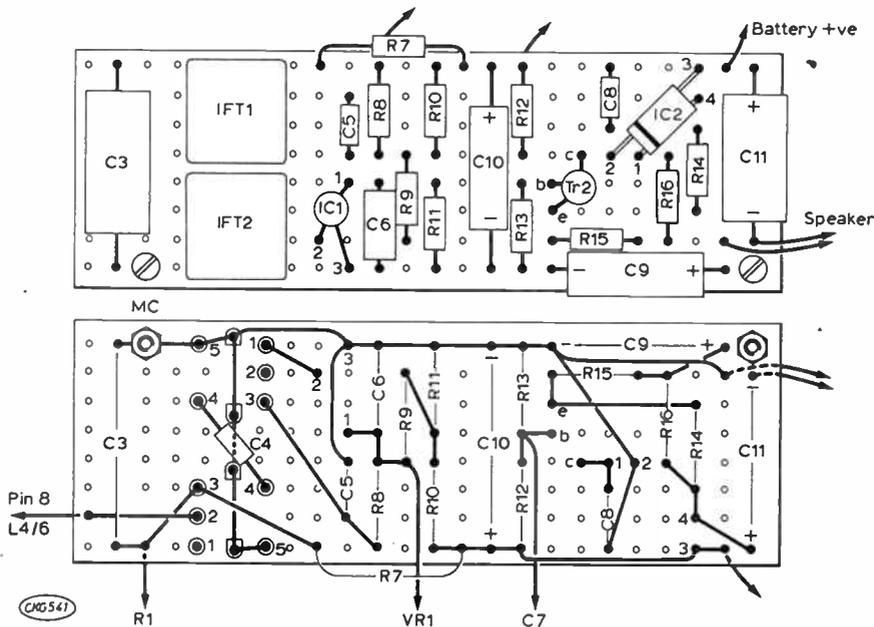


Fig. 4: The two sides of the IF/AF board and connections to the remainder of the circuit.

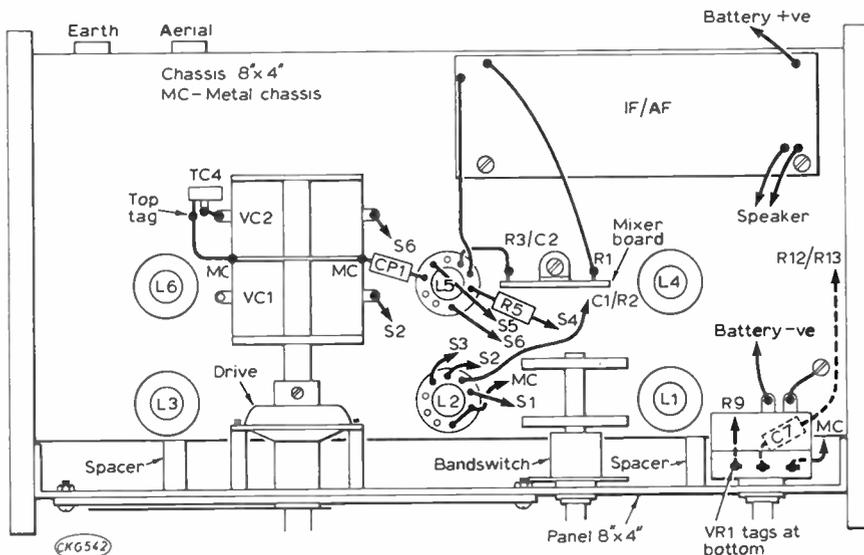


Fig. 5: Layout of major components on top of the chassis and interconnections.

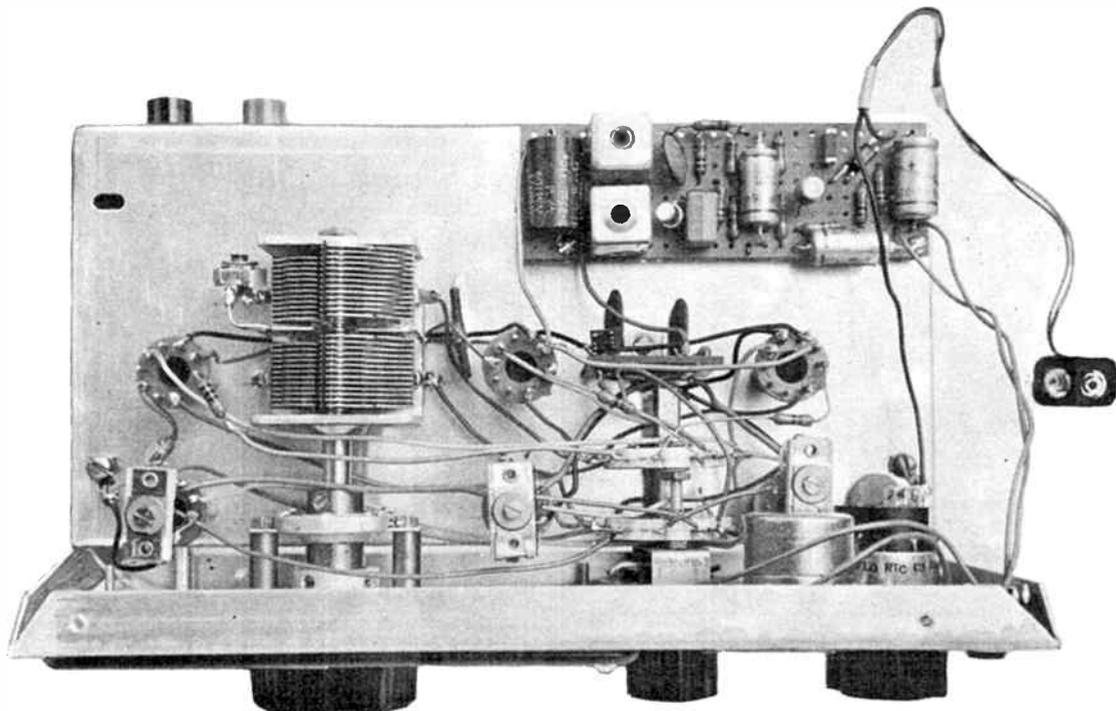
bolts, which run through the panel and the front flange of the chassis. (These two bolts with spacers are not absolutely essential, as chassis and panel are held in position by the case sides. However, with the bolts securing these parts together, assembly and testing can be completed before fitting 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 $\frac{1}{4}$ in. 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.

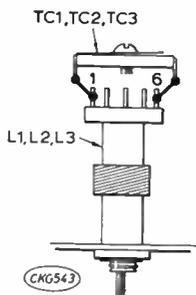


Fig. 6. Method of mounting trimmers on top of the coils.

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.

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.

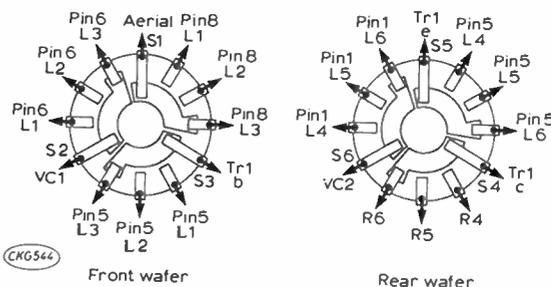


Fig. 7. Details of the wiring on the bandchange switch wafers.

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:—

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RADIO IC SELECTOR All compatible with TOKO filter blocks

TYPE No.	MODES	SENSITIVITY	FULL DATA	DEVICE £
TAD 100	AM inc.det.	4 μ V for 9dB SN/N	23p	1-55
TBA 651	ALL	1 μ V - 6dB --	54p	2-00
TBA120A	FM inc.det.	15 μ V-limiting begins-10.7MHz	23p	1-07
CA 3088E	AM inc.det.	200 μ V for 20dB SN/N	16 p	1-50
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	Model 803	Model 303
Overall Diameter	8"	3"
Natural resonance	30Hz	—
Main resonance	*35Hz	1200Hz
Magnet Pole Diameter	1"	1/2"
Magnet Flux Density	13,000 gauss	10,000 gauss
Frequency response	30Hz-8kHz	2kHz-17kHz
Impedance	8-15 ohms	8-15 ohms
Power Handling	*15 watts	*15 watts

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J. B. DANCE M.Sc.

THERE are a number of integrated circuit audio power amplifiers available at the present time. One of these, the LM380N device, has a number of features which make it attractive to the amateur experimenter. In particular, it is very useful in circuits requiring the minimum number of components. The device is manufactured by the National Semiconductor Company, and is available from Ambit International, 37 High Street, Brentwood, Essex, or Athena Ltd., 140 High Street, Egham, Surrey.

ADVANTAGES

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.

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

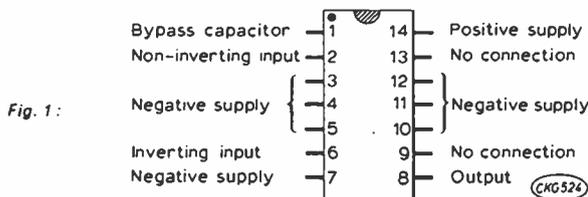
The voltage gain of the LM380N is fixed at 50 (or 34dB) by the internal circuitry of the device. Although this fixed gain limits the versatility of the amplifier, it does result in a minimum number of external components being required for its use.

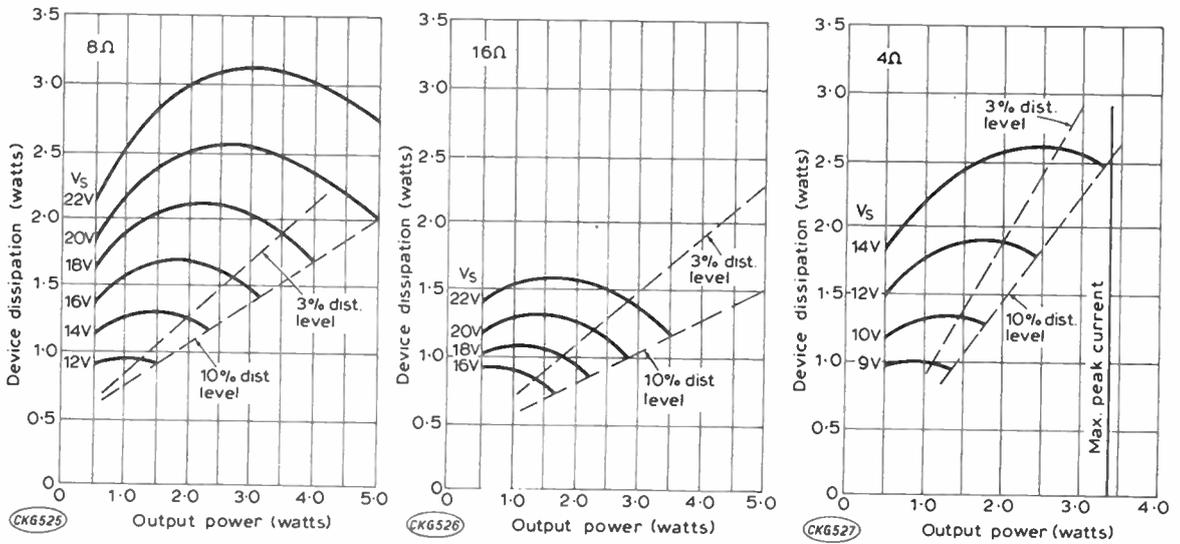
HEAT SINK

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.

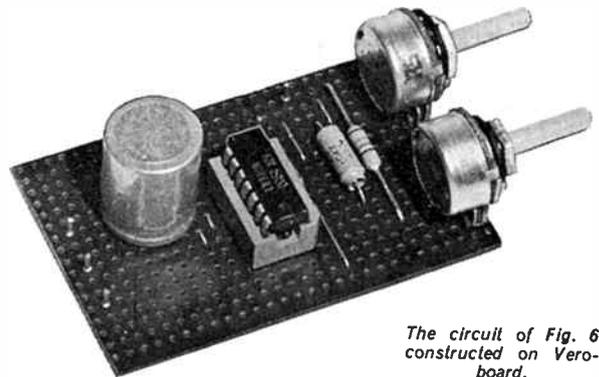
The three per cent total harmonic distortion line shown in Figs. 2 to 4 is approximately the onset of clipping.

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 Vero-board.

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

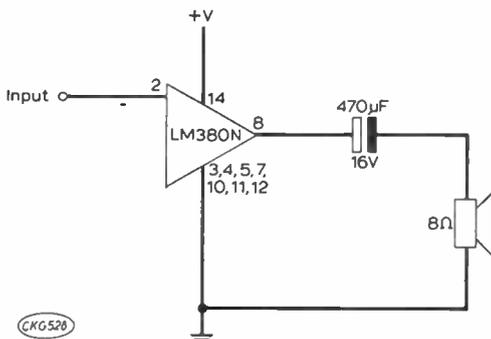


Fig. 5: A simple circuit using the LM380N.

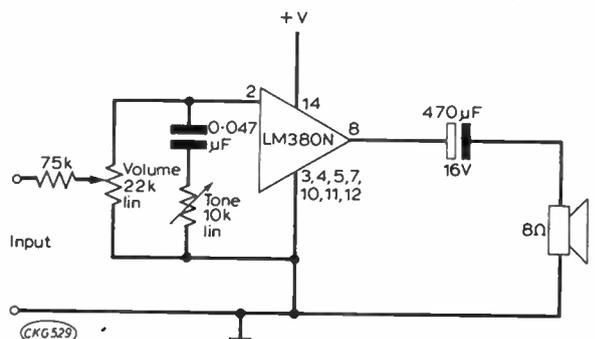


Fig. 6: A record player amplifier suitable for use with a crystal or ceramic pick-up cartridge.

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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Full lists and technical data will be found in Catalogue No. 6. See also amendments list.

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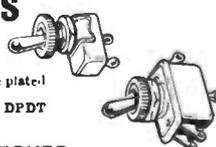
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2.2							7p
4.7			10p				8p
10				10p			8p
22		7p	7p				7p
47	7p	8p	7p	8p			8p
100	7p	7p	7p	7p			11p
220	7p	8p	8p	8p			12p
470	8p	9p	10p	12p			17p
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C	1/8W	5%	4.7 Ω - 470K Ω	E24	1	0-9	0.75 nett
C	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	1-6 nett
MO	1/2W	2%	10 Ω - 1M Ω	E24	4	8	2 nett
WW	1W	10% \pm 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

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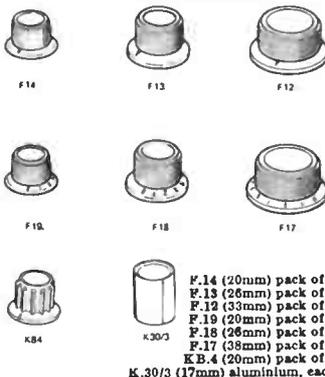
Values:
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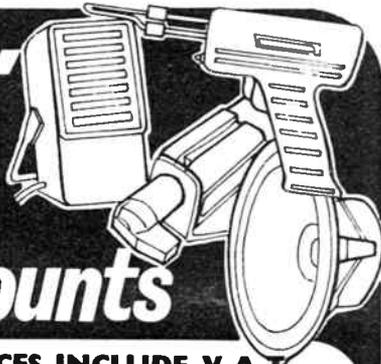
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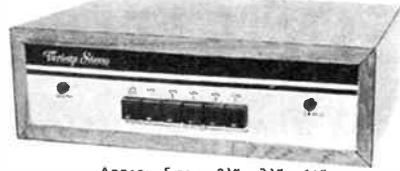
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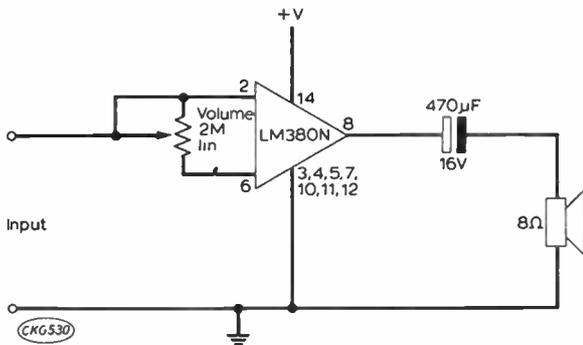


Fig. 7: A high input impedance achieved by use of a common-mode volume control.

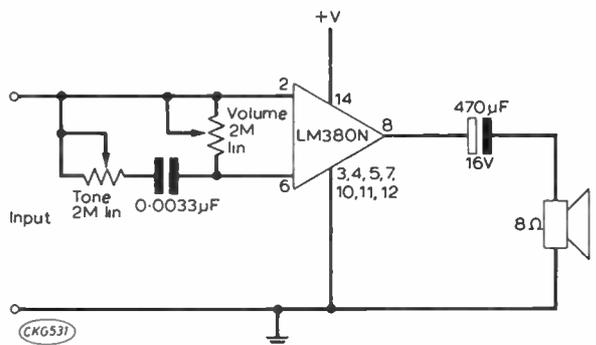


Fig. 8: This circuit features common-mode controls for both volume and tone.

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 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.

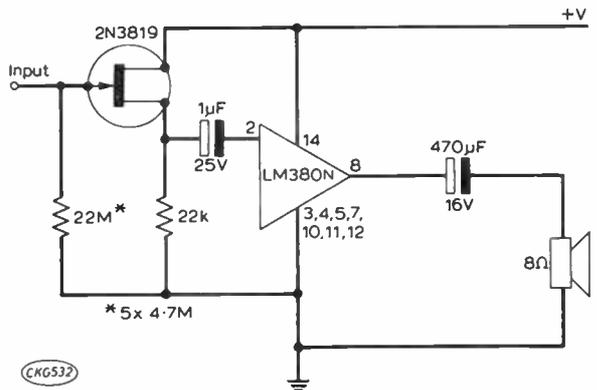


Fig. 9: The addition of a FET input stage gives a very high input impedance.

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.

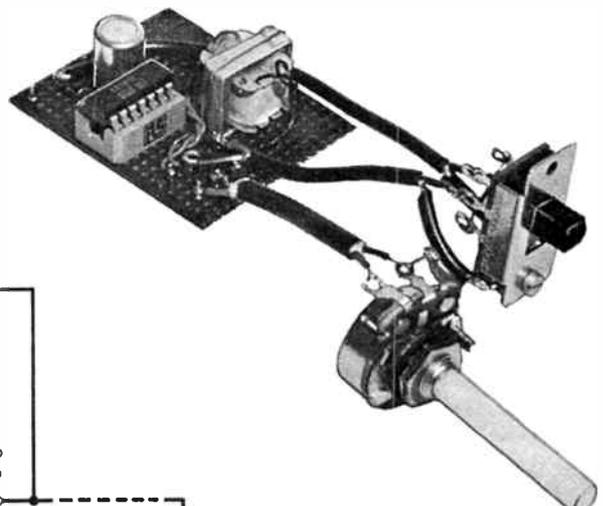
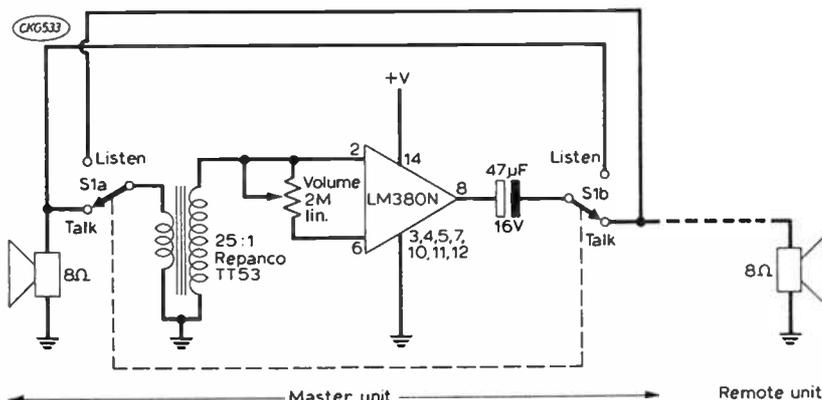


Fig. 10: An intercom system in which the loudspeakers double as microphones. The view above shows the amplifier with controls attached.

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.

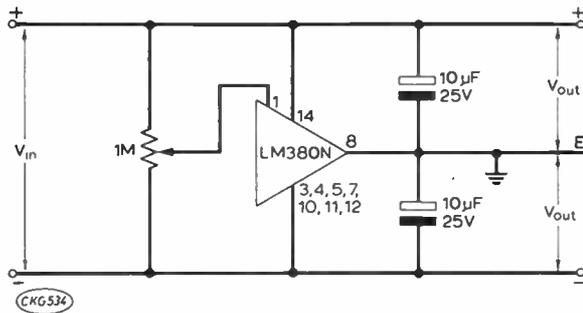


Fig. 11: A circuit to provide a split power supply from a single source.

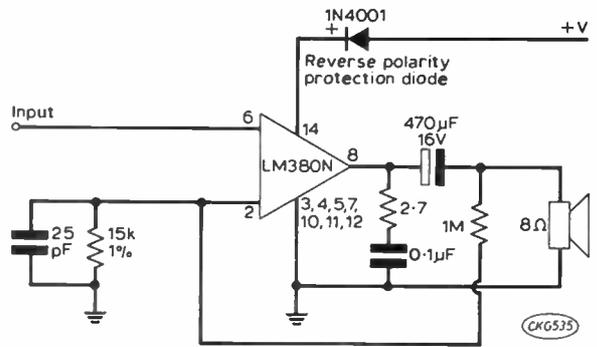


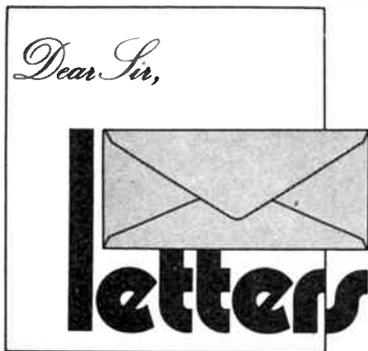
Fig. 12: Increased gain may be obtained by the use of positive feedback.

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 Cairns-more 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 Cairns-more 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!

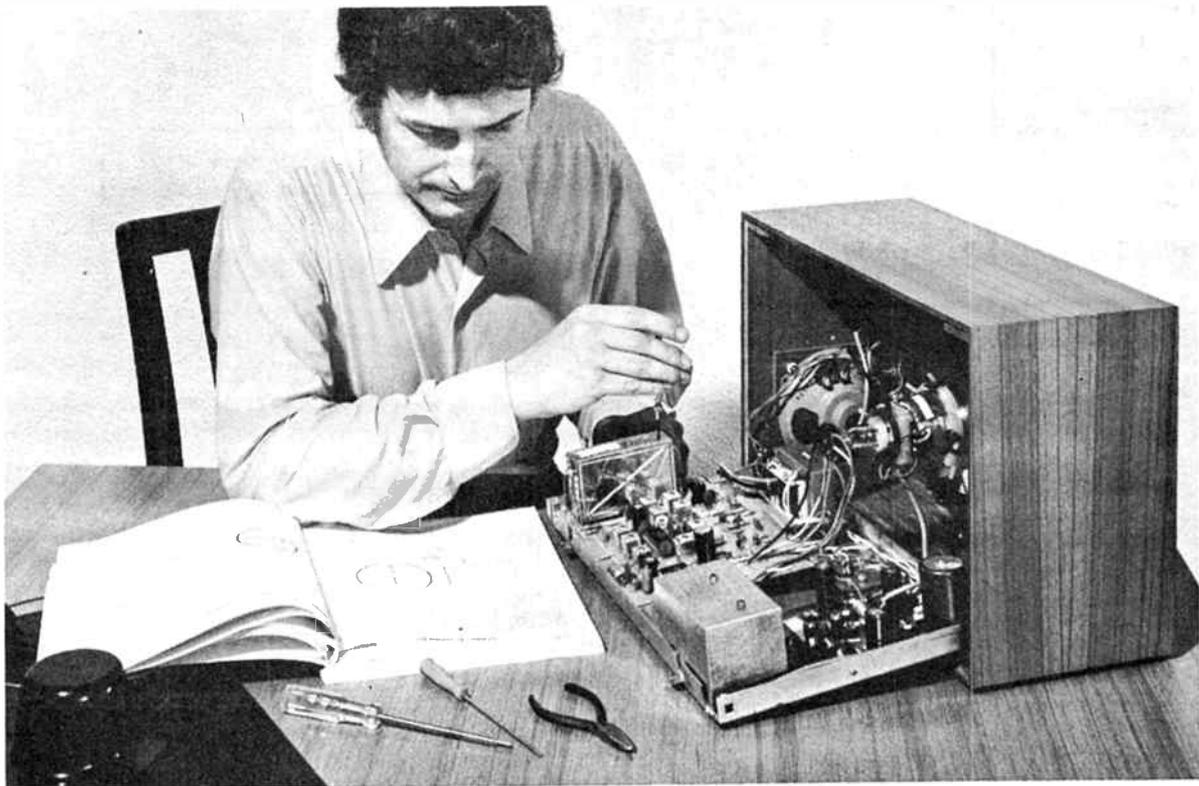
80m talkback was used between the two base camps in order to co-ordinate the departure for the climb to the summit.

2m talkback was used from summit to summit.

Those involved were:—

At the GM end: G3VUQ, G3YQC, G8AMG, G8APZ, G8AZU, G8DKK. At the GW end: G3XSQ, G3YMV, G8BPN, G8CKT, G8ENX, G8FTB, G8HCO.—Michael H. Tooley, G8CKT, (Weybridge, Surrey).

—continued on page 762



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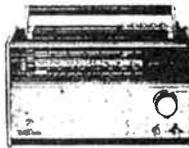
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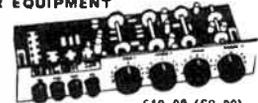
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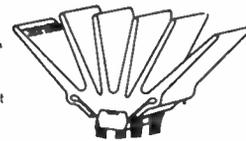
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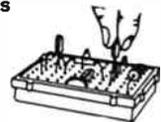
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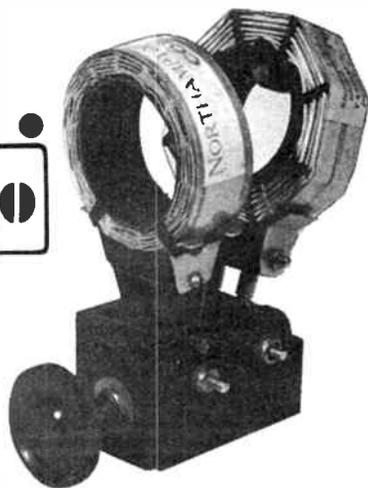
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GOING BACK...



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.

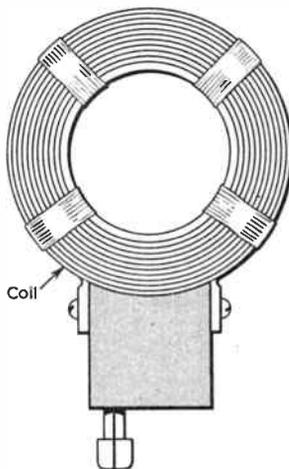
My recent vintage radio construction includes a one tube SW receiver (using a transmitting type '30). The coils (plug-in) are my originals from 1932. These are about the only parts surviving from that era. While I was in the army in pre-World War 2 days, a relative threw the rest away! I also have two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

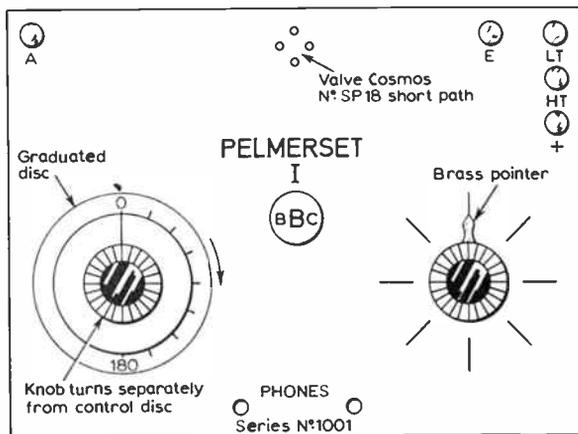
I possessed one vintage radio in recent years (an RCA Radiola) but an avid collector got it away from me. All I have at the moment is a vintage tube tester, Signal Generator and Output meter (Weston, circa 1929). The trouble is that some collectors in this country possess 100 to 300 radios leaving none 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.



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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

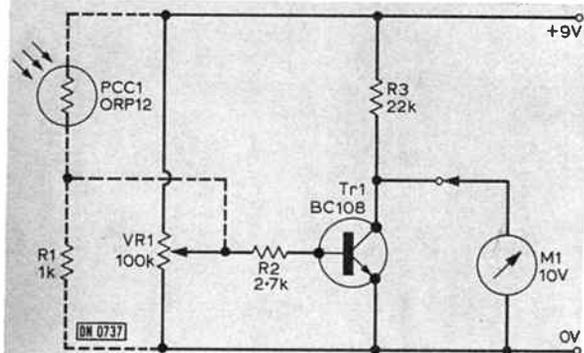


Fig. 14a: If PCC1 and R1 are used as alternatives, omit VR1 and link in PCC1 on the "left-hand" end of R2.

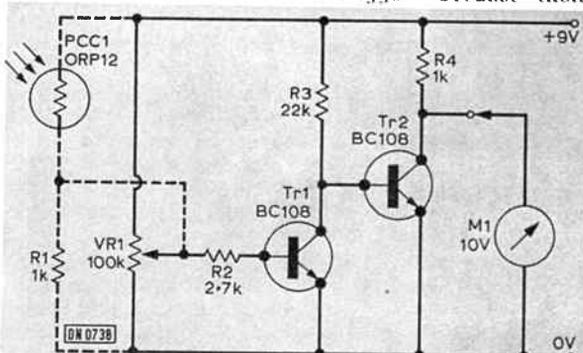


Fig. 15a: The extra stage of amplification effectively improves the rise time of the output signal between the power rail extreme voltages.

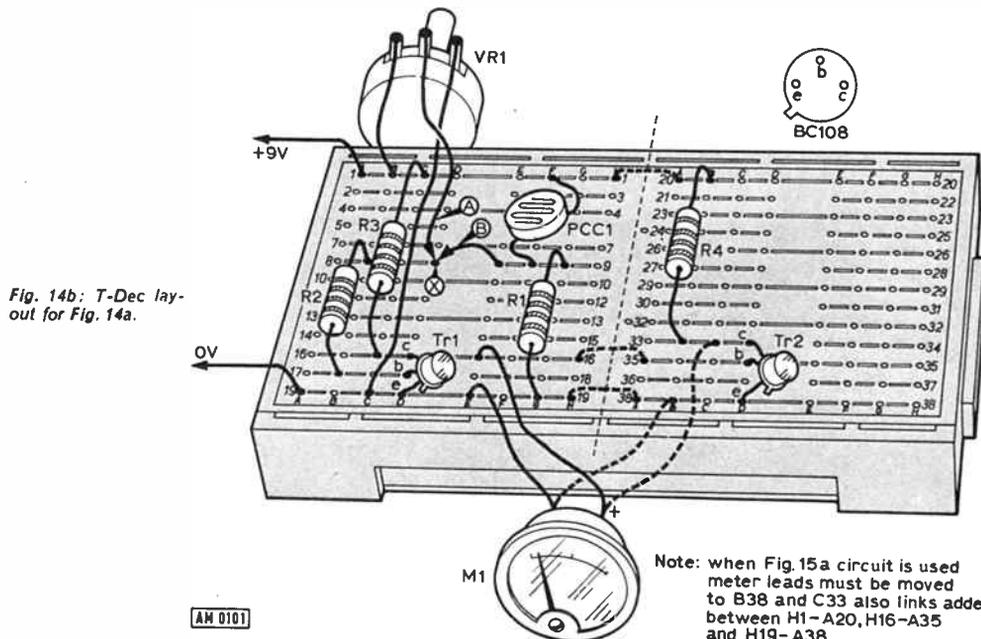


Fig. 14b: T-Dec layout for Fig. 14a.

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

Note: when Fig. 15a circuit is used meter leads must be moved to B38 and C33 also links added between H1-A20, H16-A35 and H19-A38

AM 0101

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"

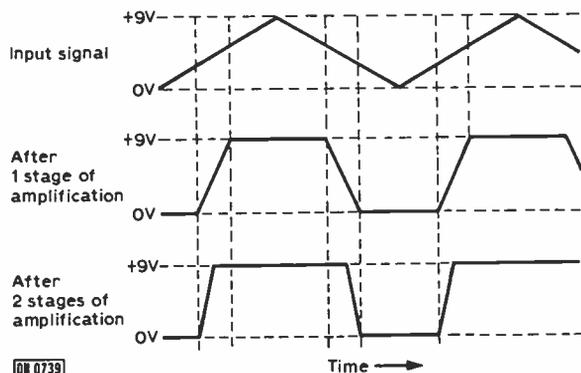
First of all we had better look at what we are calling an "edge" so that we can compare the difference between fast and slow edges. Fig. 14a is a very simple transistor amplifier stage which gives an output inversely proportional to the voltage at the wiper of VR1 (or, if you are using the photocell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



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

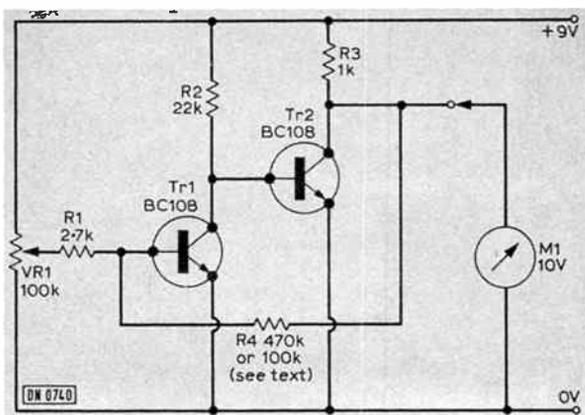


Fig. 17a: True trigger action is obtained by using positive feedback via R4.

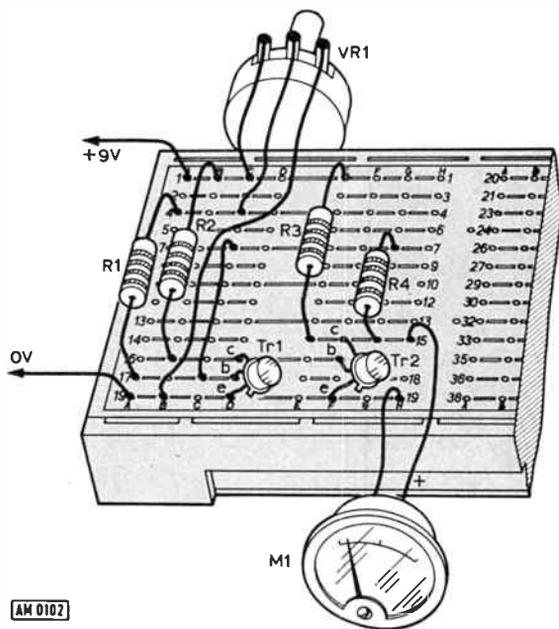


Fig. 17b: T-Dec layout for Fig. 17a.

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

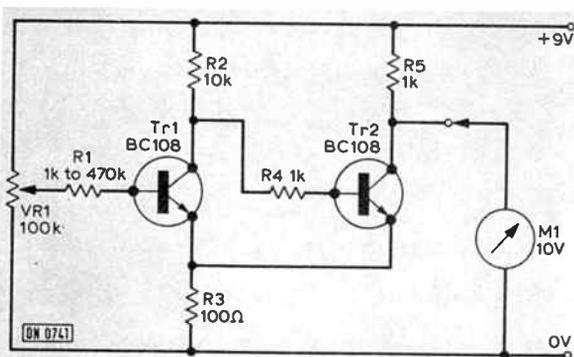


Fig. 18a: Schmitt trigger circuit. The trigger level can be controlled over small limits by changing R1 in the range 1kΩ to 470kΩ.

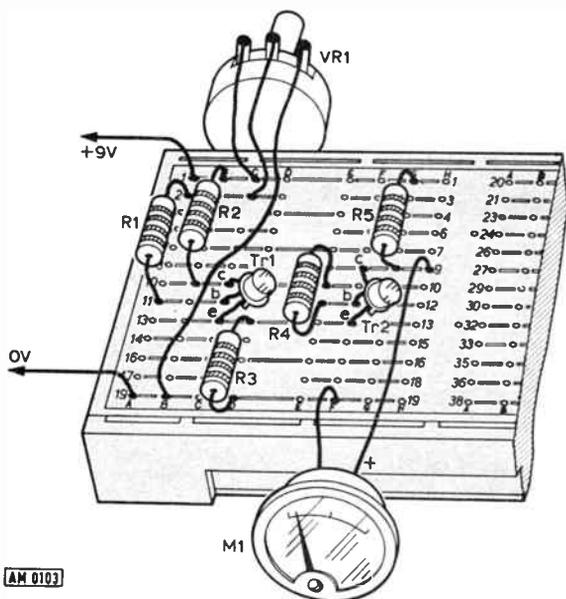


Fig. 18b: T-Dec layout for Fig. 18a.

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 your-

self 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

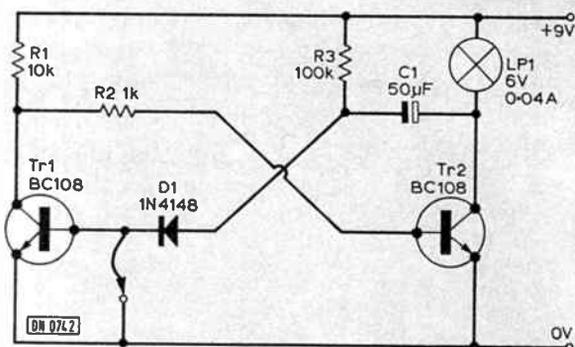


Fig. 19a: Basic monostable multivibrator. Capacitor C1 can be increased to 3,000μF to extend the dwell time.

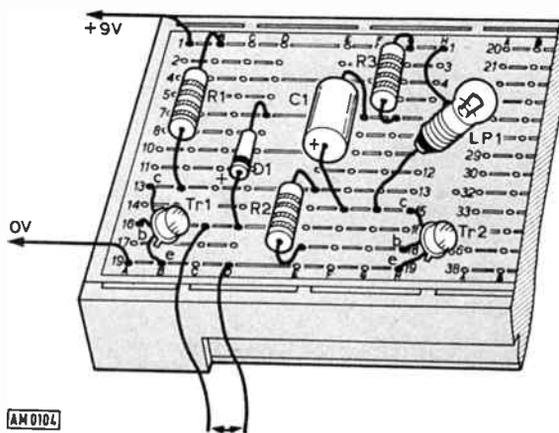


Fig. 19b: T-Dec layout for Fig. 19a.

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 3,000 μ F capacitor you can substitute it for C1 and get a "dwell" time of about 3½ minutes. The dwell time can be calculated as $0.7 \times C1 \times R3$ (C in Farads R in ohms and the time will be in seconds).

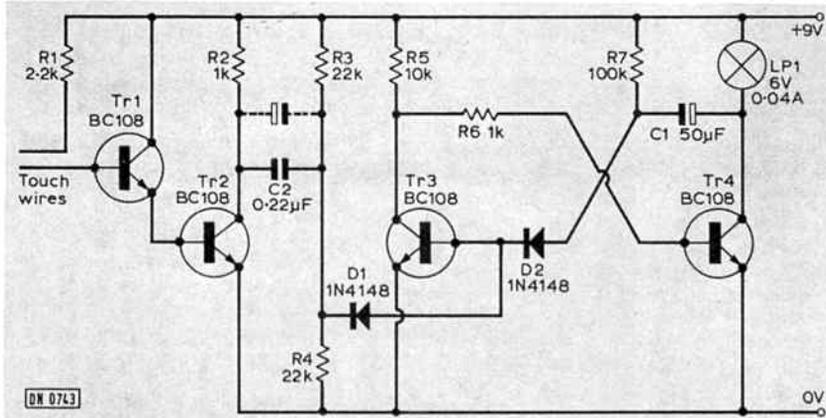


Fig. 20a: Touch-sensitive child's room-light. Supply current is approximately 1mA rising to about 80mA when the lamp is on. Duration of 3½ minutes can be obtained by making C1 3,000 μ F and C2 50 μ F. The capacitor shown dotted, across C2, indicates how it is connected—plus to R2.

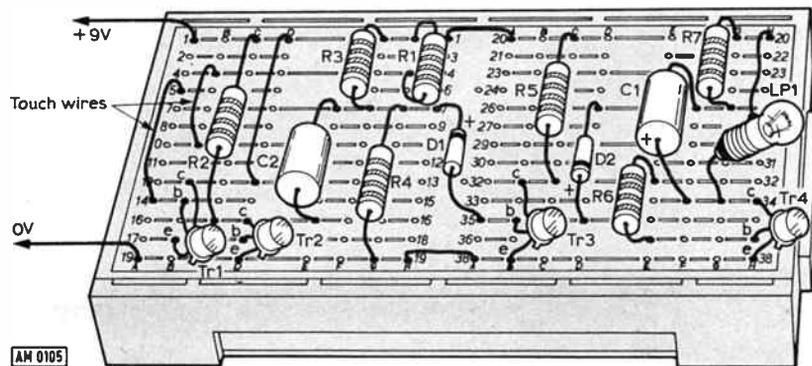


Fig. 20b: T-Dec layout for Fig. 20a.

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!).

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 snippet 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 ± 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 beastly 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?



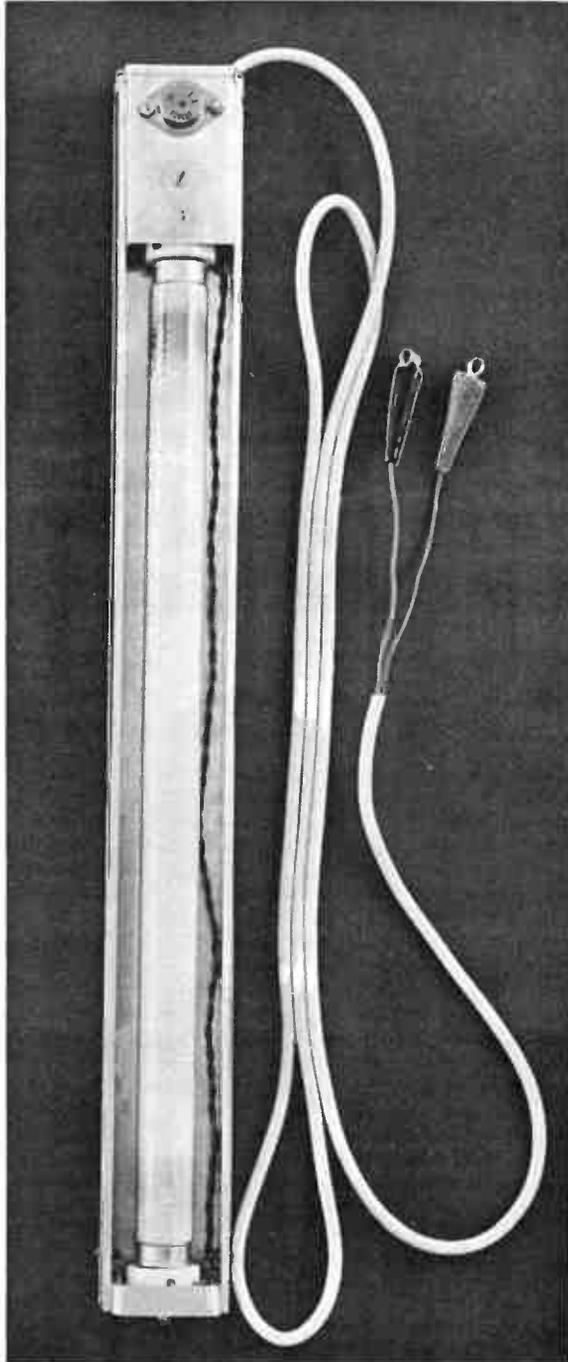
Curing Radio Interference in Audio Equipment

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 UNIT FROM YOUR 12V BATTERY

FOR: EMERGENCY LIGHTING, CARAVANS

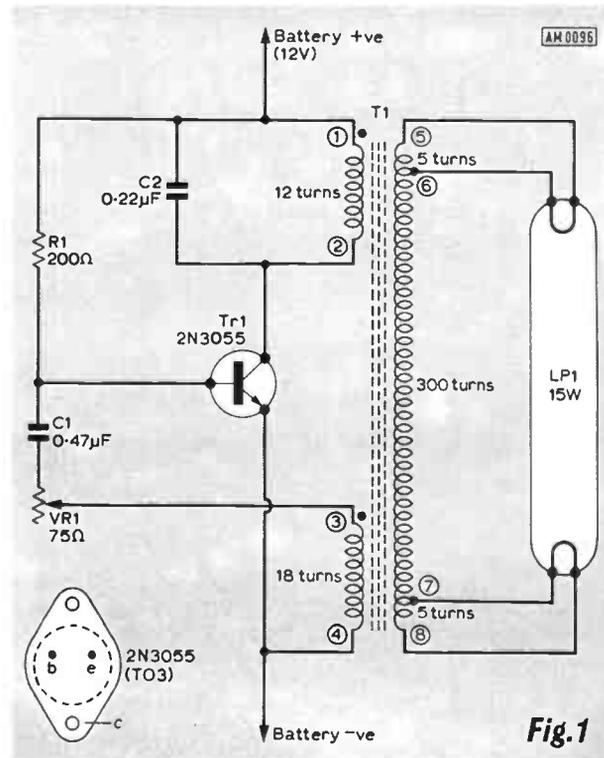


THE battery operated 15W fluorescent lamp unit described here is of simple construction, being designed around readily available components. The whole assembly is made up in aluminium, consisting of a framework which supports the tube and houses the oscillator module. A cover plate acts as reflector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



NIT TERRY



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.

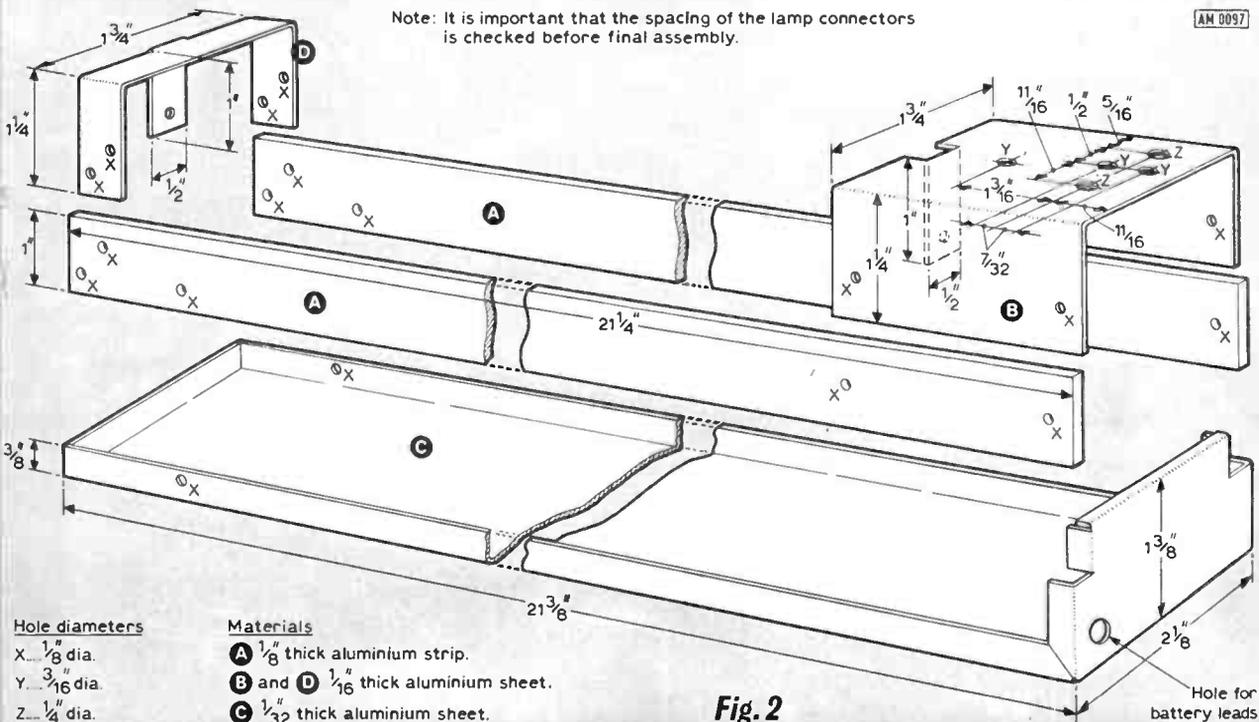
The operating frequency is determined by the 0.47µF base timing capacitor C1, the variable resistor, the tuning capacitor and the load conditions. Since the load (the fluorescent tube) is a high resistance until alight, the circuit has a "soft" start, the oscillations starting at low frequency and amplitude 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 1/16 in. 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 1 in. hardwood.

The oscillator housing is bent up from 1/16 in. 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



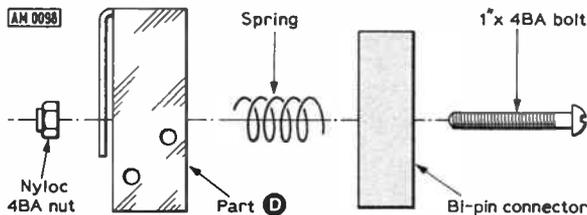


Fig. 3: Details of the spring-loaded tube connector.

other bi-pin tube connector. This connector is mounted on a lin. 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 then 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	0.47 μ F 250V polyester
C2	0.22 μ F 250V polyester
R1	200 Ω 5W wire-wound
VR17	5 Ω pot. wire-wound (see text)
Tr1	2N3055 with insulating kit
LP1	15W fluorescent tube

Miscellaneous

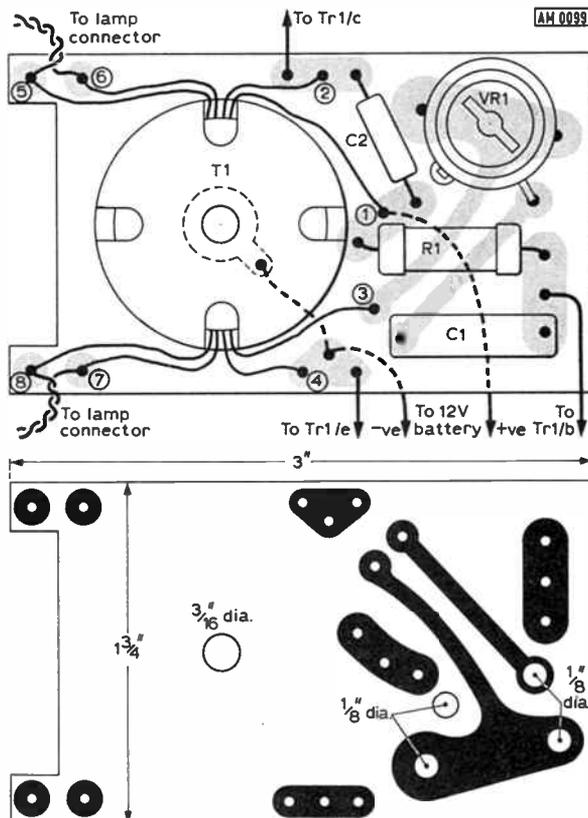
Pot core (2 x half cores) Mullard FX2242 and bobbin DT2180 (available complete from Hawnt Electronics Ltd., 112 Pritchett St., Birmingham, B6 4EN for £1.20 inc.).

Bi-pin tube connectors (2). 28 and 32SWG enamelled copper wire. PCB, 3 x 1 $\frac{1}{2}$ in. Length of twin 5A wire, as required, with two large crocodile clips.

Aluminium: 4ft of 1 x $\frac{1}{8}$ in. strip (Part A), 6 x 5in. of $\frac{1}{8}$ in. sheet (Part B), 24 x 3in. of $\frac{1}{32}$ in. sheet (Part C).

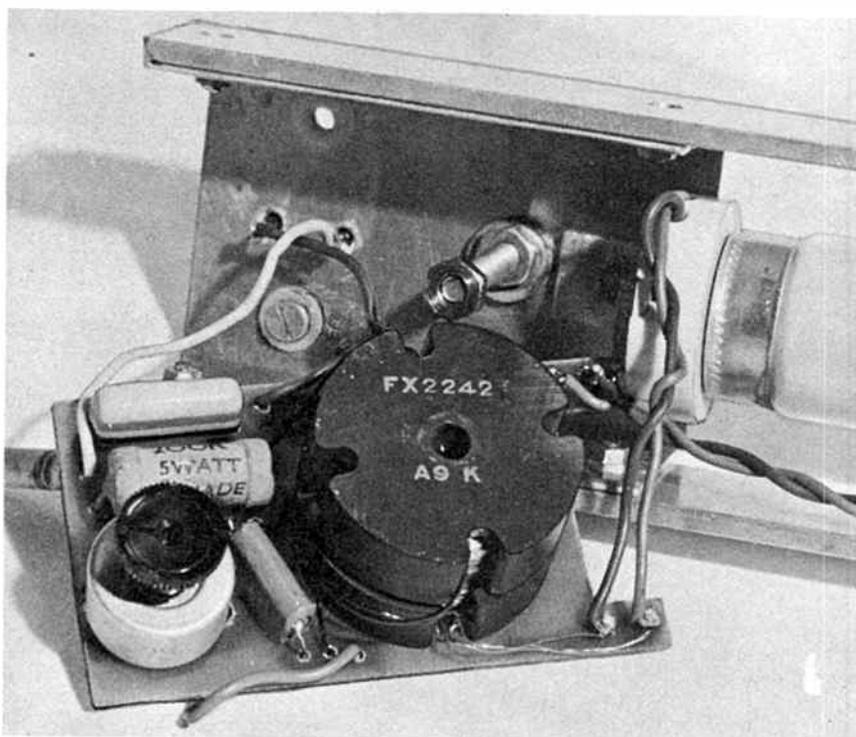
wound, with a turn of insulation put right round the finished bobbin. The start, tap 1, tap 2 and finish should be labelled (5) (6) (7) and (8) respectively. The two ferrite cores can then be placed around the bobbin and the transformer loosely bolted on to the circuit board.

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

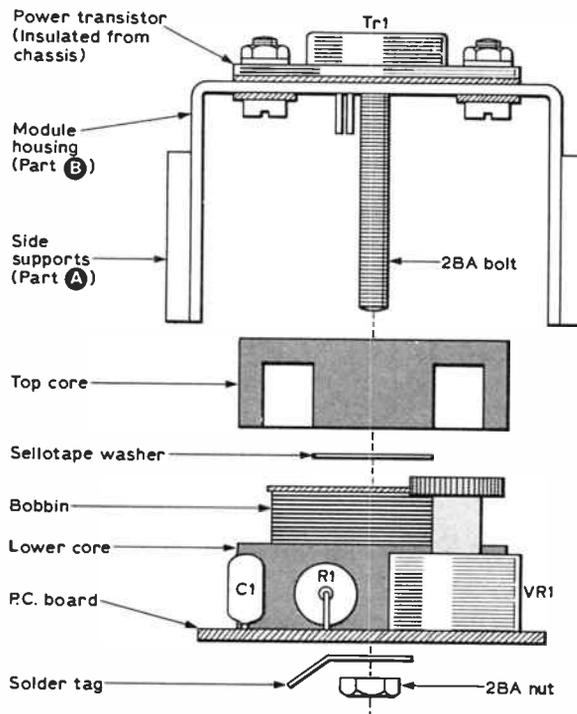


Fig. 5: An exploded diagram of the oscillator transformer and mounting.

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.

COMING SOON
Q4 MATRIX MATE

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.

SPRING INTO ACTION

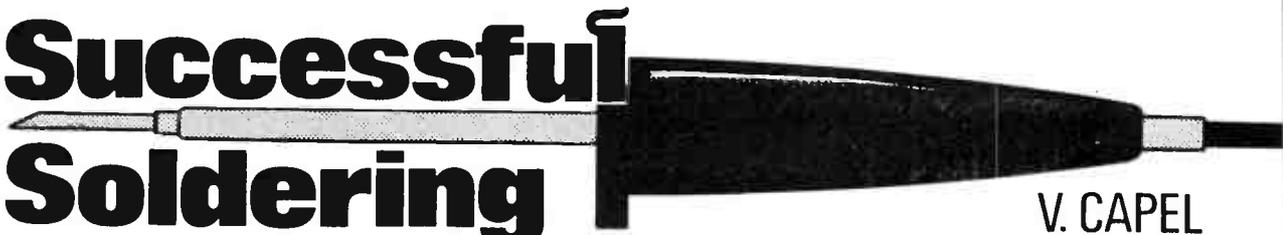
The next series of special issues of P.W. will be in the Spring 1974.

In the coming months we shall be giving advance information on our new

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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 out-flow 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.

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Complete kit - £24.95! (PLUS VAT)

The Cambridge - new from Sinclair

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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.

The cost? Just £27.45!

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

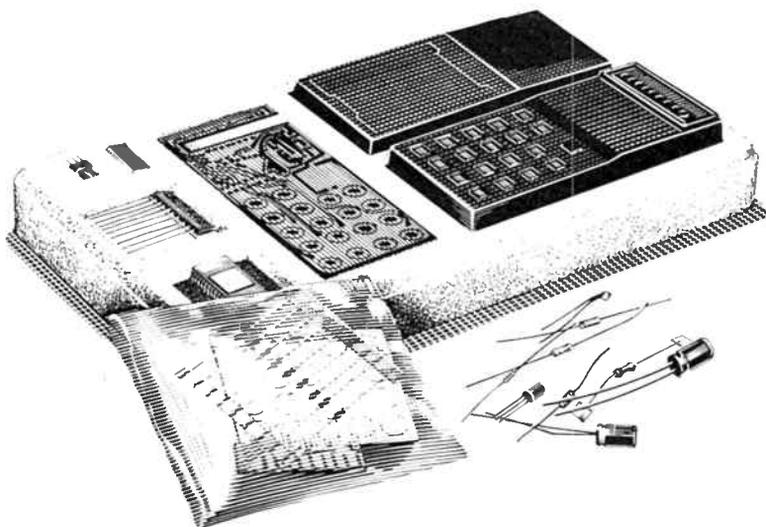
- * Uniquely handy package. $4\frac{1}{2}'' \times 2'' \times \frac{1}{8}''$, weight $3\frac{1}{2}$ oz.
- * Standard keyboard. All you need for complex calculations.
- * Clear-last-entry feature.
- * Fully-floating decimal point.
- * Algebraic logic.
- * Four operators (+, -, x, ÷), with constant on 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} .
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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.

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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.



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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.



How? It's all explained in this unique booklet, written by a leading calculator design consultant. In its fact-packed 32 pages it explains, step by step, how you can use the Sinclair Cambridge to carry out complex calculations like:

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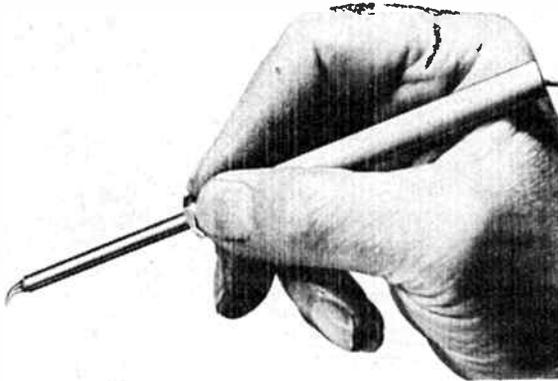
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Because of the limitations of the 25 to 40 watt iron, most workshops have at least one or two other types and sizes of iron available. For larger jobs, an iron with a rating of 60 to 100 watts is required. These irons are similar to their smaller counterparts 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

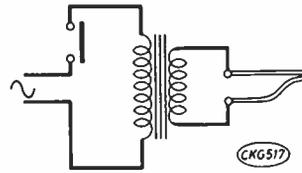


Fig. 1: Circuit of a transformer iron with element/bit consisting of a wire loop.

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.

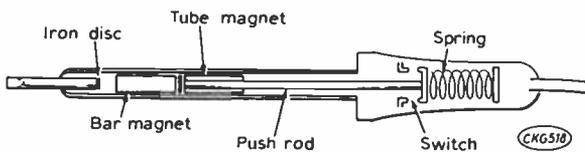


Fig. 2: Mechanism of a heat-controlled iron using the Curie effect.

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.

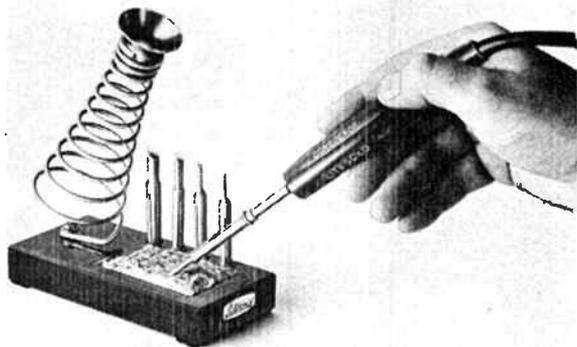
Little can be done to stop the flaking other than running the iron at a lower temperature during standby periods, but the cavities can be almost eliminated by using the Savbit solder developed by Multicore. This contains minute traces of copper which satisfies the affinity of the solder without it taking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

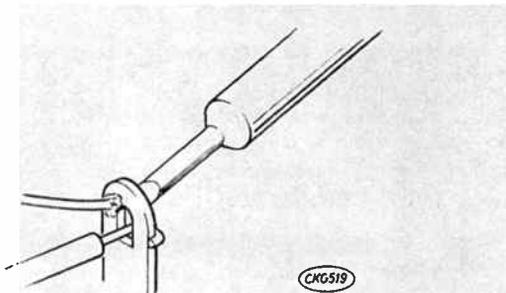


Fig. 3: The iron should heat the whole joint—not just the solder.

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.

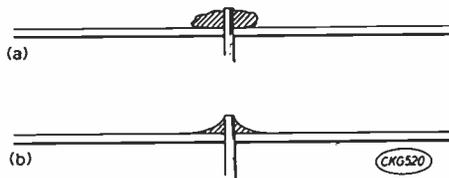


Fig. 4: (a) A 'dry' joint, showing the blob of solder due to insufficient heat or dirty surfaces. (b) A good joint, showing smooth flow of solder over joined surfaces.

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 $\frac{3}{8}$ " thick breadboards and $\frac{1}{16}$ " 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

PART 3 D. BOLLEN

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

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 quadrasonic 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 accus-

tomed 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.

Note: all exposed wiring must be sleeved

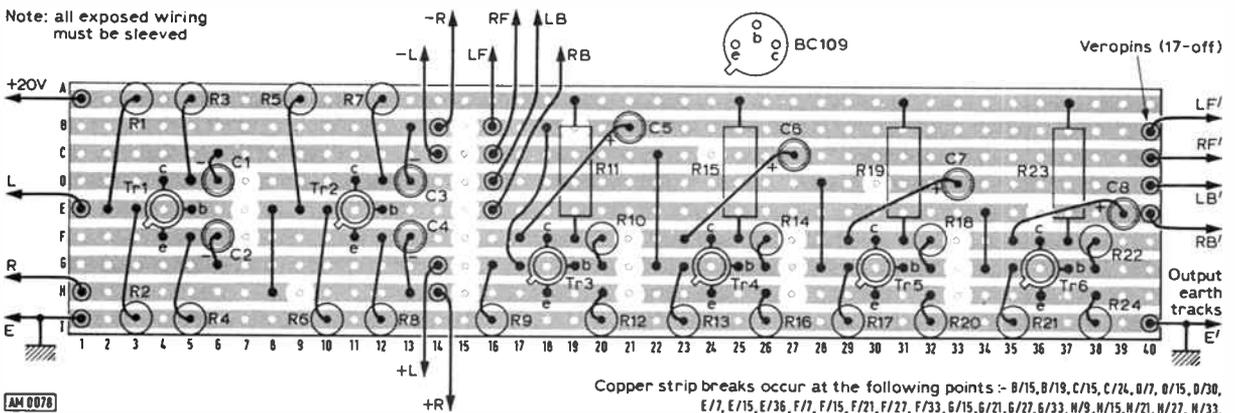
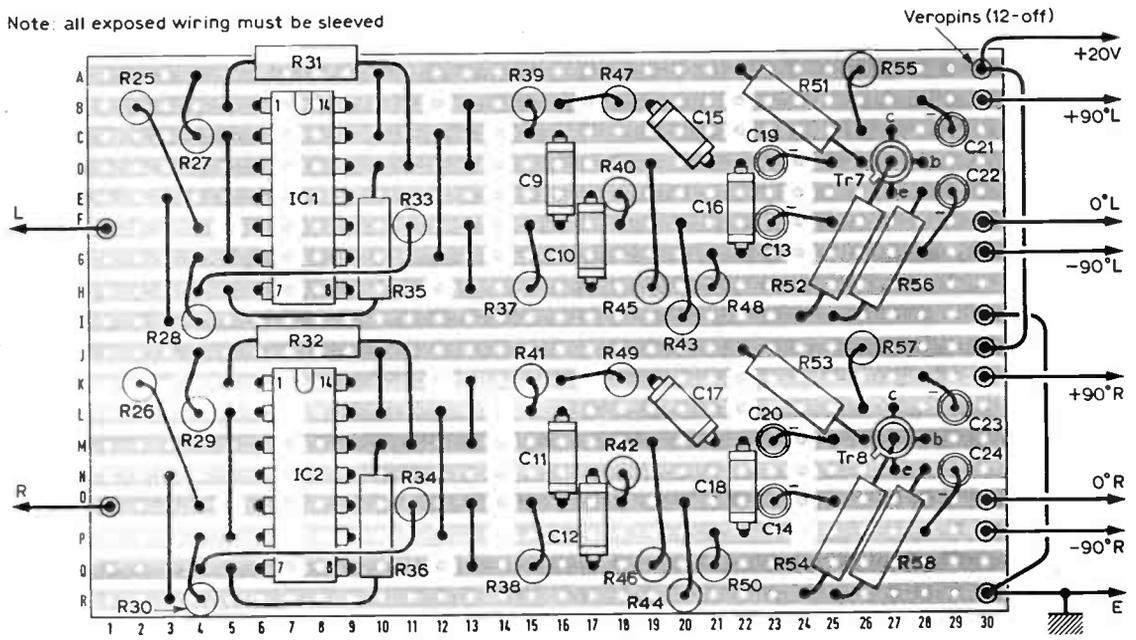


Fig. 16: Component layout of unit A circuit board. Note breaks in copper strips.

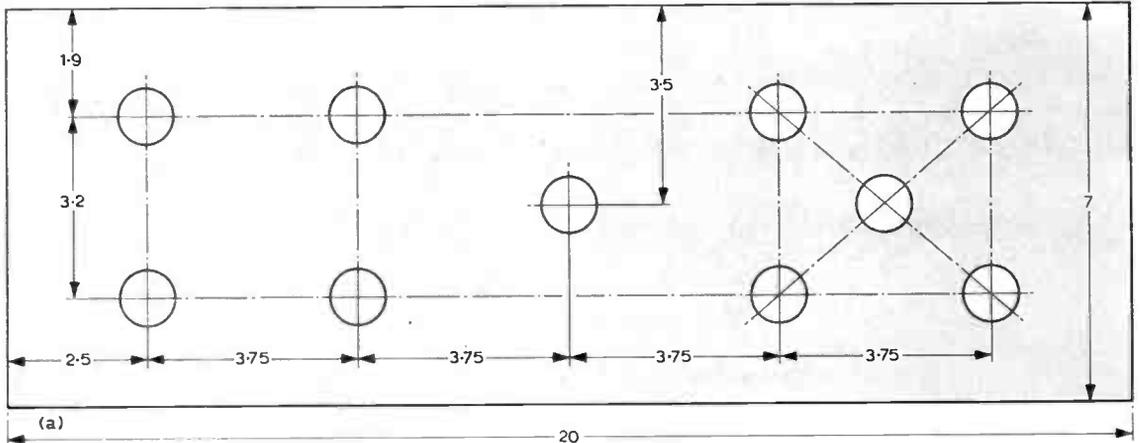
Note: all exposed wiring must be sleeved



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/17, 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.



AM 0081

All dimensions in cm. Drill all holes 1cm diameter

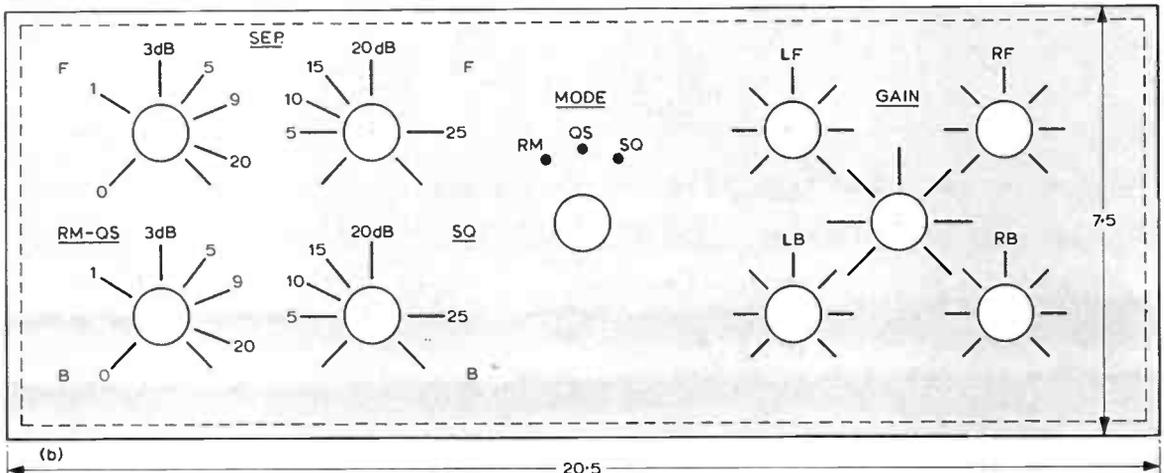


Fig. 18(a): Drilling details of front of chassis tray. Fig. 18(b): Front panel layout.

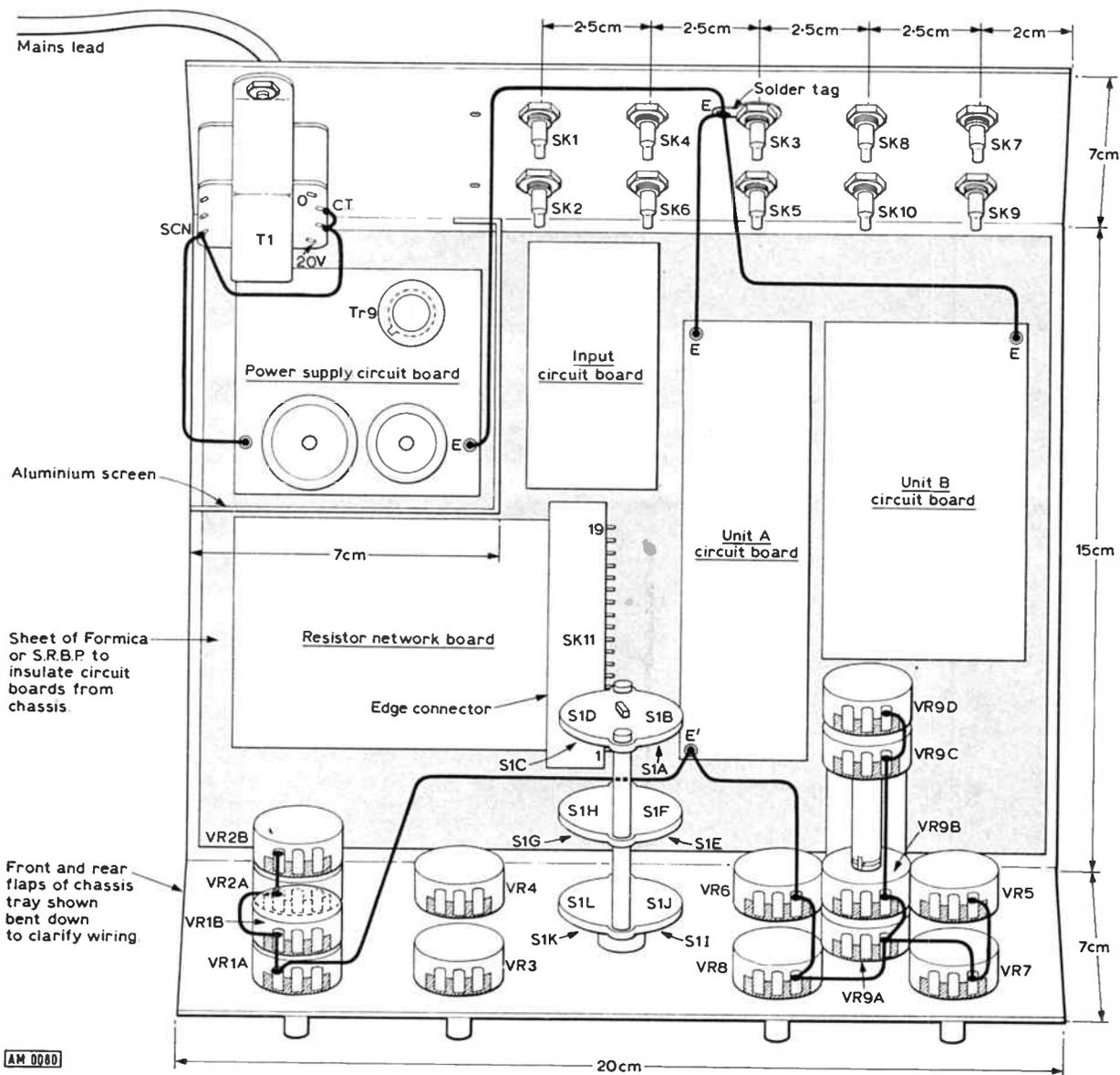


Fig. 19: Multi-system decoder layout showing earth wiring.

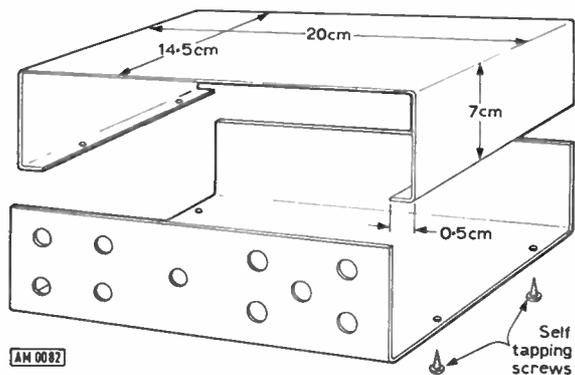


Fig. 20: Dimensions and fixing details of the chassis cover.

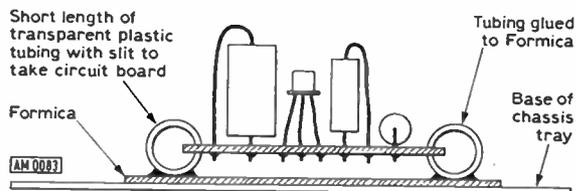


Fig. 21: A method of securing the circuit boards.

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.

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.

Small piece of 16swg aluminium to engage in slot at the back of the front pots, and slot in the spindle.

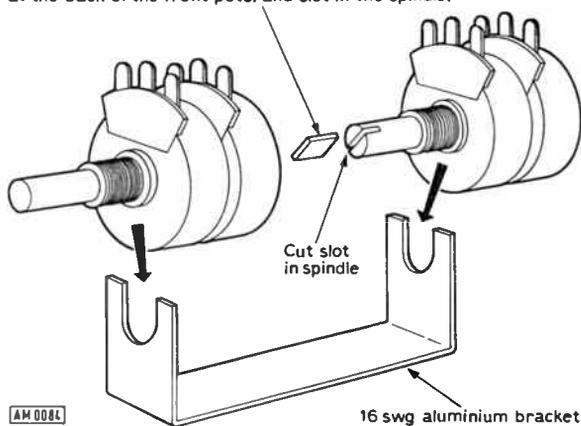
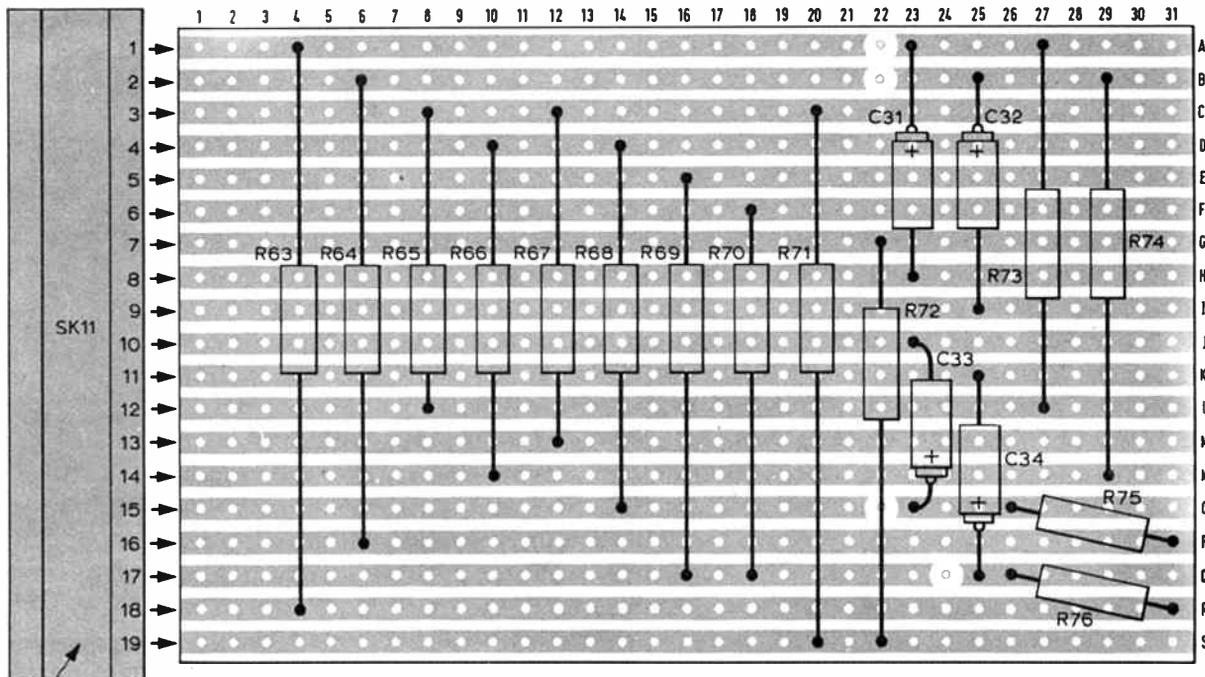


Fig. 22: VR9 assembly utilising two dual-gang potentiometers.

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.



Edge connector

AM 0085

Copper strip breaks occur at the following points:- Q/24, O/22, B/22, A/22.

Fig. 23: Component layout of resistor network board.

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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.

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.

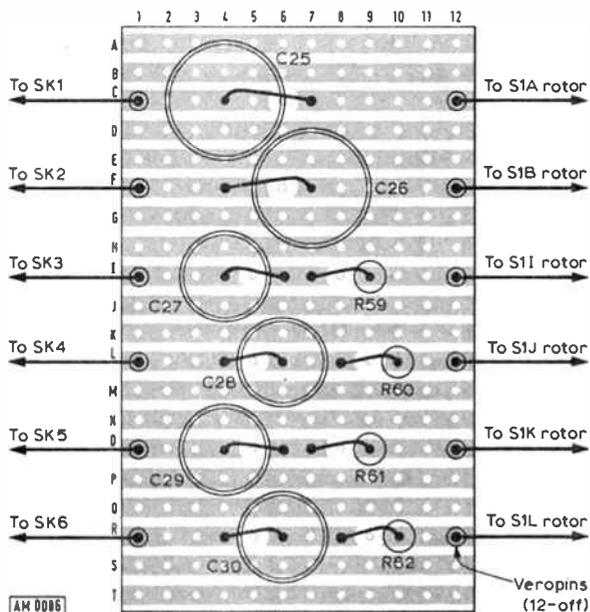
A suitable edge connector, such as the RS Components 0.1in. 25-way, may be cut down to 19 ways with a small saw. When the resistor network board is completed it can be inserted in SK11, and the latter glued to the insulating board on the chassis tray.

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



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.

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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).

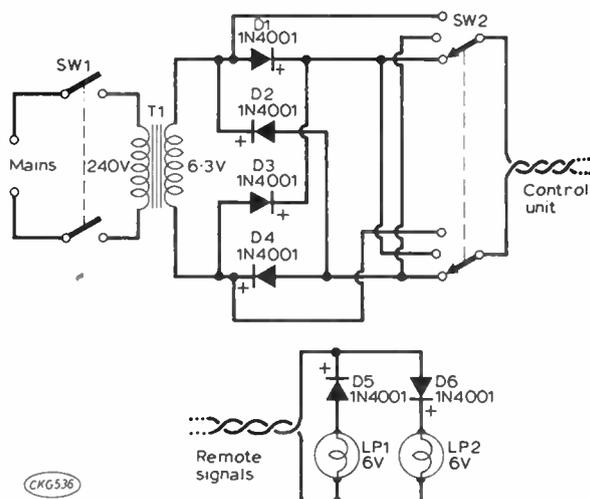
The third code, having both lamps on at the same time, is obtained by turning SW2 into the third position which applies a.c. to the signal wire pair direct from the transformer. LP1 and LP2 will now each light up, LP2 on positive and LP1 on negative half cycles.

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 break-down 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

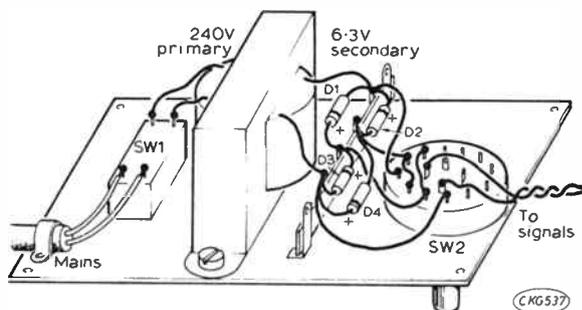
salvaged from old equipment. Any 6.3V transformer will do for T1 and probably the best source is an old valved radio.

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



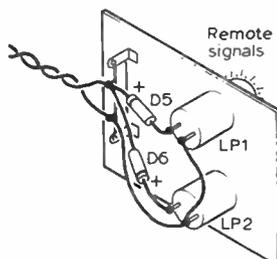
▲ Fig. 1. Circuits of Control Unit and Remote Signals

▼ 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.





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'España* 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.



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 Audio-tronic 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.

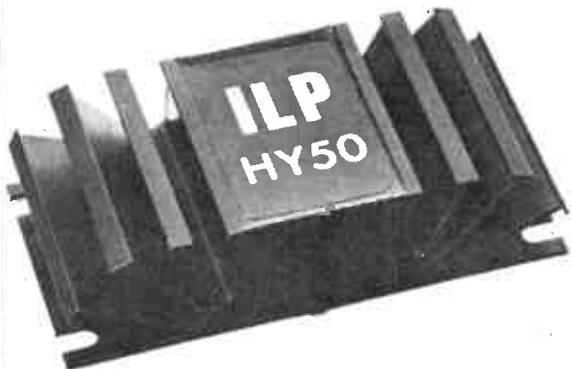
The following is a list of BBC Local Radio stations. Birmingham, Blackburn, Manchester and Teesside will have transmission powers increased. Slant polarisation is employed at Blackburn, Derby, Leeds, Leicester, Manchester, Nottingham, and Sheffield (main). All others use horizontal polarisation. Medium 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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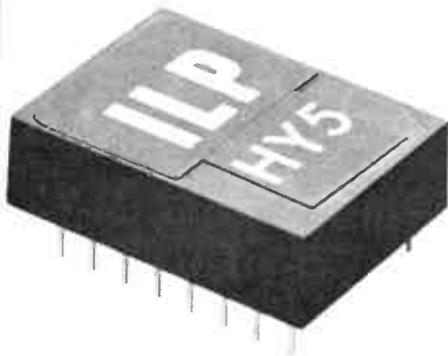
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Unchallenged for two years, the HY5, our unique multifunction preamplifier/tone hybrid, has been brought into line with the advancements in our power hybrids. Like the HY50, the new HY5 has no external components & has been redesigned to run off a split power-line with improvements in signal/noise, overload, capability & reduced distortion. The output has been increased to match the power module (Odb), and to share the same power supply. Overall size is reduced by the use of a new thin film circuitry while the device still retains all the functions of the earlier device.

When combined with the HY50 & power supply only potentiometers are required to complete a simple mono amplifier with input & output facilities expected to be found on HI-FI amplifiers. The combination of two HY5's & two HY50's sharing a common power supply (PSU50) are linked by a balance control to form a complete stereo system.

INPUTS
 Magnetic Pick-up 3mV (within 1db RIAA curve)
 Ceramic Pick-up up to 3mV
 Microphone 10mV
 Tuner 250mV
 Auxiliary 3-100mV
 Input impedance 47kΩ 1kHz

OUTPUTS
 Tape 100mV.
 Main output, 0db (0.775volts)

ACTIVE TONE CONTROLS
 Treble ± 12db at 10kHz
 Bass ± 12db at 100Hz

OVERLOAD CAPABILITY (equalization stage) 40db on most sensitive input

OUTPUT NOISE LEVEL (below 10mV magnetic input) 68db

DISTORTION 0.05% at 1kHz

SUPPLY VOLTAGE ± 16-25 volts

SUPPLY CURRENT 15mA

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POWER SUPPLY PSU50



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INPUT VOLTAGE 210-240 volts
SIZE L. 70, D. 90, H. 60 mm

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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 continent 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, H18LC, 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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0A2	.33	6BE6	.20	6LD20	.55	128H7	.35	50C5	.32	E182CC1.00	EF91	.17	KT41	.98	PEN453DD	UF41	.60	AA129	.17	BC108	.14	0A9	.14
0B2	.33	6BH6	.70	6N7GT	.60	128J7	.44	50CD62	.17	E1148	.58	EP92	.30	KT44	1.00	UF42	.80	AAZ13	.20	BC113	.28	0A10	.47
0Z4	.44	6BJ6	.39	6Q7G	.44	128K7	.55	50EH6	.55	EAS0	.27	EF97	.55	KT66	.80	UF80	.85	AC107	.17	BC115	.17	0A47	.11
1A3	.49	6BQ7A	.50	6Q7GT	.47	128Q7	.55	50L6GT	.45	EA76	.88	EF98	.65	KT81	2.00	UF86	.84	AC113	.28	BC116	.28	0A70	.17
1A5GT	.49	6BR7	.90	6Q7(M)	.55	14H7	.55	58A2	.48	EABCS0	.90	EF183	.25	HV72A	.83	UF114	.87	AC128	.22	BCY12	.55	0A81	.10
1A7GT	.83	6BR8	.75	6R7G	.80	14H7	.75	58A3	.40	EAC91	.36	EF184	.27	HV72B	.83	UF124	.88	AC132	.22	BCY33	.22	0A85	.09
1B3GT	.49	6BB7	1.40	6R7M	.75	19A7	.80	AC1	.90	EAF42	.48	EF80A	1.20	KTW63	5.00	UF409	1.20	AC154	.28	BCY34	.25	0A90	.14
1B5GT	.55	6BW6	.72	6R7M	.85	19A7	.85	AC1	1.40	EAF601	.50	EF80	3.4	MHL16	.75	UF602	.85	AC156	.22	BCY38	.25	0A91	.10
1L4	.14	6BW7	.50	6SC7GT	.33	20D4	2.00	150B2	.58	EB34	.25	EL32	.60	P61	.40	UF33/2	5.00	AC157	.28	BCY39	.28	0A95	.10
1N5GT	.60	6RZ6	.49	6S67	.39	20P2	.67	807	.87	EB91	.12	EL34	.48	PABC80	.32	YP81	.25	AC165	.28	BCZ11	.42	0A200	.10
1R5	.28	6CB8A	.40	6B17	.44	20L1	.80	6702	.80	EBG41	.48	EL35	1.00	PC86	.44	YP82	.26	AC168	.28	BF158	.32	0A202	.11
1R4	.33	6C4	.28	6B17GT	.55	20P1	.55	6763	.50	EBG81	.29	EL37	.74	PC88	.44	YP83	.26	AC178	.42	BF159	.28	0C22	.48
1U4	.44	6C9	1.00	6B17GT	.44	20P1	.76	7476	.70	EBF80	.36	EL41	.32	PC89	.53	YP86	.31	AC178	.61	BF163	.22	0C46	.17
1U5	.80	6CD6G	.80	6B17GT	.33	20P4	.80	AC/PEN	.98	EBF83	.33	EL41	.50	PC97	.38	YP500	.80	AC177	.31	BF173	.42	0C24	.48
2D21	.44	6CG8A	.75	6U4GT	.70	20P5	.95	AC/PEN/	.98	EBF89	.26	EL43	.38	PC900	.29	YP500A	.80	AC177	.28	BF180	.33	0C25	.48
2GK5	.55	6CH6	.55	6V6G	.17	25A6G	.38	DD	.98	EEL21	.60	EL44	.23	PC84	.29	YP800	.31	AC178	.28	BF181	.44	0C36	.85
3A4	.36	6CL6	.48	6V6GT	.27	25L6G	.20	AC/PEN	.38	ECB6	.59	EL45	.40	PC85	.24	YP801	.31	AC178	.28	BF185	.44	0C38	.47
3D6	.19	6CM7	.75	6X4	.27	25Y6G	.70	AC/TH1	.50	ECB8	.59	EL46	.38	PC88	.39	YP730	.48	AC178	.28	BF185	.44	0C38	.47
3Q4	.49	6CU5	.75	6X6GT	.28	26Z4G	.38	AC/TP	.98	EC92	.94	EL91	.33	PC89	.42	QV03/10	.10	AC178	.28	BF185	.44	0C38	.47
3Q5GT	.55	6CW4	.75	6Z6	.75	26Z4G	.38	AL60	.78	EC93	.95	EL95	.32	PC8189	.48	YP120	.40	AC178	.28	BF185	.44	0C38	.47
3B4	.28	6DE7	.75	7B7	.60	25Z5	.50	ATP4	.40	EC93	.95	EL96	1.20	PCF80	.26	Q875/20	.63	AC178	.28	BF185	.44	0C38	.47
4CB6	.55	6DT6A	.75	7H7	.55	25Z6G	.70	AZ1	.40	EC94	.98	EL96	.75	PCF82	.30	Q895/10	.69	AC178	.28	BF185	.44	0C38	.47
5C88	.55	6EW6	.75	7R7	1.50	30A3	.65	AZ21	.46	EC94	.98	EL96	.75	PCF84	.40	QV04/7	.63	AC178	.28	BF185	.44	0C38	.47
6T4	.30	6E5	.75	7Y4	.44	30C15	.65	AZ41	.53	EC92	.94	EL91	.33	PCF96	.44	R19	.28	AC178	.28	BF185	.44	0C38	.47
5U4G	.30	6F1	.70	7Z4	.80	30C17	.76	CL33	.90	EC93	.95	EL95	.32	PCF90	.67	TH233	.98	AC178	.28	BF185	.44	0C38	.47
5V4G	.35	6F6G	.38	9D7	.40	30C18	.70	CV63	.58	EC94	.98	EM94	.31	PCF90	.40	TP250	.98	AC178	.28	BF185	.44	0C38	.47
5Y4GT	.30	6F13	.48	10C2	.65	30C19	.60	CY1C	.55	EC95	.94	EM95	1.00	PCF90	.37	UAB90	.30	AC178	.28	BF185	.44	0C38	.47
5Z4G	.34	6F14	.40	10D7	.55	30P5	.61	CY31	.29	EC96	.40	EM97	.49	PCF90	.55	UAF42	.49	AC178	.28	BF185	.44	0C38	.47
5Z4GT	.38	6F18	.55	10P1	.60	30P1L	.68	CY31	.29	EC96	.40	EM97	.49	PCF90	.55	UAF42	.49	AC178	.28	BF185	.44	0C38	.47
6J30L2	.55	6F23	.65	10P9	.65	30P1L2	.69	DAF91	.36	EC97	.48	EM98	.54	PCF90	.55	UAF42	.49	AC178	.28	BF185	.44	0C38	.47
6A8G	.44	6F24	.60	10P18	.55	30P1L3	.50	DC90	.60	EC98	.44	EM98	.54	PCF90	.55	UAF42	.49	AC178	.28	BF185	.44	0C38	.47
6AC7	.16	6F25	.51	10L1D11	.70	30P1L4	.65	DP91	.18	EC98	.44	EM98	.54	PCF90	.55	UAF42	.49	AC178	.28	BF185	.44	0C38	.47
6AG5	.27	6F28	.60	10P13	.64	30P1L5	.66	DP96	.36	EC99	.27	EM98	.54	PCF90	.55	UAF42	.49	AC178	.28	BF185	.44	0C38	.47
6A18	.60	6F32	.30	10P14	2.00	30P1L6	.55	DIH83	.55	EC99	.27	EM98	.54	PCF90	.55	UAF42	.49	AC178	.28	BF185	.44	0C38	.47
6AJ5	.75	6GH8A	.75	12A8	1.00	30P1L7	.65	DH76	.45	EC99	.27	EM98	.54	PCF90	.55	UAF42	.49	AC178	.28	BF185	.44	0C38	.47
6AK5	.27	6GK5	.65	12AC6	.55	30P1AMR	.95	EZ1	.40	EC99	.27	EM98	.54	PCF90	.55	UAF42	.49	AC178	.28	BF185	.44	0C38	.47
6AK6	.60	6OU7	.75	12AD6	.60	30P12	.69	EZ10	.50	EC99	.27	EM98	.54	PCF90	.55	UAF42	.49	AC178	.28	BF185	.44	0C38	.47
6AM8A	.55	6H6GT	.18	12AE6	.60	30P19/	.60	EZ11	.50	EC99	.27	EM98	.54	PCF90	.55	UAF42	.49	AC178	.28	BF185	.44	0C38	.47
6AN8	.49	6J5GT	.29	12AT6	.28	30P4	.65	EZ12	.50	EC99	.27	EM98	.54	PCF90	.55	UAF42	.49	AC178	.28	BF185	.44	0C38	.47
6AQ5	.35	6J6	.30	12AV6	.38	30P1L1	.57	EL96	.32	EC99	.27	EM98	.54	PCF90	.55	UAF42	.49	AC178	.28	BF185	.44	0C38	.47
6AR5	.55	6J7G	.24	12AV6	.28	30P1L3	.75	DM70	.20	EC99	.27	EM98	.54	PCF90	.55	UAF42	.49	AC178	.28	BF185	.44	0C38	.47
6AB7	1.00	6J7M	.38	12BA6	.30	30P1L4	.75	DM71	.50	EC99	.27	EM98	.54	PCF90	.55	UAF42	.49	AC178	.28	BF185	.44	0C38	.47
6AT6	.30	6J8A	.76	12BE6	.30	30P1L5	.87	DM72	.68	EC99	.27	EM98	.54	PCF90	.55	UAF42	.49	AC178	.28	BF185	.44	0C38	.47
6AU6	.28	6K7G	.12	12BH7	.27	35A3	.48	DY902	.30	ECL80	.28	ECL82	.28	PC900	.29	YP500	.80	AC178	.28	BF185	.44	0C38	.47
6AV6	.38	6K8G	.83	12J7GT	.55	35D5	.70	EB90C	1.65	ECL82	.28	ECL82	.28	PC900	.29	YP500	.80	AC178	.28	BF185	.44	0C38	.47
6AW8A	.65	6L1	2.00	12K6	.58	35L6GT	.43	E80F	1.20	ECL82	.28	ECL82	.28	PC900	.29	YP500	.80	AC178	.28	BF185	.44	0C38	.47
6AX4	.55	6L8GT	.55	12K7GT	.38	35W4	.23	E83F	1.20	ECL84	.54	ECL84	.54	PC900	.29	YP500	.80	AC178	.28	BF185	.44	0C38	.47
6BG	.25	6L7	.50	12Q7GT	.45	35Z4GT	.24	E88OC	.60	ECL86	.54	ECL86	.54	PC900	.29	YP500	.80	AC178	.28	BF185	.44	0C38	.47
6BA6	.19	6L18	.49	12RC7	.50	35Z5GT	.30	E92CC	.40	ECL86	.54	ECL86	.54	PC900	.29	YP500	.80	AC178	.28	BF185	.44	0C38	.47
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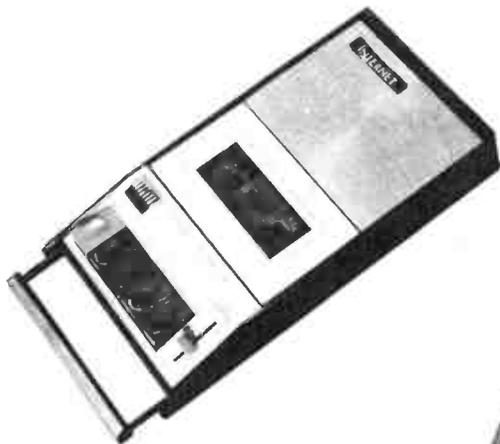
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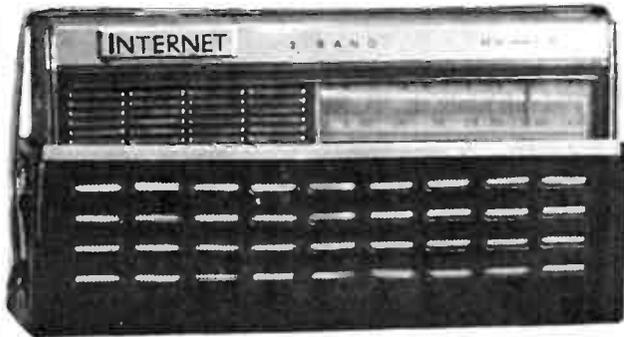
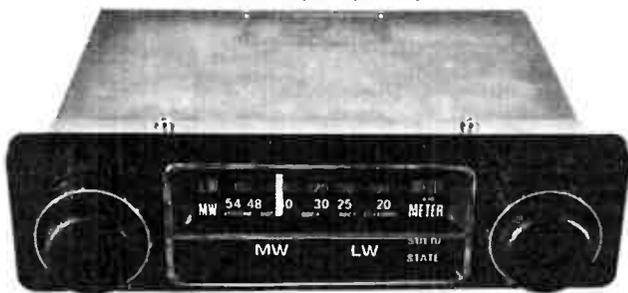
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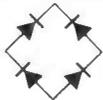


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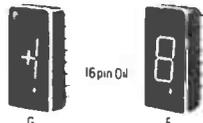
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1 watt	Carbon Film	±5%	E24 Series 10Ω to 10MΩ	11p
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1 watt	Carbon Composition	±5%	E12 Series 10Ω to 10MΩ	6p
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10 watt	Wire Wound	±5%	10KΩ, 15KΩ, 20KΩ, 25KΩ	17p
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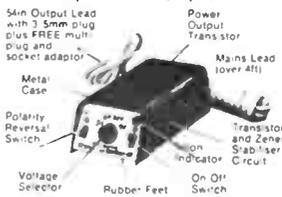
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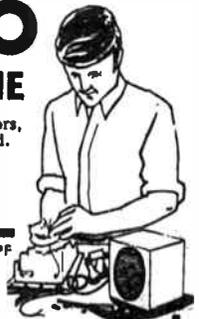
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This is an ultra precision tape motor designed for use in the AMPEX model AG20 portable recorder. Torque 450GM/CM. Stalls load at 500ma. Draw 60ma on run. 600rpm ± speed adjustment. Internal AF/RF suppression. 1/2" dia. x 1 1/2" spindle, motor 3" dia. x 1 1/2" Original cost £16.50. **OUR PRICE** £3. P. & P. 25p. Large quantities available (special quotations). Mu-metal enclosure available. 75p each. FREE P. & P.

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240AC type MM4. 2lb. pull. 1 1/2" x 1 1/2" x 1". Travel 1/2". 60p each. P. & P. 10p. Quantity discounts: 10-50 10%. 50 upwards 25%.

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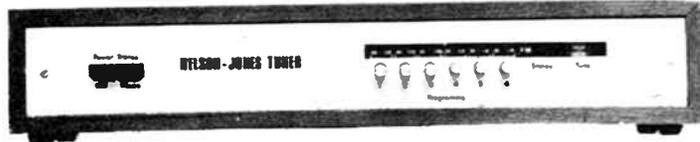
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as in 'W.W.' June '73

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Tuning is accomplished by variable capacitance diodes and a Push Button Unit with 6 positions. AFC disable is incorporated as well as a pointer for each button showing tuning position in the range 87.5-108MHz, i.e. each 'button' is fully tuneable simply by turning.

Our complete metalwork system is supplied with nuts, bolts, board standoffs, push button mains on/off and stereo mute assembly, sockets, fuse and holder. Printed and Anodised Front Panel and Veneered Teak case. Power supply kits are supplied with complete kits of parts, or separately. LED tuning ind. is also supplied.

Prices for complete kits start at £23.95 + 50p pp. + VAT for mono tuners, (phase locked decoders are also available to fit in the cabinet). Please send large SAE for complete details of special offers and our complete lists.

GREEN LED's—the latest for 'stereo' lamps. 1-9 69p, 10+ 59p.

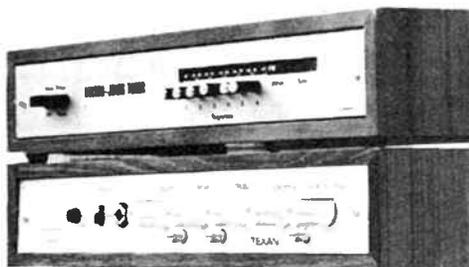
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The Cabinet of the Nelson-Jones Tuner is specially designed to match the Texan amplifier cabinet, see photographs, so that owners of Texan's are assured of compatibility, both in superb performance and appearance.

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75mm x 100mm 33p
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Type	Volts	Frequency	Price	Type	Volts	Frequency	Price
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BC 109	30	150 MHz	10p	2N 709	15	900 MHz	30p
BF 179	225	125 MHz	40p	2N 718	60	60 MHz	12p
BF 180	30	625 MHz	25p	2N 753	25	250 MHz	12p
BFW 58	80	80 MHz	15p	2N 744	20	300 MHz	12p
BFX 43	30	500 MHz	20p	2N 1613	75	60 MHz	17p
BFX 98	40	50 MHz	17p	2N 2220	60	250 MHz	15p
BFY 53	30	50 MHz	10p	2N 3053	60	100 MHz	17p
BSX 19	40	500 MHz	10p	2N 3707	30	12p	
BSX 67	30	200 MHz	12p	2N 5179	20	900 MHz	40p

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Uni-Junction Transistor Similar to 2N2646—25p

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BXY 27	Varactor Diode. "S" Band. Cut-off	70 GHz	£1
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BXY 37C/D	ditto	100 GHz	£1
BXY 38C/E	ditto	120 GHz	£1
BXY 39C/D	ditto	150 GHz	£1
BXY 40D/E	ditto	180 GHz	£1
BXY 41C/D/E	ditto	200 GHz	£1
CV 7777 (AAY 51)	Microwave Mixer Diode	18 GHz	£2
CAY 10	Microwave Detector Diode	250 GHz	£5
AEY 13	Microwave Tunnel Diode	6 GHz	£5
AEY 16	ditto	10 GHz	£10
AEY 17	Microwave Detector	18 GHz	£3
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BAW 95	Schottky Barrier Diode	12 GHz	50p

SILICON P.N.P.

Type	Volts	Frequency	Price
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BFS 92	100	70 MHz	20p
BFS 95	40	70 MHz	17p
BFX 12	25	210 MHz	10p
2N 2906	60	200 MHz	15p
2N 3702	40	100 MHz	11p
2N 3703	50	100 MHz	12p

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BLY 218	36	1,200 MHz	£2
2N 709	15	800 MHz	15p
2N 3926	36	250 MHz	£1

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Type	Volts	Frequency	Price
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ACY 26	80	75 watts	£1
AF 124	20	75 MHz	20p
AFY 19	32	350 MHz	20p
ASY 32	25	5 MHz	10p
ASZ 21	15	450 MHz	20p
GET 113	32		10p
GET 120	32	2 watts	10p
OC 123	50	1 MHz	10p
OCY 70		Light-sensitive	20p
2N 1307	30	10 MHz	15p
2N 1309	30	15 MHz	15p
2N 443	60	150 watts	£1

£1 100 1/2 WATT RESISTORS
100 CERAMIC CAPACITORS
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5 1/2 in. x 1 in. x .15 BOARDS
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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.

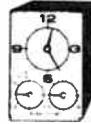


DRILL CONTROLLER NEW IKW MODEL

Electrically 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. £1.35.
Made up model also available. £2.95.

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TIME SWITCH

Smith's mains driven clock with 16 amp switch, also notes showing how you can wake up with music playing, kettle boiling or come home to a warm house, warn of 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

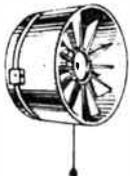
For experimenting with the ZN414.
KIT NO. 1. Pleassey Miniature Tuning Condenser with built-in LW switch and 3" Ferrite slab and litz wound MW coil, 72p.
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Model 772 — small but powerful lin. pull approx. size 1 1/2 x 1 1/2 x 1 1/2in. 60p.
Model 4001/—lin. pull. Size 2 1/2 x 2 x 1 1/2in. 88p.
Model T11—1 1/2in. pull. Size 3 x 2 1/2 x 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: PPI, PPS, PP4, PP6, PPT, PPS, and others. Kit comprises: mains transformer rectifier, smoothing and load resistor condensers and instructions. Real snip at only £1.10 plus 20p postage.

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Ex G.P.O. Black standard model with dialling disc but no internal bell. Supplied with connection diagram £1 each. Ditto with bell but without dialling disc £1.25 model as illustrated with bell and dial £1.50 each plus 50p post for single then 65p per pair.



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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" x 3 1/2" x 2 1/2", 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. £2.95 plus 30p post or Kit of Parts £5.95. Battery Model Kit only £4.95.



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Standard size 1 1/2" wafer—silver-plated 5 amp contact, standard 1/2" spindle 1/2" long—with locking washer and nut.

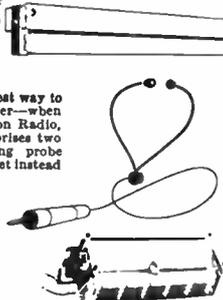
No. of Poles	2way	3 way	4 way	5way	6way	8way	9way	10way	12way
1 pole	44p	44p	44p	44p	44p	44p	44p	44p	44p
2 poles	44p	44p	44p	44p	44p	44p	44p	44p	44p
3 poles	44p	44p	44p	44p	44p	44p	44p	44p	44p
4 poles	44p	44p	44p	44p	44p	44p	44p	44p	44p
5 poles	44p	44p	44p	44p	44p	44p	44p	44p	44p
6 poles	44p	44p	44p	44p	44p	44p	44p	44p	44p
7 poles	44p	44p	44p	44p	44p	44p	44p	44p	44p
8 poles	44p	44p	44p	44p	44p	44p	44p	44p	44p
9 poles	44p	44p	44p	44p	44p	44p	44p	44p	44p
10 poles	44p	44p	44p	44p	44p	44p	44p	44p	44p
11 poles	44p	44p	44p	44p	44p	44p	44p	44p	44p
12 poles	44p	44p	44p	44p	44p	44p	44p	44p	44p

TWENTYLITE

Fluorescent lightin' units with polyester cbsoke and finished white enamel, 2ft. model. Ideal kitchen, bedroom, hall-way, 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 stethosheet instead of earpiece 88p. 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. £3.55. 2kW. Model as above except 2kW. £2.75. Don't miss this. Control Switch 88p. P. & P. 40p.

ROOM THERMOSTAT. Made by the famous Smiths Company. 15 amp. at 250v. Elegant white and beige case, size 4 1/2 inches long by 1 1/2 square approx. Adjustment is by slider (lockable) adjusts through range 30°—90° F. Special Snip price £1.65

CAPACITOR DISCHARGE CAR IGNITION

ELECTRONIC 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 £2.55 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, 6A 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. Inpnt 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" x 1/2", 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 Britnac panel mounting, holic size 1 1/2 x 1. Our ref RS 85 price 11p each. 5 amps made by Meem, 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, 65p.

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, make detector counter etc. Price 22p complete with three circuits.

Mains Flex. Padded, circular, cotton covered overall. Six amp (23-38) 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, 83p.

Stesso Pre-amplifier 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 x 8" high x 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 make 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—its easy with this to make a perfect PC board, just draw straight on to the copper—allow 10 mins. to dry, then immerse in ferroc chloride or other etchant on removal the circuit stands in high relief, 99p.

8L103D. Pleassey IC, three watt amplifier which works with the Ferranti ZN414 to become probably the first two IC radio in existence, the circuit and constructional details appeared in September's *Practical Wireless*, so we can supply the 8L103D at £1.76, the ZN414 at £1.38, also most other items, send for PW IC radio parts list.

EDUCATIONAL KITS—all with pictorial instructions

With 3 kits or more we give FREE an accurate 11 piece balance kit. Price of kits 44p each post paid. Special price for all 7 kits £2.00 with free balance kit.

KA2 Lens Kit. Eleven parts, concave lens, one convex lens, stage and slit frame, etc.
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KA4 Buzzer Kit. Eleven parts. Operation of buzzer seen.
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KA9 Bell Kit. Eight parts, including bell and push button switch. Build a complete electric bell.
KA10 Morse Key buzzer and bell kit. 25 part kit easy to construct, simple to operate.

TERMS: 10% discount if ten of an item ordered, send postage where quoted—other items, post free if order for these items is £6.00 otherwise add 20p.

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SN7401AN	0.38	0.38	0.33	SN7451N	0.20	0.18	0.16	SN74147N	2.80	2.80	1.83
SN7402N	0.20	0.18	0.16	SN7453N	0.20	0.18	0.16	SN74148N	2.01	2.01	1.83
SN7403N	0.20	0.18	0.16	SN7454N	0.20	0.18	0.16	SN74150N	2.30	2.30	2.01
SN7403AN	0.38	0.38	0.33	SN7460N	0.20	0.18	0.16	SN74151N	1.15	1.15	1.00
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SN7405N	0.20	0.18	0.16	SN7472N	0.38	0.38	0.34	SN74156N	2.30	2.30	2.01
SN7405AN	0.44	0.44	0.38	SN7473N	0.44	0.41	0.37	SN74155N	1.15	1.15	1.00
SN7406N	0.40	0.38	0.35	SN7474N	0.48	0.48	0.42	SN74156N	1.09	1.09	1.00
SN7407N	0.40	0.38	0.35	SN7475N	0.59	0.55	0.51	SN74157N	1.09	1.09	0.95
SN7408N	0.25	0.22	0.19	SN7476N	0.45	0.45	0.44	SN74159N	2.01	2.01	1.76
SN7409N	0.33	0.33	0.28	SN7480N	0.80	0.70	0.50	SN74160N	1.58	1.58	1.38
SN7409AN	0.44	0.44	0.38	SN7481N	1.25	1.10	0.95	SN74161N	1.58	1.58	1.38
SN7410N	0.20	0.18	0.16	SN7482N	0.87	0.80	0.72	SN74162N	1.58	1.58	1.38
SN7411N	0.25	0.23	0.21	SN7483N	1.20	1.10	1.00	SN74163N	1.58	1.58	1.38
SN7412N	0.28	0.28	0.25	SN7485N	1.87	1.87	1.63	SN74164N	2.01	2.01	1.76
SN7412AN	0.38	0.38	0.33	SN7486N	0.45	0.45	0.44	SN74165N	2.01	2.01	1.76
SN7413N	0.30	0.27	0.25	SN7489N	4.32	4.32	3.78	SN74166N	2.16	2.16	1.89
SN7414N	0.72	0.72	0.63	SN7490N	0.75	0.70	0.63	SN74167N	4.10	4.10	3.59
SN7416N	0.30	0.27	0.25	SN7491AN	1.10	1.00	0.90	SN74170N	2.88	2.88	2.52
SN7417N	0.30	0.27	0.25	SN7492N	0.75	0.70	0.63	SN74172N	5.76	5.76	5.04
SN7420N	0.20	0.18	0.16	SN7493N	0.75	0.70	0.63	SN74173N	1.66	1.66	1.45
SN7422N	0.28	0.28	0.25	SN7494N	0.85	0.80	0.75	SN74174N	1.80	1.80	1.57
SN7422AN	0.38	0.38	0.33	SN7495N	0.50	0.50	0.50	SN74175N	1.89	1.89	1.61
SN7423N	0.37	0.34	0.32	SN7496N	1.00	0.90	0.83	SN74176N	1.44	1.44	1.26
SN7425N	0.37	0.37	0.32	SN74100N	2.16	1.89	1.89	SN74177N	1.44	1.44	1.26
SN7427N	0.37	0.37	0.32	SN74104N	0.60	0.53	0.45	SN74180N	1.44	1.44	1.26
SN7428N	0.43	0.43	0.37	SN74105N	0.60	0.53	0.45	SN74181N	5.18	5.18	4.58
SN7430N	0.20	0.18	0.16	SN74107N	0.51	0.51	0.45	SN74182N	1.44	1.44	1.26
SN7432N	0.37	0.37	0.32	SN74110N	0.67	0.67	0.60	SN74183N	2.16	2.16	1.89
SN7433N	0.43	0.43	0.37	SN74111N	0.86	0.86	0.75	SN74185AN			
SN7433AN	0.57	0.57	0.50	SN74116N	2.16	2.16	1.89		2.16	2.16	1.89
SN7437N	0.43	0.43	0.37	SN74118N	1.00	0.90	0.83	SN74188N	6.48	6.48	5.67
SN7438N	0.43	0.43	0.37	SN74119N	1.92	1.92	1.68	SN74190N	2.80	2.80	2.01
SN7438AN	0.67	0.67	0.50	SN74120N	1.05	1.05	0.92	SN74191N	2.30	2.30	2.01
SN7440N	0.20	0.18	0.16	SN74121N	0.57	0.57	0.50	SN74192N	3.30	3.30	2.01
SN7441AN	0.55	0.79	0.73	SN74122N	0.80	0.80	0.70	SN74193N	2.30	2.30	2.01
SN7442N	0.85	0.79	0.73	SN74123N	1.44	1.44	1.26	SN74194N	1.72	1.72	1.51
SN7443AN	1.60	1.27	1.18	SN74125N	0.69	0.69	0.60	SN74195N	1.44	1.44	1.26
SN7444AN	1.60	1.27	1.18	SN74126N	0.69	0.69	0.60	SN74196N	1.58	1.58	1.38
SN7445N	2.16	2.16	1.89	SN74132N	0.72	0.72	0.63	SN74197N	1.58	1.58	1.38
SN7446N	2.16	2.16	1.89	SN74136N	0.68	0.68	0.55	SN74198N	1.16	1.16	2.77
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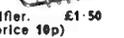
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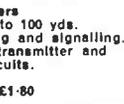
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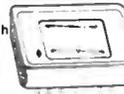
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SC35D	400v	85p
SC35E	500v	£1.20

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Type	P.I.V.	Price ea.
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SC40B	200v	95p
SC40D	400v	£1.20
SC40E	500v	£1.50

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Type	P.I.V.	Price ea.
SC45A	100v	£1.05
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SC45D	400v	£1.45
SC45E	500v	£1.85

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 B05/10 100v 22p
 B05/20 200v 23p
 B05/40 400v 25p
 B05/60 600v 27p
 1/4 x 1/4" dia.

2 AMPS P.I.V.
 B10/05 50v 25p
 B10/10 100v 25p
 B10/20 200v 28p
 B10/60 600v 30p
 1/4 x 1/4" dia.

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TE20D 120kHz-500mHz RF Generator	16-95 carr. 40p
TE22D 20Hz-200kHz Audio Generator	18-75 carr. 40p
SE350A Deluxe Signal Tracer	9-95 carr. 20p
SE400 Vols/ohms/R-C sub./RF field/RF gen.	11-25 carr. 20p

New Revolutionary Supertester 680R

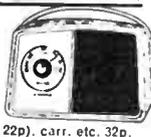
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	Transistor tester	11-00
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Easiphone telephone amplifier	6-15 p & p 25p
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LL1 Door Intercomm. and chime	11-95 p & p 25p
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1 Kw Dimmer/Controller	3-00 p & p 10p
9" Twin spring unit For	2-75 p & p 15p
16" Twin spring unit Reverbs	6-50 p & p 25p
Car Tachometer Electronic	7-50 p & p 15p
VHF 105 Aircraft Band Corrector	3-95 p & p 15p
B2005 4 Ch. mic. mixer	2-95 p & p 15p
B2004 2 ch. Stereo mixer	4-75 p & p 15p

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Portable MW/LW radio kit using Mullard RF/IF module. Features MW — bandspread for extra selectivity. Slow motion tuning. Fibre glass PVC cabinet. 600MW output. All parts £7-98 (battery 22p). carr. etc. 32p.



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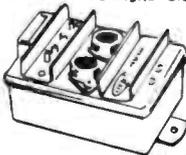
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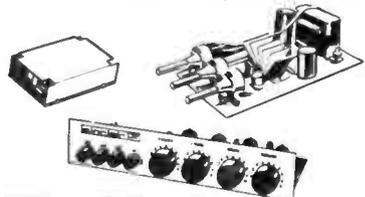
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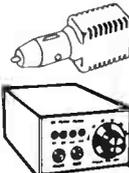


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Selection from our List, sent free for stamped addressed envelope. (Free overseas, and with all orders on request). Cash with order only—No C.O.D. or Caller service. Charges (Min. 7p) in brackets after all items apply to G.B. and Eire only. Regret orders under 30p plus charges unacceptable. S.A.E. please for enquiries or cannot be replied to. Overseas, including Eire and Channel Isles, orders less 10% off prices below, which include V.A.T. RECORDING TAPE: Finest quality/value British Mylar available: STANDARD 5" 600ft. 40p. 5 1/2" 900ft. 55p. 7" 1200ft. 62p. LONG PLAY 5" 900ft. 55p. 5 1/2" 1200ft. 62p. 7" 1800ft. £1.00 (Charges for 5" and 5 1/2", singles 10p, two to four 9p each; five and over 85p the lot. For 7", one, two or three 12p each reel, 3, 4 and 5 reels 84p the lot, 6 reels and over 40p the lot). Other sizes and accessories in list. CASSETTES, Two types, Both in Library Cases, C60 32p, C90 45p, C120 72p. Deluxe Types: C60 55p, C90 72p, C120 99p. (Charges for both types, under 5, 9p each. 5 for 17p). All quantities over 5, 28p the lot.) CARTRIDGES all with standard fittings and styli. Stereo-compatible Mono GP91/8C 98p; STEREO GP93 £1.85, Stereo Ceramic GP94 £1.75. Comparatives shown in List, with more types inc. Sonotone 9T4HC, Stereo Ceramic Diamond £1.70 (All at 8p each). DIAMOND STYLI: single tip types: ACOS GP37, GP39, GP38/67, GP71, BR TCS/LP/ST; COLLAARO O.P. and DC294, GARRARD GC2, GC8, GC810, GC121, RONETTE BF40, CO.P. and T. PHILIPS 3301 (3060, 3066, 3302, 3304), 3010/12/13/16, SONOTONE 19T/20T ALL at 85p each. SAPPHIRE 16p. DIAMOND DOUBLE TIP TURNOVER TYPE8 (78 sap. on other side). For ACOS GP73, GP91 (for cartridges GP93, GP94, etc.) GP918C (for stereo compat. types) GP104, BR ST4 (8T3, 8T5), 8T9 (8T8), 8T12/14/16, SONOTONE 8TA, 9TA, 9T4HC, PHILIPS 3306, 3310, 3224, 3228/22, GP260, GARRARD GCM31, and 22, GC823, GK825 and 26, GCMIT and 22T, GCM24T, GC823, GR825T and 26T, GCM31, GC838, GC835, GC838, K840A, K841B, ETC. ALL at 68p. SAPPHIRE 32p. DOUBLE DIAMOND STYLI: same dia STYLI tip each side: no. 78) All types £1.85. SAPPHIRE DOUBLE STYLI, TIPPED 32p. DIAMOND STYLI GOLD-RING REPLACEMENTS: G800, G800H & G850, £2.25 each, G800E £3.75 (All Styli 9p up to 3). PICK-UP WIRE: super thin flex screened, sheathed, TWIN 7p per yard, 4-core 15p per yard, (either up to 6 yards, 7p). Over, charges paid. MICROPHONES: CRYSTAL-LAPLE 11", clip/hand, lead 3-5mm jack plug 85p (10p), CM20 Cream Plastic hand 85p (10p). "MIC 4Q Curved metal hand grip £1.10 (11p) ALL with leads. DYNAMIC: Excellent Mike, 50K Ω , only 3 1/2" long, black/chrome, switched, lead with 2- and 3-5mm jack plugs £1.37 (11p). Cardiol Ball, 50K/600 Ω built in volume control, on/off switch, special 20ft lead, the best value anywhere at £6.00 (33p); Uni-dir. mesh ball 50K/600 Ω jack plug cable, adaptor, £5.25 (33p); Omni-dir. Ball mesh, 50K, cable adaptor, jack plug £4.25 (33p each). SPEAKERS: Very popular 12" ROUND, fitted tweeter, 3, 8 or 15 ohms (state which) £2.06 (33p) or pair for stereo £4.65, charges paid. SMALL 2 1/2", 3 Ω , 8 Ω or 64 Ω (state which) 41p (9p). More speakers in List. HEADPHONES: High resistance 2000 Ω adjustable £1.10 (11p). EARPIECES: with lead and min. 2-5mm or 3-5mm (state which) jack plug. MAGNETIC 12p. CRYSTAL (3-5mm plug only) 28p (up to 6 for 9p any size). SOLDERING IRON: Slim, modern, British high speed, 81", all parts replaceable, highest quality, fully guaranteed £1.28 (11p). TRANSFORMERS: sub-min. 11 1/2" x 11 1/2" x 12mm. OUTPUT (3 Ω) for OCT7, etc.) 16p or DRIVER 17p (Up to 12 for 7p). CONNECTING WIRE: Packs of 5 coils, each coil 5yds. Assa. coils. SOLID CORE 16p (8p). FLEXIBLE CORE 16p (10p). RETRACTABLE FLEXIBLE LEADS (CURLIES) with phono plug each end, or phono plug one end, phono socket at the other (state which) 6ft. 30p; 12ft. 58p (either 7p). VIBRATORS: 12v/4 pin non-synch. 121HD4, 2 1/2" ex. pins. 83p. SAME but 3 1/2" ex. pins, USA. 16p. 12v/7 pin synth. (1287R) 2 1/2" ex. pins. 78p (9p any type). MAINS BATTERY ELIMINATORS: Two models, both 240v A.C. input. Suit most radios and cassette recorders/players, with front switch, pilot lights, mains and output leads Model 8C, 3, 6, 7, 8 and 9v 400mA, stabilised with multi-output adaptor £5.50 (35p). Model N.R. has additional 12v output and is 500mA £8.00 (35p).

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EB99	50p	EL91	38p	PC189	80p
EB99	50p	EL92	38p	PC190	80p
EB99	50p	EL93	38p	PC191	80p
EB99	50p	EL94	38p	PC192	80p
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These superbly designed & engineered Saxon power amplifiers use 3A 'Mestic' 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.



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- SA35** 35 watts RMS. Uses 7 transistors and 7 diodes. Carr. paid. **£4-45**
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- SA100** makes an ideal unit in disco assemblies. A real glutton for work. Reliable, tough and compact, 11 transistors, 6 diodes. Carr. paid. **£10-90**

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
Load 4 to 16 ohms
Quiescent current 15 mA
Noise Better than -75dB
Supply voltage SA35 25-45 volts
SA50/SA100 40-70 volts
Size 4 1/2" 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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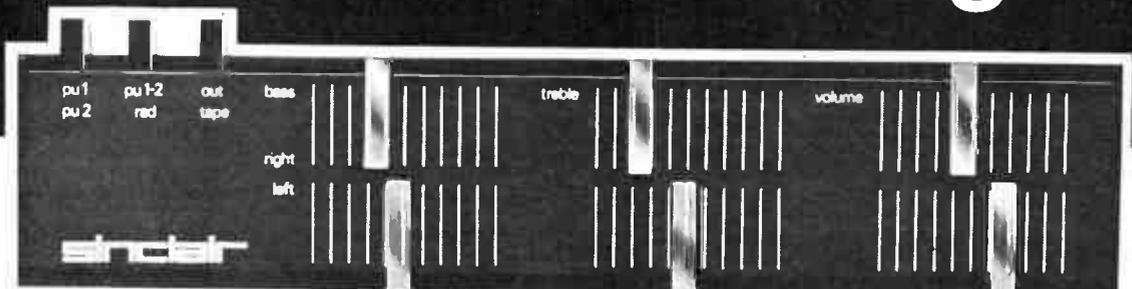
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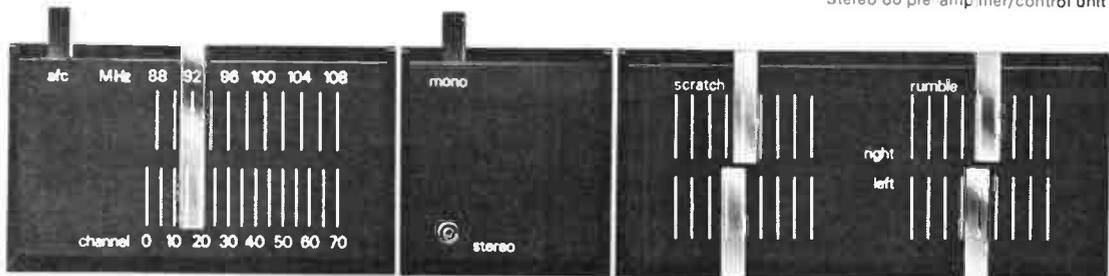
now...

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 3" 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

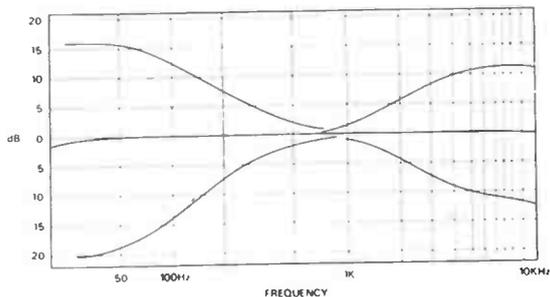
Size - 260 x 50 x 20mm (10 1/4 x 2 x 3/4 ins)
 Finish - Black, with white markings
 Inputs - Mag P U 3mV RIAA corrected; Ceramic P U 300mV
 Radio 300mV; Tape 30mV
 S/N ratio - 60db
 Frequency range - 20Hz to 15KHz ± 1dB 10Hz to 25KHz - 3dB
 Power requirements - 20 to 35 volts
 Outputs - 100mV ± AB monitoring 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



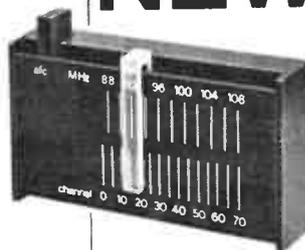
Project 80 FM tuner smaller, more efficient

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 x 50 x 20mm (3 1/4 x 2 x 3/4 ins). Greater adaptability (and possibly financial convenience) results from the tuner and stereo decoder section being made available separately.

TECHNICAL SPECIFICATIONS

Size - 85 x 50 x 20mm (approx 3 1/4 x 2 x 3/4 ins)
 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 x 50 x 20mm (1 7/8 x 2 x 3/4 ins)
 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 60S
- 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 (4 $\frac{1}{4}$ × 2 × $\frac{1}{2}$ ins)

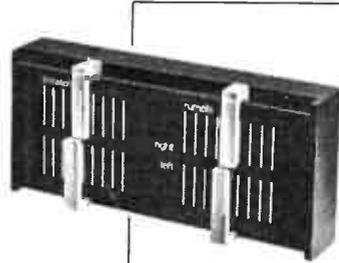
Voltage gain—minus 0.2dB

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

(2 $\frac{1}{8}$ × 3 $\frac{1}{8}$ × $\frac{1}{2}$ ins) 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 \pm 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

(2 $\frac{1}{8}$ × 3 $\frac{1}{2}$ × $\frac{1}{2}$ ins) 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

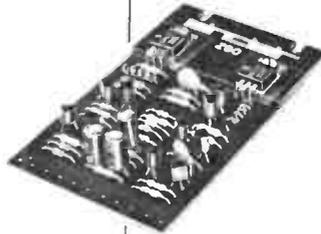
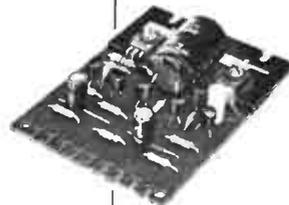
Built-in protection against

transient overload and short

circuit

Load impedance—4 Ω 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 incorporated in a commercially available constructor module. Normal working voltage (adjustable) 45V

RRP £7.98+0.79p V.A.T.

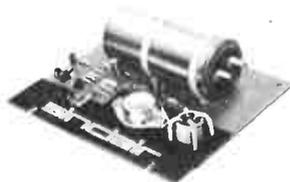
Without mains transformer

PZ.5 30V un stabilised

RRP £4.98+0.49p V.A.T.

PZ.6 35V stabilised

RRP £7.98+0.79p V.A.T.



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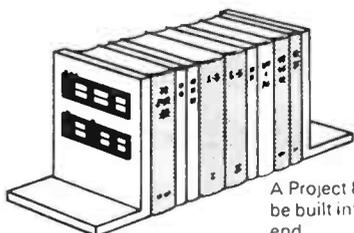
World Radio History

Recommended Project 80 applications

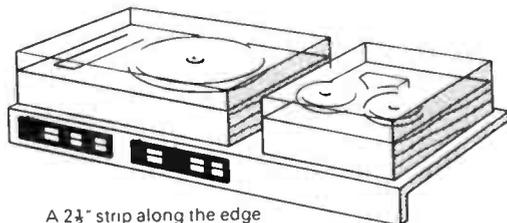
System	The Units to use	Units cost
Simple battery record player	Z.40	£5.45 +£0.54p V.A.T.
Mains powered record player	Z.40, PZ.5	£10.43 +£1.04p V.A.T.
30W. RMS continuous sine wave stereo amp.	2 × Z.40s, Stereo 80; PZ.6	£30.83 +£3.08p V.A.T.
50W (8 Ω) RMS continuous sine wave de luxe stereo amplifier	2 × Z.60s, Stereo 80; PZ.8	£33.83 +£3.38p V.A.T.
Indoor P.A.	Z.60, PZ.8	£14.93 +£1.49p V.A.T.
Car Radio	F.M. tuner, Z.40	£16.40 +£1.64p V.A.T.

From Sinclair the worlds most advanced hi-fi modules

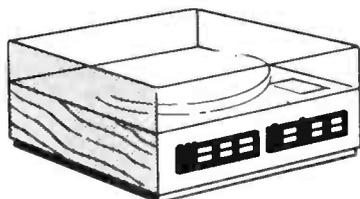
Sinclair Project 80 the ultra-modern non-obtrusive hi-fi



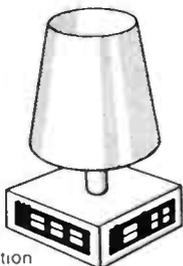
A Project 80 system could be built into a book-shelf end



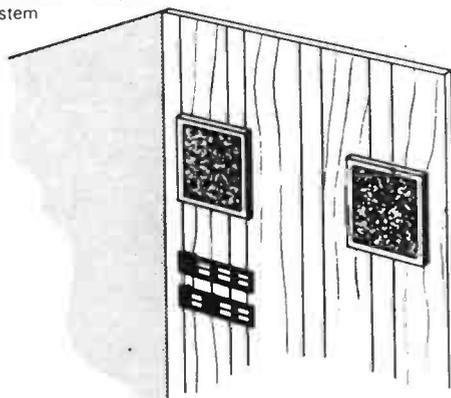
A 2½" strip along the edge of a shelf could be sufficient to contain a complete system



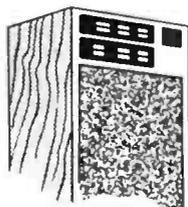
The modules mount very easily onto a playing plinth



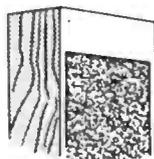
A novel application would be to build around the base of a lampshade



Two Sinclair Q.16 loudspeakers suitably positioned together with Project 80 could be mounted on to a false wall.



Project 80 could be easily mounted onto a loudspeaker cabinet



When you have seen for yourself how fantastically slim and cleverly designed these modules are, further ways will suggest themselves in which they can become a pleasing part of your particular domestic environment.

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World Record History

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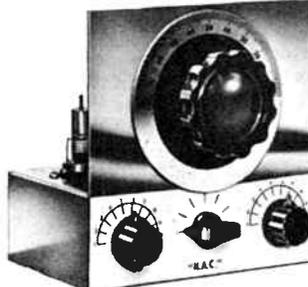
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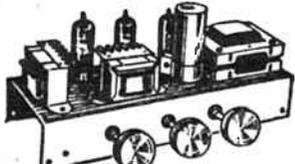
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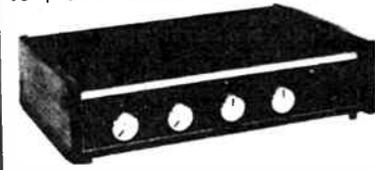
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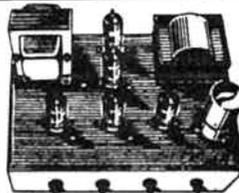


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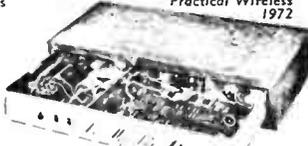
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