

PRACTICAL WIRELESS

JUNE 1965

2¢

**FREE
INSIDE!**

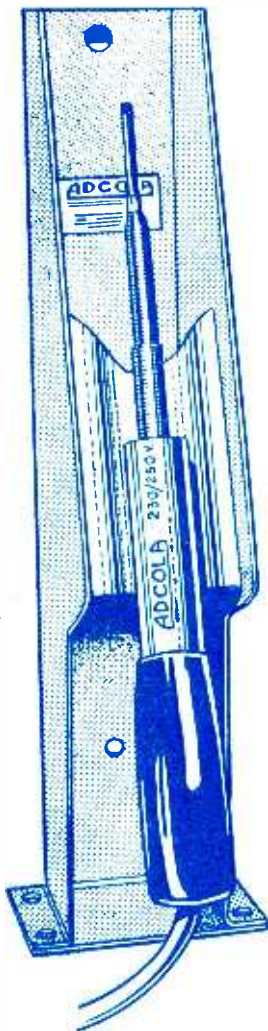
DOUBLE-SIDED
BLUEPRINT
TO BUILD THIS
**ELECTRONIC
HAWAIIAN
GUITAR**



**BUILT-IN TRANSISTOR
PREAMP / CONTROL UNIT**



SOLDERING INSTRUMENTS AND EQUIPMENT



**DESIGNED FOR
THE AMATEUR'S
RADIO STATION**

ILLUSTRATED
List No. 70 $\frac{1}{8}$ " BIT
IN
PROTECTIVE
SHIELD
List No. 68

for catalogue apply direct to:—
Sales and Service Dept.

**ADCOLA PRODUCTS LTD.,
ADCOLA HOUSE,
GAUDEN ROAD, LONDON, S.W.4**

Telephones
MACaulay 4272 & 3101

Telegrams
SOLJOINT LONDON SW4

The

SUPER 6

**LONG & MEDIUM WAVE
TRANSISTOR RADIO**



A quality radio available as a kit or ready built. The sparkling performance and superb finish of the completed receiver give you value equivalent to a £12. 12. 0 commercial model.

★ All new parts. ★ 6 transistors and diode. ★ 350mW output. ★ Superhet circuit, Ferrite rod aerial. ★ Weymouth Radio printed circuit board. ★ Component positions and references printed on back of board. ★ Nicely styled wooden cabinet, 11 x 7½ x 3½in. ★ Vinyl covered in various colours. ★ 6 x 4in. speaker giving good bass and treble response. ★ Full instruction booklet 2/- Free with kit. ★ I.F. Frequency 470 kc/s. ★ Lining up service if required. ★ All parts supplied separately. Write for list. S.A.E. please. ★ 9v. battery required. VT9 or P.P.9 (3/9 with kit).

COMPLETE KIT ONLY

PLUS 5/- POST

OR FULLY BUILT £6.17.6 Tax & Carr. Paid

£4.17.6

Volume and Tone Controls. In order—Value; With or without mains switch; Spindle length from fixing face; Body dia.; Price. (A) 2M Log. SP, 2, 14—3/-; (B) 2M Log. No. 2, 14—2/-; (C) 1M Log. DP, 1, 14—3/-; (D) 1M Log. No. 1, 14—2/-; (E) 500K Log. DP, 1, 14—3/-; (F) 500K Lin. No. 1, 14—2/-; (G) 100K Lin. DP, 2, 14—3/-; (H) 100K Log. DP, 1, 14—3/-; (J) 100K Lin. No. 1, 14—2/-; (K) 50K Lin. DP, 2, 14—3/-; (L) 5K Log. DP, 2, 14—3/-; (M) 1K Lin. No. 2, 14 Wirewound—2/-; (N) 150 Lin. No. 1, 1 Wirewound—2/-; Post 9d. (1); 1/- (2 or more). Parcel 1 of each 13 Controls, 25/- Post paid.

ELECTRONICS (Camberley) LTD.
15 VICTORIA AVENUE, Camberley, Surrey
Post Orders Only Please

JACKSON



the big name in **PRECISION** components

Precision built radio components are an important contribution to the radio and communications industry.

SL 16 DRIVE



A general purpose slide rule Drive for F.M./V.H.F. Units, short-wave converters, etc. Printed in two colours on aluminium, with a 0-100 scale and provision is made for individual calibrations. Complete with bronze escutcheon and glass. Retail 15/-.

It's reliable if it's made by JACKSON!

JACKSON BROS. (LONDON) LTD.

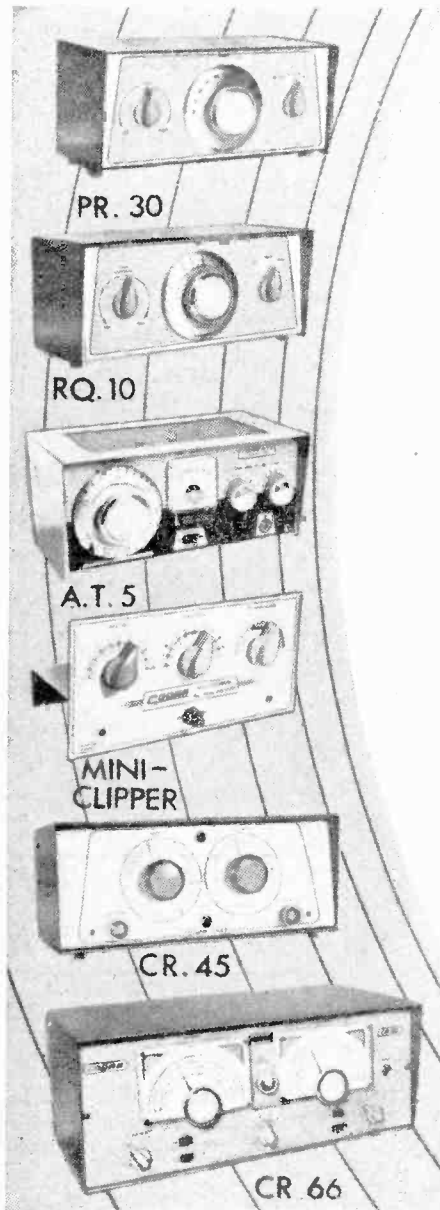
Dept. R.S., Kingsway-Waddon, Croydon, Surrey
Telephone Croydon 2754-5

Telegrams Walfilco, Souphone, London

FOR PEAK PERFORMANCE AT LOW COST—

PICK CODAR

AMATEUR RADIO EQUIPMENT



Advanced design and craftsmanship plus an unequalled reputation proved by the many hundreds of testimonials received from CODAR users is your guarantee of complete satisfaction. Only the best is good enough for CODAR—Mullard, Brimar, Jackson, Denco, Electroniques, Thorn, A.E.I., are just some of the famous names built into CODAR equipment. CODAR-KITS are supplied with clear pictorial diagrams and easy to follow instructions—no technical knowledge or special tools are required for complete success. Build your Short Wave Station with CODAR-KITS and enjoy peak performance and world wide reception previously possible only from much more expensive equipment.

For illustrated leaflets giving fullest details send 6d in stamps

CODAR R.F. PRE-SELECTOR. Will considerably improve the performance of any superhet receiver. "Results are amazing." "Well worth the money." **MODEL P.R.30.** Uses EF183 Frame Grid tuned R.F. Amplifier and provides up to 20dB gain plus substantial image rejection, improved signal/noise ratio and selectivity. Selector switch for either dipole or single wire antenna. Power requirements 180-250 volts 12 M/A H.T. 6.3 volts 3 amp I.T. Size 8 1/2 in. x 5 1/2 in. Ready built, complete with cables, plugs and instructions, £4.10.0, Carr. 3/- **MODEL P.R.30X.** Self powered version for 200-250V. A.C. and also provides 25 M/A at 200V. H.T. and 6.3V. 1 amp I.T. for other accessories. £7.4.0, Carr. 3/6.

CODAR "Q" MULTIPLIER MODEL R.Q.10. For use with any superhet receiver with an I.F. between 450 and 470 Kc/s. Provides considerable increase in selectivity for either peaking or rejecting a signal on AM, CW or SSB. Both PEAK and NULL functions tuning over receiver I.F. passband. B.F.O. facility included. Size 8 1/2 in. x 5 1/2 in. Power requirements 180-250V. H.T. at 5 M/A 6.3V. 3 amp I.T. Ready built complete with cables, plugs and instructions, £6.15.0, Carr. 3/- **MODEL R.Q.10X.** Self powered version for 200-250V. A.C. and also provides 25 M/A at 200V. H.T. and 6.3V. 1 amp I.T. for other accessories, £8.8.0, Carr. 3/6.

CODAR A.T.5. 12 WATT 2 BAND TRANSMITTER. The newest, most compact transmitter for fixed or mobile use on 160/80 metres. "The tiny TX with the BIG voice." Size only 8 1/2 in. x 5 1/2 in. (Base area is less than two-thirds of this BIG voice.) High stability new type calibrated V.F.O. 1.8-2.0 Mc/s and 3.5-3.8 Mc/s (up to 4 Mc/s export). Air-spaced CODAR-COIL Pi-net output, P.A. Plate current meter plus neon indicator. Plate/screen modulator. AM/CW switch and Panel key jack. Plug changeover for 6 or 12 volts heater supply. Ready built £16.10.0, Carr. 4/- **A.T.5 POWER SUPPLY KIT.** Type 250/S. For 200/250 V. A.C. with Standby/Net/Transmit and aerial changeover switching, stabilised V.F.O. supply, neon standby/transmit indicator £8.0.0, Carr. 5/- Type 12/MS 12 volt solid state power supply unit £11.5.0, Carr. 5/- Type 12/RC Remote Control and Aerial Switching unit, £2.7.6, Carr. 2/6. (H.P. terms available)

CODAR-KIT MINI-CLIPPER—OUR FAMOUS SHORT-WAVE RECEIVER

★ Can be built in one evening ready to switch on and bring the World to your fingertips at very low cost. ★ Supplied complete with valve, one coil 25-75 metres and 4 page instruction manual PRICE 39/6, Carr. 2/6. Extra Coils 4/9 each. Instruction Manual only 2/- (credited on order). Electrical Bandsread available. Provision to add 2 transistor amplifier.

CODAR-KIT CR45 MAINS T.R.F. SHORT-WAVE RECEIVER. World wide reception—North and South America, Russia, India, Australia, Far East, Amateurs, Shipping, etc. ★ Separate electrical bandsread. ★ 3 slow motion vernier drives. ★ Low loss polystyrene plug-in coils, factory aligned. ★ Dials calibrated in frequencies and degrees. ★ Power output 3 watts for 2/3 ohm speaker. ★ Valve line-up: ECC81, EL84, EZ80. **CODAR-KIT CR45 complete** with valves, 3 coils (10-28, 25-75, 60-176 metres) and 11 page instruction manual LESS Cabinet, £7.5.0, Carr. 4/6. **CR45 CABINET**, 12 in. x 5 1/2 in. x 7 in. with sliding door for easy coil changing, 35/- Extra coils 4/9 each, instruction manual only 4/- (credited on order). (Can now be supplied ready built—price on request). (H.P. terms available.)

CODAR-KIT CR 66 COMMUNICATION RECEIVER. The finest superhet kit ever offered. ★ Covers 540 Kc/s—30 Mc/s in 4 bands. ★ Separate electrical bandsread. ★ Factory aligned Coil unit and I.F. Transformers. ★ Regenerative I.F. stage for maximum gain and BFO for C.W. reception. ★ Power output 3 watts for 2/3 ohm speaker. ★ Panel controls: Aerial Trimmer, A.V.C., Standby, Bandswitch, A.P. Gain, I.F. Gain, B.F.O., etc. ★ Valve line up: ECH81, EBF89, ECC81, EL84, EZ80, EM84. ★ Size 16 in. x 6 1/2 in. x 8 1/2 in. **CODAR-KIT CR 66.** Complete with 17 page instruction manual, £19.15.0 (Ready-built £23.0.0) **CR 66 "S"** Meter Model Kit £22.0.0 (Ready-built £25.0.0) Carr. 7/6 extra on all models (H.P. terms available). In-struction Manual only, 7/6 (credited on order).

CODAR COILS AIR-SPACED INDUCTORS. A complete range of low loss air-spaced inductors developed by CODAR. Over 40 different sizes from 1 in. to 3 in. diameter suitable for all types of circuits application including V.F.O. P.A. Tank, Pi-network, A.T.U., aerial loading, etc. Full data and prices on request.

CODAR RADIO COMPANY

G1RE G1HGO

BANK HOUSE, SOUTHWICK SQUARE,
Southwick, Sussex. Tel. 3149

Canada: Codar Radio of Canada, Tweed, Ontario.

R.S.C.
(MANCHESTER) LTD

Terms: C.W.O. or C.O.D. No C.O.D. under £1. Postage 2/9 extra under £2. 4/6 extra under £5. Trade Supplied. S.A.E. with all enquiries please. Personal shoppers welcomed at any of the branches below. Open all day Saturday.

BRADFORD 10 North Parade (Half-day, Wed.)
BRISTOL 14 Lower Castle Street (Half-day Wednesday) Tel: 22904

BIRMINGHAM 30/31 Gt. Western Arcade, opp. Snow Hill Station. CENTRAL 1279. No half-day

DERBY 26 Osmaston Rd., The Spot (Half-day Wed.) Tel: 41361

DARLINGTON 13 Post House Wynd (Half-day Wednesday) Tel: 68043

EDINBURGH 133 Leith Street, (Half-day Wed.)

GLASGOW 326 Argyle Street, (No Half-day).

Tel: CITY 4158

HULL 51 Savile Street (Half-day Thursday) Tel: 20505

LEICESTER 32 High Street (Half-day Thurs.) Tel: 56420

LEEDS 5-7 County (Mecca) Arcade (No half-day) Tel: 28252

LIVERPOOL 73 Dale St. (No half-day) Tel: CENTRAL 3573

LONDON 238 Edgware Road W5 (Half-day Thursday) Tel: PADDDINGTON 1629

MANCHESTER

60A-60B Oldham St. Tel: CENTRAL 2778 (No half-day) New large store.

MIDDLESBROUGH 106 Newport Rd. (Half-day Wednesday) Tel: 47096

SHEFFIELD 13 Exchange Street Castle Market Bldgs. (Half-day Thursday) Tel: 20716

JASON FMTI V.H.F./F.M. Radio Tuner design. Total cost of parts including valves, tuning £6.19.6

SUPERHET FEEDER UNIT. Design of a high quality Radio Tuner. Specially suitable for use with our Amplifiers. Delayed A.V.C. Controls are Tuning, W.Ch. and Vol. Only 250v. 15mA H.T. and L.T. of 6.3v. 1 amp. required from amplifier. Size approx. 9 x 6 x 7 in. high. Simple alignment procedure. Point-to-point wiring diagrams, instructions and priced parts lists with illustrations. 2/6. Total building costs £5.5.0. S.A.E. for leaflet.

TRANSISTOR SALE Mullard OC71 2/11, OC45 3/11, OCC44 3/11, OC72 2/11, OC81 2/11, OC171 8/9, Ediswan XA101 3/9, XA112 3/9, XC101A 3/9. Postage 6d. for up to 3 transistors.

EX GOVT. SELENIUM RECTIFIERS 12v 15 AMP (BRIDGE) F.W. ONLY 19/9

EX. GOVT. SMOOTHING CHOKES. 200 mA, 3-5 H, 50 ohms. Farmox 8/9, 150mA, 10H, 50 ohms 9/9; 120mA, 12 H, 100 ohms, 8/9; 100mA, 10 H, 100 ohms, 6/9; 80 mA, 5-10 H, 250 ohms 2/11

TANNOY RE-ENTRANT LOUD-SPEAKERS. For outdoor or Factory use, 8 ohms, 8 watts. Only 25/9

EX. GOVT. 2V ACCUMULATORS. 16 A.H. Size 7 x 4 x 2 in. Brand new. 4/9 each. Three for 12/6, carr. 5/-

HI-FI 10 WATT AMPLIFIER Brand New Complete Units £7.19.6 Carr. 5/6

Manufacturer's discontinued Model. Push-pull output. Latest high efficiency valves. Dual separately controlled inputs for 'Mike' and gram. Separate Bass and Treble Controls. High Sensitivity. Output for 3 or 15 ohm speaker. Guaranteed tested and in perfect working order.

MAIL ORDERS TO:
54 WELLINGTON STREET, LEEDS 1

R.S.C. MAINS TRANSFORMERS (FULLY GUARANTEED)

Interleaved and Impregnated. Primaries 200-230-250 v. 50 c/s. Screened

TOP SHROUDED DROP THROUGH

250-0-250v. 70mA, 6.3v. 2a, 0-5-6.3v. 2a 17/9

350-0-350v. 80mA, 6.3v. 2a, 0-5-6.3v. 2a 21/9

250-0-250v. 100mA, 6.3v. 2a, 6.3v. 1a 21/9

250-0-250v. 100mA, 6.3v. 3.5a, C.T. 28/9

250-0-250v. 100mA, 6.3v. 4a, 0-5-6.3v. 3a 19/9

300-0-300v. 130mA, 6.3v. 4a, 6.3v. 1a, for Mullard 510 Amplifier 35/9

300-0-300v. 100mA, 6.3v. 4a, 0-5-6.3v. 3a 28/9

350-0-350v. 100mA, 6.3v. 4a, 0-5-6.3v. 3a 28/9

350-0-350v. 150mA, 6.3v. 4a, 0-5-6.3v. 3a 37/9

FULLY SHROUDED UPRIGHT

250-0-250v. 60mA, 6.3v. 2a, 0-5-6.3v. 2a 18/9

Midget type 21 x 3 x 3 in. 18/9

250-0-250v. 100mA, 6.3v. 4a, 0-5-6.3v. 3a 28/9

300-0-300v. 100mA, 6.3v. 4a, 5v. 3a. 28/9

300-0-300v. 130mA, 6.3v. 4a, C.T. 6.3v. 35/9

1a, for Mullard Amplifier 35/9

350-0-350v. 100mA, 6.3v. 4a, 0-5-6.3v. 3a 29/9

350-0-350v. 150mA, 6.3v. 4a, 0-5-6.3v. 3a 38/9

FLAT-IRON TRANSFORMERS

200-250v. 50 c/s primaries 6.3v. 1.5a, 5/9; 6.3v. 2a, 7/6; 12v. 1a, 7/11; 6.3v. 3a, 8/11; 6.3v. 6a, 17/6; 12v. 1.5a, twice 17/6.

or 12v. charging. Louvred steel case with stoved grey hammer finish. Fused and ready for use with mains and out-59/9

put leads and battery clips. 59/9

Carr. 4/6. Terms: Deposit 12/- and 5 monthly payments of 12/- (Total £3.12.0).

ARMSTRONG TRUVOX LEAK QUAD, ROGERS, LINEAR, W.B. FANE, WHARFEDALE, GOODMAN GARRARD, GOLDRING, GRAMPIAN, LUSTRAPHONE SHURE, RESLO

All items Cash or Terms.

Vast Range of components, etc.

R.S.C. BATTERY CHARGER AND KITS

for A.C. Mains 200-250v., 50c/s. ASSEMBLED HEAVY DUTY CHARGER KIT. Fitted Am-6/12 v. 6 amps., meter and variable output. Mains transformer 0-200-250v. Selector. F.W. (Bridge). Selenium Rectifier. Ammeter. Variable Charge Rate Selector panels. Fuses. Fuse-holder and circuit. 59/9. Carriage 4/6.

SELENIUM RECTIFIERS F.W. (BRIDGED) TYPES

6/12v. 1a, 3/11 6/12v. 8a, 15/3 6/12v. 2a, 6/11 6/12v. 10a, 28/9 6/12v. 3a, 9/9 6/12v. 15a, 35/9 6/12v. 4a, 12/3

COMPLETE POWER PACK KIT

Consisting of Mains Trans., Metal Rectifier, Double electrolytic smoothing choke chassis and circuit. For 200-250 v. A.C. mains. Output 250v., 60mA, 6.3v., 2a. 19/11

SCOOP PURCHASE OF HIGH QUALITY RECORD CHANGERS

Brand new Garrard 3000 L.M. Very latest model. Normal Retail Price approx. £12.15.0. Heavy Turntable and light-weight pick-up arm. High fidelity Stereo! Mono cartridge. Fully guaranteed.

R.S.C. 4/5 WATT A5 HIGH-GAIN AMPLIFIER

A highly-sensitive 4-valve quality amplifier for the home, -snug club, etc. Only 50 millivolts input is required for full output so that it is suitable for use with the latest High-fidelity Pick-up heads in addition to all other types of pick-ups and practically all "mikes". Separate Bass and Treble Controls are provided. These give full long-playing record equalisation. Hum level is negligible being 71 dB down 15 dB of Negative feedback is used. H.T. of 300v. 25 mA and L.T. of 6.3v. 1.5a, is available for the supply of a Radio Feeder Unit or Tape-Deck pre-amplifier. For A.C. mains 200-230-250v. 50 c/s. Output for 2-3 ohm speaker. finished chassis, point-to-point wiring diagrams and instructions. Exceptional value £4.15.0, or assembled ready for use 25/- extra, plus 3/6 carr., deposit 22/6 and 5 monthly payments of 22/6 (Total £26.15.0) for assembled unit.

R.S.C. GRAM. AMPLIFIER KIT. 3 watts output. Negative feedback. Controls Vol., Tone and Switch. Mains operation 200-250v. A.C. Fully isolated chassis. Circuit, etc., supplied. Only 39/9, Carr. 3/9.

AMPLIFIER. For use with any single or auto-change unit. Output for 2/3 ohm speaker. For 200-250v. A.C. mains. Size 11 1/2 x 2 1/2 x 2 1/2 in. Controls: Vol. and Tone with Switch. Only 59/6

COMMUNICATION RECEIVERS RX 601A LUXE 4 BAND

220/240v. 50/60 c.p.s. A.C. mains operation. Frequencies covered 1600 Kc/s to 30 Mc/s continuous. Incorporates 5in. speaker. Slide rule tuning dial 'S' meter. Internal ferrite aerial for medium wave. Telescopic whip aerial 58in. 10 section for short waves. Fitted sockets for optional outdoor aerial. Headphones, external speaker socket. Other features are electrical bandspread tuning, Noise limiter, A.V.C., B.F.O., stand by switch. Size approx. 12 1/2 x 5 1/2 x 8 1/2 in. Handsome crackle finished metal cabinet. Brand new with full instructions manual. Usual guarantee 19 Gns. Carr. & pkg. 10/-.

R.S.C. 4 WATT GRAM. AMPLIFIER KIT. Complete set of parts to build a good quality compact unit suitable for use with any record playing unit. Mains isolated chassis separate Bass and Treble controls. Output for 2-3 ohm speaker. For 200-250v. A.C. 59/9

R.S.C. BABY ALARM or INTER-COMM KIT. Complete set of parts with diagrams, etc. Housed in two polished walnut finished cabinets of pleasing design. High sensitivity. For 200-250v. A.C. mains. Fully isolated. Controllable at both units. An intercomm. of this class would normally cost £20-£30. Only 89/6, carr. 5/- ready for use, 6 gns.

R.S.C. BATTERY TO MAINS CONVERSION UNITS. Type BMI. An all-day battery eliminator. Size 6 1/2 x 4 1/2 in. approx. Completely replaces batteries supply 1.4v and 90v where A.C. mains 200-250v. 50 c/s is available. Suitable for all battery portable receivers requiring 1.4v. and 90v. Complete kit with diagram 39/9 or ready for use 46/9

R.S.C. BATTERY TO MAINS CONVERSION UNITS. Type BMI. An all-day battery eliminator. Size 6 1/2 x 4 1/2 in. approx. Completely replaces batteries supply 1.4v and 90v where A.C. mains 200-250v. 50 c/s is available. Suitable for all battery portable receivers requiring 1.4v. and 90v. Complete kit with diagram 39/9 or ready for use 46/9

R.S.C. BATTERY TO MAINS CONVERSION UNITS. Type BMI. An all-day battery eliminator. Size 6 1/2 x 4 1/2 in. approx. Completely replaces batteries supply 1.4v and 90v where A.C. mains 200-250v. 50 c/s is available. Suitable for all battery portable receivers requiring 1.4v. and 90v. Complete kit with diagram 39/9 or ready for use 46/9

R.S.C. BATTERY TO MAINS CONVERSION UNITS. Type BMI. An all-day battery eliminator. Size 6 1/2 x 4 1/2 in. approx. Completely replaces batteries supply 1.4v and 90v where A.C. mains 200-250v. 50 c/s is available. Suitable for all battery portable receivers requiring 1.4v. and 90v. Complete kit with diagram 39/9 or ready for use 46/9

R.S.C. BATTERY TO MAINS CONVERSION UNITS. Type BMI. An all-day battery eliminator. Size 6 1/2 x 4 1/2 in. approx. Completely replaces batteries supply 1.4v and 90v where A.C. mains 200-250v. 50 c/s is available. Suitable for all battery portable receivers requiring 1.4v. and 90v. Complete kit with diagram 39/9 or ready for use 46/9

R.S.C. BATTERY TO MAINS CONVERSION UNITS. Type BMI. An all-day battery eliminator. Size 6 1/2 x 4 1/2 in. approx. Completely replaces batteries supply 1.4v and 90v where A.C. mains 200-250v. 50 c/s is available. Suitable for all battery portable receivers requiring 1.4v. and 90v. Complete kit with diagram 39/9 or ready for use 46/9

R.S.C. BATTERY TO MAINS CONVERSION UNITS. Type BMI. An all-day battery eliminator. Size 6 1/2 x 4 1/2 in. approx. Completely replaces batteries supply 1.4v and 90v where A.C. mains 200-250v. 50 c/s is available. Suitable for all battery portable receivers requiring 1.4v. and 90v. Complete kit with diagram 39/9 or ready for use 46/9

R.S.C. BATTERY TO MAINS CONVERSION UNITS. Type BMI. An all-day battery eliminator. Size 6 1/2 x 4 1/2 in. approx. Completely replaces batteries supply 1.4v and 90v where A.C. mains 200-250v. 50 c/s is available. Suitable for all battery portable receivers requiring 1.4v. and 90v. Complete kit with diagram 39/9 or ready for use 46/9

R.S.C. BATTERY TO MAINS CONVERSION UNITS. Type BMI. An all-day battery eliminator. Size 6 1/2 x 4 1/2 in. approx. Completely replaces batteries supply 1.4v and 90v where A.C. mains 200-250v. 50 c/s is available. Suitable for all battery portable receivers requiring 1.4v. and 90v. Complete kit with diagram 39/9 or ready for use 46/9

R.S.C. BATTERY TO MAINS CONVERSION UNITS. Type BMI. An all-day battery eliminator. Size 6 1/2 x 4 1/2 in. approx. Completely replaces batteries supply 1.4v and 90v where A.C. mains 200-250v. 50 c/s is available. Suitable for all battery portable receivers requiring 1.4v. and 90v. Complete kit with diagram 39/9 or ready for use 46/9

R.S.C. BATTERY TO MAINS CONVERSION UNITS. Type BMI. An all-day battery eliminator. Size 6 1/2 x 4 1/2 in. approx. Completely replaces batteries supply 1.4v and 90v where A.C. mains 200-250v. 50 c/s is available. Suitable for all battery portable receivers requiring 1.4v. and 90v. Complete kit with diagram 39/9 or ready for use 46/9

R.S.C. BATTERY TO MAINS CONVERSION UNITS. Type BMI. An all-day battery eliminator. Size 6 1/2 x 4 1/2 in. approx. Completely replaces batteries supply 1.4v and 90v where A.C. mains 200-250v. 50 c/s is available. Suitable for all battery portable receivers requiring 1.4v. and 90v. Complete kit with diagram 39/9 or ready for use 46/9

R.S.C. BATTERY TO MAINS CONVERSION UNITS. Type BMI. An all-day battery eliminator. Size 6 1/2 x 4 1/2 in. approx. Completely replaces batteries supply 1.4v and 90v where A.C. mains 200-250v. 50 c/s is available. Suitable for all battery portable receivers requiring 1.4v. and 90v. Complete kit with diagram 39/9 or ready for use 46/9



R.S.C. G100 100 Watt AMPLIFIER

TERRIFIC POWER OUTPUT FOR ALL PURPOSES

For ELECTRONIC ORGAN, LEAD, RHYTHM and BASS GUITAR and any other musical instrument. FOR VOCALIST, Gram, RADIO and Tape etc.

- ★ Incorporating SIX 12in. PLUS TWO 15in. HEAVY DUTY LOUDSPEAKERS. Total Rating, 140 watts.
- ★ Housed in 4 substantial Wood Cabinets of pleasing design and covered in contrasting shades of Rexine and Vynair with gold trimmings.
- ★ 4 Jack Inputs in TWO CHANNELS with 4 Independent Volume Controls.
- ★ Separate Bass and Treble Controls on each channel.
- ★ For standard 200-250v. A.C. mains operation.

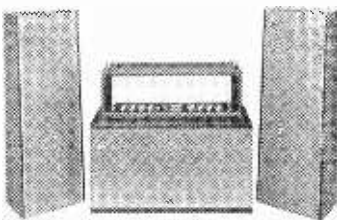
Fantastic Value at only

89¹/₂

Carr. 30/-
Gns.

Or Deposit £11.7.6
and 52 weekly
payments of 35/-
(Total 97 Gns).

Send S.A.E. for full descriptive leaflet, or visit one of our many branches and hear this fabulous amplifier.



R.S.C. BASS-REGENT 50 WATT AMPLIFIER

AN EXCEPTIONALLY POWERFUL HIGH QUALITY ALL-PURPOSE UNIT

For lead, rhythm, bass guitar and all other musical instruments

For vocalists, gram, radio, tape and general public address

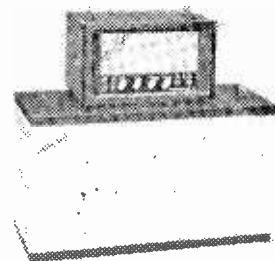
- ★ UNUSUALLY POWERFUL, LOUDSPEAKER COMBINATION: consisting of a FANE HIGH FLUX 15in. 30 watt unit PLUS a FANE 12in. 20 watt unit with extended frequency response.
- ★ 4 Jack Socket Inputs and two independent Vol. Controls for simultaneous use of up to 4 pick-ups or 'mikes'.
- ★ Separate cabinets fully covered in contrasting tones of Rexine/Vynair with gold trimmings, for speakers and amplifiers.
- ★ Separate Bass and Treble Controls giving 'boost' and 'cut'.

Send S.A.E. for leaflet. Or call at one of our many branches and compare the Bass-Regent with units at more than three times the cost.

47

Carr. 25/-
GNS.

Or deposit £5.11.0.
and 12 monthly
payments of £4.
(Total 51 Gns).



HEAVY DUTY LOUDSPEAKERS IN SUBSTANTIAL CABINETS

TYPE REG1

Two Tone Rexine/Vynair covered. Suitable for Bass-Guitar. Speaker Unit 15in., High Flux, 15 ohms, 30 watts. Cabinet size approx. 24 x 21 x 13in.

Only **19¹/₂** Gns.
Or Deposit 5/9 and 9 monthly payments of 44/5. (Total 21 Gns).



R.S.C. BASS/20 AMPLIFIER suitable for BASS GUITAR

A highly efficient unit incorporating massive 15in. high flux loudspeaker specially constructed to withstand heaviest load conditions. Rating 25 watts. Individual bass and treble controls give ample "Boost" and "Cut". Two jack socket inputs separately controlled. Cabinet is of substantial construction and attractively finished in two contrasting tones of Rexine and Vynair. Size approx. 24 x 21 x 13in. Carr. 17/6. Send S.A.E. for leaflet. **29¹/₂** Gns. Or deposit £3.4.6. & 12 monthly payments of 51/8. (Total 32 Gns).

INTEREST CHARGES REFUNDED

ON H.P. ACCOUNTS SETTLED IN 6 MONTHS

R.S.C. COLUMN SPEAKERS

Covered in two-tone Rexine/Vynair. Ideal for vocalists and Public Address. Normally supplied for 15 ohm matching but can be supplied for 100v. line for 35/- extra.

Type C58. 15-20 watts. Fitted five 8in. high flux speakers. Overall size approx. 42 x 10 x 5in. **12¹/₂** Gns. Carr. 10/-

Or deposit of 29/- and 9 monthly payments 29/- (Total £14.10.0).

Type C42. 10 watts. Fitted four 12in. 12,000 line 10 watt speakers. Overall size 52 x 14 x 8in. approx. **19¹/₂** Gns. Carr. 15/-

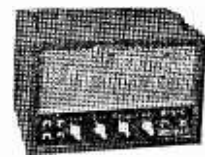
Or deposit of 51/9 and 9 monthly payments of 44/5 (Total 21 Gns).

30 WATT HIGH QUALITY AMPLIFIER FOR LEAD RHYTHM AND BASS GUITAR

and for Vocal or Instrumental Groups

A Four Input, two volume control Hi-Fi unit with separate Bass and Treble "Cut" and "Boost" controls. Designed for vocal or instrumental groups. For Bass, Lead or Rhythm Guitar. Six Mullard or Brimar latest type valves. Housed in strong Rexine covered cabinet with twin chrome carrying handles. Attractive black and gold perspex fascia plate. For 200-250v. A.C. mains. Output for 3 or 15 ohm speakers. Send S.A.E. for leaflet.

16¹/₂ GNS. Carr. 12/6



R.S.C. BASS-MAJOR 30 WATT

MULTI-PURPOSE HIGH FIDELITY HIGH OUTPUT AMPLIFIER for VOCAL & INSTRUMENTAL GROUPS

Eminently suitable for lead, rythm, bass guitar and all other musical instruments

- ★ Incorporating two 12in. 25 watt Heavy Duty, High Flux Fane Loudspeakers, one with dual cone for high frequencies.
- ★ Robust wood cabinet with exceptionally attractive covering of Rexine/Vynair with gold trimmings.
- ★ Four Jack Socket Inputs and two independent Volume Controls for simultaneous connection of up to four Pick-ups or "Mikes".
- ★ Separate Bass and Treble Controls.

SUPERIOR TO UNITS AT TWICE THE COST. Send S.A.E. for leaflet or call for demonstration at any branch.

Carr. 17/6
Terms: Deposit £4.3.0
and 12 monthly payments of £3.8.4.
(Total 43 Gns).

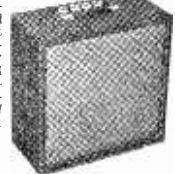
39¹/₂

Gns.

R.S.C. G15 15 WATT AMPLIFIER

for Lead or Rhythm Guitar, 'Mike', Gram or Radio High-fidelity push-pull output. Separate bass and treble "Cut" and "Boost" controls. Twin separately controlled inputs so that two instruments or "mike" and pickups can be used at the same time. Loudspeaker is a heavy duty flux 12in. 20 watt model with cast chassis. Cabinet is covered in contrasting shades of Rexine/Vynair. Size approx. 18 x 18 x 8in.

Only **19** Gns. Carr. 10/-
Send S.A.E. for leaflet.
Or DEPOSIT 2 Gns. and 12 monthly payments of 33/3 (Total 21 Gns).



LINEAR TREMOLO/PREAMP UNIT

Designed for introducing the Tremolo effect to any amplifier which is fitted with a reserve power supply point for smoothed H.T. and 6.3v. A.C. L.T. The unit plugs into power supply point and any input socket or amplifier. Controls are Speed (frequency of interruptions), Depth (for heavy or light effect), Volume and Switch. Three sockets are for two inputs and Foot Switch. ONLY **4** Gns.

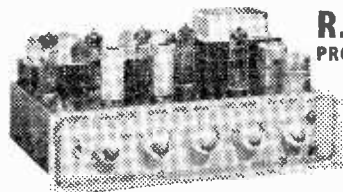
R.S.C. G5 AMPLIFIER

for Guitar, 'Mike', Gram or Radio 3 watt high quality output. Incorporating high flux 12in. 10 watt 12,000 line loudspeaker. Sensitivity 30 m.v. High impedance jack input. Handsome strongly made cabinet (size 14 x 14 x 7in. approx.) finished in complementary shades of Rexine/Tygan. 200-250v. A.C. mains. Suitable for Lead or Rhythm Guitar in home or small club, etc. **£9.19.6** Or DEPOSIT 22/3 and 9 monthly payments of 22/3 (Total £11.2.6) Carr. 7/6.

TRANSISTORISED SOUND MIXER

Enables mixing of up to 4 inputs, i.e., mic., tape, gram, tuner, etc., into single output. Compact and completely self-contained, uses standard 9 volt battery. Four standard jack inputs. PRICE **49/6** Post 3/6.





R.S.C. STEREO 20/HIGH FIDELITY AMPLIFIER

PROVIDING 10/14 WATTS ULTRA LINEAR PUSH-PULL OUTPUT ON EACH CHANNEL

SUITABLE FOR "MIKE", GRAM., RADIO OR TAPE. INTENDED FOR THE HOME OR STUDIO BUT SUITABLE FOR LARGE HALLS OR CLUBS

Features include:

- ★ Four-position tone and compensation Input Selector switch.
- ★ Stereo Mono switch so that peak monaural output of 28 watts can be obtained.
- ★ Separate Bass "Lift" and "Cut" and Treble "Lift" and "Cut" controls.
- ★ Neon panel indicator.
- ★ Handsome Perspex frontplate

Read S.A.E. for illustrated leaflet. Carr. 10/-

13 Gns.

Based on a current Mullard design and employing valves ECC83, ECC85, ECL86, ECL86, ECL86, ECL86, ECL86. Output transformers are high quality sectionally wound to required specification. Output matchings for 3 cm 15 ohm speakers on each channel.

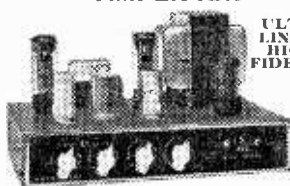
Complete set of parts with point to point wiring diagrams and instructions, or Factory assembled, tested and supplied with our usual 12 month guarantee for 15 gns. or DEPOSIT 2 gns. and nine monthly payments of 41/- (Total £27.15.6.)

FREQUENCY RESPONSE ± 2 dB. 30-20,000 c.p.s.
HUM LEVEL 60dB down.
SENSITIVITY: 15 millivolts maximum.
HARMONIC DISTORTION (each channel) 0.2%.
For operation on 200/250v. A.C. Mains.

AUDIOTRINE HI-FI TAPE RECORDER KIT 25 1/2 GNS.

REALISM AT INCREDIBLY LOW COST, CAN BE ASSEMBLED IN AN HOUR
Incorporating the latest Collaro Studio Tape Transcriber. The Audiotrine High Fidelity Tape Amplifier with negative feedback equalisation for each of 3 speeds. High Flux P.M. Speaker, empty Tape Spool, a Reel of Best Quality Tape and a Handsome Portable Carrying Cabinet tastefully covered in two contrasting shades of Rexine and Vynal. Size 14 1/2 x 15 x 8 1/2 in. high and circuit. Total cost if purchased individually approximately £40. Performance equal to units in the £60-£80 class. S.A.E. for leaflets. TERMS: Deposit £3 and 12 monthly payments of 44/- (Total £28.6s.).

R.S.C. A10 30 WATT AMPLIFIER



ULTRA
LINEAR
HIGH
FIDELITY

A highly sensitive Push-Pull high output unit with self-contained Pre-amp. Tone Control Stages. Certified performance figures compare equally with most expensive amplifiers available. Hum level 70 dB down. Frequency response ± 3 dB. 30-20,000 c/s. A specially designed sectionally wound ultra linear output transformer is used with 807 output valves. All components are chosen for reliability. Six valves are used EF86, EF86, ECC83, 807.

807, GZ34. Separate Bass and Treble Controls are provided. Minimum input required for full output is only 12 millivolts so that ANY KIND OF MICROPHONE OR PICK-UP IS SUITABLE. The unit is designed for CLUBS, SCHOOLS, THEATRES, DANCE HALLS or OUT-DOOR FUNCTIONS, etc. For use with Electronic ORGAN, BASS, LEAD OR RHYTHM GUITAR, STRING BASS, etc. For standard or long-playing records. OUTPUT SOCKET PROVIDES L.T. and H.T. for RADIO FEEDER UNIT. An extra input with associated vol. control is provided so that two separate inputs such as Gram and "Mike" can be mixed. 200-250 v. 50 c/s. A.C. Mains output for 3 and 15 ohm speakers. Complete kit of parts with fully punched chassis and point-to-point wiring diagrams and instructions. Supplied factory built with EL34 output valves and 12 months guarantee for 14 Gns. If required perforated cover with carrying handles can be supplied for 19/6. Send S.A.E. for leaflet, also speaker.

11 Gns.

Carr. 10/-

guarantee, for 14 Gns. If required perforated cover with carrying handles can be supplied for 19/6. Send S.A.E. for leaflet, also speaker.

TERMS: DEPOSIT 34/6 and 9 monthly payments of 33/6. (Total 16 gns.).

INTEREST CHARGES REFUNDED

ON H.P. and CREDIT SALE
Accounts settled in 6 months.

LINEAR TAPE PRE-AMPLIFIER. Type LP1, Switched Equalisation, Position for Recording at 1 in, 3 1/2 in, 7 1/2 in. per sec., and Playback, EM84 Recording Level Indicator. Designed primarily as the link between a Collaro Tape Transcriber and a Hi-Fi amplifier, suitable almost any Tape Deck Only 91 gns. S.A.E. for leaflet.

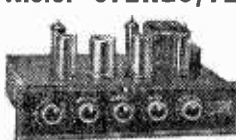
HIGH FIDELITY 12-14 WATT AMPLIFIER TYPE A11

PUSH-PULL ULTRA LINEAR
OUTPUT "BUILT-IN" TONE
CONTROL PRE-AMP STAGES

Two input sockets with associated controls allow mixing of "mike" and gram., as in A10 High sensitivity. Includes 5 valves, ECC83, ECC83, EL84, EL84, E281. High quality sectionally wound output transformer specially designed for Ultra Linear operation and reliable small condensers of current manufacture. INDIVIDUAL CONTROLS FOR BASS AND TREBLE "Lift" and "Cut". Frequency response ± 3 dB 30-20,000 c/s. Six negative feedback loops. Hum level 60 dB down. ONLY 23 millivolts input required for FULL OUTPUT. Suitable for use with all makes and types of pick-ups and microphones. Comparable with the very best design for STANDARD OR LONG PLAYING RECORDS. FOR MUSICAL INSTRUMENTS SUCH AS STRING, BASS, LEAD OR RHYTHM GUITARS, etc. OUTPUT SOCKET with plug provides 300v. 30mA. and 6.3v. 1.5A. For supply of a RADIO FEEDER UNIT. Size approx. 12 x 9 x 7 in. For A.C. mains 200-250v. 50 c.p.s. Output for 3 and 15 ohms speaker. Kit is complete to last nut. Chassis is fully punched. Full instructions and point-to-point wiring diagrams supplied. Only Carr. 10/- (Or factory built 51/- extra).

If required louver metal cover with 2 carrying handles can be supplied for 18/9. TERMS ON ASSEMBLED UNITS. DEPOSIT 25/- and 9 monthly payments of 25/- (Total £12.10.0). Send S.A.E. for illustrated leaflet detailing Cabinets, Speakers, Mikes, etc.

R.S.C. STEREO/TEN HIGH QUALITY AMPLIFIER



A complete set of parts for the construction of a stereophonic amplifier giving 5 watts high quality output on each channel (total 10 watts). Sensitivity is 50 millivolts. Suitable for all crystal stereo heads. Ganged Bass and Treble Control give equal variation for "Lift" and "Cut". Provision is made for use as straight (monaural) 10-watt amplifier. Valve line-up ECC83, ECC83, EL84, EL84, E281. Outputs for 2-3 ohm speakers. Point-to-Point wiring diagrams and instructions supplied. Send S.A.E. for leaflet. Full constructional details and price list 2/6. Carr. 10/-

8 Gns.

Or supplied factory assembled with 12 months' guarantee for £11.7.6. Terms: Deposit 2 gns. and 9 monthly payments of 24/2 (Total £12.18.6.).

ONLY 3
PAIRS OF
SOLDERED
JOINTS
PLUS
MAINS



12 in. 10 WATT HIGH QUALITY LOUDSPEAKER



In walnut veneered cabinet. Gauss 12,000 lines. Speech coil 1 ohms or 15 ohms. Only Carr. 5/-

£4.19.6

Terms: Deposit 11/3 and 9 monthly payments of 11/3. (Total £5.12.6.) 12 in. 20 WATT HI-FI LOUDSPEAKERS IN CABINETS. Size 18 x 18 x 10 in. Finish as above. Only £7.18.6. Terms: Deposit 17/9 and 9 monthly payments of 17/9 (Total £28.17.6). Carr. 8/6.

W.B. "STENTORIAN" HIGH FIDELITY P.M. SPEAKERS HF1012. 10 watts rating. Where a really good quality speaker at a low price is required, we highly recommend this unit with an amazing performance. £4.12.0. Please state whether 8 ohm or 15 ohm required.

R.S.C. JUNIOR BASS REFLEX CABINET. Designed for above speaker, but suitable for any good quality 8 in. or 10 in. speaker. Acoustically lined and ported. Polished walnut veneer finish. Size 18 x 12 x 10 in. Strongly made. Handsome appearance. Ensures superb reproduction for only £3.19.8.

R.S.C. STANDARD BASS REFLEX CABINET. For 12 in. loudspeakers, acoustically lined and ported. Size 20 x 14 x 18 in. Beautiful walnut veneer finish. Recommended for use with Audiotrine Speaker System. £5.19.6.

AUDIOTRINE CORNER CONSOLE CABINETS. Strongly made. Beautiful polished walnut veneer finish. Pleasing design. JUNIOR MODEL. For up to 4 in. speaker. Approx. 20 1/2 x 14 in. 49/9

STANDARD MODEL. To take up to 10 in. speaker. Size 27 x 18 x 18 in.

£4.11.9

SENIOR MODEL. To take up to 12 in. speaker and with Tweeter out-out. Size approx. 30 x 30 x 15 in. (Recommended for use with Audiotrine speaker system). 7 gns. or terms.

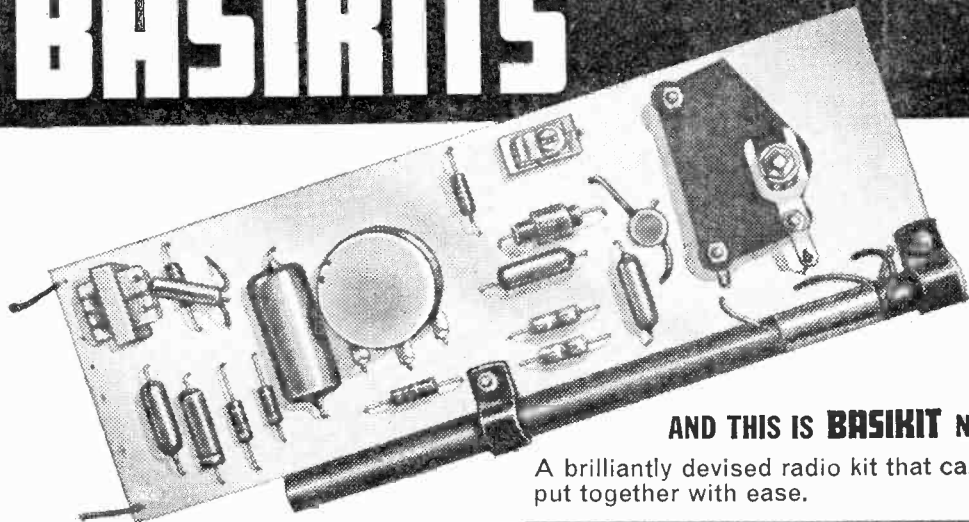
AUDIOTRINE HI-FI SPEAKER SYSTEM. Consisting of matched 12 in. 12,000 line, 15 ohm high quality speaker; cross-over unit (consisting of choke, condenser, etc.) and Tweeter. The smooth response and extended frequency range ensure surprisingly realistic reproduction. Standard 10 watt rating.

£4.19.9. Carr. 5/-

Or Senior 20 watt. £6.19.6. Carr. 7/6.



HERE COMES THE BIG BREAKTHROUGH IN EDUCATIONAL ELECTRONICS— BASIKITS



AND THIS IS **BASIKIT** No. 1

A brilliantly devised radio kit that can be put together with ease.

YOUR KEY TO THE FASCINATING WORLD OF ELECTRONICS

All circuits are designed around top quality components, not near equivalents. Full size printed circuits with every component position marked. Makes construction extraordinarily simple. No fiddling with microscopic connections—no inspired guesswork called for. A lavish instruction manual not only tells you how to construct your Basikit but also advises you on its use and explains exactly how your Basikit works.

- * VOLUME CONTROL
- * PRECISE TUNING
- * PULLS IN A HOST OF STATIONS
- * MORE THAN TWENTY FULL SIZE
HIGH QUALITY COMPONENTS

59/- complete for your biggest and best ever opportunity to learn as you build!

ALSO AVAILABLE: The *Basikit mains battery Power Unit* which powers all Basikits. Yours for **42/6**. The *Basikit Amplifier* that brings real full-voiced power to your Basikit No. 1 Radio. **57/6** complete.

Watch out for more Basikits.

ORDER YOUR **BASIKIT** ON THIS COUPON:

TO: BASIKITS DIVISION, K.L.B. ELECTRIC LTD. 335 WHITEHORSE RD, CROYDON

Please supply BK1 Radio @ **59/-**
BK2 Audio amplifier @ **57/6**
BK3 Power unit @ **42/6**

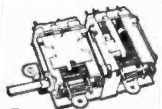
Illustrated leaflet on Basikits (enclose stamped addressed envelope)

From: **NAME** _____

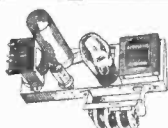
ADDRESS _____

P.O.

CHEQUE P.W.

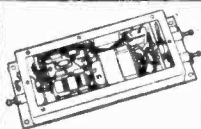


2



Comprising chassis $8\frac{1}{2} \times 2\frac{1}{2} \times 1\frac{1}{2}$ in. Double wound mains transformer, output transformer, volume and tone controls, resistors, condensers etc. Valves 6V6, ECC81 and metal rectifier. Circuit 1/6 free with kit. 29/8 plus 3/- P. & P.

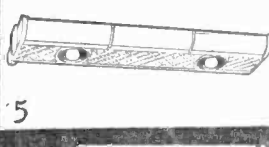
3



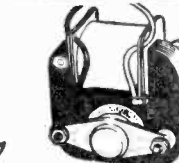
4



6



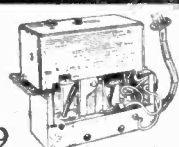
5



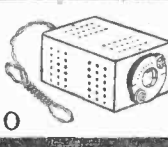
7



8



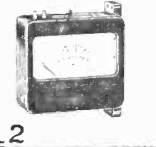
9



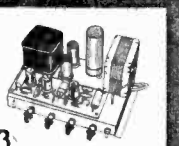
10



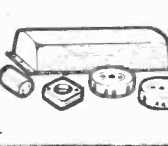
11



12



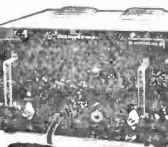
13



14



15



16

1. 6 VALVE 15 WATT PUSH-PULL AMPLIFIER, $15 \times 7 \times 1\frac{1}{2}$ in. A.C. Mains 200-250 volts. 4 inputs with controls for same and bass and treble lift controls. Tapped for 3 and 16 ohm speakers. Extra H.T. and L.T. for F.M. Tuner supplies etc. Built and tested. 7 gns. P. & P. 12/6.

2. CYLONDA M.F.M. PERMEABILITY TUNERS FOR ALL TRANSISTOR OPERATION. Size $2\frac{1}{2} \times 2\frac{1}{2}$ in. approx. By famous manufacturer. A.M. I.F. 470 Kc/s. F.M.-I.F. 10.7 Mc/s. A.M. coverage from 1820 Kc/s-925 Kc/s. F.M. coverage 108 Mc/s-88 Mc/s. Circuit diagrams 2/6. FREE with Tuner, 1st, 2nd and 3rd A.M. I.F.'s, 1st, 2nd, 3rd and 4th F.M. I.F.'s V.H.F. Osc. choke, A.M. I.F. trap. All the above are the R.F. end of an A.M./F.M. receiver car radio etc. The above items, £2.10.0.

3. AMPLIFIER KIT. 3 to 4 watt Amplifier Kit.

4. TRANSISTOR INVERTOR. 50 v. D.C. Input. Output 240 v. A.C. 40 watts incorporating transformers, choke, condensers and 2 GET73. In solid 16 gauge aluminium case, size $15 \times 6 \times 2\frac{1}{2}$ in. by famous manufacturer. 19/8, plus 6/- P. & P.

5. FLUORESCENT LIGHT FITTING. Twin 40 watt 200/250 v. less tubes 39/8. P. & P. 6/-.

6. SIGNAL GENERATORS. Cash £75.0. & P. P. 6/6. Coverage 100 Kc/s. to 100 Mc/s on fundamentals and 100 Mc/s to 200 Mc/s on harmonics. Case $10 \times 6\frac{1}{2} \times 5\frac{1}{2}$ in. Three uniaxial valves and Metal Rectifier. A.C. mains 200/250v. Internal modulation of 400 c.p.s. to a depth of 30 per cent. Modulated or unmodulated R.F. output continuously variable 100 multivolts, C.W. and mod. switch, variable A.F. output. Magic eye as output indicator. Accuracy 2 per cent.

7. A.C. MAINS MOTOR. Can be used for a variety of purposes, silent running, satisfactory in every way. 230/250v. A.C. 9/8. P. & P. 2/-.

8. POCKET MULTI-METER. Size $3\frac{1}{2} \times 2\frac{1}{2} \times 1\frac{1}{2}$ in. Meter size $2\frac{1}{2} \times 1\frac{1}{2}$ in. Sensitivity 1,000 O.P.V. on both A.C. and D.C. A.C. and D.C. volts. 0.15, 0.150, 0.1500. D.C. current 0-150 mA. Resistance 0-100K Ω . Complete with test leads, battery and full instructions. 39/8. P. & P. 2/6. FREE GIFT for limited period only. 30 watt Electric Soldering Iron value 15/- to every purchaser of the Pocket Multi-Meter.

9. CHANNEL TUNER I.F. 16-19 Mc/s. Continuously tunable from 174-216 Mc/s. Valves required—PCF80 and PCF84 (in series). Cover BBC and ITA ranges. Also Police, Fire and Taxis, etc. Brand new by famous maker. 10/-, P. & P. 3/-.

10. POWER SUPPLY KIT in metal case, size $3\frac{1}{2} \times 2\frac{1}{2} \times 2$ in. Incorporating mains transformer, rectifier and condensers. 230/250 A.C. mains. Output: 9v. 100mA. 10/8 plus 2/6 P. & P.

11. B.S.R. MOTARCH UA14 WITH FULL FI HEAD, 4-speed, plays 10 records, 12in., 10in., or 7in. at 16, 33, 45 or 78 r.p.m. Intermixes 7in., 10in. and 12in. records of the same speed. Has manual play position: colour brown. Dimensions: $12\frac{1}{2} \times 10\frac{1}{2}$ in. Space required above baseboard 4 1/2 in., below baseboard 2 1/2 in. Fitted with Full FI turnover crystal head. £5.19.6. P. & P. 6/6.

12. 50 MICRO-AMP METER movement by world famous manufacturer. Size $3 \times 2\frac{1}{2}$ in. 25/-, plus 1/6 P. & P.

13. 8-WATT 5-VALVE PUSH-PULL AMPLIFIER & METAL RECTIFIER. Size $9 \times 4 \times 1\frac{1}{2}$ in. A.C. Mains. 200-250 v. 5 gns. For use with 50 or 100 L.P. records, musical instruments, all makes of pick-ups and mikes. Output 8 watts at 5 per cent total distortion. Separate bass and treble lift controls. Two inputs, with controls for gram. and mike. Output transformer tapped for 3 and 16 ohms speech coils. Built and tested. £3.19.6. P. & P. 7/-.

14. 40W. FLUORESCENT LIGHT KIT incorporating GEC Choke size $8\frac{1}{2} \times 1\frac{1}{2} \times 1\frac{1}{2}$ in. 2 bi-pin holders, starter and starter holder, 11/6. P. & P. 3/6.

Similar to above: 80W Fluorescent Light Kit incorporating GEC choke size $11\frac{1}{2} \times 1\frac{1}{2} \times 1\frac{1}{2}$ in. 2 bi-pin holders, starter and starter holder 17/6. P. & P. 4/6.

15. FIRST QUALITY PVC TAPE.

5 1/2 in. Std. 850 ft.	9/-	5 in. D.P. 850 ft.	10/8
7 in. Std. 1200 ft.	11/6	3 in. T.P. 600 ft.	8/-
7 in. L.P. 240 ft.	4/-	5 in. T.P. 1800 ft.	20/6
5 1/2 in. L.P. 1200 ft.	11/6	5 1/2 in. T.P. 2400 ft.	27/6
7 in. L.P. 1800 ft.	18/6	7 in. T.P. 3600 ft.	37/8

P. & P. on each 1/6, 4 or more Post Free.

16. FIXED FREQUENCY SIGNAL GENERATOR. Crystal controls in metal case, size $10 \times 6 \times 6$ in. Incorporating two FC13 valves, mains transformer, metal rectifier, choke, indicator, lamp, crystal and numerous components. Modulated or unmodulated output socket. Originally used for I.T.V. frequencies. Brand new. 39/8, plus 6/- P. & P. A.C. mains 200-250 volts.

SILICON RECTIFIERS. 250v P.I.V. 750 mA. Size for 7/8 post paid

RADIO & T.V. COMPONENTS (ACTON) LTD.

21b High Street, Acton, London, W.3.

All enquiries S.A.E. Goods not despatched outside U.K.

Shop hours 9 a.m.—6 p.m. Early closing Wednesday

SPECIAL OFFER! FROM R. & T.V. LTD.

Elegant Seven

COMBINED PORTABLE & CAR RADIO

The Radio with the STAR features
4in. SPEAKER

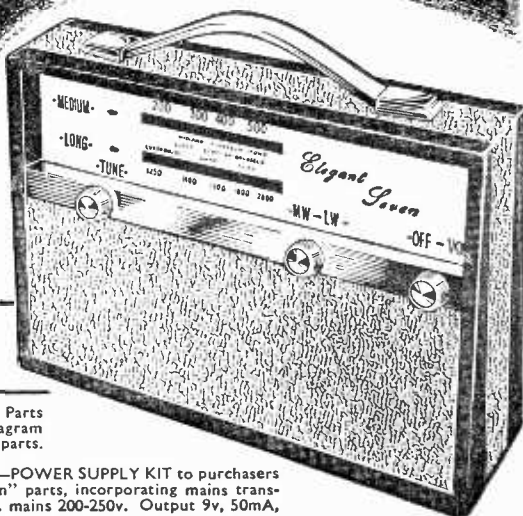
- ★ 7-transistor superhet. Output 350mW.
- ★ Two-tone grey wooden cabinet, fitted handle with silver coloured fittings. Size $12\frac{1}{2} \times 8\frac{1}{2} \times 3\frac{1}{2}$ in.
- ★ Horizontal tuning scale, size $11\frac{1}{4} \times 2\frac{3}{8}$ in. in silver with black lettering.
- ★ All stations clearly marked.
- ★ Ferrite-rod internal aerial.
- ★ I.F. 470 Kc/s.
- ★ Operated from PP9 battery.
- ★ Full comprehensive instructions and point-to-point wiring diagrams.
- ★ Printed circuit board, back printed with all component values.
- ★ Fully tunable over medium and long waveband.
- ★ Car aerial socket.
- ★ Full after-sale service.

ONLY
£4.4.0

Plus 5/6 P. & P. Parts
list & circuit diagram
2/6. FREE with parts.

SPECIAL OFFER—POWER SUPPLY KIT to purchasers of "Elegant Seven" parts, incorporating mains transformer etc. A.C. mains 200-250v. Output 9v, 50mA, 7/6.

Goods not despatched outside U.K. All enquiries S.A.E. Terms C.W.O.



RADIO & TV COMPONENTS (ACTON) LTD 21C High St., Acton, London W3
Open 9 a.m.—6 p.m. including Sats. Early closing Wed.

Now Ready! RADIO & TV SERVICING 1965 Volume

NEARLY
600 PAGES
TV & RADIO
CAR RADIO
RADIOGRAMS
RECORD
REPRODUCERS
TAPE
RECORDERS

Circuits and Data for over 480 Models

Specially produced to help you do repair jobs more quickly—more efficiently. Keeps you up-to-date with developments. Shows you the latest servicing aids. If you have previous volumes in Newnes RADIO & TV SERVICING library be sure to add this 1965 volume and be ready to tackle models 1964-5. One repair job more than repays the cost. You'll see!

POST COUPON TODAY!

IT'S YOURS ON
7 DAYS'
**FREE
TRIAL**

★ ALL THESE MAKES

Alba, Baird, Bush, Cossor, Dansette, Decca, Defiant, Dynatron, E.A.R., E.M.I., Ekco, Elizabethan, Ever Ready, Ferguson, Ferranti, Fidelity, G.E.C., Grundig, H.M.V., Hitachi, Invicta, Kolster-Brandes, McMichael, Magnavox, Marconiphone, Masteradio, Motorola, Murphy, Pam, Perdio, Peto Scott, Philips, Playcraft, Portadyne, Pye, Radiomobile, Regentone, Revelation, R.G.D., Roberts' Radio, Sharp, Sinclair, Sobell, Sound, Stella, Stereosound, Teletron, Ultra, Zenith.

PLUS LATEST DEVELOPMENTS, etc.

Easy No-Interest Terms if kept after Free Trial

To: George Newnes, Ltd.,
15-17 Long Acre,
London, W.C.2.

If under 21 your father must fill up coupon.

Full Name
(BLOCK LETTERS) (Mr., Mrs., Miss)

Address

Occupation

Signature
(Mr., Mrs., Miss)

Tick ✓ where applicable

The address on left is—

My Property ☐

Rented unfurnished ☐

Parents' Home ☐

Furnished Accom. ☐

Temporary Address ☐

THE PRACTICAL WAY TO LEARN ELECTRONICS

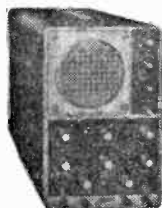


HIGHEST QUALITY KITS USING BRITISH COMPONENTS

World-Famous kit-sets anyone can build

The clearly written instruction manuals, issued with each kit, show you how. You will be proud of the professional appearance & performance of your model. A KIT FOR EVERY INTEREST . . . FOR HOME, WORKSHOP, SERVICE DEPARTMENTS

TEST INSTRUMENTS



10-12U

5in. OSCILLOSCOPE Model 10-12U. Laboratory quality at utility oscilloscope price. Wide band amplifiers essential for T.V. servicing. F.M. alignment, etc. T/B covers 10 c/s-500 kc/s in 5 ranges. £41.10.0 Assembled **£32.12.6** Kit

PORTABLE 'SCOPE Model OS-1. A compact portable oscilloscope, ideal for servicing and general work. Printed circuit board. Case 7½ x 4½ x 12½in. long. Wt. only 10½ lbs. £30.8.0 Assembled **£22.18.0** Kit

REGULATED POWER SUPPLY Model IP-20U. Transistorised 0-5-50 v. D.C. Up to 1.5 amps. Compact 9½ x 6½ x 11in. £47.8.0 Assembled **£35.8.0** Kit

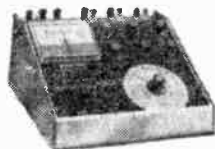
VALVE VOLTMETER, Model V-7A. The world's best selling VTVM. Measures up to 1,500 volts (d.c. and r.m.s.) and 4,000 pk. to pk. Res. 0-152 1,000 MΩ. Centre zero dB scale, d.c. input resistance 11MΩ. 4½in. meter. Complete with test prods, leads and standardising battery. £19.18.6 Assembled **£13.18.6** Kit



V-7A

DE-LUXE 6in. VALVE VOLTMETER. Model 1M-13U. Similar spec. to model V-7A but with improved accuracy. Larger meter. Unique gimbal mount. £26.18.0 Assembled **£18.18.0** Kit

R.F. and H.V. probes available as extras.



DE-LUXE TRANSISTOR TESTER. Model 1M-30U. Many special features. Unmatched in quality and performance at the price. Send for full specification. £35.10.0 Assd. **£24.18.0** Kit

TV ALIGNMENT GENERATOR. Model HFV-1. Covers 3-5 to 220 Mc/s fundamentals. £44.10.0 Assembled **£34.18.0** Kit

RF SIGNAL GENERATOR. Model RF-1U. Up to 100 Mc/s fundamental, 200 Mc/s harmonics. Up to 100 mV output on all bands. £19.18.0 Assembled **£13.8.0** Kit

MULTIMETER. Model MM-1U. Ranges: 0.15 v. to 1,500 v. a.c. and d.c.; 150µA to 15A d.c.; 0.02Ω to 20MΩ. 4½in. 50µA meter. £18.11.6 Assembled **£12.18.0** Kit

A wide range of other test instruments available including: R/C Bridge C-3U £10.10.0. AF V/Volmeter AV-3U £16.10.0. Wattmeters AW-1U, £17.5.0. (Capacitance meter) CM-1U £15.15.0. Power supplies. Decade boxes etc. Many other instruments available under American Mail Order scheme. Why not send for full details?

LOW-PRICED SPEAKER SYSTEM SSU-1



A practical solution to the problem of a moderately priced speaker suitable for Stereo Mono amplifiers where the equipment has to be compact. Two speakers, balance control, ducted port reflex cabinet.

Horizontal or vertical (with matching legs)

Incl. P.T. **£11.12.0** Kit

HI-FI SPEAKER SYSTEMS

COTSWOLD STANDARD MODEL. Acoustically designed enclosure "in the white" 26 x 23 x 15½in., 12in. bass speaker, elliptical middle speaker, 2in. pressure unit. Covers 30-20,000 c/s. Complete kit with all controls.

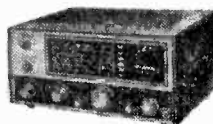


MFS SYSTEM. A minimum floor space model for the smaller room. 26in. high x 16½in. x 14in. deep. Similar performance to standard model. Price either model **£23.4.0** Kit

"AMATEUR" EQUIPMENT

AMATEUR BANDS RECEIVER Model RA-1. Covers all amateur bands from 160-10 m. Half lattice crystal filter. 8 valve, "S" meter, tuned R.F. amplifier stage.

£39.6.6 Kit
Assembled **£52.10.0**



RA-1

AMATEUR TRANSMITTER. Model DX-100U. Covers all amateur bands 160-10M. 150 w. d.c. input, self contained with power supply. Modulator, VFO. Assembled **£104.15.0** **£79.10.0** Kit

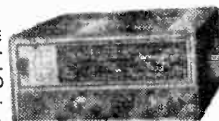


DX-40U

AMATEUR TRANSMITTER Model DX-40U. Covers 80-10 m. Power inputs 75 w. C.W., 60 w. peak C.C. phone. Output 40 w. to aerial. Prov. for VFO.

£33.19.0 Kit
Assembled **£45.8.0**

COMMUNICATIONS TYPE RECEIVER RG-1. A high performance low cost receiver for the discriminating listener. Freq. cov. 600 kc/s-1.5 Mc/s and 1.7 Mc/s to 32 Mc/s. Send for details. £53.0.0 Assembled **£39.16.0** Kit



Other kits in the amateur range include: SSB Adaptor SB-10U £39.5.0. Variable freq. Oscillator VF-1U £10.17.6. Balun Coil Unit B-1U £4.15.6. Grid-Dip Meter GD-1U £10.19.6. Q Multiplier QPM-1 £8.10.0. Reflected Power Meter HM-1U £8.5.0. Wide range of models under American Mail Order Scheme.

MONEY BACK GUARANTEE

Daystrom Ltd. unconditionally guarantee that each Heathkit product assembled in accordance with our easy-to-understand instruction manual must meet our published specifications for performance or the purchase price will be cheerfully refunded.

DAYSTROM LTD

Dept. P.W.-6, GLOUCESTER, ENGLAND

MODELS FOR HOME, TEST AND WORKSHOP



BRITISH HEATHKIT MODELS USE BRITISH COMPONENTS

More and more people are buying and specifying Heathkit models because:

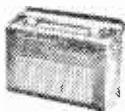
- ★ **Easy-to-Follow instructions** . . . The step-by-step instruction manuals tell you what to do and how to do it. Large size pictorial diagrams show you how.
- ★ **A satisfying Hobby** . . . assemble any Heathkit model, switch on and find that it performs exactly like an expensive, factory-built set. You will be proud of your model, your friends will admire it, and you built it successfully yourself.
- ★ **You save money** . . . and get better performance at lowest possible cost.

TRANSISTOR RECEIVERS

"OXFORD" LUXURY TRANSISTOR DUAL WAVEBAND RECEIVER.

The ideal domestic or personal portable receiver. 10 Semi-conductors. Solid leather case. Send for full details.

Incl. P.T. **£14.18.0** Kit



6 TRANSISTOR PORTABLE. Model UXR-1. Prealigned I.F. transformers. Printed circuit, 7in. x 4in. high flux speaker. Real hide case. Very easy to build.

Incl. P.T. **£12.11.0** Kit

7 TRANSISTOR PORTABLE. Model RSW-1. Two short trawler and medium wave bands. Incl. P.T. **£19.17.6** Kit

"MOHICAN" GENERAL COVERAGE RECEIVER. Model GC-1U. Excellent portable or general purpose receiver for "amateur" or short wave listening. See full spec. leaflets.

Assembled **£45.17.6** **£37.17.6** Kit



SPEAKERS FOR YOUR OWN ENCLOSURE

12" Heavy-duty Bass (Fane 122/12) **£7.7.0.**

2" Tweeter (Fane 301) **£3.1.6.**

(both as used in the Cotswold systems).

12" Bass speaker (Audiom-51) **£9.12.5.**

8" Goodmans General Purpose G8 **£1.8.6.**

Two Speakers + Cross-over, System SCM-1.

(As used in model SSU-1) with details for enclosure **£4.12.0.**

RPM INDICATOR (Electronic rev. counter). A must for the motoring enthusiast. For 4 cylinders, 12V. pos. or neg. earth. **£8.19.0** (complete). Send for details.

A WIDE RANGE OF BOOKS ON ELECTRONICS AND RADIO. PLEASE SEND FOR LISTS OR PRICES.

HI-FI TUNERS

Model FM-4U. Tuning range 88-108 Mc/s. Tuning unit (FMT-4U) with 10.7 Mc/s I.F. (**£2.15.0** incl. P.T.). I.F. Amp. (FMA-4U) complete with cabinet and valves (**£13.3.0**).

Total **£15.18.0** Kit



FM-4U

Assembly can be arranged.

AM/FM TUNER. Covers FM 88-108 Mc/s. A.M. 16-50, 200-550, 900-2,000 m. Tuning heart (**£4.13.6** incl. P.T.), and I.F. Amp (**£21.16.6**).

Total **£26.10.0** Kit



EQUIPMENT CABINETS

A large range, in kit form or assembled and finished, available to meet most needs. Illustrated details on request.

Prices from **£7.15.0** to **£44.2.0**

Many other models covering a wide range of equipment for HOME, OFFICE or WORKSHOP

SEND FOR FREE BRITISH CATALOGUE

American Catalogue sent for 1/- post paid

PUBLIC ADDRESS AMPLIFIER, PA-1. 50 w. Amplifier, two heavy duty speakers, variable Tremolo. Ideal for use with guitars, etc. **£54.15.0** Kit

£74.0.0 Assembled

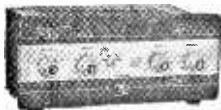
Legs optional extra 17/6. Set of 4.

50 W POWER AMPLIFIER, MA-50

Ideal for PA work, electronic organs etc. **£27.18.0** Assembled **£19.18.0** Kit



HI-FI AMPLIFIERS



S-33

6W STEREO AMPLIFIER Model S-33. 3 w./ch. Inputs for radio, tape and gram. Stereo/Mono ganged controls. Sensitivity 200mV. **£18.18.0** Assembled **£13.7.6** Kit

6W DE-LUXE STEREO AMPLIFIER. Model S-33H. An inexpensive stereo, mono amplifier with high sensitivity. Suitable for use with Decca Deram cartridge. **£21.7.6** Assembled **£15.17.6** Kit

TAPE RECORD/REPLAY AMPLIFIER KITS. Will operate with most tape decks. Send for details.

TA-1M (Mono), £19.18.0 Kit. TA-1S (Stereo), £25.10.0 Kit.

STEREO CONTROL UNIT. Model USC-1. Ideal for use with MA-12 amplifiers. Kit **£19.10.0.** Assembled **£26.10.0.**

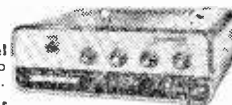
18W STEREO AMPLIFIER. Model S-99. Ganged controls. Stereo Mono gram, radio and tape recorder inputs. P/B selection. **£27.19.6** Kit

£37.19.6 Assembled

5W HI-FI MONO AMPLIFIER. Model MA-5. A low priced amplifier based on the S-33. Printed circuit construction makes it easy to build.

£15.10.0 Assembled **£10.19.6** Kit

HI-FI MONO POWER AMPLIFIER. Model MA-12. Ideal for use with Models USC-1 and UMC-1. 0.1 THE at 10W. Wide frequency range. **£15.18.0** Assembled **£11.18.6** Kit



DAYSTROM LTD

Dept. P.W.-6, GLOUCESTER, ENGLAND

Please send me FREE BRITISH CATALOGUE (Yes/No)

Full details of model(s).....

NAME

ADDRESS

P.W.6

BARGAINS GALORE—WAREHOUSE BEING CLEARED

FLEXIBLE COUPLINGS



These couplings extend as well as bend for joining shafts out of alignment and for slugging tuning controls where the rotor has to come in and out. Price 10/- dozen.



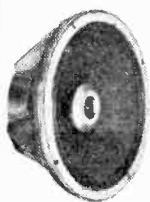
Compressor/Vac. Pump

Fitted with outlet and inlet valve, suitable for paint spraying, refrigerator etc. complete with V belt drive wheel. Price 27/6 plus 6/6 post and packing.

Sheet Paxolin

Ideal for transistor projects. Size 6 x 6 in., 12 x 6 in., 12 x 12 in., 3/6; 24 x 12 in., 6/-; 24 x 24 in., 12/-; 48 x 24 in., 24/-; 48 x 48 in., 48/-; 96 x 48 in., 96/-; 96 x 96 in., 192/-; 192 x 96 in., 192/-; 192 x 192 in., 384/-; 384 x 96 in., 384/-; 384 x 192 in., 768/-; 768 x 96 in., 768/-; 768 x 192 in., 1536/-; 1536 x 96 in., 1536/-; 1536 x 192 in., 3072/-; 3072 x 96 in., 3072/-; 3072 x 192 in., 6144/-; 6144 x 96 in., 6144/-; 6144 x 192 in., 12288/-; 12288 x 96 in., 12288/-; 12288 x 192 in., 24576/-; 24576 x 96 in., 24576/-; 24576 x 192 in., 49152/-; 49152 x 96 in., 49152/-; 49152 x 192 in., 98304/-; 98304 x 96 in., 98304/-; 98304 x 192 in., 196608/-; 196608 x 96 in., 196608/-; 196608 x 192 in., 393216/-; 393216 x 96 in., 393216/-; 393216 x 192 in., 786432/-; 786432 x 96 in., 786432/-; 786432 x 192 in., 1572864/-; 1572864 x 96 in., 1572864/-; 1572864 x 192 in., 3145728/-; 3145728 x 96 in., 3145728/-; 3145728 x 192 in., 6291456/-; 6291456 x 96 in., 6291456/-; 6291456 x 192 in., 12582912/-; 12582912 x 96 in., 12582912/-; 12582912 x 192 in., 25165824/-; 25165824 x 96 in., 25165824/-; 25165824 x 192 in., 50331648/-; 50331648 x 96 in., 50331648/-; 50331648 x 192 in., 100663296/-; 100663296 x 96 in., 100663296/-; 100663296 x 192 in., 201326592/-; 201326592 x 96 in., 201326592/-; 201326592 x 192 in., 402653184/-; 402653184 x 96 in., 402653184/-; 402653184 x 192 in., 805306368/-; 805306368 x 96 in., 805306368/-; 805306368 x 192 in., 1610612736/-; 1610612736 x 96 in., 1610612736/-; 1610612736 x 192 in., 3221225472/-; 3221225472 x 96 in., 3221225472/-; 3221225472 x 192 in., 6442450944/-; 6442450944 x 96 in., 6442450944/-; 6442450944 x 192 in., 12884901888/-; 12884901888 x 96 in., 12884901888/-; 12884901888 x 192 in., 25769803776/-; 25769803776 x 96 in., 25769803776/-; 25769803776 x 192 in., 51539607552/-; 51539607552 x 96 in., 51539607552/-; 51539607552 x 192 in., 103079215104/-; 103079215104 x 96 in., 103079215104/-; 103079215104 x 192 in., 206158430208/-; 206158430208 x 96 in., 206158430208/-; 206158430208 x 192 in., 412316860416/-; 412316860416 x 96 in., 412316860416/-; 412316860416 x 192 in., 824633720832/-; 824633720832 x 96 in., 824633720832/-; 824633720832 x 192 in., 1649267441664/-; 1649267441664 x 96 in., 1649267441664/-; 1649267441664 x 192 in., 3298534883328/-; 3298534883328 x 96 in., 3298534883328/-; 3298534883328 x 192 in., 6597069766656/-; 6597069766656 x 96 in., 6597069766656/-; 6597069766656 x 192 in., 13194139533312/-; 13194139533312 x 96 in., 13194139533312/-; 13194139533312 x 192 in., 26388279066624/-; 26388279066624 x 96 in., 26388279066624/-; 26388279066624 x 192 in., 52776558133248/-; 52776558133248 x 96 in., 52776558133248/-; 52776558133248 x 192 in., 105553116266496/-; 105553116266496 x 96 in., 105553116266496/-; 105553116266496 x 192 in., 211106232532992/-; 211106232532992 x 96 in., 211106232532992/-; 211106232532992 x 192 in., 422212465065984/-; 422212465065984 x 96 in., 422212465065984/-; 422212465065984 x 192 in., 844424930131968/-; 844424930131968 x 96 in., 844424930131968/-; 844424930131968 x 192 in., 1688849860263936/-; 1688849860263936 x 96 in., 1688849860263936/-; 1688849860263936 x 192 in., 3377699720527872/-; 3377699720527872 x 96 in., 3377699720527872/-; 3377699720527872 x 192 in., 6755399441055744/-; 6755399441055744 x 96 in., 6755399441055744/-; 6755399441055744 x 192 in., 13510798882111488/-; 13510798882111488 x 96 in., 13510798882111488/-; 13510798882111488 x 192 in., 27021597764222976/-; 27021597764222976 x 96 in., 27021597764222976/-; 27021597764222976 x 192 in., 54043195528445952/-; 54043195528445952 x 96 in., 54043195528445952/-; 54043195528445952 x 192 in., 108086391056891904/-; 108086391056891904 x 96 in., 108086391056891904/-; 108086391056891904 x 192 in., 216172782113783808/-; 216172782113783808 x 96 in., 216172782113783808/-; 216172782113783808 x 192 in., 432345564227567616/-; 432345564227567616 x 96 in., 432345564227567616/-; 432345564227567616 x 192 in., 864691128455135232/-; 864691128455135232 x 96 in., 864691128455135232/-; 864691128455135232 x 192 in., 1729382256910270464/-; 1729382256910270464 x 96 in., 1729382256910270464/-; 1729382256910270464 x 192 in., 3458764513820540928/-; 3458764513820540928 x 96 in., 3458764513820540928/-; 3458764513820540928 x 192 in., 6917529027641081856/-; 6917529027641081856 x 96 in., 6917529027641081856/-; 6917529027641081856 x 192 in., 13835058055282163712/-; 13835058055282163712 x 96 in., 13835058055282163712/-; 13835058055282163712 x 192 in., 27670116110564327424/-; 27670116110564327424 x 96 in., 27670116110564327424/-; 27670116110564327424 x 192 in., 55340232221128654848/-; 55340232221128654848 x 96 in., 55340232221128654848/-; 55340232221128654848 x 192 in., 110680464442257309696/-; 110680464442257309696 x 96 in., 110680464442257309696/-; 110680464442257309696 x 192 in., 221360928884514619392/-; 221360928884514619392 x 96 in., 221360928884514619392/-; 221360928884514619392 x 192 in., 442721857769029238784/-; 442721857769029238784 x 96 in., 442721857769029238784/-; 442721857769029238784 x 192 in., 885443715538058477568/-; 885443715538058477568 x 96 in., 885443715538058477568/-; 885443715538058477568 x 192 in., 1770887431076116955136/-; 1770887431076116955136 x 96 in., 1770887431076116955136/-; 1770887431076116955136 x 192 in., 3541774862152233910272/-; 3541774862152233910272 x 96 in., 3541774862152233910272/-; 3541774862152233910272 x 192 in., 7083549724304467820544/-; 7083549724304467820544 x 96 in., 7083549724304467820544/-; 7083549724304467820544 x 192 in., 14167099448608935641088/-; 14167099448608935641088 x 96 in., 14167099448608935641088/-; 14167099448608935641088 x 192 in., 28334198897217871282176/-; 28334198897217871282176 x 96 in., 28334198897217871282176/-; 28334198897217871282176 x 192 in., 56668397794435742564352/-; 56668397794435742564352 x 96 in., 56668397794435742564352/-; 56668397794435742564352 x 192 in., 113336795588871485128704/-; 113336795588871485128704 x 96 in., 113336795588871485128704/-; 113336795588871485128704 x 192 in., 226673591177742970257408/-; 226673591177742970257408 x 96 in., 226673591177742970257408/-; 226673591177742970257408 x 192 in., 453347182355485940514816/-; 453347182355485940514816 x 96 in., 453347182355485940514816/-; 453347182355485940514816 x 192 in., 906694364710971881029632/-; 906694364710971881029632 x 96 in., 906694364710971881029632/-; 906694364710971881029632 x 192 in., 1813388729421943762059264/-; 1813388729421943762059264 x 96 in., 1813388729421943762059264/-; 1813388729421943762059264 x 192 in., 3626777458843887524118528/-; 3626777458843887524118528 x 96 in., 3626777458843887524118528/-; 3626777458843887524118528 x 192 in., 7253554917687775048237056/-; 7253554917687775048237056 x 96 in., 7253554917687775048237056/-; 7253554917687775048237056 x 192 in., 14507109835375550096474112/-; 14507109835375550096474112 x 96 in., 14507109835375550096474112/-; 14507109835375550096474112 x 192 in., 29014219670751100192948224/-; 29014219670751100192948224 x 96 in., 29014219670751100192948224/-; 29014219670751100192948224 x 192 in., 58028439341502200385896448/-; 58028439341502200385896448 x 96 in., 58028439341502200385896448/-; 58028439341502200385896448 x 192 in., 116056878683004400771792896/-; 116056878683004400771792896 x 96 in., 116056878683004400771792896/-; 116056878683004400771792896 x 192 in., 232113757366008801543585792/-; 232113757366008801543585792 x 96 in., 232113757366008801543585792/-; 232113757366008801543585792 x 192 in., 464227514732017603087171584/-; 464227514732017603087171584 x 96 in., 464227514732017603087171584/-; 464227514732017603087171584 x 192 in., 928455029464035206174343168/-; 928455029464035206174343168 x 96 in., 928455029464035206174343168/-; 928455029464035206174343168 x 192 in., 1856910058928070412348686336/-; 1856910058928070412348686336 x 96 in., 1856910058928070412348686336/-; 1856910058928070412348686336 x 192 in., 3713820117856140824697372672/-; 3713820117856140824697372672 x 96 in., 3713820117856140824697372672/-; 3713820117856140824697372672 x 192 in., 7427640235712281649394745344/-; 7427640235712281649394745344 x 96 in., 7427640235712281649394745344/-; 7427640235712281649394745344 x 192 in., 14855280471424563298789490688/-; 14855280471424563298789490688 x 96 in., 14855280471424563298789490688/-; 14855280471424563298789490688 x 192 in., 29710560942849126597578981376/-; 29710560942849126597578981376 x 96 in., 29710560942849126597578981376/-; 29710560942849126597578981376 x 192 in., 59421121885698253195157962752/-; 59421121885698253195157962752 x 96 in., 59421121885698253195157962752/-; 59421121885698253195157962752 x 192 in., 118842243771396506390315925504/-; 118842243771396506390315925504 x 96 in., 118842243771396506390315925504/-; 118842243771396506390315925504 x 192 in., 237684487542793012780631851008/-; 237684487542793012780631851008 x 96 in., 237684487542793012780631851008/-; 237684487542793012780631851008 x 192 in., 475368975085586025561263702016/-; 475368975085586025561263702016 x 96 in., 475368975085586025561263702016/-; 475368975085586025561263702016 x 192 in., 950737950171172051122527404032/-; 950737950171172051122527404032 x 96 in., 950737950171172051122527404032/-; 950737950171172051122527404032 x 192 in., 1901475900342344102245054808064/-; 1901475900342344102245054808064 x 96 in., 1901475900342344102245054808064/-; 1901475900342344102245054808064 x 192 in., 3802951800684688204490109616128/-; 3802951800684688204490109616128 x 96 in., 3802951800684688204490109616128/-; 3802951800684688204490109616128 x 192 in., 7605903601369376408980219232256/-; 7605903601369376408980219232256 x 96 in., 7605903601369376408980219232256/-; 7605903601369376408980219232256 x 192 in., 15211807202738752817960438464512/-; 15211807202738752817960438464512 x 96 in., 15211807202738752817960438464512/-; 15211807202738752817960438464512 x 192 in., 30423614405477505635920876929024/-; 30423614405477505635920876929024 x 96 in., 30423614405477505635920876929024/-; 30423614405477505635920876929024 x 192 in., 60847228810955011271841753858048/-; 60847228810955011271841753858048 x 96 in., 60847228810955011271841753858048/-; 60847228810955011271841753858048 x 192 in., 121694457621910022543683507716096/-; 121694457621910022543683507716096 x 96 in., 121694457621910022543683507716096/-; 121694457621910022543683507716096 x 192 in., 243388915243820045087367015432192/-; 243388915243820045087367015432192 x 96 in., 243388915243820045087367015432192/-; 243388915243820045087367015432192 x 192 in., 486777830487640090174734030864384/-; 486777830487640090174734030864384 x 96 in., 486777830487640090174734030864384/-; 486777830487640090174734030864384 x 192 in., 973555660975280180349468061728768/-; 973555660975280180349468061728768 x 96 in., 973555660975280180349468061728768/-; 973555660975280180349468061728768 x 192 in., 1947111321950560360698936123457536/-; 1947111321950560360698936123457536 x 96 in., 1947111321950560360698936123457536/-; 1947111321950560360698936123457536 x 192 in., 3894222643901120721397872246915072/-; 3894222643901120721397872246915072 x 96 in., 3894222643901120721397872246915072/-; 3894222643901120721397872246915072 x 192 in., 7788445287802241442795744493830144/-; 7788445287802241442795744493830144 x 96 in., 7788445287802241442795744493830144/-; 7788445287802241442795744493830144 x 192 in., 15576890575604482885591488987660288/-; 15576890575604482885591488987660288 x 96 in., 15576890575604482885591488987660288/-; 15576890575604482885591488987660288 x 192 in., 31153781151208965771182977975320576/-; 31153781151208965771182977975320576 x 96 in., 31153781151208965771182977975320576/-; 31153781151208965771182977975320576 x 192 in., 62307562302417931542365955950641152/-; 62307562302417931542365955950641152 x 96 in., 62307562302417931542365955950641152/-; 62307562302417931542365955950641152 x 192 in., 124615124604835863084731911901282304/-; 124615124604835863084731911901282304 x 96 in., 124615124604835863084731911901282304/-; 124615124604835863084731911901282304 x 192 in., 249230249209671726169463823802564608/-; 249230249209671726169463823802564608 x 96 in., 249230249209671726169463823802564608/-; 249230249209671726169463823802564608 x 192 in., 498460498419343452338927647605129216/-; 498460498419343452338927647605129216 x 96 in., 498460498419343452338927647605129216/-; 498460498419343452338927647605129216 x 192 in., 996920996838686904677855295210258432/-; 996920996838686904677855295210258432 x 96 in., 996920996838686904677855295210258432/-; 996920996838686904677855295210258432 x 192 in., 1993841993677373809355710590420516864/-; 1993841993677373809355710590420516864 x 96 in., 1993841993677373809355710590420516864/-; 1993841993677373809355710590420516864 x 192 in., 3987683987354747618711421180841033728/-; 3987683987354747618711421180841033728 x 96 in., 3987683987354747618711421180841033728/-; 3987683987354747618711421180841033728 x 192 in., 7975367974709495237422842361682067456/-; 7975367974709495237422842361682067456 x 96 in., 7975367974709495237422842361682067456/-; 797536

LOUDSPEAKERS



We supply a complete range of Goodmans, Wharfedale, Stentorian, TSL Speaker Units and complete systems. A comprehensive leaflet is available on request this covers technical specifications and prices of

nearly 50 types including—

Celestion GX1512 (4in.) £11.10.0
 Celestion Model CX2012 £18.10.0
 Stentorian HF 312 5 watts £3.18.0
 Stentorian HF1012 10 watts £4.18.0
 Goodmans Axiote 8, 6 watts £5.10.11
 Goodmans Axiom 10, 10 watts £6.5.11
 Goodmans Axiom 201, 15 watts £10.17.4

Wharfedale Super 8/RS/12/DD 6 watts £6.14.2

Wharfedale Golden RS/DD 3 watts £7.17.5

Wharfedale RS/12/DD 15 watts £11.10.0

Guitar Speakers include—

Wharfedale W12EG 15 watts £10.10.0

Wharfedale W13EG 20 watts £17.10.0

Goodmans Audiom 51B 15 watts £9.2.8

Goodmans Axiom 61B, 20 watts £14.7.8

Carr. and Ins. extra

THE TRAVLER Mk. II
CAR RADIO

★MEDIUM AND LONG WAVES

★12 VOLT POSITIVE EARTH

★Push Button Wave Change

★SIZE 7 x 2 x 7 inch

★TRANSISTORISED



ONLY
9½ gns.

P. & P. 5/-

Ready built complete with 7 x 4in. speaker fitted to baffle. Fixing brackets, filter unit, all nuts and bolts and fitting instructions.

Optional Extras: 3-section chromium plated weatherproof telescopic aerials. Type 1, 17in./44in. 19/6. Type 2, 21in./48in. 29/6. Both plus P. & P. 2/6 if purchased separately.

The "HIGHWAYMAN" Car radio to build yourself. Similar in appearance to above but with on/off push button switch. Complete set of parts only £7.19.6. P. & P. 5/-.

TUNER UNITS



ARMSTRONG

Mono/Tuner Amp. Model 127M £26.10.0

Stereo/Tuner Amp. 127... £31.10.0

AM/FM Tuner 223... £28.15.0

FM Tuner 224... £22.10.0

Carr. and Ins. 7/6

STERN FIDELITY Mk. II VHF/FM

Built and tested £14.5.0

Carr. and Ins. 5/-

JASON

FMT1 FM Tuner, Kit of Parts £6.16.0

FMT2 FM Tuner, Kit of Parts £10.12.6

FMT3 FM Tuner for Fringe areas, Kit of Parts £12.5.0

FMT4 FM Tuner £20.0.4

JTV2/FM/TV Sound, Kit of Parts £15.15.0

Carr. and Ins. on above 5/- each.

TRIPLSTONE

FM Tuner unpowered £13.19.6

FM Tuner self-powered £15.14.6

Carr. and Ins. 5/- each.

Descriptive leaflets free on request.

Please state model required.

STERN-

GREAT BRITAIN'S GREATEST

STERN-CLYNE HI-FI EQUIPMENT

Ready Built or Kit of Parts

	Complete Kit of parts	Ready built and tested	Carr. and Ins.	Instruction book available separately
Stern Mono-Gram Amplifier 3 watts	£4 10 0	£6 0 0	3/6	2/6
Mullard 2 valve Audio Pre-Amplifier	£6 6 0	£9 10 0	5/-	2/-
Mullard 3 valve Audio Pre-Amplifier	£10 0 0	£13 13 0	5/-	3/6
Mullard "3-3" Amplifier with Tone Control Unit 33/RC 3 watts	£8 8 0	£11 10 0	6/6	2/-
Mullard "5-10" Main Amplifier Model 510/M, 10 watts	£10 0 0	£13 10 0	6/6	2/-
Mullard "5-10" Amplifier with Tone Control Unit, 10 watts ..	£12 0 0	£16 0 0	7/6	2/-
Stern Twin Three Stereo Amplifier, 3 watts per Channel ..	—	£9 0 0	5/-	—
Stern Twin Three Stereo Amplifier in Portable Case with Two Speakers and Leads	—	£16 10 0	10/-	—
Mullard "10+10" Stereo Amplifier, 10 watts per Channel ..	£16 0 0	£20 0 0	8/6	3/-
Mullard "10+10" Stereo Amplifier with Passive Control Unit ..	£20 0 0	£24 0 0	10/-	3/-
Mullard Dual Channel Pre-Amplifier	£12 10 0	£16 0 0	7/6	3/-
The above two items purchased together	£27 0 0	£34 0 0	15/-	—
HF/TR3 Tape Amplifier with Power Unit	£13 13 0	£19 0 0	7/6	3/-
Type "CC" Tape Pre-Amplifier with Power Unit	£14 0 0	£19 10 0	7/6	3/6
STP-1 Tape Pre-amplifier with Power Unit, Mono and Stereo ..	£22 0 0	£28 0 0	8/6	5/-
CR3/6 Tape Recorder with Studio Deck	£33 8 0	—	15/-	3/-

INDIVIDUAL DESCRIPTIVE LEAFLETS GIVING TECHNICAL SPECIFICATIONS, DIMENSIONS, PRICES, TERMS ETC., FREE ON REQUEST

RECORD PLAYERS



Garrard SRP10 Single Player £5.9.1

BSR UA25 4-speed changer £5.19.6

Garrard Autoslim changer £6.10.0

Garrard AT6 changer £10.19.6

BSR Super Slim changer £9.19.6

Garrard AT6 LM Auto-changer (3000LM) £11.11.11

Philips AG1010 Stereo/ Mono Record Player £13.13.0

Carriage and Ins. 5/- on above.

Garrard 4HP Single Player £16.17.6

Golding Lenco Model 88 Transcription Turntable £18.18.5

Garrard Laboratory Type "A" Autochanger £19.16.0

Garrard 301 Strobe Transcription Turntable £22.0.5

Golding Lenco GL58 with 580 Cartridge £21.19.0

Golding Lenco GL70 less Pick-up Head £27.9.4

Carr. and Ins. 7/6 on above.

Descriptive leaflet including prices with alternative cartridges, dimensions, terms etc. free on request.

MICROPHONES

Extensive range available. Send B.A.E. for illustrated brochure.

ANOTHER STERN-CLYNE BARGAIN OFFER!!

SAVE £10!

STEREO AM/FM RADIOGRAM CHASSIS

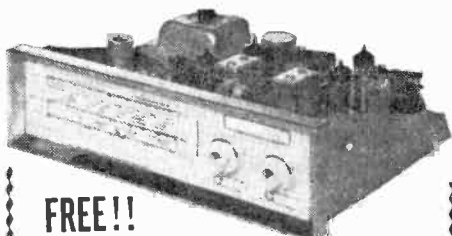
by famous maker

List Price OUR Carr.
£30.17.11 PRICE **19** Gns. 7/6

BRAND NEW WITH FULL GUARANTEE

Full Medium Long and VHF Coverage.

3 watts per channel output. 3 ohm output impedance. Internal aerial for A.M. Provision for Multiplex adaptor. Pick-up and Tape input sockets. A.C. Mains 200/250 volts.



FREE!!

Two 10 x 6in. matching speakers supplied free if the following items are purchased together: CHASSIS 19 GNS. and GARRARD Autoslim with stereo plug in head £8.7.0. (or any unit above £8.7.0) Carr. 15/- extra.



NEW LOW PRICE COMMUNICATION RECEIVERS

HE 40, 550 Kc/s-30 Mc/s in 4 bands. £19.19.9.
Carriage 10/-.

HE 30, 650 Kc/s-30 Mc/s in 4 bands. £34.13.0.
Carriage Paid.

KT 320, Specification as HE 30 but offered as complete kit of parts. £26.5.0. Carriage Paid.

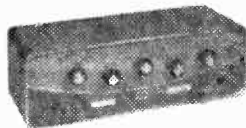
HA 83, 550 Kc/s-31 Mc/s in 4 bands. £25.4.0.
Carriage Paid.

Starflight 90 Watt Transmitter
Band coverage 80 - 40 - 20 - 15 and 10 Metres.
£30.9.0. Carr. 15/- (H.P. Terms available).
Send S.A.E. for fully descriptive brochure.

CLYNE

ELECTRONIC HOBBIES ORGANISATION

DOUBLE FEATURE PRE-AMPLIFIER



Inputs for microphone, crystal or magnetic pick-ups, tuner unit and in addition offers full facilities for tape recording and high fidelity replay. This unique feature means that should you wish to include tape in your hi-fi system at a later date all that is required is a suitable tape deck. Push-button switching for 3 tape speeds equalised.

KIT OF PARTS 11 GNS.
BUILT AND TESTED 18 GNS. (Carr. and Ins. 5/-)

JL10 POWER AMPLIFIER



Incorporates the latest diode/pentode ECL86 valves in push-pull PARTRIDGE ultra linear output transformer, PARTRIDGE mains transformer and smoothing choke. 10 watts power output, surplus power output, surplus power available for tuner.

KIT OF PARTS 94 GNS.
BUILT AND TESTED 12 GNS.

(Carr. and Ins. 7/6)

Prices if both units purchased together:
KIT OF PARTS 104 GNS.
BUILT AND TESTED 29 GNS. (Carr. & Ins. 10/-)

AMERICAN RECORDING TAPE

6in.	600ft.	Standard Acetate	8/6
5in.	900ft.	Long Play Acetate	10/-
5 1/2in.	1,200ft.	Long Play Acetate	12/6
3 1/2in.	600ft.	Double Play Mylar	11/6
7in.	1,200ft.	Standard Play Mylar	12/6
5in.	1,200ft.	Double Play Mylar	15/-
7in.	1,800ft.	Long Play Mylar	20/-
5 1/2in.	1,800ft.	Double Play Mylar	22/6
7in.	2,400ft.	Double Play Mylar	25/-

Postage and Packing 1/- per Reel. Extra 4 or more Reels POST FREE.

FULLY AUTOMATIC TAPE SPLICER
14/6. P. & P. 1/6.

PLASTIC TAPE SPOOLS 2 1/2in., 1/-; 3in., 1/6;
4in., 2/-; 5in., 2/-; 5 1/2in., 2/6; 7in., 2/6.

PLASTIC SPOOL CONTAINERS. For spool sizes
5in., 1/6; 5 1/2in., 2/-; 7in., 2/6. Any single item plus
6d. P. & P. Orders over £1 post free.

We carry fully comprehensive stocks of Tape
Recorders, Decks and Accessories at All Branches
or order with confidence by mail.

VISIT YOUR NEAREST STERN-CLYNE ELECTRONICS CENTRE

LONDON

18 Tottenham Court Road, W.1. MUSEUM 5929/0095. Half Day Saturday.
23 Tottenham Court Road, W.1. MUSEUM 3451/2. Half Day Thursday.
309 Edgware Road, W.2. PADDDINGTON 6863. Half Day Thursday.
109 Fleet Street, E.C.4. FLEET STREET 3812/3. Half Day Saturday.
162 Holloway Road, N.7. NORTH 7941. Half Day Thursday.
9 Camberwell Church Street, S.E.5. RODNEY 2876. Half Day Thursday.

CROYDON

12 Suffolk House, George Street, MUNICIPAL 3250. Half Day Wednesday.

BRISTOL

26 Merchant Street, Bristol 1, Bristol 20261. Open 6 days a week.

LIVERPOOL

52 Lord Street, Royal 7450. Open 6 days a week.

MANCHESTER

26/22 Withy Grove, Manchester 4, BLAckfriars 5379/5246.

Open 6 days a week.

SHEFFIELD

125 The Moor, Sheffield, Sheffield 29993. Half Day Thursday.

MAIL ORDERS AND ENQUIRIES TO

Dept. P.W. 3/5 Eden Grove, Holloway, London N.7. NORTH 8161/L.

LASKY'S RADIO

Offer the Finest Value and HOME CONSTRUCTORS

We consider our construction parcels to be the finest value on the home constructor market. If on receipt you feel not competent to build the set, you may return it as received within 7 days when the sum paid will be refunded less postage.

THE "SKYROVER" RANGE

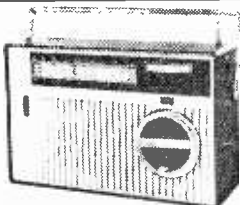
GENERAL SPECIFICATION

7 transistor plus 2 diode superhet, 6 waveband portable receiver. Operating from four 1.5 v. torch batteries. The SKYROVER and SKYROVER DE LUXE cover the full Medium Waveband and Short Waveband 31-94 M. and also 4 separate switched band-spread ranges, 13M, 16M, 19M and 25M, with Band Spread Tuning for accurate Station Selection. The coil pack and tuning head is completely factory assembled, wired and tested. The remaining assembly can be completed in under three hours from our easy to follow stage by stage instructions.

A simple additional circuit provides coverage of the 1100-1950M. band (including 1500 M. Light programme). All components and detailed construction data.

Only 10/- extra—Free
This conversion is suitable for both models that have already been constructed.

Data for Receiver 2/6 extra. Refunded if you purchase the parcel. Four U2 batteries 3/4 extra. All Components Available Separately.



NEW—The SKYROVER Mk III

Now supplied with redesigned cabinet, edgewise controls, black and chrome plastic cabinet. Size 10 x 6 1/2 x 3 1/2 in. with carrying handle.

Can now be built for **£8.19.6** Post 5/-.
H.P. Terms: 20/- dep. and 11 months at 16/6. Total H.P. Price £10.1.6.

The SKYROVER DE LUXE

Tone Control Circuit is incorporated with separate Control. In a wood cabinet, size 11 1/2 x 6 1/2 x 3 1/2 in. covered with a washable material with plastic trim and carrying handle. Car aerial socket fitted.

Can now be built for **£10.19.6** H.P. Terms: 25/- dep. and 11 mths at 20/-. Total H.P.P. £12.5.0.

We are pleased to announce the opening of our premises at 42 TOTTENHAM COURT ROAD, LONDON, W.1.

This branch, will be devoted exclusively to the quality High Fidelity equipment—Tape Recorders, Record Reproducers, Radios, Tuners, etc. Custom built installations will provide balanced comparisons of the best in Hi-Fi in ideal surroundings. Open all day Thursday, until closing Saturday.

OUTSTANDING TAPE RECORDER OFFER

ELIZABETHAN TYPE LZ 511 STEREO RECORDER

A fully professional 4-track, 3-speed Stereophonic Tape Recorder—at almost half price! 4-track record and replay—Mono or Stereo, 3 speeds—7 1/2, 3 1/2, 1 1/2 i.p.s.—fast forward and rewind. Frequency response 40/16,000 c.p.s.—at 7 1/2 i.p.s. Output 3 watts per channel to 8 x 3 1/2 in. speakers in detachable enclosures which also form lid of the recorder (equipped with 3 ft. extension leads). 2 VU record level meters; tape position indicator and auto tape stop; inputs for 2 microphones and 2 radio/pick-ups. Controls include: volume, treble monitor, bass, etc.—duplicated for each channel. Takes 7 in. speeds. For 200-250 v. 50 c.p.s. mains operation. Overall size (including speakers) 25 x 13 x 8 in. Makers original List Price 65 Gns.

LASKY'S PRICE 39 GNS. Including 2 crystal microphones (tape and spoil, Carr. and Ins. 15/- extra.



THE NEW "KUBA" IMPORTED AM/FM STEREO RADIOGRAM CHASSIS

Long, medium and short waveband coverage plus VHF/FM. Piano key wave-change, separate 3-wheel tuning on AM and FM. Bass, treble and balance controls, Magna-voice operation. Overall size (including speakers) 21 x 6 1/2 x 8 in. Made to the very highest standards.

LASKY'S PRICE 29 1/2 GNS.

Carriage & Insurance 12/6 extra.

INTERNATIONAL TAPE

Famous American Brand—Fully Guaranteed

3in. Message tape, 150ft.	3 6	5 1/2in. Double play, 1,800ft. Mylar base	22 6
3in. Message tape, 225ft.	4 11	5 1/2in. Long play, 1,200ft. Acetate base	12 6
3in. Message tape, 300ft.	7 6	5 1/2in. Standard play, 850ft. PVC base	11 6
3 1/2in. Triple play, 600ft. Mylar base	15 0	5 1/2in. Triple play, 2,400ft. Mylar base	45 0
4in. Triple play, 900ft. Mylar base	17 6	7in. Standard play, 1,200ft. Mylar base	12 6
5in. Double play, 1,200ft. Mylar base	15 0	7in. Long play, 1,800ft. Mylar base	19 6
5in. Long play, 900ft. Acetate base	10 0	7in. Double play, 2,400ft. Mylar base	25 0
5in. Standard play, 600ft. PVC base	8 6	7in. Long play, 1,800ft. Acetate base	15 0
5in. Triple play, 1,800ft. Mylar base	35 0	7in. Triple play, 3,600ft. Mylar base	58 6

P. & P. 1/- extra per reel; 4 reels and over Post Free.

The "REALISTIC" Seven

★ 7-transistor Superhet. ★ 350 milliwatt output into 4in. high flux speaker.

★ All components mounted on a single printed circuit board ★ Full medium and longwave cover. ★ Plastic cabinet with carrying handle, size 7 x 10 x 3 1/2 in. Blue/Grey or all Grey.

★ Socket for car aerial. ★ 1 F. frequency 170 Kcs.

★ Ferrite rod internal aerial. Operates from PP9 or similar battery. ★ Full data supplied.

All coils and I.F.'s etc. fully wound ready for immediate assembly. An Outstanding Receiver.

Can be built for **£5.19.6** Post 4/6.

PP9 Batt. 3/9. Data and Instructions separately 2/6. Refunded if you purchase the parcel. All parts sold separately.



REALISTIC Seven DELUXE

With the same specification as standard model—PLUS a superior wood cabinet in contemporary styling with full vision circular dial. **ONLY £1 EXTRA**

NEW SINCLAIR SUPER MINIATURES

THE MICRO-6

Self-contained pocket radio. Size only 1 1/4 x 1 1/4 x 1 in. Amazing performance. Complete with earphone and detailed construction data. Can be built for only **59/6** Mercury cell 1/11 extra. All parts sold separately.

THE SLIMLINE

The new 2-transistor pocket radio. Size only 2 1/4 x 1 1/4 x 1 in. Micro alloy transistorised and printed circuit. All components available separately. Easy to assemble.

CAN BE BUILT FOR 49/6

THE X10 AMPLIFIER

10 watt power amplifier fitted with integrated pre-amplifier. Requires only 1 mV. for an output of 10 watts. Only 6 x 3 x 1 in.

KIT PRICE £5.19.6 Post Free.

AVAILABLE READY BUILT, TESTED AND GUARANTEED £8.19.6 Post Free. 3 pots for Volume, Bass and Treble, 7/6 the 3 extra. Mains power pack, if required 54/-

RECORD PLAYERS

45 r.p.m. 6 volt Batt. operated complete with pick-up fitted crystal cartridge. Size only 7 1/2 in. x 6 in. Fitted auto stop and start. New and perfect.

45 r.p.m. Model **49/6** Post 2/6

2-speed model for 33 and 45 r.p.m. (as illustrated) **59/6** Post 2/6

GUITAR PICK-UPS

CG M5 Crystal-high imp. Size 1 1/2 x 1 x 1 in. Clips to finger board. Complete with cable

LASKY'S PRICE 15/11 Post 1/-

CG M35. Fully adjustable pick-up position carrier. Separate tone and volume control. Pick-up size 3 1/2 x 1 1/2 in. Comp. with lead and plug.

LASKY'S PRICE 59/6 Post 1/6



LASKY'S FOR D.I.Y. CONSTRUCTION BARGAINS

Service in Great Britain to both & HI-FI ENTHUSIASTS

COMPLETE MONO/STEREO SYSTEMS TO YOUR SPECIFICATION
AT LASKY'S SUPER PRICES

COMMUNICATION RECEIVERS

MODEL HE30 Covers range from 540 Kc/s to 30 Mc/s. 9 valves. 200-250v. A.C. mains. Brand new with full instruction manual, in steel cabinet. Size 15 x 8 x 10in.

LASKY'S PRICE 33 GNS.

KIT PRICE 25 GNS. POST FREE

H.P. Terms (Ready Built): £8.13.0. dep. and 11 monthly payments of £2.16.0. Total H.P.P. £37.0.0.

MODEL HE40 Covers Medium wave band and 1.6-4.4 Mc/s. 4.5-11.0 Mc/s. 11.0-30.0 Mc/s. 4 valves plus metal rectifier for 200/250v. A.C. mains. Size 13½ x 8½ x 9in. Brand new with instruction manual. No Kits available.

LASKY'S PRICE 19 GNS.

H.P. Terms: £4.0.0. dep. and 11 months at £1.12.0. Post 10/-.

MODEL HE80 14-valve supersensitive communication receiver. Freq. range 540 Kc/s—30 Mc/s. and 144-146 Mc/s. Dual conversion 2 metres with extra R.F. stage. Steel case 17 x 7½ x 10in. For 200/250v. A.C. mains. Brand new with full instruction manual. No Kits available.

LASKY'S PRICE 59 GNS.

H.P. Terms: £12.19.0 dep. and 11 monthly payments of £4.18.0. Total H.P.P. £98.17.0. POST FREE.

REFLECTOGRAPH MODEL A SEMI-PROFESSIONAL TAPE RECORDER

These recorders are new and guaranteed in the maker's original cartons. They represent an excellent opportunity for the professional and the quality conscious amateur to acquire the best at almost half price. Brief specification: Frequency response 35 to 15,000 c/s at 7½ i.p.s.; two speeds—7½ and 3½ i.p.s.; 3 motors; 8in. reel capacity; record level meter; separate record and play back volume controls; bass and treble controls; fast forward and rewind; built in 8 x 6in. speaker with extension L.S. socket; monitoring facilities provided through the internal speaker; outlet from pre-amplifier for extra amplification; for 200/250V. 50 c.p.s. mains use; tape position indicator fitted. Inputs for microphone and radio pick-up. The recorder is finished in grey and is mounted in free standing mahogany plinth—size 20 x 16 x 9in.

LASKY'S PRICE £69 GNS.

Carr. & Ins. 30/-.

Few only—carrying cases for the Reflectograph. **LASKY'S PRICE 6½ Gns. Post 5/-.**

OPTIONAL EXTRA—PAMPHONIC VR 53 STUDIO RIBBON MICROPHONE. For use with the Reflectograph Model A recorder. Low impedance. Listed at £9.18.6.

LASKY'S PRICE £4.19.6. Post 7/6. POST FREE if ordered with the Reflectograph recorder.

E.M.I. 4-SPEED RECORD PLAYER New, unused and individually boxed fitted with lightweight pick-up with AVO8 G.P. 7½/2 stereo cartridge. Cabinet space required 13½ x 12½ x 4½in. A 9in. metal turntable is fitted. For use on 200/250 volt A.C. Mains with Auto-stop. The stereo **LASKY'S PRICE 79/6** extra

B.S.R. AUTOCHANGERS AT LOWEST EVER PRICES

Brand new and fully guaranteed—complete with cartridge and stylus.

UA16 4 speed mains £4.19.6 UA20 4 speed mains £5.19.6
Add 5/- carriage and packing on each.

207 EDGWARE ROAD, LONDON, W.2 | 33 TOTTENHAM COURT ROAD, W.1.

Near Praed St. PADDINGTON 3271/2 | Nearest Stn., Goudge St. MUSEUM 2605

BOTH OPEN ALL DAY SAT. Early closing Thurs., Mail Orders to Dept. X.W., 207 Edgware Rd., W.2

152/3 FLEET STREET, LONDON, EC.4.

Telephone: Fleet Street 2833

Open all day Thursday. Early closing Sat



List price of this recorder is £110.5.0

LASKY'S FOR SPEEDY MAIL ORDER SERVICE

THE PEMBRIDGE COLLEGE OF ELECTRONICS PROVIDES TRAINING IN RADIO AND TELEVISION

FULL-TIME COLLEGE COURSE IN RADIO AND TELEVISION

Our Course has now been extended to sixteen months' duration to include theoretical and practical instruction on transistor television receivers, U.H.F. television receivers and colour television.

Next course commences 7th Sept., 1965.

This Course is recognised by the Radio Trades Examination Board (R.T.E.B.) for the Radio and Television Servicing Certificate examinations.

Provides excellent practical experience on valve and transistor radio receivers and all well-known makes of television receivers.

To:

The Pembridge College of Electronics (Dept. P11)
34a Hereford Road, London, W.2.

Please send, without obligation, details of the
Full-time Course in Radio and Television.

Name _____

Address _____

BENTLEY ACOUSTIC CORPORATION LTD.

Suppliers to H.M. Government. 38 CHALCOT ROAD, LONDON, N.W.1 Telephone: PRIMROSE 9090

NEAREST UNDERGROUND: CHALK FARM. ALL GOODS LISTED BELOW ACTUALLY IN STOCK
ALL GOODS ARE NEW, BEST QUALITY BRANDS ONLY, AND SUBJECT TO MAKERS' FULL GUARANTEE. PLEASE
NOTE THAT WE DO NOT SELL ITEMS FROM USED EQUIPMENT NOR MANUFACTURERS' SECONDS & REJECTS,
WHICH ARE OFTEN DESCRIBED AS "BUT HAVE A SHORT AND UNRELIABLE LIFE"

O42	4/8	BRW6	8/9	7/87	5/9	25246	7/1	AC/PEP	5/9	EAR80	5/9	EL81	5/3	LN309	9/6	R17	17/6	1101	19/8	G13	5/6
O82	6/1	BDW7	5/1	7/5	8/1	23245	7/3	AC/PEP	5/9	EAR91	3/3	EL83	6/9	LN309	9/6	R18	17/6	1102	19/8	G14	5/6
O242T	4/3	BRN6	4/1	7/6	6/9	23266T	8/1	AC/PEP	5/9	EAR92	7/6	EL84	4/6	LN309	9/6	R19	17/6	1103	19/8	G15	5/6
1A3	2/8	6/4	2/3	7/7	5/1	278U	23/3	AC/PEP	5/9	EAR93	1/1	EL85	7/6	LN309	9/6	R20	17/6	1104	19/8	G16	5/6
1A4	12/6	6/5	4/1	7/6	15/1	28147	6/9	AC/PEP	5/9	EAR94	4/9	EL86	7/6	LN309	9/6	R21	17/6	1105	19/8	G17	5/6
1A5	5/1	6/6	3/1	7/3	19/6	300C1	1/6	AC/PEP	5/9	EAR95	2/3	EL87	2/6	LN309	9/6	R22	17/6	1106	19/8	G18	5/6
1A7T	7/9	6/8	3/1	7/6	14/6	300C5	1/6	AC/PEP	5/9	EAR96	2/3	EL88	2/6	LN309	9/6	R23	17/6	1107	19/8	G19	5/6
1C1	4/1	6/9	10/9	7/17	5/9	300C7	17/6	AC/PEP	5/9	EAR97	2/3	EL89	2/6	LN309	9/6	R24	17/6	1108	19/8	G20	5/6
1C2	8/1	6/10	8/1	7/87	12/6	300C8	10/6	AC/PEP	5/9	EAR98	4/1	EL90	2/6	LN309	9/6	R25	17/6	1109	19/8	G21	5/6
1C3	6/6	6/12	5/9	7/7	5/1	300C9	5/9	AC/PEP	5/9	EAR99	4/1	EL91	2/6	LN309	9/6	R26	17/6	1110	19/8	G22	5/6
1C4	5/1	6/13	5/1	7/3	5/1	300C10	12/6	AC/PEP	5/9	EAR100	4/1	EL92	2/6	LN309	9/6	R27	17/6	1111	19/8	G23	5/6
1C5	5/1	6/14	5/1	7/3	5/1	300C11	12/6	AC/PEP	5/9	EAR101	4/1	EL93	2/6	LN309	9/6	R28	17/6	1112	19/8	G24	5/6
1C6	5/1	6/15	5/1	7/3	5/1	300C12	12/6	AC/PEP	5/9	EAR102	4/1	EL94	2/6	LN309	9/6	R29	17/6	1113	19/8	G25	5/6
1C7	5/1	6/16	5/1	7/3	5/1	300C13	12/6	AC/PEP	5/9	EAR103	4/1	EL95	2/6	LN309	9/6	R30	17/6	1114	19/8	G26	5/6
1C8	5/1	6/17	5/1	7/3	5/1	300C14	12/6	AC/PEP	5/9	EAR104	4/1	EL96	2/6	LN309	9/6	R31	17/6	1115	19/8	G27	5/6
1C9	5/1	6/18	5/1	7/3	5/1	300C15	12/6	AC/PEP	5/9	EAR105	4/1	EL97	2/6	LN309	9/6	R32	17/6	1116	19/8	G28	5/6
1C10	5/1	6/19	5/1	7/3	5/1	300C16	12/6	AC/PEP	5/9	EAR106	4/1	EL98	2/6	LN309	9/6	R33	17/6	1117	19/8	G29	5/6
1C11	5/1	6/20	5/1	7/3	5/1	300C17	12/6	AC/PEP	5/9	EAR107	4/1	EL99	2/6	LN309	9/6	R34	17/6	1118	19/8	G30	5/6
1C12	5/1	6/21	5/1	7/3	5/1	300C18	12/6	AC/PEP	5/9	EAR108	4/1	EL100	2/6	LN309	9/6	R35	17/6	1119	19/8	G31	5/6
1C13	5/1	6/22	5/1	7/3	5/1	300C19	12/6	AC/PEP	5/9	EAR109	4/1	EL101	2/6	LN309	9/6	R36	17/6	1120	19/8	G32	5/6
1C14	5/1	6/23	5/1	7/3	5/1	300C20	12/6	AC/PEP	5/9	EAR110	4/1	EL102	2/6	LN309	9/6	R37	17/6	1121	19/8	G33	5/6
1C15	5/1	6/24	5/1	7/3	5/1	300C21	12/6	AC/PEP	5/9	EAR111	4/1	EL103	2/6	LN309	9/6	R38	17/6	1122	19/8	G34	5/6
1C16	5/1	6/25	5/1	7/3	5/1	300C22	12/6	AC/PEP	5/9	EAR112	4/1	EL104	2/6	LN309	9/6	R39	17/6	1123	19/8	G35	5/6
1C17	5/1	6/26	5/1	7/3	5/1	300C23	12/6	AC/PEP	5/9	EAR113	4/1	EL105	2/6	LN309	9/6	R40	17/6	1124	19/8	G36	5/6
1C18	5/1	6/27	5/1	7/3	5/1	300C24	12/6	AC/PEP	5/9	EAR114	4/1	EL106	2/6	LN309	9/6	R41	17/6	1125	19/8	G37	5/6
1C19	5/1	6/28	5/1	7/3	5/1	300C25	12/6	AC/PEP	5/9	EAR115	4/1	EL107	2/6	LN309	9/6	R42	17/6	1126	19/8	G38	5/6
1C20	5/1	6/29	5/1	7/3	5/1	300C26	12/6	AC/PEP	5/9	EAR116	4/1	EL108	2/6	LN309	9/6	R43	17/6	1127	19/8	G39	5/6
1C21	5/1	6/30	5/1	7/3	5/1	300C27	12/6	AC/PEP	5/9	EAR117	4/1	EL109	2/6	LN309	9/6	R44	17/6	1128	19/8	G40	5/6
1C22	5/1	6/31	5/1	7/3	5/1	300C28	12/6	AC/PEP	5/9	EAR118	4/1	EL110	2/6	LN309	9/6	R45	17/6	1129	19/8	G41	5/6
1C23	5/1	6/32	5/1	7/3	5/1	300C29	12/6	AC/PEP	5/9	EAR119	4/1	EL111	2/6	LN309	9/6	R46	17/6	1130	19/8	G42	5/6
1C24	5/1	6/33	5/1	7/3	5/1	300C30	12/6	AC/PEP	5/9	EAR120	4/1	EL112	2/6	LN309	9/6	R47	17/6	1131	19/8	G43	5/6
1C25	5/1	6/34	5/1	7/3	5/1	300C31	12/6	AC/PEP	5/9	EAR121	4/1	EL113	2/6	LN309	9/6	R48	17/6	1132	19/8	G44	5/6
1C26	5/1	6/35	5/1	7/3	5/1	300C32	12/6	AC/PEP	5/9	EAR122	4/1	EL114	2/6	LN309	9/6	R49	17/6	1133	19/8	G45	5/6
1C27	5/1	6/36	5/1	7/3	5/1	300C33	12/6	AC/PEP	5/9	EAR123	4/1	EL115	2/6	LN309	9/6	R50	17/6	1134	19/8	G46	5/6
1C28	5/1	6/37	5/1	7/3	5/1	300C34	12/6	AC/PEP	5/9	EAR124	4/1	EL116	2/6	LN309	9/6	R51	17/6	1135	19/8	G47	5/6
1C29	5/1	6/38	5/1	7/3	5/1	300C35	12/6	AC/PEP	5/9	EAR125	4/1	EL117	2/6	LN309	9/6	R52	17/6	1136	19/8	G48	5/6
1C30	5/1	6/39	5/1	7/3	5/1	300C36	12/6	AC/PEP	5/9	EAR126	4/1	EL118	2/6	LN309	9/6	R53	17/6	1137	19/8	G49	5/6
1C31	5/1	6/40	5/1	7/3	5/1	300C37	12/6	AC/PEP	5/9	EAR127	4/1	EL119	2/6	LN309	9/6	R54	17/6	1138	19/8	G50	5/6
1C32	5/1	6/41	5/1	7/3	5/1	300C38	12/6	AC/PEP	5/9	EAR128	4/1	EL120	2/6	LN309	9/6	R55	17/6	1139	19/8	G51	5/6
1C33	5/1	6/42	5/1	7/3	5/1	300C39	12/6	AC/PEP	5/9	EAR129	4/1	EL121	2/6	LN309	9/6	R56	17/6	1140	19/8	G52	5/6
1C34	5/1	6/43	5/1	7/3	5/1	300C40	12/6	AC/PEP	5/9	EAR130	4/1	EL122	2/6	LN309	9/6	R57	17/6	1141	19/8	G53	5/6
1C35	5/1	6/44	5/1	7/3	5/1	300C41	12/6	AC/PEP	5/9	EAR131	4/1	EL123	2/6	LN309	9/6	R58	17/6	1142	19/8	G54	5/6
1C36	5/1	6/45	5/1	7/3	5/1	300C42	12/6	AC/PEP	5/9	EAR132	4/1	EL124	2/6	LN309	9/6	R59	17/6	1143	19/8	G55	5/6
1C37	5/1	6/46	5/1	7/3	5/1	300C43	12/6	AC/PEP	5/9	EAR133	4/1	EL125	2/6	LN309	9/6	R60	17/6	1144	19/8	G56	5/6
1C38	5/1	6/47	5/1	7/3	5/1	300C44	12/6	AC/PEP	5/9	EAR134	4/1	EL126	2/6	LN309	9/6	R61	17/6	1145	19/8	G57	5/6
1C39	5/1	6/48	5/1	7/3	5/1	300C45	12/6	AC/PEP	5/9	EAR135	4/1	EL127	2/6	LN309	9/6	R62	17/6	1146	19/8	G58	5/6
1C40	5/1	6/49	5/1	7/3	5/1	300C46	12/6	AC/PEP	5/9	EAR136	4/1	EL128	2/6	LN309	9/6	R63	17/6	1147	19/8	G59	5/6
1C41	5/1	6/50	5/1	7/3	5/1	300C47	12/6	AC/PEP	5/9	EAR137	4/1	EL129	2/6	LN309	9/6	R64	17/6	1148	19/8	G60	5/6
1C42	5/1	6/51	5/1	7/3	5/1	300C48	12/6	AC/PEP	5/9	EAR138	4/1	EL130	2/6	LN309	9/6	R65	17/6	1149	19/8	G61	5/6
1C43	5/1	6/52	5/1	7/3	5/1	300C49	12/6	AC/PEP	5/9	EAR139	4/1	EL131	2/6	LN309	9/6	R66	17/6	1150	19/8	G62	5/6
1C44	5/1	6/53	5/1	7/3	5/1	300C50	12/6	AC/PEP	5/9	EAR140	4/1	EL132	2/6	LN309	9/6	R67	17/6	1151	19/8	G63	5/6
1C45	5/1	6/54	5/1	7/3	5/1	300C51	12/6	AC/PEP	5/9	EAR141	4/1	EL133	2/6	LN309	9/6	R68	17/6	1152	19/8	G64	5/6
1C46	5/1	6/55	5/1	7/3	5/1	300C52	12/6	AC/PEP	5/9	EAR142	4/1	EL134	2/6	LN309	9/6	R69	17/6	1153	19/8	G65	5/6
1C47	5/1	6/56	5/1	7/3	5/1	300C53	12/6	AC/PEP	5/9	EAR143	4/1	EL135	2/6	LN309	9/6	R70	17/6	1154	19/8	G66	5/6
1C48	5/1	6/57	5/1	7/3	5/1	300C54	12/6	AC/PEP	5/9	EAR144	4/1	EL136	2/6	LN309	9/6	R71	17/6	1155	19/8	G67	5/6
1C49	5/1	6/58	5/1	7/3	5/1	300C55	12/6	AC/PEP	5/9	EAR145	4/1	EL137	2/6	LN309	9/6	R72	17/6	1156	19/8	G68	5/6
1C50	5/1	6/59	5/1	7/3	5/1	300C56	12/6	AC/PEP	5/9	EAR146	4/1	EL138	2/6	LN309	9/6	R73	17/6	1157	19/8	G69	5/6
1C51	5/1	6/60	5/1	7/3	5/1	300C57	12/6	AC/PEP	5/9	EAR147	4/1	EL139	2/6	LN309	9/6	R74	17/6	1158	19/8	G70	5/6
1C52	5/1	6/61	5/1	7/3	5/1	300C58	12/6	AC/PEP	5/9	EAR148	4/1	EL140	2/6	LN309	9/6	R75	17/6	1159	19/8	G71	5/6
1C53	5/1	6/62	5/1	7/3	5/1	300C59	12/6	AC/PEP	5/9	EAR149	4/1	EL141	2/6	LN309							

L.K. ELECTRONICS

Under the personal direction of D. Miller, late C.B.S.

The Cheapest - The Best - The Quickest Service

SPRING SALE — Fantastic reductions for one month only

● **SCOOP! B.S.R. U.A. 25 Autochangers.** T.C. 8 Mono P.U. Brand new and boxed. Wired for stereo. Note **OUR** price **£5.10.0**. P.P. 5/6. The very very, latest model.

● **SCOOP! B.S.R. U.A. 14 Autochangers.** T.C. 8 Mono P.U. Brand new and boxed. Wired for stereo. Note **OUR** price **£5.10.0**. P.P. 5/6. Latest model.

● **SCOOP! Garrard Autoslim.** Mono P.U. Brand new and boxed. Wired for stereo. Latest model. Note **OUR** price **£6.0.0**. P.P. 6/-.

● **SCOOP! Garrard A.T.5.** Wired for stereo, inclusive of head and mono cartridge (A.T.5 is an auto transcriber). The finest changer of them all. **OUR** price, brand new and boxed **£7.19.6** only. P.P. 6/6.

AUTOCHANGERS Single Players

E.M.I. Autostop, Mono **£5.10.0** P.P. 5/6

Garrard S.R.P. 10, Mono **£5.10.0** P.P. 5/6

E.M.I. Separate Pick-up **£3.5.0** P.P. 4/6

Transcription Units Stereo Head Mono

Garrard 4 H.F. Stereo **£15.10.0** P.P. 7/6

Philips A.G. 10/16 Stereo **£12.10.0** P.P. 7/6

Garrard A.T.6 Stereo **£9.19.6** P.P. 7/6

Garrard 301 **£20.10.0** P.P. 7/6

● **SCOOP! Record Player Cabinets.** Two-tone, deluxe finish with cut-out board. These are brand new and product of very famous national manufacturers. **OUR** price **£3.5.0** only P.P. 5/6.

● **SCOOP! 3-watt Gramophone Amplifier.** Complete with 5in. Speaker. 49/6. P.P. 5/6.

The amplifier is complete, on a fabric-covered baffle board. Output transformer included. Tone and volume controls and on/off switch. Ready to switch on and play. Terrific volume. Size 12½ x 6 x 3½in. back to front. For 200-250v. A.C. Output 3 watts. **WHY NOT BUILD A QUALITY RECORD PLAYER? THE ABOVE PRICES SAVE YOU POUNDS.** We give you free a 12in. or 10in. L.P. Record of our choice (new) with every Auto-changer purchased.

● **SCOOP! Diodes—**over 1,000,000 in stock—ideal substitute O.A.81 vision detector.

Note **OUR** price **£1.0.0** per 500. P.P. 2/- (in 500 lots only).

● **SCOOP! Transistor Tape Recorder.** The best obtainable by very famous manufacturer. Brand new, boxed, guaranteed Reduced from 12 gns. **OUR** price **£7.10.0**. P. & P. 4/6. Complete with microphone, tape, batteries and operational booklet. Features push-pull amplifier, two motors, single switch operation, pause speed, wind, rewind, record, play back. Can be used in any position, indoor or outdoor.

● **SCOOP! 5 valve Superhet Radio Chassis—**Brand new—fully aligned and tested. Valve line-up 35W4, 50C5, 12BA6, 12BE6, 12AV6. Ferrite Rod Aerial, dial etc. **OUR** price 6 guineas only. P. & P. 5/6.

FREE while stocks last, attractive Plastic Cabinet in choice of pastel colours and matching Speaker to every purchaser.

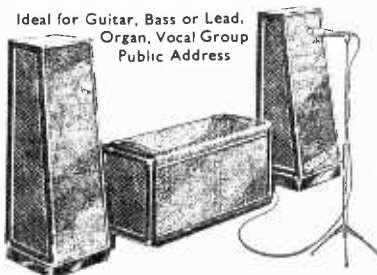
● **SCOOP! Tune your T.V. receiver from your armchair.** Beautiful Remote Control Units by Ekco, Ferguson, etc. In manufacturers sealed carton, original cost 3-4 guineas. **OUR** price **£1.1.0** only. P.P. 2/6. A thousand and one uses for this splendid equipment. Limited stocks only.

● **SCOOP! Radio Cabinets—**attractive pastel colours (plastic). Approx size 6 x 4 x 1in. **OUR** price 7/6 only. Limited stocks only.

● **SCOOP! For 1 guinea only.** P.P. 2/6. **Vavox Capacity Aerial.** The only aerial with additional short wave feed for hypersensitive reception on short and ultra-short waves with the Vavox A.1 performance on medium and long waves.

THE SIOUX 60 WATT MULTIPURPOSE AMPLIFIER

Ideal for Guitar, Bass or Lead,
Organ, Vocal Group
Public Address



**ONLY
39 GNS.**

PACKING &
CARR. EXTRA

Incorporating Two High Duty Speakers designed to handle efficiently the full output of Amplifier at frequencies down to 25 c.p.s. Heavily made Cabinet in two-tone Vynair. For 200-250 v. to 50 c.p.s. A.C. Mains operation. Four jack socket inputs and two independent volume controls for simultaneous connection of up to four instrument pick-ups or microphones. Level frequency response throughout the Audible Range. **OUR INCLUSIVE PRICE FOR AMPLIFIER MIKE, STAND, SPEAKERS, LEADS, ETC. ONLY 39 Gns. (REGRET NO H.P.)**

Now used by Leading Groups and Guitarists throughout the country. By request we will supply all units separately. Cabinet 10 guineas. P.P. 10/6. Amplifier 20 guineas. P.P. 5/6. Speakers (pair) 7 guineas. P.P. 5/6. All leads supplied where applicable—complete assembly time under 30 minutes. **Sioux Junior Mk. II, 15 watts as above but incorporating one 12in. speaker. £15.15.0. P.P. 21/-.**

● **SCOOP! Cartridges—Ceramic Diamond Styli—Stereo—by Acos.** Limited number only at one quarter of original price—15/- only. P.P. 1/- While stocks last.

TRANSISTOR SECTION

● **SCOOP! A first-class 2 wave-band 8 transistor superhet chassis by world famous manufacturer.** Fully built, aligned, tested, guaranteed. Full coverage long and medium waves. Note **OUR** price only **£6.0.0**. P. & P. 2/6. Suitable speaker 10/6. P. & P. 1/6. A few cabinets can be supplied at 22/6 each. P. & P. 2/6. **OUR** price for the package deal **£7.4.0** only, plus 4/6 P. & P. Ideal for Caroline.

S.A.E. enquiries please. Our Complete Lists 1/- only—credited against your order.

● **IF NOT ADVERTISED IT IS STILL IN STOCK.**

L.K. ELECTRONICS (Victoria) LTD.



7-17 GILLINGHAM ROW, WILTON ROAD, LONDON, S.W.1

All correspondence to Number 17



Brand new individually checked and guaranteed VALVES

AC/FL 4/6	DL810	8/-	EF91	2/9
ACP4 6/-	DL819	15/-	EF92	2/-
ACPEFEN 5/-	EB0F	25/-	EF95	5/-
AL60 5/-	EL148	2/6	EF183	8/-
ARS 5/-	EL266	50/-	EF184	8/-
ARP3 3/-	EL145	30/-	EF171	300/-
ARP12 2/6	EL1524	12/6	EL32	3/9
ARP24 3/6	EA60	1/-	EL34	10/-
ARP34 4/-	EA73	7/-	EL36	5/-
ATK21 6/-	EAB080	5/-	EL38	12/6
ATP4 2/3	EA91	3/6	EL41	7/-
ATP7 5/6	FAF42	8/-	EL42	8/-
AT7 55/-	EB34	1/6	EL43	8/-
B6H 15/-	EB91	3/-	EL41	8/-
BL63 10/-	EB023	6/-	EL43	6/3
B64 8/-	EB041	7/-	EL44	5/-
B85 20/-	EB081	5/-	EL45	8/-
B884 37/6	EBF80	5/-	EL41	4/6
B2134 16/-	EBF83	7/6	EL35	5/-
BT19 25/-	EBF89	6/6	EL60	20/-
BT35 25/-	EC02	7/-	EL60	20/-
BT45 150/-	EC53	12/6	EMN1	7/6
BT83 35/-	EC70	4/-	EMN4	6/3
CC31 2/-	EC90	2/-	EMN5	9/-
CL33 9/-	EC91	3/-	EN31	10/-
CV1 3/-	EC91	3/-	EN31	10/-
CV7 5/-	EC92	5/-	ERU205	8/-
CV102 1/-	EC93	5/-	EY21	5/6
CV103 4/-	EC94	5/6	EY86	6/6
CV4014 7/-	EC95	6/6	EY91	3/-
CV4015 5/-	EC96	4/-	EZ40	5/-
CV4025 10/-	EC98	3/-	EZ41	6/6
CV4046 40/-	EC93	5/-	EZ80	5/6
CV31 5/6	EC98	5/-	EZ81	3/6
D1 1/6	ELH53	7/6	FM657	5/-
D11 9/3	ELC80	9/-	FM661	5/-
D61 6/-	ELC81	7/6	FM663	5/-
D77 3/6	ELC83	10/-	FW4/5000 6/6	PT13
DA20 12/6	ELC86	10/-	FW4/5000 6/6	PT25H
DA60 7/6	EF36	3/4	GI/37K19	PX4
DAF96 6/-	EF37	7/-	GS020	PX5
DD41 4/-	EF39	5/-	GM4	PX3
DE75 3/6	EF40	8/-	GM4	PX3
DET20 2/-	EF50	2/6	GZ32	10/-
DET25 15/-	EF52	6/-	GZ34	10/-
DF73 5/-	EF53	4/6	H63	7/-
DF91 3/-	EF55	3/-	HK54	22/6
DF92 3/-	EF71	7/6	HL2K	2/6
DF96 6/-	EF72	5/-	HL23	6/-
DK92 6/6	EF74	4/-	HL23DD 5/-	PZ1-35
DK98 6/6	EF80	5/-	HL41	4/-
DL92 5/-	EF81	6/-	HV82	9/-
DL93 6/-	EF85	4/6	K3A	30/-
DL94 5/6	EF86	6/6	K78C	22/-
DL96 5/6	EF89	3/9	KT32	8/-

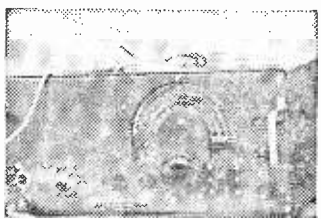
MANY OTHERS IN STOCK include Cathode Ray Tubes and Special Valves. All U.K. orders below £1, P. & P. 1/-; over £1, 2/-; over £3, P. & P. free C.O.D. 2/6 extra. Overseas Postage extra at cost.

MARCONI COMMUNICATION RECEIVERS CR.150 Frequency coverage 2-60 Mc/s in 5 bands. Two lfs 1st 1,600 kc/s. 2nd 463 kc/s. Image signal protecting over 40 dB up to 30 Mc/s and 20-40 dB from 30-60 Mc/s. Self-checking calibration (built in calibrator). Stabilisation of supply and temperature compensation. Electrical and mechanical indicator Bandpass from 100 c/s to 10 kc/s in 5 stages. Acoustic filter associated with 100 c/s. Bandpass position for CW reception. Facilities for diversity reception. Excellent checked condition. £49. Mains P.S.U. by P.C. Radio £4.10.0. Carriage 30/- C.R.150/2. Frequency coverage 1.5-22 Mc/s in 4 bands. All other features as in C.R.150. Price £35. Carriage 30/-.

P.C. RADIO'S mains P.S.U. for above, 90/-. **DHR HIGH RESISTANCE HEADPHONES.** New. 14/- P. & P. 1/6. **WIDE RANGE MULLARD VALVE VOLT METER TYPE E 7555/2.** 100mV-500V. D.C. or A.C. peak from 35c to 5mc, additional range 500V. to 15kc D.C. or peak A.C. Frequency response with probe is lever from 35c to 100mc. Power supply 110/245V. A.C. Price £25. Carriage £1.

SEALED HI-SPEED SIEMENS RELAYS 1700 x 1700 ohms 15V. P. & P. 1/6. **STABILISED POWER SUPPLY UNIT TYPE R.2001 (EDISWAN)** with 2 independent outputs. 1. 0-100V. 50mA metered and regulated by coarse and fine adjustments. 2. 250V. Bias as 5mA. Stability 0.02%. Price £18.

WELL PROVEN RELIABLE COMMUNICATION RECEIVER P.C.R.2



(Made by Pye). 120 kc/s-350 kc/s. 525 kc/s-1600 kc/s. 6 Mc/s-22 Mc/s. Overall sensitivity 1-2µV 5% Noise ratio 10 db at 6µV. Circuit incorporates an RF stage, two I.F. stages, tone control, A.V.C. antenna trimmer. 6V6 output. Set in fully working condition together with headphones and speaker plug. £7.12.6. Carriage 15/-.

Ditto but with built-in power supply for 210-250V A.C. £9.19.6. Carriage 15/-.

EVERSHED MEGGER CIRCUIT TESTER. 2 ranges 0 to 1,000Ω, 100Ω to 200,000Ω. With test leads, leather carrying case. Tested £4.19.5. P. & P. 3/6.

P.C. RADIO LTD

170 GOLDHAWK ROAD, W.12

Shepherd's Bush 4946
Open 9-5.30 p.m. Thursday 9-1 p.m.

PANEL METERS (round)

0-50 microamps	2 1/2"	D.C.**	40/-
0-100 microamps	2 1/2"	D.C.**	35/-
0-100 microamps	2 1/2"	A.C.	30/-
0-200 microamps	2 1/2"	D.C.	32/6
0-500 microamps	2 1/2"	D.C.	30/-
0-500 microamps	3 1/2"	D.C.	37/6
0-1 mA*	2"	D.C.	19/6
0-1 mA	3"	D.C.**	35/-
25-0-25mA	2 1/2"	D.C.	45/-
500 mA	3 1/2"	A.C.	25/-
0-100 mA	3 1/2"	A.C.	22/6
150-0-1,500 mA	3"	D.C.	29/-
0-5 V	3 1/2"	D.C.	32/6
0-5 V	3 1/2"	A.C.	22/6
0-15 V	2"	A.C.	17/6
0-50 V	2 1/2"	D.C.	28/-
0-150 V	2 1/2"	A.C.	24/-
0-10 kV	2 1/2"	D.C.	63/-

**Weston", as usually used in H.R.O. as "S" meter. *Projection type

VERY HIGH CLASS COMMUNICATION RECEIVER Type B.T. 402E: 150 KCF-385 KCF-51J KCF-30 MCF-1. Fully tested £60, carriage 30/-.

STABILISED POWER SUPPLY UNIT TYPE R.1095 (EDISWAN)

with 2 independent outputs.
1. DC 120-250V. 50mA metered and regulated.
2. AC 6.3V. CT 3 amps. Stability 0.02%. Price £18.

C.R. Tubes
CV1596 4/-
(600) 55/-
E4040/B 16 5/6
VCR97 28/-
VCR138-30/-
VCR138A 5/-
VCR139A 40/-
VCR139B 35/-
VCR139C 40/-
VCR139D 40/-
VCR139E 40/-
VCR139F 40/-
VCR139G 40/-
VCR139H 40/-
VCR139I 40/-
VCR139J 40/-
VCR139K 40/-
VCR139L 40/-
VCR139M 40/-
VCR139N 40/-
VCR139O 40/-
VCR139P 40/-
VCR139Q 40/-
VCR139R 40/-
VCR139S 40/-
VCR139T 40/-
VCR139U 40/-
VCR139V 40/-
VCR139W 40/-
VCR139X 40/-
VCR139Y 40/-
VCR139Z 40/-

Photo Tubes
C1048 4/6
C1049 4/6
C1050 4/6
C1051 4/6
C1052 4/6
C1053 4/6
C1054 4/6
C1055 4/6
C1056 4/6
C1057 4/6
C1058 4/6
C1059 4/6
C1060 4/6
C1061 4/6
C1062 4/6
C1063 4/6
C1064 4/6
C1065 4/6
C1066 4/6
C1067 4/6
C1068 4/6
C1069 4/6
C1070 4/6
C1071 4/6
C1072 4/6
C1073 4/6
C1074 4/6
C1075 4/6
C1076 4/6
C1077 4/6
C1078 4/6
C1079 4/6
C1080 4/6
C1081 4/6
C1082 4/6
C1083 4/6
C1084 4/6
C1085 4/6
C1086 4/6
C1087 4/6
C1088 4/6
C1089 4/6
C1090 4/6
C1091 4/6
C1092 4/6
C1093 4/6
C1094 4/6
C1095 4/6
C1096 4/6
C1097 4/6
C1098 4/6
C1099 4/6
C1100 4/6
C1101 4/6
C1102 4/6
C1103 4/6
C1104 4/6
C1105 4/6
C1106 4/6
C1107 4/6
C1108 4/6
C1109 4/6
C1110 4/6
C1111 4/6
C1112 4/6
C1113 4/6
C1114 4/6
C1115 4/6
C1116 4/6
C1117 4/6
C1118 4/6
C1119 4/6
C1120 4/6
C1121 4/6
C1122 4/6
C1123 4/6
C1124 4/6
C1125 4/6
C1126 4/6
C1127 4/6
C1128 4/6
C1129 4/6
C1130 4/6
C1131 4/6
C1132 4/6
C1133 4/6
C1134 4/6
C1135 4/6
C1136 4/6
C1137 4/6
C1138 4/6
C1139 4/6
C1140 4/6
C1141 4/6
C1142 4/6
C1143 4/6
C1144 4/6
C1145 4/6
C1146 4/6
C1147 4/6
C1148 4/6
C1149 4/6
C1150 4/6
C1151 4/6
C1152 4/6
C1153 4/6
C1154 4/6
C1155 4/6
C1156 4/6
C1157 4/6
C1158 4/6
C1159 4/6
C1160 4/6
C1161 4/6
C1162 4/6
C1163 4/6
C1164 4/6
C1165 4/6
C1166 4/6
C1167 4/6
C1168 4/6
C1169 4/6
C1170 4/6
C1171 4/6
C1172 4/6
C1173 4/6
C1174 4/6
C1175 4/6
C1176 4/6
C1177 4/6
C1178 4/6
C1179 4/6
C1180 4/6
C1181 4/6
C1182 4/6
C1183 4/6
C1184 4/6
C1185 4/6
C1186 4/6
C1187 4/6
C1188 4/6
C1189 4/6
C1190 4/6
C1191 4/6
C1192 4/6
C1193 4/6
C1194 4/6
C1195 4/6
C1196 4/6
C1197 4/6
C1198 4/6
C1199 4/6
C1200 4/6
C1201 4/6
C1202 4/6
C1203 4/6
C1204 4/6
C1205 4/6
C1206 4/6
C1207 4/6
C1208 4/6
C1209 4/6
C1210 4/6
C1211 4/6
C1212 4/6
C1213 4/6
C1214 4/6
C1215 4/6
C1216 4/6
C1217 4/6
C1218 4/6
C1219 4/6
C1220 4/6
C1221 4/6
C1222 4/6
C1223 4/6
C1224 4/6
C1225 4/6
C1226 4/6
C1227 4/6
C1228 4/6
C1229 4/6
C1230 4/6
C1231 4/6
C1232 4/6
C1233 4/6
C1234 4/6
C1235 4/6
C1236 4/6
C1237 4/6
C1238 4/6
C1239 4/6
C1240 4/6
C1241 4/6
C1242 4/6
C1243 4/6
C1244 4/6
C1245 4/6
C1246 4/6
C1247 4/6
C1248 4/6
C1249 4/6
C1250 4/6
C1251 4/6
C1252 4/6
C1253 4/6
C1254 4/6
C1255 4/6
C1256 4/6
C1257 4/6
C1258 4/6
C1259 4/6
C1260 4/6
C1261 4/6
C1262 4/6
C1263 4/6
C1264 4/6
C1265 4/6
C1266 4/6
C1267 4/6
C1268 4/6
C1269 4/6
C1270 4/6
C1271 4/6
C1272 4/6
C1273 4/6
C1274 4/6
C1275 4/6
C1276 4/6
C1277 4/6
C1278 4/6
C1279 4/6
C1280 4/6
C1281 4/6
C1282 4/6
C1283 4/6
C1284 4/6
C1285 4/6
C1286 4/6
C1287 4/6
C1288 4/6
C1289 4/6
C1290 4/6
C1291 4/6
C1292 4/6
C1293 4/6
C1294 4/6
C1295 4/6
C1296 4/6
C1297 4/6
C1298 4/6
C1299 4/6
C1300 4/6
C1301 4/6
C1302 4/6
C1303 4/6
C1304 4/6
C1305 4/6
C1306 4/6
C1307 4/6
C1308 4/6
C1309 4/6
C1310 4/6
C1311 4/6
C1312 4/6
C1313 4/6
C1314 4/6
C1315 4/6
C1316 4/6
C1317 4/6
C1318 4/6
C1319 4/6
C1320 4/6
C1321 4/6
C1322 4/6
C1323 4/6
C1324 4/6
C1325 4/6
C1326 4/6
C1327 4/6
C1328 4/6
C1329 4/6
C1330 4/6
C1331 4/6
C1332 4/6
C1333 4/6
C1334 4/6
C1335 4/6
C1336 4/6
C1337 4/6
C1338 4/6
C1339 4/6
C1340 4/6
C1341 4/6
C1342 4/6
C1343 4/6
C1344 4/6
C1345 4/6
C1346 4/6
C1347 4/6
C1348 4/6
C1349 4/6
C1350 4/6
C1351 4/6
C1352 4/6
C1353 4/6
C1354 4/6
C1355 4/6
C1356 4/6
C1357 4/6
C1358 4/6
C1359 4/6
C1360 4/6
C1361 4/6
C1362 4/6
C1363 4/6
C1364 4/6
C1365 4/6
C1366 4/6
C1367 4/6
C1368 4/6
C1369 4/6
C1370 4/6
C1371 4/6
C1372 4/6
C1373 4/6
C1374 4/6
C1375 4/6
C1376 4/6
C1377 4/6
C1378 4/6
C1379 4/6
C1380 4/6
C1381 4/6
C1382 4/6
C1383 4/6
C1384 4/6
C1385 4/6
C1386 4/6
C1387 4/6
C1388 4/6
C1389 4/6
C1390 4/6
C1391 4/6
C1392 4/6
C1393 4/6
C1394 4/6
C1395 4/6
C1396 4/6
C1397 4/6
C1398 4/6
C1399 4/6
C1400 4/6
C1401 4/6
C1402 4/6
C1403 4/6
C1404 4/6
C1405 4/6
C1406 4/6
C1407 4/6
C1408 4/6
C1409 4/6
C1410 4/6
C1411 4/6
C1412 4/6
C1413 4/6
C1414 4/6
C1415 4/6
C1416 4/6
C1417 4/6
C1418 4/6
C1419 4/6
C1420 4/6
C1421 4/6
C1422 4/6
C1423 4/6
C1424 4/6
C1425 4/6
C1426 4/6
C1427 4/6
C1428 4/6
C1429 4/6
C1430 4/6
C1431 4/6
C1432 4/6
C1433 4/6
C1434 4/6
C1435 4/6
C1436 4/6
C1437 4/6
C1438 4/6
C1439 4/6
C1440 4/6
C1441 4/6
C1442 4/6
C1443 4/6
C1444 4/6
C1445 4/6
C1446 4/6
C1447 4/6
C1448 4/6
C1449 4/6
C1450 4/6
C1451 4/6
C1452 4/6
C1453 4/6
C1454 4/6
C1455 4/6
C1456 4/6
C1457 4/6
C1458 4/6
C1459 4/6
C1460 4/6
C1461 4/6
C1462 4/6
C1463 4/6
C1464 4/6
C1465 4/6
C1466 4/6
C1467 4/6
C1468 4/6
C1469 4/6
C1470 4/6
C1471 4/6
C1472 4/6
C1473 4/6
C1474 4/6
C1475 4/6
C1476 4/6
C1477 4/6
C1478 4/6
C1479 4/6
C1480 4/6
C1481 4/6
C1482 4/6
C1483 4/6
C1484 4/6
C1485 4/6
C1486 4/6
C1487 4/6
C1488 4/6
C1489 4/6
C1490 4/6
C1491 4/6
C1492 4/6
C1493 4/6
C1494 4/6
C1495 4/6
C1496 4/6
C1497 4/6
C1498 4/6
C1499 4/6
C1500 4/6
C1501 4/6
C1502 4/6
C1503 4/6
C1504 4/6
C1505 4/6
C1506 4/6
C1507 4/6
C1508 4/6
C1509 4/6
C1510 4/6
C1511 4/6
C1512 4/6
C1513 4/6
C1514 4/6
C1515 4/6
C1516 4/6
C1517 4/6
C1518 4/6
C1519 4/6
C1520 4/6
C1521 4/6
C1522 4/6
C1523 4/6
C1524 4/6
C1525 4/6
C1526 4/6
C1527 4/6
C1528 4/6
C1529 4/6
C1530 4/6
C1531 4/6
C1532 4/6
C1533 4/6
C1534 4/6
C1535 4/6
C1536 4/6
C1537 4/6
C1538 4/6
C1539 4/6
C1540 4/6
C1541 4/6
C1542 4/6
C1543 4/6
C1544 4/6
C1545 4/6
C1546 4/6
C1547 4/6
C1548 4/6
C1549 4/6
C1550 4/6
C1551 4/6
C1552 4/6
C1553 4/6
C1554 4/6
C1555 4/6
C1556 4/6
C1557 4/6
C1558 4/6
C1559 4/6
C1560 4/6
C1561 4/6
C1562 4/6
C1563 4/6
C1564 4/6
C1565 4/6
C1566 4/6
C1567 4/6
C1568 4/6
C1569 4/6
C1570 4/6
C1571 4/6
C1572 4/6
C1573 4/6
C1574 4/6
C1575 4/6
C1576 4/6
C1577 4/6
C1578 4/6
C1579 4/6
C1580 4/6
C1581 4/6
C1582 4/6
C1583 4/6
C1584 4/6
C1585 4/6
C1586 4/6
C1587 4/6
C1588 4/6
C1589 4/6
C1590 4/6
C1591 4/6
C1592 4/6
C1593 4/6
C1594 4/6
C1595 4/6
C1596 4/6
C1597 4/6
C1598 4/6
C1599 4/6
C1600 4/6
C1601 4/6
C1602 4/6
C1603 4/6
C1604 4/6
C1605 4/6
C1606 4/6
C1607 4/6
C1608 4/6
C1609 4/6
C1610 4/6
C1611 4/6
C1612 4/6
C1613 4/6
C1614 4/6
C1615 4/6
C1616 4/6
C1617 4/6
C1618 4/6
C1619 4/6
C1620 4/6
C1621 4/6
C1622 4/6
C1623 4/6
C1624 4/6
C1625 4/6
C1626 4/6
C1627 4/6
C1628 4/6
C1629 4/6
C1630 4/6
C1631 4/6
C1632 4/6
C1633 4/6
C1634 4/6
C1635 4/6
C1636 4/6
C1637 4/6
C1638 4/6
C1639 4/6
C1640 4/6
C1641 4/6
C1642 4/6
C1643 4/6
C1644 4/6
C1645

Why NOT BUILD ONE OF OUR PORTABLE TRANSISTOR RADIOS...

BACKED BY OUR SUPER AFTER SALES SERVICE

ROAMER SEVEN Mk III

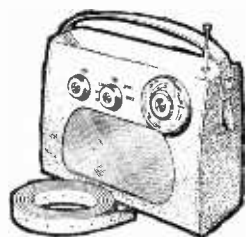
5 WAVEBAND PORTABLE OR CAR RADIO

Amazing performance and specification ★ Now with PHILCO MICRO-ALLOY R.F. TRANSISTORS

● 9 stages—7 transistors and 2 diodes

Covers Medium and Long Waves, Trawler Band and two Short Waves to approx. 15 metres. Push-pull output for room filling volume from rich toned heavy "Celestion" speaker. Air spaced ganged tuning condenser. Ferrite rod aerial for M & L waves and telescopic aerial for S Waves. Real leather look case with gilt trim and shoulder and hand straps. Size 9 x 7 x 4in. approx. The perfect portable and the ideal car radio. (Uses PP7 battery available anywhere).

Total cost of parts now only £5.19.6 P. & P.
Parts Price List and easy build plans 3/- 5/6

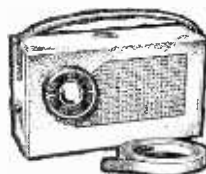


"... amazed at volume and performance... has really come up to my expectations."
S. G. Stockton-on-Tees.

MELODY SIX

● 8 stages—6 transistors and 2 diodes

Our latest completely portable transistor radio covering medium and long waves. Incorporates pre-tagged circuit board, 3in. heavy duty speaker, top grade transistor volume control, tuning condenser, wave change slide switch, sensitive 6in. ferrite rod aerial. Push-pull output.



Wonderful reception of B.B.C. Home and Light, 208 and many Continental stations. Handsome leather-look pocket size case, only 6½ x 3½ x 1½in. approx. with gilt speaker grille and supplied with hand and shoulder straps.

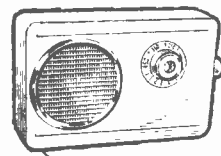
Parts Price List and Total cost of all easy build plans 2/- parts now only £3.9.6 P. & P. 3/6

New TRANSONA FIVE

"Home, Light, A.F.N. Lux. all at good volume!"
G. P. Durham.

● 7 stages—5 transistors and 2 diodes

Fully tunable over Medium and Long Waves and Trawler Band. Incorporates Ferrite rod aerial, tuning condenser, volume control, new type fine tone super dynamic 2½in. speaker etc. Attractive case. Size 6½ x 4½ x 1½in. battery available anywhere.)

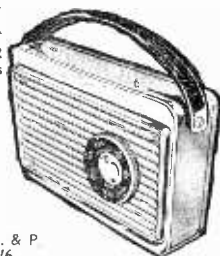


with red speaker grille. (Uses 1289 battery available anywhere.)
Total cost of all parts now only 42/6 P. & P. 3/6
Parts Price List and easy build plans 2/-

TRANSONA SIX

● 8 stages—6 transistors and 2 diodes

This is a top performance receiver covering full Medium and Long Waves and Trawler Band. High-grade approx. 3in. speaker makes listening a pleasure. Ferrite rod aerial. Many stations listed in one evening including Luxembourg loud and clear. Attractive case in grey with red grille. Size 6½ x 4½ x 1½in. (Uses PP4 battery available anywhere.) Carrying strap 1/- extra.

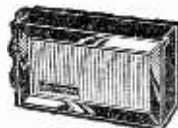


Total cost of all parts now only 59/6 P. & P. 3/6
Parts Price List and easy build plans 1/6.

POCKET FIVE

● 7 stages—5 transistors and 2 diodes

Covers Medium and Long Waves and Trawler Band, a feature usually found in only the most expensive radios. On test Home, Light, Luxembourg and many Continental stations were received loud and clear. Designed round supersensitive Ferrite Rod Aerial and fine tone 2½in. moving coil speaker, built into attractive black case with red speaker grille. Size 5½ x 1½ x 3½in. (Uses 1289 battery available anywhere).



Parts Price List and easy build plans 1/6.
Total cost of all parts now only 42/6 P. & P. 3/6.

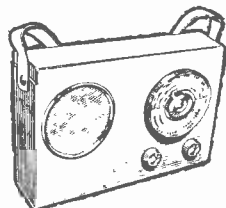
ROAMER SIX NEW!!

NOW WITH PHILCO MICRO-ALLOY R.F. TRANSISTORS

● 6 WAVEBAND !!

● 8 stages—6 transistors and 2 diodes

Listen to stations half a world away with this 6 waveband portable. Tunable on Medium and Long waves, Trawler band and two Short Waves. Sensitive ferrite rod aerial and telescopic aerial for short waves. Top grade transistors, 3-inch speaker, handsome case with gilt fittings. Size 7½ x 5½ x 1½in. Carrying strap 1/6 extra.



★ EXTRA BAND FOR EASIER TUNING OF LUX, ETC.

Parts Price List and Total cost of all easy build plans 2/- parts now only £3.19.6 P. & P. 3/6

SUPER SEVEN

● 9 stages—7 transistors and 2 diodes

Covers Medium and Long Waves and Trawler Band. The ideal radio for home, car, or can be fitted with carrying strap for outdoor use. Completely portable—has built-in Ferrite rod aerial for wonderful reception. Special circuit incorporating 2 R.F. Stages, push-pull output, 3in. speaker (will drive large speaker). Size 7½ x 5½ x 1½in. (Uses 9v battery, available anywhere.)



Total cost of all parts now only £3.19.6 P. & P. 3/6
Parts Price List and easy build plans 2/-

All components used in our receivers may be purchased separately if desired. Parts price lists and easy build plans available separately at fixed prices stated. Overseas post 10/-.

RADIO EXCHANGE CO.

61, HIGH STREET, BEDFORD. Phone: 2367

Callers side entrance
Barratts Shoe Shop
Open 9—5 p.m.
Sats. 10—12.30 p.m.

PRACTICAL WIRELESS

JUNE 1965
VOL 41 NO 700

SELF-SUFFICIENCY

RECENT letters from readers tread on the thorny subject of the competence, or otherwise, of the radio enthusiast. There are so many opinions, that it is virtually impossible to generalise. Nevertheless, we are tempted to make a few observations which may bring more tolerance—or add fuel to the flames!

Competence is a somewhat intangible element; a variable definition. What is considered to be competent by one person in a given context, may be considered highly incompetent by another. The dictionary tells us that competence means "suitableness", "adequateness", "sufficiency".

Who can, therefore, say exactly what is competence? A piece of equipment built by A could be looked upon with awe by B (who is a novice) but sneered at by C (who is a professional). The horizon shifts according to one's own ability or personal criterion. If a man builds a set which works perfectly but looks untidy, is he competent? Is a highly experienced amateur considered incompetent if he cannot build a computer yet competent if he can construct a simple crystal set? Where does competence begin and end?

We have a sneaking feeling that there might be an element of inflated self-importance in those who go out of their way to make too much of a noise about how good they are and how bad others may be. There is a certain regular reader who cheerfully admits that nothing he builds ever works well, if at all, and more often than not produces bizarre results which would drive the designer grey with despair. This does not deter him; on the contrary, it seems to feed his appetite for more.

To the purist, this reader is hopelessly incompetent but, for him, his erratic constructional efforts have an "adequateness" and a "sufficiency". He may be no genius, but he probably gets more fun out of radio than many self-styled perfectionists!

CONTENTS

	page
News and Comment	118, 148
An Electronic Hawaiian Guitar	by I. J. Kampel 120
Simple Two-transistor Set	by P. Taylor 125
PCR Mods	by W. V. Woods 127
Designing a Multimeter—Part 2	by K. Berry 135
On the Short Waves	by John Guttridge and David Gibson, G3JDG 140
Automatic Control Systems	by A. D. Taylor, G8PG/GW8PG 142
Using a Portable in the Car	by G. J. King 144
A Stabilised Nine Volts	by P. G. Thomson 150
A.F./R.F. Signal Generator—Part 2	by C. Marshall 157
Preparing for the R.A.E.—Part 8	by Brian Robinson 165
Practically Wireless	by Henry 173
Long Wave Convertor	by James Brett 174
Club News	178

All correspondence intended for the Editor should be addressed to: The Editor, "Practical Wireless", George Newnes Ltd., Tower House, Southampton Street, London, W.C.2. Phone: TEMple Bar 4363. Telegrams: Newnes Rand London. Subscription rates, including postage: 29s. per year to any part of the world. © George Newnes Ltd., 1965. Copyright in all drawings, photographs and articles published in "Practical Wireless" is specifically reserved throughout the countries signatory to the Berne Convention and the U.S.A. Reproductions or imitations of any of these are therefore expressly forbidden. THE JULY ISSUE WILL BE PUBLISHED ON JUNE 3RD.

Ground Communication

I WAS interested in C. R. Bradley's article on ground communication (P.W. Feb., 1965) and after reading N. W. Roberts' letter in the April issue, I had some new ideas on the subject.

A power cathode follower could be used as an output stage, being driven hard so that the output stage only conducts for a fraction of the time, as in "Class C" output stages.

A line output valve could be used to give quite a lot of power, thus greatly increasing the range. If the carrier frequency was high enough, certain communications receivers could tune to it, thereby greatly increasing the sensitivity of the receiving end. I would suggest that a CR100 (B28) communications receiver is used, as it will tune down to just under 60kc/s.

Huw Lewis.

Swansea,
Glamorgan.

D.F. Aerial

WITH reference to the article "A Ferrite Rod D.F. Aerial for 1.5-3Mc/s" (P.W. January, 1965). The reference to "d.f. below 3Mc/s" should have read "d.f. above 3Mc/s", since we are dealing with frequency and not wavelength. Also, the reference to "adding 10° to compass bearing" on page 838, should have read "subtract 10°" although the present magnetic variation is about 6.8°.

F. C. Judd.

South Woodford,
London, E.18.

Can Anyone Help?

I AM thinking of building the "Ten Five" described in P.W. October, 1964, but I am having great difficulty in obtaining some of the parts in my country. I would be extremely grateful, therefore, to any reader who would send me the variable capacitors, coils and transformers employed in this circuit. In return, I will send anything of the same value from my country.

Rudolph Lobo.

236 Godavari Hostel,
Indian Institute of Technology,
Madras-36,
India.

NEWS AND..

GOONHILLY PREPARED FOR "EARLY BIRD" . . .

Now that the world's first commercial communications satellite 'Early Bird' is in a stationary orbit somewhere over the Atlantic and inter-continental telephone calls via satellite are destined to become everyday occurrences, the GPO's tracking station at Goonhilly has been completely modified to cope with the expected volume of traffic.

Modifications have included a new, shallower reflector surface for the aerial dish, which has brought its performance up to, if not ahead of the American and French horn type aerials. The control system too, which steers the aerial, has been modified, for although the satellite is practically stationary in relation to the Earth, there will be some movement. Weak signals received at the aerial will be amplified by travelling wave masers newly designed by Mullard Limited.

Satellite 'Early Bird' in conjunction with Goonhilly or either the French or German ground stations, will eventually provide up to 240 telephone circuits between the North American continent and a network of European countries.

. . .AND G6AG CONTACTS "OSCAR III"



Mr. C. J. McClelland (G6AG) of Chalfont St. Peter, Bucks., seen here in his shack, has the distinction of being the first amateur operator to receive reports from the U.S. of trans-Atlantic v.h.f. reception of transmissions he made via the communications satellite Oscar III. Other reception reports arrived from Czechoslovakia, France, Belgium and many English stations, while actual contacts were made with amateurs in Germany, Switzerland and Sweden.

Mr. McClelland, who is a Chief Engineer at Ultra Electronics Ltd., used a home-made transmitter operating at 1kW on 144.1Mc/s for these contacts, the satellite equipment converting and re-transmitting the signals on 145.9Mc/s \pm 25kc/s.

TRANSISTOR TESTER KIT

Just £24 18s. will buy one of Heathkit's latest test equipment kits, the IM-30U transistor tester. Available also in assembled form at £35 10s., this new instrument from Daystrom Ltd., Gloucester, will provide complete d.c. analysis of p-n-p and n-p-n transistors and permit direct read-off of d.c. gain (alpha, beta). Facilities for many other tests including diode or collector-to-emitter and collector-to-base leakage, collector current and voltage, etc., make the model IM-30U a really comprehensive piece of equipment.

.. COMMENT

SMALLER AND SMALLER

The Japanese radio manufacturers Standard have recently added three new pocket-sized receivers to their range. The most inexpensive of the three, the G433, is also the tiniest, measuring less than $1\frac{1}{2}$ in. x 2 in. x $\frac{7}{8}$ in. Inside this minute case Standard have packed a 7-transistor circuit, a $1\frac{1}{2}$ in. speaker, a ferrite rod aerial and two mercury cells. Denham and Morley Ltd., are the UK agents for this radio which costs £9 19s. 6d., and all other Standard receivers.

THE "PIRATE" DANGER TO SHIPPING

During February this year an urgent radio report from a lightship to a shore base was held up for 30 minutes because both frequencies normally available were blocked, one by a pirate broadcasting station. This was only one instance of shipping communications bands being blocked by pirate operations, but it clearly illustrates the very real danger they present.

In a written answer to a parliamentary question recently, the Postmaster-General, listed 19 specific instances when transmissions from pirate radio stations had caused interference to ship to shore communications, seven of these instances singling out 'Radio Caroline' as the offender.

A NEW WAY TO VARY RESISTANCE

A new device which permits completely noise-free resistance control, has been introduced by Mullard. In appearance it is a plastic block measuring 17mm x 17.5mm x 22mm, with just four lead-out pins. Enclosed in this block are a cadmium sulphide cell and a 12V filament lamp. Varying the brightness of the lamp causes changes in the resistance of the cell and control over at least three decades (typically 100 to 10,000 Ω) can be achieved with complete lack of noise.

A JUKE-BOX FOR YOUR HOME

Now for the first time, for anyone who wants it, KB (Footscray, Kent) offer four hours of continuous 7in. record playing (or $7\frac{1}{2}$ hours on e.p.'s) with their new Discomatic portable juke-box.

The Discomatic houses forty 45 r.p.m. records and will automatically select and play any of the 80 sides in order selected by push buttons. The output from its transistorised amplifier is $2\frac{1}{2}$ W and additional speakers and amplifier may be connected.

The price you pay for having a juke-box in your home is 69 guineas, but then, unlike commercial machines, you don't have to put any money into it once you've bought it.



more News and Comment

Overseas Ham

I AM happy to inform you that I recently passed the R.A.E. and obtained my ticket (9M2FF).

I have just built the Beginner's 10W Transmitter (P.W. Dec. '63), which I will use as a top band and standby transmitter.

Over the years I have built many constructional projects from PRACTICAL WIRELESS designs, and they all work very well. Thank you for a most interesting magazine.

Mohd. Yusoff Bin Mohamed.

Mersing, Johore.
Malaya.

Considering the difficulties overseas readers often face in obtaining components, it is always gratifying to hear of the perseverance with which they pursue their hobby.—Editor.

Bottling Acid

In the May, 1965, issue you printed an article by F. L. Thurston, a continuation of "Cabinet and Chassis Techniques". Mr. Thurston describes processes involving certain chemicals and towards the end of the process advocates that "all chemicals involved should be well stoppered up in glass containers".

I would point out, however, that one of the chemicals is hydrofluoric acid, which attacks glass and should thus be kept in bottles made of wax or gutta-percha.

Ian Gregory. Boreham Wood.
Herts.

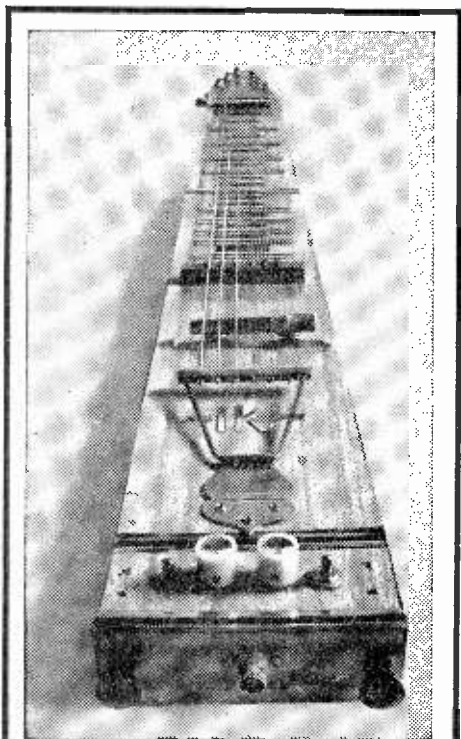
Excellent Design

My thanks to P.W. and Mr. Groome for the excellent pulse-counter f.m. tuner design in the April issue. I made up the simpler, single limiter version and quality has proved at least equal to that from a very well known tuner selling at more than £25. By the way, I found the greater gain of an EF183 frame grid pentode, instead of the EF80 specified for the first stage, helpful in this fairly weak reception area.

H. E. Owens.

Hornsey,
London, N.8.

on page 148



AN ELECTRONIC

Hawaiian Guitar

by I. J. Kampel

COVER
SUBJECT

THE conventional electric guitar today enjoys an immense popularity, but not so much is heard of the Hawaiian guitar, an instrument capable, in the right hands, of producing most enjoyable music, its very construction making the need for an electronic tremolo non-existent.

The body of the guitar is made from a solid plank of soft wood which, when completed, will be completely covered with Formica. A gloss

grained Formica is used to give the benefits in appearance of polished wood. Although a channel and a hollow pocket must be cut out of the wood, no difficult shaping is required.

The article will describe two designs for pick-up heads which may be constructed quite cheaply as compared with manufactured heads, the cheapest of which is little under £2. This is where the chief part of the metalwork comes, hence if the constructor has neither the tools, facilities nor abilities to tackle it, a head might be purchased.

The pre-amp and control circuit must be very carefully constructed, as only absolute minimum volume has been allowed for these—little over six cubic inches!

Principle

Just as a tape-head responds to varying strength magnetic fields, as produced by the magnetic tape passing the head, so the pick-up head of the electric guitar responds to varying magnetic fields.

Fig. 10a (on the Blueprint) indicates three bar magnets placed side by side. Every magnet has two poles—which are known as north (N) and south (S) poles. It is a well known fact that unlike poles attract and like poles repel. Hence, a N and S pole attract each other where a N and N or a S and S tend to repel each other. Fig. 10a indicates unlike poles placed side by side, and the dotted lines, representing the magnetic fields, indicate that they are attracted to each other where, alongside, Fig. 10b, where we have three like poles, they are seen to repel. North poles are indicated, but the effect would be exactly similar if they were south poles (as of course they are at the other end of the magnets).

Now consider Fig. 10c. This corresponds to Fig. 10a, but now we have above the first two an oscillating steel string which effects the magnetic fields. As the poles attract, the left-hand magnet's field is effected by the string directly above it, but as its field strays across towards the other magnet, not only does it affect the neighbour's magnetic field by its own changes due to the first oscillating wire, but also it is effected by the neighbouring oscillating wire.

It will be seen in Fig. 10d, with like poles, that the influence of one pole upon its neighbour is not nearly so great and that each magnet is more free to 'consider' the frequency of the oscillating wire above it.

Gain, tone and a rhythm switch are provided as well as the necessary on/off switch. It is, however, a simple matter to eliminate the rhythm switch if desired, but more of this later. The output may be fed to a guitar amplifier or any high-gain amplifier.

Construction of Guitar Body

The minimum dimensions of the piece of timber required for the body (planed), are 3ft. 6in. x 5in. x 1½in., though 6in. is perhaps an easier width. Firstly square one end and draw clearly a central line up the timber, taking measurements from either side of this except where stated. Mark 2½in. off at either side and then 1½in. on either side 35½in. from the base. This gives the taper where symmetrical. Then mark the taper-off, one side

(see Fig. 6) to a point $\frac{1}{4}$ in. from the central line, 6 in. further along. Extend the original taper on the other side for a further $1\frac{1}{4}$ in. before taking it to its top point $\frac{1}{4}$ in. from central line. The basic outline may then be cut.

A step is then cut out of the upper portion of the wood, leaving only $\frac{1}{4}$ in. width, to take the two treble key units. These should be purchased from a music shop, and the type with the winding knob set at right-angles to the metal pin, three per plate, should be used. These must be staggered to allow room for the two on opposite sides. Position these with care before drilling the holes through which pass the pins. Screws in the plate on the reverse side secure the two base plates of these keys. The pins usually have a small point on their top, just enough to mark clearly central indentations if a piece of card is pressed on top of them, or more practically if they are pressed on to a piece of card. Thus a template can easily be constructed. It is important that these holes are positioned accurately or the plates will not push home or may cause the pins to bend. If large, it might be necessary to cut the corner off one of the base plates to fit in the space provided. See that the pins line up with the slope of the taper.

Now we may move on to the further end of the instrument, the business end. As Fig. 6 shows, a $3\frac{1}{2}$ in. x 2 in. rectangle is cut from the base to make room for the electronics, leaving two wooden sidepieces tapering from $\frac{1}{4}$ in. A number of saw cuts in the portion of wood to be removed will ease the chiselling operation. When the rectangle has been removed and the edges tidied up, from the top and the bottom of the wooden sidepieces, saw or chisel enough to just allow a sheet of aluminium to sit across the sidepieces flush to the other wood.

When this has been completed a $\frac{1}{4}$ in. channel about $\frac{1}{2}$ in. deep must be cut down the central line to the point $10\frac{1}{4}$ in. along where a channel across the grain is cut to take the underside of the pick-up head. Bevel the channel down where it enters the end pockets.

Other than the pre-amp a battery has to be contained within the instrument to power it. The battery, housed in a hollow near to the pre-amp, accessible from the underside. A compartment is cut out just large enough for the battery and is covered by either a plywood lid (it will not be seen) or a block of the same wood as that of the instrument, $\frac{1}{4}$ in. thick. The compartment is cut in from the side of the wood as the Formica covering will hide the gaping hole thus made, at right angles to the tapering side, for if it is cut in relation to the central line we have an unsuitable shape. The battery itself, leaving room for contacts, requires a volume of 3 in. x 2 in. x $\frac{1}{2}$ in. below the underside of its covering lid which screws into place with two countersunk screws, one in either side of the $\frac{1}{4}$ in. wide supporting ledge, just deep enough to make lid flush with base of instrument. This compartment will just break through at the back to the central channel. If you use a metal plate as a battery cover, or some very thin material, and do not break through to the channel, it will be necessary to drill a hole through to the channel, as the power supply wires run along this channel to the pre-amp.

Construction of Preamp Chassis

Firstly a tapering plate of aluminium is cut to fit on the underside of the instrument, $2\frac{1}{2}$ in. long, the width of the guitar (tapering from 5 in). Holes are countersunk for four screws, and this may be screwed in place. Take next another piece of aluminium, scribe a line $2\frac{1}{2}$ in. in from one side, and then cut a 5 in. width of aluminium about $4\frac{1}{2}$ in long, tapering it from the scribe to match the taper of the base of the instrument. Before bending mark out and drill for the two switches and two potentiometers. Provided that small carbon potentiometers are used, when placed side by side with the switches, *touching*, there will be just enough room, but there is no room for mistakes or spacing between these components. The holes should be drilled on a central line across i.e. $1\frac{1}{4}$ in. from base. As dimensions of different makes may differ slightly these measurements are not given. There is just, without any breathing space, enough room for two small carbon potentiometers plus two toggle switches.

When the holes for these components have been drilled, fold the aluminium at a right angle to fit round the top and end. Drill next for a chassis-mount type coax socket, and when this has been done fold over a small lip to just rest on the lower base plate, already affixed to the instrument. Before folding this over, however, two further holes should be drilled if it is wished to store the instrument on end. These are to take either kettle knobs, bolted to the inside of the chassis, or small cupboard doorknobs, passing through a hole in the aluminium to screw into the base of the wooden sidepieces. Holes are also drilled, four in number, on the topside of the metal, to take two securing screws in either sidepiece. N.B.: Doorknobs screwed into base of sidepieces will not be sufficient to hold on chassis. Chromium-plated, round-headed screws, $\frac{1}{2}$ in. long, say No. 4's should be used for the top. To give full screening to the pre-amp, the three remaining sides of the pre-amp compartment may be lined with very thin tin-plate or aluminium, making sure that all are electrically linked, but it will be necessary of course to cut out a section in the one across the width to expose the channel. See Fig. 3.

Fitting the Formica

After checking that the sides of the instrument are square lay the shaped timber the correct way up on to the top surface of the Formica to be used, and pencil round the outline.

When the outline has been marked in pencil, and checked, enlarged by a Formica's width all the way round, scribe the line to be cut. Remember that if grained wood, the grain should run down the instrument rather than across.

Position the holes for the pins at the top end carefully, drilling the Formica, from the top surface, holes just large enough for the pins to pass through. Always work Formica from the top surface to prevent chipping. Saw across the Formica at the bottom end slightly less than the $2\frac{1}{2}$ in. the plate covers. From the shop where the Formica is purchased may also be obtained a selection of edging, though expensive (4d. per ft.), enhances the finished appearance greatly. A $\frac{1}{4}$ in.

width of gold strip with a central black line was selected by the author, this edging being quite thin, flat and easily cut with scissors. This was also used to break the monotony of the sides, as well as mark the frets (see Fig. 7). If a piece of edging is fitted on the top of the Formica that is stuck to the top of the chassis, at the base and across the join, overlapping slightly, keeping the controls on the centre line between the edgings, the edging overlaps the Formica join and make it indistinguishable. The chassis section of course is held to the main body of the instrument only by the screws and is thus easily detachable.

A rectangle $2\frac{1}{2}$ in. x $\frac{1}{2}$ in. must be cut to fit exactly over the cross-ways channel designed to take the pick-up head. This may be chiselled, but if so it is advisable not to use a good chisel. If fret-sawed the side cut will still have to be chiselled unless the blade will turn through 90° .

The next step is to measure 4 in. towards the base of the instrument from the centre of the cross-ways channel. This is the position for the bridge. Then, using Fig. 6 and the Table, the positions for the frets may be marked. The distance from the bridge (B) to the 12th fret should be the same distance as that from the 12th to the top bridge (T.B.), in this case 12 in. Mark this out initially, and then mark off the key frets—3, 5, 9 etc. When this has been done then drill holes along the central line where these key frets cross, and also at the two bridges, just large enough to take small $\frac{1}{8}$ in. screws, countersinking them. Screw two or three in to hold the Formica in place.

Cut strips of Formica to go along the sides, ensuring that the grain runs the length of the instrument. The top Formica should overlap the side Formica, and the top Formica may be planed flush. Finally cut and shape pieces of Formica to fit the underside of the top cut out, drilling through where necessary to allow the fixing screws for the key plates to pass through, and also cut a piece for the base of the instrument, drilled as the aluminium for the coaxial socket. It is best to fold the aluminium, stick the Formica to it and to then drill all necessary holes in one operation.

A combined bridge and tailpiece may be used for the instrument if you find it possible to obtain one, but this may be difficult. If one is obtainable, however, the instrument may be made shorter. The tailpiece used in the prototype was designed to fit over the end of an instrument, being bent at a right-angle. This was straightened out to fit flat on the surface. Some length could be taken off if the furthest end of the tailpiece was cut off and new screw holes drilled. This was not done as the tailpiece shaping looked better as it was.

Position the tailpiece on the central line between the bridge position and the edging put across above the controls. Its position is not critical. Mark the positions of the screw holes and then drill them. Any central ones will unfortunately fall in the central channel and hence only a false screw through into a small block of wood may be put or a bolt if one is found to match the screws. At least two screws should go through to solid wood. To prevent this the channel could be offset. There is, however, a reason why at least one screw in the channel could be of use (explained later).

The stage has now been reached when the Formica may be stuck down. The most suitable adhesive is Evo-Stik. When the two sides have been stuck—leave after impact for ten minutes—plane off the edge of top piece of Formica if this has not already been done and unscrew. This is then stuck on before placing screws all the way down. If these screws are not put through the surface Formica there is a danger that the tension of the strings—pulling at one end on the pins, which in turn pull on the Formica, and at the other end the tailpiece, which through its screw has a similar effect—might cause the whole length to buckle upwards.

You may now mark out the additional frets, sticking edging across the marks as the final marking. Where on an ordinary guitar the frets project upwards and the fingers press the strings down on to these frets, on the Hawaiian guitar the strings never touch the frets and the fingers themselves do not play such an important role. A metal bar is used on the strings, sliding it up and down, quick oscillating movements about a point causing a tremolo effect.

The key frets, those marked initially, must be distinguishable from the other frets and this can be done in two ways. In ordinary guitars a spot is commonly placed by the fret to indicate it, for in the ordinary guitar the finger presses the wire in the spaces between frets rather than hovering above the frets as does the bar with a Hawaiian guitar. The second method, and seemingly more suitable for this type of guitar, is to make the key frets different to the other frets. The author did this with the black and gold edging, using the full width for key frets, so covering the countersunk screw heads and only the cut-out central black line of the edging for the other frets. All frets except the most important fret, the 12th, were made the same length, the 12th much longer as Fig. 7 indicates.

With the two plates of keys screwed in place at the top and the tailpiece near the bottom, the Formica on and edging where desired and indicating the frets, it only remains to complete the electronics and make a pick-up head.

N.B.—It would be most unwise to construct the body of the guitar as a light plywood frame as the extreme tension of the strings combined with the warping quality of plywood would make it a most unsound proposition.

Preamplifier and Control Unit

The circuit is as indicated in Fig. 1, the pick-up head is in series with the first transistor's emitter in the grounded-base low-impedance configuration. The output is taken from Tr3 collector via a coupling capacitor. The output is coupled via VR1, the gain or volume control, and is then fed through the filter or tone control, using screened leads, and finally through the rhythm switch to the output socket.

It will be seen that when S1 is closed R7 is shorted out and gain is determined solely by VR1. If, however, the switch is open R1 is included in the output circuitry, so reducing the volume slightly. This means that it is not necessary to adjust the gain control to drop volume briefly and

when dropped it is a simple matter to flick back to original volume. It will also be seen that with this method the reduced volume introduced by the rhythm switch being open drops the volume to a lower level, proportional to that of the original gain setting and not simply to a lower pre-selected level determined by a resistor, regardless of original setting, as many do.

If the level obtained with this rhythm switch is not quite what is required it is varied by simply changing the value of R7. Increase this resistor to about $3.3k\Omega$ and the rhythm level will be even lower. Obviously if the resistor is decreased, say to just above $1k\Omega$, then the level will not drop as much.

As will be seen, the circuit incorporates a facility for shorting the output socket and hence the amplifier input when connected. This is only to be used where the instrument is plugged into a socket that has a shorting-jack, i.e. shorts out input at amplifier when no plug is inserted. This is to prevent pick-up when instrument is connected to amplifier but not switched on. Before adding this facility *be sure that the input you intend to use should be shorted before doing this, and if more than one amplifier may be used do not add this facility. If in doubt leave it out.*

The circuit is powered by a 4.5V battery. This type has two brass spring clips projecting out of the top, one longer than the other. *Note that the shorter one is positive.* When the battery seal has been broken it is usual to then remove a thin piece of slitted cardboard to reveal the contacts completely. For this use it is best to leave this cardboard in as it prevents the longer contact shorting against the other if pressed in. There is just room at either end to make contacts and *miniature* bulldog or crocodile clips may be used for this purpose. Contacts may be soldered on but this, to say the least, is inconvenient. Tinned looped wires will serve if the small contact is bent and the card removed to just slide the loop over the longer clip.

Components are mounted on the paxolin side of a 2 x 2in. section of Veroboard.

Fig. 4 shows the copper side of the board and Fig. 5 indicates the circuit layout. The other

components are best left flying as this means less wires to and from the circuit board. It will be seen that there are only three breaks (Fig. 4) at the reference points D1, G2 and D8.

Fit all components on to the board by bending the wires on the reverse side, then check the circuit before soldering. When soldering, heat shunt transistor leads on the upper side and remember that it is always advisable to slip sleeving over them to prevent shorting. This applies especially to Tr2 collector and Tr3 emitter, which pass very close to each other, not to mention all leads on Tr1. A7 to A8 is simply a wire linking tracks 7 and 8 (links only section of track 8). Cut off wires *after* the component has been soldered.

Fig. 2 indicates the wiring of pots and switches on the chassis.

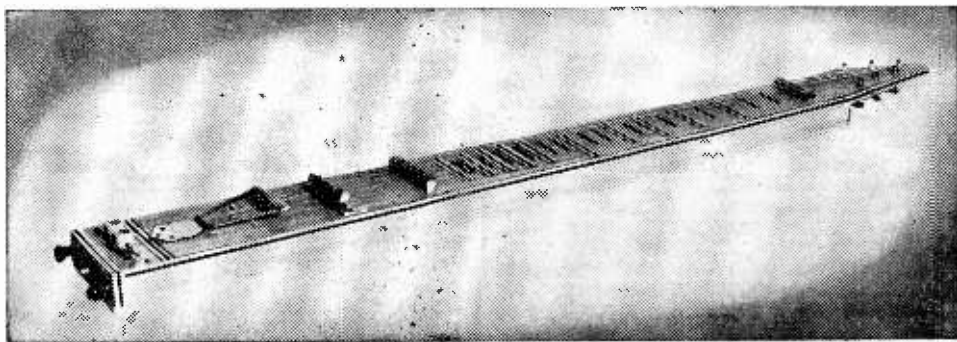
The circuit board will sit most comfortably beneath the two potentiometers if these are of the miniature type.

Use microphone coax. from the pick-up head to the circuit board and also from circuit board to VR7 and all along the output line to socket, earthing all screening to chassis.

Because of the extreme compactness of the unit it will not really be necessary to anchor the Veroboard as there will be just no room for it to move! A very thin insulator—mica, card, tape, paxolin—should be placed on the baseplate and then the board laid upon this. This is to prevent the aluminium shorting to the copper tracks. When wiring see that components are pulled firmly and tightly on to the board and see that the transistors lie down flat also. It is advisable to place another flexible insulating sheet over the components then, sandwiching them, as the contacts of the controls approach very close.

An Alternative Circuit Board

If for reasons of economy or unavailability Veroboard cannot be used, a printed circuit can be made fairly easily, using the copper-clad laminated board more commonly available. Mark out this in strips as in Fig. 4, making small holes where the holes are indicated, then etching away



The prototype instrument is finished in wood-grain Formica and gold-and-black edging material, and is seen here complete and ready for playing.

the copper not required. The square should be just under 2in.

Other Guitar Requirements

A metal bridge will be required and it is better to obtain this from a music shop than attempt to make one. This should be held in position by the tension of the strings alone. It is placed directly over the lowest exposed countersunk screw head if previous directions were followed carefully, as does the upper guide bridge, standing over the upper exposed screw head. The upper one may be pinned or glued in place. It may be found necessary to slightly raise the upper bridge if wires are not taut across it. A small wooden block or even one or more layers of Formica will do this quite easily.

You then require only the bar that is slid up and down the strings or "steel" as it is known. 5s. at a music shop and not worth the effort making (a polished surface must be offered to the strings) and a plectrum. Three of these are used by many players of a type that pushes on to the end of the thumb or finger.

Lastly but, of course, by no means least the key part of the whole instrument, you require a pick-up head.

Construction of the High-quality Pick-up Head

These, except for the inferior crystal-mike type, tend to be rather expensive. However, an excellent head may be constructed for a few shillings with a little care which gives an extremely good performance. This design is shown on the front cover and on this month's free blueprint. This requires some careful drilling and the facilities to do so. If this presents no problem there should be no difficulty.

The magnets diameter is not critical but should be around $\frac{3}{8}$ in. diameter and length about $\frac{1}{2}$ to 1in. These magnets are embedded in a brass block as this metal is non-magnetic, dimensions being $3\frac{1}{2} \times \frac{1}{2} \times \frac{1}{2}$ in.

Mark the centre point on one side of the brass block— $1\frac{1}{2}$ in. from either end—and then on the central line mark 0.5cm on either side of this central point with two more marks on either side spaced 1cm from those marked lastly, i.e. six points 1cm apart. These six points should be carefully centre-punched ready for drilling. Also centre-punch for a hole at either side to take securing screws for the head. The change of units— inches to centimetres—was necessary due to the fact that 1cm expresses the distance better than a fraction of an inch.

Drill the holes at either end for the securing screws, countersunk on one side. Drill holes through block at the remaining six points just large enough to allow the magnets to be used to push in tightly. An experiment with an odd piece of metal would be wise before drilling the block. When these holes have been drilled, on the opposite side of the block to that which was countersunk for securing screws, drill to a depth not exceeding $\frac{1}{8}$ in., holes to take diameter of windings on magnets, not exceeding $\frac{1}{8}$ in. See Fig. 8.

Magnets are not the easiest of items to obtain and if you have difficulty in obtaining rod magnets suitable it should be possible to order through

your local electronic spares stockist the following magnet manufactured by Mullard Ltd.:

5.3 mm diameter, 20mm long Magnadur 1, rod magnet, No. FD196.

Six magnets will be required, of course, and the type mentioned have their north poles indicated by a white spot. If the poles of the magnets to be used are not marked it is necessary to at least determine like poles. Take any two magnets and bring them together end to end. If they attract they are unlike poles and if they repel they are like poles. It will be obvious that if they attract, turning one magnet round will cause them to repel. Mark the ends that repel. Place one magnet to one side and then compare one of the marked magnets with an unmarked to determine which pole repels the pole marked. The one that does is like, may be marked, and hence by this method like poles determined for all six magnets.

Take a scrap piece of wood and drill six holes about 1cm apart just large enough for the base of the magnets to wedge in. Stand the six magnets in the holes, the marked poles in the wood (the only reason for this is that then the end of the magnets to be seen projecting through the head will not be marked).

A length of 36s.w.g. enamelled copper wire is then taken and wound on to the magnets in series, starting with the left-hand magnet, finishing at the right. Close-wind on the centre of each magnet, in turn, 50 turns of wire, taping or by some method securing the winds when completed. Lift the magnets out of the wood in turn to wind, replacing when secured, and go on to the next. Keep the length of wire from one magnet to the next as short as possible, taking the two final ends of wire at either end and cutting off, leaving enough length to stretch to the far end.

Fit the magnets into the brass block, ensuring that they go in the right way up, and then, if at all loose, secure by dropping a resin such as Araldite or Epofen down from the reverse side. Bostik or Durofix will serve if the above mentioned are not at hand. If necessary surround magnets on top of head but keep quantity of resin or adhesive to absolute minimum. Finally take the two ends of wire to the centre and twist together to hold in place, scraping off the enamel for electrical connections, cutting short if necessary.

The magnets should be as close to the strings as possible without the danger of them actually touching; $\frac{1}{8}$ in. should be quite safe. Before completing the head it is advisable to fit one string on to the guitar and to measure the space between it and the top surface at the point where the head will go. Deducting $\frac{1}{8}$ in. for the brass bar, and a further $\frac{1}{8}$ in. for spacing, the remaining is the amount the magnets should project through the block.

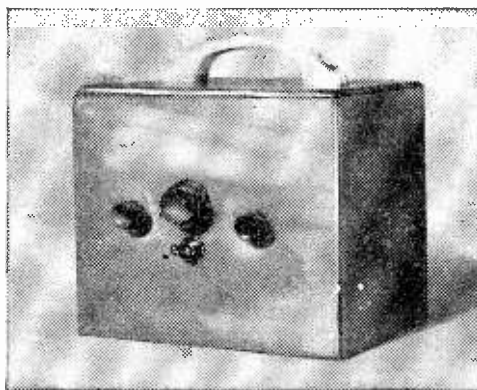
Microphone-type coaxial cable should be soldered to the ends of the wires at the head and fed up the central channel back to the preamplifier compartment. When holes have been drilled in the Formica at either side of the head's recess to allow the securing screws to pass through, the head may be screwed into place with countersunk brass-coloured screws to match the head.

NEXT MONTH A SIMPLER PICKUP HEAD IS DESCRIBED

FOR
THE BEGINNER

Simple Two-Transistor Set

by P. Taylor



THE theoretical circuit is shown in Fig. 1. The external aerial is coupled to the receiver either via C1 or TC1, depending on the position of the wavechange switch S1. TC1 has been made variable so that optimum results may be obtained on the crowded medium wave band. As will be seen from diagrams, the tuning coils have been wound on a 5½ in. x ½ in. piece of ferrite rod, the type that is commonly available from any good radio component stockist. This method results in the aerial coils having a very high "Q" which improves sensitivity and selectivity.

The r.f. signal which appears across the aerial circuit (which is tuned by VC1) is passed to the detector D1, a germanium diode.

The audio signal is then passed to the base of Tr1, the first audio amplifier. Amplified signals from the collector of Tr1 are then passed, via C2, to the base of Tr2, the audio output stage. R2/R3 are emitter biasing components and transformer T1 is the loudspeaker matching transformer. Potentiometer VR1 acts as a volume control.

Constructional Details

The chassis was made from a 6 in. x 5 in. x ½ in. piece of deal with small brass carpentry nails or pins (½ in. long) placed in the positions shown in Fig. 2. These are driven in to a depth of approximately ¼ in. These form the tagpoints for

Fig. 2: The wooden base-board which acts as a "chassis", components being soldered to heads of nails driven into the wood.

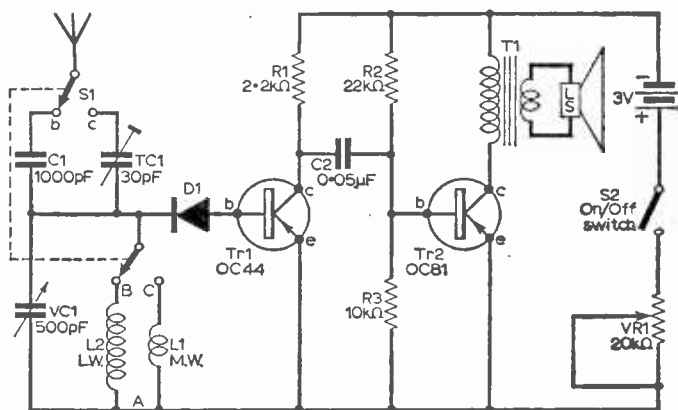
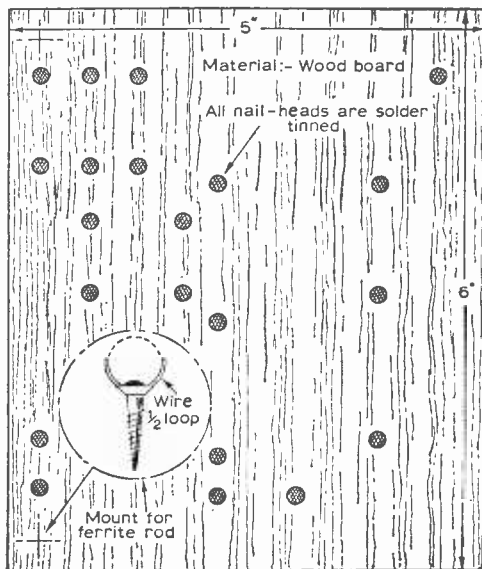


Fig. 1: The simple circuit of the receiver. D1 can be practically any crystal diode, and T1 is a transistor output transformer.



PCR MODS

BY W. V. WOODS

Improving the PCR, PCR2 and PCR3 ex-government communications receivers.

LARGE numbers of the PCR communications receivers are now available on the surplus market covering the following frequencies: PCR, LW, MW, SW 15—50m, internal speaker. PCR2, LW, MW, SW 13—50m, external " PCR3, MW, SW1 120—43M.

SW2 43—13m, " "

While these receivers generally have quite a good performance it is obvious that they have a number of shortcomings which, after all, is only to be expected, since most of the PCR's are approximately 20 years old and great progress has been made in the development of radio receivers since the 1940's.

The PCR's were originally designed to work off a 12V d.c. supply with the h.t. (250V) provided by a vibrator pack. One of the first jobs therefore is to provide a mains power supply.

The valve heaters are wired in series parallel to operate from 12V, so these must first be rewired in parallel to work off 6.3V: a suitable power supply is shown in Fig. 1. The choke (L1) is usually already fitted to the PCR.

There is ample room for the mains transformer (T1) to be mounted on top of the chassis, but in order to leave space for any further additions it may prove necessary to move L1. On the PCR2 and 3 L1 can be placed between the front panel and the output transformer, the mains transformer (T1) is then mounted in the space formerly occupied by L1. On the PCR the loudspeaker prevents the re-mounting of L1. This may be overcome by fitting a physically smaller choke in place of L1; the new choke could be mounted under the chassis. If no other additions are envisaged L1 may be left in its original position and T1 mounted in the remaining space between L1 and the front panel. Care should be taken to place the cores of L1 and T1 at right-angles to one another, otherwise mains hum may be induced into the h.t. line.

The valves normally fitted to the PCR's are:

- V1 R.F. amplifier, EF39.
- V2 Frequency changer, ECH35.
- V3 First i.f. amplifier, EF39.

- V4 Second i.f. " EF39.
- V5 First af, avc, det, EBC33.
- V6 Audio output, EL32 or 6V6G.

An improvement in r.f. gain can be achieved by replacing V1 with a 6SG7 or its miniature equivalent the 6BA6. The 6SG7 requires least mechanical work since it fits the same octal socket as the EF39 and only requires rewiring of the socket and the reduction of the cathode bias resistor to 68Ω; the 6BA6 requires a B7G socket and mounting plate.

These two modifications considerably improve the PCR's performance and are intended for constructors who do not want to disturb the original wiring too much. However, for those who wish to make more extensive modifications and additions there are a number of other circuit changes that can be made.

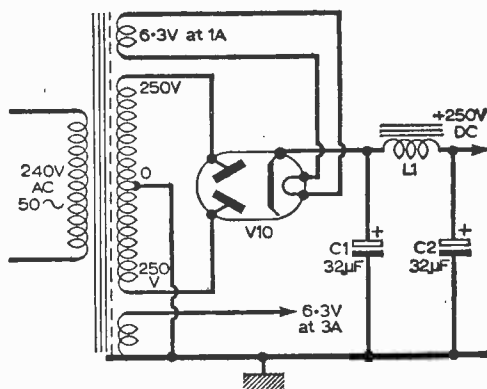


Fig. 1: A simple power supply circuit designed to replace the vibrator unit fitted to the original.

COMPONENTS LIST

- C1, C2 32+32μF electrolytic 350V
- V10 EZ81, EZ80, 6V4, 6X5GT, 6X4
- T1 Mains transformer. Secondaries: 250-0-250V, 70mA; 6.3V, 3A; 6.3V, 1A
- L1 10H 70mA L.f. choke

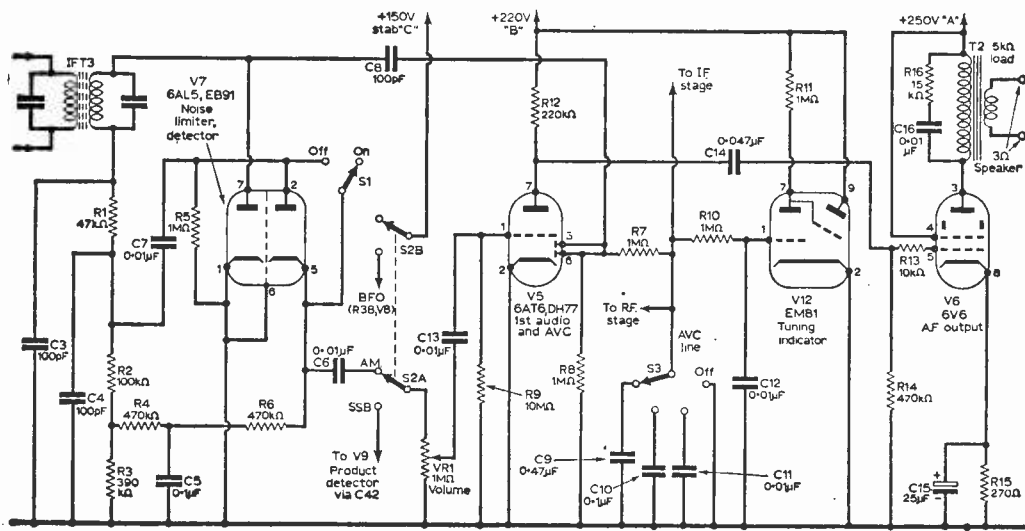


Fig. 2: A rearranged a.g.c. line as shown here permits increased i.f. gain without the risk of overloading the receiver. In this circuit, S1 is the noise limiter on/off switch; S2A, B is the a.m./s.s.b. switch, and S3 the a.g.c. time constant control.

COMPONENTS LIST

Resistors:

R1	47k Ω	R9	10M Ω
R2	100k Ω	R10	1M Ω
R3	390k Ω	R11	1M Ω
R4	470k Ω	R12	220k Ω
R5	1M Ω	R13	10k Ω
R6	470k Ω	R14	470k Ω
R7	1M Ω	R15	270 Ω 1W
R8	1M Ω	R16	15k Ω

All 10% $\frac{1}{2}$ W carbon, unless otherwise stated
VR1 1M Ω potentiometer

Switches:

S1	Single-pole on/off
S2A,B	Double-pole change-over
S3	Single-pole 4-way

Transformers:

T2	Output transformer: 5k Ω : 3 Ω turns ratio
----	--

Capacitors:

C3	100pF ceramic 350V
C4	100pF ceramic 350V
C5	0.1 μ F paper tubular 350V
C6	0.01 μ F paper tubular 350V
C7	0.01 μ F paper tubular 350V
C8	100pF ceramic 350V
C9	0.47 μ F paper tubular 350V
C10	0.1 μ F paper tubular 350V
C11	0.01 μ F paper tubular 350V
C12	0.01 μ F paper tubular 350V
C13	0.01 μ F paper tubular 350V
C14	0.047 μ F paper tubular 350V
C15	25 μ F electrolytic 25V
C16	0.01 μ F paper tubular 350V

Valves:

V5	6H6GT/G	V7	6AL5 or EB91
V6	6U6GT/G	V12	EM81

A.G.C. and Noise Limiter

In the PCR's original form a.g.c. was applied to the r.f. and first i.f. stages only. Since there was no manual r.f. gain control it was possible to overload the set on strong signals and to overcome this the gain of the i.f. stages (V3 and V4) was limited by using larger than normal cathode bias resistors.

By rearranging the a.g.c. line (Fig. 2) so that V1, 3 and 4 are all controlled by the a.g.c., we can increase the i.f. gain without the risk of overloading. The cathode resistors of V3 and V4 should be reduced to 330 Ω and 220 Ω respectively. A.G.C. is not applied to V2, thus enabling it to work at maximum gain.

This alternate a.g.c. system has the advantage that we can alter the a.g.c. time constant by

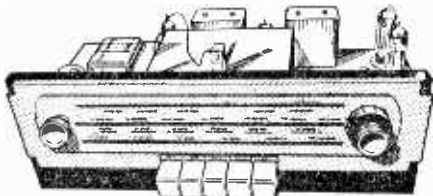
switching in different valve by-pass capacitors; this can be very useful for combating various types of fading on distant short wave stations.

By substituting a 6AT6 or 6SQ7-GT for V5 we can simplify the audio and detector circuits considerably and make the circuit more suitable for the addition of a noise limiter, a most valuable addition to the receiver! The 6AT6 or 6SQ7 also increases the audio gain.

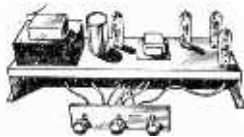
By removing the 8 μ F electrolytic (next to V6) from the chassis and using wire-ended capacitors in the power supply we now have an extra hole in the chassis.

Work should commence by stripping out all wiring surrounding V5 and V6, including the tone control switch and bracket. An octal socket for V6 is now placed in the hole originally occupied

BRAND NEW AM/FM (V.H.F.) RADIO GRAM CHASSIS AT £13.13.0 (Carriage Paid)



Chassis size 10 x 6 x 4 1/2 in. High. New manufacturing plant for a 10 in. in colours, predominantly cream. 200-250V. A.C. only. Pick-up, Ext. Speaker, Ae. E., and Dipole Sockets. Five push-buttons—O.P.F. (L.W., M.W., H.F.), and Gram. Aligned and tested O.P. Transformer. Tone control, 1000-1900 M.; 200-550 M.; 88-98 Mc/s. Valves E280 rect.; ECH81, EF89, FAB280, ELN4 ECUS5, 3-ohm speaker required. 10 x 6 in. ELLIPTICAL SPEAKER 25/- to purchasers of this chassis. TERMS: (Chassis) £3.10.0 down; and 5 monthly payments of £2.4.0. Cheap Room Dipole for V.H.F. 12/6. Feeder 6d. per yard. ALTERNATIVE DESIGN, L.W. 1000-1900 M.; S.W. (8-15 Mc/s); M.W. 190-475 M.; V.H.F. 87-100 Mc/s; Gram position. Otherwise similar to above chassis. Price £15.15.0 (car. paid). TERMS: £3.10.0 down and 6 monthly payments of £2.4.0. Total H.P. price £16.14.0. Circuit diagram 2/6.



PUSH-PULL O.P. AMPLIFIER £5.5.0 (6/- Car.)

Brand new 200-240 A.C. mains. Bass, treble and vol. controls, with valves E280, ECOS8 and 2-EL84's giving full 8 W. Chassis 12 x 3 1/2 x 3 1/2 in. With o.p. trans for 2-3 ohm speaker. Front panel (normally screwed to chassis) may be removed and used as "living panel."

GUITAR AMPLIFIER—8 WATTS. £5.4.0 (6/- P. & P.)

Chassis as above. Valves E280 x EL84, 6 BRS. Output for 8 and 15 ohm bass, treble and volume controls. On/off. Input 200/240V.A.C. Also suitable for neck-up radio etc.

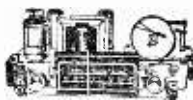
INTERNATIONAL TAPE

Famous American Brand—fully Guaranteed at record low prices. In sealed cartons.

3in. Message tape, 150ft.	3/6
3in. Message tape, 225ft.	4/11
3in. Message tape, 300ft.	7/6
3 1/2in. Triple play, 900ft. Mylar base	15/-
4in. Triple play, 900ft. Mylar base	17/6
5in. Double play, 1,200ft. Mylar base	15/-
5in. Long play, 900ft. Acetate base	10/-
7in. Standard play, 600ft. P.V.C. base	8/6
5in. Triple play, 1,800ft. Mylar base	35/-
5 1/2in. Long play, 1,200ft. Mylar base	15/-
5 1/2in. Double play, 1,800ft. Mylar base	22/6
5 1/2in. Long play, 1,200ft. Acetate base	12/6
5 1/2in. Standard play, 900ft. P.V.C. base	11/6
7in. Triple play, 2,400ft. Mylar base	45/-
7in. Standard play, 1,200ft. Mylar base	12/6
7in. Long play, 1,800ft. Mylar base	19/6
7in. Double play, 2,400ft. Mylar base	25/-
7in. Long play, 1,800ft. Acetate base	15/-
7in. Triple play, 3,600ft. Mylar base	58/6

P. & P. 1/- extra per reel, 1 reel and over Post Free.

SELF-POWERED V.H.F. TUNER CHASSIS. Covering 88-95 Mc/s. Mullard permeability tuner. Dims. 6 x 6 x 6 in. high. Valves ECH85 and 2-EP89's plus 2 diodes with E280 rectifier. Mains transformer. Fully wired and tested ONLY £28.17.6 (car. paid). Room dipole 12/6. Feeder 6d. per yard.



BATTERY ELIMINATOR

For 4 Low Consumption Valves (96 range) 90V. 14 mA and 1.4V. 125 mA. 42/6 (4/-). 200-250V. A.C. Also for 250mA. 1.4V. and 90V. 15mA at same price. Two separate units to replace existing batteries. 4 x 2 1/2 x 2 1/2 in. and 3 x 2 1/2 x 1 1/2 in.

ALL ITEMS ARE NEW AND FULLY BUILT UNLESS OTHERWISE STATED. TESTED BEFORE DESPATCH. Delivery by return. Terms available on items over £5. Send 6d. (stamp will do) for 20 page illustrated catalogue.

ALL ITEMS GUARANTEED 12 MONTHS VALVES 3 MONTHS
Regret overseas orders cannot be executed.

GLADSTONE RADIO

ONLY ADDRESS—

66 ELMS ROAD, ALDERSHOT, Hants.

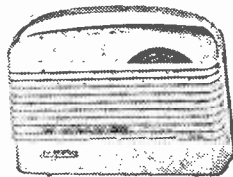
(2 mins. from Station and Buses.)

Aldershot 22240

CLOSED WEDNESDAY AFTERNOON

"REALISTIC" 'SEVEN'

1 Transistor superhet. 350 Milliwatt output, 4-inch speaker. All components mounted on a single printed circuit board size 5 1/2 x 5 1/2 in. in one complete assembly. Plastic cabinet, with carrying handles, size 7 x 10 x 3 1/2 in. External Socket for car aerial. Ferrite rod aerial. Price for the complete parcel, including Transistors, Cabinet, Speaker, etc., and full Construction Data: **£5.19.6** P. & P. 4/6.



PP9 Battery 3/9. Data and instructions separately 2/6. Refunded if you purchase the parcel. Any parts supplied separately.



4 TRANSISTOR MINIATURE PUSH-PULL AUDIO AMPLIFIER HIGH IMPEDANCE

PRINTED CIRCUIT, 4in. x 2 1/2in. x 1 1/2in. over transformers. Output for 3-ohm speaker. Suitable for microphone, record player, guitar and intercom. Volt battery required. Frequency range 100 cps. to 25 cps. Push-pull output class B. Instruction sheet provided. Fully wired ready for use. Two types, 200mW 35/-, 500mW, 41/-, (P. & P. 2/6 each).

4 WATT MONO and 2 x 2 WATT STEREO AMPLIFIERS

Only £4.16.8. (P. & P. 4/6). Suitable for record player, radio, tape after equalisation. Double wound mains transformer. Fully built. For A.C. mains of 200-250V. 14 db. neg. feedback. Controls are volume (on/off), treble and bass. Contact cooled metal rectifier (bridge): ECOS8 and EL54 valves. Output for 3 ohm speaker. Chassis size 6 1/2 x 6 in. (over spindles) overall height, including valves, 5 1/2 in. High and low input by Phono sockets. **STEREO AMPLIFIER ON ABOVE CHASSIS.** Valves 2 x UCL22. Metal rectifier. 2 x 2 W. Input and output by Phono sockets. 3 ohm speakers required. Suitable for record player, etc. Price £5.2.6. (P. & P. 6/-).

E.M.I. 4-speed PLAYER & P.U. (separate)

8 in. metal turntable. 200-250V. motor. Turnover head. Our price 59/6. (P. & P. 4/6).

GRAMOPHONE AMPLIFIERS AND PLAYERS

14 watt type. With 6 x 4 in. speaker. Radio 134 x 7 1/2 in. 200-240V. A.C. ECU82 and Rectifier. Tone and Volume On/Off switch. Two knobs. Ready to play. 49/6, post 5/-.

4 watt type. Valves UY85, UP85 and UL84, 200-240V. A.C. Covered badge 13 1/2 x 7 1/2 in. (6 in. speakers), 3 front controls: bass, treble, on/off/vol. 80/- Post 5/-. Double wound mains transformer. Cabinet to fit either type with plain motor board £3 car. paid. Complete record player (2 valve amp.), fully built (NOT A KIT), £10.17.6. with UA14 4-speed autochanger, or with Garrard Auto-slim 4-speed autochanger, £11.5.0. Single Player in Cab. 13 1/2 x 13 x 5 1/2 in. B.S.R. Monarch 4-speed deck, £8.9.6.

READY BUILT TEST METERS

All brand new—complete with test leads and batts.	
HAIKI 20,000 O.P.V.	25 19 6
TE-13 1,000 O.P.V.	21 19 8
TEK-500 30,000 O.P.V.	28 17 0
200-H 20,000 O.P.V.	25 5 0
P-1 2,000 O.P.V.	22 12 6
P-3 4,000 O.P.V.	24 2 6
MT-659 50,000 O.P.V.	210 19 6

TAPE RECORDER AMPLIFIER

Fully built. Front panel 12 1/2 x 3 1/2 in. Chassis size 10 1/2 x 5 x 4 in. Valves EF86, ECOS8 and 2-EL84's. Controls (1) MIC, Vol, (2) Tuner/P.U. Vol, (3) Play back or monitor. (1) Tone, 2 Jack sockets for Tuner/P.U. and MIC-switch for superimpose. Separate power pack including transformer and rectifier. For Colmar studio deck only. Price £28.14.0 (6/- P. & P.).

4-SPEED AUTOCHANGERS

BRS-UA14	85 19 6
GARRARD AUTOSLIM	26 10 0
STEREO	27 5 0
AUTOSLIM DE LUXE AT6	210 19 0
STEREO	211 10 0

(Car. 5/- each)

13 x 8 in. LOUDSPEAKERS 49/6

Three ohm. Ceramic magnet or latest type. BRAND NEW. (Post 3/6).

CM21 CRYSTAL MICROPHONE

With 3.5 mm. Jack plug, 12/6 (post 1/6).

TELEPHONE AMPLIFIER

Powerfully amplifies the incoming call. Fully transistorised. Pick-up, suction fixed to phone. Battery-operated. Fitted with on/off switch and vol. control. Size: 4 1/2 x 3 x 1 1/2 in. Complete with PP9 battery. **69/6** P. & P. 2/6.

THE THINKING MACHINE

We are told that the electronic thinking machine may very well become a reality in twenty or thirty years time... Ultimately, we will be able to leave most of the important business and government decisions to the impartial machine!

This could result in some very interesting possibilities!

But, how about the immediate future? Are You prepared for the electronic age that is now with us? Or more vitally still—are you ready to face the age of automation?

Most readers of this message have already thought about this important topic and realise that the major impact of the electronic age is yet to be felt!

As each day passes, more and more semi-skilled jobs are disappearing... As each day passes, more machines are controlled electronically... Yet the electronic technician and engineer are becoming more in demand.

Are you considering electronics seriously? Would you like to try a short course that will prove to you whether you should make electronics your future work? We offer a short course that will get you started the right way... Completion of the course will be your assurance that you should take more advanced study with one of the very fine schools we have in this country... But it is essential to start somewhere, so why not start with Sim-Tech and prove to yourself that you have what it takes to learn electronics easily—the cost is very modest—the course excellent—the lessons crystal clear, practical, easy to master and use. Early lessons make fundamentals clear even to the beginner, while other lessons will give you the practical knowledge of an expert!

This is a real home study course of 36 lessons that has been bound into one giant eight by eleven inch, 216 page manual. Each page is divided into two columns. A wide column features the text, while a narrow column at the side has the instructor's comments, helpful suggestions and additional pictures to simplify the more difficult parts.

Everyone can benefit from this practical course, including those whose main interest may be nothing more than a desire to have a clearer appreciation of electronics as it relates to their present work or hobby.

In addition to the course, Sim-Tech offer the opportunity to take an examination in radio and electronics to those who have studied the electronics course and feel they have attained a sufficiently high standard of proficiency. There is an additional fee of one guinea for the examination. (Which is entirely optional.) Further details are given with each course ordered.

Sounds good doesn't it, but how can you be sure that you are not wasting your money? Well, we will send you this course, on the understanding that you must be convinced this is the best value you have ever seen in electronic training. Otherwise you may return the course (or have your money refunded if sent with order) after you have examined it in your own home for a full seven days.

The price? Only 39/6d plus postage 1/6d. Terms? Why, of course! See coupon. Open to all permanent residents of the U.K. excluding Ireland.

SPECIAL! SEND CASH WITH ORDER AND WE WILL INCLUDE A FREE 70 PAGE BOOK ON THE OSCILLOSCOPE OR RADIO FAULT FINDING.

These books are regularly sold at 5/- each and are loaded with useful information. By sending cash you reduce bookkeeping and other costs, which savings we are able to pass back to you.

----- FREE TRIAL OFFER! -----

To: Sim-Tech Book Company, Dept. 1, XT2., Gater's Mill, West End, Southampton Hamts.

Please send your **ELECTRONICS AND RADIO COURSE** for a full seven, days' trial. If not delighted, I may return the course post paid without further obligation on my part. Otherwise I will pay cash price, OR 10/9 fortnightly until purchase price of 41/- plus 2/- service charge has been paid.

☐ Tick here if enclosing full purchase price.

Please send me ☐ **FREE. RADIO FAULT FINDING BOOK.**

☐ **FREE. OSCILLOSCOPE BOOK.**

Amount enclosed £.....

I understand that you will refund this money in full if I am not 100% satisfied. Overseas customers please send full amount (including Ireland).

NAME

ADDRESS

City County

UNUSUAL SINGLE SPEAKER SYSTEM

A CONCRETE COLUMN



An inexpensive column speaker constructed from a concrete pipe and fitted with a good 8in. or 10in. unit has attracted much interest and admiration because of its clean open sound.

Complete kits of wooden fixtures are available including absorbent wadding and diffusing cone.

Price **£3.15.0** for 8" model. Recommended 8" unit—Super 8/RS/DD **£6.14.2** including purchase tax.

Price **£4.18.0** for 10" model. Recommended 10" units—Super 10/RS/DD **£10.18.8**; Golden 10/RS/DD **£7.17.5**; 10" Bronze/RS/PD **£4.12.9**. Prices include purchase tax.

Suitable concrete pipes can be purchased from builders' merchants at about 12/6 and 17/6.

Descriptive leaflet free on request from:



Dept. P

WHARFEDALE WIRELESS WORKS LTD

IDLE BRADFORD YORKSHIRE

Grams: Wharfedel Bradford

Phone: Idle 1235/6

by the 8 μ F capacitor; V5 will now occupy V6's original position; the remaining space between i.f.t.3 and V5 is now used for the noise limiter detector valve V7. This may be a 6AL5/EB91, 6H6-GT or EB34; alternatively two OA202 silicon diodes could be used in place of V7 or an EABC80 could be used in place of V5 and V7.

Fig. 2 also shows how a tuning indicator can be fitted if required: any type with characteristics similar to the EM81 may be used, the latter was chosen mainly for physical convenience.

The R.F. and F.C. Stages (Fig. 3)

To bring the "front end" up to modern standards substitution of an EF183 for V1 and an ECH81 for V2 is recommended.

These changes can be executed without disturbing the main coil and switch wiring. V1

and V2's sockets will have to be replaced by B9A sockets mounted on small aluminium plates. It is advisable to have a source of stabilised h.t. for the oscillator anode and mixer screen, so the power supply of Fig. 4 is recommended.

VR2 is the r.f. gain control varying the bias on V1. A small two-lug tagstrip is mounted under the retaining bolt for the oscillator trimmer bank, thus making a junction point for R23, R25 and the 150V stabilised h.t. line. A short piece of 80Ω coaxial cable is used between the wavechange switch and pin 2 (control grid) of V2 because this lead is rather long owing to the orientation of the valve holder to give short leads to the oscillator section.

The original V1 and V3 had a common screen supply. The new V1 now has its own separate

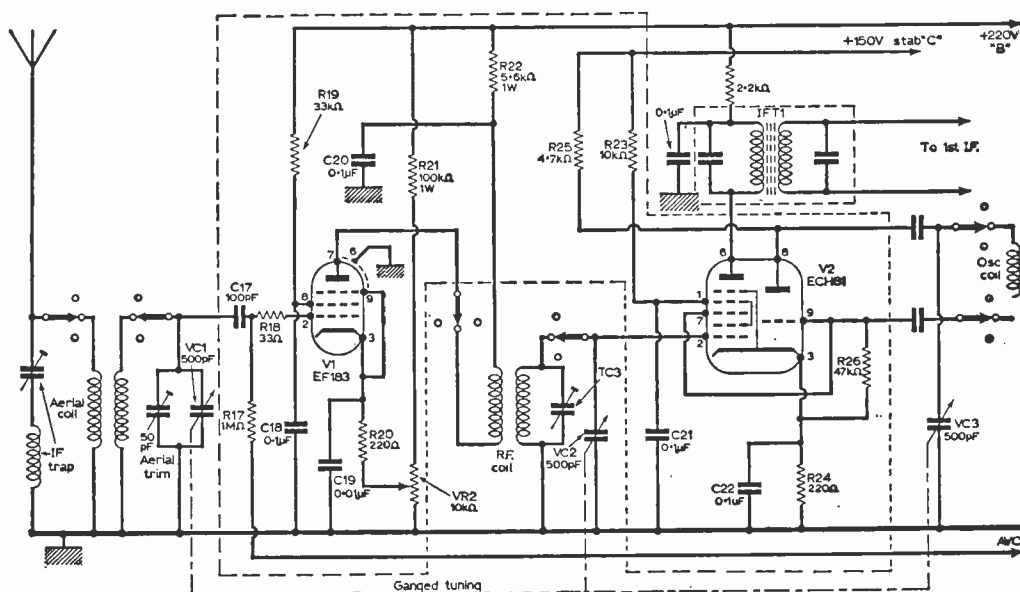


Fig. 3a: The modified r.f. and f.c. stages of the circuit. Sections of the circuit outside the dotted box remain unchanged

COMPONENTS LIST

Resistors:

R17	1M Ω	R22	5-6k Ω 1W
R18	33k Ω	R23	10k Ω
R19	33k Ω	R24	220 Ω
R20	220 Ω	R25	4-7k Ω
R21	100k Ω 1W	R26	47k Ω

All 10% $\frac{1}{2}$ W carbon, unless otherwise stated
 VR2 10k Ω w.w. potentiometer

Capacitors:

C17	100pF silver mica 350V
C18	0.1μF paper 350V
C19	0.01μF paper 350V
C20	0.1μF paper 350V
C21	0.1μF paper 350V
C22	0.1μF paper 350V

Valves:

Y1	EF183	Y2	ECH81
----	-------	----	-------

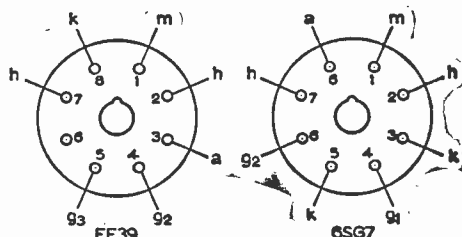


Fig. 3b: Pin connections for alternative r.f. amplifier valves (VI). The first grid of the EF39 is a top cap connection.

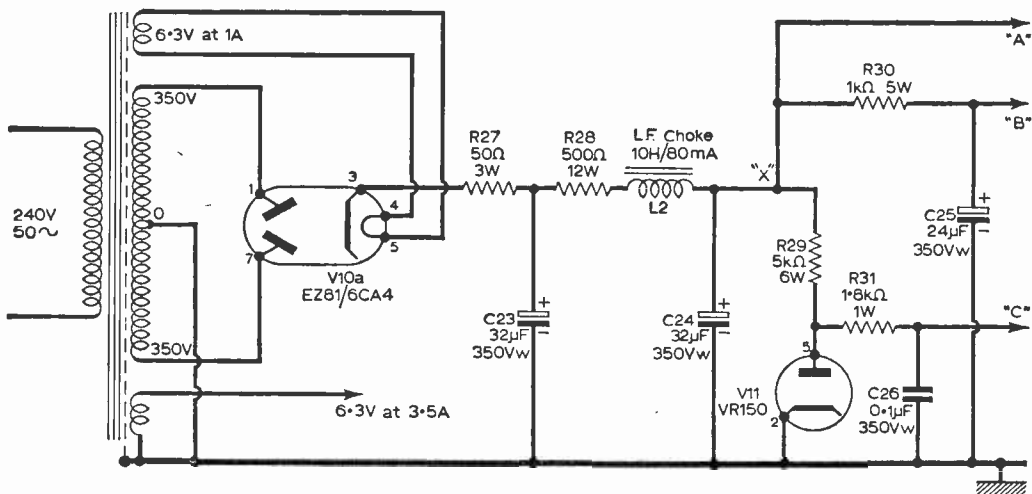


Fig. 4: An alternative regulated power supply. R27 and R28 may be omitted with a mains transformer rated at 250-0-250V, 80mA. R28 is normally fitted to those sets obtained from disposal sources. Voltage outputs are "A" 250V to V6 (Fig. 2); "B" 220V to V12 (Fig. 2). V3 and V4 (Fig. 5) V1 and V2 (Fig. 3) and V9 (Fig. 6); "C" 150V to S2B (Fig. 2) and V2 (Fig. 3a). The Douglas MT.2AT mains transformer used in the original has an 0-5-6.3V rectifier winding which permits the use of 5Z4GT/G, a 5V4G or a 5Y3GT/G in the place of V10a. With the 5Y3, C23, C24 and C25 must be rated at 475V. With the transformer specified in the Components List, alternatives for V10a are EZ80/6V4, and 6AX5GT.

COMPONENTS LIST

Resistors:

R27	50Ω 3W	R30	1kΩ 5W
R28	500Ω 12W	R31	1.8kΩ 1W
R29	5kΩ 6W		

Capacitors:

C23	32μF electrolytic 350V
C24	32μF electrolytic 350V
C25	24μF electrolytic 350V
C26	0.1μF paper 350V

Miscellaneous:

V10a	EZ81 or 6CA4 (see also caption Fig. 4)
V11	VR150
T3	Mains transformer. Secondaries: 350-0-350V, 80mA; 6.3V, 1A; 6.3V, 3.5A. (See also caption Fig. 4)
L2	10H 80mA l.f. choke

COMPONENTS LIST

Resistors:

R32	100kΩ
R33	330Ω
R34	12kΩ 1W
R35	100kΩ 1W
R36	2.2kΩ
R37	220Ω
All 10% ½W carbon, unless otherwise stated	

Capacitors:

C27	0.1μF paper 350V
C28	0.1μF paper 350V
C29	0.1μF paper 350V
C30	0.1μF paper 350V
C31	0.1μF paper 350V

Miscellaneous:

V3	6K7G	V4	6K7G
----	------	----	------

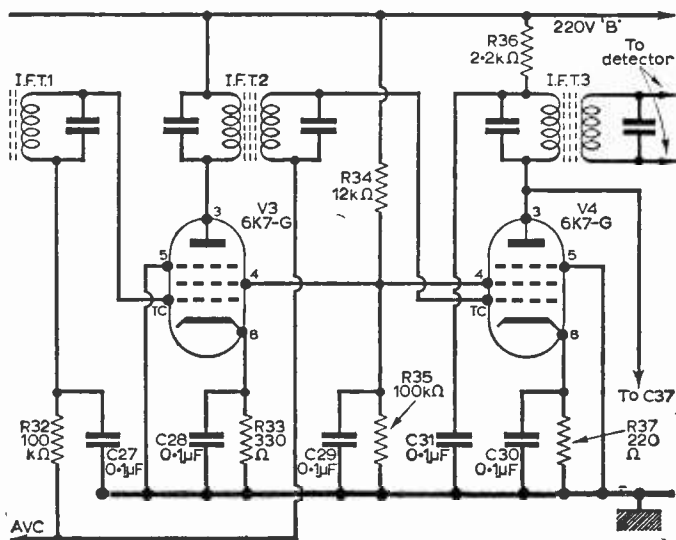


Fig. 5: Modified I.f. stages of the circuit.

supply, so V3 now requires a source of supply. The simplest way to do this is to make a common supply for V3 and V4 (Fig. 5).

Fig. 5 shows 6K7-Gs for V3 and V4 in place of the original EF39s; these were used because they

were on hand, in practice EF39s, CK7s, 6U7s, 6SS7s or 6SK7s could be used without any circuit changes, although 6SS7s and 6SK7s have different connections to the other types.

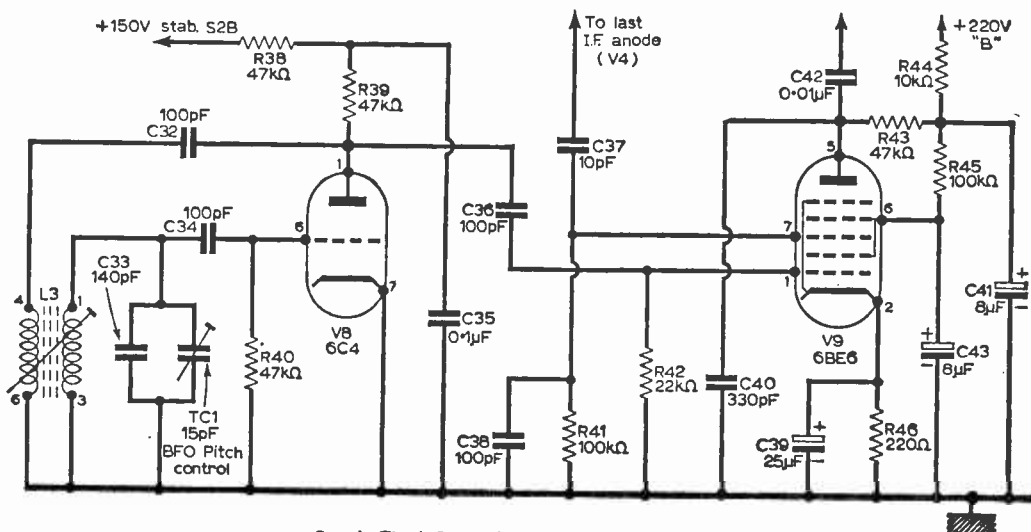
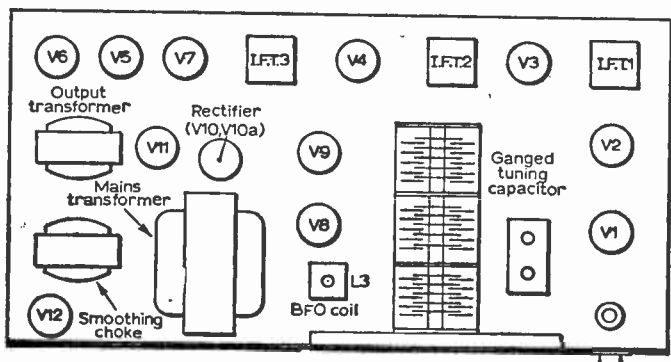
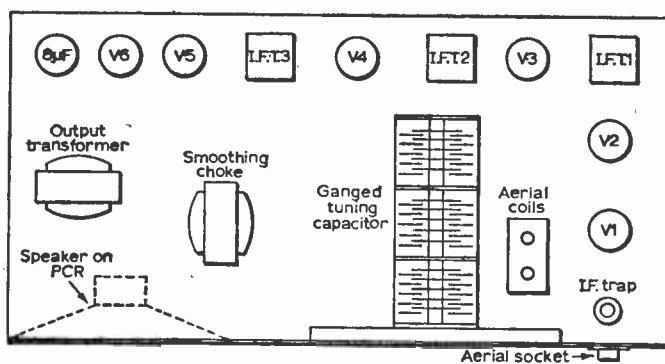


Fig. 6: The b.f.o. and product detector circuits.



COMPONENTS LIST

Resistors:

R38	47kΩ	R43	47kΩ
R39	47kΩ	R44	10kΩ
R40	47kΩ	R45	100kΩ
R41	100kΩ	R46	220Ω
R42	22kΩ		

All 10% 1/4W carbon

Capacitors

C32	100pF silver mica 350V
C33	140pF silver mica 350V
C34	100pF silver mica 350V
C35	0.1μF paper 350V
C36	100pF silver mica 350V
C37	10pF silver mica 350V
C38	100pF silver mica 350V
C39	25μF electrolytic 25V
C40	330pF silver mica 350V
C41	8μF electrolytic 275V
C42	0.01μF paper 350V
C43	8μF electrolytic 275V

Miscellaneous:

V8	6C4	V9	6BE6
TC1	15pF variable capacitor		
L3	B.F.O. coil		

(Denco BFO2/465)

Fig. 7a (top): The original layout of the chassis. The loudspeaker is only included on the PCR model.

Fig. 7b (bottom): The completely remodelled chassis layout. The valve-holder for V1 should be orientated (by pointing its location pip—see Fig. 3b) to face the left, and V2 similarly orientated to face upwards.

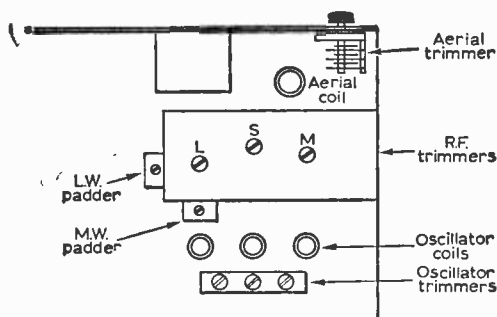


Fig. 8a: The arrangement of the trimmers and padders which is common to the PCR and PCR2 models.

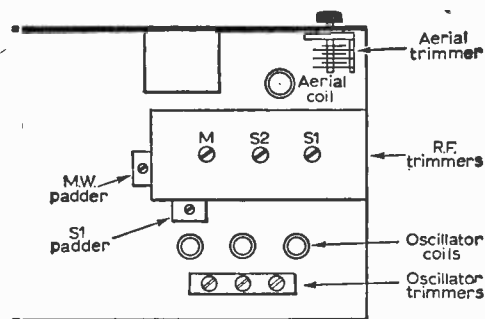


Fig. 8b: The trimmer and padder arrangement for the model PCR3.

Product Detector and B.F.O. (Fig. 6)

The addition of the product detector enables the demodulation of single sideband signals, a system of transmission favoured by many amateurs of today.

V8 (6C4) is the beat frequency oscillator which takes its h.t. supply from the stabilised 150V line; any medium mu triode or triode connected pentode could be used for V8. V9 is the product detector, a 6BE6 or its octal equivalent the 6SA7-GT.

There is ample space for L3, V8 and V9 on the chassis between the power supply and the three-

modulated r.f. signal generator covering the i.f. and r.f. ranges of the receiver and suitable tools to adjust the i.f.t. cores and the trimmers.

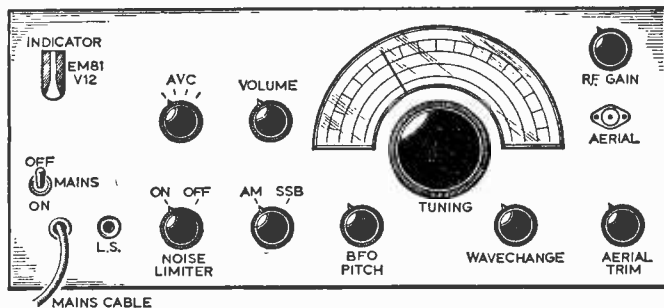
Both signal generator and receiver should be switched on for about five minutes to let them reach their correct operating temperature. The receiver should, of course, be checked to make sure that it is functioning correctly on all bands.

I.F. Alignment (PCR, PCR2 and PCR3)

Set generator to 465kc/s.

Switch receiver to medium wave (tuning capacitor fully closed).

Fig. 9: The front panel layout of the PCR2 and PCR3 after modification.



gang tuning capacitor. New holes will have to be punched for these components.

Should all these modifications be carried out the PCR will have been transformed into an extremely useful communications receiver with the following valve line-up:

V1	R.F. amplifier,	EF183.
V2	F.C.,	ECH81.
V3	First i.f. amplifier,	6K7G.
V4	Second i.f. amplifier,	6K7G.
V5	A.F., a.g.c.,	6AT6 or 6SQ7.
V6	Output,	6V6-GT/G.
V7	Noise limiter/detector,	6AL5 or 6H6.
V8	B.F.O.,	6C4.
V9	Product detector,	6BE6 or 6SA7.
V10	Rectifier,	EZ81/6CA4.
V11	V. Reg.,	VR150.
V12	Tuning indicator,	EM81.

Because of the rewiring of V1 and V2 realignment will be necessary; this will require a

Inject signal into control grid (pin 2) of V2, peak i.f.t.3, 2 and 1 in that order, starting with secondary of i.f.t.3, working up to primary of i.f.t.1. The EM81, if fitted, can be used as an output indicator. The generator output should be reduced as the circuits are peaked; this prevents the a.v.c. broadening the response.

R.F. Alignment

Positions of trimmers and padders are shown in Fig. 8. Generator signal is applied to the aerial terminal.

All trimming and padding adjustments should be repeated until one has no effect on the other.

When properly aligned the short wave performance is excellent—stations in Europe, Canada, U.S.A., Cuba, Windward Islands (using only 5kW), India, Pakistan, etc., etc., have been received and Radio Australia is heard loud and clear using only an indoor aerial 15ft long.

designing a MULTIMETER

by K. Berry

Theory, Design and
Construction of
Simple Instruments

CONTINUED FROM PAGE 32 OF THE MAY ISSUE

THE second multimeter, Design No. 2, enables measurements to be made of d.c. voltage, d.c. current and resistance. The meter employs switching but because there is no a.c. facility it is of the simplest nature and should deter no constructor. The circuit is shown in Fig. 7.

Specification

Voltage	D.C. only current	Resistance
0—5	0—1mA	1,500Ω mid scale
0—10	0—10mA	
0—50	0—100mA	
0—100	0—1A	
0—500		
0—1,000		

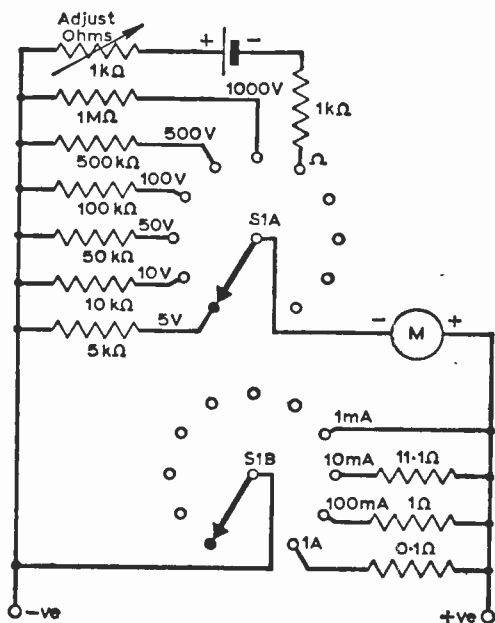


Fig. 7: Design circuit No. 2. This instrument will measure d.c. volts, d.c. amps and resistance.

The basic movement is a 2½in. round 1mA meter scaled 0—100. As in the case of design No. 1 the voltage ranges have been chosen so as to facilitate reading from the meter scale. The resistance of the meter used in the prototype was 100Ω and the values quoted for the shunts are based on this value. If a meter having a lower resistance than this is used a resistor can be connected in series with the meter so that the combined resistance of the meter plus series resistor is 100Ω. If a meter having a resistance higher than 100Ω is used, then the resistance of the shunts required can be calculated from the expression given in the section on current measurement.

COMPONENTS LIST FOR DESIGN NO. 2

Multipliers

5V	5kΩ	} ¼W.
10V	10kΩ	
50V	50kΩ	
100V	100kΩ	} ¼W.
500V	500kΩ	
1,000V	1,000kΩ	

Shunts

10mA	11.1Ω (3 x 33Ω in parallel).
100mA	1Ω
1A	0.1Ω } approx.

Miscellaneous

M moving coil meter 0—1mA f.s.d.
S1 1 pole, 11 position, 2 bank.
Terminals.
Dry cell 1.5V.
Potentiometer 1kΩ.
Resistor 1kΩ ¼W.

Once again high-stability 1% or 5% resistors are recommended for use as multipliers. For the shunts it is necessary for the 100mA and 1A ranges to make one's own. This will necessitate the acquisition of some resistance wire; unfortunately this is not usually available in very small quantities from the normal suppliers but a wire suitable for the purpose can readily be obtained from most electrical dealers. This is the wire contained in the spiral elements sold for replacements on "bowl"-type electric fires.

To determine the amount of wire required for the 100mA shunt connect the meter (switched to its 10mA range) in series with a 3V battery and a 500' or 1,000' rheostat. Adjust the rheostat until the meter reads exactly full scale. Disconnect the battery and set the meter to its 100mA range. Connect one end of the resistance wire to one of the meter terminals and connect a length of normal copper wire to the other meter terminal. Tap the copper wire on to the resistance wire at a point, say, 6in. from the meter terminal and

reconnect the battery. Now slide the copper wire along the resistance wire until the meter reads $\frac{1}{10}$ full scale (i.e. 10mA). The length of wire required as a shunt is thus determined. This should be cut from the remainder of the wire and insulated with sleeving. It can then be wound into a coil for easy insertion into the meter circuit.

It must be pointed out that the current in the circuit must not vary whilst the shunt is being found, i.e. the battery voltage must stay constant during that time. As a check the meter should be

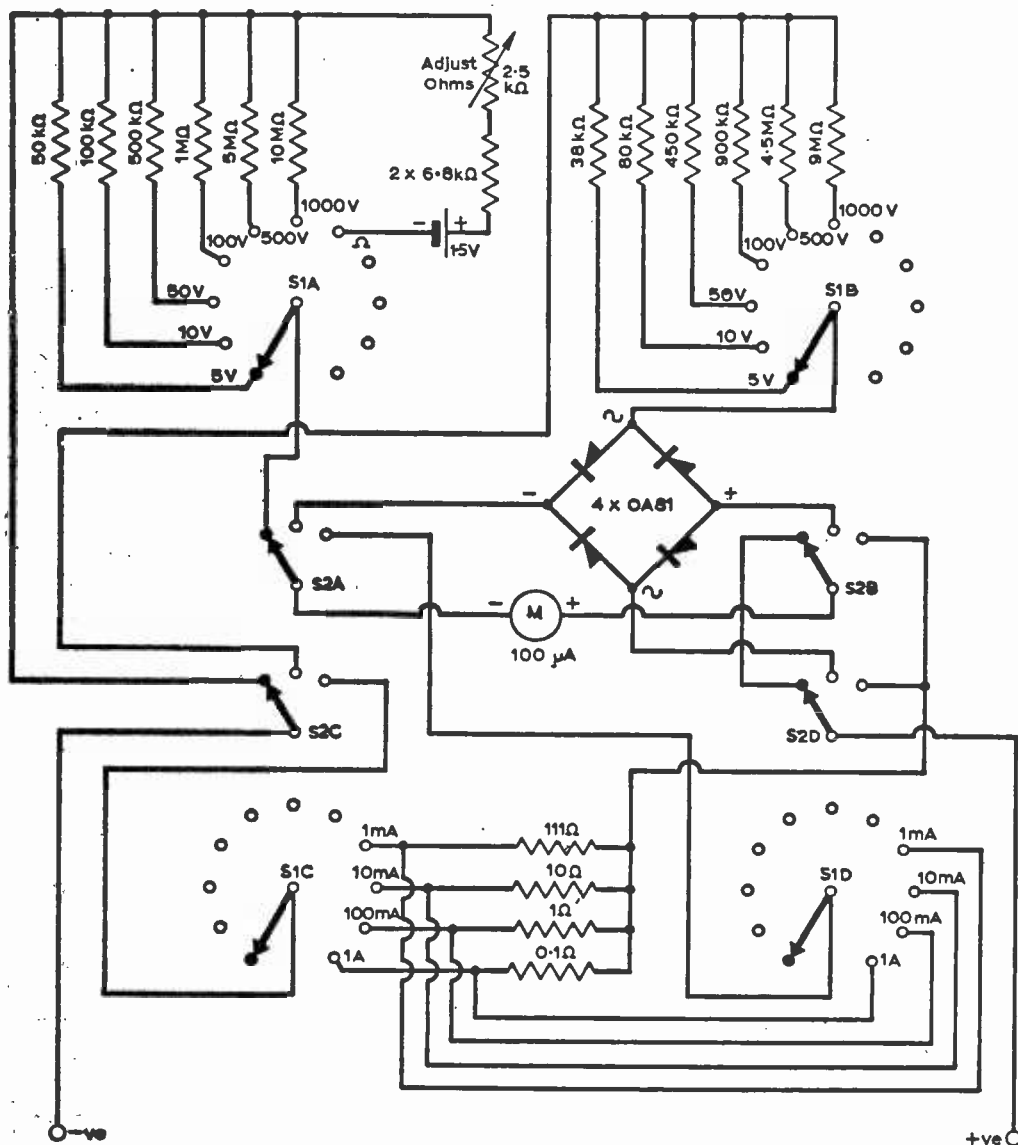
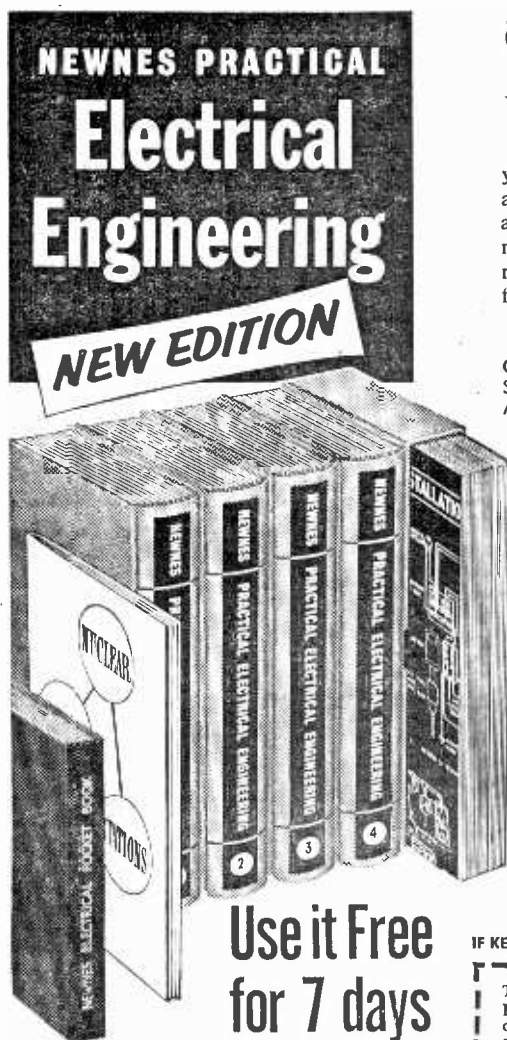


Fig. 81: Design No. 3—the most comprehensive, with facilities for measuring a.c. and d.c. volts, d.c. amps and ohms.

87 Experts guide you to advancement and higher rewards



Use it Free for 7 days

ABSOLUTELY COMPREHENSIVE!

This is what you receive without cost or obligation—

4 Volumes strongly bound in Grey Moroquette, 9½ in. x 6½ in., 2,352 Pages of instructive information on latest practice. Over 2,000 Photos, Diagrams, Perspective and Working Drawings, Electrical Circuits, and Data on test procedures, etc.

o o o

24 Data Sheets in colour and 12 Quick-reference Blueprint Charts complete in strong Chart Case.

o o o

'Nuclear Power Stations' Booklet Contains fascinating cut-away sections in full colour with explanatory text.

o o o

Free! Newnes Electrical Pocket Book (Value 10'6) Nearly 400 pages with 258 illustrations, diagrams, tables.

YOUR FUTURE, if it is in electrical engineering, depends on your ability and the services you can render. The more experienced you are the better your prospects, the better your income . . . it's as simple as that! This New Edition of Newnes comprehensive and authoritative publication is invaluable to you if you mean to progress. Produced with the full technical resources of NEWNES it covers every facet of the vast field of modern electrical engineering.

INSTALLATION WORK OF ALL KINDS

Commercial Buildings, Small Houses and Flats, Hospitals, Schools, Theatres, Cinemas, Electric Appliances, Alarm Systems.

INSTRUMENTS, MACHINES, EQUIPMENT

Electric Motors, Control Gear, Transformers, Rectifiers, Electronic Control in Industry, Measuring and Recording Instruments and Electricity Supply Meters.

OPERATION, MAINTENANCE, REPAIR

Welding Plant, Electric Traction, Cranes, Lifts, X-Ray Equipment, Testing Domestic Equipment, Batteries.

GENERATION, TRANSMISSION, DISTRIBUTION

Power Stations, Power Cables, Public Supply, Underground Distribution Systems, Town and Rural Supplies, Cable-laying and Faults.

Over 2,000 Instructive Action Photographs, Diagrams, Working Drawings, Circuits. Many Concise Data Tables.

SEND TO-DAY—FREE EXAMINATION will enable you to check it for your **day-to-day** problems—it will surprise you!

IF KEPT SAME PRICE CASH OR TERMS—NOTHING EXTRA IF YOU PAY MONTHLY

To: GEORGE NEWNES LTD., 15-17 Long Acre, London, W.C.2
Please send Newnes PRACTICAL ELECTRICAL ENGINEERING without obligation to buy. In 8 days I will return it or post only 16/- deposit, then 20/- monthly for 16 months, paying £16. 16s. in all. Cash in 8 days £16. 16s.

If under 21 your father must fill up coupon.
If married woman your husband must fill it up.

Full Name _____
(BLOCK LETTERS) (Mr., Mrs., Miss)

Address _____

Occupation _____

Signature _____
(Mr., Mrs., Miss)

Tick ✓ where applicable

The address on left is—

My Property ☐

Rented unfurnished ☐

Parents' Home ☐

Furnished Accom. ☐

Temporary Address ☐

(PEE)72/1331

7 VALVE AM/FM RADIOGRAM CHASSIS

NEW 1965 MODEL NOW AVAILABLE.

Valve line-up ECC85, ECC81, EF89, EAB80, EL84, EM81, EZ80.

Three Waveband and Switched Gram positions. Med. 200-550 m. Long 1,000-2,000 m. VHF/FM 88-95 Mc/s. Phillips permeability tuning insert on FM and combined AM/FM IF transformers. Latest circuitry including AVC and Neg. Feedback. Three watt output. Sensitivity and reproduction of a very high standard. Chassis size 13½ x 6½ in. Height 7½ in. Edge illuminated glass dial 11½ x 3½ in. Vertical pointer. Horizontal station names. Gold on brown background. A.C. 200/250 v. operation. Magic-eye tuning. Circuit diagram now available.

Aligned and tested ready for use £13.19.6 Carr. & Ins. 7/6.

Complete with Tape a/p Socket, ext. spkr., p/u Sockets, indoor F.M. aerial, and 4 knobs—walnut or ivory to choice. 3 ohm P.M. Speaker only required. Recommended Quality Speakers 10in. R.A. 27/6; 13½ x 8in. E.M.L. 'Fidelity' 37/6; 12in. B.A. with conc. Tweeter, 42/6 Carr. 2/6.

6 VALVE AM/FM TUNER UNIT

Med. and VHF 190 M-550 M, 85 Mc/s-103 Mc/s. 6 valves and metal rectifier, Self contained power unit, A.C. 200-250 v. operation. Magic eye indicator, 3 push-button controls, on/off. Med. VHF diode and high output sockets with gain control. Illuminated 2-col. perspex dial 11½ x 4 in. Chassis 11½ x 4 x 3½ in. A recommended Fidelity Unit for use with Mullard 3/3 5-10 amplifier. Available only at present as built up units, aligned and tested ready for use. Bargain price £12.10.0, Carr. 5/6. We hope to produce this popular unit in kit form very shortly.

NEW BRITISH RECORDING TAPE

Famous Manufacturer. Bulk purchase, genuine recommended Tape Bargain. Unconditional Guarantee. Fitted Leader and Stop Poles (except 3in.).

Standard (PVC base) Long Play (PVC base) D'ble Play (Mylar base)

3in.	150ft. 3/6	225ft. 4/6	300ft. 6/6
5in.	600ft. 11/6	900ft. 15/-	1200ft. 25/-
5½in.	850ft. 14/6	1200ft. 17/6	1800ft. 32/6
7in.	1200ft. 17/6	1800ft. 22/6	2400ft. 42/6

Post and Packing—3in. Reels, 6d. Each additional Reel, 3d.
4in. to 7in. Reels, 1/- Each additional Reel, 6d.
EMPTY TAPE REELS (Plastic): 3in., 1/3; 4in., 2/-; 5in., 2/-; 5½in., 2/-; 7in., 2/3.
PLASTIC REEL CONTAINERS (Cassettes): 3in., 1/3; 5in., 1/3; 5½in., 2/-; 7in., 2/3.

JASON F.M. TUNER UNITS

Designer-approved kits available.

FMT1, 5 gns. 4 valves, 20/-.
FMT2, £7.10.0 5 valves, 35/-.

JTV Mercury, 10 gns. 3 valves 22/6.

JTV2 £13.18.6, 4 valves, 28/6.

NEW JASON F.M. HANDBOOK 2/6.
Prompt Alignment Services 7/6 plus 2/6.

BARGAIN BUY!

A 24 gns. Tape Recorder offered at the bargain price of only 15 gns. plus 10/- carr. Supplied in 3 Units already wired and tested. A Modern Circuit for quality recording from Mike, Gram or Radio, using latest D.S.R. Twin Track Monardeck Type TD2. Valve line-up—EP86, ECL82, EM84, EZ80, and Selenium Diode. Send for detailed list—3d. stamp.

Complete Kit Comprising items below:

2-tone Cabinet and 7in. x 4in. Speaker. Size 14 x 8 x 7½ in.	£3. 5.0 Carr. 5/6
Wired Amplifier complete with 4 Valves, front Panel, Knobs, etc.	£5.19.6 Carr. 3/6
B.S.R. Monardeck Type TD2.	£7. 7.0 Carr. 4/6
Accessories: Mike, Tape, empty Reel, screened Lead and Plugs, Instructions, etc.	£1. 0.0 Carr. 2/6

BARGAIN PRICE 15 Gns. Carr. 10/-

CONDENSERS—Silver Mica. All values, 2 pF. to 1,000 pF., 6d.; each. Ditto ceramics 9d. Tib. 450v. T.C.C. etc. .001 mfd., .01 and .1/350v. 9d. .02-1/500v., 1/- .25 Hunte 1/6. .5 T.C.C. 1/6, etc.

RESISTORS—Modern rainins full range 10 ohms to 10 megohms. 20% 1-4 w. 3d. ea. ditto 1 w. 6d. ea. 2 w. 9d. ea. 10% 1-4 w. 4d. ea. 5% Hi-stab. 1-4 w. 6d. ea. (below 100 ohms and over 1 meg. 9d. ea.) 1% Hi-stab. 1 w. 1/6 ea. (below 100 ohms 2/- ea.).

VOLUME CONTROLS—5k—2 Meg. ohms. 3in. SPINULES MORGANITE MIDGET TYPE. 1½ in. dia. Guar. 1 year. 1.0G or 1.1N. radios, less sw. 3/-, D.P. Sw. 4/6. Twin Micro less Sw. 6/6. Some values with 1P Sw. 9/6.

ENAMELLED COPPER WIRE—1½ in. reels 14g-20g. 3/-; 22g-28g 3/6; 30g-34g. 4/3; 36g-38g. 4/6; 39g-40g. 5/-, etc.

New Boxed	Valves	Reduced Bargain Prices
1T4	3/6	EY86 9/-
1R5, 1R5	6/-	EZ81 7/-
354, 3V4	7/-	GZ82 9/6
ECC81	7/-	PCX84 8/-
ECC82	7/-	PCX80 8/-
ECC83	7/-	PC183 10/6
ECL80	9/-	PC184 10/-
ECL82	10/-	PC185 11/6
ECL83	10/6	PL36 10/6
EF80	7/6	PL81 9/6
EF86	8/6	PL83 8/-
EL33	12/6	PY33 10/6
EL34	12/6	PY82 7/-
EL84	7/-	U25 10/6
EY51	9/-	U184 9/-

Send for detailed bargain lists, 3d. stamp. We manufacture all types Radio Main Transf. Chokes, Quality O/P Trans., etc. Enquiries invited for Specials, Prototypes for small production runs. Quotation by return.

RADIO COMPONENT SPECIALISTS

70 Brigstock Road, Thornton Heath, Surrey. TH21 888. Hours: 9 a.m.-6 p.m., 1 p.m. Wed. Terms C.W.O. or C.O.D. Post and Packing up to ½ lb. 9d., 1 lb. 1/3, 3 lb. 2/3, 5 lb. 2/9, 8 lb. 3/6.

Stentorian

MODEL H.F. 1016 'MAJOR'

This unit makes use of the high flux density available in the magnet system of the previous H.F.1016 unit. A curved diaphragm is used with a rigid centre section coupled to the voice coil. The rigid coupling and the design of the cone termination give a balanced response over the whole audio range. The unit is specially suitable for use in the smaller type of enclosure having a volume of approximately 1½ cubic feet.

Other Stentorian speakers:

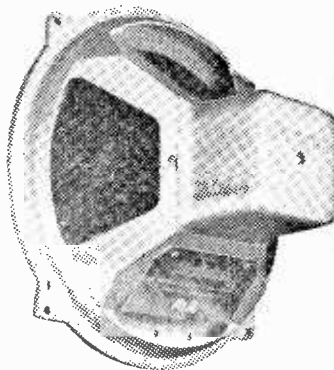
Type	Flux Density	Price	Type	Flux Density	Price
8" H.F.816*	16,000 gauss	£6.6.0	T.816	16,000 gauss	£5.19.3
8" H.F.812*	12,000 gauss	£3.16.6	T.12 tweeter	16,000 gauss	£13.17.9
8" H.F.810	10,000 gauss	£2.17.0	T.10 tweeter	14,000 gauss	£4.12.9
6" H.F.610	10,000 gauss	£2.7.3 Steel £2.9.3 diecast	T.359 tweeter	9,000 gauss	£1.12.3

*These two speakers incorporate a universal impedance speech coil.

WHITELEY ELECTRICAL RADIO CO. LTD. MANSFIELD, NOTTS.

Telephone: MANSFIELD 1762-5

London Office: 109 Kingsway, W.C.2
WA3



Specification:

Chassis—die cast aluminium
Cone—graded pulp cambric surround; Cone dia.—10 ins.,
Pole dia.—1 in.; Flux density—16,000 gauss; Total flux—64,000 maxwells; Impedance—15 ohms.

Price: £9.8.6 (inc. tax)

switched back to its 10mA range, when it should read exactly full scale.

This procedure is then repeated for the 1A range. Some difficulty may be experienced in soldering the resistance wire, since it is sometimes difficult to tin. Satisfactory results should, however, be obtained if the wire is cleaned carefully with a piece of fine emery cloth. The use of one of the proprietary non-corrosive fluxes can also be of assistance. If, however, the wire refuses to be tinned it should be wrapped round a small screw, say 6BA, sandwiched between a washer and a soldering tag. A nut is then threaded on the screw and the assembly tightened. The connection is obtained by soldering on to the solder tag.

Design No. 3

This, the last design, is the most comprehensive of the three. Facilities are included for measuring a.c. and d.c. voltages, resistance and d.c. current. This meter should prove suitable for nearly all measurements which are likely to arise. The circuit is given in Fig. 8.

Specification

Voltage A.C. and D.C.	Resistance	Current D.C.
0—5	15,000Ω mid scale	0—1mA
0—10		0—10mA
0—50		0—100mA
0—100		0—1A
0—500		
0—1,000		

The basic movement is a 3½in. round 100μA meter scaled 0—100. The circuit employed (Fig. 8) uses two switches. The main meter range switch SW1 is an 11-position four-bank switch, whilst the second switch SW2 selects either a.c. or d.c. volts and current. It would be possible to eliminate SW2 by increasing the number of banks on SW1 but this was thought to be undesirable on the grounds of cost and size.

A feature of this design is the use of an additional switch bank (SW1D) to safeguard the meter when it is used to measure current. The use of this switch ensures that the meter reads only when it is connected across a shunt and if a switch contact connecting that shunt into circuit becomes high resistance or open circuit then no current flows in the meter. If the meter were permanently connected into circuit and the necessary shunts were switched across it then failure of the switch could result in damage to the meter.

Examination of the circuit for design No. 2 (Fig. 7) will show what is meant. If SW1B becomes defective the full load current will flow through the meter. The addition of an extra switch bank would eliminate this possibility.

The meter used in the prototype had a resistance of 1,000Ω and the values quoted for the shunts are based on this value. As in the case of design No. 2 these must be adjusted to suit the particular meter used. The values quoted for the a.c. multipliers are approximate and the precise value required should be found by the method given in design No. 1.

COMPONENTS LIST FOR DESIGN NO. 3

Multipliers (all ¼W)

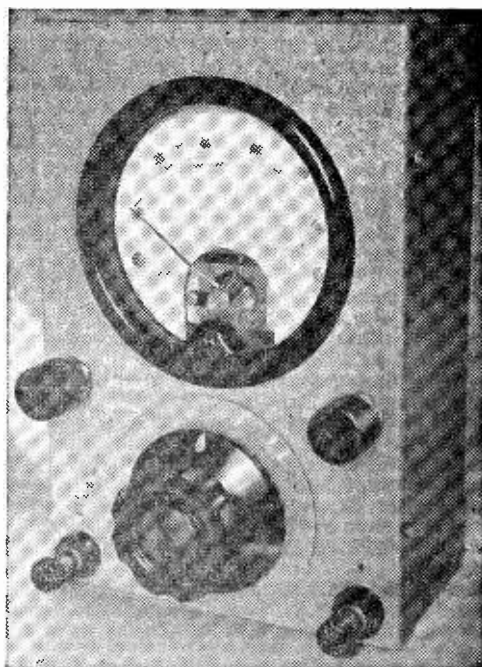
	A.C.	D.C.
5V	38kΩ	50kΩ
10V	80kΩ	100kΩ
50V	450kΩ	500kΩ
100V	900kΩ	1MΩ
500V	4.5MΩ	5MΩ
1,000V	9MΩ	10MΩ

Shunts

1mA	111Ω (29Ω+82Ω)
10mA	10Ω
100mA	1Ω
1A	0.1Ω

Miscellaneous

M moving coil meter 0—100μA f.s.d.
 S1, 1 pole, 11 position, 4 bank.
 S2, 4 pole, 3 position, 1 bank.
 4 OA81 germanium diodes.
 Terminals
 Dry cell 1.5V.
 Potentiometer 2.5kΩ.
 2 resistors 6.8kΩ ¼W.



The appearance of Design No. 3 when made up.

The construction of this meter should present no difficulties. As in the case of the previous designs no details of construction have been given but a suitable metal or plastic case will no doubt be easy to obtain. The version of this meter made by the author is shown in the photograph. ■

on the Short Waves

MONTHLY NEWS FOR DX LISTENERS

All times are in G.M.T.

All frequencies are in kc/s.

The Broadcast Bands—by John Guttridge

NEWs first of all this month from the Caribbean area. W. Smith (West Bromwich) reports the Windward Islands Broadcasting Service, St. George's, Grenada, and *Radio Habana*, (Apt. Postal 7026, Habana, Cuba). W.I.B.S. has now returned to 15,085 from 11,895 for its evening transmission, whilst *Radio Habana* is using 11,735 for its 2010—2140 English transmission to Europe. (This is confirmed by Roy Patrick, Derby). Paul Harris, of Elgin, has heard *Habana* in Spanish from 1900—2000 on 9,655.

A schedule and card have been received from *Trans World Radio*, Bonaire, Netherlands Antilles. The card is a big disappointment, giving no QSL details and no exact frequencies. English is carried from 1030—1230 (—1430 Sundays), and 0200—0430 on 800 medium wave and in the 31m band. Other transmissions are Spanish 1000—1030 31m., 0130 (0100 Sunday)—0200 19m., Dutch 2200—2215 19m., Portuguese 0930—1000, 2300—2330, 0030—0100 19m., German 2300—2315 Thursday, 0000—0030 19m., Russian 2330—2400 19m.b., French 2145—2200 19m., and Cantonese (not Sunday) 2200—2215 19m. Many of these transmissions are also carried on 800kc/s medium wave which is still well heard during the night in the U.K. Judging from the *World Radio Handbook*, likely short wave frequencies are 9,675/9,755/15,265.

Both Ian Taylor of Slough and R. Nelson of Castleton, mention *La Voz de los Andes*, HCJB, (Cas.691, Quito, Ecuador). The present QSL card gives no verification details. English is used from 1900—2030 on 17,890/15,115/11,755.

Moving Eastwards, Paul Harris mentions *Radio South Africa* (P.O. Box 8606, Johannesburg), which has full verification details on its QSL, and *Radio-diffusion du Senegal* (B.P. 1756, Dakar, Senegal), which he still hears on 9,675. He has also had a report acknowledged by the outlet of *Radio Nacional de Espana* in the Canary Isles. The schedule is given as 1400—1600 on 9,660 to Europe and 0000—0300 on 11,800 to South America. All in Spanish.

One of the most popular European stations at present appears to be *Radio Tirana* (Rue Ismail Qemal, Tirana, Albania). Ian Taylor gives the English schedule as 2000—2030, 2130—2200 on 7,090/9,715, whilst W. Smith says 1,088 medium wave is used additionally for the 2130 transmission. Both have had cards from the station—one with no date and one with no verification details. Alan Jones, of Chertsey, reports very strong signals at 0645 on 7,088 in an unidentified language.

Coming right home, devotees of the BBC should note that the General Overseas Service is to be renamed the *World Service*.

Items have come in about the two stations at Monaco. First *Radio Monte Carlo* (16 Boulevard Princesse Charlotte, Monte Carlo). W. Smith reports a QSL consisting of a piece of paper giving the date, time and metre band, and Paul Harris had a verification giving the date only. Paul also reports *Trans World Radio* (Rue de la Poste, P.O. Box 141, Monte Carlo) with a Norwegian broadcast from 1700—1730 on 9,630.

Full details are given on the card issued by *Radio Norway*, Oslo, Norway. Amongst transmissions affected by frequency changes recently are 0745—0815 on 11,850/15,175/17,825/21,730/6,130 and 1700—1830 on 11,850/15,175/17,825/21,730/6,130.

According to W. Smith coloured QSL's giving full details are now being issued by *Vatican Radio*, Vatican City, Vatican State.

New times and extensive frequency changes are features of the summer schedule of the Overseas Service of Swiss Broadcasting Corporation, Berne. The new English times are: 1200—1300 on 7,110/9,665; 1845—2015 on 9,665/6,055; 0115—0245 on 9,655/9,535/6,120; 0415—0515 on 9,655/9,535; 1315—1445 on 15,320/15,305/15,255/17,845; 1500/1630 on 17,830/15,305/15,255/11,865; 2100—2230 on 11,865/9,545; 0830—1000 on 17,830/15,305/15,225.

An Asian station heard recently by Paul Harris is *Radio Republik Indonesia* (P.O. Box 157, Djakarta). German, he says, is now aired by this station on Tuesdays and Fridays from 1700—1730 on 9,865/11,715.

Roy Patrick reports new frequencies for the transmission in English to Europe from 1945—2030 by *Radio Pakistan* (71 Garden Road, Karachi 3). They are 6,250/7,135.

With the gradual improvement in reception conditions as solar activity increases, *Radio Japan*, Tokyo, Japan, has announced that it hopes to resume evening transmissions to Europe in the spring next year. Burmese is now transmitted in the South-east Asian service with the result that it has been extended by half an hour to run from 1230—1600. Frequencies are 9,675/11,705/11,875. The Hawaiian service on 15,235/17,725 has moved to the new time of 0600—0700. Other services affected by frequency changes are the African (1900—2000) on 9,670/11,780 and the North and Latin American (0200—0400) on 11,780/15,135/15,235. Three General Service transmissions have been extended to a full hour. These are at 1000 and 1400 on 9,505/9,740/11,815 and 2300 on 6,140/15,105/15,425. The 1800—1830 and 1900—1930 transmissions are now on 9,505/9,605/9,740.

The Amateur Bands—by David Gibson G3JDG

ONCE upon a time, a scribe was foolish enough to suggest a contest for stations using as an antenna an end-fed coathanger and a pair of base-loaded cuff links. Reader **H. S. Stevens** of Aylesbury bravely (?) took up the challenge and here are some extracts from his log this antennae were taken via a pi-coupler into an S640 receiver). All on a.m. 16in. Wire Coathanger Antenna: 28Mc/s—9J2DT, ZC4KW, ZC4MO. 21Mc/s—UB1BL, PY2CH, PY9WL, PY5AQM, CT3XM, CR4AJ, ZS8C, CR6CG, CR4AI, CR6DL, PY9HL, YV1PF, YV1BM, ZE7JR, UB5BH. 14Mc/s—EA4, DL9, 11PAØ and SP5. 3in. Gold Plated Cuff Links Antenna: 1½in. lead to pi-coupler: 21Mc/s—5A1TK, 5A4Ti, WA4WVD, 9Q5RB, PY5AQM. 14Mc/s—UB2KAB, K2CAK, W4ZYS, K2HLB, SM5BL, W8NGO, W1JFG, SP5AR, WB2APG.

Well done, Mr. Stevens—the outright winner (and only entrant)!

21Mc/s

"My favourite band," say more and more readers. This band is challenging 14Mc/s in DX popularity.

Stephen Beal (London) collected these on his P.W. t.r.f. and 66ft. longwire: W1ROU, 2ZX, 2AWD, 2RGU, 2SJM, 3MSK, 8HRV, 8WYT, K2HV, 3MBF, UB5BX, EA8EA. All a.m.

Bernard Hughes (Worcester) got these between 1300—1700 on his 840C+Codar preselector and dipole: CR5SP, CT3AQ, H18WSR, ITICFN, K44CX, VE8BZ (Baffin Is.), VO1GX, WØZYM, ZS8G, ZC4MO, ZC4TJ, XE3AF, 9Q5DL, 9Q5RB.

John Fitzgerald (Gt. Missenden) says 15m has been wide open between 1100-1900. His unusual rig is Hitachi WH837 8-transistor superhet plus a 20m dipole—CO3CO, CR4BC, 5SP, 6DL, 7FR: CT3AM, EA8EN, ET3USA, K7JDX, 9WEZ; LU5AQ, SVØWCV, TN8BK, YV4KT, ZB1RM, 2AK; ZC4HK, ZS2AR, 6ADF, 8C, 8G; 7X2MD, 9J2BK, 9L1WN, 9Q5A1, 9Q5HP. All a.m.

Martin Briscoe (Bolton) uses a VR66 and PR30 preselector, with a folded dipole, and logged: Z7FC, ET3USA, ITICF, KZ5TD, MP4DAA, OD5CY, SV1DL, ZB1RM, ZC4MO, ZS1AB, 5A1TK, 5A5TE, 9Q5RB, 9J2DT, 9X5RZ.

BRS26171 (Lowestoft) found a new ground plane was better than his 264ft. longwire and dipole. This, with his Cr100 and a.y.u., produced these:—CP1LN, CT3AQ, ET3USA, KP4AXC, MP4TAA (or DAA?), OD5CE, OD5DU, PY4BOP, PY6OPY, PY1XP, ZB1CE, ZB4MO (surely 1MO?), ZE7JR, 4X4AB, 9G1SS, 9G5AB.

J. Cowley (Lancs) has an HA63 and a joystick on a 20ft. pole, aided by an old 19 Set a.t.u. He found—CR6E1, HK7UL, KP4ASN, KR6MB, OA4NQ, PY1FH, PZ1CM, UL7NH, VK2EW, VR6TC (Pitcairn Is.), W7KVT, WØHHX, ZS5KI, 9J2FB. All these were on c.w.

14Mc/s

Staying open later and packed with DX. A sample is the colossal log received from **R. Garvey** (Cheltenham) using an S640 and 90ft. longwire.

We have selected the cream, as follows—AP5HQ, CN8BU, HM5BF, JA4BJO, JA6PN, KR6MH, UL7KSB, UM8AP, XW8BA, ZL2BG, 5R8AN, WA6HLU. All on c.w.

Paul Bernard (Birmingham) sent this log: EA8EA, HA8WH, K1DHG, K2CAK, OZ7NK, SM6CKS, UA1KBE, UA1KUD, W2AXH, W2SFP, W3OJX, YO2BB, 4X4RD. The receiver was a one-valver! Aerial was 69ft. longwire.

Alan Dailey (Leeds) uses an R107 with pre-selector and comments on an amazing improvement by raising his 90ft. longwire from a height of 8-10ft. to 20ft. Proof of the pudding:—BV1USG, CO8MN, CX8AX, DU1AA, FK8AU, HC1MX, HC8FM (Galapagos Is.), HK3AVE, HP1AA, HS1X, HV1CN, HZ3TA, JA1BRD, K1LMV/VE8 (Baffin Is.), KA5DG, KR6DL, KA7DB, LU5DBS, MP4MAM, PY4AS, TG9EL, VK6XX, VK9TL (Norfolk Is.), VP2LS, VP2GTA, VS9AWR, ZD3C, ZD5R, ZD8WR, (Ascension Is.), 6Y5UC, 7X3CT, 9M4MB, 9M8EB. Some very fine DX there, Alan.

W. Clarke (Devon) has an AR88 and inverted dipole. He pulled in these on s.s.b.—APIAD, ET3MEN, DU7GB, FM7AEL, HR1SR, KC4OA, KG4AN, KP4CL, KL7DR, KX6BQ, OA1SU, VK3AM, VK4RH, VK5MS, VP2LF, VP4KD, VP9CP, XE1ME, XE1YO, YA3BMC, YV5FTS, ZL2KL, ZL2DU, ZL3FA, ZL3UY, 4X4HW, 4X4BL.

Norman Ponsford, also of Devon, uses a t.r.f. (CR45) with a 60ft. longwire. These were heard on a.m. on one day between 1600-1730—F8SC, HV1CN, K1DIR, K1HVV, OH2TI, SP9ANH, SM4CHM, UQ2KFG, UA2KAK, W2GBC, W3ZVA, W3MSK, W7ESK, W8BF, WØNVZ, 5A1TT. On a Sunday between 1725-1840 he found: EL3C, HB9DO, OE1KRB, K2UYT, SM5AWL, UB5KSP, VE2ADL, VE1AGD, W8UFG, YV5BBU, 5A4TK.

P. Whelan finds the band lively on his CR300/2 and reports CE7BV, CP5EZ, CX2CO, HK3KY, LA4EJ/P (Jan Meyen Is.), LU4DM, LU4ACJ, OD5CY, PY2ON, VP7NY, YV5AXA. His ariel is 50ft. of wire stretched between the lifeboats, and the log above was received "somewhere off the Kent coast." Does this make him P. Whelan/MM?

L.F. Bands

The only report of a non-G station this month was of OK1KLX. This is surprising since DX has been about (W6, VP3, VE, etc.)—maybe it's because the DX is on c.w.

One or two have braved the QRM and G side-band nets to winkle out the interesting ones. **Gilles Whyllie** (Renfrewshire) got OHØNC, TI2JIC, VE3CW, ZL2AAG, ZL4LM, all on s.s.b. **Alan Dailey** got HBØAFM/M, HBØAFM, PJ2AA, VE3AXU/M. **D. Foster** (Essex) raised VE1IE, VO1HI and W2ZTL.

One or two have taken up the challenge of DX on 7Mc/s, including **M. Woollin** (Leeds), who found WB2GWY, K1LTZ, K2ODC, KV4CI and

—continued on page 162

Automatic Control Systems



A system of fully automatic change-over from send to receive and vice-versa, with only two relays.

by A. D. Taylor, G8PG/GW8PG

AUTOMATIC changeover on telephony or "push-to-talk" operation on telephony is a great operating convenience in the amateur station. It allows the operator to monitor the frequency during an "over", thus reducing the effects of interference, changes contacts between stations from monologues into conversations and considerably reduces fatigue during long operating sessions. The relay control system described in this article allows "listening through" between words on c.w. and also at any time on telephony by merely releasing the "press-to-talk" switch. The delay time can be adjusted, between a few milliseconds and about one second, by means of a potentiometer. As the transmitter v.f.o. is held on continuously while sending words the problem of "chirp" on c.w. is eliminated. The system has been operated on the various bands with a transmitter running at powers up to 60W.

Circuit Description

The circuit is shown in Fig. 1. Transformer T1, rectifier MR1 and capacitor C1 together provide a 24V 0.5A supply for operating the

relays. This supply energises the relay coils when the morse key or "push-to-talk" switch is operated. Both relays then operate immediately, the current which operates RC/5 flowing through rectifier MR2. As soon as contacts RC1 close, C2 charges up from the 24V supply and the potential across this capacitor is sufficient to hold RC/5 operated for a time which can be varied by altering the value of VR1. When the morse key is released for the space between symbols the keying relay, RK/1, releases immediately, but RC/5 coil is isolated owing to the removal of the forward bias on MR2; this relay therefore remains operated. When the operator presses the key for the next symbol RK/1 operates immediately and the loss of charge on C2 is made good by conduction through MR2. If the operator makes a longer pause, such as that between words, C2 discharges sufficiently for RC/5 to release and return the station to the "receive" condition. The provision of MR2 and relay contacts RC1 are key factors in the operation of the circuit. If MR2 were not fitted the charge on C2 would hold both relays operated and keying would be impossible.

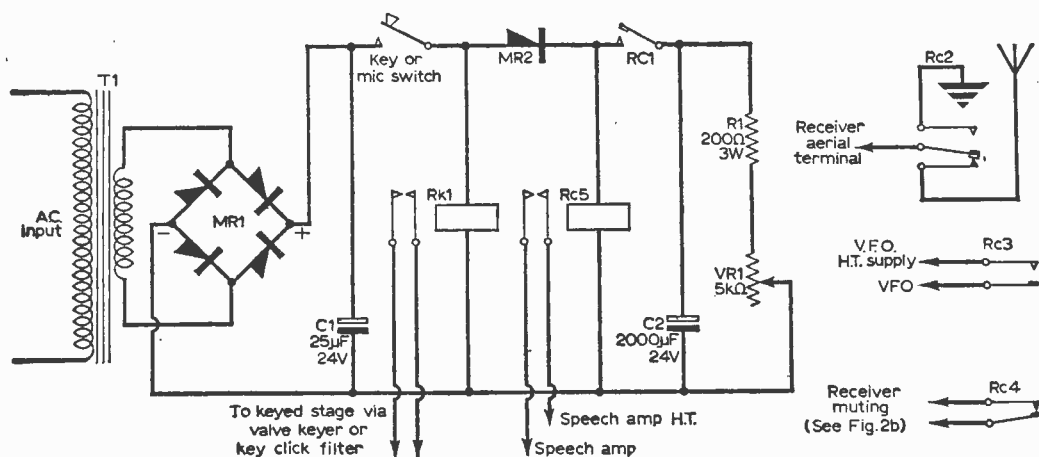
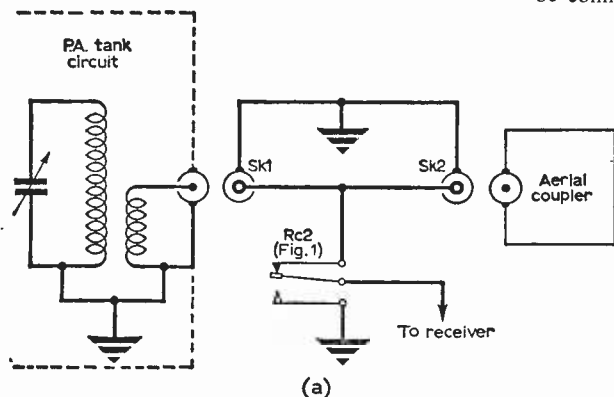


Fig. 1: The transmitter control circuit. T1 should be a general-purpose low voltage transformer. MR1 and MR2 should be 24V 0.5A components (e.g. GEC X541 B.I.P.I. or surplus 1A bridge for MR1).

If C2 were connected directly across the coil of RC/5 instead of via RC1 the relay would be slow-to-operate as well as slow-to-release, thus interfering with the operation of the system.

The use of the remaining contacts on RC/5 is self-explanatory except for the method of connecting the aerial to the receiver via contact RC2, which is unconventional as will be seen from examination of Fig. 2a. On receive the receiver aerial connection is "tapped in" to the inner conductor of the coaxial cable used to connect the transmitter output to the aerial coupler. This method eliminates the need for a heavy-duty aerial changeover relay and, provided the precautions mentioned later are taken, it works very well and has no effect on the transmitter output or the s.w.r. on the cable.

Receiver muting is achieved by connecting a variable resistor in series with the earth return from the existing r.f. gain control and shorting it out on "receive" by means of contacts RC4 as



shown in Fig. 2b. This method has the advantage that it is only necessary to unsolder one wire in the receiver when installing it.

Choice of Relays

Relay RK/1 is one of the small, ex-Government high-speed relays often described as "Siemens high-speed relays". These are available from a number of sources and any model (there are five different types) should be suitable. Relay RC/5 can be any 24V relay which mounts the necessary contact assemblies and has a coil resistance of 800Ω or more. If a very high resistance relay is used (say 10,000Ω coil) the value of RV1 should be increased to 100kΩ.

Transmitter Requirements

Owing to the type of aerial connection to the receiver the p.a. should use fixed bias or a clamper valve if RK/1 is used to key an intermediate stage. Unless this provision is made there is a possibility that during reception the p.a. valve may radiate noise which will be picked up in the receiver. In the prototype installation no noise was picked up from a p.a. using a simple clamper valve, keying being in a buffer/doubler stage preceding the p.a.

Construction

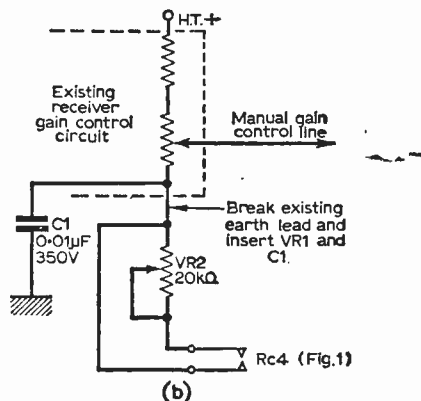
The unit can be built on any suitable chassis or in a wooden box. The relays are fairly quiet in operation but it is suggested that they be mounted on a piece of sound-absorbent material to reduce noise to a minimum. The aerial sockets, SK1 and SK2 in Fig. 2a, should be mounted as close to each other as possible, and relay RC/5 should be placed so that the lead from contacts RC2 to the sockets does not exceed 1in. in length. The frames of the two sockets must also be bonded together carefully. The layout of the remaining components is not critical. The receiver aerial connection is made via a terminal, the key connection is via a jack and the remaining control leads are connected via an international octal plug and socket.

Setting-up Adjustments

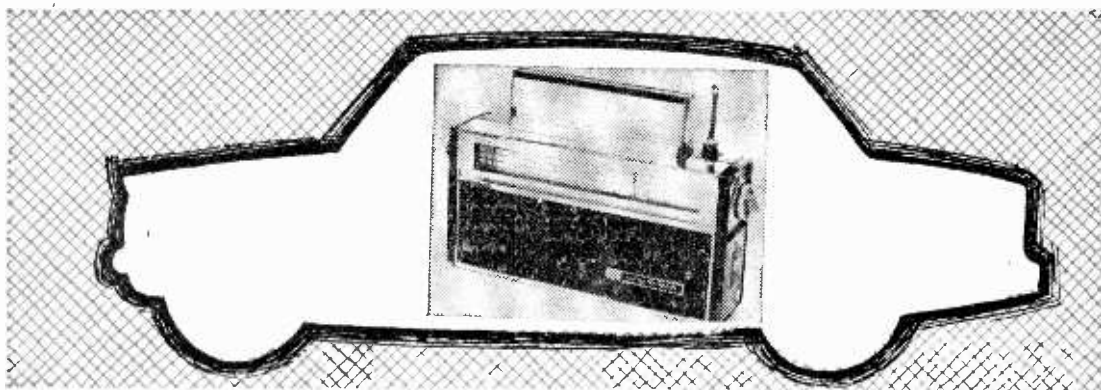
The first tests should be made with the international octal plug withdrawn. The mains should be connected and the 24V output from the power

Fig. 2a (left): The receiver aerial connection.

Fig. 2b (below): The circuit arrangement for muting the receiver.



supply checked. The key should then be connected and when it is pressed relays RK/1 and RC/5 should operate immediately. When the key is raised RK/1 should release immediately and RC/5 after a delay period. It should be possible to vary this delay period by adjusting VR1. The operation of contacts RK1 and RC2 to 5 should then be checked with the aid of an ohmmeter to ensure that they make and break correctly. The unit can then be connected to the transmitter and receiver, after which VR1 is adjusted to give the desired delay and VR2 (Fig. 2b) to give the desired level of sidetone from the receiver. ■



OWING to the great popularity of the transistor portable, it is understandable that many car owners have endeavoured to employ this possession in the car as well as in the home, office, on the bench and so forth. One advantage of the use of a portable in a car is that a separate car radio licence is not required. That is, provided the radio is not a fixture and does not run from the car battery.

It is generally possible to embrace the portable within the household licence covering the domestic radio and TV set. Note, however, that if the portable is used by a different family, even in the same house, then a licence may be required specifically for the portable. The Post Office will advise on these matters.

Unfortunately, the portable does not work very well in the car by itself. This is because it relies upon its internal ferrite rod aerial for picking up the signals, and signals do not pass very easily through the metal body of a car. There is some signal present inside the body of a car, of course, as some is bound to get in through the windows, and a certain amount even through the metal panels. Thus, by turning the volume control pretty well full on reasonable reception *may* be possible provided the set is orientated so that the internal ferrite rod aerial picks up as much as possible of the little signal there is available in the car.

Under this condition the set is highly sensitive. The background noise is often fairly high, this being in the form of a "hiss" when the required station is tuned in. Provided this was the major disadvantage, the set could probably be used in 40 per cent of the cases on the local stations with reasonable entertainment value.

However, the trouble really starts when the engine is turning. Since the set is now pulling really hard to catch on to as much signal as possible, it responds strongly to the smallest amount of interference. And inside a car with the engine running exists a high level of ignition interference, even when the engine is moderately suppressed.

Superimposed upon the weak signal, therefore, is the continuous, staccato crackle characteristic of

ignition interference. Unless the tuned station is producing a relatively high signal field in the area, the interference generally outweighs the signal inside the car and the set has to be switched off.

POOR S/I RATIO

This arises, of course, from the poor signal/interference ratio, as shown in Fig. 1. Here we have the strong outside signal S_o giving rise to the weak inside signal S_i due to the screening of the car. Also inside the car is the strong interference signal I . The signal/interference ratio is thus S_i/I .

At S/I ratios below 100-to-1 (40dB) the interference can be heard in the background. When the ratio rises above 100-to-1 the interference is pushed well into the background and is not heard.

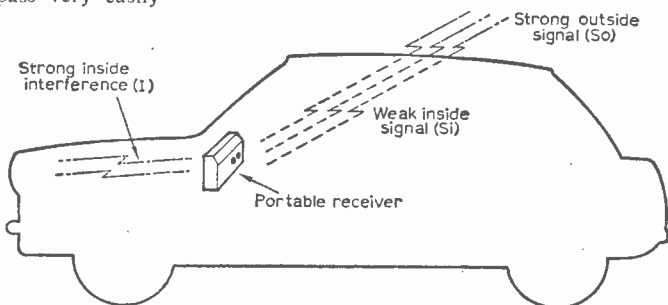
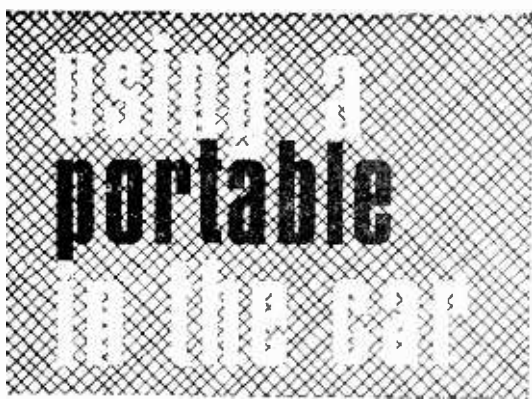


Fig. 1: Poor signal/interference ratio and signal fading are factors associated with using an ordinary transistor portable inside a car. Here the signal/interference ratio is given by S_i/I .

At ratios below about 50-to-1 the interference can be so disturbing that the portable just cannot provide reception of entertainment value in the car.

The problem is considerably aggravated due to the directivity characteristic of the portable's ferrite rod aerial. Thus, if the set is carefully orientated in the car for the best signal/interference ratio with the car travelling in one direction, the ratio is worsened when the car alters course.

To retain the best signal/interference ratio while travelling in a car, therefore, it is necessary to turn the set correspondingly each time the car alters course. This is highly undesirable and not particu-



G. J. KING

car-type aerial. This type of set has considerable advantage over the ordinary portable used in the car with an aerial plugged into the car aerial socket because the aerial circuits are designed for optimum matching to a car-type aerial.

One of the reasons why an ordinary portable fails to react so well with a car-type aerial is that the matching and coupling efficiency between the car-type aerial and the aerial socket is not generally very good. Then, of course, there is the disadvantage of the ferrite rod aerial remaining in circuit as we have seen.

It is not easily possible for the owner of an ordinary portable to introduce modifications so that the ferrite rod can be switched out of circuit when the set is used in a car with a car aerial. This is because the ferrite rod aerial acts as the aerial coils as well as the "collector" of signals.

RE-RADIATION INSIDE CAR

The author has tackled the problem from the aspect of the existing type of ordinary portable whose owner may wish to take it out in the car without introducing any modifications whatever. The "radiation" principle is of interest.

In this system a wideband amplifier feeds into a push-pull wideband power amplifier, using trans-

larly safe so far as the lone rider is concerned.

It is possible to improve the signal/interference ratio by placing the receiver in line with one of the windows of the car. This overcomes the screening effects of the metal car body to some extent and the signal/interference ratio may then rise to S_0/I . On fairly strong stations this may be sufficient with correct orientation of the set to produce a ratio better than 40dB.

Unfortunately, however, the directivity problem still exists and complete fade-outs can occur when the car turns a corner. Moreover, it is not usually very convenient to have a portable perched up near one of the windows.

Transistor portable manufacturers, realising the need to do something about these problems, now almost universally fit a car aerial socket on their sets. This allows a car aerial to be employed with the set, the theory being that a signal of value S_0 (Fig. 1) is brought into the set.

MARGINAL IMPROVEMENT

The theory is good, but in practice the results are very marginal and sometimes there is virtually no improvement at all with the car aerial connected. There are two reasons for this.

One is that transistor portable manufacturers are in a very competitive field and so obviously they are not in a position to spend a great deal of extra money to introduce additional facilities for a minority market.

The other is that the extra signal picked up by a simple car-type aerial is hardly worth bothering about if one compares the efficiency of the ferrite aerial in the set with that of the car aerial. The former is many times more efficient than the latter.

Over the past two years the author has been making a special study of the subject and has reached the conclusion that one solution is to improve the overall efficiency of the simple car-type aerial so that it is at least as efficient as the set's ferrite rod aerial without being directional. Another solution is to "radiate" inside the car a signal field over the whole of the long and medium wave bands at least equal to that of the signal field outside the car. The resulting designs are the subject of British Patent App. No. 4097/64.

Set manufacturers have also now introduced the "hybrid" portable/car radio set. This is basically a transistor portable with facilities for switching out the internal ferrite rod aerial and switching in circuits for accepting the signals picked up on a

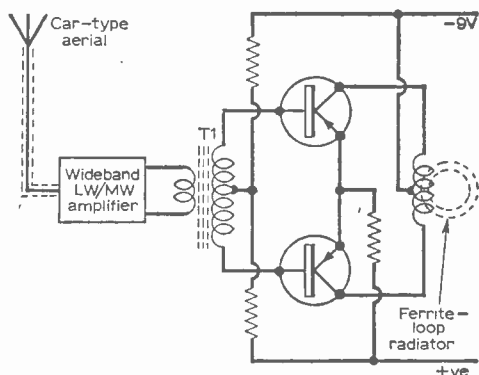


Fig. 2: A wideband amplifier driving a push-pull r.f. power amplifier can be employed to "radiate" strong signals, at least equal in strength to those outside the car, inside the car.

sistors, as shown in Fig. 2. Here a wideband medium frequency amplifier is supplied with signals from a car aerial and the signals at the output of this amplifier are coupled to the power amplifier by T1. The collectors of the output transistors are then loaded to a ferrite loop radiator which is located at a convenient site inside the car.

All the signals thus picked up by the car-type aerial are re-radiated inside the car at a strength at least equal to that outside the car as shown in Fig. 3. The signal/interference ratio then becomes $S_1=S_0/I$ and, provided ordinary ignition interference suppression precautions are taken, the ratio is generally better than 40dB on all but very distant stations.

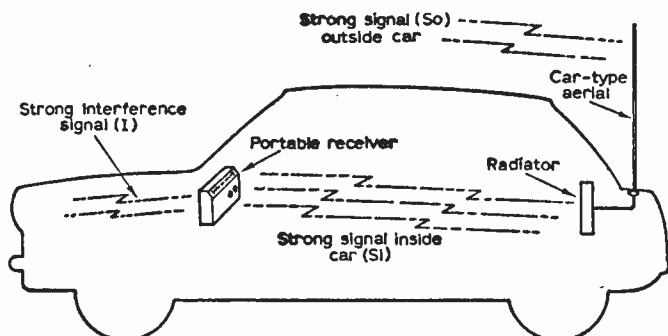


Fig. 3: The resulting improvement in the signal/interference ratio by the use of the "radiator" is shown here as $S_i - S_{0i}$. Directivity troubles are also eliminated.

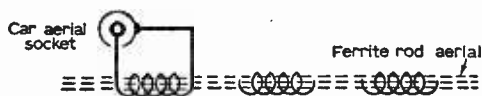


Fig. 4: Most transistor portables feature a "car aerial" socket connected to the ferrite rod aerial by means of a small coil, as this diagram shows.

EFFECT OF A.G.C.

The amount of interference produced by a portable operating in an interference environment is affected not only by the signal/interference ratio but also by the strength of the wanted station irrespective of that of the interference.

This is because the greater the strength of the signal picked up by the portable the greater will be the effect of the automatic gain control (a.g.c.) circuits inside the set and the less will be the sensitivity of the set to interfering signals anyway!

This means that the effect of interference resulting from a given signal/interference ratio will be less the greater the strength of the signal proper. As an illustration the signal/interference ratio is 10 to 1 with a wanted signal of $100\mu\text{V}$ and an interference signal of $10\mu\text{V}$. The interference

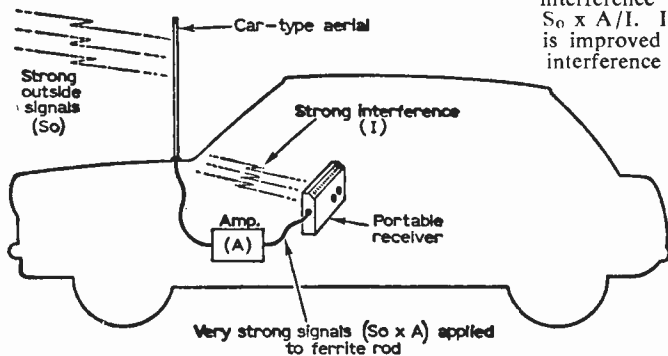


Fig. 5: By use of a wideband amplifier with gain A the signal/interference ratio is improved approximately to $S_0 - A/I$. Thus, the ratio is improved by the numerical gain of the amplifier.

would be considerably troublesome under these conditions because $100\mu\text{V}$ of wanted signal would be barely sufficient to push the set into a.g.c.

However, with a wanted signal of 1mV and an interference signal of $100\mu\text{V}$ (still 10 to 1 ratio) the interference effect would be less, since 1mV of wanted signal would push the set well into a.g.c. action and thus diminish its sensitivity to the interference. A.G.C. action thus tends to improve the effective signal/interference ratio.

It will be appreciated, of course, that the set-up in Fig. 3 completely destroys the directional properties of the transistor portable when it is used in the car, for the portable and/or radiator is positioned for the most convenience and the optimum signal/interference ratio. Neither the set nor the radiator moves relative to each other, so this optimum will be maintained whatever station tuned.

In practice it has been discovered that the complications and expense of re-radiation can be deleted without detracting from the overall effect by utilising the aerial coupling loop provided by the set manufacturer. This loop comprises a number of turns of wire wound round the ferrite rod and terminated across the car aerial socket as shown in Fig. 4.

DIRECT BOOST

By using this we can do away with the push-pull output stage shown in Fig. 2 and employ only the wideband amplifier by connecting the output of the amplifier direct to the car aerial socket. This arrangement is shown in Fig. 5, from which it will be seen that the outside signal now present in proximity to the set's ferrite rod aerial is $S_0 \times A$, where A is the gain of the wideband amplifier.

If the amplifier has a gain of ten times then the signal focused around the set's ferrite rod is $10 \times S_0$, which could be considerable. The signal/interference ratio now rises approximately to $S_0 \times A/I$. In general the signal/interference ratio is improved by at least ten times relative to the interference actually inside the car.

This can be easily demonstrated by running the portable inside the car with the engine running and the amplifier switched off, noting the background noise and interference crackles, and then switching the amplifier on. When the arrangement is correctly employed both the interference and the background noise disappear completely or very significantly.

The success of the arrangement is not only due to the boost that the amplifier provides to the signal, thereby improving the signal/interference ratio directly and also by pushing the set's a.g.c.

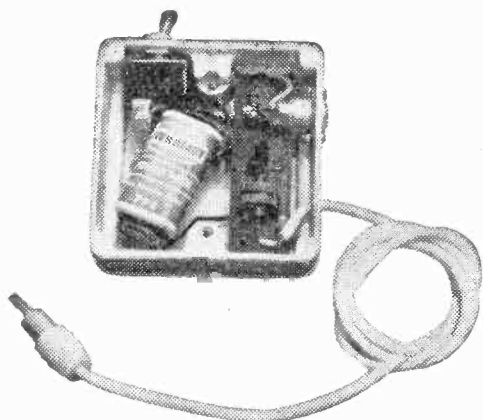


Fig. 6: Inside view of commercial wideband amplifier for use with transistor portables inside cars.

hard on, but by the improvement in matching that can be secured between the car-type aerial and the set's aerial socket. The amplifier can thus be designed to match at its input a simple type of car radio aerial and at its output the aerial circuit of the set.

In that way optimum signal transfer results from the aerial to the set which, as has already been intimated, rarely occurs when a car-type aerial is plugged straight into the set. As with the "radiation" arrangement the direct boost also kills the directivity of the ferrite rod and, in fact, the aerial/amplifier combination easily matches the efficiency of the set's ferrite rod aerial, which was the original target of the exercise.

There are one or two points that should be remembered when these arrangements are adopted. One is that the signal/interference ratio improvement relates to the interference actually inside the car and not to interference outside the car. This means that ordinary suppression of the ignition and electrical system is required as when any radio is used in a car. Another is that if the amplifier is made with too great a gain unsuppressed passing traffic can cause trouble. Excessive gain is unnecessary since it just cannot be used on a main road. The same applies to an amplifier whose response extends beyond about 2Mc/s.

EXTRA L.W. BOOST

Above that frequency local car interference starts showing up really badly, so it is as well to curtail the response of this type of amplifier at about 1.5Mc/s. It is generally desirable to give a lift of around 40dB at 1,500m, for the Light Programme is pretty poor in some parts of the country, and this now makes a handy station for late night car travellers since the recent extension of popular music.

To determine the maximum amount of gain that can be accommodated under practical conditions

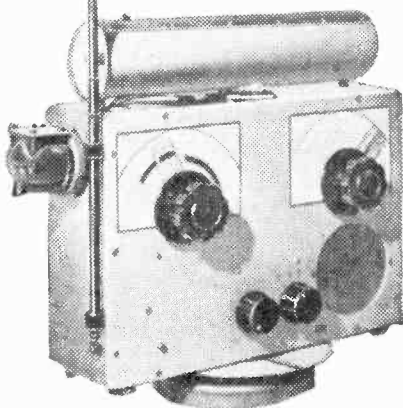
Continued on page 170

NEXT MONTH IN PRACTICAL WIRELESS

1

D.F. RECEIVER

Design for an eight transistor D.F. receiver for small craft. Specially designed for the Marine Radiobeacon band.



2

STEREO AMPLIFIER

Hi-Fi 10 + 10. 25 c/s-40 kc/s \pm 2dB. 18dB negative feedback. Crosstalk 26dB down.

3

JUNIOR AMPLIFIER

Amplifier for the Junior Crystal Set. Comprehensive construction details.

4

VALVE KEYING CIRCUIT

Improved valve keying circuit for the amateur transmitter.

**JULY NUMBER
ON SALE JUNE 3**

ORDER YOUR COPY NOW!

Incompetence

RARELY have I seen a correspondent so completely "off the beam" as R. A. Packer (May issue). Not only is he under the impression that an 807 is an I.O. based valve (all the 807s that I have used during the past 20 years have come supplied with five-pin U.X. bases) but he is addicted to making sweeping and completely false generalisations.

He obviously never peruses the advertisement sections of P.W. because a quick glance through any recent issue would show him that many manufacturers are still making and selling a large variety of kits and completed units using the ever-popular I.O. valves.

His remarks regarding "Competent Constructors" are not only illogical but show great intolerance—a "constructor" is one who constructs, a "designer" is one who designs.

Moreover, most amateurs I have met do not enjoy the obviously ample financial sources of Mr. Packer; 6K8s and 6V6s at a bob a time are a far more attractive proposition to the typically financially embarrassed amateur than ECH81s and ECL86s at several shillings each.

Finally, in case Mr. Packer thinks that I am a "Radio Square", let me hasten to add that for years I have regularly (and quite competently) constructed equipment using everything from Jumbo valves to miniature deaf-aid components.

J. D. Methven.

Crawley,
Sussex.

Correspondents

I WOULD like to correspond with anyone who is interested in radio and of my own age (13).

Richard Edeson,

32 Crewe Avenue,
Ferrybridge,
Knottingley,
Yorks.

I AM a radio experimenter and keen reader of P.W. I would like to correspond with anyone who shares an interest in the same field. I am 26 years of age.

Kenneth Smith.

7 Luyan Hill,
Belmont,
Port of Spain,
Trinidad.

NEWS AND..

STEREO HEADPHONES FOR DEAF CHILDREN



The little girl on the left is wearing a hi-fi stereo headset manufactured by Standard Telephones and Cables Limited and designed to rather special requirements. The microphone on the boom feeds the child's speech through a small amplifier back to the phones at increased volume. In fact the headsets have been designed to help deaf children learn to speak by enabling them to listen to their first efforts of forming sounds and words.

These specifications required the phones to handle, without distortion, sounds exceeding the threshold of pain level for normal hearing, and for each earpiece to have individual volume control.

RECORD DECKS AT THE FAIR

The 1965 Audio Fair was recently held in London, and naturally enough, record decks and players were well represented by a number of British and overseas manufacturers.

Garrard Engineering Ltd. (Newcastle Street, Swindon) had a wide range of decks on display, from inexpensive auto-changers to high performance transcription units and including three which had not previously been seen in the UK. One of these, type A.70, incorporates a new record-changing mechanism which, with a sloping centre spindle and a pusher platform at one corner of the deck, provides a gentler disc release than the conventional arrangement.

One of the foreign manufacturers represented at the Show by their UK agents Denham and Morley Ltd. (173 Cleveland St., London, W.1) were the Scandinavian Radio and Television Company of Denmark. Two S.R.T. transcription decks and a record player were displayed, the transcription decks both featuring belt driven turnable and variable speed control.

The German firm of Telefunken were represented by their agents Welme Corporation Ltd. (27 Chancery Lane, London, W.C.2), who had on show two Telefunken sound systems comprising record deck, amplifier and speaker units. One of these featured a belt driven deck and a 12-valve amplifier.

SOME NEW MICROPHONES ON THE MARKET

Vitavox Ltd., Westmoreland Road, London, N.W.9 have recently introduced a new dynamic microphone (Multi-Zed M100) with four alternative output impedances. Impedances of 25Ω, 200Ω, 10kΩ and 'high', are available from the mic. which incorporates a tapped ratio line transformer. Frequency response is from 50c/s to 15kc/s ± 3 dB.

Another new microphone is the model 4126 capacitor from STC. This professional instrument measures only two inches plus, yet it incorporates the unusual feature of an integral field-effect-transistor head amplifier. Another unusual feature is the price—around £120.

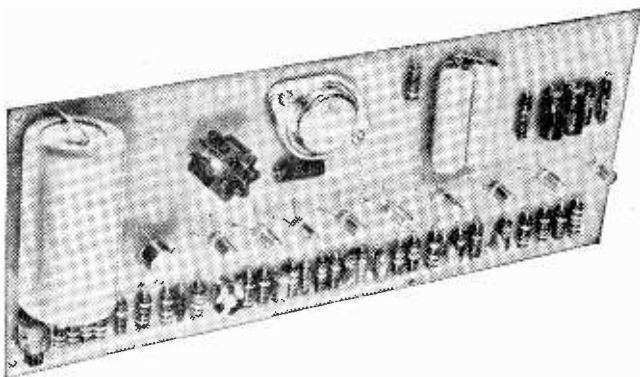
Another recent addition to the STC range of microphones is their model 4119 ribbon mic. This is a high quality tubular microphone with a narrow cardioid directional sound pick-up. Especially suitable for pop singers, the microphone costs £25.

.. COMMENT

PMG TO GRANT LICENCES TO VISITING AMATEURS

Good news for overseas amateurs visiting the UK. is the recent announcement of the Postmaster-General that in future they can expect to be granted licences to operate transmitting equipment whilst in this country. This concession will apply to all foreign amateurs whose own country are prepared to grant similar facilities to UK licensed operators.

NEW TRANSISTOR AMPLIFIER KIT



This is a 12-transistor amplifier with a 20W r.m.s. music power output (40W peak) claimed by its makers. It is Sinclair Radionics' new X-20 unit which combines preamp and power amplifier on a panel measuring only $8\frac{1}{4}$ in. x $3\frac{1}{4}$ in. x 1 in. Tone and volume controls for mono or stereo can be added to suit practically any requirements, and any type of pick-up, as well as outputs from f.m. tuners and tape preamps, can be connected to it. Frequency response of the amplifier is 20c/s to 20kc/s \pm 1dB, input sensitivity 1mV into 5k Ω and signal to noise ratio is better than 70dB. Power requirements are 36V d.c. at 700 mA.

In kit form the X-20 will cost you £7 19s. 6d., or built and tested the price is £9 19s. 6d. from Sinclair Radionics Ltd., Comberton, Cambridge.

POLICE TO GET POCKET TRANSCEIVERS

Police forces throughout the country will soon be using pocket-sized radio transmitter/receivers manufactured by G.E.C. (Electronics) Ltd. 400 of these sets have been ordered by the Home Office, following a period of 12 months' operational use by the Lancashire Constabulary.

G.E.C.'s transceiver is the smallest v.h.f. pocket set to be granted G.P.O. and Home Office approval and already many arrests have been attributed to its use.

STEREO TRANSMISSIONS: NEW TIMES

The experimental pilot-tone stereophonic transmissions from Wrotham, which have until recent weeks been taking place three afternoons a week on the Third Network Music Programme, are now forming part of the Music Programme transmissions from Wrotham on 91.3Mc/s on Mondays from 2.30 to 3 p.m. and on Thursdays from 11 to 11.30 a.m.

These transmissions will also be radiated by the Swingate station near Dover, on 92.4Mc/s.

BECAUSE OF THE LARGE NUMBER OF "OUTSTANDING" "SELL OR LOAN" REQUESTS NOW HELD BY US, WE REGRET THAT FOR THE NEXT FEW MONTHS WE WILL NOT BE ABLE TO ACCEPT ANY LETTERS FOR THIS COLUMN.

Sir, I would be grateful if any reader could sell or loan me...

... details on the power unit No. 2 for the 19 Set, and any other information on the 19 Set.—J. Watts, 103 Strathnairn St., Roath, Cardiff, S. Wales.

... conversion details of v.h.f. receiver R126 (a) to include a.v.c., (b) to all 6V valves.—F. S. Murphy, Old Abbey, Drogheda, Ireland.

... operating manual etc. on aircraft receiver RU19 model, type CW-460-480, made by Western Electric.—P. Etterley, The Ingle, Granby, Notts.

... details of a four transistor superhet receiver.—Shahid Mumtaz, 791-F Satellite Town, Rawalpindi, West Pakistan.

... an instruction manual for the R107 and any details on this receiver.—T. Nolan, 50 Albert Road, Gurnard, Isle of Wight.

... any information on where to buy an Ekco car radio CR/61A.—E. Amadasu, 6 Idahosa St., Benin City, Nigeria.

... a circuit diagram and operating manual for a No. 38 Mk. 3 set.—G. A. Mackay, 32 Ty-Wern Ave., Rhiwbina, Cardiff, Glamorgan, S. Wales.

... circuit and service details on the Pye domestic receiver, model 391/H, made about 1950.—Desmond Walsh, Ballylynch, Carrick-on-Suir, Co. Tipperary, Ireland.

... a manual or service gen. on ex-army receiver R107. The h.t. is weak and will not oscillate.—W. Brewer, 174 Tyne-mouth Road, Heaton, Newcastle upon Tyne 6.

... any information, layout, circuit diagrams etc., on ex-Admiralty receiver, B28.—W. Hillman, 42 Gertrude Street, Abercynon, Mountain Ash, Glamorgan, S. Wales.

... surplus valves 5V4 and 6C5 cheaply. I am 12 years old but am a very keen radio fan.—E. King, 14 Windmill Road, Cookham Rise, Berkshire.

... the circuit diagram and conversion details for reception set R220 Mk. 2.—C. R. Pearson, 3 North View Avenue, Bideford, Devon.

... circuit diagram and manual for the Eddystone S640. Also any modifications for s.s.b. reception.—R. Garvey, 181 Arle Road, Cheltenham, Glos.

... the circuit diagram of a Philips AG8106 tape recorder.—C. Jones, Tenby House, High Street, Newchapel, Stoke-on-Trent.

... circuit diagram and service details of walkie talkie set 38 Mk. 3, manufactured by Minimitter Ltd.—H. F. Hynd, NASA Switching Centre, Room 1, Annexe, Electra House, Victoria Embankment, London, W.C.2.

... any information and circuit diagram on the No. 19 Mk. 2 "B" set.—M. Franklin, 17 Hitherwood Drive, London, S.E.19.

... service sheet on dual standard TV set (17 in.) made by British Radio Corp. The only mark on the chassis is PA77.—P. Gormley, 2 Francis Street, Londonderry, N. Ireland.

... the handbook of the Armstrong chassis No. F.C.48.—T. Renfrew, 6 Wallington Terrace, Birkenhead, Cheshire.

A Stabilised Nine Volts

A compact unit to power transistor receivers from the mains.

BY P. G. THOMSON

THIS power unit was originally constructed to form part of a mains-battery transistor portable radio. In the light of experience gained from building and operating similar power supplies, it was felt that a stabilised type with ample power rating was to be preferred. Further in designing this power unit particular attention was paid to economy, compactness and hum level.

Circuit Design

To give an ample current rating about 350mA is needed. The output voltage varies from 9.3V without load, to 8.7V with a load of 350mA (See Fig. 1.). Different output voltages may be attained for individual needs, by using a different zener diode.

The operation of the circuit is as follows. The secondary voltage from mains transformer T1, is

rectified by a full wave rectifier consisting of D1, D2, D3 and D4, capacitor C1 being used to smooth the output from these rectifiers. Resistor R1 allows current to flow through the zener diode D5, so setting the base reference voltage for transistor Tr1. The transistor de-amplifies the large voltage variations on its collector side, so that they appear as only very small variations on its emitter side. Decoupling and extra smoothing are achieved by capacitor C2. Fuses F1 and F2 are included to protect the power unit and any equipment it may be connected to.

Other output voltages and current ratings can be obtained using the same circuit, with modified component values. The main design considerations for this circuit are:—

- (1) The mains transformer:—
Current Rating $> (I_M + I_Z)$

$$\text{Voltage Rating} = \frac{V_C}{\sqrt{2}}$$

Where:—

I_M = Maximum current taken by load.

I_Z = Current taken by diode to establish zener voltage.

V_C = Maximum voltage at collector of Tr1.

V_Z = Zener voltage.

V_C is given by:—

$V_C = \sqrt{2} \times \text{Transformer secondary voltage.}$

The higher the secondary voltage (i.e. the greater the voltage allowed across Tr1) and current rating of the transformer, the better the regulation.

- (2) The current ratings for each of the full wave rectifier diodes should be:—

$$\frac{1}{2}(I_M + I_Z)$$

The voltage ratings for each of the rectifier diodes will depend upon the transformer secondary voltage, which will in turn depend upon the output voltage, and the voltage it is decided to allow across the transistor. The voltage rating for each of the diodes will be:—

$$\frac{1}{2}(V_C)$$

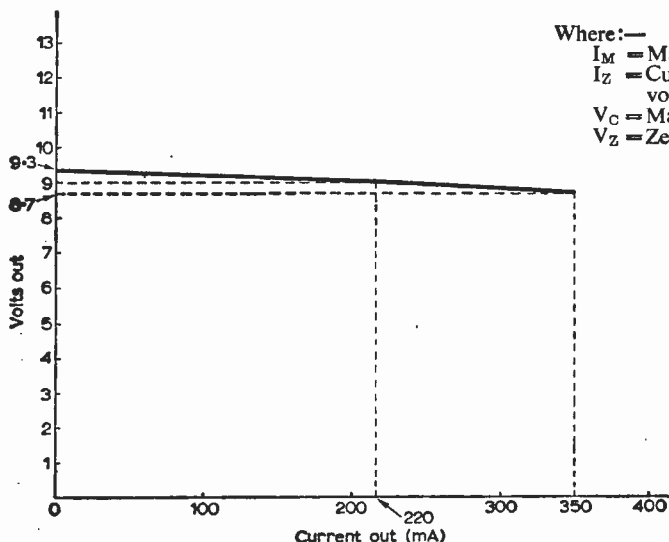


Fig. 1: This graph illustrates the reduction of output voltage from the unit, with increased current load.

ELECTRONICS

**LEARN - THE
PRACTICAL
WAY . . .**

**your career . . .
hobby . . .
own business . . . ?**

The demands for good Electronic Engineers is increasing almost daily throughout the world. Electronics is now the most rapidly expanding of all industries with its applications reaching into almost every sphere of human activity. If you are looking for a new career with new opportunities, then now is the time to choose—Electronics. If you are already employed in this field—then now is the moment to seek high qualifications to secure the top jobs which are waiting to be filled. Most of all the great potential of electronic development means unlimited scope for the future and will ensure a secure occupation for you—unlikely to be affected by possible future recessions in other industries.

The British National Radio School has had 25 years' experience of HOME STUDY coaching for students wishing to master the fascinating subjects of Electronics—whether the object be career or as a hobby or new interest. The School is entirely independent and specialises ONLY in the teaching of electronic subjects. It employs only fully qualified staff to conduct and supervise each individual course taken by a student and it is this close and personal contact between Tutor and Student which we believe makes possible the successful completion of a course of study.

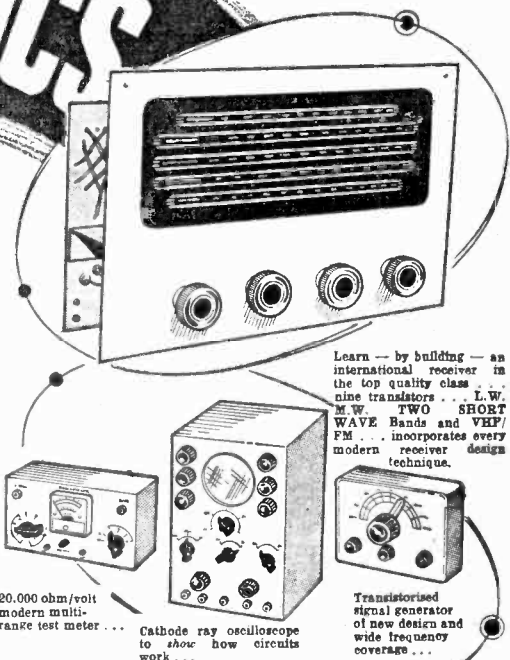
A special feature of our system is that all courses start right from the beginning and no previous knowledge or experience is necessary or expected. Training is carried out in easy step-by-step stages using the most modern methods of tuition. The great advantage of the home study method is that it provides a complete self-contained course giving everything needed for the subject concerned and enabling work to be done in the comfort of one's own home and over any period of time desired.

EXAMINATION COURSES

- CITY & GUILDS TELECOM. TECHNICIANS CERT.
- CITY & GUILDS FULL TECHNOLOGICAL CERT.
- A.M.Brit.I.R.E. EXAMINATION
- RADIO AMATEURS LICENCE EXAMINATION
- P.M.G. CERTIFICATES FOR RADIO OPERATORS
- R.T.E.B. SERVICING CERTIFICATES

OTHER COURSES

- MATHEMATICS
- TELEVISION
- TRANSISTORS
- SERVO-MECHANISMS
- COMPUTERS
- RADAR & NAVIGATIONAL AIDS



Complete picture way library of theory books and practical manuals
NO MATHEMATICS!

BUILD AND EXPERIMENT WITH ALL THE ABOVE—AS—YOU—LEARN . . .

This is a new complete experimental course comprising a mixture of theory and practical work using a very full range of electronic components and apparatus. Starting right from the beginning—or at a later stage if needed—the course enables the student to build up all the basic electronic circuits—amplifier, oscillator, rectifier, detector, etc.—and finally to the design, construction, testing and servicing of a latest design fully transistorised receiver using nine transistors and covering long and medium wave and TWO SHORT WAVEBANDS plus VHF/FM reception. It is of real luxury quality throughout—operates from a 9V. battery and can be used anywhere in the world. Every present-day technique in circuitry is covered and the course also includes multi-range test meter, signal generator and oscilloscope. By the end of the course the student will be able to deal with any type of servicing work with confidence and will also have a very useful workshop of equipment. Nearly 100 interesting and absorbing EXPERIMENTS are carried out during this comprehensive course enabling anyone to gain full mastery of electronics.

FREE



POST NOW
TO: BRITISH NATIONAL SCHOOL, RADIO HOUSE, READING, BERKS.
Please send me your free Brochure, giving details of your Courses, without any obligation, to:—

NAME
ADDRESS } Block Caps Please

I am interested in..... } courses above
(We do not employ representatives) PW 6/65

British National Radio School

THE LINEAR 'SUPER 30' HIGH FIDELITY PUBLIC ADDRESS AMPLIFIER

TECHNICAL DETAILS

SENSITIVITY FOR 30 WATTS

Gram.—50 millivolts
Mic. 1—5 millivolts
Mic. 2—160 microvolts

FREQUENCY RESPONSE

±2 dB, 30 c.p.s.—20,000 c.p.s.

BASS CONTROL

+15 dB to -15 dB at 50 c.p.s.

TREBLE CONTROL

+12 dB to -12 dB at 10 Kc/s

HUM AND NOISE

-60 dB.

HARMONIC DISTORTION

0.5% for 30 watts.

VALVES

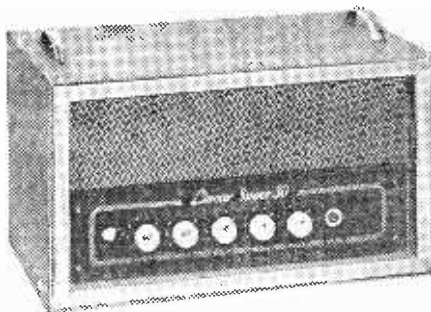
Mullard ECC83, ECC83, ECC83, EL34, EL34, CZ34.

NEGATIVE FEEDBACK

20 dB.

DAMPING FACTOR

12.



RETAIL PRICE **33 Gns.**

Send S.A.E. for leaflet.

For operation on standard 200-250v., 50 c.p.s., A.C. mains. 110/120v. models available for export.

Trade and export enquiries Invited.

LINEAR PRODUCTS LTD.
ELECTRON WORKS, ARMLEY, LEEDS

A HIGHLY EFFICIENT

30 WATT GENERAL PURPOSE PUBLIC ADDRESS UNIT

With input mixing facilities and outputs for 3-7.5-15 and 330 ohms (100v line)

A special feature of the 'SUPER 30' is its high degree of stability, ensuring that the longest output leads can be used without fear of the usual troubles associated with instability.

Three high sensitivity standard jack inputs with provision for high and low impedance microphones.

- all these and hundreds more

Mon. Sat. 9 a.m.—5.45 p.m. Wednesday 1 p.m.
Lunch 1.30 to 2.30

Special 24 Hour Express Mail Order Service

AZ31 12/6	EBF59 7/6	EF80 8/-	EZ41 7/-	PCL83 9/-	U25 10/-	UL84 6/-	5Y8G/GT 8/6	6C5GT 8/-	6V6G 4/-	12BA6 7/8
DAF91 4/6	ECC81 4/-	EF91 4/-	EZ80 5/6	PCL84 7/-	U26 10/6	UY41 7/6	6C6 6/6	6V6GT 7/6	12BE6 7/6	
DAF96 6/6	ECC82 5/-	EF92 4/-	EZ81 5/6	PCL85 7/6	U191 13/6	UY85 5/6	6A7 12/6	6X4 4/6	12K7GT 5/-	
DF91 3/-	ECC83 5/6	EF98 10/-	6Z92 12/6	PCL86 10/-	U301 18/6	V4P4B 17/6	6A8 8/6	6X5G 5/-	12K5CT10/-	
DF96 6/6	ECC84 6/6	EF183 9/-	HL41DD 8/-	PL36 11/6	U801 19/6	VR150/30 7/-	6AL5 3/6	6X5GT 8/6	12Q7GT 6/-	
DK91 5/6	ECC85 6/-	EF184 8/-	12/6	PL81 7/6	UAB80 5/6	W81M 5/6	6AM6 4/-	6F6 5/6	630L2 12/6	12Q7 12/-
DK92 7/6	ECH35 12/6	EL33 17/6	KT66 12/6	PL82 7/6	UAF42 8/6	W81M 5/6	6AQ5 6/6	6H6 1/-	7B6 21/-	19AQ5 8/-
DK96 7/6	ECH42 8/6	EL41 9/-	KT81 10/6	PL83 7/6	UBC41 13/6	X61M 13/6	6AT6 4/6	6J6G/GT 5/6	7B7 8/6	26Z4 7/6
DL92 5/-	ECH81 7/-	EL42 9/-	KTW61 7/-	PL84 7/-	UBF80 7/6	X78 26/-	6B8G 2/6	6J7G 5/-	7C5 10/6	35L6GT 8/6
DL94 7/-	ECH83 5/6	EL84 5/-	MU14 17/6	PY32/3 10/-	UBF89 7/6	X79 40/-	6BA8 5/6	6K7G 2/-	7C6 9/6	35W4 6/6
DL96 6/6	ECL80 6/6	EL95 9/6	N78 22/6	PY81 6/-	UCH42 8/6	IR5 5/6	6BE6 5/6	6K7GT 5/6	7H7 6/-	35Z4 6/6
EABC80 8/6	ECL82 8/6	EM80 8/6	OZ4 5/-	PY82 5/6	UCH81 7/-	IR5 5/6	6BJ6 6/-	6KR6 4/-	787 18/-	50C5 8/6
EAF42 8/6	ECL86 8/6	EM81 8/-	PC84 8/-	PY83 7/6	UCH82 8/6	IT1 3/-	6BR7 10/6	6KRGT 9/6	7Y4 6/6	80 2/6
EP91 3/6	EP41 7/6	EM84 8/-	PC89 8/6	PY800 8/6	UCL83 9/-	3T4 6/-	6BR8 12/6	6L6G 7/6	8D3 4/-	90CG 25/-
EB41 8/-	EF80 5/-	EY51 7/6	PCF80 7/6	PZ30 12/6	UF41 7/6	3V4 7/-	6BRW6 8/-	6Q7G 6/-	10F1 10/-	98CV 25/-
EBF80 7/6	EF85 7/-	EY86 7/6	PCF86 9/6	SB61 3/-	UF89 7/-	51 4G 4/-	6BRW7 9/-	6QGT 10/-	12AU7 5/-	807 8/6
EBF83 8/-	EF86 7/-	EZ40 7/-	PCL82 7/6	U14 8/-	UL41 7/6	5V4G 8/-	6C4 3/6	6U8G 7/6	12AX7 5/6	954 4/-

COMPLETE VALVE LIST FREE WITH ORDER

OBsolete VALVES A SPECIALITY
SEND FOR QUOTATION

TERMS OF BUSINESS C.W.O. or C.O.D.
4/2 PACKING CHARGE ON ALL C.O.D. ORDERS. POSTAGE 6d. per VALVE

Mon.—Sat. 9 a.m.—5.45 p.m. Weds. 1 p.m.
Lunch 1-30 to 2-30

BRAND NEW TRANSISTORS

OC35 10/-	OC72 8/-	OC81D 5/-
OC42 6/-	OC74 8/-	OC81m/pr 12/6
OC44 5/-	OC75 8/-	OC82 8/-
OC45 5/-	OC77 8/-	OC82D 6/-
OC71 5/-	OC81 5/-	OC170 6/-

SILICON RECTIFIERS

400 volts 350 mA ... 7/6 each

SETS OF VALVES

IR5, IS5, IT4, 354, 3V4	...	Set of 4, 17/-
DAF91, DF91, DK91, DL92, DL94	...	Set of 4, 17/-
DAF96, DF96, DK96, DL96	...	Set of 4, 25/-

R.S.T. VALVE MAIL ORDER CO.

211a STREATHAM ROAD MITCHAM SURREY

Tel. MITcham 6202
Open Daily to Callers

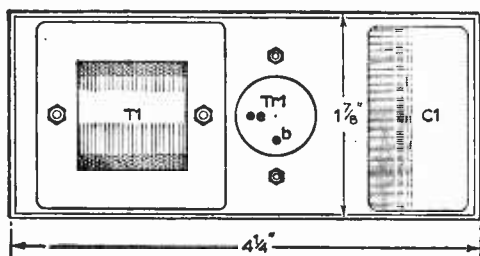


Fig. 4a: A view from underneath the chassis.

Construction

The aluminium chassis is made in three parts. The chassis dimensions and the position of the fixing holes are shown in Fig. 3. The exact dimensions and relative positions of the holes are not shown since they will depend upon the particular components used by the constructor.

The position of the larger components is shown in Fig. 4. The rest of the components are assembled together on a sub-chassis made of Veroboard (this consists of a perforated board of insulating material with strips of copper laid across it, Fig. 5). However these components could equally well have been assembled together on a piece of perspex, or similar material, and connected by means of conventional wiring.

The procedure when wiring is as follows. First mount the principal components (those shown in Fig. 4) to the chassis and connect them up. Then wire the sub-chassis and when complete, connect to the components already mounted on the main chassis. The sub-chassis is held in position by means of the wire connections made from it to the chassis.

Operation

It will be seen from the theoretical circuit (Fig. 2), that switch S1 and a battery B1 have been included in the circuit. As previously mentioned the unit was designed to be incorporated in a transistor radio, B1 and S1 facilitate mains-battery operation, whether or not they are included in the constructor's version will depend upon the function the power supply is put to.

The hum level of this power supply is exceptionally low. The prototype was used to feed a one-watt transistor amplifier driving an 8 x 5 in. loudspeaker, at a load of 220mA (12mA quiescent into the amplifier, the remainder into a resistive load). Hum was only discernable 6 in. away from the loudspeaker, the hum level increased at 350mA but was still barely audible. At higher loads the hum level increased appreciably.

It is important to realise that since the transistor is bolted to the aluminium chassis, the whole of the chassis is at collector potential and thus must *not* be earthed.

Conclusion

The total cost to the author was about £2, which is less than other similar units, and has been achieved without sacrificing voltage regulation and smoothing.

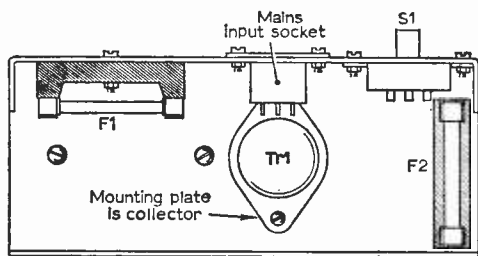


Fig. 4b: Looking down from above the chassis, F1, S1 and the input socket are shown to be fitted to the front panel.

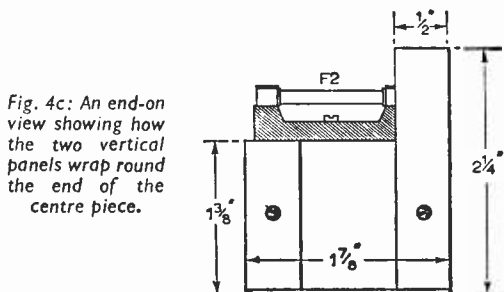


Fig. 4c: An end-on view showing how the two vertical panels wrap round the end of the centre piece.

The would-be constructor is advised to look through radio magazines to find the most reasonably priced components.

The completed unit is capable of powering most types of transistor portable radios and record players. It will be appreciated that the output ratings and construction configuration of the unit may be easily modified to suit individual requirements. ■

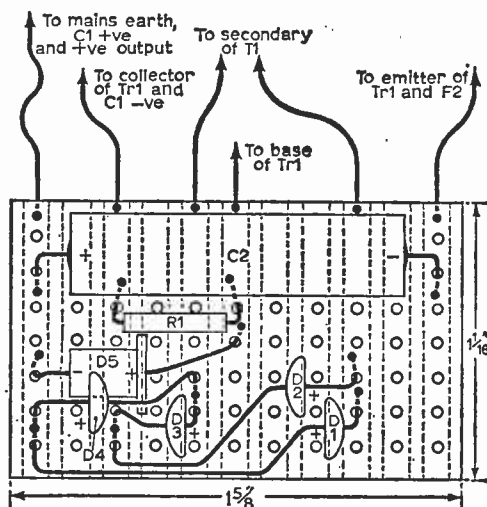


Fig. 5: The component layout and wiring details of the Veroboard-based sub-chassis.

SURPLUS HANDBOOKS

19 set Instruction Handbook 3/6 each, P.P. 6d.
 1155 Instruction Handbook 3/6 each, P.P. 6d.
 H.R.O. Instruction Handbook 3/6 each, P.P. 6d.
 Frequency Meter, BC 221
 Instruction Handbook 3/6 each, P.P. 6d.
 46 Trans/Receiver 3/6 each, P.P. 6d.
 Details and Notes 3/6 each, P.P. 6d.
 38 set A.P.V. Inst. Handbook 3/6 each, P.P. 6d.
 R.F. unit 24 circuit diagram and details 1/6 each, P.P. 3d.
 R.F. unit 25 circuit diagram and details 1/6 each, P.P. 3d.
 R.F. unit 26 circuit diagram and details 1/6 each, P.P. 3d.
 Receiver R1355 circuit diagram and details 1/6 each, P.P. 3d.
 Receiver R1224A circuit diagram and details 1/6 each, P.P. 3d.
 R1116A circuit diagram and details 1/9 each, P.P. 3d.

MORSE KEYS

Morse key assembly.
 Key with base cover and terminal. Complete with lead. 6/11. P. & P. 2/-.
 2 Morse Keys for 12/6 post free.



19 TRANS. REC. MAINS POWER PACK

Operate your 19 set receiver straight off the mains. Ready built power unit complete with modification and fitting instructions. Price 59/6. P. & P. 3/6. Please state model Mk.11 or Mk.111.

TANK AERIALS

Fully interlocking copper rods. One foot sections. Ideal for car or scooter aerials. Will make excellent dipoles. Six sections complete with canvas carrying case 3/6. P. & P. 1/6. Additional sections 6d. each. Please send sufficient postage.

PAXOLIN SHEETS

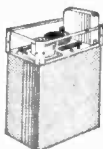
Strong, high quality paxolin sheets. Size 10 1/2 x 8 1/2 x 1/10in., 3 for 5/-. P. & P. 1/- 6 for 10/-. Post free.

DOUBLE THROAT MIKES

Double throat mikes. Can be adapted for use with musical instruments. 5/11. P. & P. 9d.

WIRELESS SET
No. 38 AFV

A lightweight walkie talkie with transmitting range 3 to 5 miles and frequency coverage 7.4 to 9 Mc/s. Operates from 12 and 120 v. external dry batteries. Large, clearly numbered tuning control, with tuning lock. In good condition. Price £4 per pair, post free.



DYNAMOTOR

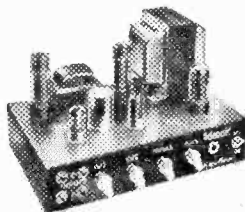
Run all your mains A.C./D.C. equipment from your car battery. 6 v. input gives 250 v. output, or 12 v. input gives 500 v. output at 30 watts. Very low battery drain. Size only 5 1/2in. x 3 1/2in. A must for the caravaner. ONLY 25/-. P. & P. 3/6.

Portable Mains Soldering Iron. 30 watt version. Features removable handle that covers tip and barrel. Complete with lead and plug. Only 10/6. P. & P. 1/6.

TWO-WAY RADIOS



A compact V.H.F. Trans./rec. that can be held in the hand. Size approx. 15 x 3 x 3in. Range up to three miles under favourable conditions. Utilises three miniature valves and self-contained standard batteries. Easy to operate and economical to run. Ideal for authorised fixed or mobile operation. British manufacture. Limited number left. Price 12 gns. per pair, post free.

THE GOLDENAIR "THIRTY"
HI-FI AMPLIFIER

A high quality 30-watt amplifier developed for use in large halls and clubs, etc. Ideal for bass, lead or rhythm guitars, schools, dance halls, theatres and public address. Suitable for any type of mike or pick-up. Valve line-up: two 6F66; one 6X5; one 6Z5; two 6L34. Four separate inputs are provided with two volume controls. Bass and Treble controls are incorporated. Amplifier operates on standard 50 c/s mains. 3 ohm and 15 ohm speakers may be used. Perforated cover with carrying handles can be provided if required, price now 25/-. Customers are invited to see and hear this amplifier at our shop premises in Lambert's Arcade. Send S.A.C. for illustrated leaflet. Cash price 16 gns. Carriage 15/- to be sent with order.

TYPE 19 SHORT WAVE RECEIVING SET



Works straight off the mains. An excellent short wave receiver, requires only phones for immediate operation. Price £5.10.6. P. & P. 10/-.

During an evening's testing of this excellent receiver, we obtained clear reception from scores of stations, many of them thousands of miles distant, including ship stations, Government transmission, maritime broadcasts and also the short wave radio Luxembourg broadcasts.

YORK

New shop open at
 97 WALMGATE, YORK

Open weekdays 9 a.m.-5.30 p.m.
 Sats. 9 a.m.-6 p.m.
 Half-day Wednesday.
 Callers welcome.

High Impedance Personal Listening Earpiece. Suitable for all types of crystal sets and transistor sets. Complete with lead and plug. Price 4/11. P. & P. 6d.

Valve Sale. 2/6 each, P. & P. 9d. 2 for 5/-, post free. 6V6, 607, 6116, 6K7, 618G, EF50, 11A.


Monster Parcel No. 3. Six crocodile clips. One portable mains soldering iron, 5 phono plugs, 6 coils of multi core solder, 6 valves, 3 T.V. aerial plugs, 12 British octal valve holders, 12 wafers, 3 car aerial plugs, 3 sheets of 10 x 6in. paxolin, 6ft. copper rod aerial, 3 sturdy made panel mounting base holders, 24 new resistors, 6 assorted pots, 1 operators unit, a very useful piece of equipment. All this for only 25/-. P. & P. 3/6.

M.A.T. Transistors. M.A.T. 100, 7/9; M.A.T. 120, 7/9; M.A.T. 121, 8/6; Ferrite slab aerials suitable for Transistor sets, 3/-. P. & P. 6d.

CRYSTAL SET

A wonderful educational kit for all children. Provides hours of amusement while following the easy step by step instructions. It is powered entirely by wireless waves, eliminating the expense of batteries. No soldering required. Receives all main stations. Includes super sensitive personal listening device. Price now 25/-. P. & P. 2/6.

SENSITIVE
MULTIMETER

20,000 ohms per volt 1% resistance used throughout. Single control system for all ranges. Compact and lightweight. Highly accurate. £5.10.0. P. & P. 3/-.


VEHICLE RADIO TELEPHONE

Originally used by the armed forces for inter-communication. This handy little trans./rec. is powered by a car battery and standard H.T. batteries. Communication is possible up to a distance of three miles depending on local conditions. Very low battery drain. Few left in stock. Price 5 gns. each, 2 for £10, post free.

TRAWLER BAND
TRANSISTOR RECEIVER

A compact 4 semi-conductor receiver, complete with personal listening earpiece that receives amateur and maritime stations. You will be amazed at the stations that can be received on this set. Works from standard batteries. Complete kit with building instructions. Price 49/6. P. & P. 1/6.

NEW WALK ROUND STORE OPEN IN LAMBERT'S ARCADE, LOWER BRIGGATE, LEEDS 1. NEXT TO HALFORD'S CYCLE SHOP. OPEN ALL DAY SATURDAY.
 ALL MAIL ORDERS TO OUR BRIGGATE HOUSE ADDRESS.
 POSTAGE RATES APPLY U.K. ONLY. S.A.E. WITH ALL ENQUIRIES

TERMS:

CASH WITH ORDER

5/- EXTRA ON C.O.D.

ORDERS

No C.O.D. under 30/-



SEND 1/- FOR LISTS
 TRADE SUPPLIED

ORDERS FROM
 ABROAD WELCOMED

SONA ELECTRONIC CO. (Dept. PW18) BRIGGATE HSE, 13 ALBION PL, LEEDS

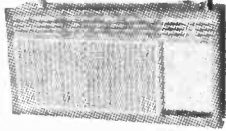
WIRECOMP ELECTRONICS

WIRECOMP'S BARGAIN STORE 48 Tottenham Court Road, London, W.1

Thousands of bargains: Transistor Radios—Record Players—
Tape Recorders—Radiograms—Rock Bottom Prices

FAMOUS MAKE TRANSISTOR RADIO THE "STELLA"

7 transistor portable radio. Long Med. and Short wavebands. Fitted tone switch and sockets for personal earphone and external aerial; chrome telescopic aerial. Uses four 1.5 v. torch batts. Plastic cabinet in beige and red, size 4 x 7 x 1 1/4 in. Excellent tone. 7in. p.m. speaker. Comp with shoulder strap and external aerial. Full guarantee. List price 17 gns.
WIRECOMP'S PRICE **£9.19.6** P. & P. 5/-



NEW SUPER MINIATURE POCKET RADIOS
THE SINCLAIR MICRO-S. Self-contained pocket radio. Size only 1 1/4 x 1 1/2 x 1 1/4 in. Complete with earphone and detailed construction data. Can be built for only **59/6**
Mercury cell 1/11 extra (2 required).

THE SINCLAIR SLIMLINE. The new 2-transistor pocket radio size only 2 1/4 x 1 1/4 in. Micro alloy transistorised and printed circuit. All components available separately. Easy to assemble. Can be built for **49/6**

INTERNATIONAL BRAND TAPE

MYLAR BASE		Fully Guaranteed	
3in. Triple play, 600ft.	15/-	3in.—150ft.	3/6
4in. Triple play, 900ft.	17/6	3in.—225ft.	4/11
5in. Double play, 1,200ft.	15/-	3in.—300ft.	7/6
5in. Triple play, 1,800ft.	35/-	5in. Long play, 900ft.	10/-
5in. Double play, 1,800ft.	22/6	5in. Long play, 1,200ft.	12/6
5in. Triple play, 2,400ft.	45/-	7in. Long play, 1,800ft.	15/-
7in. Stand play, 1,200ft.	12/6		
7in. Long play, 1,800ft.	19/6	P.V.C. BASE	
7in. Double play, 2,400ft.	25/-	5in. Standard play, 600ft.	8/6
7in. Triple play, 3,600ft.	58/6	5in. Stand. play, 840ft.	11/6

P. & P. 1/- extra per reel, 4 reels and over Post Free

PAMPHONIC 3001 INTEGRATED STEREO AMP

New, unused and fully guaranteed. Brief spec.: 7 watts per channel; freq. response 40 c/s to 20 Kc/s; sep. inputs for crystal and magnetic pick-ups, radio and tape; 15 ohms out.; sockets for tape recording; Volume, bass, treble and balance controls. For A.C. mains 100/250 v. In free standing housing, size 13 x 10 x 4 1/2 in. Makers list price £88.10.0.

WIRECOMP'S PRICE 23 GNS.

Carr. and Pack 10/6

PAMPHONIC 1002A CONTROL UNIT

Inputs for pick-up, radio, tape and microphone. Controls for volume, bass, treble, filter and selector. Fitted with 2-ECC40 valves.

WIRECOMP'S PRICE £4.19.6

Carr. and Pack 2/6

PAMPHONIC 1002B CONTROL UNIT/PREAMP

An individual push-button correction network is provided for every important recording characteristic with separate inputs for radio, tape and mic. Max. output is 1 volt. Unpowered. Volume, bass, treble and filter controls provided. 1-EF86 and 2-ECC81 valves fitted. Size 10 x 4 x 5 in. Brand new and boxed. Makers list price £25.4.0.

WIRECOMP'S PRICE £6.19.6

Carr. and Pack 2/6

PAMPHONIC 2001A PRE-AMPLIFIER

Sensitivity from 3 to 120 mV. for i.v. out. Fitted with 2-ECC40 valves. Inputs for radio, tape, pick-up and mic. with pre-set level controls. Bass, treble, filter and selector controls fitted. Unpowered. Size 10 x 4 x 4 in.

WIRECOMP'S PRICE £5.19.6.

Carr. and Pack 3/6

PAMPHONIC 732A SWITCHED RADIO TUNER

Gives instant pre-selection of 3 medium wave stations and 1 long wave station (easily adjustable to your local frequencies). Self powered. For use on 200/250 v. A.C. 3 valves. Fitted with tone and volume controls for use in conjunction with a power amplifier. In metal case, size 16 x 7 x 3 1/4 in.

WIRECOMP'S PRICE £5.19.6

Carr. and Pack 7/6

323 EDGWARE RD., LONDON, W.2. AMBassador 7115

All branches open all day Saturday Early closing Thursday

378 HARROW RD., LONDON, W.9. CUNningham 9530

Mail Orders to the above address for prompt service

FREE TO AMBITIOUS ENGINEERS

— THE LATEST EDITION OF ENGINEERING OPPORTUNITIES

Have you sent for your copy?

ENGINEERING OPPORTUNITIES is a highly informative 156-page guide to the best paid engineering posts. It tells you how you can quickly prepare at home for a recognised engineering qualification and outlines a wonderful range of modern Home Study Courses in all branches of Engineering. This unique book also gives full details of the Practical Radio & Electronics Courses, administered by our Specialist Electronics Training Division—the B.I.E.T. School of Electronics, explains the benefits of our Employment Dept. and shows you how to qualify for five years promotion in one year.

We definitely Guarantee

"NO PASS — NO FEE"

Whatever your age or experience, you cannot afford to miss reading this famous book. If you are earning less than £30 a week, send for your copy of "ENGINEERING OPPORTUNITIES" today—FREE.

WHICH IS YOUR PET SUBJECT?

Mechanical Eng.,
Electrical Eng.,
Civil Engineering,
Radio Engineering,
Automobile Eng.,
Aeronautical Eng.,
Production Eng.,
Building, Plastics,
Draughtsmanship,
Television, etc.

GET SOME LETTERS AFTER YOUR NAME!

A.M.I. Mech. E.
A.M.I.C.E.
A.M.I. Prod. E.
A.M.I.M.L.
A.I.O.B.

B.Sc.
A.M.I.E.R.M.
City & Guilds
Gen. Cert. of Education
Etc., etc.

PRACTICAL EQUIPMENT

Basic Practical and Theoretical Courses for beginners in Radio, T.V., Electronics, Etc., A.M.I.E.R.E., City & Guilds
Radio Amateurs' Exams, R.T.E.B. Certificate
P.M.G. Certificate
Practical Radio
Radio & Television Servicing
Practical Electronics
Electronics Engineering
Automation

INCLUDING TOOLS!

The specialist Electronics Division of B.I.E.T.

NOW offers you a real laboratory training at home with practical equipment. Ask for details.

B.I.E.T. SCHOOL OF ELECTRONICS

POST COUPON NOW!

Please send me your FREE 156-page "ENGINEERING OPPORTUNITIES" (Write if you prefer not to cut page)

NAME _____

ADDRESS _____

SUBJECT OR EXAM THAT INTERESTS ME _____

SE/21



BRITISH INSTITUTE OF ENGINEERING TECHNOLOGY
(Dept. SE/21), 29 Wright's Lane, London, W.8

THE B.I.E.T. IS THE LEADING ORGANISATION OF ITS KIND IN THE WORLD

AF/ RF

SIGNAL GENERATOR

C. MARSHALL

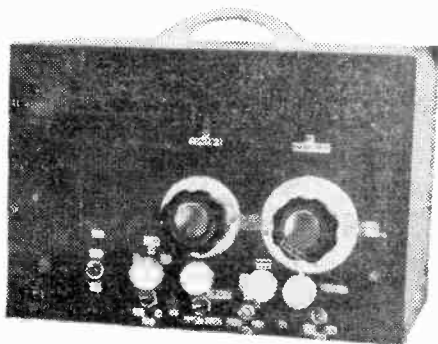
CONTINUED FROM
PAGE 73 OF THE
MAY ISSUE

THE power pack described here is suitable for powering both audio and r.f. units of the generator. A chassis similar to that for the audio generator described last month is used. First mark the positions for the fixing holes of the transformer, capacitors, tag strip, switch, warning light and valveholder on the chassis. A suggested layout of the major components is given in Fig. 6. Securely bolt all components to the chassis, placing a slip-proof washer under each nut. The theoretical circuit is given in Fig. 5 and no difficulty should be experienced in wiring up the power supply.

When all wiring is complete it should be carefully checked for incorrect connections and short-circuits. If all appears to be correct, the unit should be switched on and the h.t. and l.t. outputs tested with a multimeter. The open circuit h.t. voltages should be about 300V and the l.t. should be 6.3V. If all appears in working order the unit may be put safely to one side until the audio oscillator is ready for testing.

The RF Oscillator Circuit

The oscillator is basically a cathode-coupled Hartley oscillator. The four switched coils are tuned by a 500pF tuning capacitor and a range of about 175kc/s—22Mc/s is obtained. A fifth range covering the higher frequencies was tried but great difficulty was experienced in getting the valve (an ECC81) to oscillate at these frequencies.



If such a band is needed, other valves (such as ECC84 or ECC85) should be tried.

The r.f. signal may also be modulated by a fixed tone of about 440c/s obtained from a simple transformer-coupled oscillator stage (V4a). Modulation is switched off by shorting the grid of the modulator oscillator to chassis.

The output is taken from the anode of the r.f. oscillator V4b to a cathode-follower output stage. This is found to be quite adequate for normal use as r.f. and i.f. stages are usually of high gain and followed by the audio section. The output coupling capacitor C24 should be of 1,000V working for absolute safety.

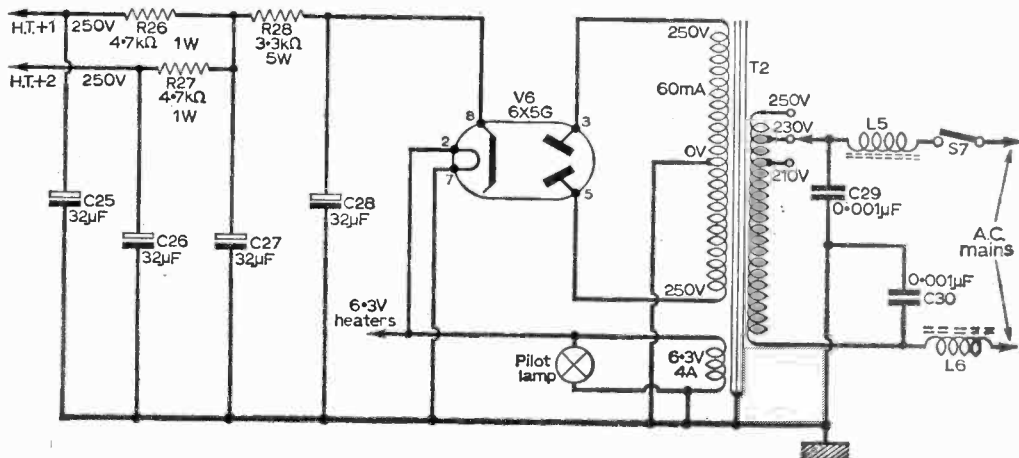


Fig. 5: This circuit will provide suitable power outputs for both the audio and r.f. oscillator units.

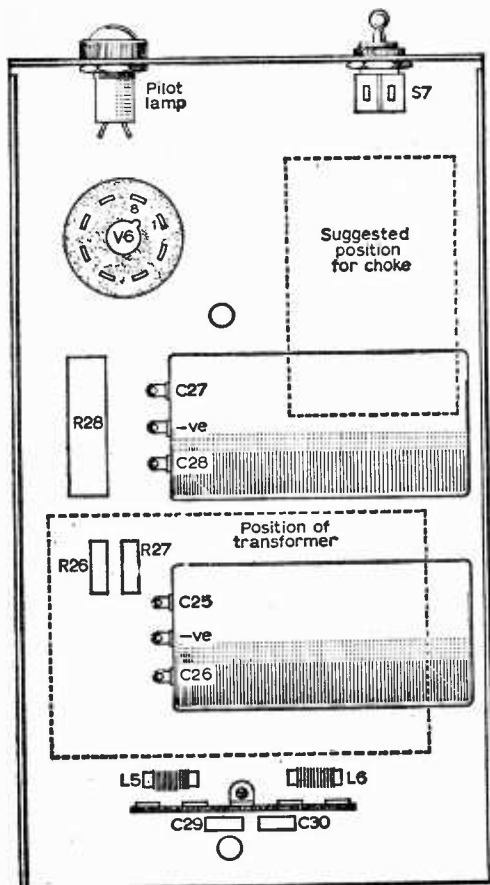


Fig. 61 Component layout of the power pack chassis.

POWER SUPPLY COMPONENTS LIST

Resistors:

R26 4.7k Ω $\frac{1}{2}$ W
R27 4.7k Ω $\frac{1}{2}$ W
R28 3.3k Ω 5W

Capacitors:

C25 32 μ F electrolytic 350V
C26 32 μ F electrolytic 350V
C27 32 μ F electrolytic 350V
C28 32 μ F electrolytic 350V
C29 0.001 μ F paper
C30 0.001 μ F paper

Miscellaneous:

V6 6X5
S7 On/off toggle switch
T2 Mains transformer. Primaries: 210/230/250V. Secondaries: 250/0/250V, 60mA; 6.3V, 4A
L5, 6 R.F. chokes
6.3V indicator lamp and lampholder. One International Octal valveholder.

Construction

This unit is built in a similar manner to the other two units. In order that better connections can be made to the chassis at high frequencies it would be better if a tinplate chassis was available as wires can then be soldered directly to the chassis.

The switch and valve holes should be cut and the transformer fixing holes and the grommet holes drilled. Holes should also be drilled to take the coil formers and tuning capacitor brackets.

The wiring should now be completed except for the coils. All wiring must be short and direct and either ceramic or mica capacitors should be used at r.f. The leads to the range switch should be wired. The coil for range 1 (L1) can now be wound.

Take the 2 x $\frac{1}{4}$ in. former and put a small dab of plastic cement about $\frac{1}{4}$ in. from the base. Fasten one end of the 30s.w.g. enamelled copper wire in the cement, leaving about 6in. free. Pile-wind 350 turns spaced to $\frac{1}{4}$ in. on the former, then twist a 6in. loop in the wire to form the centre tap. Wind another 350 turns in the same direction in the $\frac{1}{4}$ in. above the centre tap. Fasten the end temporarily with a small knot.

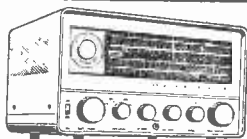
Connect the coil to the circuit. Test the oscillator by applying the output to a receiver tuned to the long waves via a 10pF capacitor. The range of the coil should be adjusted by means of a ferrite slug until it covers about 600—175kc/s. In order to match up with Band II the coil should be adjusted to oscillate at 600kc/s (500m) with the vanes of the capacitor about 5° enmeshed.

The coil for range 2 (L2) is wound in a similar manner, there being two pile windings of 90 turns each over $\frac{1}{4}$ in. with a centre tap between them. This coil should be connected into circuit and the coverage adjusted by means of the ferrite slug so that it resonates at 600kc/s with the vanes about 5° from fully enmeshed. The highest frequency can be found with a s.w. receiver and will be about 2.5Mc/s (120m).

Range 3 coil (L3) has a total of 80 turns with a tape in the centre, but this coil is wound in a single layer. When connected its minimum frequency should be adjusted to about 2.5Mc/s with the condenser 5° from enmeshed. If the maximum frequency of range 2 is nowhere near 2.5Mc/s then range 3 should be adjusted to overlap at a convenient frequency.

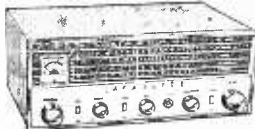
Range 4 (L4) coil has a total of 14 turns, centre tapped. In the author's prototype oscillation was not obtained over the whole band but only over the higher frequency half (the 90° with lower capacity in the tuning capacitor). The minimum oscillation frequency should be adjusted to give a suitable overlap with range 3. As the frequency on this band is very dependent on stray capacities no two units will be alike and constructors should be prepared to experiment with this coil.

The number of turns on the coils given above is only a guide. If the correct range cannot be obtained with the slug the number of turns should be adjusted. If adjustment seems to need the ferrite slug to be driven further in increase the number of turns; if it needs to come further out decrease them. When adjusting the coils remember



LAFAYETTE HA 63 COMMUNICATION RECEIVER

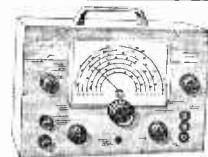
7 valves + Rectifier, 4 Bands 550 Kc/s—31 Mc/s. 'S' Meter-BFO-ANL-Bandspread Tuning - Built in speaker, 200/250V A.C. Brand New. 24 Gns. carr. paid.



STAR SR 40 COMMUNICATION RECEIVER

4 Bands 550 Kc/s—30 Mc/s. 'S' Meter-BFO-ANL-Bandspread Tuning - Built in speaker, 200/250V A.C. Brand New. 181 Gns. Carriage 10/-.

S.A.E. FOR DETAILS OF ALL EQUIPMENT



STAR SR.600 AMATEUR COMMUNICATION RECEIVER

New crystal controlled triple conversion de-Luxe 80-10 Mc band receiver. Employs up-to-date design and techniques. 95 Gns. S.A.E. for full details.

LAFAYETTE TE-20A R.F. SIGNAL GENERATOR

120 Kc/s—300 Mc/s on 6 ranges Variable R.F. and A.F. outputs Large clear scale. Size 7 1/2 x 10 1/2 x 4 1/2 in. 200/250V. A.C. Operation. Brand New £12.19.6. Carr. 5/-.



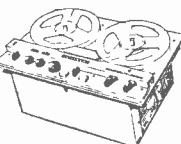
LAFAYETTE TE-46 RESISTANCE CAPACITY ANALYZER

2 pF. 2,000 mF/d. 2 ohms, 200 megohms. Also, checks impedance, Turns ratio. Insulation 200/250V. A.C. Brand New £15, carr. 7/6.

MAIN LONDON AGENTS FOR CODAR EQUIPMENT

TE-22 SINE SQUARE WAVE AUDIO GENERATORS

Sine, 20 c.p.s. to 200 Kc/s on 4 bands. Square: 20 c.p.s. to 25 Kc/s. Output



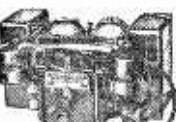
All Martin Audiokits in Stock



RK140 STEREO TAPE DECKS WITH BUILT-IN PREAMPLIFIER

4 Transistors, 4 Valves. Will record or playback 1 Track Stereo or Mono at 7 1/2 or 3 1/2 IPS. 7in. spool size. Twin meter level indicators, 4 inputs. Output 500 MW. 40-18,000 CPS., response. Size 15 x 10 x 6 1/2 in. 200/250 volt A.C. operation. Brand New 42 Gns. P. P. 15/-.

VARIABLE VOLTAGE TRANSFORMERS
Brand New Guaranteed. Fully Shrouded.
Input 230V. 50/60 c/s output 0-23V.
1 Amp £4.10.0. 8 Amp £14.10.0.
2.5 Amp £5.17.6. 10 Amp £16.10.0.
5 Amp £9.10.0. 12 Amp £18.15.0.
2.5 Amp Portable 20 Amp £32.10.0.
Metal Case with Meter Fuses etc. £9.17.6.



ARMY FIELD TELEPHONES TYPE F

Generator Bell Ringing, 2 Line Connection. With Wood Carrying Case. Fitted Batteries. Completely Fully Tested £4.19.6. Pair Carr. 5/-.

LAFAYETTE HI-FI STEREO HEADPHONES

16Ω—25-15,000 Cycles. Air Cushioned Headband with cable and overload Junction Box. Brand New Guaranteed. £2/6. P. & P. 2/6.



TS-76 20,000 O.P.V. PUSH BUTTON MULTI-TESTER

Large clear plastic scale, simple operation, D.C. volts up to 1,000V. A.C. volts up to 1,000V. Resistance up to 10 megohm. Current up to 250mA. Decibels, 20 to +36dB. Size 6in. x 4 1/2 in. x 2 1/2 in. Complete with leads, batteries and instructions. ONLY £5.5.0. P. & P. 2/-.

TYPE 13 DOUBLE BEAM OSCILLOSCOPES

Perfect order. £27.10.0. Carr. 20/-.



SINCLAIR X10 AMPLIFIER IN STOCK.

X10 Kit £5.19.6. Ready Built £6.19.6. P.S.U. £2.14.0.

MULTIMETERS

Brand New—Fully Guaranteed. Lowest over prices. Supplied with leads, batteries and instructions.

MODEL PT-34
1,000 o.p.v.
0/10/50/250/1,000V. AC and D.C.
0/1/100/500mA D.C.
0/100KΩ
39/6. P.P. 1/6.

MODEL AR-620
20,000 o.p.v.
0/10/50/250/500/1,000V. A.C. and D.C.
0/500μA/10/250mA
0/10K/100K/1 MegΩ
250pF—0.02mF
0-500 Henrys
92/6. P.P. 2/6.

MODEL ITI-2
20,000 o.p.v.
0/5/25/250/500/2,500V. DC
0/10/50/500/1,000V. AC
0/50μA/25/250mA D.C.
0/60KΩ/6 MegΩ
0.01—3mF
78/6. P.P. 2/6.

MODEL NII-201
30,000 o.p.v.
0/1/5/10/50/250/500/1,000V. D.C.
0/10/50/250/500V. A.C.
0/50μA/10/250mA
0/5K/500K/5 MegΩ
99/6. P.P. 2/6.



MODEL 250J
2,000 o.p.v.
0/10/50/500/2,500V. DC
0/10/50/500/2,500V. AC
0/2 MegΩ
0/250mA
—20 to +36dB
49/6. P.P. 2/6.

OS/88/U OSCILLOSCOPES

High quality Portable American Oscilloscope. 3in. c.r.t. T/Y 3c/s-50 Kc/s X Amp: 0-500 Kc/s Y Amp: 0-2 Mc/s. Power requirements 105-125V. A.C. Supplied in "as new" condition, fully tested. 72s, Carr. 10/-, Suitable 230/115V. Transformer, 15/6.



CLEAR PLASTIC PANEL METERS

First grade quality. Moving Coil panel meters, available ex-stock. S.A.E. for illustrated leaflet. Discounts for quantity. Available as follows.

Type MK. 38P. 1 1/2/3 1/2 in. square fronts.			
2mA ..	22/6	10V. DC ..	22/6
5mA ..	22/6	20V. DC ..	22/6
10mA ..	22/6	50V. DC ..	22/6
50mA ..	22/6	100V. DC ..	22/6
100mA ..	22/6	150V. DC ..	22/6
150mA ..	22/6	200V. DC ..	22/6
200mA ..	22/6	500V. DC ..	22/6
300mA ..	22/6	750V. DC ..	22/6
500mA ..	22/6	15V. DC ..	22/6
750mA ..	22/6	50V. AC ..	22/6
1-0-1mA ..	22/6	150V. AC ..	22/6
100-0-100μA ..	22/6	300V. AC ..	22/6
500-0-500μA ..	22/6	500V. AC ..	22/6
1mA ..	22/6	"S" Meter 1mA ..	22/6
		3V. DC ..	22/6

POST EXTRA. Latest prices available—send for lists.
ILLUMINATED "9" METER, 1 1/2 in. square front. Cal. in 8 units. 6V. lamp. 29/6. P.P. 1/-, Ditto 2 1/2 in. square 39/6. P.P. 1/-.

AMERICAN TAPE

First grade quality American tapes. Brand new and guaranteed. Discounts for quantities.
3in. 225ft. L.P. 4/-
3in. 600ft. acetate mylar 10/-
5in. 600ft. std. plastic 8/6
5in. 900ft. L.P. acetate 10/-
5in. 1200ft. D.P. mylar 15/-
5in. 1200ft. L.P. acetate 12/6
5in. 1800ft. D.P. mylar 22/6
7in. 1200ft. std. mylar 15/-
7in. 1800ft. L.P. acetate 20/-
7in. 1800ft. L.P. mylar 25/-
Postage 2/-, Over £3 post paid.

RECORDING HEADS

Reuter: 1 track, set of 2, 19/6
Miniflux: 1 track, set of 3, 29/6
Bradmatic: 1 track, set of 2 99/6
Post Extra

CLASS D WAYMETER No. 1 Mk. II

Crystal Calibrated covering 1.5-8 Mc/s on 2 bands, 6V. D.C. operation. Supplied brand new with handbook, headset and case, 59/6, Carr. 5/-.

COSSOR 1035 DOUBLE BEAM OSCILLOSCOPES

Guaranteed perfect order! £35 Carr. 20/-.

SINCLAIR X10 AMPLIFIER IN STOCK.

X10 Kit £5.19.6. Ready Built £6.19.6. P.S.U. £2.14.0.

MARCONI TFI44G/4 STD SIGNAL GENERATORS

85 Kc/s-25 Mc/s. Perfect order. £25. Carr. 30/-.

SILICON RECTIFIERS

250 P.I.V.	750mA	3/-
200 P.I.V.	6amp	5/6
1,000 P.I.V.	650mA	7/6
800 P.I.V.	500mA	5/6
400 P.I.V.	3amp	7/6
400 P.I.V.	500mA	3/6
150 P.I.V.	165mA	1/-
70 P.I.V.	1amp	3/6
95 P.I.V.	3amp	5/6

Post extra

MINE DETECTOR No. 4A

Will detect all types of metals. Fully portable. Complete with instructions, 39/6 each. Carr. 10/-, Battery 8/6 extra.

BEST BUY!

Send 1/- P.O. for full catalogue and lists.
Open 9 a.m. to 6 p.m. Every day. Monday to Saturday. Trade supplied.

GW. SMITH & CO (RADIO) LIMITED

Phone: GERRARD 8204/9155
Cables: SMITHEX LESQUARE
3-34 LISLE STREET, LONDON, W.C.2

CLEARANCE of COMPONENTS at GREATLY REDUCED PRICES!

Here is your once-a-year chance! We must clear these lines to make way for new stocks. On the left-hand side we list the quantity available, in case you wish to make an offer for the lot. In cases where we have only a few items left it would help if you could state a second choice.
Order TO-DAY! PLEASE INCLUDE 2/- EXTRA TO COVER POSTAGE AND PACKING.

Quantity		Each
120	CO-AX PLUGS AND SOCKETS	
60	Films & Equipment Co-ax Plugs	1/-
	Films & Equipment Co-ax Sockets	2/6
100	CONDENSERS (ELECTROLYTIC)	
30	500µF 25V T.C.C. 2 1/2 x 1 1/4 in.	1/6
30	800µF 25V T.C.C. 2 1/2 x 1 1/4 in.	1/9
30	100µF 50V T.C.C. 1 1/2 x 1 1/4 in.	2/-
40	32µF 150V T.C.C. 1 1/2 x 1 1/4 in.	1/6
20	25µF 50V T.C.C. 1 1/2 x 1 1/4 in.	1/-
100	16µF 375V T.C.C. 4 1/2 x 1 1/4 in.	4 for 2/-
100	16µF 350V Dubilier 2 x 1 in.	4 for 2/-
24	4µF 450V T.C.C. 1 1/2 x 1 in.	1/-
250	16 + 16 300V T.C.C. 2 1/2 x 1 in.	1/6
	CONDENSERS (NON-ELECTROLYTIC)	
100	4µF 600V Dubilier 4 1/2 x 2 x 1 1/4 in. Visconol Type	4/6
300	2µF 800V Dubilier 4 1/2 x 2 x 1 1/4 in. Visconol Type	3/6
200	2µF 600V Dubilier 2 1/2 x 1 1/2 x 1 1/4 in.	2/6
300	2µF 500V Dubilier 2 1/2 x 1 1/2 x 1 1/4 in.	1/6
300	2µF 500V Wego 2 1/2 x 1 1/2 x 1 1/4 in.	1/-
50	.01µF 400V Hunts W97	1/6
	CONDENSERS (HIGH VOLTAGE CERAMIC)	
20	3pF 4kV working	1/6
60	1000pF 3kV working	2/6
50	200pF 10kV working	4/-
	CONDENSERS (TUNING)	
10	2-gangs AM/FM 500pF and 10pF (each section)	3/6
24	2-gangs 50pF (each section)	4/6
80	Single gang 160pF Eddystone S.W. Condenser	2/6
80	Single gang 20pF Eddystone S.W. Condenser	2/6
50	Single gang 20pF	1/6

Quantity		Each
500	CONDENSERS (TRIMMING AIR DIELECTRIC)	
50	100pF Jackson type	3 for 2/-
50	30pF Polar (spindle 1/4 in. long)	1/6
50	20pF Jackson type	1/6
	CONDENSERS (TRIMMING, POSTAGE STAMP TYPE)	
200	300pF + 1000pF	6 for 2/6
500	50pF + 50pF + 50pF + 50pF + 50pF	1/-
	METERS	
34	40 Amp. (10mA without shunt), 2 1/2 in. Scale	19/6
20	500 Micro-amp. 1 1/2 in. Scale marked 0-15 and 0-600	15/-
	MISCELLANEOUS	
12	Ground Leads with jack plug	3/6
36	Handles Brass 4 in.	2/-
10	Handles, Metal, covered in grey plastic, 1 1/4 in.	1/-
30	I.P. Transformers, 10 M/c	2/6
50	Panel Mounting Neon Lamps complete with G.E.C. tuneon bulb and suitable resistance for mains use	2/-
24	High Voltage Lead-throughs, 1 1/2 x 1 1/4 in. fixing disc 1 1/4 in.	2/6
50	Heavy Duty Suppressor Chokes	1/-
50	1 1/2 x 1 1/4 in. Ceramic Coil Formers, with fixing lugs	1/-
60	High quality Diodes, suitable FM	1/6
250	Carbon Granite Microphone Inserts	4 for 2/-
	POTENTIOMETERS	
300	2MΩ Presets	6 for 4/6
	RELAYS	
80	Siemens high speed change-over Relays, 1,000 (500 Ω each coil) per pair	15/-
	RESISTORS	
700	1MΩ Wirewound 1% non-inductive. Surprise your friends show them a million ohm wire-wound resistor, size 1 x 1/4 in. Surprise us too, by buying one	6d.
	SWITCHES	
50	Toggle Switches, D.P.D.T., 250V 3A	2/-
	TRANSFORMERS	
250	Output Transformers, 7kΩ to 5Ω suitable ECL86. Made to high Admiralty specification. Make a cheap Stereo outfit 2 for 7/6	
	VALVES	
50	EF90 Mullard Valves, Brand new	5/-
12	EN80 Mullard Valves, Brand new	5/-
70	EF92 Mullard Valves, Brand new	5/-
200	T711 Valves, Brand new	2/6

HOME RADIO LTD. Dept. PW, 187 LONDON ROAD, MITCHAM, SURREY
'Phone MIT 3282

COMMUNICATION

MINI-RECEIVER

FROM CONCORD

49'6



IT HAD TO COME EVENTUALLY! THE "SKYSCRAPER" PERSONAL COMMUNICATIONS RECEIVER. Highly sensitive. World-wide short-wave reception including new in English and countless other broadcasts from RUSSIA, AMERICA, SWITZERLAND, BRAZIL and other far flung countries. Take it anywhere—it's featherweight! Size only 6 x 3 x 1 1/4 in. It features: Bandspeed Tuning, Vernier Dial, Miniature Valve Circuits, Plug-in Coils, Own Rod Aerial, etc. 50% of production to be exported—supplies may be limited later. Anyone can assemble it within 2 hours—only a few connections to make—experience definitely unnecessary. Complete set of parts including Case, Personal phone, Easy-To-Follow-Plan—everything at unbelievable DIRECT FROM FACTORY TO YOU PRICE OF 49/6 plus 2/6 post, etc. REFUND IF NOT DELIGHTED. (Parts a laible separately.)

— READ WHAT SATISFIED CUSTOMERS SAY —

L.S. of LONDON W.8 writes... given it a good try out and I am very pleased with the results.

J. W. of BRIGHTON writes... I have recommended your radio to many of my friends.

B.M. of Harrogate writes... I would like to thank you... It is a real bargain.

S.B. of SOMERSET writes... delighted with this radio... glad if you could send one more.

T. F. of STEVENAGE writes... I would just like to say how pleased my son is with this radio.

POST THIS COUPON NOW!

CONCORD ELECTRONICS LTD. (Dept. P.W.) 9 WESTERN RD., HOVE, SUSSEX
Please send me immediately..... COMMUNICATION MINI-RECEIVERS.
I have enclosed £..... Cash/cheque/P.O.

NAME.....

ADDRESS.....

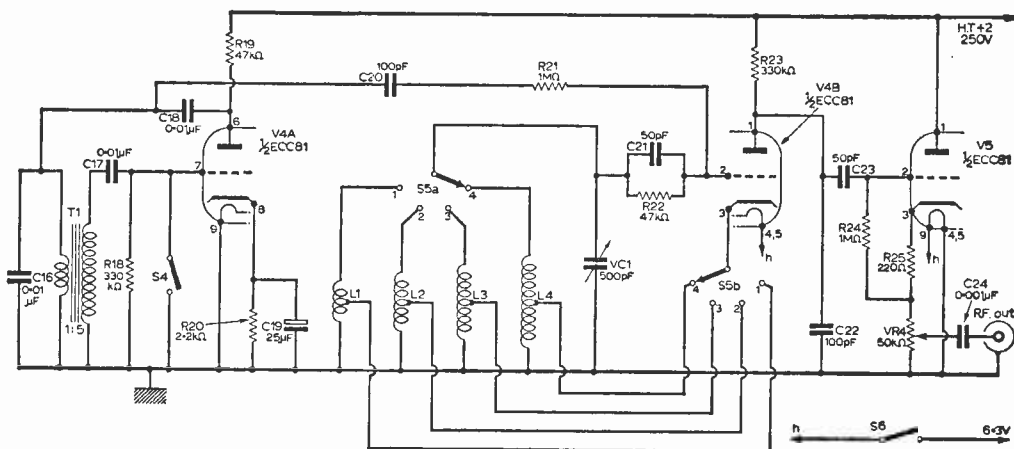


Fig. 7: The r.f. oscillator circuit.

R.F. OSCILLATOR COMPONENTS LIST

Resistors:

R18	330k Ω	R22	47k Ω
R19	47k Ω	R23	330k Ω
R20	2.2k Ω	R24	1M Ω
R21	1M Ω	R25	220 Ω

All 10% $\frac{1}{2}$ W carbon
VR4 50k Ω potentiometer

Capacitors:

C16	0.01 μ F paper
C17	0.01 μ F paper
C18	0.01 μ F paper
C19	25 μ F electrolytic 25V
C20	100pF mica
C21	50pF mica

C22	100pF mica
C23	50pF mica
C24	0.001 μ F mica
VC1	500pF variable

Miscellaneous:

V4	ECC81	V5	$\frac{1}{2}$ -ECC81
S4	On/off toggle switch		
S5	2-pole, 4-way rotary switch		
S6	On/off toggle switch		
T1	Valve inter-stage transformer; 5 : 1 ratio		
L1, 2, 3, 4	See text		
	Aluminium for chassis. Coaxial output socket.		
	Two B9A noval valveholders.		

to keep the centre tap exactly in the centre of the coil. When all the coils are adjusted to the constructor's satisfaction the winding should be fixed in position with polystyrene cement.

The modulating frequency is altered by changing C16. It should be about 440c/s (a middle C on the piano) for standard work, but this is not critical.

When the unit is completed satisfactorily it may be fixed in the case and calibrated.

Calibrating the r.f.

There are many ways of calibrating an r.f. oscillator, some more accurate and complicated than others. Such methods include the use of crystal markers or very accurate oscillators. The same restrictions were enforced in the calibration of this oscillator as with the audio and the following method was evolved. The only equipment necessary is a reasonably accurately calibrated receiver covering the required range. The R1155 receiver will cover up to 18Mc/s and many "domestic" sets will cover 18-25Mc/s.

Switch the signal generator and receiver on and leave them to warm up for at least 15 minutes. Tune the receiver to 200kc/s. This is the standard for the whole calibration and must be done accurately. Turn the generator to Band I and tune

to the most powerful heterodyne. This corresponds to 200kc/s and a note should be made of the dial reading (the dial is fitted with a temporary scale marked 0—180°). Tune the receiver to about 400kc/s to find the second harmonic of 200kc/s. Tune the oscillator to 400kc/s and note this reading. Return the oscillator to 200kc/s.

Repeat this procedure over the whole of Band I and over as much of Band II as possible (until the harmonics are too weak. This will be at about 1.4Mc/s). You will then have a series of 200kc/s marker points.

In order to draw an accurate graph of Band I more points are needed. Tune the receiver to 1Mc/s. When the oscillator is tuned to about midway between 400 and 600kc/s the second harmonic of 500kc/s will be received. Repeat this at 600kc/s on the receiver to get the 300kc/s mark. Fill in as many of these odd 100kc/s marks as is possible by using the known frequencies (i.e. third harmonic of 300kc/s gives 900kc/s).

The oscillator should be tuned to 500kc/s and 500kc/s marks made as far up the band as possible. If extra points are needed for range 2 250kc/s marks can be made; 1Mc/s marks are adequate for range 4.

When sufficient checkpoints have been made four graphs can be accurately drawn showing the

relationship between dial reading and frequency for each band. A permanent dial can then be made from the graphs and firmly fixed to the knob. To check that the dial is in the correct position it is only necessary to check its position at 200kc/s.

Although this method is certainly not the most accurate it is sufficiently so for most amateur purposes and it is quite simple.

With all three chassis included the constructor now possesses a signal generator of reasonably high quality and accuracy, suitable for any purpose for which the average amateur may need it, at a price such that they cannot afford to be without it. The author built his generator from scratch for under £4 and it has served him well for some years now.

The cabinet constructed by the author was made from plywood which was lined completely with tinfoil to provide screening. Alternatively a cabinet may be constructed from 20s.w.g. aluminium sheet.

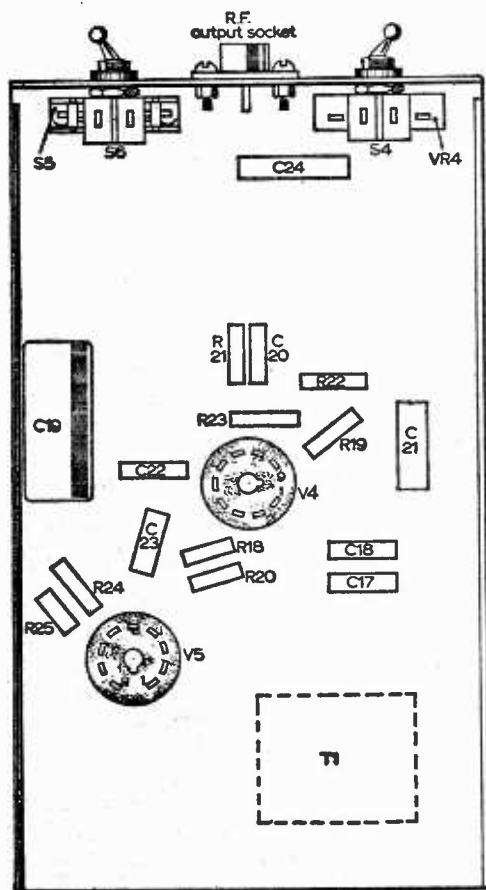


Fig. 8: An underchassis view of the r.f. unit. Dimensions for this chassis are 7in. x 4in. with a 2½in. front panel and ¾in. flanges.

ON THE SHORT WAVES

—continued from page 141

6W8BF on c.w., together with hordes of Europeans and U's.

S. W. L. Jolley (Staffs) uses a 66ft. longwire and a 19 Set sans a.t.u. and preselector and found this lot between 2330-0030, all on c.w.—HA5KFR, IT1AGA, OE6MZG, SP8AQK, UA3AN, UA1KCU, VE1OU, W1HGT, W1UKS, W2CA, WB2DU, W2CJC, W3DVO, W3FKB and 5K4ALE. If anyone knows which planet the last one comes from we would be pleased to know. Another interesting one was G3AM/TR, using only 500mW and working ON5PA.

28Mc/s

Ten metres almost, but not quite, deserted. D. H. Foster (Essex) using an HRO with "very much bent" 132ft. longwire found CR4AE on c.w. at 1830 in QSO with CO2OM. Also OD5BU and LU4DM on phone. L. Morrison (Suffolk) found ZE8IH and ZE5JS on phone around 1130. Wilfred Smith (Staffs) reports several G's active and logged ZE1JE and 9J2DT. At G3JDG a 28Mc/s ground plane has sneaked skywards and great things are expected.

General Snippets

P. Collins informs us that FH8CD is active on Comoros Island on 14 and 21Mc/s s.s.b., Malta will probably be changing to 9H1 (at the moment it's ZB1), and PY7BAL/O is on 7012kc/s, and is situated on Fernando de Noronha.

A new one for Chatham Island is ZL3AWJ/3, and the pre-fix for Portuguese Guinea will probably now change to CR3.

ISWL/G11570 says that three W's will operate CEØXA on San Felix and San Ambrosi Islands for about one week from around April 20th. Anyone hear them? Alan Dailey says the MP4MAH operates from a caravan in Oman. ZB1JM is on Gozo Island, north-west of Malta. VS9OC is on Masirah Island and is active on 20 and 40 c.w. AC5H on 14035kc/s and XW8AX and XW8AZ are both active on 20 s.s.b.

GM3LXI left for St. Helena on the 1st April, and another call already on the island will be ZD7IP. G3JDG is active on 28Mc/s Sunday mornings (real DX).

Contest enthusiasts have a quiet time for May. On the 3rd, 144Mc/s portable contest; 8-9th, USSR DX c.w.; 15-16th, Second 70Mc/s Open Contest; 29-30th, first 432Mc/s, contest. June 4-7th, CHC/FHC/HTH QSO party. Finally, June 12-13th is National Field Day.

In future please submit your logs in alphabetical order of prefix.

CATALOGUE RECEIVED

We have recently received the latest illustrated catalogue of Messrs. Henry's Radio Ltd. (303 Edgware Road, London, W.2). This latest edition which has been completely brought up to date to include many new lines, contains 90 pages detailing hundreds of components and may be obtained from Henry's for 2s. 6d. post paid.

RETURN-OF-POST

ON CASH OR C.O.D. ORDERS

MARTIN FM TUNER KIT

Fully transistorised, unit construction, front end and I.F. Amplifier supplied all ready built and tested. Illustrated leaflet available. £12.17.6. Deposit £2.11.6 and 12 monthly payments of 18/11. Total credit price £13.18.6.

HI-FI LOUDSPEAKERS

	Cash Price	Deposit	Credit Terms Monthly Payments	Total Credit Price
GOODMANS				
Axiote 8in.	£5.10.11	£1. 7.11	6 of 16/4	£6. 5.11
Axiom 10in.	£6.12. 8	£1.12. 8	6 of 19/2	£7. 7. 8
Axiom 301 12in.	£11. 8. 9	£2. 8. 9	12 of 16/11	£12. 8. 9
Axiom 301 12in.	£15.18. 9	£3. 8. 9	12 of 23/5	£17. 4. 9
Audion 51 Bass 12in.	£9.12. 5	£1.18. 5	12 of 14/6	£10.12. 5
Audion 61 Bass 12in.	£15. 0. 0	£3. 0. 0	12 of 22/-	£18. 4. 0
Trebas 100	£26.18.11	£1.18.11	6 of 19/8	£27.11.11
OX5000 Crossover Unit W.B.	£2. 2. 2	—	—	—
HF1016 Major 10in.	£9. 8. 6	£1.18. 6	12 of 14/2	£10. 8. 6
HF1016 10in.	£7. 7. 0	£1.16. 0	6 of 21/-	£8. 2. 0
HF1012 10in.	£4.12. 0	£1. 7. 6	3 of 25/-	£5. 2. 0
HF516 8in.	£5. 6. 0	£1.10. 0	6 of 18/6	£7. 1. 0
T318 8in.	£25. 3	£1. 8. 8	6 of 17/8	£26.14. 3
T359 Tweeter	£1.12. 3	—	—	—
T10 Tweeter	£4.12. 9	£1. 7. 9	3 of 25/-	£5. 2. 9
CX3000 Crossover Unit.	£1.13. 3	—	—	—
OX1500 Crossover Unit.	£2. 2. 0	—	—	—

TAPE RECORDING EQUIPMENT

	Cash Price	Deposit	Credit Terms Monthly Payments	Total Credit Price
TAPE DECKS				
All carriage free				
Collaro Studio, latest model, two track, Bratmatic Heads	£10.19. 6	£2. 3. 6	12 of 16/4	£11.19. 6
MARTIN TAPE AMPLIFIER KITS				
Tape Amplifiers, For Collaro 8311-V 2-Track £11.11.0. 8311-4-V 4-Track, Marriott "X" heads £12.12.0.				
Tape Pre-Amplifiers, For Collaro 8319-CP 2-Track £6.8.0. 8319-4-CP 4-Track, Marriott "X" heads £9.9.0.				
Drop through assembly for mounting 8319 Pre-Amp under Collaro Deck, £11.1.8. Carrying Case with speaker for Collaro Deck and 8311 Amp, £5.5.0.				
CREDIT TERMS available on decks, amp. and cases. Ask for quote.				
MULLARD TAPE PRE-AMPLIFIER KIT				
We stock complete kits and all separate components for the Mullard Tape Pre-Amplifier. Fully detailed list available.				

ARMSTRONG

	Cash Price	Deposit	Credit Terms Monthly Payments	Total Credit Price
127 M. AM/FM Tuner Amp.	£26.10.0	£5. 6. 0	12 of 33/10	£28.12. 0
224 FM Tuner	£22.10.0	£4.10. 0	12 of 33/-	£24. 6. 0

ILLUSTRATED LISTS

Illustrated lists are available on LOUDSPEAKERS, TAPE DECKS, TEST GEAR, GRAMOPHONE EQUIPMENT, AMPLIFIERS. Any will be sent free upon request.

AMPLIFIER KITS

We have full stocks of all components for the Mullard 510, Mullard 3-3, Mullard 2 and 3 Valve Pre-amp, Mullard Stereo, Mullard Mixer. Fully detailed list on any of these sent upon request.

Instruction Manual: All Mullard Audio Circuits in "Circuits for Audio Amplifiers" 9/5 Post Free.

LATEST TEST METERS

	Cash Price	Deposit	Credit Terms Monthly Payments	Total Credit Price
AVO Model 8 Mark III.	£24. 0. 0	£4.18. 0	12 of 35/2	£25.18. 0
AVO Model 7 Mark II.	£22. 5. 0	£4. 8. 0	12 of 32/9	£24. 1. 0
AVO Multimeter Mark 4	£19.10. 0	£1.18. 0	12 of 14/4	£10.10. 0
T M K TP10	£4. 7. 0	£1. 7. 0	3 of 20/4	£7. 6. 0
T M K TP53	£6.11. 6	£1.11. 6	6 of 19/2	£14.7. 6
T M K 500	£9.17. 6	£1.17. 6	12 of 15/-	£10.17. 6
TAYLOR Model 127A	£10.10. 0	£2. 2. 0	12 of 16/8	£11.10. 0
TAYLOR Model 888	£23.10. 0	£4.14. 0	12 of 34/6	£25. 8. 0

STEREO COMPONENTS

Morganite ganged potentiometers as specified for the Mullard circuits. ★ Log/Auto-Log, 500k, 1 meg., 2 meg. ★ Log/Log, 50k, 250k, 1 meg., 2 meg. ★ Lin/Lin, 250k, 1 meg., 2 meg. All 10/6 each. Postage extra.

GRAMOPHONE EQUIPMENT

	Cash Price	Deposit	Credit Terms Monthly Payments	Total Credit Price
GARRARD CHANGERS				
AUTOBLIM Mono	£6.10. 0	£1.15. 0	6 of 20/-	£7. 5. 0
AUTOBLIM AT6 Mono	£11. 9. 0	£2. 6. 0	12 of 18/11	£12. 9. 0
AUTOBLIM AT6 Stereo/Mono	£12. 5. 4	£2. 9. 4	12 of 18/-	£13. 5. 4
AT6 LM (3000 LM) Stereo/Mono	£12.15. 0	£2.15. 0	12 of 18/4	£13.15. 0
A70 (Deram Cart) Stereo/Mono	£27. 5. 6	£5. 9. 6	12 of 40/-	£28. 9. 6
4HF PLAYER UNIT MONO	£16.12. 6	£3. 6. 6	12 of 24/5	£17.19. 6
UA15 Mono B.S.R. CHANGERS	£8.19. 6	£1.14. 6	6 of 20/-	£9.14. 6
UA15 Stereo/Mono	£7.19. 6	£1.19. 6	6 of 22/6	£8.14. 6
UA25 Mono	£5.19. 6	£1.14. 6	6 of 20/-	£7.14. 6
UA25 Stereo/Mono	£7.19. 6	£1.19. 6	6 of 22/6	£8.14. 6

See our Gramophone List for details of Record Players and Transcription Units

WATTS RADIO (Mail Order) LTD

54 CHURCH STREET, WEYBRIDGE, SURREY

Telephone: Weybridge 47656

Please note: Postal business only from this address.

Callers welcome by appointment

CLOSED FOR ANNUAL HOLIDAYS: AUGUST 7th to 30th

TECHNICAL TRAINING

in radio television and electronics

Whether you are a newcomer to radio and electronics, or are engaged in the industry and wish to prepare for a recognized examination, ICS can further your technical knowledge and provide the specialized training so essential to success. ICS have helped thousands of ambitious men to move up into higher paid jobs—they can help you too! Why not fill in the coupon below and find out how?

Many diploma and examination courses available, including expert coaching for:

- Institution of Electronics & Radio Engineers (Brit.I.R.E.)
- C. & G. Telecommunication Techns' Certs.
- C. & G. Supplementary Studies
- R.T.E.B. Radio/T.V. Servicing Certificate
- Radio Amateurs' Examination
- P.M.G. Certs in Radiotelegraphy
- General Certificate of Education, etc.

Examination Students Coached until Successful

NEW SELF-BUILD RADIO COURSES

Learn as you build. You can learn both the theory and practice of valve and transistor circuits, and servicing work while building your own 5-valve receiver, transistor portable, signal generator and multi-test meter—all under expert tuition. Three courses to choose from

POST THIS COUPON TODAY

for full details of ICS courses in Radio, T.V. and Electronics.

INTERNATIONAL CORRESPONDENCE SCHOOLS

Dept. 171, Intertext House, Parkgate Road, London, S.V.V.II

Please send me the ICS prospectus—free and without obligation.

(state Subject or Exam.) _____

NAME _____

ADDRESS _____

6.65

INTERNATIONAL CORRESPONDENCE SCHOOLS

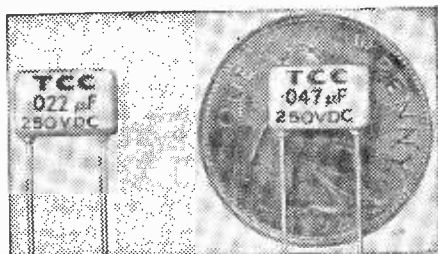
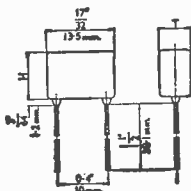


MINIATURE METALLIZED POLYESTER CAPACITORS

Ideally suitable for printed wiring panels and transistorised circuits.

Incorporating a new dielectric material and of unique construction, they are of small physical size and meet the requirements of H.5 D.E.F. 5011 Specification. The windings are virtually non-inductive and the wire terminations are soldered direct to the metal electrodes eliminating contact resistance and ensuring the minimum possible inductance.

Cap. μF	Dimensions		T.C.C. Type No.
	H.	T.	
0.01	$\frac{1}{4}$ " 9mm	$\frac{1}{8}$ " 5.5mm	PM X1
0.022	$\frac{1}{4}$ " 9mm	$\frac{1}{8}$ " 5.5mm	PM X2
0.047	$\frac{1}{4}$ " 9mm	$\frac{1}{8}$ " 5.5mm	PM X3
0.1	$\frac{1}{4}$ " 11mm	$\frac{1}{8}$ " 7.2mm	PM X4



Cap Tolerance $\pm 20\%$

Voltage Rating:
Ranges available in 250V D.C. and 400V D.C.

Power Factor:
 ≤ 0.01 at 1 Kc/s at $+20^\circ\text{C}$.

Temperature Rating:
Suitable for working at $+85^\circ\text{C}$. without derating.

Details of the full range are given in T.C.C. Bulletin 93, available on request.

Insulation Resistance
10,000 megohms or 2,000 ohm farad whichever is less.

Terminations:
22 s.w.g. solder-coated parallel wires for vertical mounting.

Finish:
Insulated—special non-cracking heat resisting thermosetting compound providing good insulation and good protection against the ingress of moisture.

THE TELEGRAPH CONDENSER CO. LTD.

Electronics Division • NORTH ACTON • LONDON • W.3 • Tel: ACOrn 0061 • Telex: 261383
also at CHESSINGTON, SURREY and BATHGATE, SCOTLAND

EX-RENTAL TELEVISIONS

14 in. £7.10.0
17 in. £11.0.0

Coloured FREE LIST
Demonstration daily from our large selection

12 months written guarantee

Channels for all areas

Personal collection advised, or Insured Carr., 14in. 20/-; 17in. 30/-.



AERIALS. BBC/ITA combined Loft and room aerials—from 25/-.
BBC2/UHF and colour aerials—from 20/6. SEND FOR FREE LIST.

EX-MAINTENANCE TESTED TUBES

17in.—35/- Most makes and types available. 14in.—15/-
Guaranteed good picture. Carriage 5/- extra

ONE YEAR GUARANTEED TUBES



21 in. 99/6 100% REGUNNED
Add 10/- or old tube.
17 in. 79/6 All 110°—99/6 plus
30/- refundable on
15,14 old tube. Carr. 10/6.
59/6 14in. Slimline 17 &
12 in. 19in.—overseas postage 30/-.

VALVES 9d. each. 1,000's available. Send for List.
CONDENSERS. 100—10/-. New. Assorted electrolytics and p.f.s. P. & F. 2/6.
VICORTEOLS. 20—10/-. A selection of types and sizes. P. & F. 2/6.
SPEAKERS. 7/9. 6in., 8in., 7 x 4in. and 8 x 3in. Ex. mfd. Salvage. P. & F. 2/3.
SPEAKERS. 12/9. Brand new. 7 x 4in. and 8 x 3in. P. & F. 2/3.
Speakers—Overseas Postage 4/-.

TELEPHONE HANDSET

15/6
pair

DUKE & CO. (LONDON) LTD.

621/3 Romford Road, Manor Park, E.12
Liverpool St.—Manor Pk.—10 mins.
Phone: ILFord 6001/2/3. Stamp for Free List

G.P.O. pattern House to Workshop, Garage, Inter-Office, etc.
Works off any small battery. P. & F. 4/6

Designed for the electronics age . . .
PRIMAX and PRIMAXA solder guns

S
P
O
T
L
I
G
H
T

S
O
L
D
E
R

G
U
N
S



Distributed by **S. KEMPNER LTD.**

384 FINCHLEY ROAD, LONDON, N.W.2

Tel: HAM 6365

PREPARING R.A.E. FOR THE

BRIAN ROBINSON.

8. AMPLIFIERS, FREQUENCY CHANGERS AND DETECTORS

8.1 The Triode as an Amplifier

It will be remembered from Article 6 that the triode valve can be used as an *amplifier* and also that the *amplification factor*, μ , was given by the ratio of the change in V_a to that of V_g when both were causing the same change in I_a . The three types of amplification generally met are Class A, Class B and Class C amplification.

Class A—the valve is operated on the straight line portion of the I_a/V_g curve.

Class B—the valve is operated on the curved portion of the I_a/V_g curve.

Class C—the valve is biased beyond the cut-off value.

8.2 Class A Amplification

Assume that an alternating voltage is applied to the grid of a triode and that this voltage has a peak value of 2V. If the negative bias applied to the grid is $-3V$ then it can be seen that the actual negative voltage applied to the grid can vary between -5 and $-1V$ (i.e. $-3-2=-5V$ and $-3+2=-1V$).

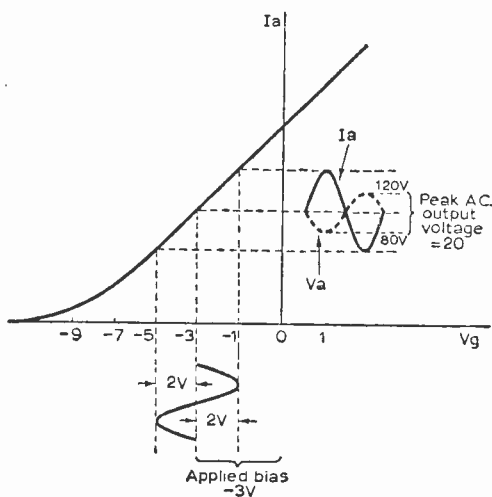


Fig. 67: Typical conditions for Class A amplification.

It can be seen from Fig. 67 that the alternating voltage applied to the grid causes an alternating current to appear in the anode circuit. The alternation of I_a does, of course, cause an alternating component to occur in V_a , this is shown dotted in Fig. 67. The peak a.c. output voltage is 20V as shown, and therefore the change in grid voltage of 2V has caused a change in anode voltage of 20V. (For the same change in I_a .) The amplification factor is $20/2$ or 10.

For Class A amplification the valve must be operated on the straight line portion of the I_a/V_g curve otherwise distortion of the signal will occur. The effect on the output caused by operating the valve used in Fig. 67 with an applied bias of $-6V$ is shown in Fig. 68. It can be seen that distortion of the output signal occurs. This type of distortion is called *harmonic distortion* and is most undesirable in a Class A amplifier.

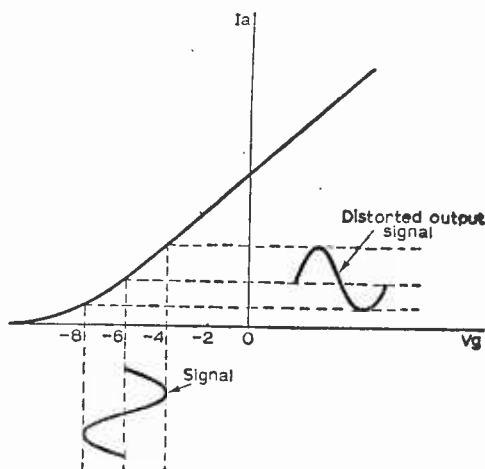


Fig. 68: Class A distortion due to over-biasing.

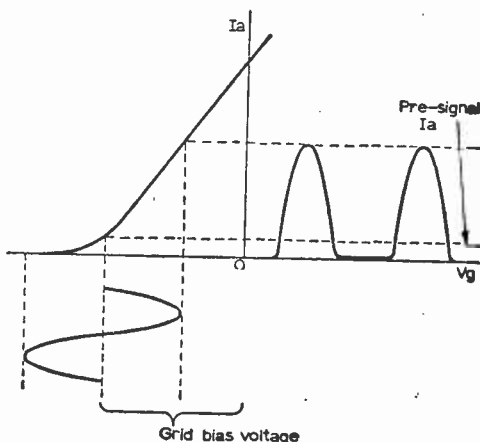


Fig. 69: Typical conditions for Class B amplification.

8.3 Class B Amplification

In Class B amplification the valve is biased near to its cut-off value. In Fig. 69 a graph showing typical operating conditions is given. The output signal is virtually only a half cycle. This output is therefore distorted as no anode current flows on almost half a cycle. The Class B amplifier is much more efficient than the Class A amplifier but the distortion of the output signal is a serious problem.

If the input signal is connected to two valves connected in *push-pull*, as shown in Fig. 70, then the problem of distortion is overcome. The signal is applied to the valves through a centre tapped transformer and the output is also taken from a centre tapped transformer. If the valves have identical characteristics the output from the secondary of the output transformer will be a sine wave. In the circuit as drawn anode current does

not flow in either valve for the duration of the dotted part of the cycle.

8.4 Class C Amplification

For this type of amplification the valve is biased beyond its cut-off value. In this case then no anode current will flow for the greater part of the cycle. Class C amplifiers are generally used for radio frequencies when the tuned circuits which are used are sufficiently selective to filter out the harmonics which occur as a result of distortion. The Class C amplifier is the most efficient of the three and is frequently used in transmitter circuits where large power outputs are required.

8.5 Frequency Changers

In the *superheterodyne receiver* (or "superhet", which will be dealt with later) the incoming signal, which could be say a broadcast station, is not amplified and then rectified (or *detected*) at its original frequency but is first of all converted to a lower frequency. This converting of a signal from one frequency to another is called *frequency changing*. The frequency to which the signal is changed is called the *intermediate frequency*. The advantages of lowering the frequency at which the signal is to be amplified are as follows—

- 1 The receiver becomes more *selective*, i.e. signals of stations with very close frequencies can be more easily separated.
- 2 Strong signals will not "block" the receiver.
- 3 Amplification is more efficient at a lower frequency, i.e. the Intermediate Frequency or i.f.

The frequency changer works in the following way. Two separate valves are required (both may however be in the same envelope), one being called the *mixer* and the other the *oscillator*. As can be seen from the block diagram in Fig. 72 it is assumed that the incoming signal is at a frequency of 5Mc/s. If an oscillator generates a signal at 5.5Mc/s then a tuned circuit at $5.5 - 5 = 0.5$ Mc/s can be placed in the anode circuit of the mixer valve. The incoming signal has therefore been converted from a frequency of 5Mc/s to one of 0.5Mc/s which is the Intermediate Frequency.

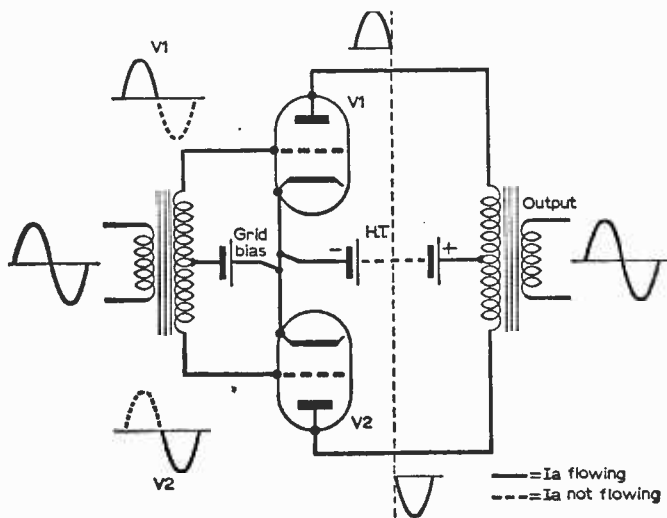


Fig. 70: A Class B push-pull amplifier circuit.

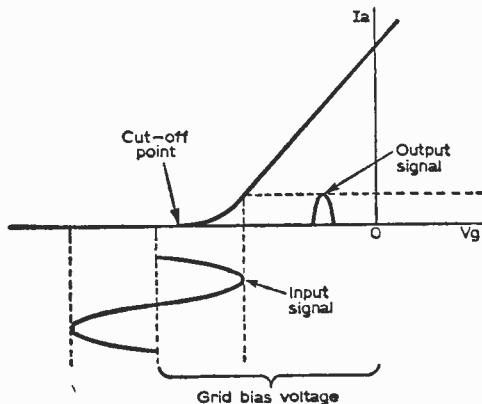


Fig. 71: Typical conditions for Class C amplification.

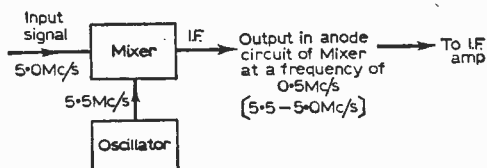


Fig. 72: A block diagram illustrating the principle of the mixer.

SURBITON PARK RADIO

● IMMEDIATE ATTENTION TO ORDERS BY POST

MARTIN AUDIOKITS & RECORDAKITS

F.M. TUNER Units Nos. 15, 16 and 17..... Cash £12.17.6d.
 Or Dep. 51/6 and 12 m. pmts. of 25/10..... (H.P. Price £13.17.6d.)
 TRANSISTORISED AMPLIFIER with stereo input selector,
 pre-amp and controls, 10 watt 15 ohm amplifier and power pack.
 Cash £15.8.0d.
 Or Dep. 62/- and 12 m. pmts. of 22/6..... (H.P. Price £16.12.0d.)
 TRANSISTORISED AMP. ASSEMBLY as above but for 10 watts
 output at 3 ohms..... Cash £14.5.0d.
 Or Dep. 57/- and 12 m. pmts. of 20/10..... (H.P. Price £15.7.0d.)

Above include front panels, knobs and instructions.
TWO TRACK RECORDAKIT AMP. (Valve) FOR STUDIO
 DECK incl valves, controls..... Cash £11.11.0d.
 Or Dep. 47/- and 8 m. pmts. of 25/10..... (H.P. Price £12.11.0d.)
COLORADO STUDIO DECK, 3-sp. 180cm..... Cash £10.19.6d.
 Or Dep. 41/- and 8 m. pmts. of 23/6..... (H.P. Price £12.0.0d.)
COMPLETE KIT with tape, mic. case & spkr..... Cash £29.19.6d.
 Or Dep. 120/- and 12 m. pmts. of 44/-..... (H.P. Price £32.8.0d.)
HALF TRACK ASSEMBLY incl. Coilard Studio Deck with Mar-
 riot "X" Heads, case, type, Mic. and Amp..... Cash £33.19.6d.
 Or Dep. 136/- and 12 m. pmts. of 49/10..... (H.P. Price £36.14.0d.)
1 TRACK PRE-AMP for Studio Deck..... Cash £8.8.0d.
 Or Dep. 34/- and 6 m. pmts. of 25/8..... (H.P. Price £9.8.0d.)
2 TRACK as above, self powered..... Cash £29.9.0d.
 Or Dep. 39/- and 6 m. pmts. of 29/4..... (H.P. Price £10.9.0d.)
 We are leading stockists for all Martin constructional kits.
 Leaflets of full ranges on request.

AMPLIFIERS-TUNERS Selection

ARMSTRONG 222 10+10w STEREO AMP..... Cash £27.10.0d.
 Or Dep. 110/- and 12 m. pmts. of 40/4..... (H.P. Price £28.14.0d.)
 ARMSTRONG 223 F.M. TUNER, powered..... Cash £22.10.0d.
 Or Dep. 90/- and 12 m. pmts. of 32/2..... (H.P. Price £24.6.0d.)
 ARMSTRONG 224 AM/FM tuner, powered..... Cash £28.15.0d.
 Or Dep. 115/- and 12 m. pmts. of 42/2..... (H.P. Price £31.1.0d.)
 ARMSTRONG 127/M, 5w amp with AM/FM..... Cash £26.10.0d.
 Or Dep. 106/- and 12 m. pmts. of 38/10..... (H.P. Price £28.12.0d.)
 ARMSTRONG 127/S 10w stereo..... Cash £27.10.0d.
 Or Dep. 150/- and 12 m. pmts. of 55/-..... (H.P. Price £40.10.0d.)
 ARMSTRONG 227M, 10w amp with AM/FM..... Cash £36.15.0d.
 Or Dep. 147/- and 12 m. pmts. of 53/10..... (H.P. Price £34.13.0d.)
 ARMSTRONG 227/S 10+10w amp with AM/FM..... Cash £52.15.0d.
 Or Dep. 211/- and 12 m. pmts. of 71/4..... (H.P. Price £56.19.0d.)
 ARMSTRONG 228/S Dillo, mag. PU, Filter..... Cash £61.0.0d.
 Or Dep. 250/- and 12 m. pmts. of 88/-..... (H.P. Price £65.16.0d.)
 We stock the Complete Armstrong Range
 ROGERS CADET Mk.3 10+10w Stereo..... Cash £29.10.0d.
 Or Dep. 118/- and 12 m. pmts. of 43/3..... (H.P. Price £31.17.0d.)
 Case Model as above £3.0.0 extra.
 LEAK Transistor Stereo 30..... Cash £49.10.0d.
 Or Dep. 198/- and 12 m. pmts. of 72/1..... (H.P. Price £53.9.0d.)

LOUDSPEAKERS Selection

GOODMANS' MAXIM..... Cash £17.10.6d.
 Or Dep. 70/6 and 12 m. pmts. of 25/10..... (H.P. Price £18.18.6d.)
 WHARFEDALE SUPER 8 RS/DD..... Cash £6.14.2d.
 Or Dep. 44/- and 8 m. pmts. of 24/3..... (H.P. Price £11.18.0d.)
 FANE 122/10 heavy duty 12in. 20 Watt..... Cash £5.5.0d.
 Full ranges of Goodmans' Wharfedale, B. etc., always
 available. Leaflets on request.

MOTORS-PICK-UPS Selection

GARRARD—all models, including following:
 Autotrim 4-sp. changer, mono..... Cash £6.12.6d.
 AT 6 Autotrim de luxe..... Cash £10.10.0d.
 Or 42/- Dep. and 8 m. pmts. of 23/6..... (H.P. Price £11.10.9d.)
 DECCA DECK Single player, with 'Deram'..... Cash £15.15.0d.
 Or 63/- Dep. and 12 m. pmts. of 23/1..... (H.P. Price £17.0.0d.)
 301 Trans. with strobe..... Cash £22.10.0d.
 Or 88/- Dep. and 12 m. pmts. of 32/3..... (H.P. Price £25.15.0d.)
 GOLDRING GL 70, with arm but less cartridge..... Cash £27.9.4d.
 Or Dep. 111/4 and 12 m. pmts. of 40/-..... (H.P. Price £29.12.4d.)
 3000 4-sp changer, LM arm, stereo..... Cash £11.12.0d.
 Or Dep. 46/8 and 8 m. pmts. of 25/9..... (H.P. Price £12.12.6d.)
 A70 Transcription changer, no cart..... Cash £22.11.0d.
 Or Dep. 90/- and 12m. pmts. of 33/-..... (H.P. Price £24.7.0d.)
 L.A.B 8 Transcription changer, no cart..... Cash £27.10.0d.
 Or Dep. 110/- and 12 m. pmts. of 40/4..... (H.P. Price £29.14.0d.)
 GOLDRING—All models including following:—
 G66 4-sp. manual, mono..... Cash £11.11.0d.
 Or Dep. 47/- and 8 m. pmts. of 25/6..... (H.P. Price £12.11.0d.)
 GL58 4-sp. manual, no cart..... Cash £17.1.0d.
 Or Dep. 69/- and 12 m. pmts. of 24/11..... (H.P. Price £18.8.0d.)
 GL70 Transcription with arm, no cart..... Cash £29.18.6d.
 Or Dep. 120/6 and 12 m. pmts. of 43/9..... (H.P. Price £32.5.6d.)
 ★ 6d. stamp with all requests for leaflets please.

We stock full ranges by all makers shown above

● SATISFACTION OR MONEY REFUND GUARANTEE

SURBITON PARK RADIO LTD.

48-50, Surbiton Road, Kingston-on-Thames, Surrey
 Phone KIN. 5549 :: Hours 9-6 daily (Weds 1.0 pm)

VALVES SAME DAY SERVICE

NEW! TESTED! GUARANTEED!

SETS 1R5, 1R5, 1T4, 3V4, DAF91, DF91, DK91, DL92, DL94, Set
 or 4 for 15/-, DAF96, DF96, DK96, DL96, 4 for 24/6.

1A7GT	7/8	6X4	3/9	DAF91	3/9	ECF96	10/9	MU14	5/-	U25	8/6
1H5GT	8/3	6X5GT	6/3	DAF96	6/-	ECF96	6/-	N18	4/10	U26	8/9
1N5GT	8/-	7166	11/9	DC990	6/9	ECF96	8/3	N108	7/11	U47	8/6
1R5	4/9	7167	8/-	DF93	8/-	ECF96	8/3	O19	4/8	U48	9/8
1R5	3/8	715	7/9	DF91	2/6	ECF96	8/3	O24	6/10	U50	5/3
1T4	2/6	716	7/9	DF96	6/-	ECF96	8/3	P25	6/9	U52	4/6
2V	10/6	717	5/9	DF91	6/-	ECF96	8/3	P47	7/-	U54	8/9
3A3	6/9	7Y4	6/-	DF97	4/-	ECF96	8/3	PC94	5/6	U78	3/9
3Q1	4/10	10LD13	7/8	DM11	12/6	ECF96	3/8	PCF89	9/6	U91	10/-
3S4	4/9	12AT7	3/9	DK92	8/-	ECF96	6/9	PCF90	6/11	U92	8/6
3V1	5/6	12AT7	4/9	DK91	4/9	ECF96	4/9	PCF92	6/9	U91	9/-
3V4	4/8	12AX7	4/9	DK92	8/-	ECF96	5/7	PCF94	7/8	U91	11/8
3V4GT	5/3	12K7GT	4/3	DK96	6/6	ECF96	7/6	PCF96	9/6	U91	15/8
3Z4GT/8	12K8GT	8/9	DL33	7/3	ECF96	4/3	PCF95	9/6	U91	5/9	
6R012	8/9	12Q7GT	4/3	DL25	6/9	ECF96	2/9	PCF92	6/11	U91	7/8
8A13	2/-	10B4GT	6/9	DL92	4/9	ECF96	2/9	PCF94	9/6	U91	7/8
6A86	2/8	6V6	7/6	DL94	5/6	ECF96	7/6	PCF94	8/3	U91	7/8
6A9Q	4/-	20L5	13/6	DL96	6/-	ECF96	7/6	PCF95	8/6	U91	6/-
6A76	4/-	20L5	11/8	DM10	4/11	EL35	11/9	PCF94	6/6	U91	8/9
6B16	4/8	21AGT	4/9	DM86	6/9	EL41	7/3	PCF93	9/6	U91	8/9
6B16	4/9	30C18	9/6	DM7	8/-	EL84	5/3	PCF94	U91	8/9	8/6
6B16GT	12/6	30F15	5/6	DM80	8/6	EL84	5/6	PCF94	U91	8/9	8/6
6B16	5/-	30F15	9/6	DM82	4/-	EM34	7/11	PCF94	U91	8/9	8/6
6B16	5/6	30L15	10/3	EB11	4/-	EM80	6/3	PCF96	8/9	U91	7/8
6B16	7/9	30P4	13/6	EB91	2/-	EM81	7/3	PCF96	8/9	U91	7/8
6B16	3/9	30P4	13/6	EB93	5/-	EM84	6/3	PCF96	8/9	U91	7/8
6F14	9/-	30P14	8/6	EB94	7/3	EM87	7/3	PCF96	8/9	U91	7/8
6F14	4/6	30P14	10/9	EB96	6/-	EM81	6/3	PCF96	8/9	U91	7/8
6K74	1/6	30P14	11/6	EB93	7/6	EM87	6/3	PCF96	8/9	U91	7/8
6K74GT	5/3	35A5	14/-	EBF99	6/6	EM80	6/3	PCF96	8/9	U91	7/8
6K80	4/3	35AGT	6/3	EBL21	10/6	EM81	6/3	PCF96	8/9	U91	7/8
6K80GT	7/6	35W4	4/9	EC04	3/9	EM80	6/3	PCF96	8/9	U91	7/8
6P28	9/6	35Z4GT	5/6	EC081	3/9	EM81	6/3	PCF96	8/9	U91	7/8
6G70	4/9	35K10	8/6	ECX82	4/9	EM81	6/3	PCF96	8/9	U91	7/8
6G70GT	7/8	ACVP12/6	6/6	ECF83	7/3	EM81	6/3	PCF96	8/9	U91	7/8
6N1GT	4/9	B36	4/6	ECU84	6/3	EM81	6/3	PCF96	8/9	U91	7/8
6N1GT	4/9	CL3	9/6	ECU85	6/3	EM81	6/3	PCF96	8/9	U91	7/8
6V6B	3/9	CL7	12/6	ECF90	7/6	EM81	6/3	PCF96	8/9	U91	7/8
6V6GT	6/6	DAC32	7/6	ECF92	7/8	EM81	6/3	PCF96	8/9	U91	7/8

READERS RADIO

24 COLBERG PLACE, and at 85 TORQUAY GARDENS,
 STAMFORD HILL REDBRIDGE, ILFORD
 LONDON, N.16. STA 4587 ESSEX. CRE 7441

Postage on 1 valve rd. extra. On 2 valves or more, postage rd. per valve extra
 Any Parcel Insured against Damage in Transit 9d. extra.

NOMBEX INSTRUMENTATION

TRANSISTORISED AUDIO GENERATOR

Model 63 £17.0.9

- ★ Laboratory Specification 10 C/s to 100 Kc/s.
- ★ Direct Calibration. ★ Sine and square output.



Also available:

- ★ INDUCTANCE BRIDGE 66 ... £18. 5.9
- ★ POWER SUPPLY UNIT 61 ... £6.13.6
- ★ C.R. BRIDGE 62 ... £8.10.9
- ★ R.F. SIGNAL GENERATOR 27 ... £9.15.9

All Prices include Battery, Post and Packing.
 Prompt delivery

S.A.E. for Technical Leaflets Trade and Export enquiries invited

NOMBEX LTD.

Phone: 3515

Estuary House, Camperdown Ter., Exmouth, Devon

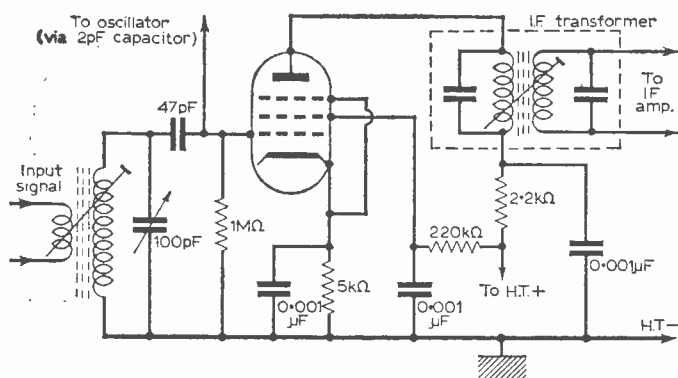
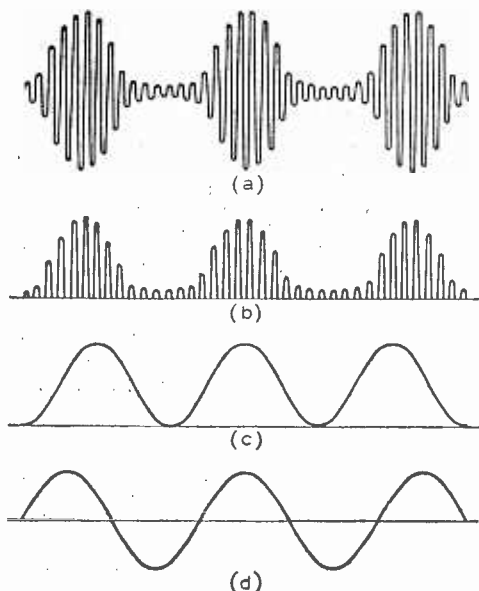
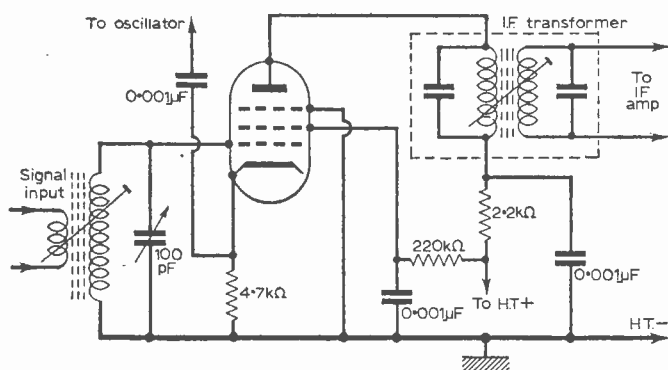


Fig. 73a (above) and b (below): Two typical mixer circuits.



and these filter out the r.f. component which remains in the rectified signal: the resulting waveform is as shown in Fig. 74c. The signal will then be passed to an *audio frequency (a.f.) amplifier* through a coupling capacitor, and as the capacitor only transmits variations of voltage the voltage which reaches the a.f. amplifier will be of the form shown in Fig. 74d.

A simple diode detector is shown in Fig. 75.

Fig. 74 (left): Illustrating the action of the diode as a detector.

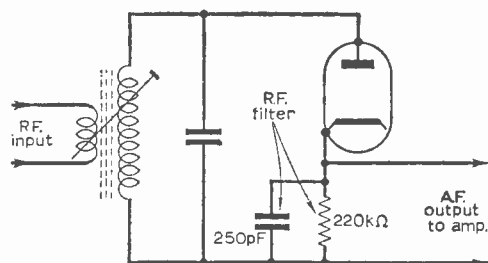


Fig. 75: A simple diode rectifier circuit.

The i.f. would still be 0.5Mc/s if the oscillator frequency were 4.5Mc/s, i.e. $5 - 4.5 = 0.5\text{Mc/s}$. (In Fig. 72 it would, of course, also be possible to have an i.f. of 10Mc/s, i.e. $5 + 5 = 10\text{Mc/s}$, but this would destroy the object of the frequency changing!) The output from a mixer at the Intermediate Frequency is taken through an Intermediate Frequency transformer. Two mixer circuits are shown in Fig. 73a and b. The main difference between the circuits is the way in which the oscillator voltage is injected into the mixer.

8.6 Detectors

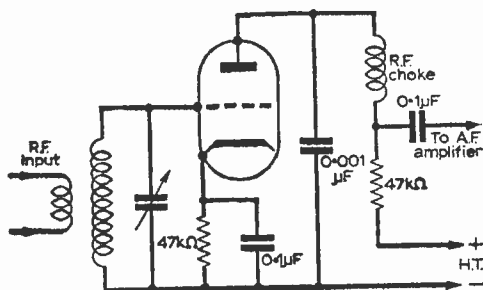
The simplest type of detector simply uses a diode valve. (Or a Germanium or Silicon Diode.) Generally a simple *half wave detector* will be used and this is very similar to the diode rectifier dealt with in Article 5. It is assumed that the r.f. signal received by the detector is *modulated*, i.e. speech or some other sound is superimposed on the r.f. signal. The modulated r.f. signal is of the form shown in Fig. 74a. This is applied to the anode circuit of the detector and anode current only flows on the positive half cycle, the rectified signal is then of the form shown in Fig. 74b. The rectified signal is then passed through a capacitance and resistance connected in parallel, and

The diode detector can handle large signals and its linearity is good. It does consume power from the circuit, however, and the "Q" of the tuned circuit will therefore be lowered, the sensitivity of the diode is also low.

8.7 The Anode Detector

If a triode is biased almost to cut-off point then a change in the grid voltage will cause a corresponding change in the anode current (average). This change of anode current will follow the changes of grid voltage and the result is that rectification will take place in the anode circuit. A typical circuit for an anode detector is given in Fig. 76 (below). The anode detector takes no power from the tuned circuit and some amplification of the signal takes place. It will not handle signals as large as the diode will however, and its linearity is not quite so good.

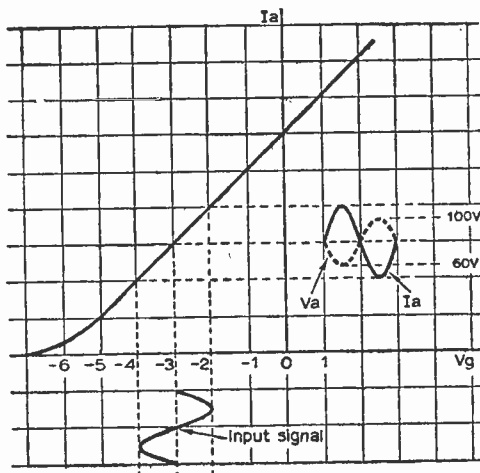
Another popular detector using the triode is the *grid leak detector* and the reader is advised to look up details of this in one of the recommended text books.



Question

In Fig. 77 (below)

- What is the applied grid bias?
- What is the peak input signal voltage?
- What is the peak change in anode voltage?
- What is the amplification factor?
- What type of amplifier is depicted?



Answer to Last Month's Question

This answer is given in Fig. 78 a and b.

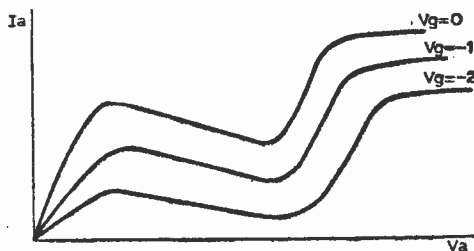
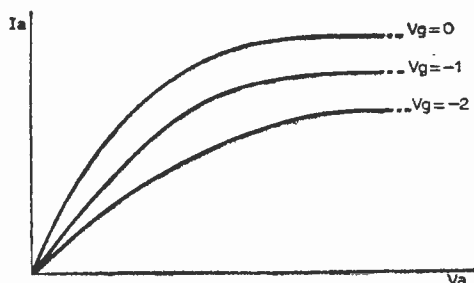


Fig. 78a (above) and b (below): Graphs the same as, or similar to these should have been obtained from the data given in last month's question.



USING A PORTABLE IN THE CAR

—continued from page 147

a prototype amplifier using an OC171 in a wide-band circuit extending to about 3Mc/s was produced. The gain was measured at about 36dB at the top end of the m.w. band. An ordinary portable was set up at sea level on the South Devon coast and tuned round the frequency of Radio Caroline. There was no trace of the station.

The above-mentioned amplifier was then connected to the portable and to an ordinary, clip-on car radio aerial. Radio Caroline was then received loud and clear at full volume. The only trouble was that the combination picked up almost every source of interference for yards around. It seems that the most useful gain is 20dB provided good matching is maintained at both the input and the output of the amplifier and that the response does not rise much above 2Mc/s.

Negative feedback can be adopted in the design both to equalise the response over the required spectrum and to secure the best input matching to the car-type aerial. The author has had a great deal of success with single transistor common-emitter amplifiers with a wideband ferrite transformer or choke in the collector circuit and with controlled negative feedback. Commercial representation of the author's design is shown in Fig. 6.

NOW ADD F.M. RADIO to your MARTIN AUDIOKIT SET-UP

with only 3 easy-to-assemble prefabricated units

The unique and outstandingly successful system developed by Martin Electronics whereby prefabricated transistorised units can be assembled to make your own choice of hi-fi now brings 3 further Units, No. 15, 16 and 17 to enable you to build a modern F.M. Tunes of exceptionally good design and performance. Intended primarily for those who have chosen an Audiokit hi-fi set-up, the Tuner may also be used with other good amplifiers if desired. With a few simple connections, you will have a tuner of excellent appearance to please the most critical ear, yet it is surprisingly inexpensive.

A whole range of Audiokit Units is available which you can assemble to your own choice with ease and complete success. Ask for the Audiokit leaflet.

- **Sensitivity**—20 micro-V for 20dB signal noise ratio: 5 micro-V for 40dB
- **A.F.C.** — ensures easy accurate tuning.
- **Tuning**—88 to 108 Mc/s
- **Audio Response**—Flat from 30 to 15,000 c/s.
- **Controls**—Tuning, and on off with switch through stage for recording, etc.

View above shows Units 15, 16 and 17 assembled. Below, the attractive escutcheon.

UNIT 15
F.M. Head & tuning condenser

£5.12.6

UNIT 16
I.F. Amp.

£5.7.6

UNIT 17
Mounting drive escutcheon & controls

£1.17.6

SUPERB QUALITY FOR VERY MODEST OUTLAY
From Radio and Hi-Fi Stockists

Trade enquiries invited

MARTIN ELECTRONICS LTD. 154/5 High Street, Brentford, Middlesex ISLeworth 1161/2

MARTIN ELECTRONICS

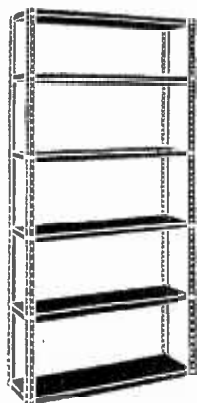
154 High Street, Brentford, Middlesex

F.M. Tuner Leaflet ● Audiokit Leaflet ●
Tick as required

Name _____

Address _____

P.W. 6



STEEL SHELVING

BRAND NEW

C.W.O. or C.O.D. FREE DELIVERY within 14 days. N. Scotland, Ireland, I.O.M., 10% extra.

65/-

71in. high x 34in. wide 12in. deep with 6 shelves as illustrated.

Each shelf will hold over 3 cwt. Shelves adjustable every 2 in. Stove-enamelled dark green. White enamel units 50% extra.

Height	Width	Depth	No. of shelves	Price	Price each 3 or more	Extra shelves
71 in.	34 in.	9 in.	6	63/-	61/-	7/-
71 in.	34 in.	12 in.	6	65/-	63/-	8/-
71 in.	34 in.	15 in.	6	74/-	72/-	9/6
71 in.	34 in.	18 in.	6	88/-	84/-	11/8
85 in.	34 in.	12 in.	6	73/-	71/-	8/-
85 in.	42 in.	12 in.	6	91/-	89/-	11/-

Contractors to H.M. Govt. and United Kingdom Atomic Energy Authority. Exporters of Steel Shelving.

Buy direct from the manufacturers

ROCHDALE METAL PRODUCTS
Dept. P.W. WATERFOOT - LANCS.
Phone: Rossendale 3221/3

LEARN ELECTRONICS AS YOU BUILD 25 CIRCUITS EXPERIMENTS TEST GEAR

including:

● MINIATURE CATHODE RAY OSCILLOSCOPE

- VALVE EXPERIMENTS
- BASIC AMPLIFIER
- BASIC RECTIFIER
- PHOTO ELECTRIC CIRCUIT
- TIME DELAY CIRCUIT
- SQUARE WAVE GENERATOR
- SIMPLE TRANSMITTER
- TRANSISTOR EXPERIMENTS
- BASIC OSCILLATOR
- ELECTRONIC SWITCH
- SIGNAL TRACER
- BASIC COMPUTER CIRCUIT
- BASIC RADIO RECEIVER
- MORSE CODE OSCILLATOR ETC. ETC.

This complete practical course will teach you all the basic facts of electronics by making experiments and building apparatus. You learn how to recognise and handle all types of components—their symbols and how to read a circuit diagram. You see how circuits are built and how they work BY USING THE OSCILLOSCOPE PROVIDED. Applications of all the main electronic circuits are demonstrated—radio reception and transmission; photo-electrics; computer basics; timers; control circuits, etc; including servicing techniques. NO MATHS USED OR NEEDED. NO THEORY NEEDED. NO PREVIOUS KNOWLEDGE OR EXPERIENCE NEEDED. Tutor service available. No extras needed—tools provided. Send now for FREE DETAILS without obligation, to address below.

TO: LERNAKIT, Dept. K 10, RADIO HOUSE, 40 RUSSELL STREET, READING

POST NOW

Please send free details—

NAME

ADDRESS

SHORT WAVE MAGAZINE

- Covers the whole field of Amateur Radio
- Is now in its 28th Year and 23rd Volume
- Runs 64 pages every Month
- Circulates in more than 75 Countries
- Is Independent and Unsubsidised
- Prints Constructional, Practical and Theoretical Articles on Amateur Transmission
- Includes Regular Activity Features
- Is Entirely Devoted to Amateur Radio
- Stocks most American Radio Books and Manuals
- Costs 42s. a Year (\$6.00 U.S.) by Subscription
- Is obtainable to order through any Retail Newsagent (3s. 6d.)

(Specimen Copy 3s. 6d.)

**55 Victoria Street,
London, S.W.1.**

EXPRESS ELECTRONICS

32 SOUTH END, CROYDON, SURREY

Telephone: Croydon 9186

FOR THE FOLLOWING BRAND NEW UNITS

AMPLIFIERS

TRIPLETONE HI-FI MAJOR	12 watt	...	£15.10.6
TRIPLETONE CONVERTIBLE	5 watt	...	£6.19.6
TRIPLETONE GEMINI STEREO	5 watt	...	£15.15.0
LINEAR	3 watt	...	£6. 6.0
LINEAR DIATONIC	12 watt	...	£12.12.0
LINEAR CONCHORD	30 watt	...	£16.16.0
ADAstra 3-3	4 watt	...	£4.19.6
LEAK TL12	14 watt	...	£18.18.0
LEAK VARISLOPE PRE-AMP	...	...	£15.15.0
LEAK TL50	50 watt	...	£33.12.0
QUAD	15 watt	...	£22. 1.0
QUAD STEREO/MONO PRE-AMP	...	...	£25. 0.0

LOUDSPEAKERS

GOODMANS AXIETTE 8in.	6 watt	...	£5. 5.0
GOODMANS AXIOM 10in.	10 watt	...	£6. 6.0
GOODMANS AXIOM 201	15 watt	...	£10.15.0

BAKERS 'SELHURST' 3 or 15 ohm

JUNIOR 8in.	8 watt foam	...	£5. 5.0
STALWART 12in.	15 watt	...	£5. 5.0
BASS GUITAR 12in.	25 watt	...	£5. 5.0
STANDARD Heavy Duty 12in.	20 watt	...	£7. 7.0
BASS Heavy Duty 12in.	25 watt	...	£12.12.0
AUDITORIUM 15in.	35 watt	...	£18.18.0

RECORD PLAYERS

GARRARD SRP10 4-speed	...	£4.19.6
GARRARD AUTOSLIM 4-speed	...	£6. 7.6
GARRARD AT6 TRANSCRIPTION	...	£9.17.6
GARRARD 4HF TRANSCRIPTION	...	£14.17.6
GARRARD A LAB SERIES	...	£17.10.0
GARRARD 301 LAB SERIES	...	£19. 5.0
DECCADEC WITH DERAM HEAD	...	£14.15.0

De-luxe record players with excellent sound reproduction incorporating the latest BSR 4-speed autochanger, independent tone and volume controls, high quality speaker. Not in kit form but factory made and tested. Finished in most attractive two-tone cabinets in blue/grey, red/grey or charcoal/grey with gilt trim. 200-250v. AC. £12.12.0.

Delivered free U.K. S.A.E. enquiries.

ASTONISHING Time Tested RADIO BARGAINS From CONCORD

MAKE 5 DIFFERENT TRANSISTOR RADIOS FOR

35/-



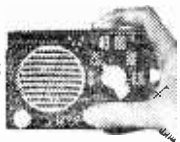
NO EXPERIENCE NECESSARY.
No soldering. Only 8 connections for first radio to work. Just look, you get

A.B.C. Plans, Cabinet, Loudspeaker (alone 17/6), Earphone, 4 Semi-conductors, Coils, Condensers, Resistors, Tuner, Switch, Screws, etc. **YES — EVERYTHING!** Loud clear English and Foreign reception. As supplied to Educational Authorities, H.M. Forces, etc. **TESTIMONIALS GALORE.** Mr. R. O'D. of Londonderry, writes:— "... I received your components and I must say that I am very satisfied with them, I have it already set up!..." **COMPLETE HOME RADIO COURSE, Originally £6 SEND ONLY 35/- plus 2/6 post etc.**

NEW RADIO

ANYONE
CAN BUILD
IN 2-3 HOURS

19/6



EVEN THE OLDER CHILDREN BUILD THEM! ... no soldering—only 16 connections! Then hear it reach out bringing in station after station, loud and clear. Palm-of-hand size 4 1/2 x 2 1/2 x 1 1/2 in. Many Testimonials: N.H. of Bradford, writes: "... I have just completed one of your sets successfully, it is the first time I have ever tackled anything like a radio, and I must state here and now, I am amazed how easy it is to a beginner like me. Your instructions and plan have obviously been very carefully thought out so that even the most dim can follow them..." Direct from Manufacturers to you. Send 19/6 plus 1/6 post etc.

PARTS AVAILABLE SEPARATELY

AMAZING CIGARETTE RADIO!

ONLY
18/6



Yet, a perfectly ordinary packet of cigarettes!—but watch your friends' astonishment on hearing it fetch in station after station, loud and clear! Still holds 10 Cigarettes—yet cleverly conceals highly sensitive, fully transistorised circuit (including tiny battery). Even a young boy can assemble it in under 2 hours. No soldering. No experience necessary. Only 16 connections to make. Ideal for taking to work with you. From our glowing testimonial file, Mr. D. B. of Huddersfield writes: "... I have fitted the parts in and it is working wonderfully..." **ALL PARTS** including Semi-Conductors, A.B.C. Plans, etc. **ONLY 18/6 plus 1/6 post, etc.** (Parts available separately).

READ WHAT SATISFIED CUSTOMERS SAY

R.C. of HARRINGAY writes
Received with thanks Skyrama
... Very pleased. Working well.

B.M. of HARROGATE writes
... I would like to thank you ... It is a real bargain.

L.S. of LONDON W.8 writes
... given it a good try out
and I am very pleased with the results.

S.B. of SOMERSET writes
... delighted with this radio
... glad if you could send one more.

D.R. of GLASGOW writes
... it is a lovely little thing
and as clear as a bell.

T.F. of STEVENAGE writes
I would just like to say how
pleased my son is with this
radio.

J.W. of BRIGHTON writes
... I have recommended your
radio to many of my friends.

W.H. of MIDDLESEX writes
Thank you for my dear little
radio. It is a real treasure
to me.

CONCORD ELECTRONICS

SEND 1/- FOR FULL LIST OF OTHER KITS AND STOCK RANGE
LTD. (Dept. P.W.20) 9 Western Road, Hove, Sussex

A COMMENTARY BY HENRY

PRACTICALLY
WIRELESSNo. 10
Some Odd
Audio

THOSE of the faithful who managed a visit to the Russell Hotel for this year's International Audio Festival and Fair may well be wondering just where the search for realism is leading us.

Stop-at-homes, who rely on the reports they read in magazines such as this, are quite sure. The road to fidelity runs right off the edge of a cliff. Before it gets to the brink, it performs that curious optical confidence trick of vanishing to a perspective point. As we get nearer and nearer what we believe to be the ultimate, there is less and less difference between the steps we take. Improvements, to quote a reviewer, are "marginal".

Last year, the gimmick was Multiplex Stereo. This year, with the radio powers-that-be still living in the age of Morse, with international committees wrangling over standards while countries go their diverse ways, even the most optimistic amplifier maker was reluctant to make Multiplex a prime selling point—despite the Quad decoder.

There were numerous "refinements". Among these, the loudspeaker with no moving parts, and the pickup with almost as

inertialess a virtue. Now that Fane appear to have got rid of the QRM bug that beset Plessey in the earlier Ionophone, and Decca the transverse pick-up stresses, we must surely be a pace more along that vanishing road?

The optical illusion metaphor is apt. Tell a chap he is seeing double and he'll shrug it off as a bit of a joke. But tell him that the pop disc that "sends" him has sounds the composer never scribbled, that the backing group did not put there, and which the vocalist could not produce, even with *that* twisted larynx, and he'll call you a purist. Worse, if you show him scientifically that half of what went in the microphone fails to come out of the loudspeaker, moving parts or no, he is likely to write you off as some sort of big-headed necromancer.

The old sneer about the audiophile who listens to the decibels rather than the music is still to be heard, even in the discreetly carpeted corridors of our exhibition hotels.

Some of the charges are justifiable. After all, who wants the London Symphony Orchestra in the lounge? They would only knock over the ornaments. On the other hand, if we consider that good listening is elusive, who is to tell the hearer whether he is getting all that the composer intended?

Using this subjectivity argument we can muse on whether the composer actually intended what we hear under "normal", or even "ideal" concert conditions. Consider the latest Festival Hall assisted resonance. Helmholtz resonators mounted above the ceiling, microphones and loudspeakers tuned to spot frequencies from 70 to 340c/s (with the 100c/s spot missing—ask Messrs Moir and Parkin why; don't complain to Henry). In all, 89 channels, with amplifiers adjusting reverberation time of each individually. All cunningly installed and adjusted



The coughs and sniffs of a Hanoverian court.

unknown to us blissful concert-goers over a period of weeks.

The point is, what of the later Beethoven? Did he, hand cupped to ear, imagine his symphonies as acoustically pure as the London County Council is endeavouring to make them? More likely, he would have considered himself in a vacuum without the coughs and sniffs of the Hanoverian Court.

It does not seem to matter so much with some modern music, where even the orchestra leader is not sure if the score is upside down. It should matter even less with a beat group. Perhaps it is at this point that the two cultures meet, so let's get back to the electronics and leave the musicians to wrangle among themselves.

Electronics—that's a laugh. What about the baby grand piano at the Paris Festival du Son, which contained tape recorder, record player, amplifiers, F.M. tuner, and, crowning insult, keyboard of an electronic organ under the lid.

A parting mention, to get your audio teeth into. Patent 982,934 describes a hearing aid with the microphone coupled to a short range radio transmitter, and its receiver fitted in a hollow tooth so that the rectified signal tickles up the exposed nerve endings.

Ouch!



Tell a chap he is seeing double

Long Wave Converter

BY JAMES BRETT

This unit will very simply add l.w. Light Programme to any medium wave-only receiver.

THE BBC medium wave Light Programme on 1,214kc/s is prone to selective fading and interference from Continental stations during the evening, and this is very much worse in the south and east of England. The long wave Light Programme on 200kc/s does not suffer these disadvantages but, however, there are a considerable number of both valve and transistor receivers which will only receive medium wave. The purpose here is to describe a self-contained simple unit not requiring any modification to the existing receiver that will convert the 200kc/s Light Programme to a convenient point on the medium wave band.

Description

The circuit (Fig. 1) consists of two stages, Tr1 being a mixer amplifier and Tr2 a local oscillator.

The 200kc/s signal is received on the ferrite rod aerial and tuned by TC1/C1. It is then amplified and converted to a medium wave frequency by Tr1. The output is taken direct from the collector load resistor via the blocking capacitor C4 and does not require a tuned circuit as the receiver to which it is connected will provide the necessary selectivity. No earth connection is needed provided the unit and the receiver are connected by only a short wire, the capacity between them providing the earth coupling.

The local oscillator which will determine the medium wave output frequency is tuned by TC2 and L3 and coupled by the winding L4 to the base of the mixer.

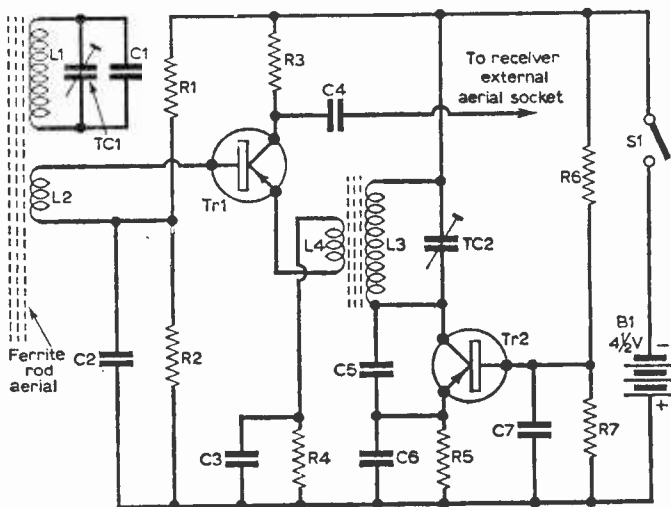


Fig. 1: The two-stage transistor circuit.

COMPONENTS LIST

Resistors:

R1	39k Ω	R5	4.7k Ω
R2	6.8k Ω	R6	39k Ω
R3	10k Ω	R7	6.8k Ω
R4	4.7k Ω		All $\frac{1}{2}$ W carbon

Miscellaneous:

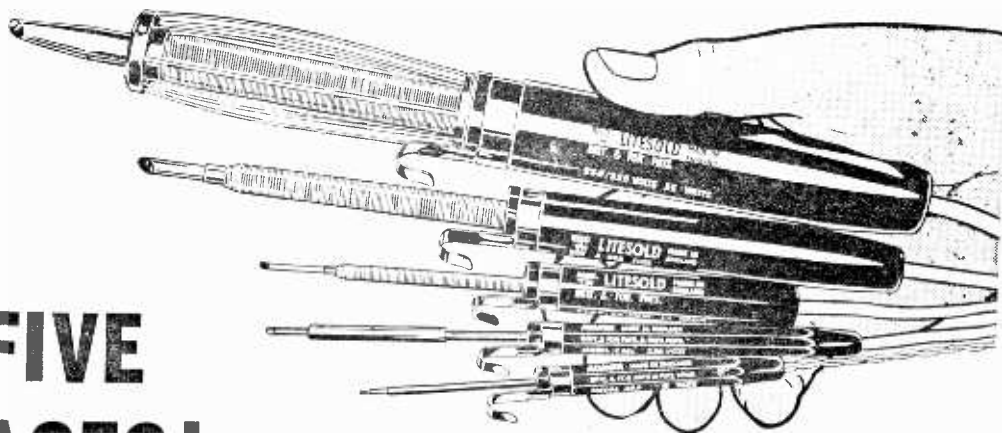
L1,2	Aerial coil	} see text
L3,4	Oscillator coil	
Tr1,2	OC44 or similar	
B1	4.5V battery	
S1	On/off toggle switch	

Capacitors:

C1	See text
C2	0.1 μ F
C3	0.1 μ F
C4	0.1 μ F
C5	33pF
C6	470pF
C7	0.1 μ F
TC1	Trimmer see text
TC2	450pF compression trimmer (Clydon type 26/3).

4 $\frac{1}{2}$ in. length of $\frac{1}{8}$ in. diameter ferrite rod. Piece of paxolin for sub-panel. Plastic or wooden box. 5/16in. diameter former, with iron dust core and screening can (Aladdin). Knob, grommet, wire, etc.

FIVE ACES!



This is a hand that can't be beaten. Five models from our tremendous range of soldering instruments. Superb performance. Amazingly compact. Developed to simplify YOUR soldering. Copper bits for greatest speed. Permatip bits for long life. May we deal you in?

Brochure P.W.10 post free on request

LIGHT SOLDERING DEVELOPMENTS LTD., 28, Sydenham Road, Croydon, Surrey

Telephone: CROydon 8589

1965 EDITION RADIO AMATEUR HANDBOOK

40/- by AKKL Postage 2/-

BASIC THEORY & APPLICATION OF TRANSISTORS by U.S. Dept. of Army. 10/- Postage 1/-

TRANSISTOR SUBSTITUTION HANDBOOK by Foulsham-Sams 12/6. Postage 1/-

WORKED EXAMPLES IN ELECTRONICS & TELECOMMUNICATIONS Vol. 1 by B. Holdsworth & Z. E. Jaworski Vol. 1 25/- Postage 1/-

TRANSISTOR RADIO SERVICING MADE EASY by W. Lemons. 18/- Postage 1/-

A BEGINNER'S GUIDE TO RADIO. Pub. Newnes. 8/6. Postage 9d

WORLD RADIO TV HANDBOOK 1965. 26/- Postage 1/-

A BEGINNER'S GUIDE TO TELEVISION. Pub. Newnes. 8/6. Postage 9d

AERIAL HANDBOOK by G. A. Briggs & R. S. Roberts. 8/6. Postage 1/-

COMPLETE CATALOGUE 1/-

THE MODERN BOOK CO.

BRITAIN'S LARGEST STOCKISTS of British and American Technical Books

19-21 PRAED STREET
LONDON, W.2

Phone: PADdington 4185
Open 5 days 9-6 p.m.

LYONS RADIO LTD.

3 Goldhawk Rd. LONDON W.12

PROGRESSIVE SHORT WAVE RECEIVER

Specialty designed kits employing plug-in coils with exceptionally clear wiring diagrams and instructions to enable even the very beginner to construct a short wave radio with every confidence of success. A second and then a third valve stage can be added the chassis supplied being punched to take all three stages. Can be operated from dry batteries or from a simply constructed mains power unit. PRICE 32/6. COST OF ALL PARTS TO BUILD THE 1 VALVE S.W. RADIO, including one coil 40-100 metres only 35/-, post 2/-; 1 1/2 valve conversion stage 7/6; 2 1/2 valve conversion stage 10/-; Extra plug-in coils to cover 10/20, 20/40, 100/200 and 200/50 metres 4/- each. Plans supplied separately 1/6.

MORSE CODE PRACTICE KITS. Comprehensive Army morse key, buzzer, battery connecting wire and book "Learning Morse" all for 9/6, post 1/6.

READY MADE BARGAINS post free. **TELEPHONE AMPLIFIER**, speaker output from G.P.O. phone leaves you free to write without holding phone, eliminates "hanging-on" etc. PRICE ONLY 63/-.

4 TRANSISTOR PUSH-PULL AMPLIFIER, 200mW. Can be used in conjunction with many projects, such as Record Player, Intercom, Output stage for Radio Tuner Unit. Supplied with circuit diagram. PRICE ONLY 39/6.

2 WAY INTERCOM/BABY ALARM. PRICE ONLY 59/6.

MULTI-RANGE TESTMETER 1,000 ohms/volt AC/DC volts in 3 ranges 0/1,000v. Resistance range 0/100k ohms, DC current 0/150 mA. PRICE ONLY 42/6.

MULTI-RANGE TESTMETER 2,500 ohms/volt, AC/DC volts in 5 ranges 0/1200v. Resistance in 2 ranges 0/1 Meg. ohms. Decibels in 5 ranges DC current: 0/400 micro amps, 0/12 mA, 0/300 mA. PRICE ONLY 67/6

Roitone



10 WATT MONO AMPLIFIER, complete with built in pre-amplifier in metal case, plastic cover covered 6 inputs, 3 each level. With equalisation each input. 1 input switch selected each level with separate vol. control for mixing. Wide range tone controls. Separate Bass and Treble. For use on 220-250v. A.C. mains. Case isolated from mains. ECL86 valves in output for low distortion. Suitable all high impedance Microphones and pick-ups. Size overall including plastic feet: Height 4 1/2 in., Width 1 1/2 in., Depth 9 1/2 in.

READY BUILT AND TESTED £14.10.0

POST AND PACKING 3/-

3W + 3W STEREO AMPLIFIER. As above amplifier but 2 separate amplifiers giving full 3 watts each channel controls. 1 Mono-Stereo 2 Balance, 3 Left Vol., 4 Right Vol., 5 Bass, 6 Treble. Input and output sockets at rear. A.C. mains, 220-250v. Case isolated. **READY BUILT AND TESTED £14.15.0**

POST AND PACKING 3/-

RADIOGRAM CHASSIS. Latest style 3 waveband chassis. Tandem controls through vertical glass dial 6 x 13 in. Plated Gold or Black. Controls: 1 Waveband, 1 W., MW., SW., 6 AM., 2 Tuning, 3 Vol., 4 Tone on/off. Ferrite Rod Aerial. A.V.C. negative feedback. Full 3 watts output for 3Ω speaker. Pilot Lamp, 220-250v. A.C. mains chassis isolated. Overall size: Height 1 1/2 in., Depth 9 in., Width 5 in. Complete with knobs. Dial

Aligned and Tested. **£9.15.0**

POST AND PACKING 5/-

TERMS: C.W.O. or C.O.D. 3/6 extra. 7-Day Money Back Guarantee. Mail Order address only.

ROITONE (Dept. P.W.)

61 HIGH STREET, CINDERFORD, GLOUCESTER

The foremost name in microphones and sound accessories

LUSTRAPHONE

The many Public Authority and Service users of Lustraphone equipment appreciate the quality and reliability resulting from our extensive experience as Specialists in the design and manufacture of microphones and associated equipment.

Microphones for all purposes incorporating the newest techniques : portable P/A systems for indoor and outdoor use : noise cancelling intercom systems : audio equipment accessories and components.

LUSTRAPHONE LTD.

St. George's Works, Regents Park Road,
London N.W.1. PRIMROSE 8844.

A complete basic guide—

BEGINNER'S GUIDE TO COLOUR TELEVISION

by
Terence L. Squires
A.M.Brit.I.R.E.

Explains fully how the signals are created in the television studios, how they are transmitted and the techniques used to receive and display them.



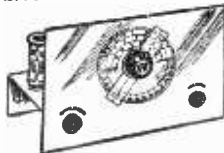
128
pages
58
diagrams

Covers: Historical Outline - The Colour Signal - The Chrominance Signal - Colour Transmission - Receiving the Colour Signal - Domestic Aerial Systems - The Receiver Block Diagram The SECAM Receiver etc.

Only 15s. from all Booksellers . . . or in case of difficulty, 16s. by post from George Newnes Ltd., Tower House, Southampton Street, London, W.C.2.

NEWNES

LISTEN TO THE WORLD on TELSTAR our 1-VALVE SHORT WAVE RADIO



Receives speech and music from all over the world. Price includes valve and one coil covering 40-100 metres. Can be extended to cover 10-100 metres. Can be converted to 2 or 3 valve and all-mains speaker use. Total Building Costs **35/-** P. & P. 2/- All parts available separately.

SLEEP LEARNING EQUIPMENT

Clockwork Time Switch suitable for any tape recorder. **23.15.0**: Pillow Speaker. **21/-**: complete outfit including Recorder, Time Switch and Pillow Speaker. **237.10.0**.

READY TO USE POCKET RADIO



P. & P. 2/- **9/11**
Covers Medium waveband. No batteries needed. Complete with earpiece.

R.C.S. PERSONAL SET

Designed for personal listening without disturbing others. Supplied complete with battery and earpiece—no extras to buy! Sensitive one transistor diode circuit gives quality reproduction over medium wave band. Attractive case with large tuning dial. Ideal for use as tape tuner. Size only 3 1/2 x 2 1/2 in.



ONLY **27/6** P. & P. 2/-

BATTERY ELIMINATORS

The ideal economical and safe way of running any TRANSISTOR RADIO, RECORD PLAYER, TAPE RECORDER, AMPLIFIER, etc. requiring voltages shown. Types Available: 9v., 6v., 4v. (single output). Size 3 1/2 x 3 1/2 in. PRICE 39/6 each. P. & P. 2/6. 9v. + 6v., 6v. + 6v. or 4v. + 4v. (Two separate outputs). Size 3 x 3 x 2 1/2 in. PRICE 42/6 each. P. & P. 2/9. (Please state output required.)

FOR THE CONSTRUCTOR

Easy to build CRYSTAL RECEIVER, 8/6. P. & P. 2/-
Easy to build PERSONAL SET with earpiece, 27/6. P. & P. 2/-
Easy to build 3-TRANSISTOR SET with speaker, 37/6. P. & P. 2/- All parts available separately.

R.C.S. PRODUCTS (RADIO) LTD.

11 Oliver Rd., London, E.17. (Mail Order only)
Export Trade Enquiries Invited

BARGAINS FROM BROADWAY ELECTRONICS

GARRARD A.T.6 Hi-Fi Autochanger G.C.8 mono cartridge—**£9.18.6**, post free.

29.18.6, post free.

GARRARD AUTOSLIM 4 speed changer—**£8.10.0**, post free.

19.10.0, post free.

ALPHAM SPEAKER with built in tweeter 3 ohm or 15 ohm 7,000 Gauss Magnet. Only **29/6**, postage 3/6.

HAYDON CABINET (17 x 15 x 8 in.) designed to take a 12in. Heavy Duty Speaker. **50/-**, postage 7/6.

The Famous B.M.3 XTAL MICROPHONE with neck lanyard 30/-, table stand for above 9/6 extra. Xtal insert 7/6.

GUITAR PICK-UP complete with clip and screened lead—**12/6**. 3-WAY PUSH BUTTON UNITS. Each button operates a 4-pole 2-way switch—4/6.

BARGAINS IN TRANSISTORS. Mullard RF Packs OC44 two OC45, 12/6; AF Packs OC81D two OC81, 8/6; OC44, 3/6; OC45, 3/6; OC71, 2/6; OC72, 3/6; OA81 diode 2/3; OC170, 6/6; AF 117, 8/6; ORP12, light cell, 7/6; OC29, 12/6; OC35, 12/6.

TRANSISTOR ELECTROLYTICS 1, 2, 4, 5, 8, 10, 16, 32, 50, 100 Mfd. all at 15 volts—1/3 each.

MEMICHAEL TELESCOPIC TV AERIAL 20in. extends to 45in.. Fitted with coax plug, will suit any set. Only **7/6**.

CARTRIDGES. Acos 67-1G Low Output, 67-2G Medium Output GP59-5 High Output. Garrard GC2 or GC8 all with mounting bracket 15/-.

Ronette Stereo with mounting bracket, **25/-**.

EARPIECES with cord and 3.5mm plug: 8 ohm magnetic 3/6; 250 ohm 4/6; 180 ohm magnetic with clip 6/6; Xtal, 4/6; 3.5mm plugs with nice long shank complete with jack, 3/6.

3.5mm plugs with nice long shank complete with jack SCREENED, 4/6.

TOGGLE SWITCHES. Single pole with on/off plate, 2/6.

NEON PANEL LIGHTS. 240v. A.C. Arcoelectric, 2/6.

TERMS: C.W.O. OR C.O.D.

BROADWAY ELECTRONICS

92 MITCHAM ROAD, TOOTING, S.W.17

Phone: BALham 3984

(four minutes from Tooting Broadway Underground Station)

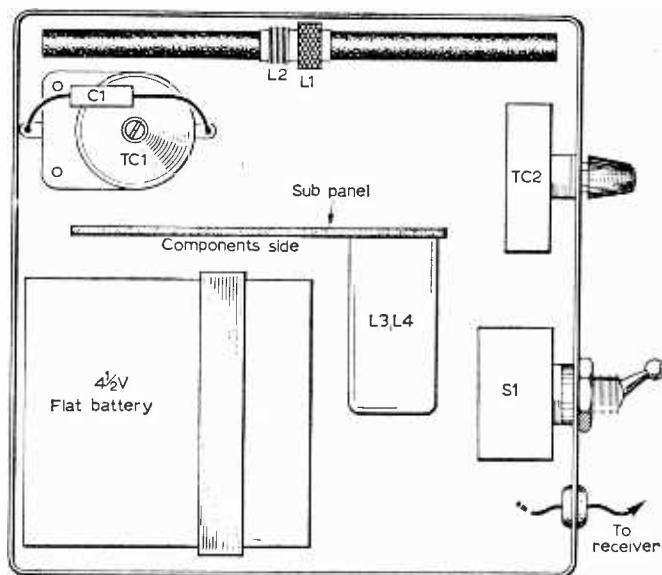


Fig. 2: This component layout was found satisfactory for the plastic case used for the prototype. The methods of mounting the components is largely a matter of convenience, but thick elastic bands can be recommended for holding the ferrite rod and battery.

The bias of both transistors is conventional and the values chosen will provide suitable operation conditions for a wide range of popular r.f. transistors such as OC44, etc.

Coils and Variable Capacitors

The tuning may be achieved by using proprietary coils or winding one's own.

If proprietary coils are chosen a suitable ferrite aerial is the Repanco FS4. This covers long wave only and has a suitable coupling winding L2. The local oscillator transformer is any medium wave coil with a coupling winding and screened, a suitable one being the Repanco XMA16.

To wind one's own coils the details are as follows: L1 200 turns 36s.w.g. pile wound. L2 20 turns 28s.w.g. close wound and adjacent to L1. Both wound near the centre of a 4 1/2 in. piece of 1/4 in. diameter ferrite rod. L3 80 turns 36s.w.g. pile wound. L4 20 turns 36s.w.g. close wound. Both wound on a 1/8 in. diameter former fitted with a

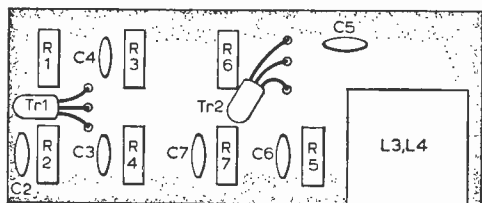


Fig. 3: Layout of components on the paxolin sub-panel.

dust slug and screening can, a suitable one being the Aladdin former and screening can.

Since the tuning of L1 is to be fixed at 200kc/s a low-value trimmer TC1 may be used and the total capacity made up to approximately 300pF by C1.

If the compression trimmer TC2 specified is not readily available a small variable capacitor with solid dielectric such as the type sold with crystal sets may be used.

Construction

The unit is built in a box approximately 5in. x 5in. x 1 1/2 in., there being plenty to choose from, sold as sandwich boxes. A wooden box can also be constructed but a metal box *must not* be used as it would screen the aerial.

The parts may be positioned in the box as shown in Fig. 2 and fixing holes marked out. The battery is held against the box by bolting to the box a piece of broad elastic band. The ferrite rod may be held in place in the same way.

The component sub-panel (Fig. 3) is a piece of paxolin drilled with a fine drill to support the lead wires of the components and the inter-connecting of the components done on the reverse side, using the component lead wires. Where wires cross, a piece of sleeving should be slipped over.

The sub-panel is held on to the box by a small angle bracket.

Alignment

The unit is connected to the receiver and the receiver switched on and tuned to a quiet part of the medium wave band. Note this frequency then move the receiver tuning by 200kc/s as indicated by the receiver dial. Switch on the converter and adjust its oscillator tuning (TC2) until the receiver produces a change in background noise showing that the converter oscillator is on the frequency indicated by the receiver. Reset the receiver tuning to its original setting and the 200kc/s Light Programme should be heard. A slight adjustment of the converter tuning TC2 may be required due to inaccuracies in the receiver dial alignment. Adjust TC1 for maximum signal and the unit is aligned.

To assist in the initial alignment a long wire aerial may be attached to the base of Tr1 via a 220pF capacitor, but on removal a slight adjustment of TC1 will be necessary.

If it is thought that the quietest point has not been found on the medium wave band a small adjustment to the receiver tuning may be made, followed by a readjustment of TC2 to regain the Light Programme. In this way the Light Programme may be brought up almost anywhere on the medium wave band.



ACTON, BRENTFORD AND CHISWICK RADIO CLUB
Hon. Sec.: W. G. Dyer, G3GEH, 188 Gunnersbury Avenue, Acton, London, W.13.

At the meeting held 18th May there was a talk and discussion on "Antennae". The Club meeting place is 66 High Road, Chiswick, and meetings start at 7.30 p.m.

BRADFORD RADIO SOCIETY
Hon. Sec.: E. G. Barker, G3OTO, 63 Woodcot Road, Baildon, Nr. Shipley, Yorkshire.

On 29th April, there was a visit to the Spen Valley A.R.S., where there was a talk on Manned Space Flight.

BROMSGROVE AND DISTRICT AMATEUR RADIO CLUB
Hon. Sec.: J. K. Harvey, 22 Elm Grove, Bromsgrove, Worcestershire.

G6WJ will give a lecture on 14th May, entitled "14Mc/s Operation and Conditions".

Meetings are held on the second Friday each month at the Co-op. Rooms, High Street, Bromsgrove.

CHESTER AND DISTRICT AMATEUR RADIO SOCIETY
Hon. Sec.: P. J. Holland, G3TZO, Field House, 19 Kingsley Road, Gt. Boughton, Chester.

There will be a surplus sale on 11th May and G3DRB will present a film show.

Meetings are every Tuesday except the first in the month, at 8 p.m. in the Y.M.C.A., Chester.

DERBY AND DISTRICT AMATEUR RADIO SOCIETY
Hon. Sec.: F. C. Ward, G2CVV, 5 Uplands Avenue, Littleover, Derby.

On 1st and 2nd May, there was the 144Mc/s Contest (portable entry) and on 29th May there will be the first 432Mc/s Contest.

GOSPORT AND DISTRICT AMATEUR RADIO SOCIETY
Hon. Sec.: J. T. Nightingale, 21 Pier Street, Lee-on-the-Solent, Hants.

Recent activities have included a talk and demonstration on Mobile 4 metre operation, and a visit to the Radio Museum of H.M.S. Collingwood.

HALIFAX AND DISTRICT AMATEUR RADIO SOCIETY
Hon. Sec.: J. Ingham, G3RMQ, Lambert House, Greetland, Halifax, Yorkshire.

On 25th May there will be a 2 Metre evening at the QTH of G3IGW, Rose Dene, Wood Lane, Hipperholme, Halifax.

HUDDERSFIELD AMATEUR RADIO SOCIETY
Hon. Sec.: R. Highton, 5 Brian Avenue, Dalton, Huddersfield, Yorkshire.

The Club recently had a visit from members of the Spen Valley Club. A favourable QTH has been taken over by the Club, so the Club station will be on the air under the call sign G3HOV.

ISLE OF WIGHT RADIO SOCIETY
Hon. Sec.: M. Pettit, 18 Berry Hill, Lake, Sandown, I.O.W.

The Society is running an R.A.E. course every Monday evening. Normal meetings are held every Friday evening, and include lectures, a construction course and film shows. All meetings are held at the Club's H.Q. at Unity Hall, Wootton Bridge, Nr. Ryde, I.O.W.

MELTON MOWBRAY AMATEUR RADIO SOCIETY
Hon. Sec.: D. W. Lillie, G3PDF, 23 Melton Road, Ashfordby Hill, Melton Mowbray, Leics.

On 27th May there will be a visit to the shack of Mr. D. Fisher. All meetings are held in the St. John Ambulance Hall, Ashfordby Hill, Melton Mowbray.

MID-WARWICKSHIRE AMATEUR RADIO SOCIETY
Hon. Sec.: H. C. Loxley, 5 Guy Street, Warwick.

At the meeting on 3rd May, there was a talk on S.S.B. Reception, and on the 17th J. Beam Aerials Ltd., will give a talk about Amateur Aerial Arrays.

NORTHERN HEIGHTS AMATEUR RADIO SOCIETY, G2SU
Hon. Sec.: A. Robinson, G3MDW, Candy Cabin, Ogden, Halifax.

The Club has recently obtained a licence (call sign G2SU) which is a re-issue of one of the founder member's call sign.

The meetings are held at the Sportsman Inn, Ogden, Nr. Halifax, at 7.30 p.m.

On 12th May there will be a visit to Manchester airport and on 26th May, there will be a recorded lecture by the late G2SU on Microphones.

READING AMATEUR RADIO SOCIETY

Hon. Sec.: N. C. Taylor, G3TOQ, 83 Stoneham Close, Tilehurst, Reading, Berks.

The next meeting of the Club will be on 29th May. The meeting will take the form of a full scale rehearsal for NFD and will be held at the QTH of G5HZ, commencing at 2.30 p.m.

ROYAL NAVAL AMATEUR RADIO SOCIETY, G3BZU
M. J. Matthews, H.Q., H.M.S. Mercury, Leydene, Petersfield, Hants.

The Society is holding a Mobile Rally at H.M. Signal School, H.M.S. Mercury, to celebrate their 5th year in existence.

Mobiles equipped for amateur operation will be able to get a "Talk-in" through G83RN operating on 1880kc/s, 70-26Mc/s and 144-2Mc/s. G3BZU will be operating on 3720kc/s for mobiles equipped for S.S.B. reception on that band.

SALTASH AND DISTRICT AMATEUR RADIO SOCIETY
Hon. Sec.: D. Bowers, 95 Grenfell Avenue, Saltash, Cornwall.

On 7th May, there will be an R.S.G.B. tape lecture, "Hints on Mobile Operation".

SLADE RADIO SOCIETY
Publicity Officer: R. L. Jenkins, 42 Warwick Road, Warley, Birmingham 32.

On 24th May there will be a lecture by Mr. D. Collins on Logic and Digital Circuits.

SOUTH BIRMINGHAM RADIO SOCIETY
Hon. Sec.: J. Rowley, G7QO, 195 Castle Lane, Solihull.

On 20th May, there will be the half-yearly Junk and Surplus Sale and on 17th June there will be a demonstration and display of Heathkit Products.

SOUTHGATE, FINCHLEY AND DISTRICT GROUP OF THE R.S.G.B.

Hon. Sec.: R. Wilkinson, G3TXA, 23 Ashridge Gardens, Palmers Green, N.13.

On 13th May there will be a talk by Truvox Ltd., postponed from some months back.

SPEN VALLEY AMATEUR RADIO SOCIETY
Hon. Sec.: N. Pride, 100 Raikes Lane, Birstall, Nr. Leeds.

There was a talk on Manned Space Flight on 29th April, and on 13th May there will be a visit to Wharfedale Wireless Works, at Idle, Bradford.

WEST KENT AMATEUR RADIO SOCIETY
Hon. Sec.: H. F. Richards, 17 Reynolds Lane, Tunbridge Wells, Kent.

On 23rd April there was an Exchange and Mart evening. On the 14th May final arrangements will be made for the NFD.

WIRRAL AMATEUR RADIO SOCIETY
Hon. Sec.: A. Seed, G3FOO, 31 Withert Avenue, Bebington, Wirral, Cheshire.

On 30th April there was an "expedition" covering top band 4 and 2 metres.

ALL this —

Experimental Slot Aerial for BBC2

Reforming Electrolytics

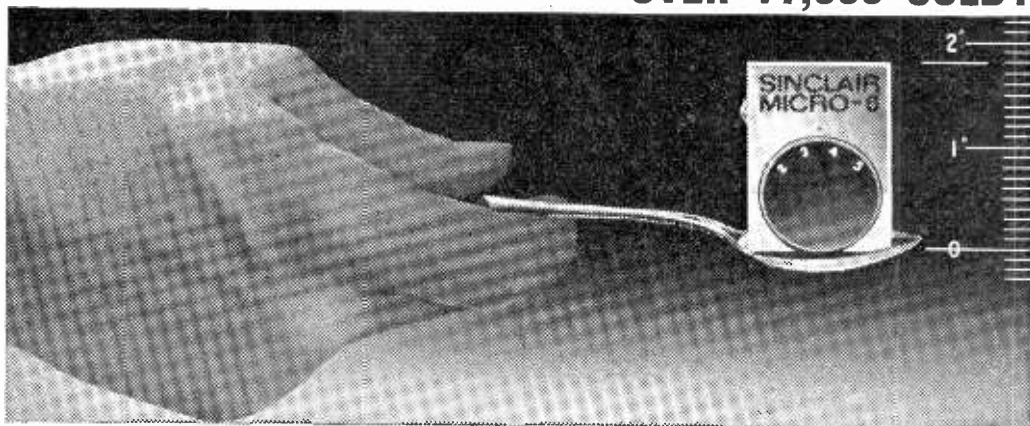
How to cure Line Scan Ringing

The C.R.T. and its uses

and more in

PRACTICAL TELEVISION

JUNE issue—out May 20—2/-

OVER 17,000 SOLD!

Smaller than any set in the world

FASCINATING TO BUILD MARVELLOUS TO USE

No set in the history of radio has ever captured the public's enthusiasm as has the world famous Sinclair Micro-6. Never was a set so small, never so efficient and powerful. Smaller than a matchbox, the Micro-6 brings in stations from all over Europe for your pleasure and entertainment (unless you use it in the U.S.A. or Australia, for example). It performs with fantastic efficiency in cars, buses, trains as well as steel-framed buildings, yet everything

to do with this set except the light-weight earpiece is contained in the minute white, gold and black base which is small enough to be held in a teaspoon! The many attractive features of the Micro-6 include an unusual and original 6-stage circuit, powerful A.G.C., bandspread for easy Luxembourg reception, vernier-type tuning and three special M.A.T. Transistors. Tunes over the medium wave-band. The instructions make building easy.

All parts including transistors, case, dial light-weight earpiece and instructions come to

59'6

MALLORY ZM.312 MERCURY CELL (2 required) each 1/11

Pack of 6 ZM.312 cells 10/6

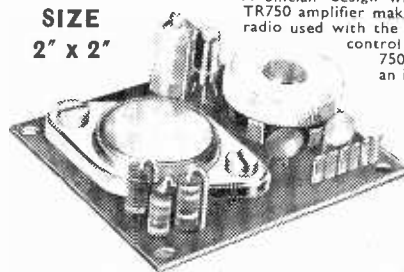
TRANSTRITA nylon wrist strap for wearing Micro-6 on wrist 7/6

SINCLAIR MICRO-6

SINCLAIR TR750 AMPLIFIER

Designed specially for use with Micro-6

SIZE
2" x 2"



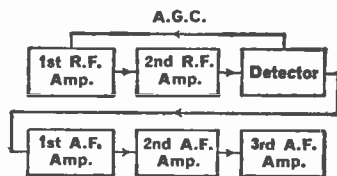
A Sinclair design which enjoys enormous popularity. The TR750 amplifier makes a powerful car, portable or domestic radio used with the Micro-6. With its own built in volume control and on-off switch, the TR750 has a full 750 milliwatt transformerless output for an input of 10mV into 10K ohms. Frequency response from 30 to 20,000 c/s \pm 1dB. For standard 25-35 ohm speakers. Also makes a record reproducer.

All parts with instructions come to

39/6

Ready built and tested

45/-



BLOCK DIAGRAM OF MICRO-6

Three special Sinclair Micro-Alloy transistors (MAT) are used to provide two stages of R.F. amplification, followed by an efficient double diode detector which drives a high-gain 3-stage A.F. amplifier. Powerful A.G.C. applied to the first R.F. stage ensures fade-free reception from the most distant stations tuned in and the set measures only $1\frac{1}{2} \times 1\frac{1}{2} \times \frac{1}{2}$ inch.

SINCLAIR MICRO INJECTOR

This ingeniously designed device generates and injects a test signal into any part of audio or radio equipment at any frequency from 1 kc/s to 30 Mc/s by means of which it becomes easy to locate faults rapidly and accurately. Measures $1\frac{1}{4} \times 1\frac{1}{2} \times \frac{1}{2}$ in. excluding probe. With full instructions.

No constructor should be without a Micro-Injector.

Parts for

building come to

27/6

Ready built and tested

32/6

X-20

See next page

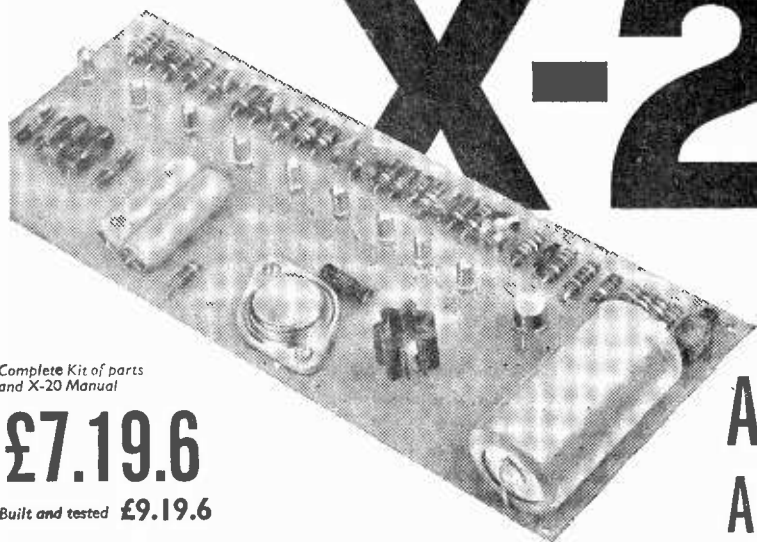
sinclair

SINCLAIR RADIONICS LTD.
COMBERTON Cambridge

Telephone
COMBERTON
682

SINCLAIR

X-20



Complete Kit of parts
and X-20 Manual

£7.19.6

Built and tested **£9.19.6**

X-20 power unit **£4.19.6**

20 WATT COMBINED AMPLIFIER AND PRE-AMP

New design - New power!

First to bring P.W.M. to constructors, Sinclair now take amplifier design even further ahead with the Sinclair X-20. This elegantly styled amplifier has all the qualities demanded of the costliest hi-fi equipment, but it costs many times less, and is far more efficient. With a maximum output of 20 watts R.M.S. (British rating) the X-20 gives you power and power to spare. It provides unsurpassed quality too, and is so designed that for very little outlay, you can add the tone and volume control system of your choice to the pre-amp stage included in the X-20. This is the ideal amplifier for stereo reproduction, and the X-20 manual included with this amplifier gives full details of how to make a stereo assembly. The X-20 measures only $8\frac{1}{2}'' \times 3\frac{1}{2}'' \times 1''$ —dimensions which will inspire constructors to build to entirely new concepts of design and layout.

... and the X-10 for those requiring a less powerful P.W.M. amplifier

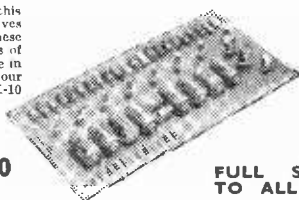
Although the X-10 has been superseded in power by the X-20 this superb Sinclair integrated P.W.M. Amplifier and Pre-amp. gives you all the advantages of quality and efficiency which makes these Sinclair designs so outstanding in every way. Many thousands of X-10's are already in use and this unit will go on giving service in those cases where its power is likely to be best suited to your listening conditions. Prices too are particularly attractive. An X-10 manual is available, 1/6.

The complete kit costs only

£5.19.6

Ready built **£6.19.6** X-10 Power supply unit **£2.14.0**

For 12-15V operation. Tone control system is added to choice. Power output 5 watts R.M.S., 10 watts peak.



- No. of transistors—12
- Output stage uses newest silicon epitaxial planar transistors and requires no heat sink.
- Frequency response—20 to 20,000 c/s ± 1 dB
- Total harmonic distortion—0.1% at 10 watts R.M.S.
- Input sensitivity—1mV into 5 K ohms
- Signal to noise ratio better than 70dB
- **OUTPUT INTO 7.5 ohms**
20 watts R.M.S. music power
15 watts R.M.S. continuous
- **OUTPUT INTO 15 ohms**
15 watts R.M.S. music power
12 watts R.M.S. continuous
- Low pass filter in output stage
- Power requirements—36Vdc at 700 mA
- P.R.F. 65-75 kc/s
- Overall size— $8\frac{1}{2}'' \times 3\frac{1}{2}'' \times 1''$
- Total weight—4½ ozs.

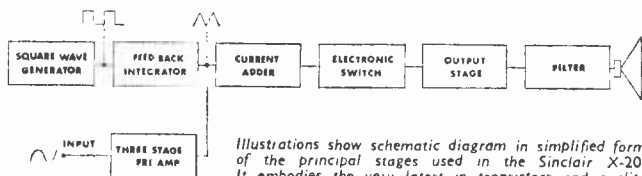
FULL SERVICE FACILITIES AVAILABLE
TO ALL SINCLAIR CUSTOMERS

SINCLAIR

SINCLAIR RADIONICS LTD. COMBERTON CAMBRIDGE

Telephone
COMBERTON 682

WHAT YOU SHOULD KNOW ABOUT THIS BRILLIANT NEW SINCLAIR DESIGN



Illustrations show schematic diagram in simplified form of the principal stages used in the Sinclair X-20. It embodies the very latest in transistors and quality components.

The Sinclair X-20 integrated Pulse Width Modulated Amplifier and Pre-amp marks a further important advance by Sinclair in the development of entirely new and original amplifier designs. Many months of research and development have gone into its production and units have been subjected to impossibly severe working conditions with sensationally satisfactory results. The X-20 has even been run flat out continuously and at the end has still shown no signs of strain or distress.

WHY P.W.M. WAS CHOSEN

This advanced form of Pulse Width Modulation used by Sinclair in the X-20 offers many important advantages over conventionally designed amplifiers. These can be summarised briefly as follows:

1. Completely faithful reproduction of the signal fed into the pre-amp. stage.
2. Brilliant transient response.
3. Absolutely flat frequency response at all power levels.
4. 95% energy conversion factor—power is not dissipated in unwanted heat.
5. Fantastically compact size in relation to power output.
6. Prices that make it possible for everyone to enjoy hi-fi at its very best.

PULSE REPETITION FREQUENCY

In the interests of quality the P.R.F. must be as high as possible without extending into the region of radio frequencies. In the X-20, the pulse repetition frequency is between 65 and 75 Kc/s, a value which is found to satisfy the most stringent demands likely to be made upon it in terms of uncompromising quality. This frequency is generated within the circuitry of the X-20 itself and the output has rise-fall times of less than 0.2 micro-seconds, a value sufficient to ensure maximum efficiency in energy conversion to the loudspeaker with perfect reproduction of the audio signal itself.

OUTPUT STAGE—95% EFFICIENT

Rise and fall times of less than 0.2 micro-seconds are achieved by using silicon epitaxial planar output transistors which makes the efficiency of the output stage at least 95%. Thus only 1 watt is dissipated in each of the output transistors when the amplifier is giving an output of 20 watts.

The complete linearity of the integrator and careful

modulator design ensure absolutely negligible distortion right up to the maximum output.

LOW-PASS FILTER

A low-pass filter cutting off above 20 Kc/s built into the output of the X-20 ensures that the output transistors always "see" a high impedance at the P.R.F., making the amplifier widely tolerant of the type of load to which it is connected.

PRE-AMPLIFIER

This consists of three transistors with two negative feed back loops which define the gain and ensure an absolutely flat frequency response. The sensitivity is sufficient for all types of pick-ups. Provision is also made for connecting high-output devices such as F.M. Tuners and Tape Pre-amps.

tone control systems

The Manual included with the X-20 Amplifier details a variety of tone and volume control systems, any one of which may be added to the amplifier for very little outlay. Full information on stereo operation is also provided, of course.

POWER SUPPLY

A special A.C. Mains operated power supply unit is available for the X-20, delivering 36 volts D.C. Full-wave rectification is used, and the unit is supplied ready built in a completely enclosed steel case.

Complete Kit of Parts including Transistors and X-20 Manual

£7.19.6

Ready built and tested **£9.19.6**

AC Mains Power unit for up to two X-20's **£4.19.6**

GUARANTEE ORDER FORM

Guarantee

Should you not be completely satisfied with your purchase when you receive it from us, your money will be refunded in full and at once without question. Please quote PW.6 should you prefer to write your order instead of cutting out this coupon.

Please send me

.....
.....
.....

for which I enclose Cash/Cheque/Money Order

value £.....s.....d.

NAME

ADDRESS.....
.....
.....

PW6

SOUND RECORDINGS

A UNIQUE BUY. Recording tape, top brand, 7in., 2,400ft., D.P., 25/-; 5in., 1,200ft., 19/6. P. and p. 1/6 per spool. Bargains in all sizes. S.A.E. for list. We repair buy and sell Recorders. E. C. KINGSLEY & CO. LTD., 132 Tottenham Court Road, London.

RECEIVERS & COMPONENTS

TRANSISTORS: PNP from 7d.; NPN high gain from 5/-; Power types, 20 watt, from 7/6; diodes 6d. All guaranteed. S.A.E. lst. LONGLAND'S, 6 Mansfield Place, Ascot, Berks.

TRANSISTORS AT GIVE-AWAY PRICE! NKT 12/5 Switching Transistors. Also capable of being used in all stages of a superhet. 6 for 10/-, OCT7 equivalent 1/- each. 25 for £1 or £3 per 100. Miniature earphones with plug and lead 5/-. Transistor electrolytics 1/6 each. Brand new 4in. speakers 10/-. Goods under 10/- add 6d. postage please. G. F. MILWARD, 17 Peel Close, Drayton Bassett, Staffs.

TRANSISTORISED SIGNAL INJECTOR. Complete kit of components and circuit of injector for testing amplifier or radio, 10/- only. Post free. G. F. MILWARD, 17 Peel Close, Drayton Bassett, Staffs.

BRISTOL'S SHOP

For Radio & TV Components

THE RADIO SHOP
The Haymarket, Bristol 1

INEXPENSIVE

Valves, Autochangers & Amplifiers

WE HAVE large stock of surplus components to dispose of, so we have decided to offer you a mixed parcel of 200 items for 45/- post paid. You won't be disappointed. —GEORGE HANNINGTON, 88 Latimer Road, London, W.11.

QUALITY COMPONENTS, guaranteed. S.A.E. for latest leaflets. J. KINDER, 6 Hooker Road, Heartsease, Norwich, Norfolk.

RESISTORS! You can't resist these! 1,000 assorted wattage and value. Cannot be repeated at £2/10/- per 1,000. G. F. MILWARD, 17 Peel Close, Drayton Bassett, Staffs.

R & R RADIO & T V SERVICE

Dept. P.W.

MARKET STREET, BACUP, LANCs.
Telephone 465

SALVAGE VALVES Tested before despatch
6F13 4/6 10P14 5/- PL82 3/6 20P4 6/8
6L18 4/6 20P5 6/8 6U01 7/6 30P16 5/4
EF80 1/6 30P4 7/- 10P1 1/6 30P84 4/-
KC82 3/- 6F15 5/- 20P2 5/6 PCL33 5/-
6C15 3/6 EF81 1/- 30P11 5/- PYS1 3/6
20P5 5/- EF85 5/- PYS2 6/- C301 6/-
PL38 6/- 6P30L2 4/- 6U4GT 5/- 10P13 5/6
PCP80 4/- 20P3 6/- 6P1 2/6 20D1 2/-
PL81 5/- 30P11 4/- KC08 3/- 30P12 5/-
P230 5/- P139 6/- KY86 4/- PYS3 5/-
U229 5/- PCL82 5/-

Speakers, Ex-TV. 5in. round, 6 x 4in., 3/6; 5in. round, 6/-; post 2/-.

Line Output Transformers available. State set model No.

Turret Tuners, 8/-, post 2/-.

Scan Coils, etc. Quote set model No. with all enquiries and S.A.E. for prompt reply. All goods subject to satisfaction or money refunded.

RATES: 7/3 per line or part thereof average five words to line, minimum 2 lines. Box No. 1/- extra. Advertisements must be prepaid and addressed to: Advertisement Manager, "Practical Wireless," Tower House, Southampton St., London W.C.2.

RECEIVERS & COMPONENTS (continued)

MUST CLEAR! Silly Prices! Turret Tuners, mostly Plessey, 2/6 plus 2/- post or £1 dozen post free. Worth more for the components alone. Speakers, removed from TVs, all tested, 7in. x 4in., 5in., 5/- plus 2/- post or £2 dozen post free. STROUD AUDIO, Paganhill Lane, Stroud, Glos.

MARCONI CANADIAN RECEIVER

NO. 52



Shipping, Amateur & Broadcast. Magnificent 10-valve receiver in three switched wavebands covering 1.75-16 Mc/s. (19-170 metres), plus 3 valve crystal calibrator

employing dual crystal to provide marker check at 10-100-1000 kc/s. One RF and two IF stages. Other refinements: valve, HT, and Signal check meter. Internal 3in. speaker and two H/Phone outputs with switched control. RF-AP Gain, Noise Limiter, Filter, RF, Heterodyne pitch control. Wide and Narrow Bandwidth. Man or AVC on CW & RF. Fast and Slow tuning with lock. Additional OSC Tuning (plus & minus). Power requirements HT 160v. 60mA; LT 12v. 1 1/2 amps. size 15 x 14 x 12in. Fully tested and working. ONLY £8.19.6. Carr. 15/6 or complete with Power supply unit suitable for 115/230v. AC mains and 12v. DC. £12.19.6. Carr. 20/-.

4 VALVE 4 WATT AMPLIFIER

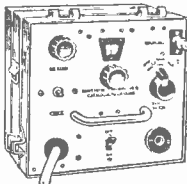
"G" Core transformers. A.C. Mains 110/230 volts. 600 ohms of high impedance input. Output 3 or 600 ohms (set choice). Controls: On/Off switch. Gain control, Indicator light. Valve inspection panel. 19 x 7 x 7in. Brand New in makers cartons. 79/6, Carr. 19/-.

TELESCOPIC AERIAL MASTS. Tubular steel copperplated, spray finish, ring can locking on each section provides for full or any height required. Suitable all fixings and base locations. Bottom section 12in. diameter, 20ft. (4 section) closed 5ft. bin. Weight 16lb. 55/-, Carr. 5/-, 34 ft. (6 section) closed 5ft. bin. Weight 20lb. 75/-, Carr. 5/-.

Further height by adding 34ft. Whips sections 13/6. Carr. 4/-.

Special price for quantities.

WAVEMETER CLASS D



Freq. band 1,900 Kc/s. to 8,000 Kc/s. (154-37.5 metres) in two ranges, 1,900 Kc/s. 4,000 Kc/s. also 4,000 Kc/s. 8,000 Kc/s. Supply 9 v. D.C. input. Complete with twin crystal. As new. PRICE 62/6. P. & P. 5/-.

CREED TELEPRINTERS. 7B Used condition. Price from £15. Carr. 30/-.

MOVING COIL HEADPHONES. (BRAND NEW). Chamois padded, complete with jack plug, 15/6.

Post 2/-, also available with matching moving coil Microphone, 19/6, post 2/-.

B44 MK. III. Dipole and rod aerials 30/- per set. P. & P. 5/-.

Microphone with connecting plug 15/6. P. & P. 2/-.

Battery input and phone plugs, 5/- each. P. & P. 1/6.

All No. 19 set parts available.

Many other bargains! S.A.E. all enquiries.

A. J. THOMPSON

"EILING LODGE"

CODICOTE, HITCHIN, HERTS.

Phone: CODICOTE 242

RECEIVERS & COMPONENTS (continued)

TRANSISTORS, UNMARKED, UNTESTED. 40 for 10/-, p. and p. 1/-, 4 packets post free. Relays, thousands of types, special catalogue free. General catalogue of mechanical and Electrical Gear, Tools, etc., 5,000 items free. K. R. WHISTON (Dept. FRW), New Mills, Stockport.

DIRECT TV REPLACEMENTS LTD., largest stockists of TV Components in the U.K. Line Output Transformers. Frame Output Transformers. Deflector Coils for most makes. Official sole suppliers for many set makers. Same Day Dispatch Service. Terms C.O.D. or C.W.O. Send S.A.E. for quotes. Day and Night Telephone GIPsy Hill 6166, 126 Hamilton Road, West Norwood, S.E.27.

GUARANTEED NEW AND TESTED TRANSISTORS

Money returned if not satisfied

NA 102; NA 103; NA 104; NA 111; NA 112, 1/6 each.
NB 113; OC 169, 2/4d. each.
OC 42; OC 13; OC 44; OC 45; OC 71, 3/- each.
NA 101; NC 121, 4/6 each.
GEP 8, 5/6d. each.
NA 701; NC 141, 6/3 each.
OC 26, 8/- each.
NA 702, 11/- each.
NA 703, 13/6 each.
Red, White or Green Spots, 9d. each.
General purpose diode, 1d. each.
Rectifier GJ 33, 3/- each; BYZ 13, 6/- each.
Send S.A.E. for full Price Lists of transistor components values, etc.

CLEVELEYS ELECTRICAL ENGINEERING COMPANY

Dept. P.W., Bank Chambers, Poulton le Fyde, Lancs

TRANSISTOR PORTABLE TRANSCEIVERS. Model STR64 with 9 transistors each unit (steel cases). Range 5 miles. Superhet crystal controlled on transmit and receive. Half price £15 pair. MAZEL RADIO SERVICE STATION, 124/138 London Road, Manchester 1, Lancs. Phone Ardwick 3505.

TAPE DECKS — B.S.R. 2 track new. boxed £4/10/- carr. paid. Tuning Capacitors. S.W. Midget 50 pf spindle, 2/3 each, 5 for 10/-. Bulgin mains S.W. D.P. on off toggle, S300, 2/3 each, 5 for 10/-. G. A. TAYLOR, 80 Nasmyth St., Denton, Lancs.

SIGNAL GENERATORS. Marconi TP144G, 8 to 25Mc s. £7; also Marconi TP390G, 10 to 150Mc/s. £4. Buyer collects. HARTLEY, 11 Pollard Road, London, N20.

8.F 375V Unused Tag-ended Electrolytics, 11/- per doz. post paid. 2 Colerbrook Avenue, Southampton



V.H.F. Receivers P104 (R1392), 100 to 150 Mc/s. 13 valves, tuning meter. Good condition and complete with conversion instructions. £3.10.0, carriage 15/-.

Wimp Amplifier. Substantial base and eight 4 ft. sections to make any length up to 24 ft., 35/-, carriage paid. 12in. sections, any number fit together for 18 Set, etc., 4d. each. Post 1/- any number.

Ceramic Insulated 3-4 Gang Variables, 56 x 56 x 35P, 3/6, post 1/6.

Canadian Chamois Padded Head and Mike Sets for 19 and 22 Set, etc., 10/-, post 2/6.

Canadian Carbon Mikes with lead and jack, 4/6, post 1/6.

(Carriage charges apply to England and Wales only)

Telephone: Worthing 9097



FOR SALE (continued)

CONDENSER BARGAIN! Miniature Paper Condensers $\frac{1}{2}$ in. x $\frac{1}{2}$ in. Ideal for transistor sets. 0001, 001, 002, 005, 02, 10F, also small 50000F and 2200F Condensers. All 7/6 per 100. 23 per 1,000. G. P. MILWARD, 17 Peel Close, Drayton Bassett, Staffs.

ELECTRIC SOLDERING-IRON



FANTASTIC BARGAIN OFFER

Lightweight Pistol Grip handle 40 watt. 240/250v. A.C. Solid copper bit. Detachable handle forms cover for iron when not in use. With 40F. Safety 3-core flex. Indispensable for every home handyman. A boon to model makers and a necessity for every wireless enthusiast. Offered to you at this new amazing price.

ONLY
9/6
1/-

C. H. SERVICE, (Dept. P.W.3)
Lusted Hall Lane, Tatfield, Kent.

HAMMER FINISH PAINT. The modern finish for electronics. Can be brushed or sprayed. Blue or Silver. 2oz. tins 3/6, post 8d; 1 pint 7/6, post 1/9; 1 pint 15/-, post 2/9. Orders over 30/- post free. Retailers supplied. Write for details. Amazing results! Return of post service. **FINNIGAN SPECIALITY PAINTS (PW)**, Mickley Square, Stocksfield, Northumberland.

TRANSISTORS

1/- each. Red or White Spots.

2/- each. XA101, XA102, XB103, OA90, XA111, XA112, OC430, V10/15.

3/- each. OC44, OC45, OC70, OC71, OC81, OC81D, XA151, XB104, XC101, XC101A, OC169, OC200.

4/- each. AF114, AF115, AF116, AF117, OC170, OC171, XA103, XA116, XB102, XB105, XC121, XU611.

5/- each. OC139, OC140, OC204, ORP60, XA701, XA703, GET7, GET8, GET9, XC141, BY100, OA211.

10/- each. OC19, OC22, OC25, OC26, OC28, OC35, 2S013.

ZENNER DIODES

4.7v. to 30v., $\frac{1}{2}$ w. 3/6, 1.5w. 5/-, 7w. 6/- each.

Plus many more. Send 6d. in stamps for full list and eq. chart.

B. W. CURSONS
78 BROAD STREET
CANTERBURY, KENT

FOR SALE (continued)

COMPONENTS new and used. Bargain prices. S.A.E. list. **CUMMINGS**, 6 Holly Street, Salford 5, Lancs.

WANTED

WE BUY New Valves for cash, large or small quantities, old types or the latest. Send details. Quotations by return. **WAITONS WIRELESS STORES**, 15 Church Street, Wolverhampton.

AMATEUR TRANSMITTER. Working for MCW/CW Shortwave. Write. **CAMPBELL**, 68 South Mains Road, Milngavie, Glasgow. Enclose S.A.E.

WE BUY New Valves and Transistors. Amplifiers, Short-wave Receivers and Components, etc. **A.D.A. MANUFACTURING CO.**, 116 Alfreton Road, Nottingham.

WANTED VALVES ONLY

Must be new and boxed
Payment by return

WILLIAM CARVIS LTD.
103 North Street, Leeds 7

URGENTLY WANTED. new modern Valves, Transistors, Radios, Cameras, Tape Recorders and Tapes, Watches, Tools, any quantity. **S. N. WILLETT**, 16 New Street, West Bromwich, Staffs. Tel. 2392.

A PROMPT CASH OFFER for your surplus brand new Valves and Transistors. **R.H.S.**, Beverley House, Mannville Terrace, Bradford 7.

MISCELLANEOUS

CONVERT ANY TV SET into an Oscilloscope. Instructions and diagrams 12/6. **REDMOND**, 42 Dean Close, Portslade, Sussex.

ELECTRONIC MUSIC?

Then how about making yourself an electric organ? Constructional data available—full circuits, drawings and notes! It has 5 octaves, 2 manuals and pedals with 24 stops—uses 41 valves. With its variable attack you can play Classics and Swing.

Write **NOW** for free leaflet and further details to **C. & S.**, 20 Maude Street, Darlington, Durham. Send 2ld. stamp.

METAL WORK

METAL WORK. All types cabinets, chassis racks, etc., to your specifications. **PHILPOTTS METAL WORKS LTD.**, Chapman St., Loughborough.

CABINETS • CASES CHASSIS

Anything in metal. "One-offs" a pleasure. Send your drawing for quote. Stove enamelled in any professional finish.

MOSS, WATSON

40 Mount Pleasant Street, Oldham
Lancs. MAIN 9400 P.V.

SERVICE SHEETS

SERVICE SHEETS. Radio and Television. 3 6 post paid. **VEST AND EMERY**, 17 Hollgarth St., Durham.

SERVICE SHEETS. Radio, TV. 5,000 models. List 1/- S.A.E. inquiries. **TELRAY**, 11 Maudland Bank, Preston

SERVICE SHEETS for all makes of Radio and TV. 1925-1965. Prices from 1/- with free fault-finding guide. S.A.E. inquiries. Catalogue of 6,000 models 1/6. Valves, modern and obsolete. Radio TV Books. S.A.E. lists. **HAMILTON RADIO**, Western Road, St. Leonards, Sussex.

SERVICE SHEETS, also current and obsolete Valves for sale. **JOHN GILBERT'S TELEVISION**, 1b Shepherd's Bush Road, London, W.12. Phone: SHE 8441.

S.E.S. SERVICE SHEETS for all TV, Radio and Tape Recorders, etc. List 1/6 plus S.A.E. **SUN ELECTRICAL SERVICES**, 38 St. George's Road, Hastings, Sussex.

SERVICE SHEETS (75,000) 4/- each. Callers welcome. Always open. 5 South Street, Oakenshaw, Bradford.

SERVICE SHEETS

4/- ea., plus postage

We have the largest display of Service Sheets for all makes and types of Radios, Televisions, Tape Recorders, etc., in the country. Speedy service.

To obtain the Service Sheet you require, please complete the attached coupon.

From:

Name:

Address:

To: **S.P. DISTRIBUTORS**
44 Old Bond St., London, W.1
Please supply Service Sheets for the following:

Make:

Model No.: Radio/TV

Make:

Model No.: Radio/TV

Make:

Model No.: Radio/TV

I also require list of Service Sheets at 1/6.

(please delete items not applicable)
I enclose remittance of

MAIL ORDERS ONLY Ju PW

SITUATIONS VACANT

RADIO AND TV Exam. and Courses by Britain's finest Home-study School. Coaching for Brit.I.R.E., City and Guilds, Amateur's Licence, R.T.E.B., P.M.G. Cert., etc. FREE brochure from **BRITISH NATIONAL RADIO SCHOOL**, Russell Street, Reading.

TV AND RADIO: A.M.I.E.R.E., City and Guilds, R.T.E.B. Cert., etc., on "No pass—no fee" terms. Over 95% successes. For details of exams and home training courses (including practical apparatus in all branches of radio, TV and electronics) write for 148-page handbook—free, B.I.E.T. (Dept. 242G), 29 Wright's Lane, London, W.8.

A.M.I. Mech.E., A.M.I.E.R.E., City and Guilds, G.C.E., etc., brings high pay and security "No pass—no fee" terms. Over 95% successes. For details of exams and courses in all branches of Engineering, Building, Electronics, etc. write for 148-page handbook—FREE, B.I.E.T. (Dept. 242B), London, W.8.

RADIO TECHNICIAN

A number of suitably qualified candidates will be required for training, leading to permanent and pensionable employment. (Normally at Cheltenham but with opportunities for service abroad or appointment to other U.K. stations.)

Applicants must be 19 or over and be familiar with the use of Test Gear and have had Radio/Electronic workshop experience. They must offer at least "O" level GCE passes in English Language, Maths. and/or Physics, or hold the City and Guilds Telecommunications Technician Intermediate Certificate or equivalent technical qualifications.

Pay according to age, e.g. at 19, £722; at 25, £929 (highest pay on entry) rising by four increments to £1,067.

Prospects of promotion to grades in salary range £997—£1,634.

Annual Leave allowance of 3 weeks 3 days, rising to 4 weeks 2 days.

Normal Civil Service sick leave regulations apply.

Apply:

RECRUITMENT OFFICER (RT 37)
Government Communication Headquarters, Oakley Priors Road
Cheltenham

EDUCATIONAL

RADIO OFFICERS see the world. Seagoing and shore appointments. Our many recent successes provide additional trainee vacancies during 1965. Grants available. Day and boarding students. Stamp for prospectus. **WIRELESS COLLEGE**, Colwyn Bay.

TRAINING

Full-time courses in **RADAR** and **RADIO-TELEGRAPHY** for prospective marine Radio Officers. Govt. approved exam. centre.
Also courses in basic **ELECTRONICS**, **RADIO**, **TELEVISION** and **PRACTICAL SERVICING**.

Apply:—Director, British School of Telegraphy, 30 Penryn Road, Earls Court, London, S.W.5.

EDUCATIONAL

(continued)

THE INCORPORATED PRACTITIONERS IN RADIO AND ELECTRONICS (I.P.R.E.) LTD., Membership Conditions booklet 1/-. Sample copy of I.P.R.E. Official Journal 2/-; pos: free. Secretary, Dept. B, 32 Kidmore Road, Caversham, Reading, Berks.

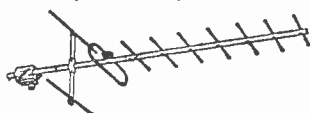
BECOME "TECHNICALLY QUALIFIED" in your spare time. Guaranteed Diploma and Exam. Home-study Courses in Radio, TV Servicing and Maintenance. R.T.E.B. City and Guilds etc. Highly informative 120-page Guide—FREE, **CHAMBERS COLLEGE** (Dept. 363), 148 Holborn, London, E.C.1.

TRAIN FOR SUCCESS WITH ICS

Study at home for a progressive post in Radio, TV and Electronics. Expert tuition for I.E.R.E., City & Guilds (Telecoms and Radio Amateurs') R.T.E.B., etc. Many unique diploma courses incl. Colour TV, Electronics, Telemetry & Computers. Also self-build kit courses—valve and transistor. Write for **FREE prospectus** and find out how **ICS** can help you in your career

IC DEPT. 541, PARKGATE ROAD, LONDON, S.W. 11.

BBC2 (625 LINE) TV AERIALS



Mast Mounting Arrays, 9 element 45/-; wide spaced high gain, 11 element 55/-; 14 element 68/6. Wall Mounting with Cranked Arm, 9 element 60/-; wide spaced high gain, 11 element 67/6; 14 element 75/-. Chimney Arrays Complete, 9 element 72/-; wide spaced high gain, 11 element 80/-; 14 element 87/6. Loft Arrays, 7 element 32/6; wide spaced high gain, 11 element, with Tilting Arm, 62/6; 14 element 70/-. All high gain units have special Multi-rod Reflector. Low loss coaxial cable 1/6 per yard. VHF transistor pre-amps from 75/-

BBC · ITV · F.M. AERIALS



B.B.C. (Band 1), Telescope, loft 21/-. External S/D 30/-.
I.T.V. (Band 3), 3 Element loft array 25/-. 5 element 35/-. Wall mounting, 3 element 35/-. 5 element 45/-.
Combined B.B.C./I.T.V. Loft 1-3, 41/3; 1-5, 48/6; Wall mounting 1-3, 56/3; 1-5, 63/6; Chimney 1-3, 63/6; 1-5, 71/3.
VHF transistor pre-amps from 75/-
F.M. (Band 2), Loft S/D 12/6, "H", 30/-, 3 element, 52/6. External units available Co-ax cable 5d. yd. Co-ax plugs 1/2. Outlet boxes 1/6. Diplexer Crossover Boxes, 12/6, C.W.O. or C.O.D. P. & P. 3/- Send Cd. stamps for illustrated lists

K.V.A. ELECTRONICS (Dept P.W.)
3b Godstone Road, Kenley, Surrey
CRO 2527

HI FI

EQUIPMENT CABINETS
OF DISTINCTION



Imperial

- Illustrated in this advertisement are two fine cabinets from the Lewis Radio Range.
- These Cabinets are just two of a really extensive range.
- Each one carefully made by British Craftsmen and soundly constructed from the best materials available.
- Fill in coupon below to obtain **FREE** catalogue showing this wonderful range of cabinets.



Lowboy

FREE THE NEW LEWIS RADIO CATALOGUE

Designed to assist your choice of Cabinet.

The New Lewis Radio Cabinet Catalogue—the most comprehensive ever prepared. Sent absolutely **FREE!** Please send your **FREE 24 page cabinet catalogue**.

NAME _____

ADDRESS _____

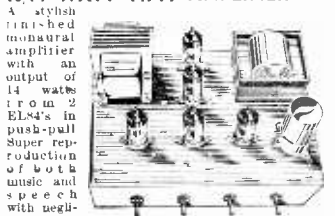
(Dept. P665)

Capitals please

LEWIS radio

100 Chase Side, Southgate, London N.14. Tel: Palmers Green 3733/9666

10.14 WATT HI-FI AMPLIFIER KIT



A stylish finished monaural amplifier with an output of 14 watts from 2 EL84's in push-pull. Super reproduction of both music and speech with negligible hum. Separate inputs for mike and gram, allow records and announcements to follow each other. Fully shielded section wound output transformer to match 3-15Ω speaker and independent volume controls and separate bass and treble controls are provided giving good hit and cut. Valve line-up 2 EL84's, ECC85, EF86 and E250 rectifier. Simple instruction booklet 1/6. (Free with parts).

All parts sold separately. **ONLY £6.19.6** P. & P. Also available ready built and tested complete with standard input sockets. **£8.15.0**. P. & P. 8/6. Carrying Case for above 28/6. P. & P. 7/6.

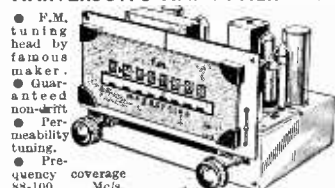
SPECIAL HARVERSON OFFER !!!
BRAND NEW HEAVY DUTY 12in. SPEAKERS.
Response 45 c/s-13 Kc/s. 1 1/2in. voice coil. Available in 3 or 15 ohms. Guaranteed full 15 watts British rating. Heavy cast aluminium frame. These are current production by world famous maker and as they are offered well below list price we are not permitted to disclose the name. **LIMITED NUMBER ONLY. UNREPEATABLE AT 89/6**. P. & P. 5/-. Also 25 watt Guitar Model available at **£5.5.0**.

HIGH GAIN 4-TRANSISTOR PRINTED CIRCUIT AMPLIFIER KIT Type Tai



● Peak output in excess of 1 1/2 watts. ● All standard British components. ● Built on printed circuit panel size 6 x 3in. ● Generous size Driver and Output Transformers. ● Output transformer tapped for 3 ohm and 15 ohm speakers. ● Transistors (5ET114) or 81 Mullard OC81D and matched pair of OC81 or 9 volt operation. ● Everything supplied, wire battery clips, solder, etc. ● Comprehensive, easy to follow instruction and circuit diagram 1/6. (Free with Kit). All parts sold separately.
SPECIAL PRICE 45/-. P. & P. 3/-. Also ready built and tested. **52/8**. P. & P. 3/-. A pair of TAI's are ideal for stereo.

HARVERSON'S F.M. TUNER Mk. I



● F.M. tuning head by famous maker. ● Guaranteed non-drift. ● Perfect tuning. ● Pre-frequency coverage 88-100 Mc/s. ● Balanced diode output. ● Two I.F. stages and discriminator. ● Attractive maroon and gold dial (7 x 3in. glass). ● Self-powered, using a good quality mains transformer and valve rectifier. ● Valves used ECC85, two EF86's and E250 (rectifier). ● Fully drilled chassis. ● Size of completed Tuner 8 x 6 x 5 1/2in. ● All parts sold separately. Set of parts if purchased at one time **£5.19.6**, plus 8/6 P. & P. and ins. Circuit diagram and instructions 1/6 post free. Mark II Version is above but complete with magic eye, front panel and brackets, **£6.12.6**. P. & P. 8/6.
Mark III Version as Mark I but with output stage. (ECC85) and tone control. **£7.7.0**. P. & P. 8/6.
Standard Metal Cabinets. Choice of Black or Green. To fit Mark I, 25/-. P. & P. 2/-. To fit Mark II, 17/6. P. & P. 3/-.
SPECIAL PURCHASE TURRET TUNERS
By famous maker. Brand new and unused. Complete with PC84 and PCF86 valves, 34.88 Mc/s L.F. Biscuits for Channels 1 to 5 and 8 and 9. Circuit diagram supplied. **ONLY 25/-** each. P. & P. 3/9.

GOBLER F.M. TUNER HEAD
89-100 Mc/s M7. Mels. L.F. 15/-, plus 2/- P. & P. (ECC85 valve 8/6 extra).

4-SPEED PLAYER UNIT BARGAINS

All Brand New in Maker's Original Packaging
SINGLE PLAYERS
GARRARD SRP10.....£5.9.11. Carr. 5/6.
B.S.R. G07 with unit mounted pick-up arm. £4.18.8. Carr. 5/6.

AUTO CHANGERS
LATEST B.S.R. UA35 Super slim mono. £6.2.8
B.S.R. UA15 £6.19.6; B.S.K. UA15. £6.19.6
LATEST GARRARD AT5.....£6.8
Standard GARRARD Automatic.....£6.10.0
GARRARD AT8.....£10.10.0. Carr. 6/6 on each.
All the above units are complete with 10mm mono head and sapphire stylus or can be supplied with compatible stereo head for 12/6 extra.

SPECIAL OFFER!
Limited number of
E.M.I. 4-SPEED SINGLE RECORD PLAYER DECKS
with unit mounted pick-up. Incorporating the following special features: Heavy 7 1/2in. metal turntable. Low flutter performance shaded pole motor for 30W/250V A.C. with 90V tap. Latest ultra lightweight pick-up (5 grammes tracking weight). High output mono ceramic cartridge. Autostop. Overall motorplate size. 12 x 10 x 2 1/2in. below and 2in. above.
UNREPEATABLE OFFER AT 89/6
Carr. 5/6

THE NEW HARVERSON KIT FOR THE HOME CONSTRUCTOR

A really excellent A.C. mains 200/240V. **AMPLIFIER KIT TYPE HSL 'FOUR' 3 VALVE, 4 WATT USING ECC83 EL84, E250 VALVES**
Special features include:

● Heavy duty double wound mains transformer with electrostatic screen. ● Separate Bass, Treble and Volume controls, giving fully variable boost and cut with minimum insertion loss. ● Heavy negative feedback loop over 2 stages ensure high output at excellent quality with very low distortion factor. ● Suitable for use with guitar, microphone or record player. ● Provision for remote mounting of controls or direct on chassis. ● All this builds onto a chassis size only 7 1/2in. wide x 4in. deep. Overall height 4 1/2in. ● All components and valves are brand new. ● Very clear and concise instructions enable even the inexperienced amateur to construct with 100% success. ● Supplied complete with valves, output transformer (3 ohms only), screened lead, wire, nuts, bolts, solder etc. (No extras to buy). **79/6** P. & P.

Comprehensive circuit diagram, practical layout and parts list 2/6. (Free with Kits).

QUALITY RECORD PLAYER AMPLIFIER
A top-quality record player amplifier. Size 7 1/2in. w. x 5 1/2in. d. x 5 1/2in. h. This amplifier (which is used in a 20 in. record player) employs heavy duty double wound mains transformer, ECC83, EL84, E250 valves. Separate bass, treble and volume controls. Complete with output transformer matched for 3 ohm speaker. Ready built and tested. **PRICE 69/6** P. & P. 4/9.

ALSO AVAILABLE. Mounted on board with output transformer and 6in. speaker, ready to fit into cabinet below. **PRICE 89/6**. P. & P. 5/9.

QUALITY PORTABLE R/PLAYER CABINET
Tinent motor board. Will take above amplifier and B.S.R. or GARRARD Autostopper or single Record Player Unit. Size 18 x 14 x 5 1/2in.
PRICE £39.6. Carr. 7/6.

LATEST MODEL B.S.R. TU/12 4-SPEED PLAYER AND PICK-UP
ONLY 69/6 Carr. 5/6

7in. metal turntable low flutter performance. 200/250 V. shaded pole motor with 90 V. tap for valve heaters. High gain crystal pick-up used in a 20 in. turntable.
LP175 head complete with sapphire stylus.

HARVERSON SURPLUS CO. LTD

170 HIGH ST., MERTON, S.W.19

CHerrywood 391

Open all day Saturday

Early closing Wed. 1 p.m.

A few minutes from South Wimbledon Tube Station

(Please write clearly)

PLEASE NOTE: P. & P. CHARGES QUOTED APPLY TO U.K. ONLY. P. & P. ON OVERSEAS ORDERS CHARGED EXTRA.

SEND STAMPED ADDRESSED ENVELOPE WITH ALL ENQUIRIES

HARVERSON AMPLIFIER BARGAIN

Special offer of Manufacturers' Surplus
2 VALVE GRAM AMPLIFIERS
Valves UY5 Rectifier and UY1.52 Triode/Pentode giving 31 watts output. Overall chassis size (inc. valves) 5in. high x 5 1/2in. wide x 2in. deep. Each amplifier new and tested and supplied complete with valves, 3 ohm output transformer and knobs for tone and volume on/off controls.
ONLY 37/6 P. & P. 4/-

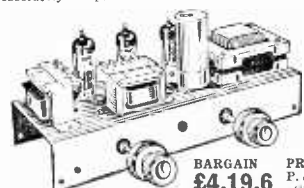
Can be used with 80 V. motor tap or 1.5k. mains dropper 2/6 extra in required. *Owing to the limited number available and the extremely high value we regret we cannot enter into any correspondence.*

NEW CARTRIDGE BARGAINS

ACOS 71.5 single aided crystal cartridge for Stereo and L.P. records. Complete with diamond stylus and universal mounting bracket. List price £2.6.4. Our price 18/6. P. & P. 1/-.
RONETTE STEREO 105 CARTRIDGE. Stereo/LP/7. Complete with two saphires. Original list price 67/6. **OUR PRICE 24/-**. P. & P. 1/-.
GARRARD G02 Mono complete. List price 24/11. **OUR PRICE 12/6**. P. & P. 1/-.

STEREO AMPLIFIERS

Incorporating 2 EL84's and 1 E250 heavy duty double wound mains transformer. Output 4 watts per channel. Full tone and volume controls. Absolutely complete.



BARGAIN PRICE £4.19.6 P. & P. 1/6
SUPER DE LUXE version of above incorporating EL84 valves, separate bass and treble controls and full negative feedback. 8 rms. P. & P. 6/6.

6 TRANSISTOR AND DIODE SUPERHET

A first-class 2 waveband transistor superhet. ● Printed circuit panel (size 8 1/2 x 2 1/2in.). ● 3 pre-aligned I.F. transformers. ● High-gain Ferrite Rod Aerial. ● All First-grade transistors. ● Car aerial winding. ● Push-pull output. ● All parts supplied with simple instructions. All parts sold separately. Set of parts if purchased at one time. **ONLY £45.0.0** P. & P. 2/6. Circuit diagram 2/- (free with set of parts).

35 OHM SPEAKERS!

Suitable for use with above. 2in. Goodmans. Ideal replacement for most pocket portables, 8/6, 3/6. 12/6; 6in., 17/6; 7 x 4in., 21/-; P. & P. 2/- per speaker.

Portable CABINET

Size approx. 9 1/2 x 9 1/2 x 3 1/2in. Suitable for above using 3 1/2in. speaker, 25/-; P. & P. 2/6.

COIL AND TRANSFORMER SET FOR TRANSISTOR SUPERHET

3 I.F. transformers, one oscillator coil, one driver transformer and wound Ferrite aerial (med., long and car aerial coupling). 32/6 complete, post 2/-. 6 transistor printed circuit board to match. 8/6. Post 1/-. Circuit diagram 1/6 extra.

SPECIAL BRAND NEW TRANSISTOR BARGAINS

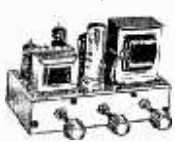
GET 15 (Matched Pair) 15/-; V15/10p. 10/-; OCT1 5/-; OCT6 6/-; AF17 12/6; ORP12 10/6. Set of Mullard 6 transistors, OC44, 2—OC45, OC81D matched pair, OC81, 25/-.

EDISWAN MAZDA

PXA101 6/8; XA103 6/6.
K.F.1. Pack: 1—PXA102 Mixer; 2—PXA101 I.F. Amp. (Equiv. OC44 and OC45). 10/6
R.F. 2 Pack: 2—PXA101 I.F. 1—PXA102 Osc.; 1—PXA102 Mixer. 12/6
L.P. Pack: Consisting of PXA113 Driver, Matched pair PXA121, mounted complete with heat sinks (Equiv. OC81D and OC82). 12/6
ALL TRANSISTORS POST FREE.

SEE
RIGHT
HAND
PAGE
FOR
MORE
ITEMS

3-VALVE AUDIO AMPLIFIER MODEL HA34



Designed for Hi-Fi reproduction of records A.C. Mains operation. Ready built on plated heavy gauge metal chassis size 7 1/2 in. w. x 4 in. d. x 4 1/2 in. h. Incorporates ECC83, EL84, E286 valves. heavy duty double-10/- each, P. & P. 16 (3 or more post free). Special quotations for quantity.

wound mains transformer and output transformer matched for 3 ohm speaker, separate Bass, Treble and volume controls. Negative feedback line. Output 4 1/2 watts. Front panel can be detached and leads extended for remote mounting of controls. The HA34 has been specially designed for us and our quantity order enables us to offer them complete with knobs, valves, P. & P. etc. wired and tested for only 6/-

BRAND NEW 3 OHM LOUDSPEAKERS

6in., 12/6; 6 1/2in., 18/-; 8in., 21/-; 10in., 25/-; 12in., 27/6; (12in. 15 ohm, 30/-); 10in. x 6in., 28/-; Latest type E.M.I. 134 x 8in. with high flux ceramic magnet, 11,000 gauss. Aluminium centre cone. 10 watts, 60 ohms to 10 Kc/s., 42/-; 15 ohm 45/-; P. & P. 6in. 2/-; 8in. 2/6; 10in. 2/6 and 12in. 3/6 per speaker

TAPE DECKS

COLLARO STUDIO DECK. 3 motors, 3 speeds, push button control. Up to 7in. spools. £10.10.0. P. & P. 7/6.

B.L.R. MONARDECK. Single speed, 3 1/2in. per sec., simple control. Up to 7in. spools. £8.15.0 plus 7/6 carr. and ins. Tapes extra on both.

BARGAIN OFFER CORNER

PRECISION 6 MINUTE DELAY ACTION SWITCH. Clockwork actuated. Made by Smitha. Separate switching actions at intervals up to 6 mins. Each switch action designed for current loading up to 15 amps at 250 volts. Suitable for photographic timer, sequence switching operations, etc. etc. Brand new and unused units offered at a fraction of their true value. OUR PRICE 10/- 10/- each, P. & P. 1/6 (3 or more post free). Special quotations for quantity.

MAINS OPERATED WATER COCK. A solenoid actuated flow control valve. 200/250V. 50 c/a. A.C. operation. Operating solenoid is isolated by rubber diaphragm from valve mechanism which is contained in heavy cast brass base. 1 1/2 in. O.D. plain tube outlet, 1/2 in. inlet bore fitted with filter. As used in automatic washing machines and ideal for any application where remote flow control of fluid is required. Brand New. Approx. size 3 1/2 x 1 1/2 x 3 1/2 in. High. 12/6 each. P. & P. 1/6 (3 or more post free).

HEAVY DUTY NON INDUCTIVE D/P MICRO SWITCH. Conservatively rated 10 amps at 250V. Standard one-hole fixing. Body size 1 1/2 x 1 1/2 in. deep, inc. terminals. 3/- each. P. & P. 1/6 (3 or more post free).

KOLA CELESTION. Approx. 9 x 1 1/2 in. 3 ohm Middle register speaker. 10/6. P. & P. 3/-.

VYNAIR AND KEXINE SPEAKER AND CABINET FABRIC. Approx. 34in. wide. Usually 35/- yard. OUR PRICE 18/6 per yard length. P. & P. 2/6 (min. one yd.) S.A.E. for samples.

ACOS CRYSTAL MIKES. High imp. For desk or hand use. High sensitivity. 18/6. P. & P. 1/6.

TEL CRYSTAL STICK MIKE. Listed at 45/-. Our price 18/6. P. & P. 1/6.

T.C.C. SUPPRESSOR CONDENSERS. 250V. A.C. .005 + .005 x .1. In tubular can 1 1/2 in. long x 1 1/2 in. dia. 2 for 3/-. Post Free.

TRANSISTOR DRIVER AND O/P TRANSFORMERS. (Tapped 2 ohm and 15 ohms output). Plus 4 suitable Transformers giving approx. 1 watt output. 25/-; P. & P. 2/6.

CONDENSERS. 5,000 mFd. 12V. wkg. Size 3 x 1 1/2 in. dia. 2/- each. P. & P. 6d. each.

5 BAND .0005 TUNING CONDENSERS. 2 1/2 in. h. x 2 1/2 in. d. x 1 1/2 in. w. with built-in trimmer. 4/6. P. & P. 2/-.

MATCHED PAIR OF 24 WATT TRANSISTOR DRIVER AND OUTPUT TRANSFORMERS. Stock size 1 1/2 x 1 1/2 in. Output trans. tapped for 5 and 15 ohm output. 12/- pair. P. & P. 2/6.

BRAND NEW PLESSEY 12V. 4 pin. non-synch. vibrators. Type 12 1-SD. ONLY 8/6. P. & P. 1/6 each.

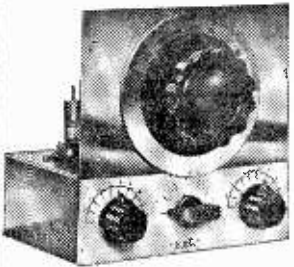
TWIN TELESCOPIC AERIAL. Comprising two 3-section heavily chromed rods. Closed 12in. each extending to 32in. each. Completely adjustable from vertical to horizontal. Supplied complete with universal mounting bracket, coax lead and plug. Suitable for F.M. or T.V. 12/6. P. & P. 2/-.

4-WAY NON-TANGLE TELEPHONE CABLE. Latest spring back coil type. Extends 12in. to 5ft. complete with rubber bushes. 4/6 each. P. & P. 1/6.

Harverson Surplus Co. Ltd.

FAMOUS FOR THIRTY YEARS for
SHORT-WAVE EQUIPMENT OF QUALITY

H.A.C. SHORT-WAVE KITS



H.A.C. were the original suppliers of Short-Wave Receiver Kits for the amateur constructor. Over 10,000 satisfied customers—including Technical Colleges, Hospitals, Public Schools, R.A.F., Army, Home, etc.

IMPROVED 1965 RANGE

1-Valve model "CX", complete kit, Price 34/6 Customers say: "Definitely the best one-valve S.W. kit available at any price." This kit contains all genuine Short-Wave components, a drilled chassis, accessories and full instructions. Ready to assemble and, of course, as all our products fully guaranteed. FULL RANGE of other kits still available including the famous model "X" price 77/-. Before ordering call and inspect a demonstration receiver or send for a descriptive catalogue and order form to—

"H.A.C." SHORT-WAVE PRODUCTS
(Dept. T.H.). 44 Old Bond St., London W.1

NEW VALVES!

Guaranteed Set Tested
24-HOUR SERVICE

1R5, 1S5, 1T4, 3S4, 3V4, DAF91, DF91, DK91.					
DL92, DL94, SET OF 4, 14/-					
DAF96, DF96, DK96, DL96, SET OF 4, 23/6.					
1R5 4/3	EB41 8/3	PCL84 7/8			
1S5 4/3	EBP80 5/9	PL36 8/8			
1T4 2/3	EBP88 5/11	PL81 8/6			
3S4 4/3	ECC81 3/6	PL82 5/11			
3V4 5/6	ECC82 4/6	PL83 5/11			
7K7G 1/3	ECC83 5/3	PL84 6/3			
6K8G 3/3	ECC84 6/3	PY32 8/6			
6G7G 4/3	EC85 8/-	PY33 8/6			
6SL7GT 4/6	EC86 5/6	PY80 4/6			
6V6G 3/6	FCP82 7/-	PY81 5/3			
12K8GT 8/6	ECH35 5/9	PY82 4/11			
20P4 13/3	ECH42 7/9	PY83 5/6			
20P5 11/6	ECH81 6/3	PY800 5/11			
30PL1 9/6	ECL80 5/11	U25 8/-			
30L15 10/3	ECL82 7/6	U26 8/6			
30PL13 10/6	ECL86 8/-	U191 9/6			
35L6GT 6/-	EF39 3/6	U301 11/-			
85A2 5/9	EF41 5/9	U801 15/-			
CL33 8/6	EF80 7/3	UABC80 5/-			
2AC32 7/6	EF83 3/6	UAF42 6/11			
DAF91 3/3	EF86 7/3	UBC41 6/-			
DAF96 5/11	EF89 4/3	UBF80 5/6			
DF33 7/6	EL41 7/-	UBF89 6/6			
DF81 2/3	EL84 4/9	UCC94 7/11			
DF86 5/11	EV31 5/6	UCC95 6/6			
DK32 7/6	FY86 5/6	UCF90 8/3			
DK91 4/3	EZ40 6/6	UCH42 6/9			
DK92 8/-	EZ80 3/9	UCH81 6/9			
DLK6 6/3	EZ81 4/3	UCL82 7/3			
DL33 6/9	ET41 6/3	UCL83 8/9			
DL35 5/1	PCB84 6/6	UCL84 6/3			
DL92 4/3	PCB89 8/6	UF89 5/9			
DL94 5/6	PCF80 6/9	UL41 7/-			
DL96 5/11	PCF82 6/-	UL84 5/9			
DY88 8/6	PCF85 3/-	UY41 3/11			
DY87 7/6	PCL82 6/11	UY85 4/11			
EBC80 5/9	PCL83 8/11	X79 20/6			

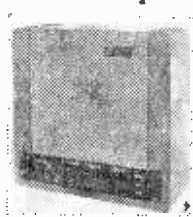
Postage on 1 valve 9d. extra. On 2 valves or more, postage 6d. per valve extra. Any parcel insured against damage in transit 6d. extra.

Office address, no callers.

GERALD BERNARD

83 OSBALDESTON ROAD,
STOKE NEWINGTON,
LONDON, N.16.

AMPLIFIERS AND SPEAKERS NORTH COURT "FIVE" AMPLIFIER



Suitable for guitars, grams and radios. The 5 watt output amplifier incorporates separate volume, treble and bass controls. Two jack socket inputs are fitted. Twin speakers give exceptionally realistic reproduction and are built into an attractive cabinet. Size: Length 11 1/2 in. Height 1 1/2 in. Depth 5 1/2 in. Finished in mottled grey with the front covered in VYNAIR. Mains Voltage 200/250, 50 K/c. Ideal for home use with any guitar. Retail £9.17.6.

Depth 5 1/2 in. Finished in mottled grey with the front covered in VYNAIR. Mains Voltage 200/250, 50 K/c. Ideal for home use with any guitar. Retail £9.17.6.

EXTENSION SPEAKER

Suitable for radio and Record Players. Size: Length 10in. Height 7in. Depth 5in. Fitted in wood cabinet. Attractively finished in mottled grey with speaker front covered in VYNAIR. Price 29/9 Retail. As above fitted with volume control. 35/9 Retail.



Price 29/9 Retail. As above fitted with volume control. 35/9 Retail.

TWIN EXTENSION SPEAKER

Suitable for all radio and record players (incorporating two speakers 6 x 4in.). Size: Length 12in. Height 7 1/2 in. Depth 5 1/2 in. Fitted in wood cabinet. Attractively finished in mottled grey with speaker front covered in VYNAIR. Price 39/6 Retail. As above fitted with volume control. 43/6 Retail.

FULLY SHROUDED UPRIGHT TRANSFORMERS

350-0-350 100mA 6.3V. 4A C.T. 0-5V. at 3 amp. 29/6 Retail.
300-0-300 100mA 6.3V. 4A C.T. 0-5V. at 3 amp. 29/6 Retail.
250-0-250 100mA 6.3V. 4A C.T. 0-5V. at 3 amp. 29/6 Retail.

All products guaranteed 12 months. Trade supplied. For name of nearest stockist and full accessory brochure, write to:

NORTHCOURT (Electrical Bldg.) LIMITED

Transformer and Coil Manufacturers
Dept. P.W. SOUTH PARK MILLS'
PUDESBY YORKS.

HIGH STABILITY RESISTORS

1% 10W. 2/- each. Full standard range 10W to 10 MΩ plus many special values required for multimeters etc.

PRECISION WIREWOUND RESISTORS
1 Watt. 1 Ω to 5K 1% 3/-; to 20K 4/3. 1% add 3d. Your value wound to order.

WHEATSTONE BRIDGE KIT

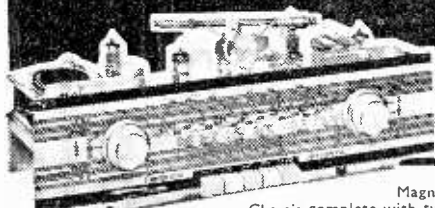
Set of 18 precision wirewound 1% resistors and 18 switches to make accurate bridge for measurement of resistance from 1 ohm to 1.1 MΩ. The variable arm is from 0 to 11,100 ohms in 10 ohm steps, multiplying and dividing ratios x1, x10, and x100. (Unknown can be read to three figures and 1% accuracy) With circuit and instructions. 67/6 post free.

THREE DECADE RESISTANCE KIT
The variable arm from the above kit, 12 x 1% resistors and 12 switches, with circuit, 45/6 post free.

Multimeters. Leaflet on request. EP10K. 10,000 o.p.v. 67/6, post 2/-; EP30K. 30,000 o.p.v. 101/-, post 3/-; EP50K. 50,000 o.p.v. 141/-, post 3/-.

Avo Multimeter Mk. 4 model. £9.10.0 post free.
PLANET INSTRUMENT CO.
35(W) DOMINION AVENUE, LEEDS 7

SENSATIONAL HALF PRICE OFFER!



THE FAMOUS
'Continental'
RADIOGRAM
AT
HALF PRICE!

Magnificent Stereophonic Radiogram
Chassis complete with two 10in. elliptical loudspeakers.
Plus a Mono Stereophonic 4-speed automatic record changer

- Easily fitted
- No soldering or technical knowledge necessary
- Fits almost any cabinet with minimum trouble
- Built-in ferrite rod aerial
- Piano key switching
- Luxembourg and Caroline received at full strength
- Listen to U.S.A., Russia, Africa Canada and even Australia
- Unique Lewis Radio 365 day guarantee, even on all the valves
- All British make

SPECIAL terms available of £3 deposit followed by 18 monthly payments of £1.14.6 (Total H.P. payments £34.1.0) post and packing 15/- extra.

INDIVIDUAL CABINETS SUPPLIED ON REQUEST

To avoid disappointment send cheque or P.O. for £3.15.0 immediately.

LEWIS radio

LEWIS RADIO (P.W.65) 100 Chase Side, Southgate, London, N.14. Telephone: PAL 3733/9666

RADIO CLEARANCE LTD.

27 TOTTENHAM COURT ROAD, LONDON W.1. Telephone: MUSEUM 9188

Trade enquiries invited. The oldest component specialists in the trade. Est. 35 yrs.

LOUDSPEAKER BARGAINS STILL AVAILABLE

Enormous purchases of Brand New and Guaranteed Plessey loudspeakers enable us to offer these units at **THE LOWEST PRICES EVER!** Don't miss this golden opportunity to obtain a first-grade permanent-magnet LOUDSPEAKER off the production line at **LESS THAN THE MANUFACTURER'S COST!** Read carefully the prepared list below and choose just the right speaker for the job—**COMPARE THE PRICES ANYWHERE! SELLING FAST—STOCKS CHANGING RAPIDLY!**

SCHEDULE OF LOUDSPEAKERS AVAILABLE

Diameter in inches	Gauss in lines	Imped. in ohms	Price	Diameter in inches	Gauss in lines	Imped. in ohms	Price	Diameter in inches	Gauss in lines	Imped. in ohms	Price
2	7000	80	8/-	3½	9500	3	10/6	4	9500	25	11/6
2½	7000	35	8/8	3½	9500	8	10/6	5	6000	3	8/-
2½	7000	50	8/8	3½	7000	35	8/8	5	7000	3	8/8
2½	7000	80	8/-	3½	9500	50	10/6	5	7500	3	9/-
3	8500	3	10/-	4	7000	25	11/6	5	8500	3	9/6
3	6000	5	8/6	4	6000	35	10/6	5	9500	3	10/6
3	7000	5	9/-	4	7000	50	11/-	5	9500	15	12/6
3	7000	35	9/-	4	7500	5	9/6	5	8500	25	10/6
3	6500	80	8/6	4	9000	50	11/6	5	9500	35	11/6
3½	6000	15	10/-	4	9500	15	11/6	6½	6000	3	11/-
3½	7000	3	8/6	4	9500	15	12/-	8	6000	15	13/6
Elliptical				Elliptical				Elliptical			
Size	Gauss in lines	Imped. in ohms	Price	Size	Gauss in lines	Imped. in ohms	Price	Size	Gauss in lines	Imped. in ohms	Price
5 x 3	6000	3	7/6	6 x 4	7000	3	9/-	7 x 4	9500	3	11/-
5 x 3	9000	35	12/-	6 x 4	8500	3	9/6	8 x 2½	6000	3	8/6
5 x 3	7000	3	8/-	6 x 4	9500	3	10/-	8 x 2½	7000	5	9/-
5 x 3	9000	3	8/6	6 x 4	9500	35	12/-	8 x 2½	9500	3	10/-
5 x 3	9500	3	9/-	7 x 3½	7000	3	9/6	8 x 6	8500	3	11/-
6 x 4	6000	3	8/6	7 x 3½	9500	3	10/6	8 x 6	8500	15	13/6

ALLOW 2/- each Speaker for postage and packing and handling charge and please specify the exact requirements—the nearest available will be sent.

SELECTED BARGAINS

Beautifully geared AM/FM 2 gang Condensers, 4/6; AM/FM IFT's 465 kc/s and 10.7 Mc/s 4/6 pair; Magnavox Crystal Tape Recorder Mikes, 12/6; 3 watt Stereo Amplifiers, complete, ready to switch on, 79/6; Sentercell rectifiers R3/2D-D3-2-1-Y, 2/6 each. DIODES—OA79, OA90, CG-46H, GD10, 2/- each. TRANSISTORS: OC45 4/6, PNA101, 5/6, AF115, 4/6, Sub. min. Germanium diode 1/3. M1 diode 6d. each. Silicone diodes, 200 p.i.v. 200 mA. 1/- each, 400 p.i.v. 330mA. 2/6 each please send STAMPED and ADDRESSED envelope with any enquiry. We regret no catalogue—our stocks move too quickly! Kindly make provision for additional postage and package charge to avoid delay. Terms: Cash With Order or C.O.D. on Orders over 10/-.

TEST METERS



20,000 O.P.V. MODEL TP 55. Reads voltage up to 1,000 D.C. at 20,000 ohms per volt and A.C. at 10,000 O.P.V.; D.C. Current to 300mA; Resistance to 10 Megs.; Capacitance to 0.1 µF; Decibels from -20 to +36; Size 3½" x 5½" x 1½". £3.19.6.

2,000 O.P.V. MODEL TP 10. Reads A.C. and D.C. Volt. up to 1,000; D.C. Current to 500mA; Resistance to 1 Meg; Capacitance to 1 µF; Decibels from -20 to +36; Output jack for Audio Measurements. Size 3½" x 5" x 1¼". £3.19.6.

30,000 OHMS PER VOLT MODEL 500. Reads voltages up to 1,000 D.C. at 30,000 ohms per volt and A.C. at 15,000 O.P.V.; D.C. current to 12 amps. Resistance to 50 Megs.; Decibels from -20 to +56; Incorporates internal buzzer for audible warning of direct shorts and blocking condenser for A.F. output measurements. Size 3½" x 6½" x 2¼". £8.19.6.

TRANSISTORISED TEST EQUIPMENT. Fully guaranteed, brand new. By NOMBREX: 150 Kc/s—350 Mc/s. Signal Generator, £9.10.0. Resistance-Capacitance Bridge, £5.5.0. 1.5 volt D.C. Power Supply, £6.10.0. Audio Generator 10/100,000 c/s. £16.15.0. Inductance Bridge, £18.0.0.

By T.M.K. INSULATION TESTER. Measures up to 500 megohms at 3 testing voltages, 100, 250 and 500, supplied with leather case and leads, £17.10.0. Illustrated details on any of the above sent on request.

LINEAR AMPLIFIERS. LG34, 4 watts, size 8½ x 4½ x 2½in. high, £5.5.0. L45A 5 watts, size 7 x 7 x 5in. high, £5.19.6. Protective cover, 12/8. L5155 5 watts stereophonic, size 10½ x 8 x 5in. £12.12.0. Cover with carrying handles, 25/- "Diatonic" 10 watts Hi-Fi Ultra Linear Push-Pull size 9 x 7 x 6½in. high, £12.12.0. Cover with carrying handles, 19/8. L1110 10 watts Hi-Fi Ultra Linear size 9 x 7 x 5in. high, £13.13.0. Cover with carrying handles, 19/8. "Conchord" 30 watts Hi-Fi Ultra Linear size 12½ x 9 x 7½in. high, £16.16.0. Cover with carrying handles, 25/- L50 50 watts Hi-Fi Ultra Linear, size 14 x 10 x 5in. high, £23.2.0. Cover with carrying handles, 32/8. All amplifiers for normal A.C. mains, and ex stock. Details on request.

"Tripletone" Convertible Amplifier. Size 10 x 3 x 4½in. high, 4 watts output matched for 2-8 ohms. OR 2 amplifiers can be coupled together for STEREO, £8.18.6 each.

"Tripletone" F.M. Tuner, size 11 x 6 x 3in. high. Coverage 86-104 Mc/s. £13.19.6 (unpowered), or £15.14.6 (self-powered). Details on request.

MICROPHONES. Crystal Types. Guitar 12/6. Desk, with built-in stand 15/-. Acous 39/1 stick. and Table stand 32/6. Super stick, with heavy Desk stand 59/6. Moving Coil Type. Stick, with heavy Desk stand 59/6. "Shimline" stick, 50K impedance, with switch 75/-. Omni-directional chrome plated die-cast frame, 50K, with switch 99/6.

ADJUSTABLE MIKE STANDS. With heavy bases and plated stems. Table type 29/6, floor type 55/-

HARRIS ELECTRONICS (London) LTD.

138 GRAY'S INN ROAD,
LONDON, W.C.1

Telephone: TR 6910x 7957

Please include carriage cost on ALL items.
Trading hours 9 a.m. - 6 p.m. Monday - Friday.
Closed Saturday. We are 2 mins. from High Holborn (Chancery Lane Station) and 5 mins. by bus from King's Cross.

VEROBOARD

The perforated Copper Board for Modern Circuitry

.15 x .15 pitch	3/-	3.75 x 3.75	3/8
2.5 x 3.75	3/8	Spot face cutter	9/-
3.75 x 5	5/-		
Special Verobolts, Pkts. 200			14/-
P. & P. on all items 1/-			

TRANSISTORISED MORSE OSCILLATOR

Fitted 2 1/2in. Moving Coil Speaker. Uses type P13 or equiv. 4v. battery. Complete with latest design Morse Key, 22/6, plus 1/6 P. & P.

TRANSISTORS—1st Grade only, no seconds, no rejects, no surplus.

OC28	17/-	OC77	9/-	GET105	10/-
OC29*	18/-	OC81*	8/-	GET573	12/6
OC41	7/-	OC83*	6/-	ZN706A	17/6
OC44	6/8	OC139	12/-	ZN458	20/-
OC45*	5/-	OC140	18/-	S8345	7/6
OC71	5/-	OC171	10/6	AC107	14/6
OC72*	7/-	OC200	10/6	AF114	11/-
OC73	6/-	OC201	21/-	AF115	10/6
OC75	7/-	OC203	14/-	AF118	10/-
OC76	6/-	GET104	6/-	AF117	9/6

Available in matched pairs

SIEMENS SEALED IN RELAYS

H96A, 2.2 ohm + 2.2 ohm, new	12/6
H96B, 50 ohm + 50 ohm, new	12/6
H96C, 145 ohm + 145 ohm, new	12/6
H96D, 500 ohm + 500 ohm, new	12/6
H96E, 1700 ohm + 1700 ohm, ex-equip.	16/6

BUILT AN EFFICIENT STROBE UNIT FOR ONLY 37/6

This wonderful device enables you to "freeze" motion and examine moving parts as stationary. We supply a simple circuit diagram and all electrical parts including the N-SP2 Strobe tube which will enable you to easily and quickly construct a unit for infinite variety of speeds. From 1 flash in several seconds to several thousands per minute. New modified circuits bring price down to 37/6 plus 3/- P. & P.

NEW 1/2 AMP FULL RANGE

Variable Voltage Transformer

Input 230v. A.C. Output continuously variable from 0-280v. at 1 amp. Open type as illustrated, £3.3.0., inc. post. 1 amp type fully shrouded £4.10.0. Also available, 2.5, 4, 5, 8, 10, 12, 20, 37.5 and 50 amp. Write for details.

LIGHT SENSITIVE SWITCH
Kit of parts, including ORP .12 Cadmium Sulphide Photocell, Relay Transistor and Circuit, etc., price 25/- plus 2/6 P. & P. ORP .12 including circuit, 10/6 each, plus 1/- P. & P.

D.C. AMMETERS

0-20 amp. D.C. M-Coil 2 1/2in. round 12/6
0-5 amp. D.C. M.L. 2 1/2in. round 11/6
0-500 Microamp. 50-min. lin. dia. Scaled 0-1 millamp. 21/-

Postage extra

All Mail Orders, Also Callers at: 4-49 High St., Kingston-on-Thames
Telephone: Kingston 9450 Closed Saturday

ULTRA VIOLET BULBS

Easy to use source of UV for dozens of practical and experimental uses.
12 volt 36 watt AC/DC SBC 6/6, P. & P. 1/-
12 volt 60 watt AC/DC SBC 8/6, P. & P. 1/-
Transformer to suit the above: Input 200-240 A.C. Output 12 Volt A.C. 36 watt, 16/6, P. & P. 2/6. Input 200-240 A.C. Output 12 volt A.C. 60 watt, 22/6, P. & P. 3/6.

Set of four colours **FLUORESCENT PAINT**. Orange, Yellow, Green and Red, in 4oz. tins. Ideal for use with the above Ultra Violet Bulbs. 9/6, P. & P. 1/6.

VAN DE GRAAF ELECTRO-STATIC GENERATOR

Fitted with Motor drive for 230v. A.C. giving a potential of approx. 50,000 volts. Supplied absolutely complete, including accessories for carrying out a number of interesting experiments, and full instructions. This instrument is completely safe, and ideally suited for School demonstrations. Price £8.6.0. plus 4/- P. & P.

A.C. VOLTMETERS

0-200v. A.C. Rect. M-Coil 3 1/2in. type W23	45/-
0-300v. A.C. M.L. 2 1/2in. F.L.	22/6
0-300v. A.C. Rect. M-Coil 2 1/2in.	29/-
0-300v. A.C. Rect. M-Coil 3 1/2in. type W23	55/-

A.C. AMMETERS

1-1, 0-5, 0-10, 0-15, 0-30 amp. F.R. 2 1/2in. dia. All at 21/- each.

SERVICE TRADING CO

PADGETTS RADIO STORES

OLD TOWN HALL
LIVERSEDGE, YORKS.

Telephone: Cleckheaton 2666

Bush 12in. TV-24C 13 channel. Tested with good tube, only wants cleaning. 75/- carriage 10/-.

14in. 13 Channel. Untested TV sets, 30/- carriage 10/- Well packed but sent out at owner's risk.

Special Offer. Brand new rebuilt TV Tubes, 12 months guarantee (not seconds). MW36/24/44, 37/6, carriage 10/- Also MW36/55, £3.5.0. Carriage 10/-.

Single Phase 240 volt 1500 r.p.m. 1-h.p. motor with pulley, 26/-, less pulley 24/-, fully guaranteed, ex. washing machine. Carriage 8/6.

One Sixth H.P. Motor, 240 volts, 15/-, post 6/9.

EX EQUIPMENT 3 months' guarantee

EL91	1/8	20P4	8/6	PZ30	5/-
EL80	2/-	U801	8/6	PC184	4/-
EC282	3/-	U281	5/-	PC142	5/-
EL51	2/6	U282	5/-	PC185	5/-
EX86	5/-	U329	5/-	PL36	5/-
EBF80	4/6	KT36	5/-	12AT7	3/-
EB91	6/6	8V6GT	4/-	6CH6	1/6
EL38	5/-	6B3	1/8	R18	3/6
EP91	6/6	6K25	5/-	ARP12	1/6
6F1	1/-	6P25	3/6	807	5/-
6F14	5/-	6U4	5/-	EF50	1/-
6F15	5/-	PY33	8/-	Doz.	8/-
10C2	5/-	PY80	3/-	EF80	1/6
10P1	1/-	PY81	3/-	Doz.	10/-
10P13	5/-	PL81	4/-	6K7	1/3
10P14	5/-	PL82	3/-	Doz.	10/-
20D1	2/-	PL83	3/-	6V6	1/9
20L1	5/-	PL38	3/-	Doz.	10/-
20P3	4/-	PY82	3/-	6K8	1/9
20P1	4/-	PCF80	4/-	Doz.	18/-
				U25	5/-

Bush 9in. TV Set, BBC Only. Untested but complete, 21/-, carriage 10/-.

Just the Job for a Scope. Tested with good tube, 55/- BBC-ITV. All channels, 75/- carriage 10/- Well packed but sent at owner's risk.

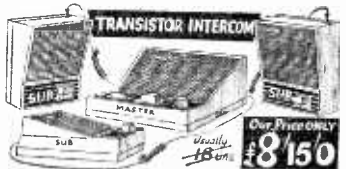
Spare Tubes, 100%, 17/-, carriage 7/6.

PAI Speakers, ex TV sets. All perfect. Rola, 6 x 4, 3/-, post 2/-; six for 20/-, post free.

Goodmans, 7 x 4, 5/-, post 2/-; six for 32/-, post paid.

Phillips, G.E.C., Plessey, 6in. and 5in. round, 3/-, post 2/-.

Reclaimed TV Tubes, Six Months' Guarantee. Mullard MW 43/80, £9/-; Mullard MW 43/89, 30/-; Mazda CRM 172, 30/-; Mazda CRM 142, 17/- Carriage 10/- New 12in. Speakers with built-in tweeter, 28/6, post paid.



Solve your communication problems with this 4-STATION TRANSTOR INTERCOM (ONE MASTER and Three SUBS) housed in attractive plastic cabinets for desk or wall mounting. Four-way calling, talking and listening from MASTER to SUBS and SUBS to MASTER. Buzzing system operates to call even when switched off, thus saves battery. Operates on single 9V PP3 battery which lasts months. On/off switch. Volume control. 2 1/2in. dynamic speaker. Ideally suitable for Office, Shop, Warehouse, Workshop and Home. Hundreds of uses. Complete with 3 pcs. of cord (each 66 ft.) 45 stadies, one roll of tape and a battery. Ready to operate. P. & P. 4/6.

WEST LONDON DIRECT SUPPLIES (PW/11)

6 CHIGNELL PLACE, WEST EALING, LONDON, W.13.

"GLOBE-KING"

Amateur Short-Wave Radio

For over twenty years the famous in comparable "Globe-King" single-valve kits have been used by enthusiasts in almost every country in the world where low cost but high precision standard equipment was essential and demanded. We now take pleasure in announcing the new transistor version, model TR2—just two transistors giving a tremendous performance. Send s.a.e. today for interesting free literature on this and other equipment. Overseas enthusiasts, note we despatch to all parts of the world via International Postal Services.

JOHNSON (RADIO)

St. Martins Gate, WORCESTER

on your OWN TRANSISTOR RADIO with a

Dewtron Wave Trap

Pat. App. for

- * Boosts distant and "faded" stations.
- * Reduces "tailing" * Use in car with your portable and you need no aerial!
- * Absolutely no connections to anything: just place special lead near radio. * Work with any transistor portable, with or without aerial socket.
- * Uses standard-type transistor battery (PP3) which lasts for months. Completely self-contained in attractive red/grey plastic case with gold trim. Price 99/6 complete with battery. P. & P. 2/- extra.

Money-back guarantee

Obtainable C.W.O. from:— D.F.W. Ltd. Dept. "PW" Ringwood Road, Ferndown, Dorset

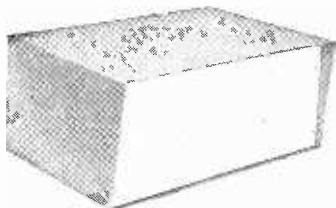
A.R.R.L. RADIO AMATEURS HANDBOOK 1965

New Edition 40/- Postage 2/6.

Transistor Substitution Handbook American, Jap. etc. 12/6. P. & P. 1/-
Troubleshooting with the Oscilloscope by Middleton, 20/-, P. & P. 1/-
A.B.C.'s of Hi-Fi and Stereo by Fantel, 18/-, P. & P. 1/-
Transistor Transmitters for the Amateur by Stoner, 21/-, P. & P. 1/-
Solar Cell and Photocell Experimenters' Guide by Robertman, 24/-, P. & P. 1/-
Amateur Radio Call Book 1965 by R.S.G.B., 5/-, P. & P. 6d.
Guide to Broadcasting Stations, new ed. by Wireless World, 5/-, P. & P. 6d.
Mullard Reference Manual of Transistor Circuits, 12/6. P. & P. 1/-

UNIVERSAL BOOK CO.

12 Little Newport Street, London, W.C.2 (adjoining Lisie Street)



CONTIL CASES

have all these advantages:

★ Lowest prices yet. ★ 21 gauge steel with 1½ ounce iron panel. ★ Electric blue hammer finish with white panel. ★ Front panels supplied with a special easy to mark out strippable coating. ★ 3 loose feet supplied free.

PRICES: Examples

Case No.	1	2	10	200
755	35/-	34/-	33/-	28/9
975	37/6	36/6	35/6	28/9
867	37/-	30/-	35/-	29/6
1277	42/6	41/-	39/-	35/6
16127	88/-	86/-	84/6	78/-
161278	119/-	117/-	116/-	109/-

5% discount for cash with order

RETURNS OF POST DELIVERY SERVICE
Postage 4/- each, except 1277, 6/- and 16127 7/6

WEST HYDE NEONS

These high intensity neons give 25,000 hour average life.

PRICES

Minimum quantity 10 at 2/6 each, 100 at 2/2 each, 1,000 at 1/10 each, 10,000 at 1/9 each. Terms cash with order. No discounts.

WEST HYDE DEVELOPMENTS LIMITED

SEND FOR
LEAFLET

30 HIGH STREET, NORTWOOD. A.DDX.
Northwood 24941

THIS WAY

TO THAT BETTER PAID JOB IN RADIO

Learn Transistor radio servicing by building a set.

The National Extension College offers unique home-study courses using the very latest teaching techniques with optional residential study at weekends.

PRACTICAL RADIO

An introduction to radio practice and theory based upon the construction by the student of a radio from parts supplied by the college. An ideal starting place for higher technical skills—and a better paid job in radio!

Courses in Electronic Engineering also available.

The National Extension College is a non-profit-making organisation created by the Advisory Centre for Education.

Write for free brochure to:



NATIONAL EXTENSION
COLLEGE (Dept. 10)
Shafesbury Road, Cambridge

TA 1729.

KEY BOOK paperbacks...

SIMPLE RADIO CIRCUITS

A COMPLETE 'BUILD YOUR OWN RADIO' GUIDE

A.T. COLLINS



SIMPLE RADIO CIRCUITS

by A. T. Collins

A Complete 'Build Your Own Radio' Guide.
Simple Mains Short Wave Receiver, Medium Wave Transistor Receiver, Dual Wave One-valver, Broadcast Bands Receiver, Two-valve Short Wave, Amateur Bands Hybrid, Transistor Superhet Tuner, etc. 96 pages.

HI-FI AND AUDIO

MODERN DESIGNS FOR THE AMATEUR CONSTRUCTOR
A T COLLINS



HI-FI AND AUDIO

by A. T. Collins

Modern Designs for the Amateur Constructor.
High Sensitivity Amplifier, Two-valve Pre-amp and Equaliser, Mains Gramophone Amplifier, Output Transformers and Loudspeakers, Cross-over Networks for Loudspeakers, Seven-watt Quality Amplifier, etc. 96 pages.

Only 3s. 6d. each

FROM ALL BOOKSELLERS

including all branches of W. H. Smith, Wyman, Menzies and Boots, or in case of difficulty 4s. each by post from George Newnes Ltd., Tower House, Southampton Street, London, W.C.2.

NEWNES

350-352 Fratton Road, Portsmouth. Tel: 22034
ALL MAIL ORDER, RETAIL SHOP AND HI-FI ROOM
**DEVONIAN COURT PARK CRESCENT PLACE,
BRIGHTON. Tel. 608722**

Head Office and Warehouse:
44A WESTBOURNE GROVE
LONDON W2
Tel.: PARK 5641/2/3

Z & I AERO SERVICES LTD.

Please send all correspondence and Mail Orders to the Head Office

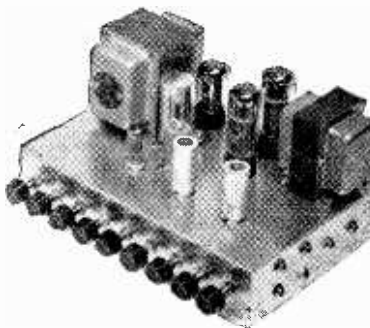
When sending cash with order, please include 2 6 in £ for postage and handling
MINIMUM CHARGE 1/6. No C.O.D. orders accepted

Retail Shop:
86 TOTTENHAM COURT ROAD,
LONDON W1
Tel.: LANKHAM 8408

0A2	6/- 6AK6	7/- 6K7	5/- 12K8	10/- 11	20/- ESSC	14/- EF54	6/- MSPST	TT21	32/- TRANSISTORS
0B2	6/- 6AM6	4/- 6K8	8/- 12Q7T	5/- 8B2	20/- EAB80	7/- EF55	8/-	10/- TT22	32/- 28004
0C3	6/- 6AN8	10/- 6L1	10/- 19AQ3	5/- 806A	14/- EAF12	8/- EF80	5/- N78	15/- 12	11/- AF114
0B3	6/- 6AQ6	8/- 6L6GT	7/- 20P2	15/- 35L4	80/- CR41	5/- EF83	10/- NPS1	25/- 26	11/- AF115
0D3	5/- 6A7	8/- 6L1T	8/- 20P4	14/- 852	5/- EM343	7/- EF85	6/- NSP2	32/- 1391	11/- AF116
1A3GT	5/- 6A78	22/6 6L25	12/6 20P1	14/- 852	3/- EBC41	7/- EF86	7/- ORP71	24/- 351	12/6
1A7GT	8/- 6A16	4/- 6Q7CT	8/- 20P3	12/- 309	2/- EBC81	6/- EF89	4/6 ORP12	12/- 281	13/- AF117
1G6GT	7/- 6A16	6/- 68L7CT	5/- 20P4	14/- 357	5/- EBC80	6/- EF91	4/6 ORP60	10/- 282	14/- AF118
1H3GT	7/- 6A16	6/- 68N7CT	4/6 20P5	12/- 358	4/- EBC85	7/- EF93	4/6 ORP10	12/- 501	12/- GET114
1J6	17/- 6B7	5/- 6L16T	10/6 25A6	5/- 359	8/- EBC89	6/6 EF94	8/- P88	12/- 1003	5/6 6C36
1N3GT	8/- 6B16	4/6 6L8	7/6 25A6T	8/- 3596	6/- EBC8	12/6 1198	10/- P97	9/- 801	18/- GET115
1Q3GT	8/- 6B16	5/- 6A6	9/- 25Z4G	7/- 3593	10/- EBC8	12/- EF95	5/- P98	6/6 146	18/- GET116
1R4	6/- 6B16	7/- 6A6T	7/6 25Z5	7/6 6080	25/- EBC90	2/6 EBC18	8/- P98A	6/6 146	6/- GET117
1R5	5/- 6B16	8/- 6A4	4/- 25Z4GT	8/6 6146	27/6 EBC41	5/- EBC184	8/- P98B	12/- 1462	8/- GET118
1R4	5/- 6B16	20/- 6X5GT	5/6 30615	10/- 6A1110	10/- EBC92	4/- EFP60	10/- P98C	11/- 1464	7/- GET119
1S4	4/6 6B16	8/- 6X5GT	8/- 30617	12/- AZ1	9/- EBC95	7/- EBC14	10/- P98D	10/- 1464	7/- GET120
1T3GT	6/- 6B16	7/- 717	8/- 30619	9/- AZ41	6/6 EBC96	9/- EBC18	17/6 146180	7/- 1464	7/- GET121
1T4	5/- 6B16	8/- 753	10/- 30621	11/- EBC11	15/- EBC94	6/6 EBC141	8/- P98E	12/- 1464	7/- GET122
1U5	6/- 6B17	11/6 756	7/- FIRST QUALITY				9/- P98F	8/- EBC121	11/- MAT121
1X2A	7/- 6B18	5/- 718					8/6 P98G	9/- P98A	8/- MAT121
1X2B	7/- 6B18	18/- 717					8/- P98H	10/- P98B	7/- T1166
2A4	12/- 6B16	9/- 91W6					8/- P98I	10/- P98C	8/- P98D
2D21	6/- 6B17	9/- 91W7					7/6 P98J	10/- P98E	8/6 P98F
3A4	4/- 6C4	2/6 10C1	10/-				22/- P98K	9/- P98I	8/6 P98L
3A5	7/- 6C31	12/- 10C2	12/-				8/- P98M	9/- P98J	8/6 P98N
3106	4/- 6C36	5/- 10D1	7/-				8/- P98O	9/- P98K	8/6 P98P
3A4	6/6 9C4D6A	10P1	14/-				8/- P98Q	9/- P98L	8/6 P98R
3Q3GT	6/6	17/- 10P3	8/-				7/6 P98S	9/- P98M	8/6 P98T
3B4	5/- 6C16	9/- 10P9	10/-				7/6 P98T	9/- P98N	8/6 P98U
3A4	5/6 6C16	9/- 10P18	9/-				7/6 P98U	9/- P98O	8/6 P98V
4THA	10/- 6C14	12/- 10L1	7/6 30P12	13/- 10L3	9/- EBC95	6/6	7/6 P98V	9/- P98P	8/6 P98W
5R4GT	9/- 6D84	15/- 30L11	10/- 30P12	14/- DAC31	6/6 EBC98	10/-	8/- P98W	9/- P98Q	8/6 P98X
3T1	8/- 6E48	8/- 10P13	12/6 30P11	11/6 10P13	4/6 EBC92	7/6	8/- P98X	9/- P98R	8/6 P98Y
3140	5/- 6E6	8/- 10P14	12/6 30P11	11/6 10P13	4/6 EBC92	7/6	8/- P98Y	9/- P98S	8/6 P98Z
5U4GB	6/6 6E7	5/- 12A17	5/- 30P14	12/6 10P13	4/6 EBC96	6/6	8/- P98Z	9/- P98T	8/6 P98A
5V40	8/6 6P8G	5/- 12A18	11/- 35A5	11/- 10P1	3/- EBC42	8/-	8/- P98A	9/- P98U	8/6 P98B
5Y3GT	5/- 6P11	6/- 12A15	7/- 35L04T	7/- 10P1	3/- EBC41	8/-	8/- P98B	9/- P98V	8/6 P98C
6Z3	6/- 6F13	6/6 12A17	5/- 35W4	5/- 10P1	3/- EBC40	8/-	8/- P98C	9/- P98W	8/6 P98D
6Z4GT	6/- 6F17	6/- 12A17	4/- 35Z4G	4/- 10P1	3/- EBC42	8/-	8/- P98D	9/- P98X	8/6 P98E
630L2	10/- 6P23	9/6 12A16	6/- 35Z5GT	6/- 10P1	3/- EBC43	8/-	8/- P98E	9/- P98Y	8/6 P98F
6A8	8/- 6P24	11/- 12A17	5/- 35A5	12/- 10P1	3/- EBC44	8/-	8/- P98F	9/- P98Z	8/6 P98G
6A3A	6/6 6P25	11/- 12A17	6/- 35B5	7/- 10P1	3/- EBC45	8/-	8/- P98G	9/- P98A	8/6 P98H
6A3B	2/6 6P25	10/- 12A16	6/- 35C5	6/6 10P1	3/- EBC46	8/-	8/- P98H	9/- P98B	8/6 P98I
6A7	6/- 6P33	6/- 12B16	5/- 35D6G	25/- 10P1	3/- EBC47	8/-	8/- P98I	9/- P98C	8/6 P98J
6A16	10/- 6J4	4/- 12B17	5/- 35L6GT	6/6 10P1	3/- EBC48	8/-	8/- P98J	9/- P98D	8/6 P98K
6A15	9/- 6J5GT	4/6 12B17GT	7/6 85A2	6/6 10P1	3/- EBC49	8/-	8/- P98K	9/- P98E	8/6 P98L
6A6	5/6 6J7GT	7/6 12K7GT	7/- 807	9/- 10P1	3/- EBC50	8/-	8/- P98L	9/- P98F	8/6 P98M



GUITAR AMPLIFIERS WITH TREMOLO



Five jack socket inputs, four with separate mixing volume controls, and one input "straight through". All inputs are of very high sensitivity only 10 millivolts input is required for full output, making them suitable for all types of guitars and microphones. Separate Bass and Treble controls, giving a wide range of lift and cut. Separate master gain control. Tremolo speed and depth controls. Jack socket for remote tremolo switching. Outputs for 3 and 15 ohm speakers. Valves used in the 30 watt amplifier EC93, EC93, EL84, EL84, EL84, EL84. In the 15 watt amplifier EC93, EC93, EL84, EL84, EL84. An extra valve EC93 is used in the tremolo circuit. The chassis is complete with baseplate and is solidly made of 18 gauge steel, finished silver grey hammer. Size 12 x 8 x 6 1/2 inches high.

P. CES
30 watt with tremolo £20.10.0
30 watt less tremolo £19.10.0
30 watt with tremolo £19.10.0
30 watt less tremolo £18.10.0
15 watt with tremolo £12.10.0
15 watt less tremolo £11.10.0

Add carriage 10/- any amplifier. Send for free descriptive leaflet.
CREDIT TERMS ARRANGED Export inquiries invited

STROUD AUDIO

CASHES GREEN ROAD, STROUD, GLOS. Stroud 793



RSGB AMATEUR RADIO HANDBOOK Third Edition

An invaluable volume of 544 pages, containing almost 700 circuits and charts, with over 100 photographs, and covering the whole field of Amateur Radio techniques from fundamentals to u.h.f. transmitters, aerials, test equipment, single sideband, propagation, etc. Each of the 22 chapters contains much information in suitable form for beginners to experienced amateurs and radio enthusiasts.

MORE THAN 25,000 COPIES ALREADY SOLD

Bound in maroon buckram linson. Price 34s. (by post 36s. 6d.), and \$5.50 post paid in USA and Canada.

Further details of other RSGB publications, information about membership of the society, including a free copy of the monthly RSGB BULLETIN, and the book itself may be obtained from the publishers:

RADIO SOCIETY OF GREAT BRITAIN

Dept. PW, 28 Little Russell Street, London, W.C.1. HOLborn 7733, 2444.

PRACTICAL WIRELESS

blueprints

MOST of these blueprints are drawn full-size and although the issues containing descriptions of these sets are now out of print, constructional details are available free with each blueprint except for those marked thus (*).

Send (preferably) a postal order to cover the cost of the Blueprint (stamps over 6d. unacceptable) to PRACTICAL WIRELESS, Blueprint Dept., George Newnes, Ltd., Tower House, Southampton Street, London W.C.2.

DOUBLE-SIDED BLUEPRINTS

The Strand Amplifier ...	...	...	*	5/-
The PW Signal Generator ...	...	...	*	5/-
The Savoy VHF Tuner ...	...	...	*	5/-
The Mayfair Pre-amplifier ...	...	...	*	5/-
The Berkeley Loudspeaker Enclosure ...	...	...	*	5/-
The Luxembourg Tuner ...	...	...	*	7/6
The PW Troubadour ...	...	...	*	6/-
The PW Everest Tuner ...	...	...	*	5/-
The PW Britannic Two ...	...	...	*	5/-
The PW Mercury Six ...	...	...	*	5/-
The PW Regency ...	...	...	*	5/-
The PW International Short Wave Two ...	...	...	*	5/-
Beginner's Short Wave Two ...	...	...	*	5/-
S.W. Listener's Guide ...	...	...	*	5/-
Beginner's 10-watt Transmitter	...	...	*	5/-
Transmitting and Aerial Data...	...	...	*	5/-
P.W. "Sixteen" Multirange Meter	...	...	*	5/-
Test Meter Applications Chart	...	...	*	5/-
The Celeste 7-transistor Portable Radio	...	...	*	5/-
The Spinette Record Player ...	...	...	*	5/-
The P.W. 35-watt Guitar Amplifier ...	...	...	*	5/-
Transistor Radio Mains Unit ...	...	...	*	5/-
7 Mc/s Transceiver ...	...	...	*	5/-

RECEIVERS

The Tutor *	...	...	...	3/-
The Citizen *	...	...	...	5/-
Dual-Wave Crystal Diode	...	...	PW95	2/6
Modern One-valver	...	...	PW96	2/6
All-dry Three	...	...	PW97	3/6
Modern Two-valver	...	...	PW98	3/6
A.C. Band-pass Three	...	...	PW99	4/-
A.C. Coronet-4	...	...	PW100	4/-
A.C./D.C. Coronet	...	...	PW101	4/-
The PW Pocket Superhet	...	...	...	5/-

MISCELLANEOUS

The PW 3-speed Autogram ...	...	...	8/-
The PW Monophonic Electric Organ	...	...	8/-
The PT Band III TV converter	...	...	1/6
The Mini-amp *	...	...	5/-
The PT Olympic *	...	...	7/6
The PT Multimeter *	...	...	5/-

PLEASE NOTE that we can supply no blueprints other than those shown in the above list. Nor are we able to supply service sheets for commercial radio, TV or audio equipment.

QUERY SERVICE

The P.W. Query Service is designed primarily to answer queries on articles published in the magazine and to deal with problems which cannot easily be solved by reference to standard text books. In order to prevent unnecessary disappointment, prospective users of the service should note that:

(a) We cannot undertake to design equipment or to supply wiring diagrams or circuits, to individual requirements.

(b) We cannot supply detailed information for converting war surplus equipment, or to supply circuitry.

(c) It is usually impossible to supply information on imported domestic equipment owing to the lack of details available.

(d) We regret we are unable to answer technical queries over the telephone.

(e) It helps us if queries are clear and concise.

(f) **We cannot guarantee to answer any query not accompanied by the current query coupon and a stamped addressed envelope.**

QUERY COUPON

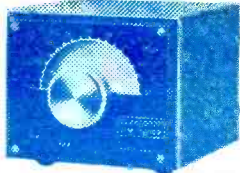
This coupon is available until 3rd JUNE, 1965 and must accompany all queries in accordance with the rules of our Query Service.

PRACTICAL WIRELESS, JUNE, 1965

HENRY'S RADIO LTD.

303 EDGWARE RD., LONDON W2

PADddington 1008/9

Open Mon. to Sat. 9-6. Thurs. 1 p.m.
Open all day Saturday**PROVED and TESTED DESIGNS****FULL AFTER SALES SERVICE AND GUARANTEE
UNBEATABLE FOR PERFORMANCE AND VALUE****DETAILED
LEAFLETS
FREE ON
REQUEST****● VHF FM TUNER TO BUILD****TOTAL COST
TO BUILD £6.19.6**

- ★ 5-transistors, 4-diodes.
- ★ Printed circuit superhet.
- ★ Tuning range 87 to 105 Mc/s
- ★ RF stage and double tuned IFT'S—9 volt 9 mA operated.
- ★ All parts sold separately.
- ★ Output up to 1 volt.
- ★ Size 4 x 3½ x 2½ in.
- ★ P.P. 2/6 (complete with front panel) ★ Cabinet Assembly 20/- extra.

● MW/LW POCKET SUPERHET RADIO TO BUILD**TOTAL COST
TO BUILD 85/-**

- ★ 6-transistor plus diode.
- ★ Push-pull speaker output.
- ★ Easy printed circuit.
- ★ Slow geared tuning.
- ★ Full MED and long waves.
- ★ Moulded cabinet 5 x 3 x 1½ in.
- ★ P.P. 2/- (Battery 2/6, Phone 5/-)
- ★ Amazing sensitivity and selectivity.

● TWO WAVEBAND ALL TRANSISTOR CAR RADIO TO ASSEMBLE**TOTAL COST
TO BUILD £8.19.6**
P.P. 3/6.

- ★ Supplied as factory built assemblies—just interconnect.
- ★ 6-transistor push-pull design—double tuned IFT'S.
- ★ Push-button wavechange—full tuning range.
- ★ Size 7 x 4 x 2 in.—fits any car—chromed front dial.
- ★ Units available separately.
- ★ Guaranteed high performance and quality.

● PUSH-BUTTON TRANSISTOR PORTABLE TO BUILD**TOTAL COST
TO BUILD £7.19.6**
P.P. 3/6 (Batteries 6/-)

- ★ 6-transistor superhet design.
- ★ Easy to build printed circuit.
- ★ 8 in. ferrite aerial, and D/T IFT'S.
- ★ Push-button wavechange.
- ★ Full Med./LW geared tuning.
- ★ Attractive sturdy cabinet.
- ★ Size 10 x 7 x 3½ in.
- ★ All parts sold separately.

● SENSITIVE SUPERHET PORTABLE**● VHF FM TUNER TO ASSEMBLE****TOTAL COST
TO BUILD £12.17.6**
P.P. 2/6

- ★ Supplied as prebuilt and aligned units plus metal work just interconnect.
- ★ 88 to 108 Mc/s. FM tuning.
- ★ 100 mV to 100Kohm output.
- ★ 6-transistor printed circuit. Superhet design.
- ★ Size 9½ x 3½ x 4 in.
- ★ (All units available separately).
- ★ P.P. 2/6

Let us quote for parts for your circuit.
Send a list for quick reply.

Fully detailed and illustrated catalogue. Over 90 pages. All types of components and equipment at competitive prices. Price 2/6 post paid.

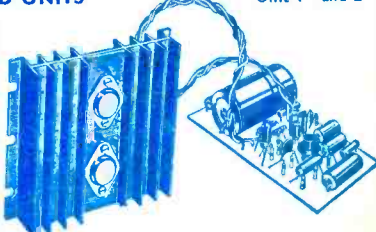
10 WATT AND 20 WATT AMPLIFIERS**● ALL TRANSISTOR PRE-BUILT AND TESTED UNITS**

Unit 1 and 2

★ POWER AMPLIFIERS

10 watts RMS music power output. 20 watts peak. 6-transistor designs. Response 40 c/s to 20 kc/s. 100 mV sensitivity.

Unit 1. For 12/15 ohm speakers, 40 volt supply.

**PRICE BUILT £5.19.6** P.P. 2/6

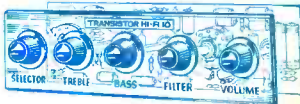
Unit 2. For 3 to 5 ohms. 24 volt.

PRICE BUILT £5.10.0 P.P. 2/6

(Mains units Mono 59/6 Stereo 69/6)

★ PREAMPLIFIERS—MONO AND STEREO VERSIONS.

8 inputs, 1½ mV to 300 mV at 1K to 500 Kohm. Response 30 c/s to 20 kc/s. Complete range of controls.



Unit 3. Mono full function preamplifier.

Size 9½ x 2½ x 2 in.

(Brown/Gold front panel, 8/6).

Unit 4. Simplified version of Unit 3. Price built 65/- P.P. 1/6

Unit 5. Stereo preamplifier for use with two power amplifiers.

Size 9 x 3½ x 1½ in.

PRICE BUILT £10.19.6

P.P. 3/6.

(Brown/Gold panel 12/6).

**Unit 3
PRICE BUILT £5.10.0** P.P. 2/-**● LOW NOISE—LOW DISTORTION—QUALITY DESIGNS**

Enables complete Mono or Stereo equipment to be assembled at a fraction of the cost of a commercial comparable design. Simple to interconnect, outstanding quality

● TWO AND FOUR TRACK PORTABLE TAPE RECORDERS TO ASSEMBLE

Prebuilt equipment—6 valves—Collaro studio decks—portable cabinets—8 x 5 in. speakers. Complete recording and playback.



★ Two track deck 10 gns. P.P. 5/-
★ Amplifier 11 gns. P.P. 3/6
★ Cabinet with speaker, 5 gns. P.P. 3/6.

or SPECIAL PRICE £26**P.P. 8/6 TWO TRACK**

★ Four Track deck £13.19.6. P.P. 5/-.

★ Amplifier 12 gns. P.P. 3/6.

★ Cabinet and speaker 5 gns. P.P. 3/6.

or SPECIAL PRICE £30 P.P. 8/6 FOUR TRACK**● 4 WATT AND 1½ WATT PACKAGE AMPLIFIERS**

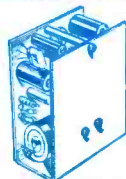
★ 6-transistor push-pull printed circuit (designs).

★ Size only 2½ x 2 x 1½ in.

★ 4 watt, 12/18 volt; 1½ watt, 9/12 volt.

★ Output for 3 to 5 ohm speakers.

★ 7 mV into 1 Kohm, 40 c/s to 15 kc/s.

**PRICES 1½ WATT BUILT 65/-** P.P. 1/6**4 WATT 79/6** P.P. 1/6