

PRACTICAL WIRELESS

NOVEMBER 1963

2¹/₂

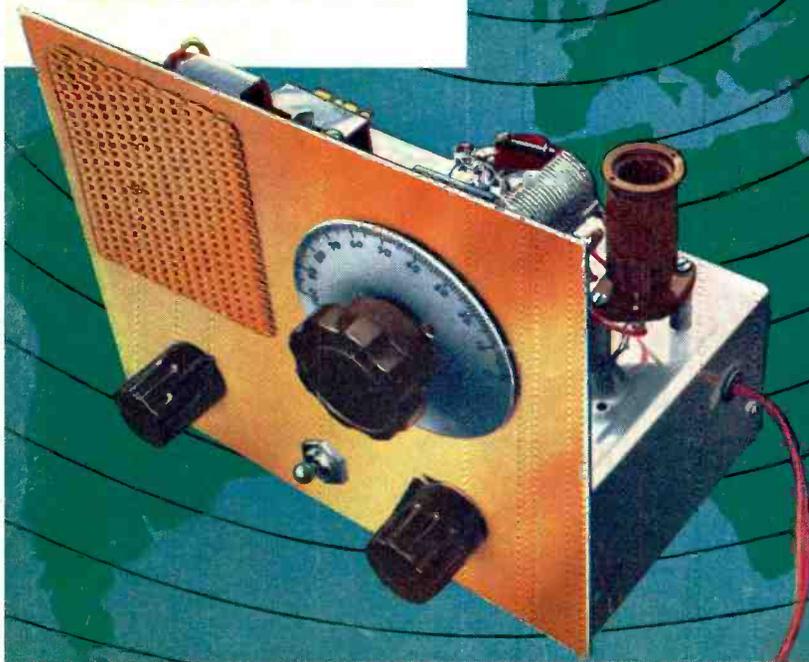
FREE INSIDE!

**DOUBLE-SIDED
BLUEPRINT**

TO BUILD THIS
**SHORT-WAVE
RECEIVER**

**BEGINNER'S
SHORT-WAVE
TWO**

*WORLD-WIDE
RECEPTION*

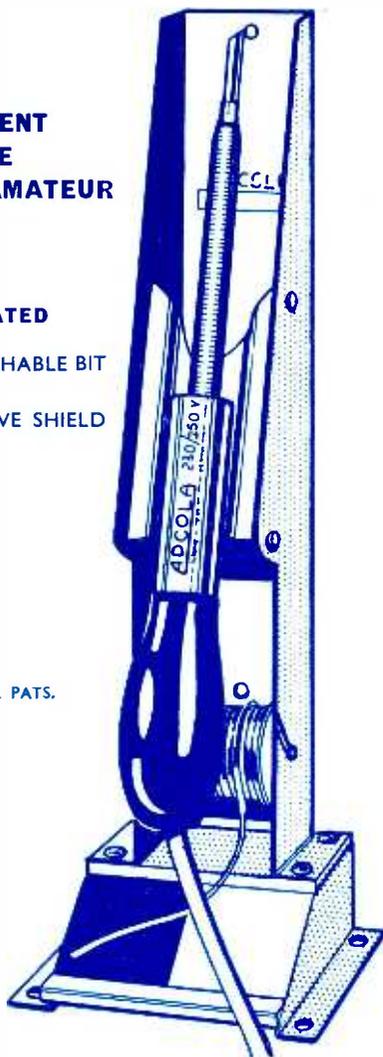




SOLDERING INSTRUMENTS

EQUIPMENT FOR THE RADIO AMATEUR

ILLUSTRATED
List 64.
 $\frac{3}{16}$ " DETACHABLE BIT IN PROTECTIVE SHIELD
List 700



BRIT. & FOR. PATS.

Sales & Service
APPLY DIRECT FOR CATALOGUE TO

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

Telephones MACaulay 4272 & 3101 Telegrams SOLOINT LONDON SW4

OSMOR
PRICE LISTS & INFORMATION ON

Various Designs in

Practical Wireless	Radio Constructor	Wireless World	R.S.G.B. Bulletin
D.I.Y.	Hobbies Wkly	Practical Motoring	Etc.

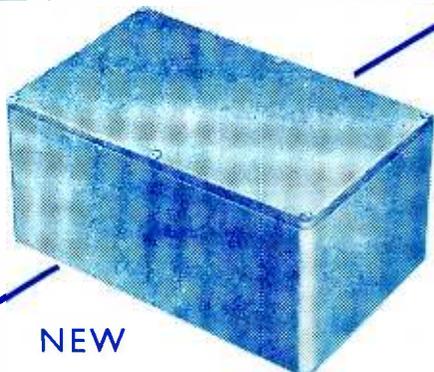
SEND 6d. POSTAGE FOR



CIRCUITS

OSMOR LTD

418 BRIGHTON ROAD
S. CROYDON SURREY
Telephone CRO 5148



NEW
EDDYSTONE
DIECAST
INSTRUMENT BOX

An addition to the three existing Diecast Boxes is the Cat. No. 903, illustrated above. This has dimensions of approximately 7 $\frac{1}{2}$ in. x 4 $\frac{1}{2}$ in. x 3in. deep—the increased depth is a notable feature. The box is cast in aluminium, thus saving considerable weight and, as with the others, is complete with a close-fitting flanged lid. Natural finish 16/8. Data sheet on request.

No. 896. 4 $\frac{1}{2}$ in. x 2 $\frac{1}{2}$ in. x 1 $\frac{1}{2}$ in. 6/8
No. 850. 4 $\frac{1}{2}$ in. x 3 $\frac{1}{2}$ in. x 2in. 9/4
No. 845. 7 $\frac{1}{2}$ in. x 4 $\frac{1}{2}$ in. x 2in. 14/8

Write the Manufacturers:

STRATTON & CO. LTD.
BIRMINGHAM 31



GUARANTEED

★ VALVES ★

by return of post THE MOST ATTRACTIVE COMPETITIVE VALVE LIST IN THE COUNTRY

All valves are new and unused unless otherwise advised.

Table with 3 columns: POST, 3 MONTHS GUARANTEE, FREE TRANSIT INSURANCE. Includes details on valve types and return policies.

Main valve list table with columns for valve type, quantity, and price. Includes various vacuum tube models like 6X4, 6X5, 6X6, etc.

Tubes advertisement featuring 'HIGHEST QUALITY - COMPARE OUR PRICES' and 'GUARANTEED NEW TYPES'. Lists prices for 12in, 14in, 15-17in, and 21in tubes.

SPECIAL TEMPORARY OFFER and P.M. SPEAKERS advertisement. Includes details on bulk purchases and speaker specifications.

4 watt AMPLIFIERS and SILICON RECTS. advertisement. Promotes excellent amplifier performance and silicon rectifier components.

NEW SHOP BRIGHTON advertisement. Announces opening in large premises at 11-12 North Rd., Brighton, with a list of electronic components.

AM/FM RADIOS advertisement. Offers fantastic offers on 7 valves plus 2 diodes, contemporary cabinets, and guaranteed 3 months.

TRANSISTORS advertisement. Features guaranteed top quality, huge reductions, and Reg Spot standard L.F. type now only 1/63.

PORTABLE RECORD PLAYERS advertisement. Offers all sizes records, all speeds, amplifier, auto-changer, Garrard new 'Slimline' Gram.

PORTABLE RADIOGRAMS advertisement. As above with 5 valve superb radio. Med. and Long wave. Fantastic value. 17 gns.

Post: 2 lbs. 2/-, 4 lbs 2/8, 7 lbs. 3/6, 15 lbs. 4/-, etc. (C.O.D. 2/- extra). ALL ITEMS LESS 5% AND POST FREE IN DOZENS. Send 6d. for list of 1000 emp-

TELEGRAPHIC TRAINING CO. 350-352 FRATTON ROAD, PORTSMOUTH DEVONIAN COURT, PARK CRESCENT PLACE, BRIGHTON 7, SUSSEX

**RADIO - AMATEUR GEAR
EDUCATIONAL KIT-SETS**



**TEST INSTRUMENTS
HI-FI EQUIPMENT**

You can Build the worlds best kit-sets; save money and enjoy yourself the Heathkit way

The clearly written instruction manuals, issued with each kit, show you how.

DEFERRED TERMS ON ORDERS ABOVE £10. ALL MODELS ALSO AVAILABLE ASSEMBLED

TEST INSTRUMENTS



0-12U

5in. **OSCILLOSCOPE**. Model 0-12U. 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.

£35.10.0 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.

£19.19.0 Kit.

ELECTRONIC SWITCH. Model S-3U. Converts a single beam oscilloscope into double beam operation.

£11.15.6 Kit.



V-7A

VALVE VOLTMETER. Model V-7A. The world's best selling VT VM. Measures up to 1,500 volts (D.C. and R.M.S.) and 4,000 pk. to pk. Res. 0.1 Ω 1,000 MΩ. Centre zero dB scale, D.C. input. Resistance 11 MΩ, 4½in. meter. Complete with test prods, leads and standardising battery.

£13.18.6 Kit.

R.F. PROBE. Model 309-CU. Will extend freq. range of Model V-7A to 100 Mc/s. Indication up to 300 Mc/s.

£1.13.6 Kit.

HIGH VOLTAGE PROBE. Model HV-336. Extends measurement of Model V-7A up to 30,000 v. D.C.

£2.19.6 Kit.

MULTIMETER. Model MM-1U. Ranges: 0-1.5 v. to 1,500 v. A.C. and D.C.; 150µA to 15A D.C.; 0.2Ω to 20MΩ. 4½in. 50µA. meter.

£12.10.0 Kit.

A wide range of other test instruments available including: R/C Bridge C-3U, £9.5.0. AF V/Voltmeter AV-3U, £14.17.6. Wattmeter AW-1U, £15.15.0. 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.

SSU-1 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

(without legs)

£10.17.6 Kit.

Horizontal or vertical

(with matching legs)

£11.12.0 Kit.

TRANSISTOR RECEIVERS

"OXFORD" LUXURY TRANSISTOR DUAL WAVEBAND RECEIVER.

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

£14.18.0 Kit.



UXR-1

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.

£12.11.0 Kit.

7 TRANSISTOR PORTABLE. Model RSW-1. Two short, trawler and medium wave bands

£19.17.6 Kit.

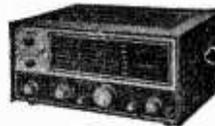
"MOHICAN" GENERAL COVERAGE RECEIVER. Model GC-1U. Excellent portable or general purpose receiver for amateur or short wave listening. See full spec. leaflet.

£39.17.6 Kit.



GC-1U

AMATEUR EQUIPMENT



RA-1

AMATEUR BANDS RECEIVER

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

£39.6.6 Kit.

AMATEUR TRANSMITTER. Model DX-100U. Covers all amateur bands 160-10M. 150 w. D.C. input, self contained with power supply. Modulator, VFO

£74.19.0 Kit.



DX40U

AMATEUR TRANSMITTER

Model DX-40U. Covers 80-10 m. Power input 75 w. C.W., 60 w. peak C.C. phone. Output 40 w to aerial. Prov. for V.F.O.

£33.19.0 Kit.

Other models in the amateur range include: SSB Adapter SB-10U, £39.5.0. Variable Freq. Oscillator VF-1U, £11.17.6. Balun Coil Unit B-1U, £4.15.6. Grid-Dip Meter GD-1U, £10.19.6. Q Multiplier QPM-1, £7.12.6. Wide range of models under American Mail Order Scheme.

**SEND FOR FREE BRITISH CATALOGUE
OVER 50 MODELS TO CHOOSE FROM.**

DAYSTROM LTD.

Dept P.W.11. GLOUCESTER.
ENGLAND.

A member of the Daystrom Group, manufacturers of the WORLD'S LARGEST-SELLING ELECTRONIC KITS

THE WORLDS BEST KIT - SETS OF THE HIGHEST QUALITY AT LOWER COST



Millions of Heathkit models are in use throughout the world because:—

- ★ They are so easy to build. Even for an absolute beginner.
- ★ The manual of instructions is foolproof. Because all manuals are written by the world's experts in kitset design.
- ★ You get professional appearance and performance with every model.

HI-FI AMPLIFIERS



S-33

6W STEREO AMPLIFIER. Model S-33. 3 w/chl. Inputs for radio-tape and gram. Stereo/Mono ganged controls. Sensitivity 200 MV.

£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.

£15.17.6 Kit.

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

TA-1M (Mono), £19.2.6. TA-1S (Stereo), £24.10.0

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

£27.19.6 Kit.



S-99

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.

£10.19.6 Kit.

HI-FI SINGLE CHANNEL AMPLIFIER. Model MA-12. Ideal for use with Models USC-1 and UMC-1. 0.1% THD at 10 W. Wide freq. range.

£11.9.6 Kit.

AVAILABLE SHORTLY

GUITAR/PUBLIC ADDRESS AMPLIFIER. PA-1. 50 W rms. 100 W pk. output. For vocal and instrument groups, public address etc. 4 inputs, 2 loudspeakers. Send for full details.

£54.15.0 Kit.

COMMUNICATIONS TYPE RECEIVER. Model RG-1. A high performance low cost receiver for the discriminating listener. Freq. coverage 600 kc/s-1.5 Mc/s. and 1.7 Mc/s-32 Mc/s. Send for details.

£39.16.0 Kit.

OTHER MODELS FROM OUR WIDE RANGE
STEREO CONTROL UNIT. USC-1. Luxury model with inputs to suit any pick-up or tuner

£19.10.0 Kit.

MONO CONTROL UNIT. UMC-1. Suitable for cabinet mounting or free-standing. Ideal for use with MA-12 or any amplifier requiring 0.25 v. or less for full output

£8.12.6 Kit.

GOLDRING/LENCO TRANSCRIPTION UNIT. GL-58. Fitted G-60 pick-up arm and R-105 cartridge. Infinitely variable speed adjustment set. 33 $\frac{1}{3}$ —80 r.p.m. 4 fixed speeds 3 $\frac{1}{2}$ lb. turntable

£18.19.2

GARRARD AUTO/RECORD PLAYER. AT-6. 4-speed stereo/mono unit with auto record selection.
With R-105 head

£13.12.1

With Decca Deram pick-up
Free plinth supplied if required.

£14.6.1

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.11, GLOUCESTER, ENGLAND

A member of the Daystrom Group, manufacturers of the
WORLD'S LARGEST-SELLING ELECTRONIC KITS

'COTSWOLD' SPEAKER SYSTEMS

STANDARD MODEL

Acoustically designed enclosure in the white 26 x 23 x 15 $\frac{1}{2}$ in. 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. 36in. high x 16 $\frac{1}{2}$ in. x 14in. deep. Almost identical performance to standard model.

Price either model **£23.4.0** Kit.

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 inc. P.T.). I.F. Amp (FMA-4U) complete with cabinet and valves (£12.6.0).



Total **£15.1.0** Kit.

AM/FM TUNER. Covers FM 88-108 Mc/s. AM. 16-50, 200-550, 900-2,000 m. Tuning heart (£4.13.6 inc. P.T.) and I.F. Amp. (£20.13.0).

Total **£25.6.6** Kit.

EQUIPMENT CABINETS

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

Prices from **£6.19.6**
to **£29.8.0**



250

AMERICAN HEATHKIT MODELS

Full details of Direct Mail Order Scheme and fully illustrated catalogue of range can be obtained from us for only 1/- post paid. (FREE to Service Depts.).

Please send me **FREE BRITISH CATALOGUE** (Yes/No)

Full details of model(s)

NAME

ADDRESS

PW11

SURBITON PARK RADIO LTD.

FOR POST HASTE—POST FREE SERVICE

MARTIN RECORDAKITS

HALF TRACK

B.S.R. TD2 Monardeck. Latest model, 6 1/2 in. spool.....	£9.90
Deposit £1.0,0 and 9 monthly.....	£1.10
Tape Amplifier for B.S.R. Deck. printed circuit wired with ECC83, ECC82, EM80 and EZ80. Complete with all plugs, sockets, panels, knobs etc. The whole amplifier mounts on to the deck making a self-contained unit.....	£8.8.0
Deposit £1.0,0 and 8 monthly.....	£1.1.0
Case with 7 x 4 in. speaker. two-tone grey.....	£4.4.0
Complete Kit as above, with Tape and Microphone	£22.0.0
Deposit £2.4,0 and 12 monthly.....	£1.16.6
Collaro Studio Deck. Very latest model, 3 speeds, 7 in spools.....	£10.19.6
Deposit £1.2,0 and 8 monthly.....	£1.7.3
Tape Amplifier for Studio Deck, with ready wired printed circuit, control and input panels, mains and output transformers, knobs, plans, screws etc. EP86, ECC83, EM84, EZ81 and 2-EL84. 9 watts output. Magic eye. Radio and Mica. Inputs Ex 1/8 socket, Tone and Monitor controls. Can be used as amplifier.....	£11.11.0
Deposit £1.4,0 and 12 monthly.....	19/-
Case for above, with 9 x 6 in. speaker, two-tone grey.....	£5.5.0
Complete Kit, with Tape and Microphone	£29.0.0
Deposit £2.12,0 and 12 monthly.....	£2.8.8

Building instructions available at 2/6 each kit (refunded if kit bought).

JASON F.M. TUNERS

JMT1, complete with 4 EF91 valves.....	£8.6.0
Deposit £1.0,0 and 3 monthly.....	£1.0.9
JMT2, less power, complete with 4 EF90 valves.....	£10.12.6
Deposit £1.2,6 and 12 monthly.....	17/5
JMT3, with power, complete with 4 EF80 and 1 EZ80.....	£12.18.6
Deposit £1.2,6 and 12 monthly.....	£1.1.1
JMT5, Fringe complete with valves, less power.....	£12.10.0
Deposit £1.5,0 and 12 monthly.....	£1.0.8
JMT6, with power, complete with all valves.....	£14.15.0
Deposit £1.2,6 and 12 monthly.....	£1.4.5
JTV/A, switched F.M. and TV sound, self powered, all valves.....	£17.0.0
Deposit £1.14,0 and 12 monthly.....	£1.8.8
Mercury II, as JTV/A but less power, all valves.....	£11.12.6
Deposit £1.1,8 and 12 monthly.....	3/6
Instruction book is included in all kits, but otherwise 2/6 and 3/6.	
JTV/A, ready built, state channels.....	£22.5.0
Deposit £2.4,6 and 12 monthly.....	£1.16.11
Monitor, ready built (as Mercury II).....	£16.10.0
Deposit £1.13,0 and 12 monthly.....	£1.7.4

AMPLIFIERS (MONO)

Linear L45 3 watt, 3 valve.....	£5.19.6
Linear D410n, 12 watt, suitable Mic or Guitar.....	£12.12.0
Deposit £1.7,0 and 12 monthly.....	£1.0.8
Linear C6000, 30 watt, ideal Guitar amp, with case.....	£18.0.0
Deposit £1.16,0 and 12 monthly.....	£1.9.10
Dalei GA5, 12 watt, 6 valve, P.A. 6 watt, ECC85 valve.....	£12.8.6
Deposit £1.8,6 and 12 monthly.....	£1.1.6
Dalei DPA15, 15 watt with 2 valve pre-amp.....	£25.4.0
Deposit £2.10,6 and 12 monthly.....	£2.1.11
Tripletone Hi-Fi Major with pre-amp. (Guitar or Mic).....	£15.18.9
Deposit £1.14,8 and 12 monthly.....	£1.6.1
Leak TL12, 10 watt Main amp. only.....	£18.18.0
Deposit £2.0,6 and 12 monthly.....	£1.11.1
Leak Variatone III pre-amplifier.....	£15.15.0
Deposit £1.11,6 and 12 monthly.....	£1.6.1
Quad, 15 watt Main amplifier only.....	£22.10.0
Deposit £2.5,0 and 12 monthly.....	£1.17.4
Quad pre-amplifier. Mono.....	£19.10.0
Deposit £1.19,0 and 12 monthly.....	£1.12.4

AMPLIFIERS (STEREO)

Dalei A6002, Integrated.....	£12.12.0
Deposit £1.7,0 and 12 monthly.....	£1.0.8
Dalei GA505, Integrated.....	£18.18.0
Deposit £2.0,6 and 12 monthly.....	£1.11.1
Koerser Cadet Mk. 2 with pre-amplifier, 4 ECC80 valves.....	£26.15.9
Deposit £2.13,6 and 12 monthly.....	£2.4.5
Leak Stereo 20, Main amplifier.....	£30.9.0
Deposit £2.4,8 and 12 monthly.....	£2.10.8
Leak Variatone III, stereo pre-amplifier.....	£25.0.0
Deposit £2.10,0 and 12 monthly.....	£2.1.6
Quad 22 Stereo Control Unit	£25.0.0
Deposit £2.10,0 and 12 monthly.....	£2.1.6

For Quad Main Amplifiers see Mono section above.

LOUDSPEAKERS

Goodmans Arlette 6	£5.5.7
Goodmans Axiom 10	£6.5.11
Goodmans 5K/20/XL	£7.0.0
Wharfedale Super 8/RS/DD	£6.14.2
W.B. HF1012 10in. Unit, 15 watt.....	£4.7.6
R.T.O. 12in. Unit, 15 watt.....	£5.5.0
R.T.C. Hi-Fi Master	£8.8.0
Goodmans XO 5000 cross-over.....	£1.19.0

QUARTER TRACK

B.S.R. TD2, Marriot heads, L series.....	£11.11.0
Deposit £1.4,0 and 12 monthly.....	19/-
Tape Amplifier, as over, but quarter-track.....	£9.9.0
Deposit £1.0,0 and 9 monthly.....	£1.1.0
Case, two-tone grey, with speaker.....	£4.4.0
Complete Kit, with tape and microphone.....	£25.0.0
Deposit £2.10,0 and 12 monthly.....	£2.1.6
Collaro Studio Deck, Marriot X series heads.....	£17.17.0
Deposit £1.17,6 and 12 monthly.....	£1.9.5
Tape Amplifier, as over but quarter track.....	£12.12.0
Deposit £1.7,0 and 12 monthly.....	£1.0.8
Case, with speaker, two-tone grey.....	£5.5.0
Complete Kit, with tape and microphone.....	£25.0.0
Deposit £2.10,0 and 12 monthly.....	£2.1.6
Tape Pre-amplifier for Collaro Studio Deck, with power supplies, ECC83, ECC82, EZ80 and EM85. Radio and Mic sockets, gives an equalised output of 400mV.....	
Half Track	£28.0.0
Deposit £1.0,0 and 8 monthly.....	£1.1.0
Quarter Track	£9.9.0
Deposit £1.0,0 and 9 monthly.....	£1.1.0

TAPE HEADS

M.S.S. Quarter track, Record/Playback and Erase Set	£2.3.0
Bradmatie Half track Record/Playback head only	£1.12.8
Bradmatie Half track Record/Playback and Erase as Studio Set	£1.19.6
Collaro pressure plate for third head position.....	4/-
Brenell Mk. 5 series 2 1/2 speed deck half track	£22.11.0
Deposit £2.5,0 and 12 monthly.....	£2.14.0
Brenell Mk. 2 Tape Amplifier with power pack.....	£26.0.0
Deposit £2.12,0 and 12 monthly.....	£2.3.8

RADIO TUNERS

Armstrong 74C V.H.F. Tuner, self powered.....	£17.10.0
Deposit £1.19,6 and 12 monthly.....	£1.9.5
Armstrong 87S Mk. 2 A.M./F.M. Tuner, self powered.....	£24.12.0
Deposit £2.18,0 and 12 monthly.....	£2.2.4
Armstrong AP208 A.M./F.M. Radio chassis, base and treble controls, P.U. inputs etc.....	£21.4.0
Deposit £2.6,0 and 12 monthly.....	£1.14.10
Armstrong Jubilee Mk. 2 A.M./F.M. push-pull output stage	£26.6.0
Deposit £2.16,6 and 12 monthly.....	£2.6.11
Armstrong Stereo 35 A.M./F.M. Radio chassis, with stereo gram.....	£29.19.0
Deposit £2.6,6 and 12 monthly.....	£2.9.5
Armstrong Stereo 19 Mk. 2 A.M./F.M. Radio chassis, stereo gram and push-pull output stages.....	£40.6.0
Deposit £4.0,6 and 12 monthly.....	£3.6.11
Brass enclosure available for AP208 and Jubilee Mk. 2.....	7/6
Hogers Switched F.M. Tuner, un-powered.....	£14.12.9
Deposit £1.1,6 and 12 monthly.....	£1.4.0
Tripletone F.M. Tuner, less power.....	£12.10.6
Deposit £1.8,0 and 12 monthly.....	£1.3.8
Tripletone F.M. Tuner, self-powered.....	£15.14.6
Deposit £1.11,6 and 12 monthly.....	£1.6.1

GRAMPHONE UNITS

Garrard SRP10 with GCS cartridge, Mono, single player.....	£6.9.11
E.S.R. UA14 with TC8 cartridge, Mono, 4 speed changer.....	£6.19.6
Deposit £1.0,0 and 6 monthly.....	£1.8.3
Garrard Autostim, Mono GCS cartridge, 4 speed changer.....	£6.19.6
Deposit £1.0,0 and 6 monthly.....	£1.8.3
Garrard AT5 Automatin de Luxe, GCS Mono cartridge.....	£11.9.0
Deposit £1.6,6 and 9 monthly.....	£1.4.9
Philips AG1018, Stereo cartridge, will change 7in. records.....	£12.12.0
Deposit £1.7,0 and 12 monthly.....	£1.0.8
Decca Deram Arm and Flute-in Shell	£5.5.6
Decca Deram Transcription Cartridge	£4.14.8
Decca Deram Auto Cartridge	£3.18.8
Golding GL58 with arm, less cartridge.....	£15.19.8
Deposit £1.12,0 and 12 monthly.....	£1.6.6
Golding "88" Transcription, no arm.....	£17.14.0
Deposit £1.19,0 and 12 monthly.....	£1.9.0
Golding GL55X, as GL58 but less pick-up arm.....	£12.1.7
Deposit £1.7,7 and 12 monthly.....	£1.1.6
Garrard 4H/F with Mono GCS cartridge.....	£17.0.0
Deposit £1.14,0 and 12 monthly.....	£1.8.2
Garrard Lab Type "A" Transcription auto-changer, Mono GCS.....	£11.9.0
Deposit £1.19,6 and 12 monthly.....	£1.12.0
Garrard 301	£20.12.2
Deposit £2.3,8 and 12 monthly.....	£1.14.0
Garrard 301 Strobe	£22.0.0
Deposit £2.4,0 and 12 monthly.....	£1.18.9

48 SURBITON ROAD, KINGSTON UPON THAMES, SURREY

Established over 30 years Telephone KIN 5549
 We pay all postage and insurance. All orders despatched same day. Money refund guarantee.
 Hours: 9 a.m.—6 p.m. (1 p.m. Wednesday). We do not close for lunch. Open all day Saturday.

BENLEY 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 DISMANTLED EQUIPMENT NOR MANUFACTURERS' SECONDS & REJECTS, WHICH ARE OFTEN DESCRIBED AS "NEW AND TESTED," BUT HAVE A SHORT AND UNRELIABLE LIFE

0A2	4/6	6BR8	9/3	6V6G	3/9	20P3	12/8	AC5/PEN	E47E	7/7	E137	17/6	KTW62	6/8	Q8150/159/8	U45	15/6	AF118	20/-	
0B2	6/6	6BR7	25/6	6V6GT	6/6	20P4	12/8	DD	E4B80	6/8	E138	12/6	KYW63	6/8	R12	6/6	U47	8/9	AF127	12/6
0ZAGT	4/3	6BR6	7/6	6X4	4/6	20P5	13/6	AC6/PEN	E4C91	3/6	E141	7/6	KZ74	5/8	R16	34/10	U50	4/8	BY213	12/6
1A5	5/6	6BR5	4/6	6X5	4/6	25A6G	7/6	AC7/PEN	E4F42	7/6	E142	7/6	L69	3/4	R17	17/6	U52	4/3	GD3	6/6
1A5	5/6	6BX6	4/6	6V6	6/6	25L6GT	6/6	(15) 17/6	E834	1/6	E181	8/9	LN152	6/6	R18	10/6	U76	4/9	GD6	6/6
1A7GT	8/9	6C4	2/3	788	9/6	25U4Q/16/2	AC7/PEN	E841	4/9	E183	7/6	LN309	8/6	R19	7/6	U78	4/4	GD14	10/6	
1C1	4/9	6C5	4/6	787	7/6	25Y5	8/6	E891	2/3	E184	5/8	LN319	9/6	R22	9/6	U84	4/7	GET102	8/6	
1C2	6/9	6C6	3/6	7C5	10/6	25Y5G	8/6	AC8G	22/8	E893	2/6	LP2	9/6	RK3/240A	U101	19/6	GET103	6/6		
1C3	6/9	6C8	7/6	7C8	7/6	25Z4G	7/6	AC9G/V18	E895	8/6	E186	7/6	N35	23/6	TD2	6/4	U107	17/6	GET104	10/6
1C6	6/9	6C9	11/6	7D3	21/6	25Z5	8/6	E8C41	2/6	E187	2/6	M819	12/6	R14	7/6	U191	10/6	GET105	7/6	
1C6	10/6	6C10	7/9	7D5	15/6	25Z6GT	8/6	ACTH1	15/6	E188	6/6	M84	8/6	R130	22/6	U251	9/6	GET111	12/6	
1D5	6/9	6C12	6/6	7D6	15/6	27SU	23/3	AC7/P	19/6	E189	5/8	MED4	8/6	SP4B	19/6	U281	9/6	GET113	8/6	
1D8	9/9	6C11	12/6	7D7	15/6	28D7	7/6	ACV/P1	12/6	E190	7/6	ML820	16/4	SP13C	12/6	U282	13/6	GET114	6/6	
1F1	6/6	6CDB6	21/6	7E7	5/6	30C1	6/6	CV2/P	20/5	E198	7/6	MLL0012/6	SP41	7/6	U301	12/6	GET787	10/6		
1F2	2/6	6C8H6	5/6	7H7	12/6	30C15	8/6	ATP4	2/3	E199	6/6	ML6	6/6	SP42	12/6	U329	9/6	GET853	8/6	
1F3	2/6	6C6W4	24/6	7H7	14/6	30F5	6/6	AZ1	6/6	E191	9/6	EM4	17/8	MS4B	20/5	U339	10/6	GET874	9/6	
1F7	15/6	6D1	1/6	7Y4	5/6	30F11	9/6	AZ21	7/6	E192	4/6	EM34	8/9	MSP4	12/5	U403	10/6	GEX35	3/6	
1F9D	3/9	6D3	9/6	8D2	2/6	30F12	11/6	AZ41	6/6	E193	12/6	EM35	12/6	MX40	9/6	U404	6/6	GEX36	10/6	
1G6	6/6	6D8	3/6	8D3	3/6	30L1	5/6	B36	6/6	E194	6/6	EM71	13/6	MX40	9/6	U401	17/6	GEX45	6/6	
1H5GT	8/3	6D9	7/6	8D4	3/6	30L2	5/6	AC9G/V18	E195	12/6	EM80	8/9	N35	23/6	TD2	6/4	U420	12/6	GEX46	6/6
1L4	2/6	6E5	6/6	91D2	3/6	30P4	12/3	C12	12/6	E196	8/6	EM81	7/8	N78	28/2	TD4	4/6	VMP44	12/6	
1L4A	18/10	6F1	9/6	91D7	12/3	30P12	7/6	C1C	12/6	E197	8/6	EM84	8/3	N108	26/2	TD12	12/6	VMP48	12/6	
1L4D	4/3	6F5	5/3	10C1	9/6	30P16	6/6	CB1L1	12/6	E198	7/6	EM85	9/3	N339	15/6	TD30	14/6	VP2	3/6	
1LX5	4/6	6F8G	4/6	10C2	13/6	30P19	12/3	COH35	13/6	E199	7/6	EM87	15/3	P61	2/9	TH41	13/6	VP2B	9/6	
1N5GT	8/3	6G2G	7/6	10C3	13/6	30P21	12/3	CK506	7/6	E200	4/6	EN31	45/6	PC4	PC80	TH233	16/6	VP4	14/6	
1P1	6/6	6F8	5/6	10D2	10/6	30P11.3	9/6	CL3	23/10	E201	6/6	EN32	10/6	PC86	10/6	TP22	8/6	VP4A	14/6	
1P10	4/9	6F11	17/9	10F1	10/6	30P14.12/6	CL4	23/10	E202	6/6	EY51	6/6	PC88	14/7	TP25	6/6	VP4B	20/5	OA10	8/6
1P11	5/6	6F12	3/6	10F9	10/6	35A5	20/9	CV6	2/6	E203	7/6	EY81	7/3	PC95	11/3	TP2620	17/6	VP13C	7/6	
1R0	4/9	6F13	5/6	10F18	10/6	35L6GT	7/6	CV63	10/6	E204	3/9	EY83	9/3	PC97	8/3	TY66	11/6	VP23	2/6	
1R4	5/6	6F14	23/3	10L1	6/6	35W4	6/6	CV271	12/6	E205	4/6	EY84	10/6	PC84	5/6	UBA	UBC80	VP4	5/6	
1R5	3/9	6F15	10/6	10L11	6/6	35W4	12/3	CV271	12/3	E206	4/6	EY85	10/6	PC82	6/6	UBA2	7/6	VP4C	14/6	
1T2	34/11	6F16	6/9	10P13	8/6	35Z4GT	4/9	CY1C	12/6	E207	8/6	EY88	9/3	PC88	11/6	UBA1	10/6	VR75	17/6	
1T4	2/6	6F17	12/6	10P14	11/6	35Z5GT	6/6	CY31	5/9	E208	5/6	EY91	3/6	PC89	7/6	UBC4	6/6	VR105	5/6	
1U4	7/6	6F18	13/6	11D5	17/6	40U4	13/2	D1	1/3	E209	4/6	EZ35	4/6	PC89	10/6	UBC1	6/6	VR150	5/6	
1U5	5/6	6F19	4/9	11D5	17/6	418T	17/6	D15	13/6	E210	3/6	EZ40	6/6	PC89	6/6	UBF80	7/6	VR151	5/6	
2A7	10/6	6G2	4/6	11E2	17/6	418T	17/6	D41	3/3	E211	6/6	EZ41	6/6	PC82	6/6	UBF89	7/6	VR152	5/6	
2C26	3/6	6P24	9/6	11E3	17/6	43	10/6	D42	10/6	E212	6/6	EZ80	4/6	PC88	11/6	UBF11	11/6	VR153	5/6	
2D120	7/6	6P26	5/6	12A6	2/3	DOA5	21/10	D63	5/6	E213	4/6	EZ81	4/6	PC86	7/6	UC92	7/6	VR154	5/6	
2D21	5/6	6P28	4/6	12A8	10/6	DOB5	7/6	D77	2/3	E214	6/6	EZ90	4/6	PL82	6/9	UC84	9/6	VR155	5/6	
2P	23/3	6F33	3/6	12AC8	3/6	DO6C	7/6	DAC32	8/3	E215	6/6	FC4	9/6	PL83	8/6	UC85	6/6	VR156	5/6	
3X2	4/6	6G4	2/6	12AD6	9/6	DO6D	6/4	DAF91	3/6	E216	6/6	FC8	14/6	PL84	4/9	UC86	10/3	VR157	5/6	
3A4	4/6	6H1	1/6	12AR6	9/6	DO6GT	7/6	DAF96	9/6	E217	6/6	FC8C	17/6	PL85	2/6	UC87	8/6	VR158	5/6	
3A5	6/9	6H6	3/6	12AH7	5/6	DO6G	6/9	ECH21	11/6	E218	6/6	FW4500/6/8	PL86	9/6	UCH42	7/3	W61M	24/6		
3B7	5/6	6J5GT	4/3	12A18	9/6	53KU	14/8	DD4	12/6	E219	6/6	FW4500/6/8	PL88	12/6	UCH81	7/3	W63	10/6		
3D8	4/6	6J6	3/6	12A16	4/9	72	6/6	DD14	12/3	E220	6/6	GH45	6/6	OTIC	10/6	PEN4D	UC182	8/6		
3E4	5/6	6J7	6/6	12A17	5/6	75	6/6	DD14	12/3	E221	6/6	GU50	4/6	PC85	28/3	UC183	9/6	VR159	5/6	
3Q5	7/3	6J7GT	7/6	12A18	6/9	76	12/6	DDT25	7/6	E222	6/6	ECH31	6/6	PEN25	6/9	UC184	7/6	VR160	5/6	
3R4	4/9	6J8	12/6	12A17	4/6	77	8/6	DP33	6/6	E223	6/6	ECH33	7/9	GZ32	7/6	PEN4D	UF42	6/6		
3V4	6/6	6K6	6/6	12A16	6/9	78	8/6	DP66	15/6	E224	6/6	ECH34	9/6	GZ33	17/6	84/6	UF80	6/6		
4D1	4/6	6K7G	1/3	12A17	4/6	80	5/6	DP72	20/6	E225	6/6	ECL80	6/6	GZ34	11/6	PEN45	UF85	7/6		
4R4GY	8/6	6K7GT	6/6	12A17	4/6	83	15/6	DP82	20/6	E226	6/6	ECL82	6/6	GZ37	14/6	PEN45D	UF85	14/6		
5T4	3/6	6K8G	3/9	12BB6	6/6	83V	19/6	DP96	6/6	E227	6/6	ECL83	10/6	H60	6/6	UF89	6/6	VR161	5/6	
5U4G	4/3	6K8GT	7/6	12BH7	7/6	85A1	28/6	DP97	10/6	E228	6/6	H63	7/6	PEN46	4/6	UL41	7/6	VR162	5/6	
5V4G	7/6	6K26	12/6	12E1	17/6	85A2	9/6	DR30	15/6	E229	6/6	HAB80	6/6	PEN3811/6	UL44	23/3	X41	15/6		
5Y3GT	4/3	6L1	9/6	12HG6T	1/8	90A4	6/6	DR63	4/6	E230	6/6	EP9	20/6	PEN43DD	UL46	9/6	X61	10/6		
6A3G	9/6	6L2	9/6	12JGT	1/6	90A5	6/6	DR76	3/9	E231	6/6	H12	10/6	UL47	17/6	UL84	15/6	VR163	5/6	
5Z3	18/6	6L6M	9/6	12JGT	7/6	90A3	3/7	DR77	4/6	E232	6/6	HL13C	7/6	PEN44	7/6	UL4	15/6	VR164	5/6	
5Z4G	7/6	6L7GT	4/6	12K6	10/6	90VC	4/2	DH41	23/3	E233	6/6	HL32	11/6	PENB4	UM34	16/10	X65	5/6		
630L2	8/6	6L17	12/6	12K7GT	3/9	90C1	16/6	HL101	25/3	E234	3/9	HL23DD5/6	23/11	UM80	8/6	X66	7/6	VR165	5/6	
6A7	9/6	6L18	7/6	12K8GT	9/6	150B2	16/6	HL107	11/6	E235	6/6	HL41	3/9	PEN/DD	URIC	7/6	X76M	11/6		
6B8G	7/6	6L19	7/6	12JGT	9/6	150C2	16/6	HL108	11/6	E236	6/6	HL41D/8/8	URIC	7/6	UL85	7/6	X78	28/2		
6A8T	4/6	6L13	7/6	12A47	7/6	161	13/6	DK40	18/6	E237	6/6	HL42D/8/8	PL33	16/11	UL86	7/6	X79	21/6		
6A7	3/6	6L13	7/6	12B2C7	4/6	185BT	34/11	DK91	4/9	E238	6/6	HL13DD	PL36	8/6	UL87	9/6	X81M	29/1		
6AC5	2/9	6L12D	6/6	12B07	3/6	215SG	6/6	DK92	6/9	E239	6/6	PL38	16/6	UL8	12/6	X101	23/6	VR166	5/6	
6A7	9/6	6N7GT	5/6	12H7	3/6	220B	10/6	DK96	6/6	E240	6/6	HN309	25/6	PL81	7/3	UL89	5/6	X109	28/2	
6AJ5	8/6	6L11	16/11	12M7	5/6	301	20/6	DL33	7/3	E241	6/6	HR2	9/6	PL82	8/6	UL12	4/8	VR167	5/6	
6AK5	5/6	6P25	8/6	12K7	3/6	302	10/6	DL36	6/6	E242	6/6	HR2A	9/6	PL33	5/9	UL19	10/6	X119	7/6	
6AK6	12/6	6P28	9/6	12K8T	6/6	303	10/6	DL63	6/6	E243	6/6	HW3	5/6	PL84	6/6	UY21	8/9	X143	7/3	
6AK9	5/6	6P28	11/6	12K7	5/6	304	15/6	DL68	15/6	E244	6/6	1W4350/5/6	PL820	8						

TECHNICAL TRAINING

in radio television and electronics

Whether you plan to have your own business, to become an electronics engineer, to take up a career in industry, or to brush-up your knowledge and study new developments, transistors, etc., an I.C.S. Course will help you to success. You learn at home in your own time, under expert tuition. Moderate fees include all books.

EXAMINATION COURSES FOR:—

C. & G. Radio and TV Servicing Certificate (R.T.E.B.)

C. & G. Radio Amateurs' Exam. (Amateur's Transmitting Licence) P.M.G. Certificates in Radiotelegraphy

British Institution of Radio Engineers, C. & G. Telecom. Technician's Cert. Gen. Cert. of Education, etc.

New practical radio construction courses

Learn as you build the I.C.S. way. Learn the theory of radio and electronics. Build a 5-valve, 2-waveband receiver, a transistor portable and an A.F. amplifier. Build a signal generator and a multimeter as well, if you wish—two essential pieces of equipment for those engaged in servicing work. Three courses to choose from.

Post this Coupon TODAY! for FREE book on careers in Radio, and full details of other I.C.S. Courses
Member of the Association of British Correspondence Colleges

INTERNATIONAL CORRESPONDENCE SCHOOLS
(Dept. 171), Intertext House, Parkgate Road, London, S.W.11.

Please send book on.....

Name..... Age.....
(Block Letters Please)

Address.....

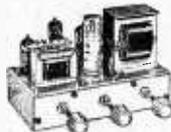
Occupation..... 11.63

INTERNATIONAL CORRESPONDENCE SCHOOLS

HARVERSON SURPLUS CO. LTD.

For address see opposite page

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 1/4 in. w. x 4 1/2 in. d. x 4 1/2 in. h. Incorporates ECC83, EL84, E280 valves, heavy duty double wound mains transformer and output transformer matched for 8 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 etc. wired and tested for only **£45.00** P. & P. 4/-.

TWO VALVE AMPLIFIER similar to above but using ECL82 and E280 with tone and volume controls. Output 3 watts. PRICE 75/- P. & P. 4/-

MARTIN RECORDAKITS

Tape Amplifier for B.S.R. Deck. **£88.00**

Cabinet with 7 x 4 in. speaker for above £44.00. Carr. and Ins. 5/-.

Tape Amplifier for Collaro Studio Deck. £111.00. P. & P. 3/6.

Cabinets with 9 x 5 in. speaker for above. £55.00. Carr. and Ins. 5/-.

Tape Pre-Amplifier, complete with power supplies, £25.00. P. & P. 3/6. Full easy-to-follow instructions supplied. Send S.A.E. for leaflet.

Full range of Microphones and Tapes always in stock.

SPECIAL OFFER!

MARCONI QUARTZ CRYSTALS TYPES ZHB

Glass encapsulated, 2 wire lead out. Size 1 1/4 in. high x 1/2 in. dia. Following frequencies (Kc/s) only available.

- 13521, 13589, 13646, 13708
- 13771, 13833, 13895, 13958
- 14021, 14083, 14146, 14208
- 14271, 14333, 14396, 14459

6/- each. P. & P. 1/- per crystal, 3 or more PostFree.

BRAND NEW CAR RADIO AERIAL BARGAINS!

BY WELL KNOWN MAKER

Following types available for wing mounting; simple one hole fitting, all heavily chromed, telescopic and complete with coax plug and lead.

TYPE H81. 3 section, open 43 1/2 in., closed 17 in., (List 32/6), OUR PRICE 22/-.

TYPE H82. 4 section, open 44 1/2 in., closed 21 in., length below wing 12 in., adjustable angle 0-25°, (List 47/6), OUR PRICE 40/-.

TYPE H83. 5 section, open 41 in., closed 1 1/2 in., length below wing 9 1/2 in., adjustable angle 0-25°. Features a tamper-proof locking device, aerial cannot be extended without using special key provided. (List 57/6), OUR PRICE 50/-.

All surplus plus 2/6 P. & P.

Limited number available TELEFUNKEN HI-FI STEREO AMPLIFIER



Model 882 with BALANCED CONTROL 110/250 v. A.C. input. 5 watt undistorted output (10 watts nominal). Size 19 x 9 x 2 in. Weight 9 lb. Complete with spec. and instructions. STILL ONLY £51.00 Carr. 7/-.

CALLERS SPECIAL

Through purchase of Electronics Manufacturing Company we have a large selection of extremely high grade

OUTPUT AND MAINS TRANSFORMERS

to suit all modern types of Hi-Fi Amplifiers. Also a few quality

HI-FI EQUIPMENT CABINETS

suitable for housing Hi-Fi Equipment.

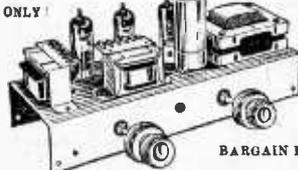
All available at bargain prices

TAPE DECKS

COLLARO STUDIO DECK £10.10.0 plus 5/6 carr. and ins.

B.S.R. MONARDECK (Single speed) 3 1/2 in. per sec. simple control. uses 6 in. spools. £8.15.0 plus 5/6 carr. and ins. (Tapes extra on both).

FEW ONLY



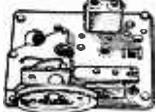
STEREO AMPLIFIER

Incorporating 2 ECL82s and 1 E280, heavy duty double wound mains transformer. Output 4 watts per channel. Full tone and volume controls. Absolutely complete.

BARGAIN PRICE **89/6** P. & P. 5/-

SPECIAL PURCHASE!
TURRET TUNERS
 by famous maker
 Brand new and unused.
 Complete with PC84 and
 PCF80 valves, 34-38 Mc/s
 I.F. Biscuits for Channels
 1 to 5 and 8 and 9. Circuit
 diagram supplied.
 ONLY 25/- each. P.P. 2/6.

F.M. TUNER HEAD



A permeability tuned tuner head by a famous maker, supplied with 100 Mc/s. (EC85) and drum and spindle, 18/6, plus 1/9 P. & P. Valve 8/6 extra. Drum and spindle 3/6 extra.

GORLER F.M. TUNER HEADS

10.7 Mc/s I.F., 15/-, plus 1/9 P. & P. (EC85 valve, 8/6 extra.)

E.M.I. 4-speed Player and P.U.

FURTHER HUGE PURCHASE enables us to offer these below P.P. at **67/6** P. & P. 4/6.



Heavy 8 1/2 in. metal turntable. Low flutter performance 200/250v shaded motor with tap at 45v for amplifier valve filament if required. Turnover LP/78 head.

RECORD PLAYER AMPLIFIER

2 valve (12Z80, ECL82), A.C. mains, 3 watts output, ready built, tested and complete with valves and output transformer. Size 7 in. w. x 2 1/2 in. d. x 6 1/2 in. h. 55/6. P. & P. 3/-. Suitable speakers: 6 in. 15/- P. & P. 1/6. 10 x 6 in. 25/- P. & P. 1/6.

4-SPEED PLAYER UNIT BARGAINS

SINGLE PLAYERS
 TU/12, £3.10.0. Carr. 3/6.
AUTO CHANGERS
 B.S.R. UA14 £6.2.6
 Latest B.S.R. UA16, £7.2.6
 Latest Garrard 'Auto-Slim' £6.17.0. Carr. 5/- on each.

LOOK OPPOSITE FOR MORE BARGAINS

HARVERSON'S F.M. TUNER Mk.1

● P.M. tuning head by famous maker.
 ● Guarded and non-drift.
 ● Permeability tuning.
 ● Frequency coverage 88-100 Mc/s. ● OA81 balanced diode output. ● Two I.F. stages and discriminator. ● Attractive maroon and gold dial (7 x 3 in. glass). ● Self powered, using a good quality mains transformer and valve rectifier.
 ● Valves used EC85, two EF80s, and E280 (rectifier). ● Fully drilled chassis. ● Size of completed tuner 8 x 6 x 5 1/2 in. ● All parts sold separately. Set of parts if purchased at one time £28.6, plus 8/6 P.P. and ins. Circuit diagram and instructions 1/6 post free. Mark II Version as 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 (ECL82) and tone control. £27.7.0. P. & P. 8/6. Handsome Metal Cabinets. Choice of Grey, Black or Green. To fit Mark I, 25/-, P. & P. 2/6. To fit Mark II, 17/6. P. & P. 2/6.

6 TRANSISTOR AND DIODE SUPERHET

A first-class 2 waveband transistor superhet. ● Printed circuit panel (size 8 1/2 x 2 1/2 in.) ● 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 **£4.5.0** P. & P. 2/6

35 OHM SPEAKERS

Suitable for use with above. 2 in. (Goodmans. Ideal replacement for most pocket portables) 8/6; 2 1/2 in. 10/6; 3 in. 12/6; 5 in. 17/6; 7 x 4 in. 21/-. P. & P. 1/6 per speaker.

Portable CABINET

Size approx. 9 1/2 x 6 1/2 x 3 1/2 in. Suitable for above using 3 1/2 in. speaker. 25/-. P. & P. 2/-.

COIL AND TRANSFORMER SET FOR TRANSISTOR SUPERHET

3 I.F. transformers, one oscillator coil, one driver transformer and wound ferrite aerial (mead., long and aerial coupling). 28/6 complete, post 1/6. 6 transistor printed circuit, board to match, 8/6, post 9d. Circuit diagram 1/8 extra.

QUALITY RECORD PLAYER AMPLIFIER

A top-quality record player amplifier. This amplifier (which is used in a 29 gm. record player) employs 6X4 5B1, EL84, E280 valves. Bass, treble and volume controls. Complete with output transformer matched for 3 ohm speaker.

PRICE **69/6** P. & P. 3/6
 DITTO. Mounted on board with output transformer and 6 in. speaker.
 Complete at **89/6**, P. & P. 4/6.

TRANSISTORS

GET 15 (Matched Pair) 15/-
 OC71 5/- PXA101 .. 6/6
 OC72 5/- XA103 .. 6/6
 OC74 6/- Y1510p .. 12/6
 Set of Mullard 6 transistors, OC44, 5-OC45, OC81D matched pair OC81, 25/-, All Post Free

HIGH GAIN 4-TRANSISTOR PRINTED CIRCUIT AMPLIFIER KIT Type TAI

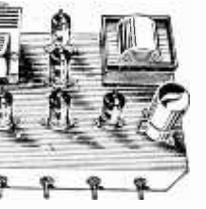
● Peak output in excess of 1 1/2 watts. ● All standard British components. ● Built on printed circuit panel, size 6 x 3 in. Generous size Driver and Output Transformers. ● Output transformer tapped for 3 ohm and 15 ohm speakers. ● Transistors (GET114 or 81 Mullard OC81D and matched pair of OC81 o/p). ● 9 volt operation. ● Everything supplied, wire, battery clips, solder, etc. ● Comprehensive easy to follow instructions and circuit diagram 1/6 (Free with Kit). All parts sold separately.



SPECIAL PRICE 45/-
 P. & P. 2/6.

10/14 WATT HI-FI AMPLIFIER KIT

A stylishly finished monaural amplifier with an output of 14 watts from 2 EL84s in push-pull. Super reproduction of both music and speech, with negligible hum. Separate controls for mike and gram. All recordings and announcements allow records and announcements to follow each other. Fully shrouded section wound output transformer to match 3-15 ohm speaker and 2 independent volume controls, and separate bass and treble controls are provided giving good lift and cut. Valve line-up 2 EL84s, ECC83, EF86 and E280 rectifier. Simple instruction booklet 1/6. Free with parts.
 All parts sold separately. ONLY **£6.19.6** P. & P. 6/6.



BRAND NEW 3 OHM LOUDSPEAKERS

2 1/2 in. 12/6; 5 in. 12/6; 6 1/2 in. 15/-; 8 in. 21/-; 10 in. 25/-; 12 in. 27/6.
 E.M.I. 2 1/2 in. tweeter .. 10/6
 8 in. x 5 in. By famous maker .. 10/6
 E.M.I. Ceramic Magnet .. 10/6
 1 3/4 in. x 8 1/2 in. high flux .. 36/-
 Rola Celestion approx. 9 in. x 6 in. middle register speaker .. 10/6
 10 in. x 6 in. .. 25/-
 also 15 ohm 12 inch., 30/- P. & P. up to 6 in. 1/8; over 6 in. 2/8 per speaker.

AMPLIFIER CARRYING CASES

BRAND NEW.
 Strongly made wooden construction, tough vydite covered, complete with carrying handle. Overall size 13 1/2 in. wide x 9 in. deep x 8 in. high with sloping front panel. Weight only 4 1/2 lbs. Ideal for our 10/14 watt amplifier and many others.
BARGAIN PRICE 28/6
 P. & P. 4/-.

AMPLIFIER ON PRINTED CIRCUIT BOARD

Two valve. UY85, UL4 O.P. trans., use with 80 volt tap off motor, 39/6.
 P.P. 2/6 on above. Dropper res. for filaments if required. 2/6.

B.S.R. AUTO UNITS

160 v. Suitable for use with above. (Slightly soiled.) £4.4.0.

LARGE CABINET

Superior CABINET similar to above to take 8 x 5 in. speaker, with motor board, will accommodate B&K UA14 or UA16. £8.9.6. Carr. 6/6. Speaker 15/- extra. P. & P. 1/6 extra.



SPECIAL BARGAIN OFFERS!

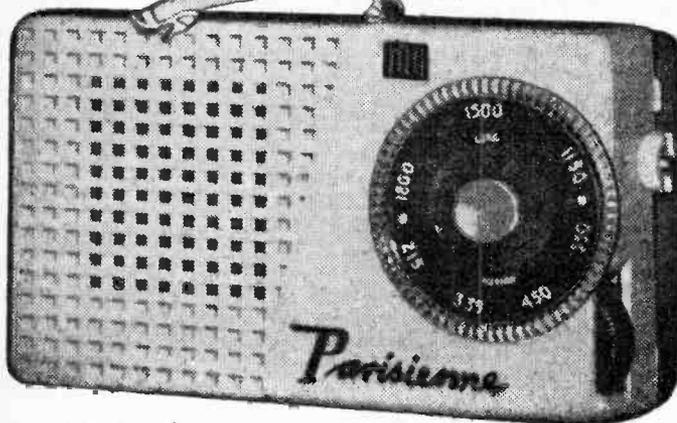
MAINS TRANSFORMERS. Tapped Primary. 1/2 wave or Bridge Rectifier. Secondary 250 v. at 75 mA A.C. 6.3 volts at 2 amps. 10/6 each. P. & P. 3/-.
TWO GANG 0005 TUNING CONDENSER. Geared precision reduction drive. Size 2 1/2 x 2 x 1 1/2 in. Brand new and unused. 3/6 each. P. & P. 1/-.
MAINS TRANSFORMER. Impregnated and fully shrouded. Size 4 1/2 x 3 1/2 in. Weight 6 lbs. Tapped primary 205, 225, 245v. Electrostatic D.C. 6.3 v. at 3.5 amps, centre tapped 5 v. at 2 1/2 amps and 6.3 v. at .6 amp. PRICE ONLY 21/- each. P. & P. 5/-.
CARBON MIKE INSERTS. Brand new, 2 1/2 in. dia. 3/6. P. & P. 9d.
ELECTROSTATIC H.F. TWEETERS. Type L.S.H. 75. Size 3 x 3 in., 2/6 each, plus 9d. P. & P.
MIDGET 2/GANG CONDENSERS. Capacity 195 and 100 pF. Polystyrene case with built-in trimmers. Size 1 1/2 x 1 1/2 in. Not used but removed from P/C Boards. Two for 9/-, plus 1/4 P. & P.
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.
TRANSISTOR DRIVER AND O/P TRANSFORMERS. 15 ohm and 15 ohm output, plus 4 suitable Transistors giving approx. 1 watt output, 30/-. P. & P. 2/-.
3 PUSH-BUTTON TRANSISTOR SWITCH. D.P.—D.T. Each Switch 5/6 and 1/- P. & P.
ACOS GP65/1 T/O MONO CRYSTAL CARTRIDGE. Complete with sapphire stylus and mounting bracket. Limited number only at 12/8. P. & P. 1/-.

MAINS TRANSFORMERS and **SPEAKER & CABINET FABRICS**

Drop thru type. Tapped primary 110v., 200v, 220v, 240v. 320-0-320v at 80mA and 6.3v at 3 amps. Generous core. Stock size 3 1/2 x 2 1/2 x 1 1/2 in. Weight 4 lbs. ONLY 15/- P. & P. 3/6.
 Oatmeal fabric for speaker or cabinet or Red rexine for cabinet 6 1/2 in. wide, 13/6 per yard length. (Minimum order). P. & P. 1/6.

HARVERSON SURPLUS CO. LTD.

170 HIGH ST., MERTON, S.W.19. Cherrywood 3985/6
 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.
 (S.A.E. ALL ENQUIRIES)

EVEN**BETTER
PERFORMANCE**With the **NEW
MARK 8****PARISIENNE!!****THE "TEN STAR" TRANSISTOR
POCKET RADIO****NOW
ONLY
69/6**

Price reduction made possible by huge demand.

- ★ No external aerial or earth required.
- ★ Free 9-volt long life battery.
- ★ Handsome black and gold tuning dial graduated for long and medium waves.
- ★ 3-inch moving coil speaker gives loud and clear reception on both long and medium waves even in your car and guarantees your favourite Luxembourg, A.F.N. and Light programmes.
- ★ Printed circuit for easy assembly including high "Q" ferrite rod aerial.
- ★ Carrying handle fitted to distinctive satin cream. Polystyrene case, size 5½ x 3 x 2in.
- ★ All new components including the highest gain transistors available.
- ★ Valuable illustrated instruction and reference booklet, 2/9. No experience necessary.
- ★ Hundreds of letters from satisfied customers (which may be inspected) underline the "Parisienne" success story and pay tribute to the unique after sales service.

All components supplied separately if required.

PLEASE SEND FOLLOWING ITEMS
TICK BOX BELOW AS REQUIRED

- FULL SET OF PARISIENNE COMPONENTS 69/6
- READY BUILT PARISIENNE £3.19.6
- BOOKLET 2/9 POST FREE

NAME _____
ADDRESS _____

I ENCLOSE CHEQUE P.O. MONEY ORDER INCLUDING
2/6 P. & P. FOR £. s. d.

**WOLVERHAMPTON
RADIO AND TV SUPPLIES**

42, DARLINGTON STREET, WOLVERHAMPTON
Telephone No. 20315

P.W.2.

**POST
NOW!**

THE R.S.C. BASS-MAJOR 30 WATT GUITAR AMPLIFIER

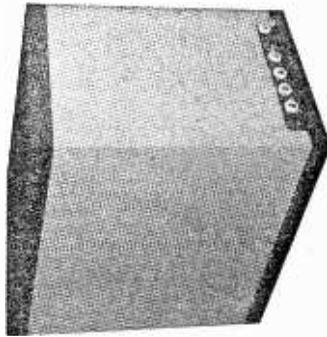
A MULTI-PURPOSE HIGH FIDELITY, HIGH OUTPUT UNIT FOR VOCAL AND INSTRUMENTALIST GROUPS

Eminently suitable for bass guitar and all other musical instruments

- * Incorporating two 12in. heavy duty 25-watt high flux (17,000 lines) loudspeakers with 2in. diameter speech coils. Designed for efficiently handling full output of amplifier at frequencies down to 25 c.p.s.
- * Dual Cone in second speaker reproduces frequencies up to 17,000 c.p.s.
- * Heavily made cabinet of convenient size 24 x 21 x 14in. has an exceptionally attractive covering in two contrasting tones of Vynair.
- * For 200-250 v. to 50 c.p.s. A.C. mains operation.
- * Four jack socket inputs and two independent vol. controls for simultaneous connection of up to four instrument pick-ups or microphones.
- * Separate bass and treble controls providing more than adequate "Boost" or "cut".
- * LEVEL frequency response throughout the audible range.
- * SUPERIOR TO UNITS AT TWICE THE COST.

39¹/₂ Gns.

Send S.A.E. for leaflet.
OR DEPOSIT of £4.3.0 and 12 monthly payments of £3.9.11. Carr. 17/6.



R.S.C. JUNIOR GUITAR AMPLIFIER
5-watt high quality output. Separate bass and treble "cut" and "boost" controls. Sensitivity 15 m.v. Two high impedance inputs. 10in. loudspeaker. Handsome, strongly made cabinet (size 14 x 14 x 7in. approx.) finished in attractive and durable polychrome. 200-250 A.C. mains operation. **£8.19.6** OR DEPOSIT £1 and 9 monthly payments of £1. Carr. 7/6.

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 6.3 v. A.C. L.T. This applies to practically all amplifiers of our manufacture, and to those of several other manufacturers. The unit plugs into power supply point and any input socket of 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. **4 Gns.**

R.S.C. SENIOR Guitar Amplifier
14 watt high-fidelity push-pull output Separate bass and treble "cut" and "boost" controls. Twin separately controlled inputs so that two instruments or "mike" and pick-up can be used at the same time. Two loudspeakers are incorporated, a 12in. high flux 14 watt bass unit, and a 6 x 4in. optimal for treble. Cabinet is well made and finished as Junior Model. Size approx. 18 x 18 x 8in. Only **16 Gns.** Carr. 10/6.

Send S.A.E. for leaflet.
OR DEPOSIT 37/- and nine monthly payments of 37/-.

R.S.C. B20 BASS GUITAR AMPLIFIER



A highly efficient unit incorporating a 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 high impedance jack socket inputs are separately controlled. All controls are conveniently positioned in recess on top of the cabinet. Cabinet is of substantial construction and attractively finished in two contrasting tones of Rexine and Vynair. Size approx. 24 x 21 x 13in. Operation from 200-250 v. 50 c.p.s. A.C. mains. Send S.A.E. for leaflet.

OR Deposit £3.2.0 and 12 monthly payments of 56/10. Carr. 17/6.

DERBY NOW OPEN AT 26 Osmaston Road THE SPOT

TRANSISTOR SALE: Mullard OC71 3/9, OC45 4/11, OC44 4/11, OC72 4/9, OC81 4/11, OC171 8/9, Ediswatt XA101 3/9, XB102 3/8, XA112 3/9, XB113 3/9, XB104 3/9, XC101A 3/9. Postage 6d. for up to 3 Transistors.

D.C. SUPPLY KIT, 12 v. 1 a. consisting of a partially drilled metal case, mains trans. F.W. Bridge Rectifier, 2 fuseholders and fuses, Change Direction switch, variable speed regulator and circuit. For 200-250 v. A.C. mains. Suitable for Electric Trains. Limited number available at 29/11.

SELENIUM RECTIFIERS
F.W. BRIDGE 24 v. 2 amp. .. 14/9
6/12 v. 1 a. .. 3/11 24 v. 20 amp. .. 89/9
6/12 v. 2 a. .. 6/11 H.T. TYPES H.W.
6/12 v. 3 a. .. 9/9 150 v. 40 mA .. 3/9
6/12 v. 4 a. .. 12/3 250 v. 50 mA .. 3/11
6/12 v. 6 a. .. 15/3 250 v. 60 mA .. 4/11
6/12 v. 10 a. .. 26/9 250 v. 80 mA .. 5/11
6/12 v. 15 a. .. 35/9 250 v. 250 mA .. 11/9
ONYX CONTACT COILS, 250 v. 75 mA. F.W. (Bridge), 10/11. 250 v. 50 mA. F.W. (Bridge), 8/11. H.W. 250 v. 60 mA. 5/11.

HI-FI 10-WATT AMPLIFIERS.
Brand New Complete Carr. **£7.19.9.**
Units. 5/6.
Manufacturers' discontinued Model. Push-Pull output. Latest high efficiency valves. Dual separately controlled inputs for "Mike". Separate Bass and Treble Controls. High sensitivity. Output for 3 or 15 ohm speaker. Guaranteed tested and in perfect working order.

HUGE PURCHASE OF BRAND NEW 24, 20 Amp. F.W. (Bridge) SELENIUM RECTIFIERS. each **49/9**

HEAVY DUTY LOUDSPEAKERS IN SUBSTANTIAL REXINE COVERED CABINETS. Type BG1. Suitable for Bass Guitar. Speaker Unit 15in. High Flux. 15 ohms. 25 watts. Cabinet size approx. 24 x 21 x 13in. Only 19/- gns. OR Deposit 24/- and 12 monthly payments of 34/9. Type BG2. Suitable for Bass Guitar. Super Sensitive. 15in. 15 ohms high flux speaker. Cabinet size approx. 30 x 21 x 14in. Attractive covering of two contrasting tones of Rexine and Vynair. Rating 50 watts. Only 29 gns. OR Deposit £3.7.6 and 12 monthly payments of 50/-.

Type BG3/2. Suitable Bass and Lead Guitar. Two 12in. high flux 15 ohms 25 watt speakers, one with aluminium speech coil and dual code to provide smooth frequency response from 25 to 17,000 c.p.s. Cabinet size approx. 30 x 21 x 14in. Covered in two contrasting tones of grey Vynair and Rexine. Rating 50 watts. Only 29 gns. OR Deposit £3.7.6 and 12 monthly payments of 50/-.

LARGE REXINE COVERED SPEAKER CABINETS. Heavy block-board construction. Very attractive two tone covering of Rexine and Vynair. Size 30 x 21 x 16in. cut for 15in. or 18in. speaker or for two 12in. 11 gns. OR Deposit 25/9 and nine monthly payments 25/9. Size 30 x 30 x 16in. cut for 15in. or 18in. speaker 13 gns. OR Deposit 30/4 and nine monthly payments 30/4. Suitable speakers available.

FANE EXTRA HEAVY DUTY LOUDSPEAKER 15in. Type 133. 40 watts. Total flux 375,000 lines. Extremely high sensitivity. 15 ohm voice coil. Only 18 gns. OR Deposit 35/- and 12 monthly payments 35/-.

FANE EXTRA HEAVY L/SPEAKER 183. 18in., 15 ohms. 60 watts. 3in. diam. Speech Coil. Total Flux 375,000 lines. High sensitivity. ONLY 25 gns. OR Deposit 52/9 and 12 monthly payments of 43/- Send S.A.E. for leaflet on 153 and 183.

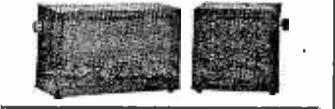
29¹/₂ Gns Carr. 17/6.
EX. GOVERNMENT ACCUMULATORS. Size 7 1/2 x 4 x 2in. 2 v. 16 A.H. brand new 6/9 each 3 for 15/6.

EX. GOVT. SMOOTHING CHOKES. 200 mA, 3-5 H. 50 ohms, Parmeko 9/9; 150 mA, 10 H. 50 ohms 9/9; 80 mA, 20 H. 200 ohms 5/9; 120 mA, 12 H. 100 ohms 8/9; 50 mA, 50 H. 1,000 ohms 6/9; 100 mA, 10 H. 100 ohms 6/9; 60 mA, 6-10 H. 250 ohms 2/11.

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

R.S.C. POWER PACK, 39/9. Louvred metal case only 8 x 3 1/2 x 2 1/2. Slove enamelled. For 200-250 v. A.C. mains Output at 4 pin plug and socket 250 v. 60 mA. fully smoothed and 6.3 v. 2 a. Suitable for power requirements of almost any Pre-amp. or Radio Tuner.

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



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

R.S.C. (Manchester) Ltd.

MAIL ORDERS to 5 County Arcade, Leeds 1. Terms: C.W.O. or C.O.D. No C.O.D. under 6/1 Postage 2/9 extra under £2. 4/6 extra under £5. Trade Supplied. S.A.E. with all enquiries please

LEICESTER 32 High St. Half-day Thursday	BIRMINGHAM 6 Gt. Western Arcade (Opp Snow Hill Sta) No half-day	SHEFFIELD 13 Exchange St. Castle Market Bldgs. Sheffield Half-day Thursday	HULL 51 Savile St., Hull	LIVERPOOL 73 Dale St. Liverpool 2 Half-day Wednesday	BRADFORD 8-16 Morley St. (above Alhambra Theatre) Bradford	MANCHESTER 8-10 Brown St. (Market St.) Manchester 2 No half-day	LEEDS 5-7 County (Mecca) Arcade Briggate, Leeds Half-day Wed.
--	--	--	------------------------------------	--	---	--	---

R.S.C.

(Manchester) Ltd.

MAIL ORDERS to 5 County Arcade, Leeds 1. 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.

LEICESTER 32 High-St. Half-day Thursday	BIRMINGHAM 6 Gt. Western Arcade (Opp Snow Hill St.) No half-day	SHEFFIELD 13 Exchange St. Castle Market Bldgs. Sheffield Half-day	HULL 51 Savile St., Hull Thursday	LIVERPOOL 73 Dale St. Liverpool 2 Half-day	BRADFORD 56 Morley St. (above Alhambra Theatre) Bradford Wednesday	MANCHESTER 8-10 Brown St. (Market St.) Manchester 2 No half-day	LEEDS 5-7 County (Mecca) Arcade Briggate, Leeds Half-day
---	--	--	---	--	---	--	---

FANE HEAVY DUTY HI-FI SPEAKERS

12in. 15 ohms. Cast chassis. Exceptionally robust 2in. diam. Voice Coil Assemblies. 122/10 20w., 5 gns. 122/10A 20w., 8 gns. 122/12 20w., 6 gns. 122/12A 20w., £7.19.6. 122/14 22w., 9 gns. 122/14A 22w., 10 gns. 122/17 25w., 11 gns. 122/17A 25w., 12 gns. 15in. 15 ohms. Cast chassis. Exceptionally robust 2in. diam. Voice Coil Assemblies. 152/12 20w., 12 gns. 152/12A 20w., 13 gns. 152/14 27w., 14 gns. 152/14A 27w., 15 gns. 152/17 35w., 16 gns. 152/17A 35w., 17 gns. "A" indicates dual cone type. 30-17,000 c.p.s. Send S.A.E. for leaflets. Terms available.

R.S.C. 30-WATT ULTRA LINEAR

HIGH FIDELITY AMPLIFIER A10
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 13 of 30-30,000 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 used: EF86, EF86, EF86, ECC83, 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 PICK-UP IS SUITABLE. The unit is designed for CLUBS, SCHOOLS, THEATRES, DANCE HALLS or OUTDOOR FUNCTIONS, etc. Can be used with Electronic ORGAN, GUITAR, STRING BASS, etc. For standard or long-playing records. OUTPUT SOCKET PROVIDES L.T. and H.T. for a RADIO FEEDER UNIT. An extra input with associated volume control is provided so that two separate inputs such as Gram and "Mike" can be mixed: Amplifier operates on 200-250 v. 50 c/s. A.C. Mains and has output for 11 and 15 ohm speakers. Complete kit of chassis and point-to-point wiring diagrams and instructions. If required pre-assembly service available at £2.19.6. The amplifier can be supplied, factory built with EL34 output valves and 12 months guarantee, for 14 gns. Send S.A.E. for leaflet. **TERMS: DEPOSIT 33/9** and 9 monthly payments of 33/9. Suitable microphones and speakers available at competitive prices.

11 Gns.

WE STOCK ARMSTRONG, DULCI, LINEAR, ROGERS, LEAK and JASON EQUIPMENT GOODMANS, W.B. AND FANE SPEAKERS

GARRARD AND GOLDRING T/TABLES

SUPERHET FEEDER UNIT. Design of high quality Radio Tuner (specially suitable for use with our Amplifiers). Delayed A.V./C. Controls are Tuning, W.Ch. and Vol. Only 250 v. 15 mA. H.T. and L.T. of 6.3 v. 1 amp. required from amplifier. Size approx. 9 x 6 x 7in. High. Simple alignment procedure. Point-to-point wiring diagrams, instructions and priced parts list with illustrations. 2/6. Total building cost £24.15.0. S.A.E. for leaflet.

R.S.C. BATTERY TO MAINS CONVERSION UNITS

Type BM1. An all-dry battery eliminator. Size 5 1/2 x 4 1/2 in. approx. Completely replaces battery supplying 1.4 v. and 90 v. where A.C. mains 200-250 v. 50 c/s is available. Suitable for all battery portable receivers requiring 1.4 and 90 v. This includes low consumption types. Complete kit with diagrams. 39/9, or ready to use, 48/6.



Type BM2. Size 8 x 5 1/2 x 2 1/2 in. Supplies 120 v. 90 v. and 60 v. 40 mA and 2 v. 0.4 a. to 1 amp. fully smoothed. This unit completely replaces both H.T. batteries and L.T. 2 v. accumulators when connected to A.C. mains supply 200-250 v. 50 c/s. KIT AVAILABLE. **ALL BATTERY RECEIVERS** normally using 2 v. accumulators. Complete kit of parts with diagrams and instructions. 48/9, or ready for use, 58/6.

P.M. SPEAKERS. 10in. W.B. "Stentorian" 3 or 15 ohms type HF 1012 10 watts, hi-fidelity type. Recommended for use with our All Amplifier, £4.7.6. 12in. R.A. 3 ohms 10 watts (12,000 lines). 59/6.

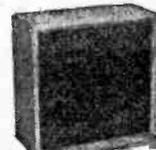
TWEETERS. R.A. 3ohm 19/9, 15ohm 25/9.

R.A. 12in. DUAL CONE 3 ohm 8 watt Speakers. Ideal for Stereo. Only 39/9 ea.

Jason FMTI V.H.F./F.M. Radio Tuner design. Total costs of parts including valves Tuning dial, Escutcheon, etc., £7.19.6.

LINEAR L45 MINIATURE 4 1/3 WATT QUALITY AMPLIFIER. Suitable for any record playing unit, and most mobile phones. Negative feedback 12 db. Separate Bass and Treble Controls. For mains 200-250 v. 50 c/s. Output for 2-3 ohm speaker. Mullard valves E280, ECC83, EL34. Size only 7 x 6 x 5 1/2 in. high. Guaranteed 12 months. Only £5.19.6. Send S.A.E. for leaflet. Terms: Deposit 22/6 and 5 monthly payments of 22/6.

12in. 10 WATT HIGH QUALITY LOUDSPEAKER



In walnut veneered cabinet. Gauss 12,000 lines. Speech coil 3 ohms or 15 ohms. Only £4.19.6 Carr. 5/- Terms: Deposit 11/3 and 3 monthly payments of 11/3.

12in. 20 WATT HI-FI LOUD-SPEAKERS IN CABINETS. Size 18 x 18 x 10in. Finish as above. Terms: Deposit 17/9 and 9 monthly payments of 17/9. Only £7.19.6. Carr. 5/-. For larger types see page 577.

LINEAR LG34 GRAM AMPLIFIER
High quality. Separate Bass and Treble controls. Handsome appearance. Completely enclosed. Black/Gold Frontplate 5 gns.

R.S.C. 45 WATT A5 HIGH-GAIN AMPLIFIER



250-250 v. 50 c/s. Output for 2-3 ohm speaker. Chassis is not alive. Kit in complete detail and includes full punched chassis (with baseplate) with Blue Hammer finish and point-to-point wiring diagrams and instructions. Exceptional value at only £4.15.0. or assembled ready for use 25/- extra. Plus 3/6 carr., or deposit 22/6 and 5 monthly payments of 22/6 for assembled unit.

A highly sensitive 4-valve quality amplifier for the home, small club, etc. Only 30 millivolts input is required for full output so that it is suitable for 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 300 v. 25 mA and L.T. of 6.3 v. 1.5 a. is available for the supply of a Radio Feeder Unit, or Tape-Deck Pre-amplifier. For A.C. mains input of 200-250 v. 50 c/s. Chassis is not alive. Kit in complete detail and includes full punched chassis (with baseplate) with Blue Hammer finish and point-to-point wiring diagrams and instructions. Exceptional value at only £4.15.0. or assembled ready for use 25/- extra. Plus 3/6 carr., or deposit 22/6 and 5 monthly payments of 22/6 for assembled unit.

NOW OPEN AT 26 Osmonston Road THE SPOT DERBY

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

THE SKYFOUR T.R.F. RECEIVER
A design of a 3 valve long and medium wave 200-250 v. A.C. Mains receiver with selenium rectifier. High gain H.F. stage and low distortion detector. Valve line-up 6K7, 3P61, 6V6C. Selectivity and quality excellent. Simple to construct. Point-to-point wiring diagrams, instructions and parts list 1/9, maximum building costs £4.19.6. Inc. attractive walnut veneered wood cabinet 12 x 6 1/2 x 5 1/2 in.

MULTI-METERS. CABY M1. Sensitivity 2,000 ohms per volt. A.C. and D.C. £4-9. A.10. Basic Meter sensitivity 155 micro-amps A.C. and D.C. ranges £4.17.6. B.20. Sensitivity up to 10,000 ohms per volt. A.C. and D.C. £8.10.0. 30,000 ohms per volt. with overload buzzer. £8.19.6.

R.S.C. JUNIOR HI-FI REPRODUCER. The very latest Goodman Acoustic 3 High Fidelity loudspeaker (retailing at approx. 5 gns.) fitted in a specially designed Bass Reflex cabinet size 12 x 18 x 10in. Acoustically lined and ported and finished in polished walnut veneer. Matching impedance 15 ohms. Frequency range 40-15,000 c.p.s. Power handling 6 watts nominal. Ideal for Stereo. Limited number. Carr. 4/6

R.S.C. BASS REFLEX CABINETS, JUNIOR MODEL. Specially designed for W.B. HF1012 Speaker. Kit is complete for any good quality 10in. speaker. Acoustically lined and ported. Polished walnut-veneered finish. Size 18 x 12 x 10in. Handsome appearance. Ensure superb reproduction for only £3.19.6.

STANDARD MODEL. As above but for 12in. speakers. Size 30 x 15 x 13in. For vertical or horizontal use. £5.19.6. Suitable legs with brass ferrules, 19/6 per set of 4.

R.S.C. CORNER CONSOLE CABINETS

Polished walnut veneer finish. Pleasing design. **JUNIOR MODEL.** Size 20 x 11 x 8in. for 8 x 6in. or 10 x 6in. speakers. £22.9.6. **STANDARD MODEL.** Size 27 x 18 x 12in. for 8 or 10in. speakers. £4.11.9. **SENIOR MODEL.** Size 30 x 20 x 15in. for 12in. Speaker. Suitable Speaker systems below. Only £6.19.6.

AUDIOTRINE HI-FI SPEAKER SYSTEMS. Consisting of matched 12in. 12,000 line, 15 ohm high quality speaker; cross-over unit (consisting of smoothe, condenser, etc.) and Tweeter. The smooth response and extended frequency range ensure surprisingly realistic reproduction. Standard 10 watt rating £4.19.6. Carr. 5/-. Or Senior 15 watt, 7 gns. Carr. 7/6.

AUDIOTRINE EQUIPMENT CABINETS. Size 36 x 15 x 18in. Beautiful walnut veneered finish. Elegant contemporary design. Robust construction. Uncut, removable baseboard. Depth above Only 12 1/2 gns. baseboard 5/- Carr. 15/-. Terms: Dep. 29/9, and 9 monthly pmts. 29/9.



AUDIOTRON HI-FI TAPE RECORDER KIT 25¹/₂ GNS. Carr. 17/6.

REALISM AT INCREDIBLY LOW COST. CAN BE ASSEMBLED IN AN HOUR
Incorporating the latest Collaro Studio Tape Transcriber. The audiotron High Quality 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 with latest attractive two-tone polychrome finish, size 14¹/₂ x 15 x 9¹/₂in. 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 £2.13.9 and 12 monthly payments of 44/-. Cash price if settled in 3 months.

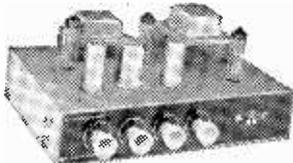


ONLY 3 PAIRS OF SOLDERED JOINTS PLUS MAINS

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. a in A10 High sensitivity. Includes 5 valves. ECC83, ECC83, EL84, EL84, E231. 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. 30-30,000 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 designs for STANDARD or LONG PLAYING RECORDS. For MUSICAL INSTRUMENTS such as GUITARS, etc.



FOR BASS AND TREBLE "Lift" and "Cut". Frequency response +3 db. 30-30,000 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 designs for STANDARD or LONG PLAYING RECORDS. For MUSICAL INSTRUMENTS such as GUITARS, etc.

OUTPUT SOCKET with plug provides 200 v. 30 mA. 6.3 v. 1.5 a. For supply of a RADIO FEEDER UNIT. Size approx. 12 x 9 x 7in. For A.C. mains 200-250v. 50 c.p.s. Output for 3 and 15 ohms speakers. Kit is complete to last nut. Chassis is fully punched. Full instructions and point-to-point wiring diagrams supplied. Only 8 Gns. Carr. (Or factory built 51/- extra.) If requiredoured metal cover with 2 carrying handles can be supplied for 18/9. TERMS ON ASSEMBLED UNITS. DEPOSIT 2/9 and 9 monthly payments of 2/9. Send S.A.E. for illustrated leaflet detailing Cabinets. Speakers, Microphones, etc., with cash and credit terms.

LINEAR TAPE PRE-AMPLIFIER. Type LP/1. Switched Negative feedback equalisation Positions for Record (1in., 3in., 7in. and Playback. EM84 Recording Level Indicator. Designed primarily as the link between a Collaro Tape Transcriber and a high fidelity amplifier, but suitable for almost any Tape Deck. Only 9 gns. S.A.E. for leaflet.

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 of "lift" and "cut". Provision is made for use as straight (monaural) 10-watt amplifier. Valve line-up ECC83, ECC83, EL84, EL84, E231. Outputs for 2-3 ohm speakers. Point-to-point wiring diagrams and instructions supplied. Send S.A.E. for leaflet. Only 8 Gns. Carr. Full constructional details and price list 2/6. Carr. 10/-.

Kit can be supplied assembled ready to use for 59/6 extra.

HI-FI CRYSTAL PICK-UP HEADS (Cartridges.) Acos Standard replacement for Garrard, B.S.R. and Collaro, 16/9. Acos Stereo-Monaural 29/9. Ronette Stereo-Monaural 59/6. B.S.R. Stereo 39/9.

BRADAMATIC RECORDING HEADS. High Impedance Record/Playback 22/-, Low Impedance Erase, 12/6.

MARRIOTT RECORDING HEADS. High Impedance, Record/Playback 15/-, Low Impedance, Erase, 10/-

PICK-UP ARMS. Complete and with latest Acos/hi-fi Turnover Cartridge 29/11. CRYSTAL MICROPHONES. Hand type NF110 14/9, R.T.C. 19/9, Acos Mic 40 25/9, Acos Mic 45 29/9, Stick type Acos 39-1 39/9, BM3 with neck band and heavy table stand 59/9. Label type 35/9.

COLLARO JUNIOR 4-speed Single Player Unit and Crystal pick-up with hi-fi Turnover head. Only £3.19.6.

B.S.R. UA14 4-sp'd AUTO-CHANGERS with hi-fi turnover head. 26.19.6. Carr. 4/6 GARRARD AUTO-SLIM 4-SPEED AUTO-CHANGER with high fidelity pick-up. Latest model. For 200-250 v. A.C. mains £7.19.6. Carr. 4/6.

GARRARD AUTO-SLIM DELUXE 4-SPEED AUTOCHANGERS. Turnover GC8 head, for 200-250 v. A.C. mains. £11.9.0.

GL3A MINIATURE 2-3 WATT GRAM AMPLIFIER. For use with any single Cr auto-change unit. Output for 2-3 ohm speaker. For 200-250 v. A.C. mains. Size 11¹/₂ x 2¹/₂ x 2¹/₂in. Controls: Vol. and Tone with Switch. Only 59/6.

B.S.R. MONARDECK TAPEDECKS. Speed 3¹/₂in. per sec. With high quality recording heads. 46.19.6. Carr. 5/-, Cabinets to take Deck and amplifier 39/6.

SENSATIONAL STEREO OFFER

A complete set of parts (4 Gns.) to construct a good quality Stereo amplifier with an undistorted output of 10 watts. For A.C. mains input of 200-250 v. Sensitivity 130 m.v. Ganged Vol. and Tone Controls. Preset balance control. Full instructions and wiring diagrams supplied. Stereo Pick-up Head 19/9 extra with above only.

SOLDERING IRONS. 200-250 v. 30 watts. First quality. For Radio work. 18/9. Spare elements and bits available.

HEAVY DUTY CHARGER KIT. 6/12 v. 6 amps. variable output. Consisting of Mains Transformer 0-200-250 v. F.W. (Bridge) Selenium Rectifier; Ammeter. Variable Charge Rate Selector Panels, Plugs, Fuses, Fuseholder and circuit, 59/9. Carr. 4/6.

R.S.C. BATTERY CHARGING EQUIPMENT

All for A.C. Mains 200-250v., 50 c/s. Guaranteed 12 months.



Assembled 4-5amps 6/12 v.

Fitted Ammeter and variable charge rate selector. Also selector plug for 6 v. or 12 v. charging. Louvred steel case with stoved blue hammer finished. Fused and ready for use with mains and output leads. Carr. 5/-, Terms: Deposit 13/3 and 5 monthly payments 13/3 6/12 v. 3a., all facilities as above. Only 59/9, carr. 3/9.

ASSEMBLED 6/12 v. 2 amps. Fitted Ammeter and selector plug for 6 v. or 12 v. Louvred metal case finished attractive hammer blue. Fused, ready for use with mains and output leads.

49/9 Carr. 15/3 6/12v. 1 amp. 27/9 Less meter.

BATTERY CHARGER KITS Consisting of Mains Transformer, F.W. Bridge, Metal Rectifier, well ventilated steel case, Fuses, Fuse-holders, Grommets, panels, Heavy Duty Clips, circuit. Carr. 3/6 extra. 6 v. or 12 v. 1 amp. 22/9 As above, with Ammeter 28/9 6 v. 2 amps. 19/9 6 v. or 12 v. 2 amps. 25/9 6 v. or 12 v. 2 amps. inclusive of Ammeter. 35/9 6 v. or 12 v. 4 amps. 45/9 6 v. or 12 v. 4 amps. with Ammeter and variable charge rate selector 52/9

CHARGER AMMETERS 0-1.5 a., 0-3 a., 0-4 a., 0-7 a., 0-80 a., 8/11.

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

Interleaved and Impregnated. Primary 200-230-250 v. 50 c/s. Screened TOP SHROUDED DIAL WINDING
250-0-250v. 70mA. 6.3v. 2a. 0.5-6.3v. 2a. 17/9
350-0-350v. 100mA. 6.3v. 2a. 5v. 3a. 21/9
250-0-250v. 100mA. 6.3v. 2a. 6.3v. 1a. 21/9
250-0-250v. 100mA. 6.3v. 3.5a. C.T. 19/9
250-0-250v. 100mA. 6.3v. 4a. 0.5-6.3v. 3a. 25/9
300-0-300v. 130mA. 6.3v. 4a. 6.3v. 1a. 10/-
Mullard 510 Amplifier. 29/9
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. 29/9
425-0-425v. 200mA. 6.3v. 4a. 5v. 3a. 49/9
FULLY SHROUDED UPRIGHT
250-0-250v. 60mA. 6.3v. 2a. 0.5-6.3 v. 2a. 17/11
Midget type 21 x 3 x 3in. 17/11
250-0-250v. 100mA. 6.3v. 4a. 0.5-6.3v. 3a. 27/9
300-0-300v. 100mA. 6.3v. 4a. 5v. 3a. 27/11
350-0-350v. 100mA. 6.3v. 4a. C.T. 6.3v. 1a. for Mullard Amplifier .. 33/9
350-0-350v. 100mA. 6.3v. 4a. 5v. 3a. 27/11
350-0-350v. 150mA. 6.3v. 4a. 5v. 3a. 35/9

FULLY SHROUDED (continued)
425-0-425v. 200mA. 6.3v. 4a. C.T. 5v. 3a. 55/-
425-0-425v. 200mA. 6.3v. 4a. C.T. 6.3v. 4a. C.T. 5v. 3a. 59/9
450-0-450v. 250mA. 6.3v. 4a. C.T. 5v. 3a. 68/9

OUTPUT TRANSFORMERS
Midget Battery Pentode 66:1 for 354, etc. 4/6
Small Pentode, 5,000 Ω to 3 Ω .. 4/6
Small Pentode 7,000 Ω to 3 Ω .. 4/6
Standard Pentode 5,000 Ω to 3 Ω .. 5/9
Standard Pentode 7,000 Ω to 3 Ω .. 5/9
10,000 Ω to 3 Ω .. 5/9
Push-Pull 9 watts. EL84, or 6V6 to 3 Ω or matched to 15 Ω .. 9/9
Push-Pull 10-12 watts to match 6V6 or EL84 to 3-5-8 to 15 Ω .. 10/9
Following types for 3 and 15 Ω speakers:
Push-Pull 10-12 watts 6V6 or EL84 .. 18/9
Push-Pull 15-18 watts 6L6, KT66 .. 22/9
Push-Pull Mullard 510 Ultra Linear .. 29/9
Push-Pull 20 watts, sectionally wound, 6L6, KT66, EL34, etc. .. 49/9

MIDGET MAINS Primaries 200-250 v. 50 c/s. 250 v. 60 mA. 6.3 v. 2a. ... 11/9
250-0-250 v. 60 mA. 6.3 v. 2a. ... 12/11
Both above size 2¹/₂ x 2¹/₂ x 2¹/₂ins.

FILAMENT TRANSFORMERS All with 200-250 v. 50 c/s. primaries 6.3 v. 1.5a, 5/9; 6.3 v. 2 a. 7/6; 0-4-6.3 v. 2a. 7/9; 12 v. 1 a. 7/11; 6.3 v. 9 a. 8/11; 6.3 v. 6 a. 17/8; 12 v. 1.5 a. twice, 17/8.

SMOOTHING CHOKES 150 mA, 7-10 H 250 ohms. 11/9
100 mA, 10 H 200 ohms 8/9
80 mA, 10 H 350 ohms 9/9
60 mA, 10 H 400 ohms 4/11

CHARGER TRANSFORMERS All with 200-230-250 v. c/s Primaries: 0-9-15 v. 1 a. 12/9; 0-9-15 v. 2a. 14/9; 0-9-15 v. 3 a., 16/9; 0-9-15 v. 5a., 19/9; 0-9-15 v. 6 a., 22/9; 0-9-15 v. 8 a., 28/9. A.T. 119 (step up/step down) TRANS. 0-110-120-230/250 .. 50-80 watts, 13/9; 250 watts, 39/9; 150 watts, 27/9. MICROPHONE TRANSFORMERS 120 : high grade, clamped, 8/9.

R S T

211a STREATHAM ROAD
MITCHAM · SURREY
Tel: Mitcham 6202

METAL RECTIFIERS

RM1	5/3	RM4	14/-	14A97	25/-
RM2	7/6	RM5	19/6	14A100	27/-
RM3	7/9	14A86	17/6		

14RA	1-2-8-2	...	...	21/-	(FC301)
16RC	1-1-16-1	...	...	8/6	
14RA	1-2-8-3	...	...	25/-	(FC31)
16RD	2-2-8-1	...	...	12/-	
16RE	2-1-8-1	...	...	8/6	
18RA	1-1-8-1	...	...	4/6	
18RA	1-1-16-1	...	...	6/6	(FC116)
18RA	1-2-8-1	...	...	11/-	
18RD	2-2-8-1	...	...	15/-	(FC124)

TERMS OF BUSINESS

C.W.O., C.O.D.; C.O.D. 4/2
extra. Postage 6d. per Valve.
Open to callers: 9 a.m. to 5.45 p.m.
Phone: Mit 6202

★ VALVE

ALL VALVES ETC. BRAND EXPRESS 24 HOUR

TRANSISTOR BARGAINS

OC44	...	...	6/-	OC77	...	...	6/-
OC45	...	...	7/-	OC81	...	...	6/-
OC71	...	...	5/-	OC81 M/Pair	...	...	16/-
OC72	...	...	8/-	OC81D	...	...	6/-
OC74	...	...	8/-	OC82	...	...	8/-
OC75	...	...	6/-	OC82D	...	...	8/-

AC2/PEN 19/6	EAC91 4/-	EF36 4/-	EM85 10/-	LN309 11/6	PEN453DD 10/0	U10 9/-
AC2/PENDD 19/6	EAF42 9/6	EF37 8/-	EY51 7/6	LZ319 12/6	PENDD4020 20/-	U12 9/-
AC/THI 30/-	EB34 2/6	EF37A 8/-	EY81 8/6	MHD4 15/-	U14 9/-	U16 9/-
AC/TP 29/-	EB41 5/-	EF39 4/-	EY83 12/6	MKT4 17/6	U16 9/-	U22 8/6
AC/VPI-5-7 16/-	EB91 4/-	EF40 15/-	EY86 7/-	MS4B 17/6	U24 21/-	U25 11/-
AZ1 15/-	EBC3 21/-	EF41 8/-	EY91 3/-	MVS/PEN 17/6	U26 10/-	U31 9/-
AZ31 13/6	EBC33 4/6	EF42 10/-	EZ35 6/-	MUI4 9/-	U33 17/6	U35 17/6
B36 9/-	EBC41 8/6	EF50A 3/6	EZ40 7/-	MX40 15/-	U37 17/6	U43 8/6
CIC 10/-	EBC81 10/6	EF50E 3/6	EZ41 7/-	N18 8/-	U47 11/-	U48 8/6
CB1 12/6	EBF80 8/-	EF80 5/-	EZ80 6/-	N37 14/-	U50 7/6	U52 4/6
CCH35 20/-	EBF83 8/-	EF85 5/-	EZ81 6/-	N78 22/6	U54 7/-	U78 4/6
CL33 12/6	EBF89 8/-	EF86 8/-	EZ90 4/6	N108 15/-	U107 16/6	U145 10/6
CY1 15/-	EBL21 21/-	EF89 9/-	EI148 2/-	N308 18/-	U191 13/6	U251 15/-
CY31 12/6	ECC31 10/-	EF91 4/-	FC2 15/-	N339 30/-	U282 19/6	U301 22/6
D77 4/-	ECC32 6/-	EF92 4/-	FC2A 17/6	N369 10/6	U329 15/-	U339 13/6
DAC32 9/6	ECC33 8/6	EF95 5/-	FC4 15/-	OB2 11/-	U403 10/-	U404 10/-
DAF91 5/6	ECC34 10/-	EF98 10/-	FC13 15/-	OD3 5/-	U601 19/6	UABC80 7/-
DAF96 7/6	ECC40 15/-	EF183 10/6	FW4/500 9/-	OZ4 5/6	UAF42 8/6	UB41 7/6
DCC90 12/6	ECC81 5/-	EF184 10/6	FW4/800 9/-	P2 10/-	UBC41 8/6	UBC81 10/-
DF33 9/6	ECC82 5/-	EK2 21/-	GZ30 10/6	PABC80 13/-	UBF80 8/-	UBF89 7/6
DF91 4/-	ECC83 7/6	EK3 21/-	GZ32 10/6	PCC84 8/-	UBF89 7/6	UCC84 11/6
DF92 7/-	ECC84 8/6	EK32 8/6	GZ33 19/3	PCC85 9/6	UCC85 7/6	UCF80 12/6
DF96 7/6	ECC85 7/6	EL2 25/-	GZ34 13/6	PCC88 12/6	UCH21 20/-	UCH22 20/-
DF97 11/6	ECC88 12/6	EL3 21/6	GZ37 19/3	PCC89 8/6	UCH42 8/6	UCH81 8/6
DH63 6/-	ECC91 3/-	EL6 21/6	HABC80 10/-	PCF80 9/-		
DH77 7/-	ECF80 7/6	EL32 4/6	HL41 8/-	PCF82 9/-		
DK32 11/-	ECF82 8/6	EL33 10/-	HL41DD 8/6	PCF84 12/6		
DK91 6/-	ECH3 21/6	EL34 14/-	HL92 8/6	PCF86 12/6		
DK92 7/6	ECH21 21/-	EL35 10/-	HL133DD 9/6	PCL82 9/-		
DK96 7/6	ECH35 19/6	EL37 17/6	HN309 25/-	PCL83 7/-		
DL33 8/6	ECH42 9/6	EL38 17/6	HVR2 13/-	PCL85 9/-		
DL35 10/-	ECH81 7/6	EL41 9/6	IW4/350 10/-	PCL86 12/6		
DL91 8/-	ECH83 8/6	EL42 9/6	W4/500 10/-	PCL88 9/-		
DL92 6/-	ECL80 7/6	EL81 12/6	KT36 8/-	PEN4 19/6		
DL93 7/-	ECL81 10/-	EL84 6/9	KT33C 8/-	PEN8A 17/6		
DL94 7/6	ECL82 9/6	EL85 10/-	KT66 17/6	PEN4DD 22/6		
DL96 7/6	ECL83 10/6	EL86 10/-	KT55 17/6	PEN4VA 17/6		
DM70 7/6	ECL86 9/6	EL90 8/6	KT61 9/6	PEN36C 20/-		
DY86 12/6	EF6 21/-	EL91 4/-	KT66 15/-	PEN45 10/-		
EA50 2/-	EF9 21/6	EL95 10/6	KT76 10/-	PEN45DD 25/-		
EABC80 5/6	EF22 14/-	EM34 9/6	KT81 8/-	PEN46 5/-		
		EM80 8/6	KTW61 8/-			
		EM81 8/6	L63 5/-			
		EM84 9/6	LN152 8/-			

ALL VALVES ETC. BRAND

LISTS FREE WITH

SALE! ★

NEW & FULLY GUARANTEED MAIL ORDER SERVICE

SETS OF VALVES

IR5, IS5, IT4, 3S4, 3V4... ... Set of 4, 19/-
 DAF91, DF91, DK91, DL92, DL94 Set of 4, 19/-
 DAF96, DF96, DK96, DL96 ... Set of 4, 26/6

SILICON RECTIFIERS

400 volts 350 mA 7/6 each

R S T

211a STREATHAM ROAD

MITCHAM · SURREY

Tel: Mitcham 6202

SPECIAL OFFER

DF91	4/-	PCC84	8/6	6K7	7/6
EABC80	5/6	PCC89	8/6	6K8	9/6
EAC91	4/-	PCF80	9/-	6L6	10/-
EB91	4/-	PCL82	9/-	6Q7	9/6
EBC33	4/6	PL84	8/6	6SL7	6/-
EBF89	8/-	UABC80	7/-	6SN7	5/6
ECC81	5/-	UBF89	7/6	6V6	8/6
ECC85	7/6	UF41	7/6	6X5	6/-
ECC91	3/-	UF89	6/6	8D3	4/-
ECH81	8/-	UL41	8/-	12A7T	5/-
EF39	4/-	UL84	7/-	12AH8	9/6
EF50	3/-	UY85	7/-	12BA6	7/6
EF80	5/-	W81	6/-	12BE6	7/6
EF85	5/-	SU4	4/-	12K7	5/-
EF91	4/-	6AQ5	6/6	12Q7	6/6
EL84	6/9	6BA6	6/-	807	6/-
EY86	7/-	6BE6	6/-		
OZ4	5/6	6D2	4/-		

Obsolete Valves a
 Speciality—Quotations
 by Return

UCL82	9/6	X76M	12/6	6A7	9/-	6F14	10/-	6S57	10/-	12AT6	7/6	25Z4	7/6
UCL83	13/6	X78	26/-	6A8G	8/6	6F15	12/6	6U4GT	10/-	12AT7	5/6	25Z5	8/-
UF41	7/6	X79	40/-	6A8GT	13/6	6F19	12/6	6U5G	7/6	12AU6	17/6	25Z6	8/6
UF42	7/6	X81	10/-	6AC7	6/-	6F23	10/6	6V6	8/6	12AU7	5/-	27SU	19/6
UF80	7/-	X109	26/6	6AJ8	9/6	6F25	16/6	6V6G	4/6	12AX7	7/6	30C1	9/-
UF85	7/6	Y61	10/-	6AK5	5/-	6F26	13/6	6V6GT	8/-	12BA6	7/6	30C15	12/6
UF86	12/6	Y63	10/-	6AK8	7/6	6F33	5/6	6X4	4/6	12BE6	7/6	30F5	10/6
UF89	6/6	Z63	7/6	6AL5	4/-	6H6	2/-	6X5G	6/-	12BH7	10/-	30FL1	10/6
UL41	8/-	Z66	10/-	6AM5	5/-	6J5	5/6	6X5GT	8/6	12C8	8/6	30L1	8/6
UL44	20/-	Z77	4/-	6AM6	4/-	6J5G	4/6	6/30L2	10/-	12J5GT	4/-	30L15	11/6
UL46	14/6	Z152	5/-	6AQ5	6/6	6J5GT	5/-	785	12/6	12J7GT	8/6	30P4	18/-
UL84	6/6	ZD152	8/6	6AQ8	9/3	6J7	7/6	786	10/6	12K7GT	5/-	(30P19)	21/-
UL85	7/6	OZ4	5/-	6AT6	6/-	6J7G	5/-	787	8/6	12K8GT	6/6	30P12	10/-
UM80	10/6	1A7	11/-	6AU6	9/-	6K7	7/6	7C5	8/-	12Q7GT	10/-	30P16	9/-
UR1C	15/-	1C5	10/-	6B7	8/6	6K7G	2/-	7C6	8/6	12H6	5/-	30P19	17/6
UJ5	10/-	1D5	8/6	6B8G	3/-	6K7GT	7/6	7C7	8/-	12SA7	8/6	30P11	15/-
UJ6	17/6	1D6	10/-	6BA6	6/-	6K8	9/6	7D3	15/-	12SC7	8/6	30P13	12/6
UJ8	15/-	1H5	9/6	6BE6	6/-	6K8G	5/-	7D5	15/-	12SG7	7/-	30P14	16/6
UJ9	7/6	1L4	5/-	6BG6G	15/-	6K8GT	9/6	7D6	15/-	12SH7	8/-	35A5	15/-
UY1N	12/6	1LN5	4/6	6BH6	8/-	6K25	17/6	7D8	15/-	12S17	8/-	35L6GT	8/6
UY21	15/6	1N5	9/6	6BJ6	6/-	6L1	10/-	7H7	6/-	12SK7	6/-	35W4	7/6
UY41	7/6	1R5	6/-	6BQ7A	12/6	6L6	7/6	7K7	8/6	12SL7	8/-	35Z4	7/6
UY85	6/6	1S4	8/-	6BR7	10/6	6L7	10/-	7Q7	10/-	12SQ7	12/-	35Z5	7/6
VMS4B	12/6	1S5	5/6	6BS7	12/6	6L8	10/-	7R7	15/-	12SN7	10/-	40SUA	15/-
VP2	12/6	1T4	4/-	6BW6	8/-	6L18	10/-	7S7	10/-	12SR7	10/-	41STH.	22/6
VP4	15/-	1U5	5/9	6BW7	8/-	6L19	15/-	7Y4	6/6	12Z3	10/-	42	12/6
VP4A	15/-	2P	22/6	6BX6	5/-	6L34	9/6	8D3	4/-	13D3	12/6	50C5	10/-
VP4B	15/-	2A3	10/-	6C4	3/6	6N7GT	9/6	9BW6	12/6	14H7	10/-	50CD6G	27/6
VP41	7/6	3A4	5/-	6C5G	6/6	6P25	10/6	10C1	12/6	14R7	10/-	50L6	8/6
VR105/30	7/6	3A5	10/6	6C5GT	8/-	6P28	12/6	10C2	17/6	14S7	16/-	53KU	12/6
VR130/30	7/-	3D6	10/-	6C6	6/6	6Q7	9/6	10C14	13/6	19AQ5	8/-	75	8/-
VU39	9/-	3Q4	8/-	6C9	12/6	6Q7G	6/6	10F1	10/-	19BG6G	15/-	78	7/6
VU111	2/6	3Q5	9/-	6CD6G	27/6	6Q7GT	8/6	10F3	12/6	20D1	10/-	80	9/-
VU120	2/6	3S4	6/-	6CH6	10/-	6SA7	7/-	10F9	12/6	20F2	17/6	85	17/6
W61	11/-	3V4	7/-	6CWH4	16/-	6SC7	8/6	10F18	14/6	20L1	22/6	85A2	12/6
W76	5/-	5U4	4/-	6D2	4/-	6SF5	10/-	10L18	15/-	20P1	15/-	185BT	30/-
W77	4/-	5V4G	7/9	6D6	5/-	6SH7	6/-	10L1D1	15/-	20P3	24/-	305	13/-
W81	6/-	5Y3	6/6	6E5	10/-	6S17	6/-	10L1D2	10/-	20P4	20/-	807B	9/-
W81M	6/-	5Y3G	5/6	6F1	10/6	6S17G	6/6	10P14	19/-	20P5	20/-	807A	9/6
W107	11/-	5Y3GT	6/6	6F6	6/9	6SK7	5/6	10P18	15/-	25A6	8/-	7475	5/-
X41	22/6	5Z3	10/-	6F7	10/-	6SL7GT	6/-	11D3	23/6	25L6	8/-		
X61M	10/-	5Z4	10/-	6F11	10/-	6SN7GT	5/6	11D5	23/6	25Y5	8/-		
X65	12/6	5Z4G	9/6	6F12	4/-	6S07	8/6	12A6	6/6	25Y5G	8/-		
X76	12/6	5Z4GT	12/6	6F13	10/-	6SR7	10/-	12AH8	9/-				

NEW & FULLY GUARANTEED

EACH ORDER OVER £1



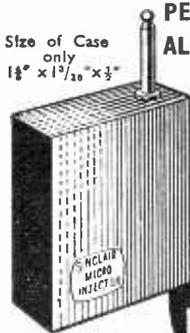
GO TRANSISTOR WITH SINCLAIR

BOOKS • CIRCUITS • TRANSISTORS • EQUIPMENT

SINCLAIR MICRO-INJECTOR

ANOTHER MASTERPIECE OF MINIATURISATION
Smaller, more versatile, covers 1 Kc/s to 30 Mc/s
PERFECT FOR FAULT FINDING AND SERVICING

Size of Case only
 $1\frac{1}{2}'' \times 1\frac{1}{10}'' \times \frac{1}{2}''$



ALL RECEIVERS AND AMPLIFIERS

Using two MICRO-ALLOY TRANSISTORS the Sinclair Micro-Injector[®] is a precision sub-miniature instrument which generates and injects a test signal into any part of a receiver or amplifier at any frequency from 1 Kc/s to 30 Mc/s. By this means the location of any fault can be rapidly found.

The Sinclair Micro-Injector is powered by a 6d. standard battery which will last for about 6 months. Its size is $1\frac{1}{2}'' \times 1\frac{1}{10}'' \times \frac{1}{2}''$, excluding the probe which is $\frac{7}{8}''$ long, by far the smallest instrument of its kind available. Assembly is extremely simple and will take even a beginner only half an hour. Clearly illustrated building instructions are provided together with operating instructions.

**SINCLAIR
MICRO
INJECTOR**

**TRACE
THAT
FAULT**



Cost total including all parts, MAT Transistors, printed circuit board, plated probe, and case in royal blue with gold trim.

27/6

SINCLAIR MICRO AMPLIFIER

OUTPERFORMS AMPLIFIERS 20 TIMES LARGER

This fantastically small, powerful amplifier is smaller than a 3d-piece. With a frequency response from 30 to 50,000 c/s ± 1 dB, and power gain of 60dB (1,000,000 times) it becomes a valuable tool in the hands of the keen experimenter as well as providing an excellent sub-miniature hi-fi amplifier with an output suitable for any earpiece or even loudspeaker. With MAT Transistors, brand new micro-miniature quality components and micro-printed circuit. The uses to which this unique amplifier can be put are almost beyond count. Circuitry details are included showing how to use it with high or low impedance inputs, in radio, etc., etc.

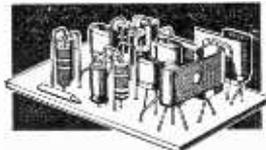
● Consumption from 0.4 mA at 1.3 v. to 1 mA at 9 volts.

● Will drive ANY earpiece or even a loudspeaker.

● Requires no special tools for building.



28/6



With circuit showing use with low and high impedance pick-ups, microphones, tapeheads, in transmitter circuits, as a mono or stereo hi-fi system, intercom., etc.

BUILT AND TESTED

59/6

ALL EQUIPMENT UNCONDITIONALLY GUARANTEED

SINCLAIR radionics LTD

69 HISTON ROAD, CAMBRIDGE

THE WONDERFUL SINCLAIR RANGE OF TRANSISTORS

M.A.T's

MICRO-ALLOY TRANSISTORS

MATs give extremely high power gains at all levels of collector current and voltages, and at frequencies from A.F. to 100 Mc/s. They may be used in place of ordinary transistors to give greatly improved performance in any circuit.

MAT 100 High gain low level type 7/9

MAT 101 Extra high gain, low level type 8/6

MAT 120 High gain, medium and high level type 7/9

MAT 121 Extra high gain, medium and high level type 8/6

★ NEW FOR V.H.F. AND U.H.F. THE ADT.140

This new Sinclair transistor, only $\frac{1}{8}''$ high x $\frac{1}{4}''$ dia., is specially designed for F.M. and T.V. applications and for V.H.F. and U.H.F. transmitters and receivers. Made by the alloy-diffused process, the ADT.140 has a typical alpha cut-off frequency of 400 Mc/s. Power gain is 15dB at 100 Mc/s and 9dB at 200 Mc/s.

Price 15/-

AND DON'T FORGET THESE



THREE
IMPORTANT
BOOKS

Each of these books is crammed with invaluable information, tested circuits and layout diagrams for receivers and equipment using MATs and the new ADT.140.

"22 Tested Circuits using Micro-Alloy Transistors" 5/6 post free

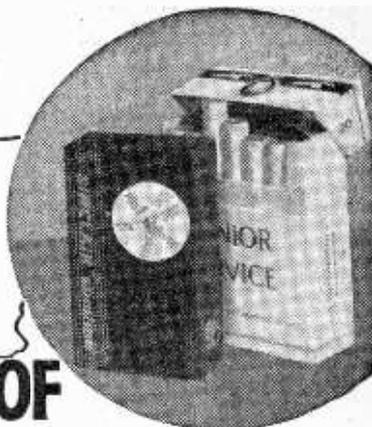
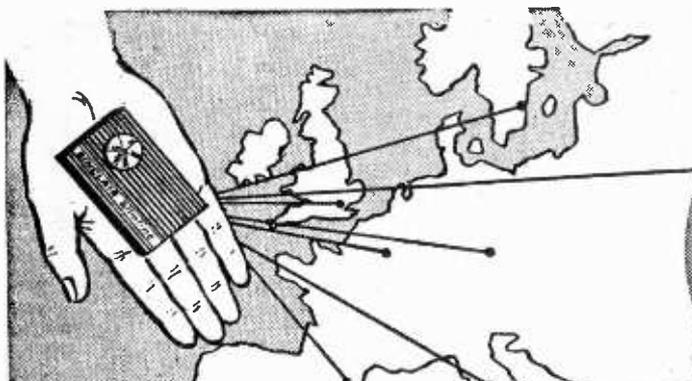
"Tested Short Wave Receivers using MATs" 5/6 post free

"Tested Superhet Circuits for Shortwave and Communication Receivers, using MATs" 6/6 post free

Special Offer to "Practical Wireless" readers
ALL Three Books for

15/-

Post free



EUROPE IN THE PALM OF YOUR HAND with the wonderful *Sinclair Slimline* MICRO-RADIO RECEIVER

and still they write!

With each post we get more and more constructors writing to us about the "Slimline". Here's a user who took his to Europe.

HOMER GREEN
BUCKS
6.9.63

Dear Sirs,

I took the "Slimline" to Paris and to Fuenterrabia near Irun in Northern Spain.

In Paris we received three French Stations and Radio Luxembourg at excellent strength.

In Fuenterrabia we could get a Spanish station, two or three French stations—and on one evening the LIGHT PROGRAMME nearly 900 miles away.

In San Sebastian which we visited one day, the local station was booming in. We are delighted with the present performance of the set. I would like a Sinclair Micro Amplifier and enclose cheque for 28/6.

With thanks,
Yours sincerely,
F.H.R. Aldred.

TAPE RECORDER USERS NOTE

The "Slimline" is unequalled as a radio jack and can be plugged into ANY tape recorder by substituting a plug and lead for the earpiece. Its power and sensitivity are ideal for this purpose.

NOW IS THE TIME TO BUILD YOUR SINCLAIR SLIMLINE.

Small enough to conceal in one hand, it gives choice of British and European programmes with staggeringly good quality and selectivity. Building is easy and interesting, and as well as providing superb listening through the earpiece, the "Slimline" makes a wonderful radio jack too.

- ★ NEW improved solid dielectric tuning capacitor
- ★ FULL coverage of medium waveband
- ★ USES Micro-Alloy Transistors throughout (MATs)
- ★ EXTREMELY robust construction
- ★ TRUE high-fidelity performance with quite incredible volume and quality of reproduction
- ★ EXTREMELY SENSITIVE—pulls in literally dozens of continental stations right across the band
- ★ IDEAL for use in car or train where tremendous volume is really valuable
- ★ IDEAL as a radio jack for tape recorders, etc.
- ★ COMPLETELY self contained; uses internal ferrite rod aerial and a PP5 battery
- ★ ELEGANT royal blue case with gold trim and calibrated dial

Size 2 $\frac{1}{4}$ x 1 $\frac{1}{4}$ x $\frac{3}{16}$ in.
Comprises brand new sub-miniature components, printed circuit board, genuine MAT transistors, case, featherweight quality earpiece and well illustrated easily followed instructions.

TOTAL COST

49/6

FULL SERVICE
FACILITIES
ALWAYS
AVAILABLE

**POST
TO-DAY**

To SINCLAIR RADIONICS LTD., 69 HISTON-RD., CAMBRIDGE

PLEASE RUSH _____ SLIMLINE(S)

FOR WHICH I ENCLOSE £ _____ : _____ s. _____ d.

NAME _____

ADDRESS _____

Block letters please _____ PW11

LASKY'S RADIO

THE FINEST RANGE OF TRANSISTOR RECEIVERS

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

Controls: Waveband Selector, Volume Control with on/off Switch, Tuning Control. In plastic cabinet, size 10 x 6 1/2 x 3 1/2 in. with metal trim and carrying handle.

Can be built for

£10.19.6

Post & Pkg. 5/- extra.

Data for each receiver 2/6 extra. Refunded if you purchase the parcel. Four U2 batteries. 2/6 extra. Four Leak-Proof batteries, 3/4 extra. All Components Available Separately.

LASKY'S FIRST AGAIN!

Now offer to the Home Constructor - full short wave coverage

The SKYROVER and the SKYROVER DE LUXE



The SKYROVER de luxe

Tone Control Circuit is incorporated, with separate Tone Control in addition to Volume Control, Tuning Control and Waveband Selector. 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. Also car aerial socket fitted. Can be built for **£12.19.6** P. & P. 5/- extra

GENERAL SPECIFICATION:

7 transistor plus 2 diode superhet. 6 waveband portable receiver. Operating from four 1.5 torch batteries.

The SKYROVER and SKYROVER DE LUXE covers 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 heart 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.

SPECIFICATIONS:

Superhet, 470 Kc/s. All Mullard Transistors and Diode. Uses 4-U2 batteries. 5in. Ceramic Magnet P.M. Speaker. Easy to read Dial Scale. Band Spread Tuning. Telescopic Aerial & Ferrite Rod Aerial. **WAVEBAND COVERAGE:** 180-576M; 31-94M and Band Spread on 13, 16, 19 and 25 metre Bands.

"SPRITE"

Can be built for

7/9/6

P. & P. 3/6 extra.



★ Six-Transistor Superhet Miniature Personal Pocket Radio. ★ Long and Medium wavebands. ★ Ferrite Rod aerial. ★ I.F. Frequency 470 Kc/s. ★ 3in. Speaker. ★ Printed circuit 2 1/2 x 2 1/2 in. ★ Slow Motion Drive. ★ In Plastic Case, Size 4 x 2 1/2 x 1 1/2 in. In order to ensure perfect results, the SPRITE is supplied to you with R.F. and I.F. stages. Driver and Output stages ready built with all components mounted on the printed circuit. The SPRITE pre-assembled, plus cabinet, speaker and all components for final construction, at the inclusive price of **7/9/6** P. & P. 3/6 extra. Data and instructions separately 2/6. Refunded if parcel is purchased. *Real calf leather case! wriststrap, personal earphone and case for earphone and battery 12/6 the lot extra.* Make no mistake this is a SUPERHET receiver of genuine commercial quality. It is not a regenerative circuit.

"COROVER"

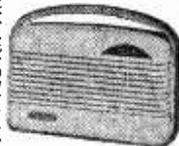
'SIX'

★ A 6-transistor plus 2-diode superhet. ★ I.F. 470 Kc/s. ★ Covers the full, medium and long wave bands. ★ Sockets for personal earpiece or tape recorder and car radio aerial. Uses MULLARD Transistors, Diode and large internal ferrite rod aerial. ★ Uses four 1.5 v. pen torch batteries. ★ All components on a single printed circuit. Simple stage by stage instructions. ★ Cabinet size 6 1/2 x 4 x 1 1/2 in. With carrying handle. ★ All coils and I.F.'s ready wound. **ALL COMPONENTS AVAILABLE SEPARATELY.** Data and instructions separately 2/6. Refunded if you purchase the parcel. **CAN BE BUILT FOR £5.7.6** P. & P. 4/- extra. Batteries 1/4.



"REALISTIC" Seven

★ 7-transistor Superhet. ★ 350 milliwatt output into 4in. high flux 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 handle, size 7 x 10 x 3 1/2 in. in Red/Grey, Blue/Grey or all Grey. ★ Easy to read Dial. ★ External socket for car aerial. ★ I.F. Frequency 470 Kc/s. ★ Ferrite rod internal aerial. Operates from PP9 or similar battery. ★ Full comprehensive data supplied with each receiver. ★ All coils and I.F.'s etc. fully wound ready for immediate assembly. An Outstanding Receiver. LASKY'S PRICE for the complete parcel including Transistors, Cabinet, Speaker, etc., and Full Construction Data. **£5.19.6** P. & P. 4/6. PP9 Batt. 3/9. Data and instructions separately 2/6. Refunded if you purchase the parcel.



PRIVILEGE PARCELS

A "Privilege Parcel" allows you to purchase the Audio System of your choice at a worth while cash saving. Some examples are listed below, but we shall be pleased to quote our "Privilege Parcel" Prices for any selection of equipment of your own choice. Send us details of your requirements.

Tudor Stereo Amp-ifier £15.0.0	Tudor Stereo Amp-ifier £15.0.0	Collaro Studio Tape Deck, 1-track model £10.10.0	Collaro Studio Tape Deck, 1-track model £13.19.6
Connoisseur Craftsman, 2-speed transcription player £12.9.6	Braun PC4L Stereo Transcription Unit £12.9.6	Lasky's Tape Amplifier £3.19.6	Martin Tape Amplifier, 1-track model £12.12.0
Decca PFSS Stereo Pick-up £18.18.0	2 x Sharon Loud-spkr systems £19.19.0	Portable Case with Speaker £5.5.0	
Total £50.4.8	Total £47.8.6	Total £24.0.0	Total £31.16.6

"Privilege Parcel" Price: £47.10.0.

"Privilege Parcel" Price: £45.0.0.

"Privilege Parcel" Price: £22.10.0

"Privilege Parcel" Price: £30.0.0.

Carriage and Packing on all the above parcels, 10/6 extra.

REALISTIC Seven DE LUXE

By popular request a De Luxe version of the well-proven Realistic "Seven" now available. With the same electrical specification as standard model—PLUS A SUPERIOR WOOD CABINET IN CONTEMPORARY STYLING, covered in attractive washable material, with super-chrome trim and carrying handle. Also a full vision circular dial, externally mounted to further enhance the pleasant styling. ALL FOR ONLY **£1** EXTRA. P. & P. as for Std. model

GIGANTIC STOCKTAKING CLEARANCE SALE!

THOUSANDS OF BARGAINS AT GIVE-AWAY PRICES

Stock No. 101—Few Only MAINS BURG-ALARMS. With complete set of door and window microswitches and Connecting Wire etc. Advertised at 7/6s. OUR PRICE to clear 3/6, plus 3/- P. & P.

Stock No. 102—BRASS RIGHT ANGLE BRACKETS, drilled with 2 holes. Approximately 1in. square. Only 8d. a pair.

Stock No. 103—9 ONLY ELECTRIC SHOE BRUSHES. To clear 8/6, plus 1/6 P. & P.

Stock No. 104—MINIATURE MEDIUM WAVE TUNING COILS with reaction winding. Clearance price 2/- each, plus 6d. P. & P.

Stock No. 105—39 ONLY PRECISION CAMERAS. Takes 127 film. To clear 8/6 each, plus 1/6 P. & P.

Stock No. 106—193 ONLY MINIATURE PLASTIC RADIO CABINETS, complete with Chrome carrying handles, Dial & P tuning knob. Size 5 1/2 x 3 1/2 x 1 1/2 in. Clearance price only 5/6, plus 1/- P. & P.

Stock No. 107—PRINTED CIRCUITS of 3 Transistor Reflex Radio made to fit above radio, 2/6, plus 1/6 P. & P.

Stock No. 108—MINIATURE PRINTED RADIO CABINETS, 5 x 3 1/2 x 2 1/2 in., 3/6 each to clear, plus 6d. P. & P.

Stock No. 109—BEAUTIFUL MINIATURE PLASTIC RADIO CABINET, size 5 x 3 x 1 1/2 in. Printed and ready drilled. OUR PRICE 3/6, plus 1/- P. & P.

Stock No. 110—MINIATURE PLASTIC RADIO CABINETS unprinted. Size 3 x 2 1/2 x 1 1/2 in., 2/6 each to clear, plus 6d. P. & P.

Stock No. 111—BEAUTIFULLY MOULDED MINIATURE PLASTIC RADIO CABINETS, complete with tiny carrying handle and tuning knob. Size 4 x 2 1/2 x 1 1/2 in. Price to clear 3/6, plus 1/- P. & P.

Stock No. 112a—Specially Printed Circuits for above cabinet of two transistor reflex radio, 2/6, plus 6d. P. & P.

Stock No. 112b—EXCEPTIONALLY GOOD LOOKING PLASTIC RADIO CABINETS "SLIM LINE". Size 6 x 3 x 1 1/2 in. Clearance price 5/6, plus 9d. P. & P.

Stock No. 113—40 ONLY BLACK CRACKLE ETHER INSTRUMENT TYPE RADIO CABINETS. Size 6 1/2 x 5 x 3 1/2 in. SPECIAL PRICE, 6/6, plus 1/6 P. & P.

Stock No. 113a—BEAUTIFUL BLACK & GOLD READY DRILLED FRONT RADIO PANELS TO GO WITH THESE 5/-, plus 1/- P. & P.

Stock No. 114—MINIATURE RADIO CABINETS IN GOLD but undrilled. Size 4 1/2 x 3 x 1 1/2 in. Give away price of 2/6, plus 6d. P. & P. Special carrying cases for above at 1/6, plus 6d. P. & P.

Stock No. 115—ELECTRIC RADIO CABINETS same as specified as above but upright design, 2/6, each, plus 6d. P. & P.

Stock No. 115a—Special carrying case for above at 1/6, plus 6d. P. & P.

Stock No. 116—ANOTHER TYPE RADIO CABINET, horizontal, 2/6 each, plus 6d. P. & P.

Stock No. 125—BRAND NEW MAGNETIC DEAF AID TYPE EARPIECES, complete with Plug and Socket. 300 ohms. OUR SPECIAL PRICE 5/-, plus 6d. P. & P.

Stock No. 128—BRAND NEW CRYSTAL DEAF AID TYPE EARPIECES. Our price 4/-, plus 6d. P. & P.

Stock No. 127—DECORATIVE SPEAKER GRILLS 2in. diameter, 3 for 1/-, plus 6d. P. & P.

Stock No. 128—4in. PLASTIC CARRYING HANDLES with fixing screws, 6d. each, plus 6d. P. & P.

Stock No. 129—BRAND NEW ASSORTED RADIO KNOBS including pointer types, 6/- a doz, plus 3d. P. & P.

Stock No. 169.

"VOLKSRADIO" POCKET RADIO

ONLY 19/6

Take - Over Bid makes this the most fantastic Offer possible - the beautifully compact "5 Star Volkstradio" measuring 4 1/2 x 2 1/2 x 1 1/2 in. receives perfectly in the bedroom, office, garden - over all medium waves (incl. Luxembourg). Under 1d. hour running cost. Anyone can assemble it in 1 or 2 hours using our simple A B C plan. Complete set of parts. Only 19/6, plus 2/6 P. & P. C.O.D. extra. (Parts can be bought separately).



Stock No. 130.

SELL SAFETY TO THE MOTORIST

BRAND NEW BOXED AUTOMATIC CIGARETTE LIGHTERS. Heavy chrome finish, holding 10 cigarettes and issues ready lit cigarettes. Works off 6 or 12 volts. Special clearance price 10/6, plus 1/6 P. & P.

Stock No. 117—477 SUB-MINIATURE TRANSISTOR RADIO CASES (Plastic, undrilled). Size only 1 1/2 x 1 1/2 x 1/2 in. To clear 1/- each, plus 6d. P. & P.

Stock No. 118—SPRING TERRY CLIPS for holding Miniature Valves. Price for 3 1/-, plus 6d. P. & P.

Stock No. 119—72 ONLY MINIATURE 6 TAG COILS covering Medium Wave and Long Wave with reaction winding. Price to clear 3/- each, plus 6d. P. & P.

Stock No. 120—SIMILAR TO ABOVE but Medium Wave only 2/- each, plus 6d. P. & P.

Stock No. 131—15 ONLY ELECTRIC VIBRATORY MASSAGERS. Brand new and boxed, complete with all accessories. To clear 15/-, plus 2/- P. & P. (Need attention).

Stock No. 132—WANDER PLUGS. New and unused. 2/- doz., plus 6d. P. & P.

Stock No. 133—5 ONLY BATTERY SHAVERS. Rotary action. Brand new. To clear, 30/-, plus 2/- P. & P.

Stock No. 134—5 ONLY MOVING COIL LOUD-SPEAKERS. Brand new, 3 ohms, 14/-, plus 2/6 P. & P.

Stock No. 135—83 ONLY STANDARD PLASTIC "CELLING SWITCHES, two way, cord operated. Clearance price 2/6, plus 1/- P. & P.

Stock No. 136—MINIATURE PUSH BUTTON SWITCHES. Brand new. Our price 8d. each, plus 4d. P. & P.

Stock No. 137—BRAND NEW TRIMMERS "WILKIN", 250 p.p. To clear 1/- each, plus 4d. P. & P.

Stock No. 138—MINIATURE ACORN VALVES. Type 954. 8d. each, plus 6d. P. & P.

Stock No. 139—6K7G BRAND NEW VALVES, 2/6, plus 9d. P. & P.

Stock No. 140—6V6G VALVES., 6/6, plus 9d. P. & P.

Stock No. 141—114 BRAND NEW VALVES, 2/6, plus 6d. P. & P.

Stock No. 142—BRAND NEW B7G VALVE HOLDERS, 6d., plus 4d. P. & P.

Stock No. 143—295 ONLY MINIATURE PRECISION "MINNETTA" SPY CAMERAS complete with 6 rolls of film and real leather carrying case. Size 2 1/2 x 1 1/2 x 1 1/2 in. Price to clear 20/- each. Post Free.



Stock No. 144—BRAND NEW 2 1/2 in. MOVING COIL LOUDSPEAKERS. SPECIAL PRICE 9/6, plus 1/6 P. & P. 30 ohms.

Stock No. 145—BRAND NEW ASSORTED RESISTORS in packets of 100, 6/-, plus 6d. P. & P.

Stock No. 146—4 PIN BATTERY PLUGS. (Fits Ever Ready Batteries B114 etc.), 5 for 1/-, plus 3d. P. & P.

Stock No. 147—4 PIN SOCKET PANELS to fit above, 3 for 1/-, plus 3d. P. & P.

Stock No. 148—2 PIN BATTERY PLUGS, 6 for 1/-, plus 3d. P. & P.

Stock No. 149—FERRITE RODS 6 1/2 in. long by 1/2 in. diameter. Price 1/6, plus 1/- P. & P.

Stock No. 150—4 WAY SOCKET STRIPS. Takes Standard Wander Plugs, 3 for 1/-, plus 3d. P. & P.

Stock No. 151—BRAND NEW "PLESSEV" MOVING COIL SPEAKERS. 2 1/2 in. 60 ohms. Matches Transistor Direct—No O.P.T. needed. Special price 12/6, plus 1/6 P. & P.

Stock No. 152—BRAND NEW H.F. TRANSISTORS. (Equivalent to OUY1). OUR PRICE 2/9, plus 3d. P. & P.

Stock No. 153—BRAND NEW "EDISWAN" I.P. TRANSISTORS TESTED, 1/6, plus 3d. P. & P.

TERMS OF BUSINESS

C.O.D. 2/6 extra regret No. C.O.D. under £1. Add extra postage for overseas. Special prices for quantity and the Trade. All goods guaranteed. Components, technical books, Hi-Fi by Leak, Jans, Loetz, Quad, etc. etc. Bend S.A.E. for quotation or with any enquiry.

Stock No. 121—MEDIUM WAVE LOOPSTICK COILS with Variable Tuning Core, 73 only. To clear 2/6 each, plus 6d. P. & P.

Stock No. 122—FEW ONLY VARIABLE TUNING CONDENSERS (Mica-Dielectric)—.0005 mid., 3/6, plus 6d. P. & P.

Stock No. 123—173 RADIO DIALS. Printed, Medium and Long Wave, Square Shape. Size 4 1/2 x 3 1/2 in. with central hole. Price 1/6, plus 3d. P. & P.

Stock No. 124—SUB-MINIATURE DIODES, all brand new and tested. Clearance price 3 for 1/-, plus 3d. P. & P.

Stock No. 170 TRANSISTOR POCKET RADIOS

BULK PURCHASE ENABLES US TO MAKE THIS FANTASTIC OFFER —AND WITH MONEY BACK GUARANTEE! "THE MAN FROM..." so named that it brings the voices of star entertainers and vocalists dramatically to life—in your home, office, etc. Only 4/- x 2 1/2

ONLY 28/6
No More To Pay. x 1 1/2 in. Fits easily Complete set of parts into your pocket or handbag. Works for months on 1 1/2 battery. Should last a lifetime, anyone can assemble it in an hour or two with our easy plan. Complete set of parts including miniature speaker, carrying case—everything only 28/6, plus 6 P. & P. C.O.D. 2/6 extra. (Parts can be bought separately.) Limited period—so rush your order before its too late. DEMONSTRATIONS DAILY.

Stock No. 154—BRAND NEW MINIATURE ELECTROLYTIC CONDENSERS 100 mfd. 12V. Our price 2/- each, plus 6d. P. & P.

Stock No. 155—30 MFD. 12V. condensers, 1/8 each, plus 6d. P. & P.

Stock No. 156—24 MFD. 25V. condensers, 1/8 each, plus 6d. P. & P.

Stock No. 157—16 MFD. 30V. condensers, 2/- each, plus 6d. P. & P.

Stock No. 158—12 MFD. 50V. condensers, 2/- each, plus 6d. P. & P.

Stock No. 159—10 MFD. 12V. condensers, 1/8 each, plus 6d. P. & P.

Stock No. 160—5 MFD. 50V. condensers, 1/9 each, plus 6d. P. & P.

Stock No. 161—4 MFD. 100V. condensers, 2/- each, plus 6d. P. & P.

Stock No. 162—BRAND NEW SUB-MINIATURE ELECTROLYTIC CONDENSERS. 100 MFD. 12V., 2/- each, plus 6d. P. & P.

Stock No. 163—BRAND NEW ASSORTED CONDENSERS 50 pf., to .01 mfd., 25 for 7/6, plus 1/- P. & P.

Stock No. 164—SPECIAL OFFER OF HOME CONSTRUCTED RADIOS NEEDING ATTENTION. Filled with components in good condition.

Stock No. 164a—TYPE (A) 3 Transistor printed circuit radios in Beautiful Miniature Cases. Size 5 1/2 x 3 1/2 x 1 1/2 in. Price 10/-, plus 2/- P. & P.

Stock No. 164b—TYPE (B) 2/3 Transistor. Size 4 1/2 x 3 x 1 1/2 in. Price 5/- each, plus 1/- P. & P. & Brand new 2 1/2 in. Miniature Coil Speakers, worth 1/-, given free with every order for five.

Stock No. 164c—TYPE (C) Transistor Printed Circuit reflex Radios in beautifully Moulded Case. Size 4 x 2 1/2 x 1 1/2 in. Price 10/-, plus 1/6 P. & P.

Stock No. 164d—TYPE (D) Miniature Valve Radios in plastic case. Price approximately 4/- x 3 x 1 1/2 in. Price 5/-, plus 1/6 P. & P.

Stock No. 164e—TYPE (E) 20 only. Valve Radios in small Fibre attache cases. Size 7 x 5 x 2 1/2 in. Price 22/6, plus 2/6 P. & P.

Stock No. 165—SURPRISE PARCEL TYPE (a). Assorted components. Price 5/-, plus 1/6 P. & P.

Stock No. 166—SURPRISE PARCEL TYPE (b). Containing 3 times the above components. Price 12/6, plus 1/6 P. & P.

Stock No. 167—GIGANT SURPRISE PARCEL TYPE (c). Price 15/-, plus 2/- P. & P.

Stock No. 168—SPECIAL CLEARANCE OF FULLY GUARANTEED BRAND NEW "BENKSON" GOLD FRONT 6 TRAN-SISTOR SUPERBET RADIOS. Complete with real leather carrying case. Personal. Earpiece, Battery. All in Beautiful Presentation Boxes. Only 75/-, plus 2/6 P. & P. 74 Only. Advertised at 85.6.0, recently Last 74—No more available.

CONCORD ELECTRONICS (Dept. 14/19) 210 Church Road, Hove, Sussex

PERSONAL CALLERS WELCOME:— Open 8.30 a.m. until 1 p.m. and 2 p.m. until 5.30 p.m. Saturdays: 8.30 a.m. until 4 p.m. Demonstrations Daily.

UNIVERSAL AVOMETERS



Guaranteed perfect working order. Supplied complete with leads, batteries and instructions. Model "D" 34 range £8.19.6 Model "D" 50 range £11.0.0 Registered Post 5/- extra.

COSSOR 1035 DOUBLE OSCILLOSCOPES
Available in excellent condition, fully checked, £45 each. Carr. 30/-.

MICROAMMETERS
0-500 microamps. 2 1/2 in. circular flush panel mounting. Dials engraved 0-15. 0-600 volts. BRAND NEW. BOXED. 15/-, P. & P. 1/6.
230/250 VOLT A.C. MOTORS
4 1/2 x 3 1/2 in. dia. 90 watts, 5,000 r.p.m. 1/2 in. spindle. Brand New, £2/6 each. P. & P. 2/-.

FIELD STRENGTH METERS
Frequency coverage 1 to 250 Mc/s. Fitted with 200 micro-amp meter. Supplied with telescopic aerial, ear-piece and instructions. 69/6 post paid.

FIELD TELEPHONES TYPE "F"
Suitable for many applications. Generator bell ringing. 2 line connection. With batteries and wooden carrying case, fully tested. £4.19.6 per pair. Carr. 5/-.

HEAVY DUTY AUTO TRANSFORMERS
0-115-230 volt step up or step down. Brand New, boxed. Ex U.S.A. 3,000 watt, £7.10.0. carr. 10/- 7,500 watt, £15, carr. £1.

MINIFLUX TAPE HEADS
Set of three, record, playback, erase. Only 69/6 set. P. & P. 9d.

PANEL METERS

1000µA	2 1/2" F.M. D.C.	42/6
1000µA	3 1/2" F.M. D.C.	62/6
1 mA	2 1/2" F.M. D.C.	25/-
30 mA	2 1/2" F.M. D.C.	12/6
30/0/30 mA	2 1/2" F.M. D.C.	9/6
350 mA	2 1/2" F.M. D.C.	10/6
15 amp.	2 1/2" F.M. D.C.	39/6
5/0/5 amp.	3 1/2" F.M. D.C.	25/-
300 v.	2 1/2" Proj. A.C.	19/6
300 v.	2 1/2" F.M. A.C.	25/-
500 v.	2 1/2" F.M. A.C.	25/-
120 v.	3 1/2" F.M. D.C.	32/6

Postage extra.

SILICON RECTIFIERS
400V. p.i.v. 4.7 amp 7/8
200V. p.i.v. 6 amp 5/6
800V. p.i.v. 500 mA 5/6
400V. p.i.v. 500 mA 3/6
70V p.i.v. 1 amp. 3/6
OA 202 miniature silicon rectifiers 1/- each.
Discount for quantities.
Please add postage.

R.C.A. AR.88 D. RECEIVERS



New release, limited number available. Frequency coverage 650 Kc/s to 32 Mc/s on 6 bands. Operation 110/230 volts A.C. Offered in excellent used condition, fully checked and guaranteed perfect order. £45 each. Carr. £2.

P.C.R.2 COMMUNICATION RECEIVERS
Excellent performance for modest outlay. Frequency coverage on three bands 800-2,000 metres, 190-550 metres, 6-22 Mc/s. Output for phone or speaker. Supplied in perfect condition £25.19.6 each. Carr. 10/- The receiver can be supplied with an internal power supply to operate on 200/250 volt A.C. at 39/6 extra or plug in external power supplies are 35/- extra. Full circuit supplied.

AVO WIDE RANGE SIGNAL GENERATORS
Frequency coverage 50 Kc/s to 80 Mc/s in six turret operated ranges. For use on standard A.C. mains. Packed in original transit cases with accessories. Supplied in as new condition, fully checked before despatch. £15. Carriage 10/-.

NATIONAL H.R.O. RECEIVERS

SENIOR MODEL. Supplied complete with full set of 9 coils covering 60 Kc/s. to 30 Mc/s. Each receiver thoroughly checked and available as follows—
TABLE MODEL. As new condition £26. TABLE MODEL. Good used condition £19.10.0
RACK MODEL. As new condition £22.10.0
RACK MODEL. Good used condition £18.18.0
N/B—Rack model is identical to table model with extended front panel to fit a 19in. rack. Carriage £1 extra.
200/250 volt A.C. power supplies for all above receivers, also sold separately. 59/6, carr. 5/-.

HALLICRAFTER S-36 V.H.F. RECEIVERS
F.M./A.M. 27-143 Mc/s. 110 volt A.C. (transformer supplied for 230 v. A.C.) Improved version of S-27. Tested before despatch. Brand new boxed with instruction manual. **£40** each Carr. £2

LAFAYETTE BRAND TAPES

First grade quality, brand new guaranteed. Discounts for bulk purchases.
5in. 900ft. std. .. 9/6
5in. 900ft. L.P. .. 10/-
5in. 900ft. L.P. "Super Mylar" 12/6
5in. 1200ft. D.P. .. 15/-
7in. 1200ft. std. .. 12/6
7in. 1800ft. L.P. .. 15/-
7in. 1800ft. L.P. "Super Mylar" 20/-
7in. 2400ft. D.P. .. 25/-
Post 2/- Over £3 post paid.

MULTIMETERS BRAND NEW—FULLY GUARANTEED LOWEST EVER PRICES

Supplied with Leads, Batteries and Instructions.

1,000 Ω/VOLT	20,000 Ω/VOLT
0/15/150/1,000 v. A.C. and D.C.	0/10/50/250/500/1,000 v. A.C. and D.C.
0/150 mA D.C.	0/500µA/0/25/500 mA, D.C.
0/100 K Ω etc.	0/50K/500K/5 meg., etc. 97/6 P. & P. 2/6.
39/6 P. & P. 1/6.	

30,000 Ω/VOLT
0/1/1/10/50/250/500/1,000 v. D.C.
0/10/50/250/500 v. A.C.
0/500µA/0/10/250 mA, D.C.
0/10K/1 meg./10 meg., etc. £5.10.0. P.P. 2/6.

30,000 Ω/VOLT
0/1/1/2/10/25/100/250/500/1,000 v. D.C. and A.C.
0/500µA/5/50/500 mA/0/12 amp. D.C.
0/60K/6 meg./60 meg., etc. £8.17.6. Post paid.
30,000 Ω/VOLT
0/10/50/250/500/1,000 v. D.C. and A.C.
0/25µA/2.5/25/250mA D.C.
0/10K/100K/1 meg./10 meg., etc. £7.10.0. P.P. 2/6.

100,000 Ω/VOLT
5/2.5/10/50/250/500/1,000 v. D.C.
2.5/10/50/250/1,000 v. A.C.
10/25µA/2.5/25/250 mA/10 amp. D.C.
20K/200K/2 meg./20 meg. ohm, etc. £8.19.6. Post paid.

Hours of Business: 3 LISLE STREET, 9 a.m.—6 p.m. Half Day Saturday
34 LISLE STREET, 9 a.m.—6 p.m. Half Day Thursday

MARCONI

CR 100/8 RECEIVERS BRAND NEW

Packed in original transit cases and complete with handbook/manual. 60 Kc/s to 30 Mc/s. 200/250 volt A.C. operation. Tested before despatch.

£35 Carriage £2.

A few CR.100 receivers available in good used condition. £21. Carr. 5/-.

COLLARO/MAGNAVOX STUDIO TAPE DECKS

Latest 1963 model. Fitted with latest bradmatic heads and interlock button. Brand new, guaranteed, with instructions and fixings. £10.10.0. Carr. 5/-.

MINE DETECTOR NO. 4A

Will detect all types of metals. Fully portable. Complete with instructions. 39/6 each. Carr. 10/- Battery 8/6 extra.

MODEL RX60 AMATEUR COMMUNICATION RECEIVER

Four bands, 550 Kc/s-30 Mc/s. Special features, S meter—audio-electrical band spread—internal 5 in. speaker—head set socket—tone control—standby switch—3 aerials, loop, wire, telescopic—200-250 volt. A.C. Brand new, guaranteed with manual £24.15.0 each. Post paid.

L.T. METAL RECTIFIERS

All full wave, bridge connected. Brand new.
12/18V. 1.5A. 3/9 24/36V. 6A. 27/6
12/18V. 2.5A. 6/3 24/36V. 15A. 45/-
12/18V. 4A. 8/6 36/48V. 2A. 19/6
12/18V. 6A. 12/3 36/48V. 4A. 29/6
12/18V. 10A. 22/6 36/48V. 6A. 32/6
12/18V. 15A. 31/6 48/60V. 2A. 21/-
24/36V. 1A. 7/3 48/60V. 10A. 82/6
24/36V. 2A. 13/6
Please add postage.

L.T. TRANSFORMERS

All primaries tapped 200/250 volts 1 Battery Charging. 3.5, 9 or 17 volt, 1 amp., 9/8. Ditto 2 amp., 1/4/3. Ditto 4 amp., 16/6. 9 or 17 volt, 6 amp., 26/-
2 Model Type 3, 4, 5, 6, 8, 10, 12, 15, 18, 20, 24 or 30 volt, 2 amp., 18/6. Ditto 4 amp., 30/-, Ditto 8 amp., 37/6. Add Postage.

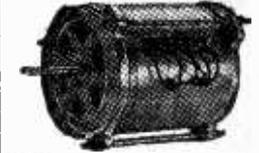
FIELD TELEPHONES TYPE "L"

Generator bell ringing, two line connection. Supplied complete with batteries, ready for use, 69/6 per pair. Carriage 5/-.

MINIATURE PANEL METERS

For 1 1/2 in. dia. panel hole.
0-50µA 39/6 0-1 mA 27/6
0-500µA 32/6 0-5 mA 27/6
0-300 v. D.C. 27/6
"S" meter 25/-

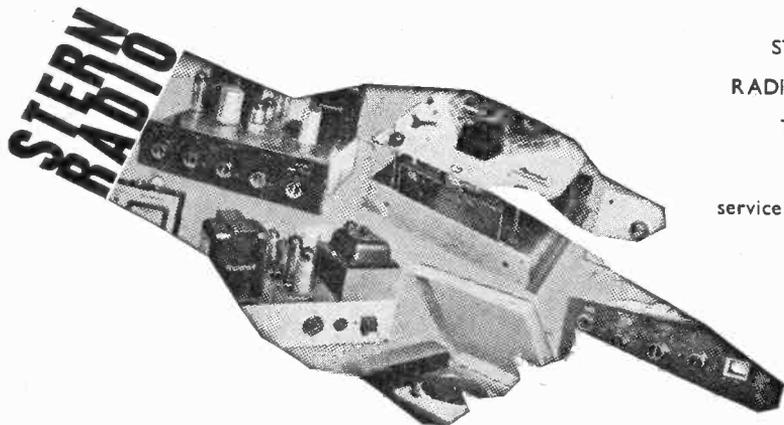
TWIN MOTOR BARGAIN



200/250 volt A.C. Twin concentric spindles operated independently. Either motor reversible. 1440 r.p.m. Brand New. Boxed. Only 12/6 each. P. & P. 2/6.

G.W. SMITH & CO (RADIO) LIMITED
Phone: GERRARD 8204/9155
Cables: SMITHEX LESQUARE
3-34 LISLE STREET, LONDON, W.C.2

Important



STERN RADIO LTD., CLYNE
RADIO LTD., PREMIER RADIO—

Three well-known names with
a reputation for quality and
service announce their amalgamation
into STERN-CLYNE LTD.

STERN—

Stern

HOW THIS WONDERFUL NEWS BENEFITS YOU

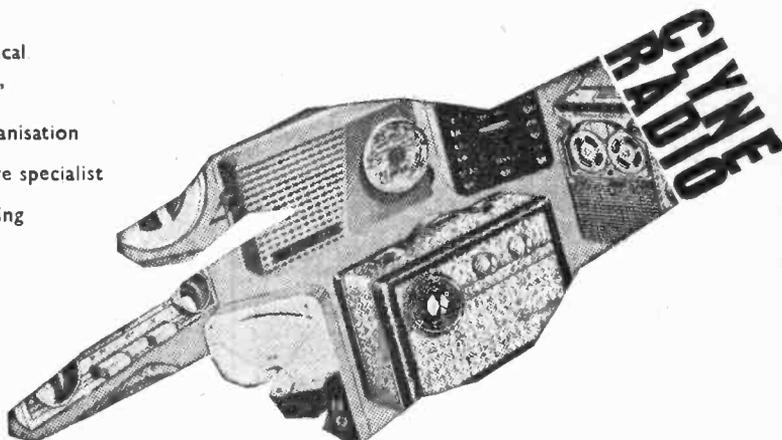
- STERN-CLYNE means a wider range of exclusive equipment available from one source, including our speciality—MULLARD DESIGNS—for the home constructor or ready assembled.
- STERN-CLYNE buying power means competitive prices.
- STERN-CLYNE offers the finest possible range of equipment and components by all leading manufacturers.
- STERN-CLYNE carry a comprehensive range of transistors, miniature components and transistor radios.
- STERN-CLYNE retail shops, showrooms and demonstration rooms throughout London and the provinces all carrying extensive stocks.
- STERN-CLYNE Mail Order Service—geared to give prompt and efficient attention.
- STERN-CLYNE Hire Purchase facilities available on orders of £10 and over.
- STERN-CLYNE Hi-Fi advisory service to help you in choosing the right equipment.
- STERN-CLYNE after sales service—complete satisfaction guaranteed.

VISIT US ON STAND No. 12 AT THE RADIO COMMUNICATIONS EXHIBITION

Great Britain's Greatest

announcement!

Combined resources, technical knowledge and over 50 years' experience gives you an organisation offering a fully comprehensive specialist service in the rapidly expanding world of electronics.



CLYNE

LIMITED

VISIT YOUR NEAREST STERN-CLYNE BRANCH

WEST END:	18 Tottenham Court Road, W.1. 23 Tottenham Court Road, W.1. 309 Edgware Road, W.2	MUSEum 5929/0095 MUSEum 3451/2 PADdington 6963
CITY:	109 Fleet Street, E.C.4.	FLEet St. 5812/3
NORTH LONDON:	162 Holloway Road, N.7.	NORth 8161/5
SOUTH LONDON:	9 Camberwell Church Street, S.E.5.	RODney 2875
CROYDON:	12 Suffolk House, George Street.	MUNicipal 3250
BRISTOL:	26 Merchant Street, Bristol 1 (open early Oct.)	Bristol 20261
MANCHESTER:	10 Withy Grove, Manchester 4.	BLAck Friars 5379

Mail Orders and enquiries to Dept. P.W.

162 Holloway Road, London, N.7. NORth 8161/5

SEE FOLLOWING PAGES FOR DETAILS OF STERN-CLYNE PRODUCTS

Electronic Hobbies Organisation

STERN-GLYNE

INTRODUCTION OFFER!! Available Shortly



FOR ONLY **48 gns** Plus 15/- Pkg. & Carr.

THE TUDOR STEREO HI-FI SYSTEM, comprising a Self Powered AM/FM Tuner, Stereo Pre-amplifier, 12 watt per channel Stereo Power Amplifier. The Tuner and Pre-amplifier are housed in matching black crackle finish metal cabinets for shelf mounting, with silver metal dials and matching knobs. Specifications: Tuner—

Outstanding quality providing full VHF/FM long and medium waveband coverage, frequency range FM 87.5-108.5 Mc/s, AM/MW 522-1830 Kc/s, LW 145-270 Kc/s, 100mV output, mains supply 105/240 A.C. Valve line-up: ECC85, EC81, EBF89, EF80, EB91, EM84, ECC83. Multiplex outlet provided. Pre-Amplifier—Designed for use with the Tudor Stereo Power Amplifier with inputs for most types of Pickups, direct play from Tape-Heads and ample sensitivity for either Crystal or Moving Coil Microphone. Distortion 0.1%, tape outputs 100mV from 30 K.ohm source, inputs—Microphone 5 mV, Tape 5.3 mV, R.I.A.A. 4.3 mV, flat 250 mV, Tuner 100 mV. Valve line-up: 2—EF86, 4—ECC83. Power Amplifier—14 watts per Channel, sensitivity 1 volt r.m.s. for 14 watts output, frequency response = 0.5db/20 c/s.—20 Kc/s. Speaker impedance 4, 8 or 16 ohms, surplus power available for Tape Pre-Amp, mains supply 105/240 v. A.C. valve line-up, 2—ECC83, 4—EL84, 1—GZ34.

MULLARD 3-VALVE PRE-AMPLIFIER TONE CONTROL UNIT

Designed mainly for Mullard Range of Amplifiers, also suitable for any Amplifiers requiring input up to 250mV. Incorporates 5 input Channels, including for Tape and Magnetic Pickups, Separate Bass and Treble controls. High pass filter 20 to 150 c/s. low pass filter 5-3 Kc/s. Totally enclosed in case size 11 1/2" x 4 1/2" x 4". **£10.0.0** (Carr. & ASSEMBLED **£13.13.0** KIT OF PARTS Ins. 5/-) AND TESTED

MULLARD "5-10" MAIN AMPLIFIER

For use with MULLARD 2 or 3 valve pre-amplifiers with which an undistorted power output of up to 10 watts is obtained. SPECIFIED COMPONENTS AND MULLARD VALVES including PARTRIDGE MAINS TRANSFORMER and choice of PARMEKO or PARTRIDGE Output Transformer. **£10.0.0** COMPLETE KIT (Parmeko Output Trans). ASSEMBLED AND TESTED **£13.10.0**

ABOVE incorporating PARTRIDGE OUTPUT TRANS. **£16.0.0** extra. Instruction book and detailed price list available separately at 2/- Post Free.

THE MULLARD 5-10RC AMPLIFIER

The popular complete "5-10" incorporating Passive Control Unit providing up to 10 watts high quality reproduction with input of 600 mV. Specified components and new MULLARD VALVES. Includes PARTRIDGE MAINS TRANSFORMERS and choice of PARMEKO or PARTRIDGE Output Transformers. Surplus Power available for Tuner. **£12.0.0** COMPLETE KIT (Carr. & Ins. 6/6). ASSEMBLED AND TESTED **£16.0.0** (Carr. & With PARTRIDGE OUTPUT TRANS. **£16.0.0** extra. Instruction book and detailed price list available separately at 2/- Post Free.

THE MULLARD 3-3RC

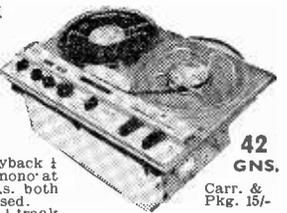
A HIGH QUALITY AMPLIFIER DEVELOPED FROM THE VERY POPULAR 3-WATT MULLARD "3-3" DESIGN. **£8.8.0** KIT OF PARTS ASSEMBLED AND TESTED **£11.10.0** Complete to the MULLARD specification including PARMEKO OUTPUT TRANSFORMER. Switched inputs for 78 and L.P. records plus a Radio position. Extra power to drive a Radio Tuning Unit is also available. (Carr. & Ins. 6/6). Please state L.S. Impedance. Instruction book and detailed price list available separately at 2/- Post Free.

THE "MONO-GRAM"

A small Amplifier of genuine high quality performance. Incorporates MULLARD ECL86 Valve, separate BASS and TREBLE controls, PARTRIDGE output Transformer producing up to 3 watts undistorted output. (Carr. & Ins. 3/6). Kit of Parts **£4.10.0** Assembled and Tested **£6.0.0** Instruction book and detailed price list available separately at 2/6 Post Free.

STEREO TAPE DECK WITH BUILT IN PRE-AMPLIFIER

A professional addition to your Hi-Fi Stereo System consisting of two basic Units, the Tape Deck and Pre-amplifier, which employs 4 Transistors and 4 Valves. The Unit will record and playback 1 track stereo or 1 track mono at either 7 1/2 i.p.s. or 3 1/2 i.p.s. both speeds being fully equalised. Features: Track System: 1 track 2 channel stereo or monaural record and playback. Independent single channel recording on either channel while playback on other channel. Head Type: 1 track 2 channel in-line stereo and associated erase heads. Low loss laminated pole pieces. Level Indicators: 2 Meters, 1 per channel. Digital Counter: 3 digit tape position indicator. Automatic Stop: When tape runs out or breaks. Inputs: Microphone 1mV (50k ohms impedance) Gram/Tuner 50mV (high impedance). Output: (cathode follower). Monitor Sockets: 2 x 5K. ohms impedance. Audio Output: 500mV. Oscillator: Pushpull 80kc. S/N Ratio: —45db or better at 7 1/2 tape speed. Speed: 45db or more between stereo channels. Frequency Response: 40 to 15,000 cycles per sec. at 7 1/2 i.p.s., 40 to 9,000 cycles per sec. at 3 1/2 i.p.s. Single Motor: 4 pole heavy duty induction type. Power Supply: 240V A.C. 50 cycles. Size: 6 1/2" x 10 1/2" x 15". Tape Size: 1-1/2" to 7". Line Up: 4-2SB173 Transistors, 2-12AT7, 1-12AU7, 1-12BH7 Valves.



42 GNS. Carr. & Pkg. 15/-

MULLARD 2-VALVE PRE-AMPLIFIER TONE CONTROL UNIT

Employing two EF86 valves and design to operate with the Mullard AMPLIFIERS, but also perfectly suitable for other makes with input up to 250 mV. ★ Equalisation for the latest R.I.A.A. characteristics. ★ Input for Crystal Pick-ups and variable reluctance magnetic types. ★ Input (a) Direct from High Imp. Tape Head. (b) From a Tape Amplifier or Pre-Amplifier. ★ Sensitive Microphone Channel. ★ Wide range BASS and TREBLE Controls. **£6.6.0** ASSEMBLED AND TESTED **£9.10.0** (Carr. & Ins. 5/-). Instruction book and detailed price list available separately at 2/- post free.

PRICE REDUCTIONS

- (a) THE KIT OF PARTS TO build both the "5-10" Amplifier and the 3-Valve Pre-Amplifier... **£15.15.0** (Carr. & Ins. 8/6)
- (a) Assembled and Tested... **£21.10.0**
- (b) THE KIT OF PARTS to build both the "5-10" Amplifier and the 3-Valve Pre-Amplifier... **£19.10.0** (Carr. & Ins. 10/-)
- (b) Assembled and Tested... **£25.10.0**
- With PARTRIDGE OUTPUT TRANSFORMER **£16.0.0** extra.

STEREO TAPE PRE-AMPLIFIER

MODEL STP-1. For use with current TRUVOX BRENNEL, or COLLARO "STUDIO" 1 and 1 track Stereo Decks. Incorporates Ferro-cube Oscillator. 4 speed Equalisation Signal Level Meter and separate Gain Controls. Includes separate Power Unit. **£22.0.0** (Carr. & Ins. 8/6). ASSEMBLED **£28.0.0** Instruction book and detailed price list available separately at 5/- Post Free.



TAPE PRE-AMPLIFIER MULLARD Type "C"

Suitable for most 1 track, Mono Tape Decks, incorporates Ferro-cube Push-Pull Oscillator, Treble Inductor and 3-sp. Equalisation. Includes Separate Power Unit. **£14.0.0** (Carr. & Ins. 7/6). ASSEMBLED **£19.10.0** Instruction book and detailed price list available separately at 3/6 Post Free.



MULLARD TAPE AMPLIFIER

MODEL HF/1R3/MK. II Based on Mullard's Type "A" design and suitable for most 1 track Mono Tape Decks. Incorporates Ferro-cube Treble Inductor. Gilson Output Transformer. and 3-speed Equalisation. Includes separate Power Unit. **£13.13.0** (Carr. & Ins. 7/6). ASSEMBLED **£19.0.0** Instruction book and detailed price list available separately at 3/- Post Free.



NEW LOW PRICES — NOW YOU CAN AFFORD A CAR RADIO



THE "HIGHWAYMAN"™

OUR QUALITY CAR RADIO TO BUILD YOURSELF AT A NEW LOW PRICE

Look at these features:
 ★ Attractive styling. ★ Push-pull output. ★ Three latest Mullard transistors plus valves types EB783 and EC8H3. ★ No Buzz, high output and sensitivity. ★ Printed circuit (latest type). ★ 7 x 4 in. high flux p.m. speaker and baffle. ★ Medium and Long Waves. ★ Push button for fingertip control. ★ Extremely low battery consumption (less than 1 amp). ★ Easy to fit any make car. (Positive earth only). ★ 12-volt operation. ★ Compact size, measures only 7 x 7 x 2 in. deep. ★ Easy assembly, supplied with dial and drive already mounted.

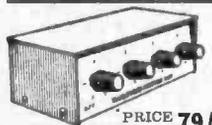
Special inclusive price of only **£7.19.6** Plus 4/- P. & P. All parts available separately. Individually priced parts list and comprehensive instruction booklet 2/6 post free. (Deducted from cost if complete parcel purchased later.)



THE "AIR KING"™

Our highly successful six-transistor luxury portable with the "SLIM Line" look. To build yourself with printed circuit chassis for reliability and simplicity in construction. May be used as Car Radio, with full MEDIUM wave and LONG wave coverage.

Look at these features:
 ★ 500 milliwatt output to high flux 7 x 3 1/2 in. high fidelity loudspeaker.
 ★ Six selected MULLARD TRANSISTORS in latest supersensitive circuit plus germanium diode. ★ Compact size only 8 1/2 x 3 1/2 x 6 1/2 in. high. ★ Attractive three-tone cabinet, black, dark grey and silver grey with all gilt control knobs and all gilt fittings.
 ★ Coax. socket for car aerial. ★ Brand new guaranteed components. ★ Push-pull output. ★ Automatic volume control.
 ★ Long-life battery. ★ Super-sensitive internal Ferrite rod aerial. Special inclusive price for **£7.19.6** (Plus P. & P. 4/-) all required components. ONLY Alignment service available. Full assembly details and individually priced parts list, all of which are available separately, price 1/6 post free.



TRANSISTORISED SOUND MIXER

Mixing 4 channels from high impedance source, giving professional results. Inputs for high impedance Microphone, Tuner, Gram and/or Tape Recorder. Compact and beautifully styled, size 8 1/2 x 2 1/2 x 2 1/2. Standard jack socket inputs.

PRICE **79/6** P. & P. Including PP3 battery circuit 2/6. diagram and instructions.

THE HE30 4-BAND COMMUNICATION RECEIVER



Outstanding Bandspread Selectivity and sensitivity with a built-in Q-multiplier combine to make the HE30 one of the finest general coverage bandspread Receivers available at this price. Covering 550kc/s—1600kc. 4.8 mc — 14.5mc. 1.6mc — 4.8mc. 10.5mc—30mc. For amateur bands an illuminated slide rule dial is provided, calibrated every 5Kcs on 80 and 40

metres taking 16 revolutions of the bandspread dial to cover each of these bands, every 20Kcs on 20 and 15 metres and every 15Kcs on 10 metres plus an edgewise S-meter. For the SWL a 0-100 logging scale for instant reset plus coverage from 0.55-30Mcs. The 8 valve plus Rectifier superhet circuit provides an RP Stage with an Aerial Trimmer for peak performance plus 2 IF Stages for improved sensitivity of 1.0 microvolts for 10db S/N ratio. The B.F.O. variable pitch control can be used to separate CW stations whilst the Q-multiplier adds the selectivity needed for crowded phone band operation. Controls: Function Switch, Audio Gain, Selectivity (Q-multiplier) Frequency (BFO). Band Selector, IF Gain, Trimmer, AVC-MVC Switch, Ant Switch, Main Tuning, Bandspread Tuning and Head-Phone Jack. Selectivity—60db at 10Kc, 0.8Kc at 6db (with Q-Multiplier) IF-45Kcs, External PM Speaker reqd., 4 or 8 ohms impedance. Output 1.5 watts, 8 modern Miniature B7G Base Valves and 5Y3 Rectifier. Size 15 x 10 x 7 1/2 in. Grey crackle finish. Full instructions and circuit diagram. PRICE **40 Gns.** Carr. & Pkg. 15/-, supplied.



THE NEW CHASSIS PUNCH SET
 Five of the most used Hole Punches made of the finest hardened steel will save hours of tedious hand labour, suitable for Aluminium, Sheet, Metal, Plastic, etc. Punch Sizes 1-1/4", 1-1/2", 1-3/4", 1-1/2" and Tommy Bar, Tapered Reamer, and Zip Fastening Carving **49/6** P. & P. Case. PRICE 3/6

THE "TRAVLER" MkII

Introducing our new ready built transistorised car radio for ONLY **9 1/2 Gns.** P. & P. 4/-

Including 7 x 4" speaker fitted to baffle, fixing brackets, filter unit, all nuts and bolts with fitting instructions.
 Star Features: ★ Handsomely Styled ★ Mullard Valves and Transistors. ★ Push Buttons. ★ 1 1/2 watts Output. ★ Long and Medium Wavebands. ★ Quality Speaker (E.M.I.). ★ Easily Fitted. ★ Radio Luxembourg (and many other foreign stations) 12 volt Positive Earth Only (applies to 99.8% of cars on the road). ★ Dimensions 7 x 2 x 7" depth.



POCKET CORDER TRANSPORTED RECORDER

Why be bothered with a notepad? Take Pocket Corder with you on those business trips, the mighty Midget is ideal. Simple to operate, a unique 4-way push-button Switch for record/playback, etc., ensures complete ease of handling. A remote Control Switch is also included for discreet recording, fully adjustable speed through the life of Batteries and the volume and tone from the 2 1/2" internal speaker is outstanding. All accessories included such as Leather Case and Accessory Case, Remote Control switch and Crystal Earpiece, Tape, Batteries and Microphone, no other extras required. Up to 34 mins. recording time, operates on 1.9 volt PP3 and 2 1/2 volt U12 Pen. Batteries. Size 5 1/2 x 4 x 2". Weight 24 ozs. PRICE **12 Gns.** P. & P. 4/-



THE MINICO JUNIOR TRANSPORTED TAPE RECORDER

Record anywhere any time. A truly portable versatile Recorder with a difference, the highly sensitive Crystal Microphone is built into the Zip Crystall Strap which leaves both hands free to operate your Cine Camera, the Microphone can be removed for office use as a Dictating Machine or for Parties. Outstanding quality of reproduction and tone, up to 45 mins. playing time, twin track and operating on 4 1/2 volt Half-Pen Batteries. Robust metal body, size 8 1/2 x 4 1/2 x 2 1/2", weight 33 ozs. Usual price 16 gns. OUR PRICE **£6.19.6** P. & P. complete with Microphone, 4/- Tape and Battery.



THE HE-40 4-BAND COMMUNICATION RECEIVER

Completely built and ready to go. Not a Kit. High sensitivity Superheterodyne receiver covering 550 Kc/s—1,500 Kc/s, 1.6 Mc/s—4.4 Mc/s, 4.4 Mc/s—11 Mc/s, 11 Mc/s—30 Mc/s. Covers all amateur, Government aircraft and broadcast stations between 550 Kc/s and 30 Mc/s. Electrical bandspread tuning. Slide rule type tuning dial giving accurate logging of stations. Internal ferrite rod aerial for medium waveband reception and a 59 in. 10 section chromium plated telescopic whip aerial for the short wave bands. Sockets for optional outdoor aerial. Internal high flux monitor loudspeaker. Latest modern miniature B7G base valves. High Q coils and I.F. transformers. Headphone socket (may also be used for external loudspeaker). Automatic noise limiter (ANL) for reduction of external interference. Beat frequency oscillator (BFO) for reception of CW (morse) signals. Receive/Stand-by switch. Signal strength meter calibrated in "S" units and reads to 59+10db. 220/240 volt A.C. mains, 50-60 cycle operation. Handsomely styled cabinet with grey crackle finish and handsome front panel, with chrome and satin chrome fittings. Measures 13 1/2 in. x 8 1/2 in. x 5 1/2 in. (high) and weighs only 11 1/2 lbs. A comprehensive instruction manual is supplied. An ideal receiver for the radio amateur and short wave listeners of all ages. Come and hear this wonderful receiver. PRICE **£24.15.0** Carr. & Pkg. 12/6



HI-FI STEREO HEADPHONES

For the connoisseur who requires perfection. Each Earphone consists of a 2 1/2" Dynamic Loudspeaker with a full frequency range, fitted with foam rubber Ear Pads for added comfort to keep out noise and to maintain an excellent bass response. The resistance Junction box with change-over switch provides simple transfer from Phones to Speaker. Specifications: Frequency Range—20-15,000 c.p.s. Input Impedance—16 ohms. Power Rating—1 watt. Weight—13 ozs. PRICE **5 Gns.** P. & P. 2/6 (Junction box 15/- ex.)



SPECIAL PURCHASE! THE SHURE MODEL M3D

Professional Dynetic Stereo Cartridge with diamond Stylus, the Shure Dynetic Moving Magnet System combines the most faithful and distortion-free reproduction with complete reliability. Specifications: Diamond Stylus 0.7 thou, Load Imp. 470K ohms. Output 5mV. Range 20-15,000 c/s ± 3db. Stylus pressure 3-4 grammes. PRICE **12 Gns.**

Great Britain's Greatest Electronic Hobbies Organisation

SEE PAGE 589 FOR ADDRESSES OF STERN-CLYNE BRANCHES

This is a first-class instrument and 'MADE IN ENGLAND' need we say more!

POCKET SIZED MULTI-RANGE TEST SET

£11.10.0 complete with leather case . . .



SEI *minitest*

- ★ D.C. SENSITIVITY 20,000 ohms per volt
- ★ A.C. SENSITIVITY 2,000 ohms per volt
- ★ D.C. ACCURACY ±2% F.S.D.
- ★ A.C. ACCURACY ±2% F.S.D.
- ★ A.C. ACCURACY maintained up to 20 kc/s.
- ★ EASY TO READ SCALE
- ★ TWENTY RANGES
- ★ ADDITIONAL DECIBEL SCALE
- ★ PRESSED STEEL CASE

RANGES:

D.C. Volts	D.C. Amps.	A.C. Volts	Ohms
0-1000	0-1 Amp.	0-1000	0-2000
0-250	0-100 mA.	0-250	0-200,000
0-100	0-10 mA.	0-100	0-20 Megohms
0-25	0-1 mA.	0-25	
0-10	0-50μA	0-10	
0-2.5	0-2.5		

A modern self-contained multi-range test set of high sensitivity, intended for the measurement of A.C. and D.C. volts, D.C. current and resistance. The pressed steel case not only effectively screens the movement from external magnetic fields but also provides that extra protection against the accidental blow or mishandling that would fracture a completely plastic moulding.

The exterior cover is moulded in grey Melamine and is designed to focus attention on the clear easy-to-read scale.

GENERAL CATALOGUE covering full range of components, send 1/6 in stamps or P.O. PLEASE SEND S.A.E. WITH ALL OTHER ENQUIRIES.

DENCO (CLACTON) LTD.
 (DEPT. P.W.) OLD ROAD, CLACTON-ON-SEA, ESSEX

THE
 PEMBRIDGE
 COLLEGE
 OF ELECTRONICS
 PROVIDES TRAINING
 IN RADIO
 AND TELEVISION

ATTENDING COURSE

Full-time One-Year Course in Radio and Television. College course in basic principles for prospective servicing engineers.

Next course commences 2nd January, 1964. 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 One-Year Course.

Name _____

Address _____

TOP QUALITY—LOW COST  **AMATEUR RADIO EQUIPMENT**

BUILD YOUR SHORT WAVE LISTENING STATION WITH CODAR-KITS.

CR 66 COMMUNICATIONS RECEIVER

THE FINEST SUPERHET KIT EVER OFFERED



Frequency Range 540 Kc/s to 30 Mc/s in four Band-switched ranges.



Electrical Bandsread. Coil Unit wired ready and I.F. Transformers factory aligned, no test equipment required. Temperature compensated trimmers. Regenerative I.F. stage for maximum gain and B.F.O. Panel aerial trimmer, separate speaker switch, 3 watts output for external 2-3 ohm speaker. Separate cathode follower for tape recording etc. Valve line-up—ECH81, EBF89, ECC81, EL84, EZ80, EM84. (Optional extra). For 200-250 volt A.C. Cabinet size 16 x 6 1/2 x 8 1/2 in.

Complete Kit with 17-page Instruction Manual Carriage 6/- **£18.50**

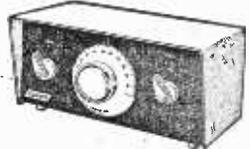
Tuning indicator parts with EM84 1/16.

H.P. TERMS AVAILABLE ON REQUEST.

★ P.R. 30 R.F. PRESELECTOR ★

Frequency range 1.5-30 Mc/s. Substantially improves the performance of any superhet receiver.

G4HZ writes... I am delighted with it, it improves my Eddystone 840 in all respects. The difference with the Pre-selector is fantastic, a weak signal on 15 metres about S2 changed to S8. On the L.F. Bands, unwanted noise and mush is cut out. G3RIA writes... The results in conjunction with my Eddystone 888 are amazing. Signals are twice as strong with much higher signal/noise ratio. A first class product well worth the money. The P.R.30 uses EF 183 Frame Grid R.F. Amplifier and provides up to 20 dB gain. Features include vernier tuning, gain control, selector switch for either dipole or end fed antenna. External power supplies (obtainable from Rx). Smart styling in grey and black. Complete, ready for use, with all plugs, cables. Now available in two Models.



P.R.30 for external power supplies 180-250 volts H.T., 6.3 volts .3 amp. L.T. (obtainable from receiver). **£4.17.6**

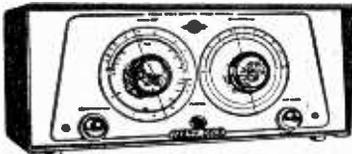
P.R.30X self powered with internal power supply for 200-250 volt A.C. Will provide 200 volts up to 25 M/a. and 6.3 volts 1 amp. for other accessories. **£7.2.0**

Carr. 3/6.

Carr. 3/6.

THE NEW CR 45 MAINS T.R.F. SHORT WAVE RECEIVER

World wide short wave reception, North/South America, India, Russia, Far East, Australia, amateurs, shipping, etc.



- ★ Separate electrical bandsread.
- ★ Three 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.
- ★ Front Panel Silver and Black, control knobs Grey.
- ★ Provision for panel phone jack.

Superb modern styling and Top quality components throughout. Complete CR 45 CODAR-KIT, with valves and 3 Coils, 10-28, 25-75, 60-176 metres. Instruction Manual 11 pages, less Cabinet.

£7.5.0

Carr. 4/6.

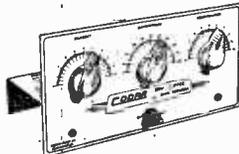
CR 45 Cabinet Silver Grey 12 x 5 1/2 x 7 in. with sliding door for easy coil changing and detachable louvered rear panel **28/6**

Extra coils 4/9 each. All parts can be purchased separately. Instructional Manual only 4/- post free.

★ THE MINI-CLIPPER

36/6

- ★ Miniature 1 valve short wave receiver.
- ★ Low loss polystyrene plug-in coils, factory aligned.
- ★ Air spaced ball bearing condensers.
- ★ Provision to add two-transistor amplifier.
- ★ Battery lasts months.



Can be built in one evening, ready to switch on, to bring the fascination of Short Wave listening at very low cost. Complete MINI-CLIPPER CODAR-KIT, valve, and one coil 25-75 metres, Instruction Manual 4 pages, 37/6, carr. 2/6. Extra Coils 4/9 each. Electrical Bandsread available. Instruction Manual only 2/-, post free.

★ THE SUPER CLIPPER

88/6

- ★ Peak Performance short wave battery receiver.
- ★ Large precision dial, dual slow motion drives.
- ★ Bandsread on all Bands.
- ★ High gain valve/transistor hybrid circuit.
- ★ 2 Mullard transistor amplifiers, pre-assembled and tested.
- ★ Low loss polystyrene plug-in coils, factory aligned.
- ★ Batteries last months.



Easy to assemble, this famous Short Wave Receiver brings a new world of listening pleasure to your finger tips. Complete SUPER-CLIPPER CODAR-KIT, valve, transistors, 2 Coils 20-60, 55-180 metres, Instruction Manual 7 pages, 88/6, carr. 2/6. Front Panel, Silver Grey, 10 x 7 1/2 in. 6/9 extra if required. Extra Coils 4/9 each.

CODAR-KITS are famous for PEAK PERFORMANCE, EASY TO FOLLOW INSTRUCTIONS, CLEAR PICTORIAL DIAGRAMS. Some of the Top Quality names who supply material for CODAR-KITS... MULLARD, BRIMAR, JACKSON, DENCO, ELECTRONIQUES, THORN A.E.I. etc. etc. only the best is good enough for the high CODAR standards which make complete success certain. 6d. in stamps brings illustrated leaflets.

CODAR RADIO COMPANY

BANK HOUSE, SOUTHWICK SQUARE, SOUTHWICK, SUSSEX

G3IRE

Canadian Distributors: JAYCO ELECTRONICS, TWEED, ONT.

G3IPA

ARMSTRONG AF208AM/FM RADIOGRAM CHASSIS



STEREO 12 Mk. 2 240/15/-
8 watts push-pull output from each channel, 16 watts total; VHF, with automatic frequency control medium and long bands; A hi-fi system on one compact chassis.

STEREO 55 228/18/-
Junior version of Stereo 12; 6 watts per channel, 10 watts total; VHF and medium bands; Inputs for tape, pick-ups and future stereo radio.

JUBILEE Mk. 2 228/15/-
Mono; 8 watts push-pull output; VHF, automatic frequency control, medium and long bands; Separate tone controls; Pick-up and tape inputs.

AF208 (ILLUSTRATED) 221/14/-
An AM/FM mono chassis of 5 watts output covering VHF and medium bands. An inexpensive version of the Jubilee Mk. 2.

All carriage free. Write for free literature.

New Boxed VALVES 90-day Guarantee

074	5/-	6K7G	5/-	EB91	4/-	PC182	10/-
1R5	6/-	6K9G	5/-	ERC41	8/-	PC184	10/-
1R5	6/-	6L6G	8/-	ERC81	8/-	PL81	10/-
1T4	3/-	6NT7	5/-	EF80	9/-	PL83	8/-
2X2	2/-	6X4	6/-	ECB42	9/-	PL83	15/-
3B4	7/-	6X7	5/-	ECB81	9/-	PY80	7/-
3V4	7/-	6V6G	5/-	EC180	9/-	PY81	8/-
3Q4	7/-	6X4	4/-	ELC82	10/-	PY82	7/-
5U3	6/-	6K5	8/-	EP85	6/-	PQ25	7/-
6Y3	6/-	12AT7	6/-	EP80	8/-	SH41	8/-
6Z4	9/-	12AD7	6/-	EL32	5/-	SP61	3/-
6A07	4/-	12AX7	7/-	EL54	7/-	U29	7/-
6AM6	4/-	12BH7	7/-	EY51	9/-	UB04	8/-
6AT6	6/-	12K7	5/-	EP85	6/-	UB81	9/-
6BA6	7/-	12K8	14/-	EZ40	7/-	UF89	9/-
6BE6	6/-	12Q7	5/-	EZ80	7/-	UCH81	9/-
6BW9	7/-	25L5G	9/-	EZ81	7/-	UC182	12/-
6C4	5/-	3E5	9/-	HAB8C910	10/-	UC183	12/-
6D8	5/-	3Z5A	5/-	HYR2A	5/-	UF89	9/-
6G8	4/-	95A	2/-	K730	8/-	UL4	8/-
6H6	3/-	DAF98	8/-	K776	8/-	UY41	7/-
6J6	5/-	DP96	8/-	MU14	7/-	UY85	7/-
6L6	5/-	DK98	8/-	PC084	8/-	UY9	7/-
6L7G	9/-	DL96	8/-	PCF80	8/-	VR150	7/-
6K6	6/-	BAB080	8/-	PCF82	8/-	W81	6/-

NEW ELECTROLYTICS FAMOUS MAKES

TUBULAR	TUBULAR	CAN TYPES
1/350V 2/-	50/380V 5/8	8/600V 9/-
2/350V 2/3	100/25V 3/-	16/600V 12/-
4/450V 2/3	230/25V 3/-	16/450V 9/-
4/450V 2/3	500/12V 3/-	32/350V 5/-
16/450V 3/-	1,000/12V 3/-	50/450V 6/-
32/450V 3/9	5,000/6V 5/-	32+32/350V 5/6
25/25V 1/9	8+8/450V 3/8	32+32/450V 7/-
25/50V 1/9	8+16/450V 3/8	32+32+32/350V 7/8
50/25V 2/-	16+16/450V 4/8	50+50/350V 7/8
50/50V 2/-	32+32/350V 4/8	100+120/350V 11/8
		100+200/275V 12/8

TELESCOPIC CHROME AERIALS. 13in. extending to 43in. 8/8 ea. Coax Adapter Plug, 1/8 extra.

TRIPLEXERS Bands I, II, III. 12/6

COAX PLUG 1/- **LEAD SOCKET** 2/-

PANEL SOCKETS 1/- **UNIT BOXES** 4/-

BALANCED TWIN FEEDER yd. 60 or 300 ohms. DITTO SCREENED per yd. 1/8. 80 ohms only.

Wirewound Ext. Speaker Control. 10Ω 3/-, 25Ω 8/6.

WIRE-WOUND POTS. 3 WATT. Pre-set Min. TV Types. All values to 10 ohms to 25 K. 3/-

30 K. 50 K. 4/- (Carbon 30 K. to 2 meg. 3/-)

WIRE-WOUND 4 WATTS POTS. Long spindle. Value, 50 ohms to 50 K., 6/8; 100 K., 7/6.

PHILIPS TRIMMERS. Ceramic. 30, 50, 70 pF. 9/-; 100 pF. 150 pF. 1/3; 250 pF. 1/8; 500 pF. 750 pF. 1/9.

TV etc. TRIMMER, 1000 pF., with knobs. 2/-.

RESISTORS. Preferred values. 10 ohms to 10 meg. 1/-, 4d.; 1 w., 4d.; 1 w., 8d.; 1 w., 8d.; 2 w., 1/-.

High Stability, 1 w., 1/-, 2/-. Preferred values 10Ω to 10 meg. Ditto 5%, 10Ω to 22 meg., 9d.

6 watt } **WIRE-WOUND RESISTORS** 1/3
10 watt } 10 ohms—10,000 ohms 2/-
15 watt } 20 ohms—10,000 ohms 2/-

12.5K to 47K 10 w. 3/-

Volume Control 80 ohm COAX CABLE
Linear of Log Tracks Semi-air spaced 1in. Long spindles. Midget Stranded copper 1in. 6d.yd.
5 K ohms to 2 Meg. 40 yds. 17/8
L.B. 3/10; D.P. 4/6; 60 yds. 25/-
Stereo L 8/8; D.P. 14/8 Fringe Quality Air spaced 1/-yd.

MAINS TRANSFORMERS 200/250 v. A.C.

Postage 2/- each transformer.
STANDARD. 250-0-250, 80 ma, 6.3 v. 3.5 a. tapped 4 v. 4 a. Rectifier, 6.3 v. 1 a. 5 v. 2 a. or 4 v. 2 a. 22/8, ditto, 350-0-350 ... 28/8
MINIATURE 200 v. 20 ma, 6.3 v. 1 a. 10/8
MIDGET, 220 v. 45 ma, 8.5 v. 2 a. ... 15/8
SMALL, 220-0-220, 50 ma, 6.3 v. 2 a. ... 17/8
STD. 250-0-250, 65 ma, 6.3 v. 3.5 a. ... 17/8
HEATER TRANS. 6.3 v. 14 amp. ... 7/8
Ditto, tapped 1.4, 2, 3, 4, 5, 6.3 v. ... 8/8
Ditto, sec. 6.3 v. 4 amp. ... 10/8
GENERAL PURPOSE LOW VOLTAGE, 2 amp. 3, 4, 5, 6, 8, 9, 10, 12, 15, 18, 24, 30 v. ... 22/8
AUTO TRANSFORMER, 150 w. ... 22/8
0, 115, 200, 230, 250 v., 500 w. ... 32/8
MULLARD '4519' Mains Transformer ... 35/8
PARNEKO MAINS TRANSFORMER. Made for special contract, the ratings can safely be doubled. Guaranteed 2 years. Primary 0-110-210-230-250 v. R.T. 300-0-300 v., 50 mA. L.T. 6.3 v. 1.8 amp. Size 4 x 3 x 3 in. ... 17/6

INTERVAL TRANSFORMERS. 3:1 or 5:1, 9/-.

O.P. TRANSFORMERS. Heavy Duty 50 mA 4/6. Multitap, 7/8. Multitap heavy duty push-pull. 10 w. 15/8. Miniature, 384, etc. 5/9.
10 w. O.P. matching trans. 3, 7, 15Ω, 12/6.
L.F. CHOKES 15/10H. 60/65 mA, 5/-; 10H., 85 mA, 10/6; 10 H., 150 mA, 14/-.
TIMED COPPER WIRE, 16 to 22 awg. 1lb. 3/-
ENAMEL COPPER WIRE 16-22, 2/8; 24-30, 3/6; 32-40, 4/6; D.C.C. 28, 34, 36 awg, 2oz. 3/6.

I.F. TRANSFORMERS 7/6 pair

485 K's Slug Tuning Miniature Can, 2 x 1 x 1/2 in. High Q and good bandwidth. Data sheets. Standard size Wehrad, 10/6 pair.

FULL WAVE BRIDGE SELENIUM RECTIFIER.

2, 6 or 12 v. 11 amp. 8/9; 2 a., 11/3; 4 a., 17/8.
CHARGER TRANSFORMERS. Tapped input 200/250 v. for charging at 2, 6 or 12 v. 11 amp. 15/6; 2 amp., 17/8; 4 amp., 22/8. Circuit included.
4 AMP CAR BATTERY CHARGER with ammeter Leads, Fuse Case, etc., for 6 v. or 12 v., 6/9.
AMMETER 0 to 5 amp. 9/6.

BOOKS list S.A.E.

'NEW W' Radio Valve Data ... 2/8
'High Fidelity Speaker Enclosure 5/-
Valve and TV Tube Equivalents ... 9/6
TV Fault Finding ... 8/6
Mullard Amplifier Manual ... 5/8
Mullard Valve Guide, Books 1, 2, 3, 4 or 5 ... 5/- each
Transistor Superhit Receivers ... 7/6
Practical Radio Inside Out ... 3/6
Master Colour Code Chart ... 1/6
4 Transistor Controlled Models ... 1/6
Principles of Colour TV ... 16/-
International Radio Stations List ... 1/6

4 TRANSISTOR PUSH-PULL AUDIO AMPLIFIER

Size 3 x 1 1/2 x 1 1/2 in.
A ready built miniature push-pull amplifier with Driver and output transformers, 4 transistors. Ideal for use with record players, intercoms, BABY ALARMs, etc. Complete with full instructions and circuit.
Price, 47/6 v. Batt. 2/3 2 1/2 in. Speaker 15/-

BAKER SELHURST LOUDSPEAKERS

12in. Fader 15w. Stalwart 3 or 15 ohms, 40-18,000 c.p.s. ... 90/-
12in. Stereo, Foam Suspension, 12w., 30-18,000 c.p.s. ... 26.17.8
12in. Standard H.D. 20w. 40-14,500 c.p.s. ... 28.0.0
12in. De Luxe 15w. 35-17,000 c.p.s. ... 29.10.0
12in. Bass 25w. 20-18,000 c.p.s. ... 212.12.0
15in. Auditorium, 35w., Bass, 20 c.p.s. to 12 kc/s. Ideal Bass Output. £18.
Details and Enclosures, plans, S.A.E.
LOUDSPEAKERS P.M. 3 OHM. 9", 3 in., 1in. 8in., 7in. 4 in. Rola, 15/6; 6in. Rola, 16/8; 8in. Pleasay 17/8; 10 x 6in. 22/8; 10in. Rola, 30/0; 12in. R.A. 30/-; 13 x 8in. Double Cone E.M.L., 35/0.
VENTRIAN HP1012. 10in. 3 to 15 ohms, 10w. 87/8; 8in. HP812 72/-; Tweeter 359 30/-.



1963 RADIOGRAM CHASSIS



THREE WAVEBANDS R.W. 18 in.—50 m. LATEST MULLARD N.W. 200 m.—350 m. ECH81, EF89, EB81, L.W. 800 m.—2,000 m. EL84, EZ80 12-month guarantee.
A.C. 200/250 v. 4-way Switch; Short-Medium-Long/Gram. Ferrite Aerial A.V.C. and Negative feedback, 3 ohm output, 3 watts. Glass dial, horizontal wording, size 13in. x 4in. Aligned and calibrated. Isolated Chassis, size 13 1/2 in. x 9in. high 6 1/2 in. deep.
£8.19.6 Carr. 5 Inp. 4/6.

C.R.T. BOOSTER TRANSFORMERS

for heater cathode short circuit, or tubes with falling emission. Full instructions supplied, mains input. Type A optional 25% and 50% boost 2v. or 4v. or 8.5v. or 10.8v. or 12.6v. State voltage required. PRICE 10/6

TWIN GANG TUNING CONDENSERS.

385 pF miniature 1in. x 1 1/2 in. 10/-; 500 pF Standard with trimmer, 9/-; midget, 7/8; with trimmer, 9/ 500 pF slow motion tuning, standard or midget. 9/ SMALL 3 gang 500 pF, 17/-, SINGLE 365 pF, 7/ SINGLE 10 pF, 25 pF, 50 pF, 75 pF, 100 pF, 160 pF. 5/8. Solid dielectric 100, 300, 500 pF, 3/8. CONDENSERS. New stock. 0.001 mfd. 7 K T.C.C. 5/8; Ditto, 20 kv. 9/8; 0.1 mfd., 7 kv. 9/ Tubular 500 v. 0.001 to 0.05 mfd. 9d.; 0.1, 0.2, 0.3, 1/8; 0.5/35 v., 1/8; 0.050 v., 9d.; 0.12, 0.001, 0.1/1, 0.1 mfd., 0.1 mfd., 2.000 volts, 3/8. CERAMIC COND. 500 v. 0.3 pF to 0.1 mfd., 9 SILVER MICA CONDENSERS. 10% 5 pF to 500 pF. 9d.; 600 pF to 3,000 pF, 1/- Close tolerance (+1 pF) 2.2 pF to 47 pF, 1/- Ditto 1% to 50 pF to 815 pF, 1/-; 1,000 pF to 5,000 pF, 1/9.

465 Kc/s SIGNAL GENERATOR

Price 15/-. Uses B.F.O. Unit, ZA 30038 ready made with valve 155. POCKET SIZE 2 1/2 x 4 1/2 in. One resistor to change, full instructions supplied. Battery 3/6 extra. 6931V Details S.A.E.

WAVECHANGE SWITCHES

3 p. 4-way 2 water long spindle ... 6
2 p. 2-way, or 2 p. 6-way long spindle ... 3
2 p. 2-way or 4 p. 2-way long spindle ... 3
3 p. 4-way or 1 p. 12-way long spindle ... 3

Wavechange "MAKITS". Wafers available: 1 p. 12 way, 2 p. 6 way, 3 p. 4 way, 4 p. 3 way, 6 p. 2 way, 1 water switch, 8/ 2 water switch, 12/8; 3 wafers switch, 15/ additional wafers 1p to 12, 3/6 each extra. Toggle Switches, s.p., 2 p. d.p., 3/ 6 p.d.c.t. 4/-. Min. Slide d.p.c.t. 3/6.

CRYSTAL MIKE INSERTS. 6/8

High output. Size 1 1/2 in. dia. x 1 in. ACOS MIC. 14, insert 1 1/2 in. dia. x 1 in. 8/ ACOS 39-16 DE LUXE STICK MIKE 35/ TSL QUALITY STICK MIKE ... 25/-

Valveholders. EA50, 61, B12A, CRT. 1/8

Engl. and Amer. 4, 5, and 7 pin. 1/ BOULDRED Mazda and Int. oct. 6/1: B7C B4A, B8C, B9A, 9d. B7C with can, 6/1: B7C with can, 1/8. Ceramic EF50, B7C, 1st. oct. 1/-, B7C, 39 A cans, 1/- each. Valve plugs B7C, B9A, 2/3.

HIGH GAIN TV PRE-AMPLIFIERS

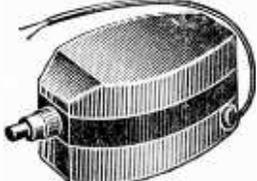
BAND 1 H.F.C. Gain 18dB. EOC84 valve. Kit price 29/6 or 49/6 with power pack. Details 6d. (PC84 valves if preferred.) Coils only 9/6.
BAND III I.F.A.—Same prices. Tunable channels 8 to 13. Gain 17dB. Circuit and coils only 9/6.

THE ORIGINAL

RADIO COMPONENT

Our written guarantee with every purchase
NEW COMPONENT LIST 1/-
Bus 133 or 68 pass door
S.R. Station Sellors

**THE "INSTANT" BULK TAPE
ERASER AND RECORDING HEAD
DEMAGNETIZER**



00/250 v. A.C. **35/-** Leaflet S.A.E.

**AMERICAN "BRAND FIVE"
PLASTIC RECORDING TAPE**

Double Play 7in. reel, 2,400ft. 42/- 5in. reel, 1,200ft. 25/-	Spare Plastic Reels
Long Play 7in. reel, 1,800ft. 35/- 5in. reel, 1,200ft. 23/6 5in. reel, 900ft. 18/6	3in. 1/6 4in. 2/- 5in. 2/- 5 1/2in. 2/- 7in. 2/6
Standard 7in. reel, 1,200ft. 25/- 6in. reel, 600ft. 16/-	
7in. Metal Reels 1/6. *EASISPLICE" Tape Splicer 5/-.	

RYSTAL SET BOOKLET, 1/-.
BYZAL DIODE G.E.C. 2/-, GEX34, 4/-, OAS1, 3/-.
HIGH RESISTANCE PHONES, 4,000 ohms 15/- pr.
MOVING COIL PHONES, 100 ohms, 10/-.
WITCH CLEANER. Fluid squirt spout, 4/8 tin.

**"6+1" TRANSISTOR RADIO
MEDIUM AND LONG WAVE KIT**
First class components to make a 6
transistor 2 waveband superhet chassis.
Ideal for portable or table radio. All
parts including BVA transistors, ferrite
aerial, with car aerial coil/printed
circuit, 8in. x 2 1/2in., but EXCLUDING
Speaker and cabinet.
Speakers, 35 ohms, 7 x 4in. 21/- **£4.5.0**
5in., 17/6, 3 1/2in., 15/6.

3ULGIN PLUGS AND SOCKETS. Non-reversible
7/4, 2-pin, 4/3; F73, 3-pin, 4/6; F194, 6-pin, 6/6.
"DOMINANT" plugs, 5/6; sockets, 3/6.
"ACKS." English open circuit, 2/6. Closed circuit,
1/3. Grundig type, 3-pin, 1/3. Grundig lead jack, 3/6.
"ACK PLUGS." English, 3/-; Screened, 4/-; Grundig,
1-pin, 5/6; Phone Plugs, 1/-; Sockets, 6d.
"LEADIN FORMERS" and cores. Hin. 8d; tin, 10d.
1.8in. FORMERS 5937 or 8 cans TV1 or 2, tin, 2/-.
q. x 2 1/2in., or tin, sq. x 1 1/2 in. 2/- with cores.

LOW MOTION DRIVES. 61, 4/3.
IRON IRON, 250V, 200V or 230V, 24/-.
INTEX SUB-MIN. IRON. 15w, 200 or 240v., 29/6.
3ENCH STAND for above, 12/6. Spares in Stock.
1/16in. Paxolin Panels, 10 x 8in., 2/-.
Miniature Contact Cooled Rectifiers,
50V 50mA, 7/6; 250V 50mA, 8/6; 250V 85mA, 3/6;
3/6; Selenium Rect., 300V 85mA, 5/-
1V etc., Silicon Sub. Min. Rectifier,
50V 450mA, 10/-, K3/25, 600V, 5mA, 5/-.
RM4, RM5, 14A100, 14A116 10/- each. FC31, 20/-
Coils Wearite "P" type, 3/- each.
Osmor Midget "Q" type, 4/-, dust core,
from 4/- each. All ranges. List S.A.E.
Teleton D.V.R., L. and Med. T.R.F. with
reaction, 4/-; Med. wave D.R., 3/6.
Ferrite Aerials, M, 6/6; M. and L., 12/6.
Osmor Ferrite Rod Aerials, L. and M.
for transistor circuits, 10/- each.
Ferrite Rods, 8 x 1in., 6 x 1in., 3/-.
H.F. Chokes, 2/6. Osmor QCL, 6/6.
I.F.C. Coils, 1 1/2in. 7/-; HAX, 3/-.
Redanco DRR2, 4/6. DRXL, 2/6.
Radio Screwdriver, 5in., 6d. Test Prods,
2/6. Neosid Trimming Tool, 1/6. Neon
Mains Tester Screwdriver, 5/-.
Multicore Solder, 4d. yd., Dispenser, 2/6.

Aluminium Chassis, 18 s.w.g. Plain
undrilled. 4 sides, riveted corners,
lattice fixing holes, 2 1/2in. sides, 7 x 4in.,
4/6; 8 x 7in., 5/6; 11 x 7in., 6/6; 13 x 8in.,
8/6; 14 x 11in., 10/6; 15 x 14in., 12/6.
Aluminium Panels, 18 s.w.g., 12 x 12in.,
4/6; 14 x 9in., 4/-; 12 x 8in., 3/-; 10 x 7in.,
2/3; 8 x 6in., 2/-.

JASON FM TUNER COIL SET 29/-.
H.F. coil, aerial coil, oscillator coil,
two i.f. transformers 10.7 Mc/s. detector
transformer, heater choke. Circuit
book using four 6AM6, 2/6.
Complete Jason FM111 kit. Jason
chassis with calibrated dial, compo-
nents and 4 valves, £6.5.0.
Model FM12 with new shelf cabinet, 5
valves, components and power pack, £10.

MAINS DROPPERS. Midget adjustable sliders
0.3A, 1,000 ohms, 5/-; 0.2A, 1,200 ohms, 5/-;
0.15A, 1,500 ohms, 5/-; 0.1A, 2,000 ohms, 5/-.
MIKE TRANSFORMERS, 50-1, 3/9.
P.V.C. Covered Wire, single or stranded, 2d. yd.
Sleeving, 1 or 2 mm., 2d.; 4 mm., 3d.; 6 mm., 5d. yd.
SPEAKER-FRET. Gold, Maroon or Green Cloth,
17 x 2 1/2in., 5/-; 25 x 3 1/2in., 10/-; Tygan, various colours
52in. wide from 13/-; 1 1/2in. wide from 5/- ft.
Samples S.A.E. Expanded Metal, Gold, 12 x 12in., 6/-.
Panel mounting fuse holders, 2/-. Fuses 60mA
—5A, 5d.

RADIO AND TELEVISION SPARES

All leading makes, volume controls,
etc., line output transformers, etc.,
B. V. A. valves (current and obsolete
types). Send S.A.E. for quotation.

WEYRAD

**COILS AND TRANSFORMERS FOR
2-WAVE TRANSISTOR SUPER-
HETS WITH PRINTED CIRCUIT
AND FERRITE ROD AERIAL.**
Long and Medium Wave Aerial—RA2W
On 6in. rod, 208pF tuning, with car
aerial coupling coil, 12/6
Osc. Coil P50/1AC, 176 pF tuning 5/4
1st and 2nd I.F. Trans.—P50/2CC, 470k/2S
1 1/2in. dia. by 5in. 5/7 each
3rd I.F. Trans.—P50/3CC. 6/-
Spare Cores 6d. each
Driver Transformer—LFD74 9/6
Wavechange Slide Switch s.d.p.t. 3/6
Printed Circuit—PCA1. Size 2 1/2 x 8 1/2in.
Ready drilled, and printed 9/6
Volume Control, 5K-DP 4/6
35 ohm Speakers, 3in., 15/6; 5in., 17/6;
7 x 4in., 21/-.
Tuning Gang with trimmers 10/6
6 Mullard Transistors and diode 42/6
Constructor's Booklet 2/-
3 ohm O.P. Trans. O.P.T.1 10/6

NEW MULLARD TRANSISTORS
OC11 6/-, OC72 7/6, OC8D 7/6, OC8L 7/6,
OC44 8/6, OC45 8/6, OC171 10/6, AF17 9/6
Sil Miniature Condensers, 0.8 mfd.,
30v., 1/3, 1, 2, 4, 5, 8, 16, 25, 30, 50, 100 mfd.,
15 volt 2/6 etc. Transistor Holders 1/3-

**B.B.C. Pocket 2 Transistor, Plus Diode
M.W. and L.W. Radio Kit, 22/6.**
Miniature earpiece, 7/6. Batt. 2/3.
Circuit details, etc., S.A.E.

**ADASTRA 3-3 AMPLIFIER 3 WATTS
HIGH FIDELITY AT LOW COST**



READY BUILT, WIRED AND TESTED
A.C. only, 200-250 V. Valves ECL85 and
E27B. 3 ohms quality output. Mullard
tone circuits. Controls: bass boost, treble
and volume. Separate engraved front
panel with de luxe finish. Quality mains
transformer. Stove enamelled chassis
size 6in. x 5in. x 3in. Bargain Price £4.16.6.
Details S.A.E.
"Performs agreeably well" (The Gramophone)

**BUILD YOUR OWN
RECORD PLAYER**

**AND
SAVE
POUNDS!!**



4 Speed Autochange or Single Player
units supplied with Brand New 5-tone
Portable Cabinets 17 x 15 x 8 1/2in. detuxe
Strong carrying handle, gilt finish
clips and hinges. As used by Famous
Make for 20gns. models. Ready cut-
out motor board 14 x 1 1/2in. Front baffle
with 7 x 4in. high flux loudspeaker
and 3 watt 2 valve UY85, UCL82 2-
stage amplifier built on metal
chassis 12 x 3 x 2 1/2in. Quality 3 ohm
output transformer, low hum level
circuit. Volume and Tone controls,
3-core safety mains lead. All items
fit together perfectly. Special in-
structions enable assembly in 30
minutes, only 5 wires to join, 12
months written guarantee. A valuable
separately or package deals as below.

AUTOCHANGER KITS COMPLETE (as above)
B.S.R. Monorel £11.20.0 P.P. 5/6
Collaro £11.5.0 P.P. 5/6
Garrard £12.5.0 P.P. 6/6

SINGLE PLAYER KITS Complete (as above)
Garrard auto stop/start .. £11.5.0 P.P. 5/6
E.M.I. auto stop/start .. £11.5.0 P.P. 5/6

OR SEPARATELY
Cabinet with cut out board £3.2.6 P.P. 3/6
Amplifier with 7 x 4 in. speaker £3.17.6 P.P. 2/6

AUTOCHANGERS
B.S.R. UA14 £6.5.0 P.P. 4/6
Garrard Autostim £6.17.6 P.P. 4/6

SINGLE PLAYERS
E.M.I. auto stop/start .. £5.10.0 P.P. 4/6
Garrard SR10 £5.10.0 P.P. 4/6
E.M.I. (separate pick-up) £3.7.6 P.P. 3/6

TRANSCRIPTION UNITS Stereo/Mono
Garrard 4HF £16.10.0 P.P. 5/-
Philips A01018 £12.5.0 P.P. 5/6
Garrard AT6 £10.10.0 P.P. 6/-

BARGAIN
B.S.R. Autochange UA18
Stereo/Mono £7.10.0 P.P. 4/6

Replacement sapphire stylus available from 5/8
Replacement Xtals from 15/-; Stereo from 31/6.

GABY MULTIMETER

Moving-coil Model M.I. 54/.

Measures D.C. or A.C. 6 v., 30 v., 120 v.,
600 v., 1,200 v. D.C. 30 mA, 300 mA.
Ohms 0-100K. Leaflet S.A.E.

ARDENTE Transistor Transformers

- Type D3035, 7.3 CT: Push-pull to 3 ohms
for OC72, etc., 1 x 1 x 1 in. 9/6
- Type D3034, 1.75 : 1 CT. Push-Pull Driver
for OC72, etc., 1 x 1 x 1 in. 9/6
- Type D3058, 11.5 : 1 Output to 3 ohms for
OC72, etc., 1 x 1 x 1 in. 9/6
- Type D167, 18.2 : 1 Output to 3 ohms for
OC72, etc., 1 x 1 x 1 in. 12/-
- Type D239, 4.5 : 1 Driver Transformer, 10/-
- Type D240, 8.5 : 1 Driver Transformer, 10/-

ARDENTE TRANSISTOR CONTROLS

- 5K or 1M Ω switched, dia. 0.9in., 5/3
- Type VC1760, 5K with switch, dia. 0.7in., 10/6
- Deaf aid earpiece xtal or magnetic, 7/6
- Sub-min Jacks 1/6. Plugs 1/6.

**COMPONENT SHOP
SPECIALISTS**

P.P. Charge 1/-.

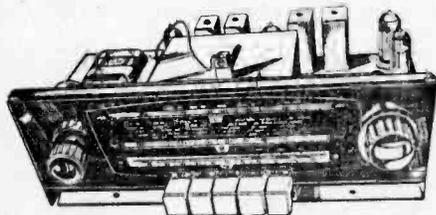
C.O.D. 2/- extra.

**337 WHITEHORSE ROAD
WEST CROYDON**

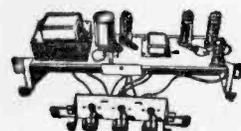
Telephone: THO 1665

(Export welcome. Send remittance,
and extra postage, no C.O.D.)

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



A.C. ONLY. Chassis size 15 x 6½ x 5½in. high. New manufacture. Dial 14; x 4in. in 2 colours, predominantly gold. Pick-up Ext. Speaker. Ae. E. and Dipole Sockets. Five push buttons—OFF, L.W., M.W., P.M. and Gram. Aligned and tested. O.P. Transformer. Tape Control. 1000-1900 M.; 200-500 M.; 88-98 Mc/s. Valves E740 rect.; ECH81. Pesa. EAB30, EL84, E280. Negative feed-back circuit. Speaker and Cabinet to fit chassis (table model). 47/6 (post 5/-). 10 x 6in. ELLIPTICAL SPEAKER, 25/-, tp purchasers of this chassis. TERMS: (Chassis) £3.10.0 down and 5 monthly payments of £2.4.0. Cheap Boom Dipole for V.H.F., 12/6. Feeder 6d. yd. Circuit diagram 2/6.



PUSH-PULL AMPLIFIER £5.5.0
(6/- Carr.)

Brand new 200/240 A.C. mains. Bass, treble and vol. controls. With valves E280, EOC83 and 2-EL84 giving full 8 w. Chassis 12 x 3½ x 3½in. With o.p. trans. for 2-3 ohm speaker. Front panel (normally screwed to chassis) may be removed and used as "flying panel". Stereo version 2 x 4 w., same price. Fixed panel. Tone & Vol. Controls.

TAPE RECORDER AMPLIFIER



Type TR3. Fully built, high gain, low noise, printed circuit. Attractive grey and gold front panel 13 x 1½in. Height 5½in. overall. Front to back 5½in. Vol. and on/off tone. Mike radio and ext. speaker jacks. Valves magic eye, EOC83, ECL82, E280. Mains trans. Ready to bolt to H.M.R. Deck. Complete with switch waver wired. Our Price ONLY £6.15.0 (6/- Packing and Carr.). Also available for Coltaro Deck at 5/- extra.

NOTE THESE LOW PRICES 6-TRANSISTOR KITS AND SETS

All brand new parts. Resins and Vynair Cabinets. Different colours. All holes drilled in printed circuit boards. Full M.W. and L.W. coverage. Car aerial socket. Alignment service. 17/6, inc. return post. All parts supplied separately. Built in 2/3 hours. 500 mw. output. Booklet 2/6, refunded on purchase of kit.

SUPERHET CIRCUITS

THE "SCALA"



"Scala Kit" £4.19.6. (Post 4/-). Size 8½ x 2 x 5½in. high and 3½in. speaker; or fully built £7.10.6.

THE "REGENT"



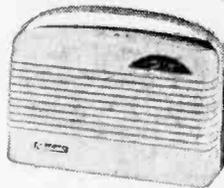
"Regent" Kit £5.17.6. (Post 5/-). Size 9 x 3½ x 7½in. 8 x 2½in. speaker; or fully built £8.

100 mF. + 200 mF. ELECTROLYTIC. New 275 v. (350 v. surge). 4in. x 1½in. dia. 5/- each. (Post 1/-). ALL ITEMS ARE NEW AND FULLY BUILT UNLESS OTHERWISE STATED. TESTED BEFORE DESPATCH. Terms Available on Items over £5. Send 6d. (stamps will do) for 20 page illustrated catalogue. Delivery by return C.O.D. 2/- extra. ALL ITEMS GUARANTEED 12 MONTHS VALVES 3 MONTHS

GLADSTONE RADIO

"SCALA", CAMP RD., FARNBOROUGH, Hants. Farnborough 8871 CLOSED SATS.

"REALISTIC" 'SEVEN'



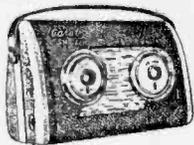
7 Transistor Superhet. 350 Milliwatt output 4-inch speaker. All components mounted on a single printed circuit board size 5½ x 5½in. in one complete assembly. Plastic cabinet with carrying handle, size 7 x 10 x 3½in. External Socket for car aerial. Ferrite rod aerial. Price for the complete parcel including Transistor, Cabinet, Speaker, etc., and Full construction data: **£5.19.6** P.P. Battery 3/9. Data and instructions separately 2/6. Refunded if you purchase the parcel.

4 TRANSISTOR MINIATURE PUSH-PULL AUDIO AMPLIFIERS



PRINTED CIRCUIT. 5in. x 2½in. x 1½in. over transformers. Output for 3-ohm speaker. Suitable for microphone, record player, guitar and radio input. 9-12 volt battery required. Frequency range 100 cps. to 25 Kcps. Push/pull output single ended. Instruction sheet provided. Fully wired ready for use. Two types available 2W output, 35/-, 4W output 41/-, P. & P. 2/6.

THIS SUPERB SET FOR £9 (Carr. pd.)



6-transistor radio covered in sponge clean Duracolor fabric, in latest two tone shades, M.W. and L.W. ferrite rod, provision for car aerial, 2-colour scale. With PP9 battery giving 300 hours use. Weighs under 4 lbs. With carrying handle, 12 x 7½in. high x 4½in. at base tapering to 2½in. at top. Brand new, fully guaranteed. 3 push buttons.

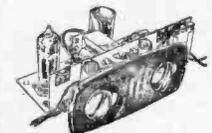
5 WATT AMPLIFIER

Our price ONLY 58/-, (post 5/-) a new hundred only; Valves EF91 and EL84 with metal rectifier. 8 x 4 x 1½in. high (5½in. over E1-84). Mains trans. and o.p. with vol. and tone controls; on-off; co-ax input.

SPECIAL REDUCTIONS ON GRAMOPHONE AMPLIFIERS

1½ watt type. Save 12/-, With 5in. speaker. Baffle 12½ x 6in. 200-240 v. A.C. ECL82 and Rectifier. Tone and Volume. On/off switch. Two knobs. Ready to play. Useful for Stereo. 46/-, post 5/-.
4 watt type. Save 20/-. Valves UY80, UY90 and UL84. 200-240 v. A.C. Covered baffle 13½ x 7½in. (6½in. speaker) 3 front controls bass, treble, on-off/vol. L.W. ferrite 5/-, post 5/-.
2½ watt type. Save 20/-, 2½ watts. EOC83, ECL82 and E280. Controls volume, bass and treble. On/off switch. 200-240 v. A.C. O.P. trans. Size 12 x 3½in. x 5½in. over valves. Suitable for microphone input and for Guitar. 55/-, post 5/-.

STEREO CONVERTER UNIT



Converts existing Radiogram to play stereo records. Chassis 8½ x 2½ x 4½in. overall height. Mains and O.P. trans., Metal Rect., ECL82 valve and all screws, panels etc. Moulded front enclosure, fully built, brand new, only extras needed speaker and stereo cartridge. Full instruction leaflet. Limited quantity at 39/6 (5/6 P. & P.).

TOP QUALITY RECORDING TAPE (Guaranteed)

(1/- per tape, six or more post free).

4in. ..	400ft.	12/6	5½in.	1200ft. ..	17/6
5in. ..	600ft.	12/6	5½in.	1800ft. ..	35/-
5in. ..	900ft.	17/-	7in.	1200ft. ..	17/6
5in. ..	1200ft.	30/-	7in.	1800ft. ..	26/6
5½in.	850ft.	15/-	7in.	2400ft. ..	45/-

BATTERY ELIMINATOR

For 4 Low Consumption Valves (96 range) 90v. 15mA and 1.4v. 125mA, 45/- (4/- post). 200-250v. A.C. Also for 250mA, 1.4v. and 90v. 15mA at same price. Two separate units to replace existing batteries.

PANEL OF 7 POTS.

10 x 1½in. - 4 x 1M and 3 x 2M. 4/- (post 1/-).



Practical Wireless

Vol. XXXIX No. 681 NOVEMBER, 1963

Editorial and Advertisement
Offices:

PRACTICAL WIRELESS

George Newnes Ltd., Tower House,
Southampton Street, W.C.2.

© George Newnes Ltd., 1963

Phone: Temple Bar 4363

Telegrams: Newnes, Rand, London,
Registered at the G.P.O. for trans-
mission by Canadian Magazine Post

SUBSCRIPTION RATES

including postage for one year

To any part of the world £1.9.0

Contents

	Page
Editorial	597
Round the World of Wireless ...	598
Beginner's Short Wave Two ...	600
Short Wave Receiving Aerials ...	602
A Simple A.M. Tuner	605
A Versatile Double-trace Oscilloscope	608
Converting a Car Radio	614
Electronic Door Chimes and Burglar Alarm	616
Showtime Roundup	621
Wiring Up the Workshop	624
The Progressive Portable	628
A Simple Wavetracer	634
Audio Level Indicator	641
Test Gear Techniques	645
Dual Impedance Loudspeaker ...	653
On Your Wavelength	654
Three-Watt Amplifier	658
Letters to the Editor	665
Club News	666

The Editor will be pleased to consider articles of a practical nature. Such articles should be written on one side of the paper only, and should contain the name and address of the sender. Whilst the Editor does not hold himself responsible for manuscripts, every effort will be made to return them if a stamped and addressed envelope is enclosed. All correspondence intended for the Editor should be addressed: The Editor, PRACTICAL WIRELESS, George Newnes, Ltd., Tower House, Southampton Street, London, W.C.2. Owing to the rapid progress in the designs of wireless apparatus and to our efforts to keep readers in touch with the latest developments, we give no warranty that apparatus described in our columns is not the subject of letters patent.

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. PRACTICAL WIRELESS incorporates "Amateur Wireless."

The Show That Never Was

IN the absence of the customary Radio Show at Earls Court this year, many companies in the radio/TV industry held their own private exhibitions for the trade, primarily retailers and wholesalers. This resulted in the extraordinary situation of something like 30 separate shows of varying size, scattered mainly around the Central London area.

The formidable task of "doing the rounds" was somewhat alleviated by the sheer novelty and by the exotic experience of visiting a galaxy of plushy suites in such buildings as the London Hilton, the Carlton Tower, the Savoy, the Mayfair, the Cafe Royal, etc. This was certainly a contrast to the rather stolid utilitarian exhibition buildings at Earls Court which even the most colourful displays never seem to completely disguise.

It was quickly obvious from a grand tour of the individual shows that the trade was turning out in force, and organisers expressed delight (and some surprise) that attendance was so far in excess of expectations.

The manufacturers were also pleased that the overall cost of mounting their exhibitions was considerably lower than that necessary for a normal Radio Show, with the added advantage of more comfortable surroundings, more space and much greater facilities.

So, from the industry's point of view, the experiment was successful on several counts: costs down, order books full, a more comfortable and a shorter show. But what of the public, who were denied their annual exhibition this year?

Some manufacturers consider that the impact of the public at the Radio Show on sales is small. They reason that since most prospective purchasers are content to be guided by the advice of their local dealers in the choice of a new set, the main task is to get the products into the dealers' shops. The projection of any "image" or the creation of public demand can best be achieved by planned advertising campaigns.

There is, of course, more than a grain of truth in this and it is probably true to say that only a fraction of the expense involved in exhibiting at the Radio Show is ever offset by sales resulting directly from any demand created at that Show.

And herein, of course, lies the dilemma which caused the cancellation of the Radio Show this year. There has been for years a strong case for a short period trade-only show, with perhaps a different exhibition aimed directly at the public. But it is obvious that here again we are in deep water.

No doubt the industry and the exhibition organisers have already given this problem much thought and will continue to do so. The Radio Show is being resumed again next year under one roof and we hope that in everybody's interest a formula will be found to reconcile the requirements of both trade visitors and the general public. In any event, we shall almost certainly see some changes in the 1964 Radio Show.

Our next issue dated December will be published on November 7th



ROUND THE WORLD

of WIRELESS

NEWS AT HOME AND ABROAD

Electrical Engineers Exhibition

AFTER having taken and allocated all available floor space at Earls Court, London, for the Electrical Engineers Exhibition, the organisers have had to partially replan the layout to accommodate extra stands since the demand for exhibiting space has been so great.

To be held from 18th to 25th March, 1964, it will be the only exhibition of its kind in the world that year and, along with the increased number of British exhibitors, many European and other overseas countries will be represented, including 12 from Germany.

TRANSISTORS FROM SOUTH AFRICA

ALREADY South Africa's leading manufacturer of long distance telephone transmission equipment, Standard Telephones and Cables (Pty) S.A. Limited (a subsidiary of the British Firm) will commence manufacture of silicon epitaxial planar transistors at its factory at Boksburg, near Johannesburg, next year.

An agreement between the Boksburg company and the South African government has been reached for the local manufacture of these components, now that the establishment of a South African plant is justified.

New Name for First Radio Firm

ON July 20th, 1897, the "Wireless Telegraph and Signal Company Limited" was officially registered in London as a limited company; total assets £100,000. On the board of directors of this new company was one Guglielmo Marconi—famous pioneer of wireless transmission. In March, 1900, the name of the company was changed—by general consent of the shareholders—to "Marconi's Wireless Telegraph Company Limited".

This, then, became the title under which the world's first wireless manufacturing company was to advance, in the first sixty-odd years of the twentieth century, from a relatively small £100,000 firm exploiting Guglielmo Marconi's patented methods of wireless transmission, to the international organisation it is today, selling electronic equipment to practically every country in the world.

Now, sixty-six years after the company's inception, the name has once again been changed, the widening scope of the products being produced rendering its former title obsolete. The name of the firm's prime mover will not be forgotten, however, when new equipment manufactured under the new title of "The Marconi Company Limited" reaches its customers the world over.

Congress Tapes

AT one of the largest international congresses ever held in the U.K., the Tannoy group of companies made use of four new RE 301 professional tape recorders, recently purchased from EMI Electronics Limited. Thirty three hours of the congress were recorded on these machines at the Royal Albert Hall, London where the congress was held. These recordings were made in two languages, and after suitable editing and copying, tapes of the highlights of the congress, six hours in length, were distributed to 56 different countries. Later after further editing, three-hour tapes were made available for distribution throughout the world.

New V.H.F. Relay Station for Sheffield

UNTIL recently v.h.f. sound transmissions in the Sheffield area originated solely from the BBC's Holme Moss station, which because of the hilly nature of the surrounding country, did not provide total coverage of the area. Now, however, another 240,000 listeners in Sheffield will be able to receive v.h.f. transmission from the new Tapton Hill relay station which recently began transmitting the North-of-England Home Service, the Light Programme and the Third Programme on 94.3Mc/s, 89.9Mc/s and 92.1Mc/s respectively.

All transmissions from the new station will be horizontally polarized.

CRITICAL STAGE OF COMMONWEALTH TELEPHONE CABLE

THE first week of September saw a critical stage in the laying of the Commonwealth telephone cable—Pacific Section. Two cable-laying ships, the HMTS "Monarch" and the C.S. "Retriever" (of Cable and Wireless Limited) faced the task of laying the cable through the Murray Fracture Zone, which is approximately 700 miles north of Hawaii and is the deepest point of the lay between Port Alberni (Vancouver) and Hawaii. Here the ocean is almost $3\frac{1}{4}$ miles deep and for 60 miles the crews of the ships had to contend with uneven ocean bottom.

However, with yet another part of the mammoth operation over, the forecast looks favourable for the opening of the 8,700 mile cable telephone service linking Britain, Canada, New Zealand and Australia, in December.

Radio Communications Show

THE main feature of the 1963 International Radio Communications Exhibition will be, appropriately enough for this the Golden Jubilee Year show, a display of amateur equipment from 50 years ago, right up to present-day gear.

Every day throughout the show, which will last from October 30th to November 2nd, The Radio Society of Great Britain (the organising body of the exhibition) will be transmitting and receiving on amateur bands under the call signs GB3RS and GB3VHF. Many hundreds of radio amateurs from all parts of Britain are expected to visit the Seymour Hall (Seymour Place, Marble Arch, London) during the time of the show, where displays, competitions, demonstrations, etc., will provide much interest and amusement for all enthusiasts.

As usual, the armed services will be exhibiting along with the G.P.O., but for the first time, this year the BBC has taken a stand.

Amateur television equipment will amongst the displays, with demonstrations of cameras, film and mobile equipment.

With many other interesting exhibits, visitors to the show can look forward to a very memorable occasion.

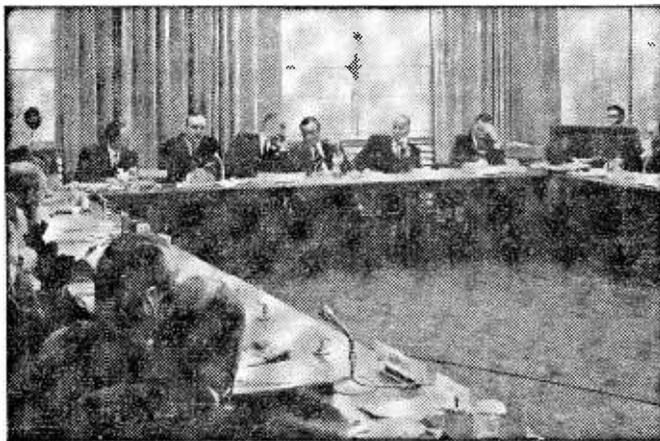
Equipment for Ghana

IN Ghana, where Marconi v.h.f. radio equipment has provided the main trunk telephone services for many years, a new multi-channel radio relay system, using the same type of equipment, will shortly be in operation, linking the country's capital, Accra, with the new Atomic Research Institute at Kwabenyang.

An ultimate total of 48 telephone channels will be carried by Marconi HM.100 equipment between the two centres.

INTERPRETATION SOUND SYSTEM

OVERSEAS delegates meeting in the new conference room of the National Coal Board at Hobart House, London, are able to listen to speeches in their own language over a sound system for simultaneous interpretation, manufactured, and recently installed, by Trix Electronics Limited. The installation allows anyone in the room to hear either the spoken address or an interpretation in one of two other languages.



The new conference room at Hobart House, the headquarters of the National Coal Board, where a Trix interpretation sound system has recently been installed.

I.E.E. President

ON 1st October, Sir Albert Mumford, K.B.E., took office as president of the Institution of Electrical Engineers for the session 1963/64. Sir Albert, who is Engineer-in-Chief of the Post Office, was made Knight Commander of the Order of the British Empire in the 1963 Birthday Honours List.

The three I.E.E. division chairmen also elected are; Dr. R. C. G. Williams, Mr. C. D. Wilkinson and Dr. J. R. Mortlock.

RADIO BROADCASTS FOR ADEN

RADIO broadcasts for schools are now taken for granted in the U.K., but for Arab students in Aden, the series of programmes being transmitted by the Aden Forces Broadcasting Association from R.A.F. Khormaksar covering G.C.E. subjects, is proving a worth while addition to their official studies. These weekly broadcasts are being transmitted on an experimental basis, as a prelude to a formal course of study which it is hoped to start in the future.

Beginner's SHORT WAVE TWO

The Blueprint given away free in this issue provides all the diagrams necessary to build this receiver. Newcomers to radio construction will find this design to be straightforward and inexpensive, thus making it an ideal introduction.

BY F. G. RAYER

THIS receiver uses a 954 acorn valve as detector, followed by a 12AT7 twin triode as two-stage audio amplifier. It is constructed on a 7in. x 4in. x 2½in. chassis, and includes a mains power-pack and 2½in. diameter loudspeaker. The panel is approximately 6in. x 7½in. The whole receiver is thus of small size.

The circuit is shown in Fig. 1. The receiver may be used over all frequencies from 1.2Mc/s to 100Mc/s (250-3m). Efficient results are of course obtained at lower frequencies than 1.2Mc/s, but the small size of VC1 makes waveband coverage rather small. For general short wave listening, a single coil covering about 14-40 metres (22-7Mc/s) will be very convenient. A second coil will allow coverage to 2.5Mc/s (120m). Such a pair of coils will allow many of the most useful bands to be tuned. Regeneration is obtained by means of the cathode tap 2 on the coil L1, and is controlled by the potentiometer VR1.

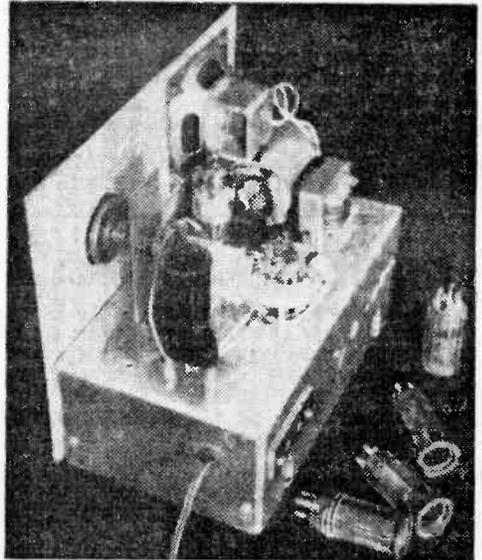
VR2 is the audio gain control, or volume control. The second triode section of the 12AT7 drives the loudspeaker through the matching transformer T1 and provides quite a reasonable output. For the power pack, two small metal rectifiers are employed for full-wave rectification, and complete isolation of the receiver from the mains, is effected by the power transformer T2.

In a receiver of this type, the layout of components in the audio stages and power supply circuit is of little importance. In the detector stage, however, wiring must be short and direct, and construction must be rigid. A valve rectifier, such as 6X4, could be used, and also a larger loudspeaker, if so desired.

Chassis Layout

This is shown in Fig. 2. VC1 is fixed to a stout bracket, so that a ball drive may be added. Tuning is quite critical, and a 2in. dia. knob is recommended. The lug on the drive is bolted to the panel. The drive is fitted with a 0-100 or 0-180 dial, or a pointer, which can be read against scales drawn on card attached to the panel.

The coil holder is mounted about ½in. above the chassis, using long bolts with extra nuts, or spacing sleeves for this purpose. Coil formers and holders other than those listed may be fitted, or a single coil, permanently wired. There is no need for the coils to be of the diameter given, and other



A rear view of the receiver, with some spare coils.

numbers of turns and gauges of wire can be perfectly satisfactory. Changing the diameter or windings will naturally modify the waveband covered, but provided smooth regeneration is obtained, there will be no loss of efficiency.

It is quite feasible to wind coils on old valve bases, or on paxolin tubes attached to old bases. Larger plug-in coils are also available from some suppliers, and can generally be used, if to hand.

Fig. 4(d) shows the underside of the coils, and pin connections. The tuned winding is between pins 1 and 3, pin 3 being earth. All cathode taps are made on this winding, at point 2. The remaining winding is for aerial coupling, the aerial being connected via C1 to socket 4. The remaining end of the aerial coupling winding is taken to pin 3.

All the coils are made in the same way, except for the number of turns and gauge of wire. If valve bases or other coils are used, the holder is

selected to suit, and appropriately wired, so that any coil can be inserted.

Windings

On the plug-in coils listed, the following numbers of turns may be used, the ranges specified being approximate.

6.75-22Mc/s 16 turns 30s.w.g., tap at $\frac{1}{4}$ turn. Aerial coupling, five turns.

2.5-7.5Mc/s 50 turns 32s.w.g., tap at $1\frac{1}{2}$ turns. Aerial coupling, 15 turns.

1.2-4Mc/s 100 turns 34s.w.g., tap at 2 turns. Aerial coupling 20 turns.

14.5-50Mc/s $5\frac{1}{2}$ turns 30s.w.g., tap $\frac{1}{4}$ to $\frac{1}{2}$ turn. Aerial coupling two turns.

Approx. 40-100Mc/s $2\frac{1}{2}$ turns 20s.w.g. double spaced, tap at $\frac{1}{4}$ turn. Aerial coupling one turn.

The two larger coils have turns side by side. Other coils are on threaded formers, with 21 turns per inch. Aerial windings are near the tuned windings, as in Fig. 4(d). The highest frequency range is with VC1 in the half-closed position (75pF).

Acorn Valve

Pin connections for the acorn valve are shown in Fig. 4(a), the valve being viewed from the anode (long) end. The valve is mounted over a $\frac{1}{2}$ in. diameter hole, so that the grid pin is on top, as in Fig. 2, and the anode pin under the chassis, as in Fig. 3.

The valve can be mounted satisfactorily by soldering wires directly to the pins, provided care is taken to avoid breaking the glass seal. Wires must be soldered only to the extreme tips of the pins, and the iron must be at full temperature, and must be removed promptly when the connection has been made.

If a valveholder is used, grid and anode connections may be soldered or clipped on. The leads from R1 and C2 to the grid pin should be extremely short, to avoid hum. If the outside foil of C2 is marked, take this end to VC1.

Loudspeaker and Panel

The panel may be painted, or left clear. It is held to the front runner of the chassis by the switch and the two potentiometers.

A clip holds the twin capacitors C9 and C10 to the chassis, and if this component does not have a metal can forming the negative connection, and in contact with the chassis, a lead should be added from negative to chassis.

The loudspeaker is just high enough to clear the capacitor, and has a matching aperture in the panel. It is secured with countersunk 6B.A. bolts. A square piece of expanded metal loudspeaker fret is then cemented to the panel, over the aperture.

Below the Chassis

Wiring and components are shown in Fig. 3. The two small, contact cooled rectifiers MR1 and MR2 are bolted to one side runner. The Mains transformer wiring should be checked as follows:

Primary to mains, via on/off switch. One 6.3V tag and centre tap of h.t. winding to chassis. Remaining 6.3V tag to tag 9 of the 12AT7 holder, and 954 heater. The h.t. tag to negative on one rectifier. Second h.t. tag to negative on second rectifier.

A tag strip with two insulated tags will be convenient to anchor the mains leads, which pass through a grommet in the chassis. Current is best drawn from a plug fitted with a low rating fuse. The receiver chassis should be earthed.

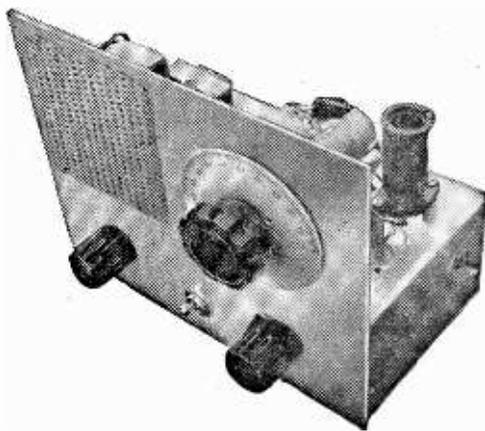
Various points marked "MC" in Figs. 2 and 3 are all soldered to tags which are bolted securely to the chassis. The negative ends of C5 and C8 must be taken to the chassis.

Operating

A regenerative receiver of this type is extremely sensitive, provided regeneration is correctly adjusted. If regeneration is not used correctly, only powerful European and similar stations will be heard.

When VR1 is slowly rotated so as to increase the 954 screen grid voltage from zero, a point will be found where oscillation begins. This oscillation is audible if a station is nearly tuned in, and will be heard as a whistle, or audio tone, which changes in pitch as tuning is adjusted. For maximum sensitivity, regeneration is kept at the point where such oscillation just fails to arise. In these conditions, extremely weak signals may be picked up.

Regeneration and tuning are critical, with the high frequency coils, and when receiving weak signals. With the lower frequency coils, and when tuning in stronger transmissions, the setting of VR1 is less important. For powerful stations received without interference, VR1 may be turned back somewhat. But in more difficult reception



The finished receiver.

conditions, VR1 is maintained near the oscillation point, as described, because this increases selectivity, and volume is reduced by VR2, if needed.

If regeneration is too violent and abrupt, with any coil, this shows that the tapping 2 needs to be slightly nearer the earthed end of the coil 3. Aerial loading influences results, and if the aerial is at all long, C1 should be reduced in capacity. This can be done by fitting a 30pF or 50 pF trimmer in this position. For indoor and other short aerials, C1 may be as shown.

PUBLISHED BY GEO. NEWNES LTD., TOWER HOUSE, SOUTHAMPTON STREET, LONDON W.C.2.

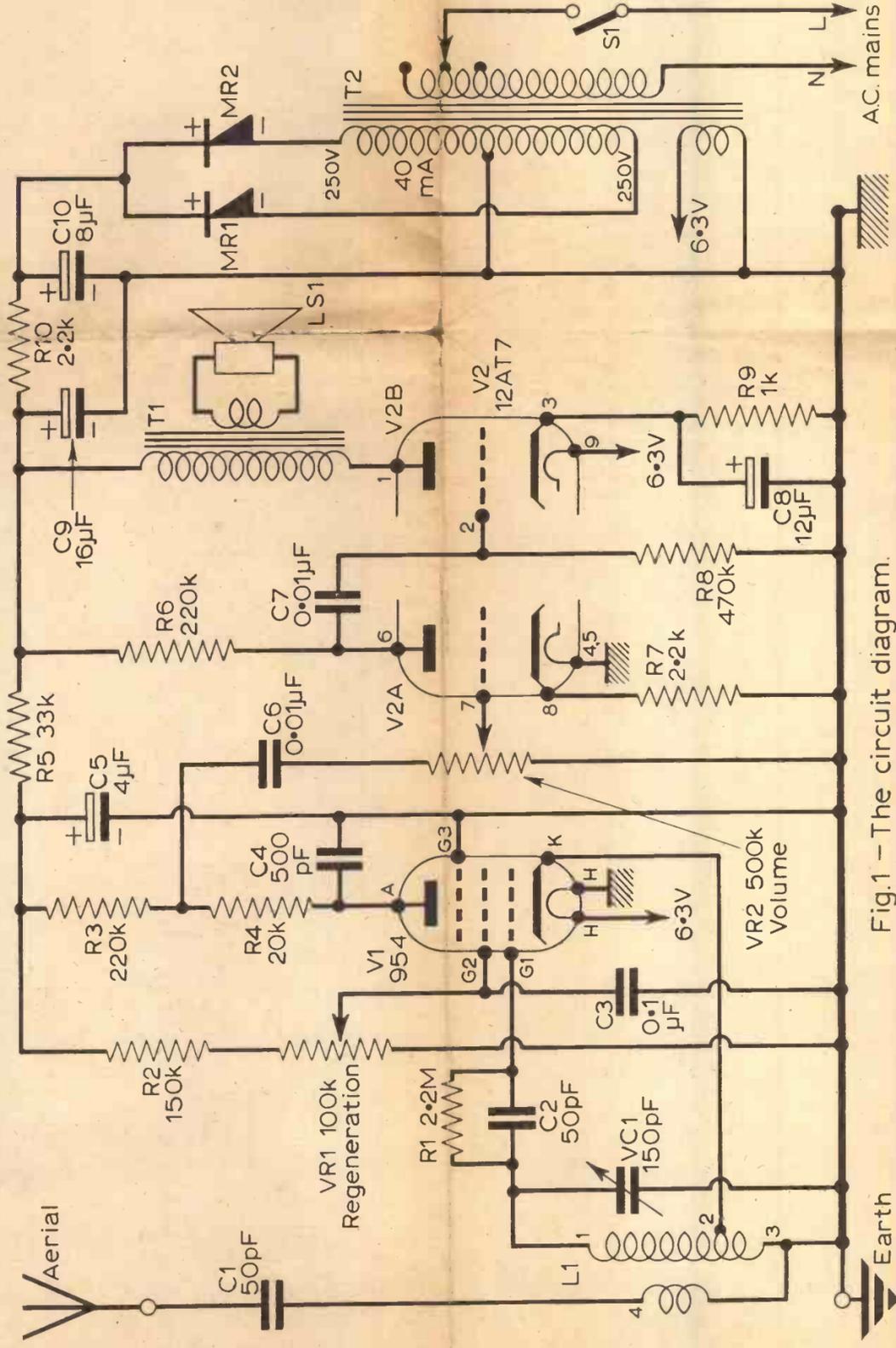


Fig. 1 - The circuit diagram.

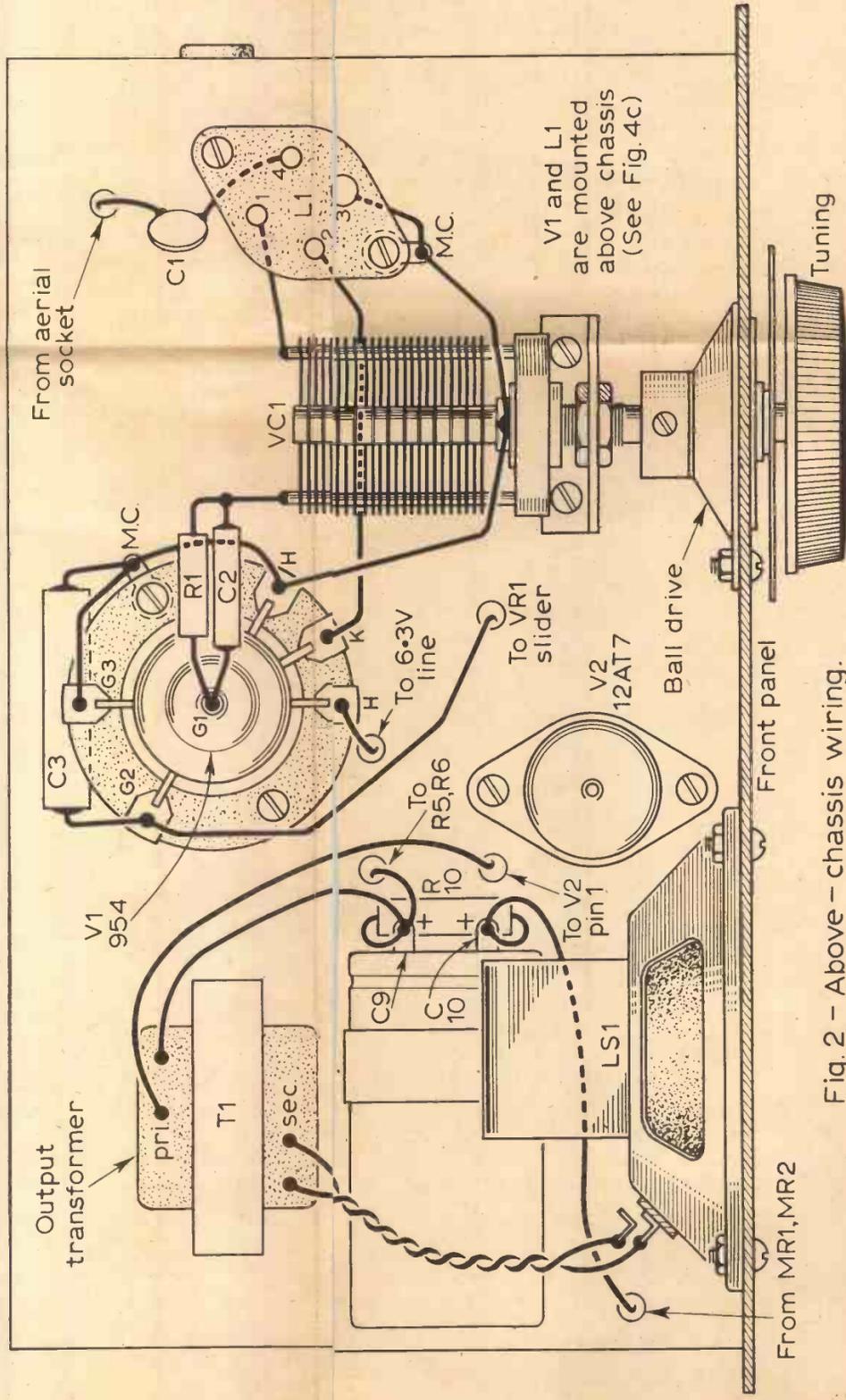


Fig. 2 - Above - chassis wiring.

- COMPONENTS LIST**
- Resistors:**
R1 2.2M Ω
R2 150k Ω
R3 220k Ω
R4 20k Ω
R5 33k Ω
R6 220k Ω
R7 2.2k Ω
R8 470k Ω
R9 1k Ω
R10 2.2k Ω
All 10%, $\frac{1}{4}$ W carbon, except where otherwise indicated
- Capacitors:**
C1 50pF mica or ceramic
C2 50pF mica or ceramic
C3 0.1 μ F paper
C4 500pF mica or ceramic
C5 4 μ F electrolytic 350V
C6 0.01 μ F paper
C7 0.01 μ F paper
C8 12 μ F electrolytic 25V
C9 16 μ F } dual electrolytic 350V
C10 8 μ F }
VC1 150pF air dielectric variable
- Transformers:**
T1 Output transformer 60 : 1
T2 Small mains transformer. Tapped primary. Secondaries: 250-0-250V 40mA; 6.3V 1A
- Valves:**
V1 954 V2 12AT7
- Other Circuit Components:**
LS1 2 $\frac{1}{2}$ in. diameter loudspeaker 2-3 Ω
S1 Toggle switch s.p.s.t.
MR1, 2 Contact cooled rectifier 250V 40mA
- Miscellaneous:**
Ball drive 6 : 1 ratio. Knobs: one 2in. diameter, two 1in. diameter. One B9A valveholder. Ribbed 4-pin plug-in coil formers (Eddystone). Coil holder (Eddystone). Aerial-earh socket strip. Tag strip (2 insulated). Chassis 7in. x 4in. x 2 $\frac{1}{2}$ in. approx. Panel 6in. x 7 $\frac{1}{2}$ in.

COIL WINDING DATA

- 1-2-4Mc/s (250-75 metres)
100 turns 34s.w.g., tap at 2 turns. Aerial coupling, 20 turns.
- 2.5-7.5Mc/s (120-40 metres)
50 turns 32s.w.g., tap at 1 $\frac{1}{2}$ turns. Aerial coupling, 15 turns.
- 6-75-22Mc/s (44-13.6 metres)
16 turns 30s.w.g., tap at $\frac{3}{4}$ turn. Aerial coupling, five turns.
- 14.5-50Mc/s (20.6-6 metres)
5 $\frac{1}{2}$ turns 30s.w.g., tap $\frac{3}{4}$ to $\frac{1}{2}$ turn. Aerial coupling, two turns.
- 40-100Mc/s (7.5-3 metres)
2 $\frac{1}{2}$ turns 20s.w.g., double spaced, tap at $\frac{1}{2}$ turn. Aerial coupling, one turn.
- The two larger coils are close wound. The other coils are on threaded formers, and spaced 21 turns per inch. Aerial windings are near the tuned winding as indicated in Fig. 4(d).

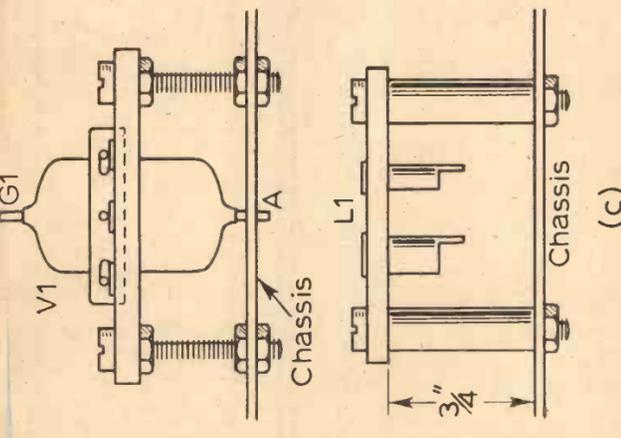
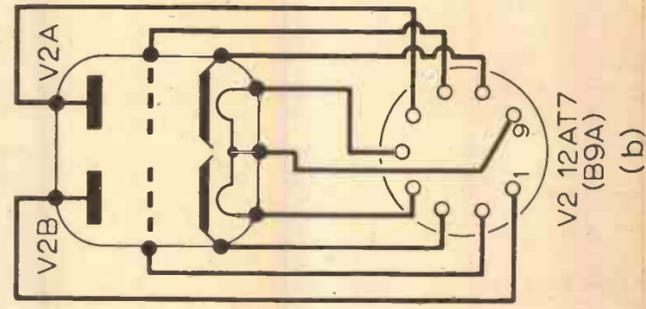
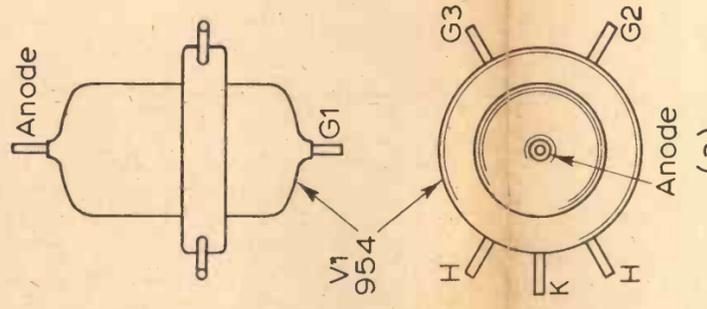


Fig. 4 - Coil and valve details.

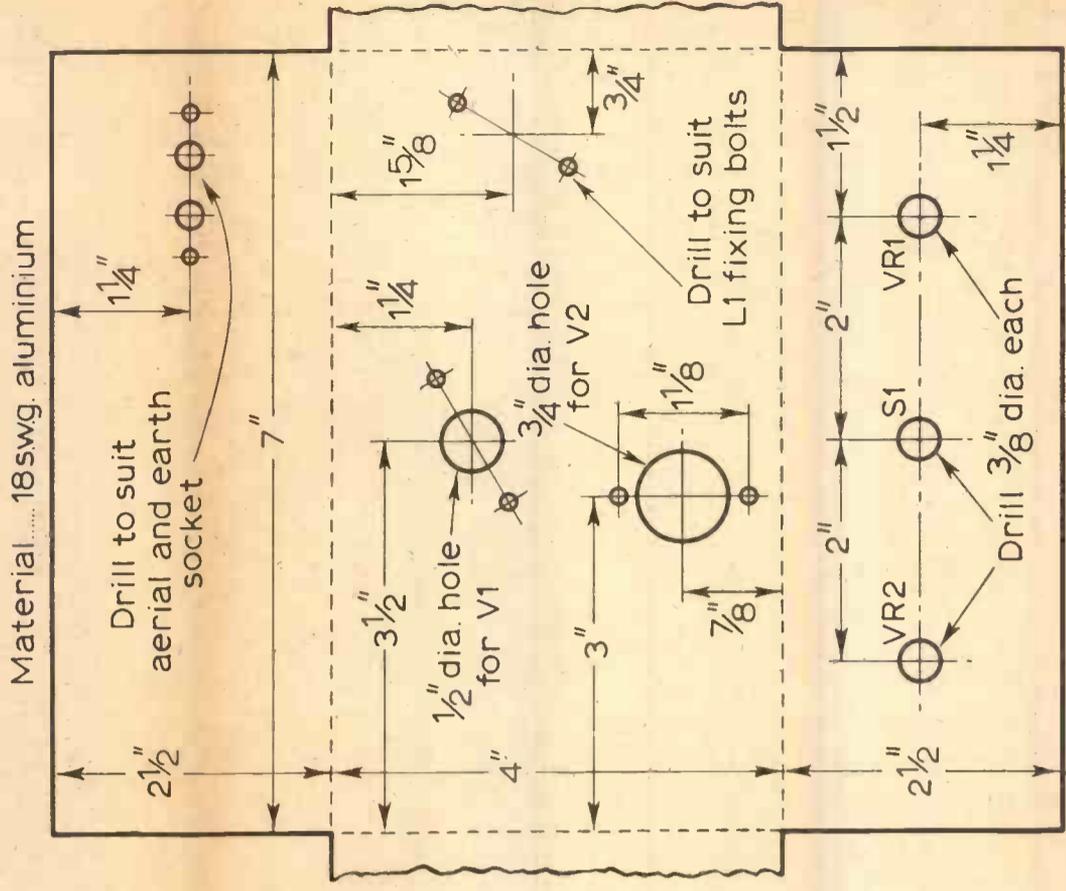


Fig 5 - Chassis drilling details.

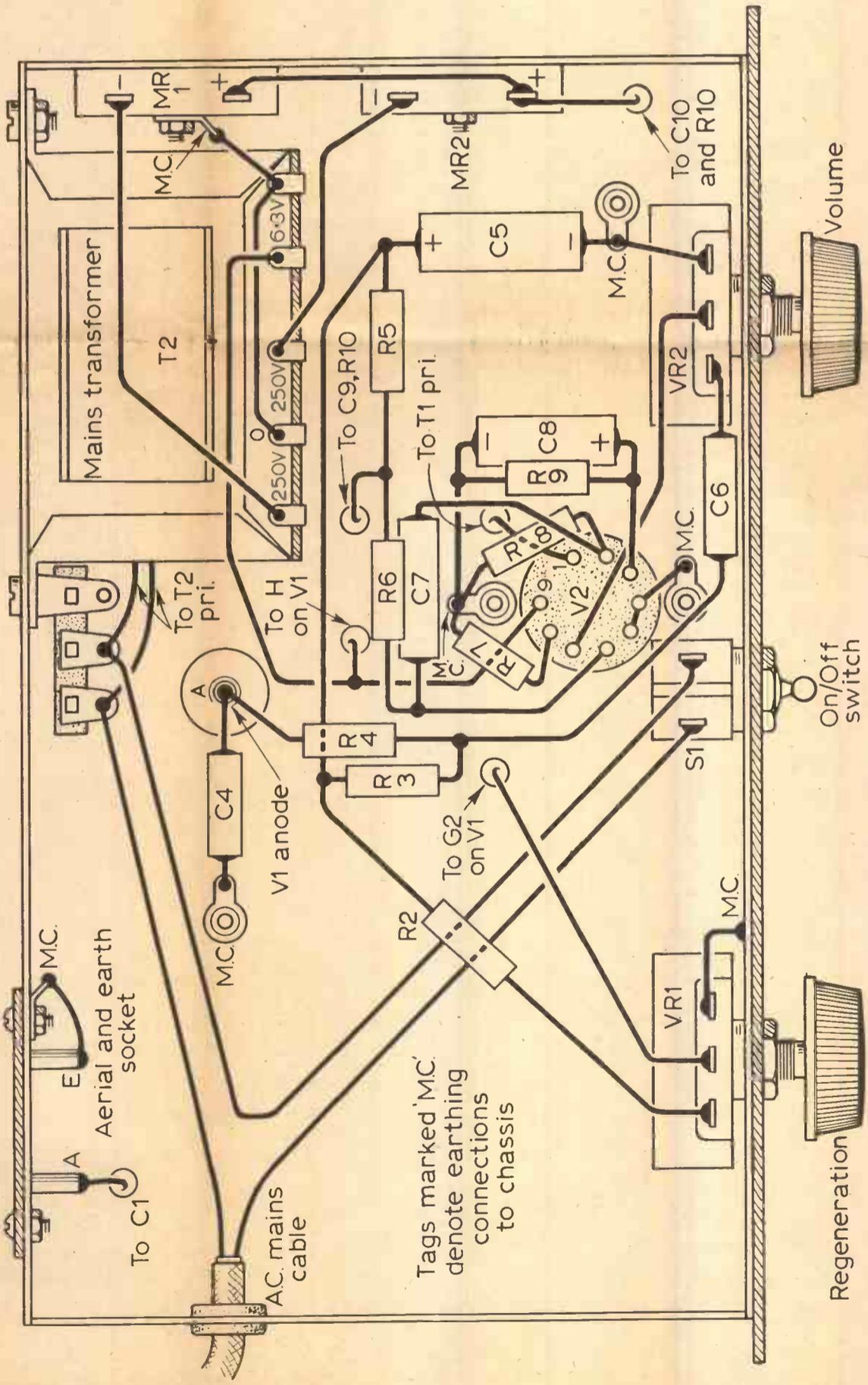


Fig 3 - Below-chassis wiring.

SHORT WAVE BROADCASTING STATIONS

THIS list is not intended to be a complete guide to the many hundreds of short wave broadcasting stations in operation, but it does indicate the stations which, in normal conditions, are most easily heard.

Frequency (kc/s)	Wavelength (metres)	Station
5930	50-57	Prague, Czechoslovakia
5960	50-34	Rome, Italy
5990	50-08	Bucharest, Roumania
6005	49-96	R.I.A.S., Berlin, Germany
6010	49-92	Rome, Italy
6025	49-79	Radio Nederland, Holland
6030	49-75	Lisbon, Portugal
6035	49-71	Muhlacker, W. Germany
6055	49-57	Monte Carlo, Monaco
6065	49-55	Schwarzenburg, Switzerland
6070	49-46	Horby, Sweden
6075	49-42	Sofia, Bulgaria
6090	49-38	Osterloog, W. Germany
6100	49-26	Radio Luxembourg
6140	48-86	Belgrade, Yugoslavia
6160	48-70	Voice of America, Tangier
6165	48-66	Voice of America, Munich, W. Germany
6175	48-58	Schwarzenburg, Switzerland
6190	48-47	Allouis, France
6190	48-47	Bremen, W. Germany
6205	48-33	Vatican City
7050	42-55	Cairo, Egypt
7105	42-22	Madrid, Spain
7125	42-11	Warsaw, Poland
7135	42-05	Monte Carlo, Monaco
7180	41-78	Baghdad, Iraq
7195	41-70	Bucharest, Roumania
7200	41-67	Belgrade, Yugoslavia
7220	41-55	Budapest, Hungary
7255	41-35	Sofia, Bulgaria
7275	41-24	Rome, Italy
7280	41-21	Allouis, France
7285	41-18	Ankara, Turkey
9009	33-03	Tel Aviv, Israel
9410	31-88	B.B.C. Overseas Service
9475	31-66	Cairo, Egypt
9505	31-56	Prague, Czechoslovakia
9510	31-55	B.B.C. Overseas Service
9515	31-53	Rome, Italy
9520	31-51	Voice of America, Tangier
9535	31-46	Schwarzenburg, Switzerland
9540	31-45	Warsaw, Poland
9570	31-35	Shepparton, Australia
9575	31-33	Rome, Italy
9585	31-30	Allouis, France
9620	31-19	Horby, Sweden
9630	31-15	Sackville, Radio Canada
9645	31-10	Vatican City
9655	31-04	Schwarzenburg, Switzerland
9675	31-01	Warsaw, Poland
9700	30-93	Sofia, Bulgaria
9715	30-88	Radio Nederland, Holland
9720	30-86	Radio Nacional, Rio de Janeiro, Brazil
9735	30-82	Deutsche Welle, W. Germany
9745	30-78	Ankara, Turkey
9770	30-71	Vienna, Austria
9780	30-67	Cairo, Egypt
9865	30-40	Diakarta, Indonesia
11705	25-63	Horby, Sweden
11715	25-61	Schwarzenburg, Switzerland
11720	25-60	Sackville, Radio Canada
11755	25-52	Leopoldville, Congo
11800	25-42	Accra, Ghana
11810	25-40	Rome, Italy
11820	25-38	B.B.C. Overseas Service
11830	25-36	Voice of America, Munich, W. Germany and Tangier
11835	25-35	Algiers, Algeria
11865	25-28	Schwarzenburg, Switzerland
11865	25-28	Havana, Cuba
11900	25-21	Paradys, South Africa
11910	25-19	Armed Forces Radio Service, Greenville, U.S.A.
11915	25-18	Voice of the Andes, Quito, Ecuador
11920	25-17	Allouis, France
11925	25-16	Radio Bandeirantes, Sao Paulo, Brazil
11965	25-06	Conakry, Guinea
11990	25-02	Prague, Czechoslovakia
12095	24-80	B.B.C. Overseas Service
15070	19-91	B.B.C. Overseas Service
15080	19-89	Paradys, South Africa
15115	19-85	Voice of the Andes, Quito, Ecuador
15125	19-83	Lisbon, Portugal
15155	19-80	ELWA, Monrovia, Liberia
15165	19-78	Damascus, Syria
15190	19-75	Brazzaville, Congo
15205	19-73	Voice of America, Greenville, U.S.A.
15220	19-71	Shepparton, Radio Australia
15250	19-67	Voice of America, Bethany, U.S.A.
15260	19-66	B.B.C. Far Eastern Station, Malaya
15280	19-63	Armed Forces Radio Service, Greenville, U.S.A.
15290	19-62	Voice of America, Tangier
15305	19-60	Voice of America, Greenville, U.S.A.
15320	19-58	Sackville, Radio Canada
15330	19-57	Voice of America, Greenville, U.S.A.
15370	19-52	Radio Tupi, Rio de Janeiro, Brazil
15385	19-50	WRUL, Boston, U.S.A.
15400	19-48	Rome, Italy
15445	19-43	Brazzaville, Congo
15475	19-38	Cairo, Egypt
15485	19-37	B.B.C. Overseas Service
17695	16-95	Voice of America, Bound Brook, U.S.A.
17780	16-87	Voice of America, Switzerland
17795	16-86	Schwarzenburg, Switzerland
17820	16-84	Sackville, Radio Canada
17895	16-76	Lisbon, Portugal
17920	16-74	Cairo, Egypt
21470	13-97	B.B.C. Overseas Service
21495	13-96	Lisbon, Portugal
21560	13-91	Rome, Italy

N.B.—No frequencies are given for Radio Moscow or Radio Free Europe as the schedules of these stations vary more often than others, but they will usually be heard on several frequencies in each band.

When and Where To Listen

4. North Africa and Near East This area is best around 12.00 to 23.00, although it is possible to hear it almost round the clock. On the broadcast bands, 16, 19 and 25 metres are usually good in daylight, with 31 and 41 metres being better after dark. On the amateur bands, 15 and 20 metres are usually best, on 15 metres 08.00 to 11.00 is often a good time.

5. Central and South Africa The best times for this area are between 13.00 and 22.00. On the broadcast bands, during daylight 19 metres is best, but after dark 25 and 31 metres are better, especially in the winter half. On the amateur bands 15 metres is likely to be useful, with 20 metres best around 17.00 to 20.00. This area is possibly one of the few which will be heard during any openings on 10 metres.

6. North Asia The best times are around 06.00 to 09.00 and around 20.00, this is not an easy area to hear, especially Japan. On the broadcast bands, 19 and 25 metres are the best. On the amateur bands, 20 metres is probably the only worthwhile recommendation.

7. South and South-East Asia This is usually best around 11.00 to 17.00. The best broadcast bands are 16 and 19 metres for the earlier part, with 25 metres being most useful later towards the end of the best period. On the amateur bands 20 metres must again be the best suggestion, with just a chance that 15 metres might occasionally open in that direction. During the winter half it is likely that the best period may extend on to around 21.00 with the 31 and 41 metre broadcast bands being best for this.

8. Australasia The best times for this area are 06.00 to 10.00 and, in winter, around 14.00 to 17.00 and around 22.00. New Zealand is not too easy to hear, and is usually better around 09.00 to 11.00. Reception is much better in the spring, winter and autumn than in the summer. In the better seasons, the best broadcast bands are 25 and 31 metres for the morning, 31 and 41 metres in the afternoon and 19 metres for the night opening which is less reliable. On the amateur bands, 20 metres is the favourite with 40 metres useful in winter in the mornings.

9. Pacific This is a difficult area usually, and is best around 06.00 to 11.00. There are few high power broadcasting stations in the area, and 19 and 25 metres are the most likely bands. Of the amateur bands, 20 metres is best.

10. Europe Obviously, this area can be heard 24 hours a day. On the broadcast bands, 25 and 31 metres are best for Southern Europe with 41 and 49 metres best for Northern Europe, 19 metres can provide European reception for Northern day. On the amateur bands 20 metres during the day, and 40 and 80 metres after dark are best, but in summer short skip occurs on 15 and 10 metres at times.

THE "Q" CODE

THE "Q" Code is used by aeronautical and maritime services in other commercial services and is very comprehensive in its full form. In its correct use, each group (made up of Q and two letters) can stand either for a question (e.g. QTH? means "what is your location?"), or the answer (e.g. QTH means "my location is ..."). Amateurs have adopted certain of the code groups to their own use and the following list shows the more usual ones with their meanings.

QRA	Full address	QRX	Wait
QRH	Your frequency varies	QSA	Readability of signal
QRK	Signal strength (also price or value, humorously)	QSB	Fading
QRL	Busy	QSL	Acknowledgement of receipt; confirmation of contact
QRM	Man-made interference	QSO	Contact
QRN	Atmospheric interference; static	QSP	Pass on a message
QRO	High power	QSY	Change frequency
QRP	Low power	QTC	Telegram, message
QRT	Closed down	QTH	Location
QRU	Nothing further to say	QTR	Time check
QTV	Ready to operate		

STANDARD FREQUENCY STATIONS

THE frequencies 2500, 5000, 10000, 15000, 20000 and 25000 kc/s are set aside for station transmitting accurate frequency standards and also time signals in many cases. Some of these stations are:

ATA	New Delhi, India, operating on 10000 kc/s.
BPV	Peking, China, operating on 5000, 10000 and 15000 kc/s.
FFH	Paris, France, operating on 2500 kc/s.
HBN	Neuchatel, Switzerland, operating on 5000 kc/s.
IAM	Rome, Italy, operating on 5000 kc/s.
IBF	Turin, Italy, operating on 5000 kc/s.
JTY	Tokyo, Japan, operating on 2500, 5000, 10000 and 15000 kc/s.
LOL	Buenos Aires, Argentina, operating on 5000, 10000 and 15000 kc/s.
MSF	Rugby, England, operating on 2500, 5000 and 10000 kc/s.
OM-A	Prague, Czechoslovakia, operating on 2500 kc/s.
RWM	Moscow, U.S.S.R., operating on 5000, 10000 and 15000 kc/s.
WWV	Washington, U.S.A., operating on 2500, 5000, 10000, 15000, 20000 and 25000 kc/s.
WWVH	Hawaii, operating on 5000, 10000 and 15000 kc/s.
ZUO	Johannesburg, South Africa, operating on 5000 and 10000 kc/s.

In addition, CHU, Ottawa, Canada, transmits on 3330, 7335 and 14670 kc/s.
Most of these stations make speech announcements at intervals, and give their call signs in morse code. WWV gives time checks and also propagation forecasts.

Signal Reporting Systems

IT has become the usual practice to use some type of code for giving signal reports. The most usual system in use on the amateur bands is a Readability/Signal Strength code, using a scale from 1 to 5 for readability and from 1 to 9 for signal strength. These are not always used correctly and often when incorrectly adjusted "signal strength meters" are used, reports such as "S9 plus 40 db" are heard. As will be seen below, S9 means "extremely strong", which can hardly be improved on! Following are the scales for readability and signal strength:

Readability:	
R1	Unreadable
R2	Only just readable, and only occasional words heard
R3	Readable, but with considerable difficulty
R4	Readable with almost no difficulty
R5	Perfectly readable
Signal Strength:	
S1	Signals only just perceptible
S2	Very weak signals
S3	Weak signals
S4	Fair signals
S5	Fairly good signals
S6	Good signals
S7	Moderately strong signals
S8	Strong signals
S9	Extremely strong signals

For reporting on telegraphy (CW) signals, an additional scale for "tone" is used to indicate the quality of the note. This is also a 1 to 9 scale, as follows:

Tone:	
T1	Extremely rough note
T2	Very rough note
T3	Rough, low pitched note
T4	Rather rough note
T5	Musically modulated note
T6	Modulated note, slight whistle
T7	Fairly good note, smooth ripple
T8	Good note, slight ripple
T9	Pure DC note

(If the note seems to be crystal controlled, an "x" is added, if the note is chirpy, a "c" is added.)

The readability/signal strength code can be used for reporting to broadcasting stations, but a better system for this purpose is the SINPO code. This has five scales, each of 1 to 5, as indicated by the letters S (Signal Strength), I (Interference), N (Noise, i.e. static), P (Propagation Disturbance, i.e. fading) and O (Overall quality of reception).

The scale for signal strength is: 1—barely audible; 2—poor; 3—fair; 4—good; 5—excellent. The scales for Interference, Noise and Propagation Disturbance are: 1—extreme; 2—severe; 3—moderate; 4—slight; 5—nil. The scale for Overall quality is: 1—unusable; 2—poor; 3—fair; 4—good; 5—excellent. Thus, in the SINPO code, a perfectly received signal would be given 55555.

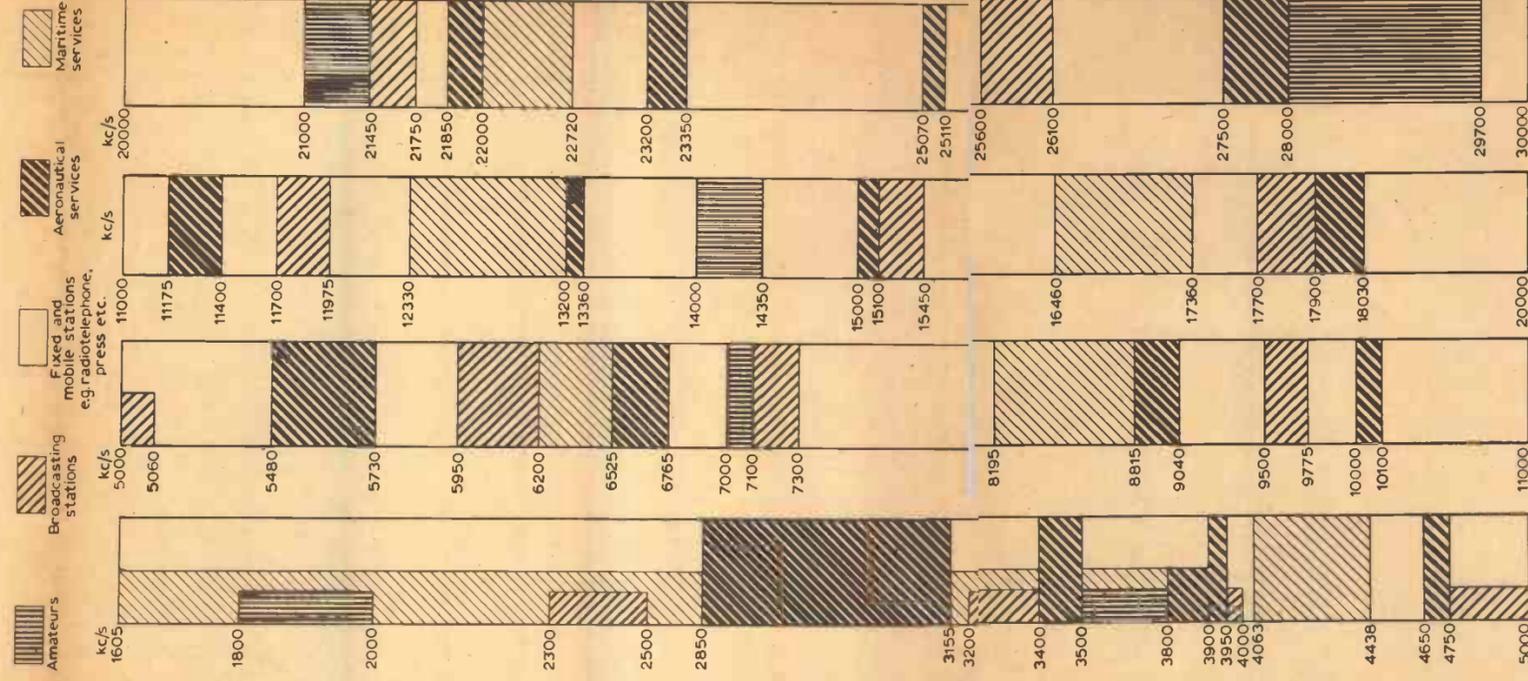
THE SHORT WAVE SPECTRUM

THE International Telecommunications Union is the controlling body over the whole of the radio frequency spectrum and allocations have been made from 10 kc/s to 40 kc/s. The accompanying chart shows the allocations between 1605 kc/s and 30000 kc/s, which is the range generally known as the "short waves". The I.T.U. divides the world into three regions for frequency allocation purposes; Region 1 comprises Europe, Africa, the Near East and the whole of the U.S.S.R.; Region 2 is made up of North America, Central America, South America and Greenland; and Region 3 contains Asia (except the U.S.S.R.) and Australasia and the Pacific.

In the main, the allocations in the s.w. range are fairly uniform over all three Regions, but there are a few differences which should be noted.

1. The amateur band 1800 to 2000 kc/s is only available in a limited number of countries.
2. The broadcasting bands 2300 to 2500 kc/s, 3200 to 3400 kc/s and 4750 to 5060 kc/s are classed as "tropical" and are limited to countries in these regions.
3. In Region 2 the amateur band beginning at 3500 kc/s extends through to 4000 kc/s.
4. In Region 2 the amateur band beginning at 7000 kc/s extends through to 7300 kc/s and the allocation 7100 to 7300 kc/s is not available for broadcasting.

The chart obviously has to leave out several minor points of difference, but these are mainly confined to the lower frequencies. The main classes of service are indicated as follows:



AMATEUR CALLSIGN PREFIXES

AMATEUR radio stations, in common with all other communications stations, have to identify themselves by call signs. Each station has an individual officially allocated call sign which follows a standard pattern, being made up of a prefix, a numeral, and a suffix. The prefix may be one letter, two letters or a numeral and letter, but it is derived from the international list of call sign allocations. The numeral may have some geographical significance, but this is not always so. The suffix may be one, two or three letters; in the bigger countries they are issued in alphabetical order, but in smaller countries they are often issued haphazardly, a popular idea being to allow the operator to use his initials as his call.

To take an example of a call sign—G3AKA. The G is the prefix allocated to England, the figure 3 has no special meaning and the AKA is the suffix. In another case—say W7XYZ. Here the W is the U.S.A. prefix, but in this case the figure 7 indicates that the station is located in a particular area of the U.S.A., and the XYZ is the suffix. One final example—say 5N2ABC. In this case 5N is the prefix for Nigeria, the figure 2 has no significance, and the ABC is the suffix.

The following is an up-to-date list of prefixes, the numeral is only given here where it is necessary to distinguish between countries, for instance VQ is the general prefix for Commonwealth countries in East Africa, but VQ1 is Zanzibar and VQ2 is Northern Rhodesia, so the numeral is virtually part of the prefix in these cases. This list is not intended to be an "official" list of countries, the various clubs and societies each issue their own lists of this kind, which only differ where some of the more out of the way places are concerned.

Occasionally, stations can be heard with additional letters, such as /P or /M after the call sign. Examples of these and their meanings are: /A indicates the station is being operated from another address than that given in the licence. /P means the

station is being operated "portable", i.e. not from a mains electricity supply; this letter is usually heard when Field Day contests are being held. /M means that the station is "mobile", i.e. in a car or other vehicle. /MM means "maritime mobile", on board a ship. /AM is "aeronautical mobile", on an aircraft. In the U.S.A., however, /P and /A are not used; instead, the call area in which the station is temporarily operating is added, for instance WZZZZ operating portable in the W2 area would sign WZZZZ/2, if he went over to California he would sign WZZZZ/6. If he crossed into Canada, he might sign WZZZZ/V23 and so on.

CALL AREAS

As mentioned above, in certain countries, there is a subdivision into call areas, indicated by the figure in the call sign. Most of the South American countries use this system, and it also applies in Australia, Canada, New Zealand and the U.S.A. Details for these latter four countries are:

Australia VK1—Canberra; VK2—New South Wales; VK3—Victoria; VK4—Queensland; VK5—South Australia; VK6—Western Australia; VK7—Tasmania; VK8—Northern Territory.

Canada VE1—Nova Scotia, New Brunswick and Prince Edward Island; VE2—Province of Quebec; VE3—Ontario; VE4—Manitoba; VE5—Saskatchewan; VE6—Alberta; VE7—British Columbia; VE8—Yukon and North West Territories; VE9—Newfoundland; VE0—Labrador.

New Zealand ZL1—Auckland; ZL2—Wellington; ZL3—Canterbury; ZL4—Otago.

United States of America K1/KN/W/WA/WB/WN/WV prefixes: 1—Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island and Vermont. 2—New Jersey and New York. 3—Delaware, Maryland, Pennsylvania and District of Columbia. 4—Alabama, Florida, Georgia, Kentucky, North Carolina, South Carolina, Tennessee, Virginia. 5—Arkansas, Louisiana, Mississippi, New Mexico, Oklahoma and Texas. 6—California. 7—Arizona, Idaho, Montana, Nevada, Oregon, Utah, Washington and Wyoming. 8—Michigan, Ohio and West Virginia. 9—Illinois, Indiana and Wisconsin. 0—Colorado, Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, South Dakota.

CT2	Azores Islands	EA0	Spanish Guinea and Fernando Poo
CT3	Madeira Islands	EI	Eire
CX	Uruguay	EL	Liberia
DJ	Germany (West)	EP	Iran
DL	Germany (West)	EQ	Iran
DM	Germany (East)	ET	Ethiopia
DU	Philippine Islands	F	France
EA	Spain	FB	Amsterdam and St. Paul Is., Crozet and Kerguelen Is.
EA6	Balearcic Islands		
EA8	Canary Islands		
EA9	Ceuta, Melilla and Ifni		
EA0	Azores Islands		
EA1	Madeira Islands		
EA2	Uruguay		
EA3	Germany (West)		
EA4	Germany (West)		
EA5	Germany (East)		
EA6	Philippine Islands		
EA7	Spain		
EA8	Balearcic Islands		
EA9	Canary Islands		

CO	Cuba
CP	Bolivia
CR4	Cape Verde Islands
CR5	Portuguese Guinea, Principe Is., and Sao Thome
CR6	Angola
CR7	Mozambique
CR8	Portuguese Timor
CR9	Macao
CT1	Portugal

FC	Corisca	KG6	Caroline Islands	TL	Central African Republic	VQ2	Northern Rhodesia	ZB1	Malta
FG	Guadeloupe	KG1	Greenland (U.S. Forces)	TN	Republic of Congo	VQ4	Kenya	ZB2	Gibraltar
FH	Comoro Islands	KG4	Guantanamo Bay	TR	Gabon	VQ7	Aldabra Islands	ZC5	North Borneo
FK	New Caledonia	KG6	Guam, Mariana Islands and Marcus Islands	TT	Chad	VQ8	Mauritius	ZD3	Gambia
FL	French Somaliland		Hawaiian Islands	TU	Ivory Coast	VQ9	Seychelles	ZD6	Nyasaland
FM	Martinique	KH	Johnston Island	TY	Dahomey	VR1	Gilbert & Ellice Islands, Phoenix Islands, British Ascension Island	ZD7	St. Helena
FO	Marquesas Is., Society Is., Tuamotu, Tubual Is., Clipperton Is.	KJ	Alaska	TZ	Mali	VR2	Fiji Islands	ZD8	Ocean Islands
FP	St. Pierre and Miquelon Is.	KL	Midway Islands	UA	U.S.S.R.	VR3	Line Islands	ZD9	Tristan da Cunha and Gough Islands
FR	Reunion Islands	KM	United States of America (novice stations)	UB	Ukraine	VR4	Southern Rhodesia	ZE	Cook Islands
FS	St. Martin Island	KN	Puerto Rico	UC	White Russia	VR5	Tonga	ZK1	New Zealand
FU	New Hebrides	KP4	Palmyra and Jarvis Is.	UD	Azerbaijan	VR6	Pitcairn Island	ZK2	Niue
FW	Wallis and Fortuna Is.	KP6	French Guinea and Inini	UE	Georgia	VR7	Sarawak	ZL0	New Zealand Antarctic
FY	French Guinea and Inini	KR	United Kingdom (special stations)	UF	Armenia	VR8	Singapore	ZL6	Western Samoa
G	England	KS4	Channel Islands	UH	Turkoman	VR9	Brunei	ZM6	Tokelau Islands
GB	United Kingdom (special stations)	KS6	Isle of Man	UI	Uzbek	VR0	Hong Kong	ZM7	Paraguay
GC	Victoria	KV	Northern Ireland	UJ	Tadzhik	VR1	Aden, Socotra, Maldive Islands, Kamarin Islands	ZS	South Africa
GD	Western Australia	KW	Scotland	UK	Kazakh	VR2	India	ZS3	South West Africa
GI	Wales	KX	Hungary	UL	Uzbek	VR3	United States of America	ZS7	Swaziland
GM	Switzerland	KZ	Switzerland	UM	Kirghiz	VR4	United States of America	ZS8	Basutoland
GW	Ecuador	LA	Galapagos Islands	UN	Moldavia	VR5	United States of America	ZS9	Bechuanaland
HA	Haiti	LU	Haiti	UP	Lithuania	VR6	United States of America	3A	Monaco
HB	Dominican Republic	LX	Dominican Republic	UQ	Latvia	VR7	United States of America	3V	Tunisia
HB0	Colombia	LZ	Colombia	UR	Estonia	VR8	United States of America	3W	Vietnam
HC	Korea	MP4	Korea	US	Ukraine	VR9	United States of America	3X	Guinea
HD	Colombia	OA	Colombia	UV	U.S.S.R.	VR0	United States of America	4S	Ceylon
HE	Korea	OD	Korea	VE	U.S.S.R.	VR1	United States of America	4U	United Nations
HF	Korea	OE	Korea	VK	Canada	VR2	United States of America	4W	Yemen
HP	Panama	OH	Panama	VK9	Australia	VR3	United States of America	4X	Israel
HR	Honduras	OK	Honduras	VO	New Guinea, Papua, Norfolk Island, Nauru, Cocos Is., Lord Howe Islands	VR4	United States of America	5A	Libya
HS	Thailand	ON	Thailand	V0	Lebanon	VR5	United States of America	5B4	Cyprus
HV	Vatican	OX	Vatican	V1	Austria	VR6	United States of America	5H3	Tanganyika
HZ	Saudi Arabia	OY	Saudi Arabia	V2	Finland	VR7	United States of America	5N2	Nigeria
I	Italy	OZ	Italy	V3	Czechoslovakia	VR8	United States of America	5R	Malagasy Republic
IL	Pelagian Islands	PA	Pelagian Islands	V4	Belgium	VR9	United States of America	5T	Mauretania
IP	Pantelaria Island	PJ	Pantelaria Island	V5	Denmark	VR0	United States of America	5U	Niger
IS	Sardinia	PK	Sardinia	V6	Netherlands	VR1	United States of America	5V	Togolese Republic
IT	Sicily	PX	Sicily	V7	Netherlands Antilles	VR2	United States of America	5W	Western Samoa
JA	Japan	PY	Japan	V8	Denmark	VR3	United States of America	5X5	Uganda
JT	Mongolia	PZ	Mongolia	V9	Netherlands	VR4	United States of America	60	Somali Republic
JY	Jordan	SL	Jordan	V0	Denmark	VR5	United States of America	6T	Sudan
JZ0	Guinea	SM	Guinea	V1	Netherlands	VR6	United States of America	6W	Senegal
K	United States of America	SP	United States of America	V2	Netherlands	VR7	United States of America	6Y	Jamaica
KA	Japan (U.S. Forces)	SU	Japan (U.S. Forces)	V3	Netherlands	VR8	United States of America	7X	Algeria
KB	Baker, Howland and American Phoenix Is.	SV	Baker, Howland and American Phoenix Is.	V4	Netherlands	VR9	United States of America	9A	San Marino
KC4	U.S. Antarctic and Navassa Island	TA	U.S. Antarctic and Navassa Island	V5	Netherlands	VR0	United States of America	9G	Ghana
		TB	U.S. Antarctic and Navassa Island	V6	Netherlands	VR1	United States of America	9K	Kuwait
		TC	U.S. Antarctic and Navassa Island	V7	Netherlands	VR2	United States of America	9L	Sierra Leone
		TD	U.S. Antarctic and Navassa Island	V8	Netherlands	VR3	United States of America	9M	Federation of Malaya
		TE	U.S. Antarctic and Navassa Island	V9	Netherlands	VR4	United States of America	9N	Nepal
		TF	U.S. Antarctic and Navassa Island	V0	Netherlands	VR5	United States of America	9Q	Congo Republic
		TG	U.S. Antarctic and Navassa Island	V1	Netherlands	VR6	United States of America	9U	Burundi
		TH	U.S. Antarctic and Navassa Island	V2	Netherlands	VR7	United States of America	9X	Ruanda

SHORT WAVE RECEIVING AERIALS

Details for planning and constructing S.W. aerials to suit restricted environments are given in this article

by A. W. Mann

ALTHOUGH highly efficient short-wave receivers are commonplace today, many are used in conjunction with aerials of comparatively low efficiency. This is, however, often no reflection on the designers or operators but is due to lack of space for outdoor erection of recommended types exactly to specification. But there are many ways in which this problem can be resolved and ample scope for originality.

Vertical aerials are used by many short-wave broadcasting authorities throughout the world and Fig. 1 shows a vertical type receiving aerial which can be erected at a comparatively low cost. All that is required is a pole of 2in. or 2½in. square section, an ex-Services type 8ft two-section whip aerial and rubber mounting base with three beehive type insulators and sufficient wire for the down lead.

Note the platform dimensions: 8in. x 6in. x 1in., fitted to the top of the pole, and the method of mounting. Use wood screws in preference to nails. The dimensions should be adhered to as the base flange of the aerial mounting is 8in. diameter. If smaller insulators than the type recommended are to hand they could be used if mounted on 1½in. wooden blocks nailed to the pole.

If insulated wire is used for the downlead do not fix it to the pole by means of insulated staples, otherwise considerable damping will result.

As vertical aerials are omnidirectional, excellent results may be expected providing that they are erected at a sufficient height. The author strongly recommends this type of aerial for use with receivers incorporating one or more r.f. stages.

In the case of regenerative receivers with no r.f. stage, a rigid copper rod is preferable to a rubber-

base mounted whip to avoid instability due to swaying in the wind. This does not apply to superhets.

Tuning the Aerial

It is generally appreciated that a tuned aerial system is more efficient than an untuned one and in addition improves the signal-to-noise ratio. Fig. 2 shows a pi-type aerial tuner using a multi-tapped coil tuned by two variable 200pF capacitors, the taps being selected by a rotary switch. The tuning coil consists of 25 turns of 20 gauge tinned copper wire spaced one diameter of the wire and wound on a 1in. diameter former.

This type of tuner should be built into a metal box. Efficient screening is essential in order to avoid direct pick-up by the coil winding, and to sharpen the tuning.

Tuning Procedure

First tune in a signal on the receiver and then rotate the aerial tuner controls to obtain a peak signal while trying different tappings. The optimum tapping is the one at which readjustment of the tuning controls produces the loudest signal and lowest noise level.

The peak points, which are more or less constant for a given band, are not the same for all

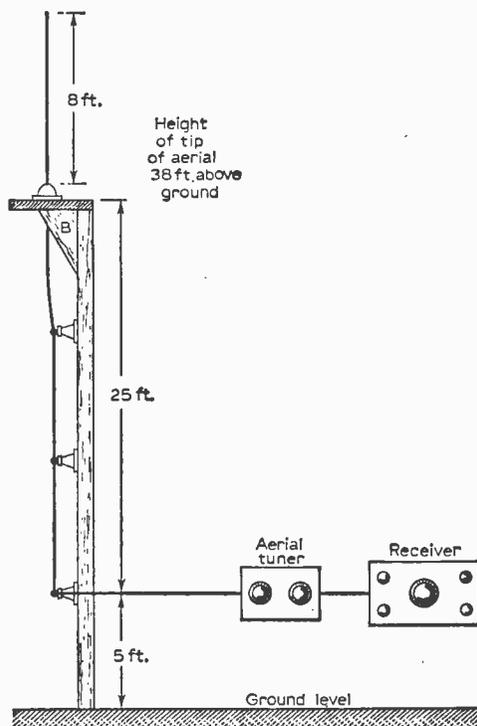


Fig. 1: An inexpensive but efficient vertical aerial.

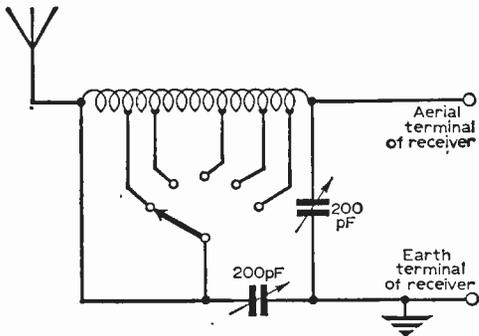


Fig. 2: A pi-type aerial tuner using a multi-tapped coil.

bands, and changing from one band to another calls for retuning of the aerial and some adjustment of the tapping points.

Once the peak points of the different bands have been found, the dial readings and tapping points can be logged for future reference. While additional tuning controls are generally to be avoided if possible, in the case of aerial tuners the advantages far outweigh the disadvantages.

Other Aerial Tuners

At Fig. 3 another very simple yet efficient aerial tuner is outlined. This consists of 26 turns of 14 gauge tinned copper wire spaced $\frac{1}{8}$ in. between turns on a $1\frac{1}{2}$ in. diameter former. Tapping points are made by spring clips, later to be replaced by a suitable switch.

With this particular tuner no difficulty should be experienced. It is necessary only to set the aerial tuning dial at zero, tune in a signal on the receiver, then tune the signal to maximum volume with the tuner. Try different tapplings, then retune the aerial. At one point on a particular turn the actual peak point will be found.

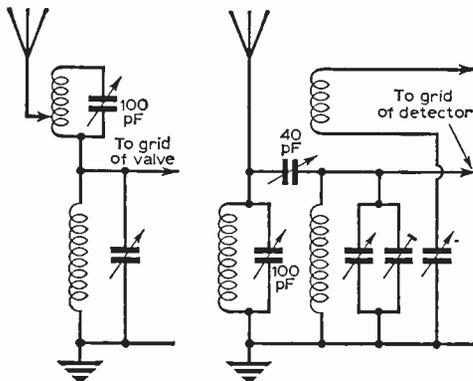


Fig. 3 (left): Another simple aerial tuner. Fig. 4 (right): This method of tuning uses a duplicate set of plug-in coils.

This procedure should be followed on all bands and the tapping points and dial readings noted. It should be remembered that when using tapped coils and spring clips in the initial tests, it is not sufficient to select merely the correct turn on the coil, but also the correct part of the turn from which to take a permanent tap to a rotary switch. This particular form of aerial tuner is ideal for use with receivers of the regenerative type.

Fig. 4 shows a method of aerial tuning in which a duplicate set of plug-in coils is used. This can also be used as an additional selectivity device and wave trap and is suitable for use with regenerative receivers. If used in conjunction with plug-in coils of identical type and make to those in the receiver no difficulty will be found in tuning to resonance. In the case of this and the series tuner of Fig. 3 a slight backing-off from the resonance point will assure stability.

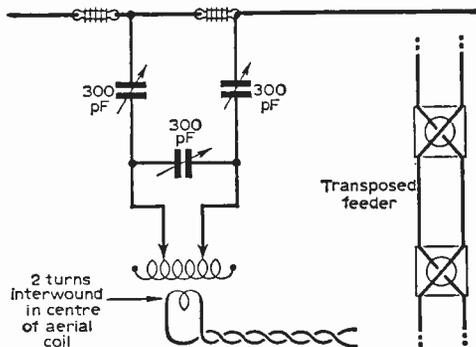


Fig. 5: This tuner is designed primarily for open wire or transposed feeders.

The aerial tuner shown at Fig. 5 is designed for aeriels with open wire or transposed feeders. Although it can be used with twisted flex feeders, tuning is rather difficult.

Indoor Directional Aerials

It sometimes happens that the erection of a good outdoor receiving aerial is impracticable or forbidden. The problem is to decide what form an indoor aerial should take.

If a criss-cross roof space arrangement is used with a single wire down lead, the chances are that the latter will be longer than the aerial if the receiver is located in a downstairs room, and furthermore will be heavily damped due to its proximity to walls.

The foregoing remarks are based on personal experience and is the reason why many really sensitive receivers give a below-average performance when used under such conditions. If, however, it is possible to arrange the down lead away from the wall a marked improvement will result. Even so, such indoor aeriels are of comparatively low efficiency.

With the foregoing considerations in mind readers should consider the erection of a dipole type, providing that each span can be at least 20ft long.

In many instances however, that will be impossible in the average roof space. However,

each span can be bent as shown at Fig. 6 and Fig. 7. The spacer shown at Fig. 8 is of plastic or other insulating material fitted with two terminals.

Plastic-covered electrical flex may be used for the transmission line and the switching over from one aerial to the other may be achieved via a relay or a double-pole, double-throw switch. The arrangement shown at Fig. 6 was fully described as relay switched by the author in *Practical Wireless* some years ago.

The use of a single dipole of the forms described

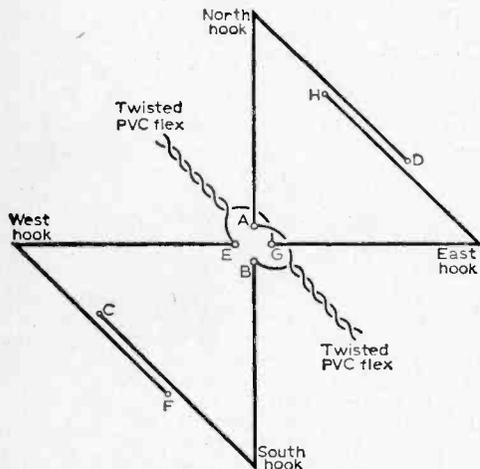
aerials are also very efficient. For some years this particular arrangement has also been used with the R1155A and R1116A with gratifying results.

General Arrangements

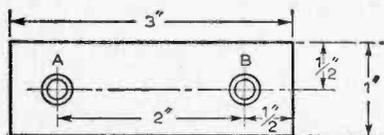
Let us examine the sketch at Fig. 6 in detail. From A to D is a single wire, as is B to C, E to F and G to H. In Fig. 7 we have single wires A to B, C to D, E to F and G to H. Two separators fitted with terminals or suitable sockets and plugs are required, details of which are given in Fig. 8. Stranded insulated aerial wire should be used and the aerial system should be supported by small brass hooks.

A Horizontal U Aerial

Where a short-wave receiver is used in a separate room the aerial arrangement shown at Fig. 9 provides scope for experiment if suspended above the receiver and between the end walls.



Figs. 6 (above) and 7 (right): Show how indoor aerials may be bent to be accommodated in limited space. Fig. 8 (below): Shows the spacer.



here is not recommended for indoor use as it is very directional. This type of aerial is only recommended when arranged as described due to its broadside directive properties. This means that for east-west reception the aerial must be run north to south and for north-south reception east to west.

If arranged as suggested the twin dipoles will provide world-wide coverage. Anyone using a receiver fitted with an S meter will find that tests using alternative aerials on a given signal will show a marked increase or decrease in signal strength, sometimes from 4 to 5 S points.

During the past 18 months the author has used the aerial shown at Fig. 6 exclusively in conjunction with a Senior National H.R.O. Using the east-west aerial a particular amateur band could appear to be more or less dead, whereas switching to the north-south aerial produced strong signals from some unexpected sources. This shows that although the H.R.O. is of high sensitivity the

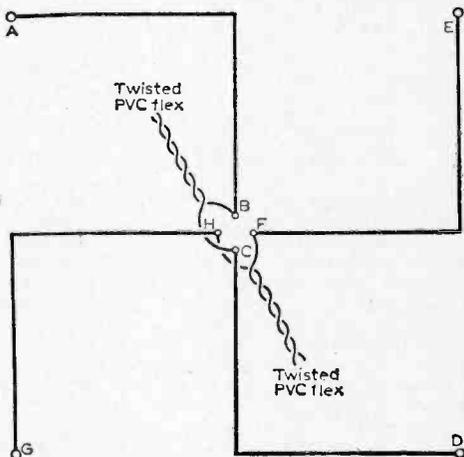
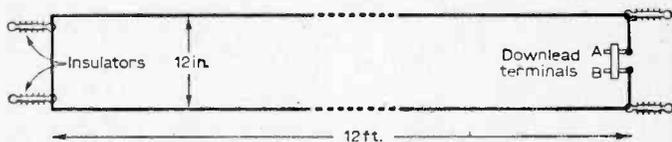


Fig. 9 (below): An aerial suitable for assembling in a room.



The down lead will be a short one and may be fitted to terminal A or B at will. This will alter the aerial directivity to some extent and if used in conjunction with the aerial tuner shown at Fig. 3 will considerably peak signals using either connection. If the terminals are shorted, a definite drop in signal strength will result.

Providing that bare stranded copper wire is used, the down lead may be tapped on at any point by means of a spring clip (such as in the Windom aerial) one-third from either end, although other points may be tried. If an S meter is available the maximum or peak point can be noted, after which the aerial tuner can be coupled in and a further note taken as to the extra gain obtained.

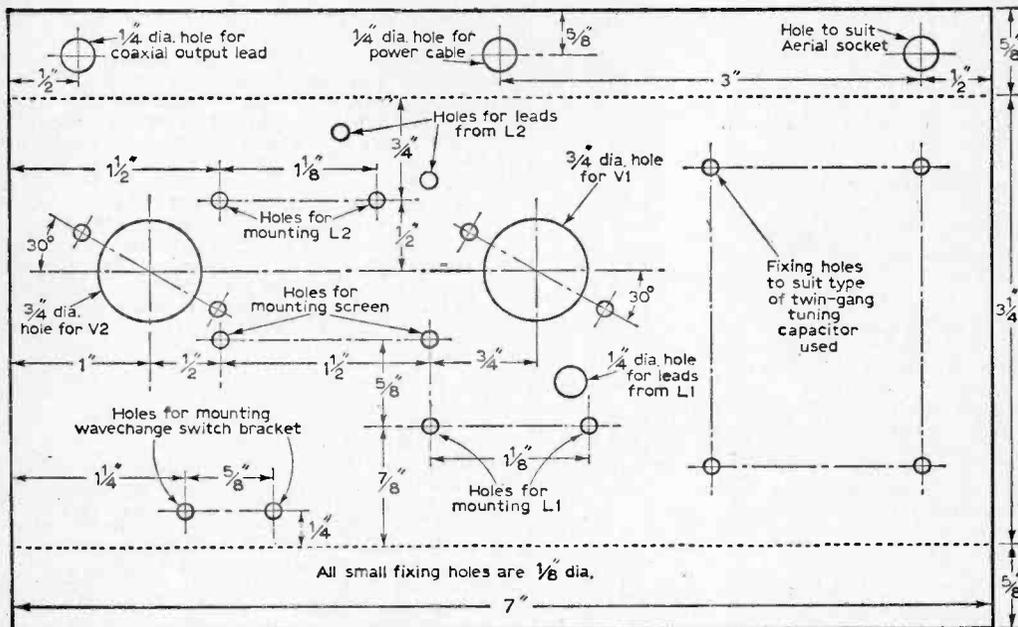


Fig. 2: The dimensions of the chassis.

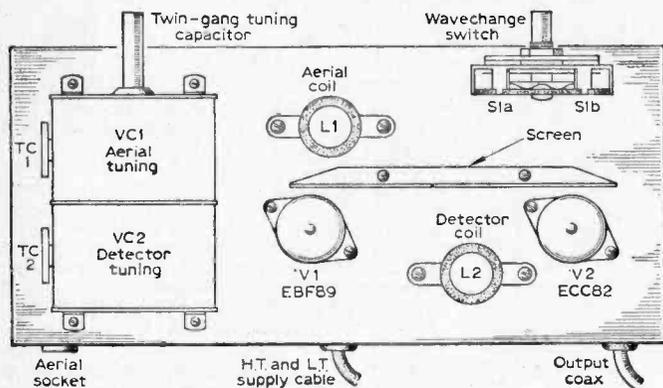


Fig. 3: The above-chassis layout diagram.

in this position if available, having the same base connections. Similarly the octal based 6SN7 or 6SL7 might be tried also.

The R.F. Coils

The coils used in this circuit were Repanco DRM3 dual range t.r.f. coils, the reaction winding being disregarded. These were used for no other reason than the writer had a pair in his spares box, and any similar dual range t.r.f. coils such as the Osrom QA11D or QR11D would suit.

If individual constructors prefer, separate coils could be used for each band but this would add some extra complexity to the switching and cost more. Apart from this the chassis would need to be increased in size to accommodate these extra components. This the writer feels would detract from the designed simplicity of the unit.

The wavechange switch was an ex-Government single-wafer, two-pole, two-way switch obtainable quite cheaply and probably to be found in most spares boxes, or could be easily adapted from a similar switch having more poles.

A simple epicyclic reducer drive for the two-gang capacitor makes for easy tuning. The trimmers were chassis mounting compression trimmers taken from an old superhet.

Construction

In the writer's tuner the overall size was kept as small as possible without making the chassis unduly cramped. A small tuning capacitor was available and a larger component might require some increase in chassis width. To keep the depth of the chassis to a minimum, both aerial and detector coils were mounted above the chassis, an earthed aluminium screen being fitted as in the drawing (Fig. 3) to prevent any instability. The screen does the job admirably as the tuner is quite stable.

The chassis was cut from a piece of 16s.w.g aluminium sheet measuring 7in. x 4 1/4in. Runners 1/8in. deep are marked and bent on the front and rear. Full details are given in Fig. 2. All holes are drilled, those for the valveholders being cut either with a chassis punch or by drilling and filing. The valveholders are then fitted with a solder tag under each bolt after which the tuning capacitor and

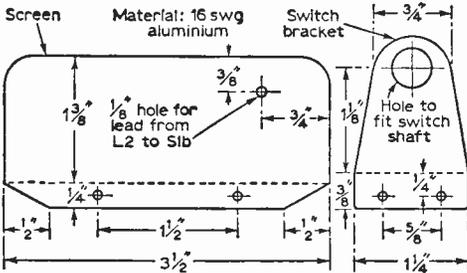


Fig. 4: Details of the screen.

drive are mounted on the right-hand side of the chassis. The method of mounting will vary with different capacitors.

The aluminium screen is drilled after being cut to size according to details given in Fig. 4 and fixed in place with 6B.A. bolts. A bracket is made from aluminium to take the wavechange switch S1 and is bent and drilled so that the switch and tuning capacitor shafts are at the same height. This bracket is also held in place with 6B.A. bolts.

The coils are finally bolted in place with the aerial coil at the front of the chassis and the detector coil behind the screen. The trimmers are soldered directly to the tuning capacitor and the earthed ends bolted to the chassis.

Wiring

As most of the components are small they can be wired directly to the valveholder tags. Tinned copper wire is used for connection and covered

COMPONENTS LIST

Resistors:

- R1 68kΩ
- R2 330Ω
- R3 270kΩ
- R4 15kΩ
- All 1/2W, carbon

Capacitors:

- C1 0.1μF paper 350V
- C2 0.1μF paper 350V
- C3 200pF silver mica
- C4 0.01μF paper 350V
- VC1 500pF } twin-gang tuner
- VC2 500pF }
- TC1 50pF compression type trimmer
- TC2 50pF compression type trimmer

Valves:

- V1 EBF89 or EBF80
- V2 ECC82

Coils:

- L1, L2 Dual range t.r.f. coils (Repanco DRM3—see text)

Switch:

- S1 Two pole, two-way rotary

POWER PACK COMPONENTS

- R1 1.8kΩ 1W
- C1 32μF } dual electrolytic 350V
- C2 32μF }
- T1 Mains transformer with tapped primary. Secondaries: 0-200V 20mA; 6.3V 1A
- MRI Contact cooled rectifier, 250V 20mA
- S1 Double-pole, on/off switch

with sleeving where necessary. As some single screened pick-up lead was available the grid lead in the detector circuit was screened although it may not have been absolutely necessary to do so.

The diodes, pins 7 and 8 of the EBF89 were strapped together at the valveholder and earthed together with pin 4 as the heater return. Pins 4 and 5 of the ECC82 are taken to the heater supply via pin 5 of V1. Pin 9 goes to earth. The grid and anode pins of the first half of the ECC82 are strapped to form the diode connections.

The h.t. circuit can then be wired. The anode of the second half of the ECC82 takes its h.t. direct from the h.t. rail without the need for an anode resistor. Similarly the h.t. supply to the anode of V1 via the detector coils does not use a resistor. The feed for the screen grid of V1 is via a 68kΩ resistor R1.

Testing

When all wiring has been completed the tuner can be connected to a suitable power supply which in the writer's case was taken from the main amplifier. A supply of 200-250V at 22mA and 6.3V 0.6A will be required. Should this not be available from the main amplifier a suitable power supply circuit is shown in Fig. 5. This uses a contact cooled rectifier and a transformer from a TV converter.

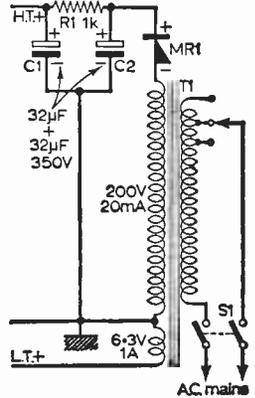


Fig. 5: Circuit of a suitable power-pack.

The output from the tuner is fed via coaxial cable to the amplifier input and a suitable aerial is connected. With the switch in the long wave-band position it should be possible to tune the BBC Light Programme at good strength. With the unit switched to medium waves the Home Service is available and, during certain hours, the Third Programme as well. During the evening several Continental stations should be heard. It is only necessary to adjust the trimmers for maximum output and the tuner is completed.

If desired an on/off switch can be fitted to the front of the tuner in the h.t. lead so that the apparatus is always ready for use without waiting for the heaters to warm up.

A pointer was cut from 1/8 in. Perspex and fixed to the epicyclic reduction gear with "Araldite" or similar glue. If a front panel is fitted the hole for the drive must be cut and the panel mounted before the pointer is glued in position. The writer's tuner was mounted in a small box with all leads coming from the rear and station names marked on the front panel with transfers.

In conclusion the writer feels that constructors of this tuner will be agreeably surprised both with the performance of this tuner and also with its simplicity and low cost.

A Versatile DOUBLE-TRACE OSCILLOSCOPE

By J. H. B. Gould

CONTINUED FROM PAGE 519 OF THE OCTOBER ISSUE

WHEN two functions have to be compared by means of an oscilloscope, it is often simplest to do this by using a double trace. Normally, a double-trace display is obtained using a split-beam or double-gun cathode ray tube; however, practically the same result can be arrived at with a normal tube, using an electronic trace-splitting circuit. The circuit described here uses one valve: a double triode.

Electronic Trace-switching

In order to produce two traces, a single-beam c.r.t. must draw each trace successively. It can do this in three ways:

- (1) By completing the one trace and then going on the other, see Fig. 14(a).
- (2) By drawing a small section of one trace, then a small section of the other, and continuing until both traces are complete, i.e. "sampling", see Fig. 14(b).
- (3) By drawing one trace several times and then carrying out the same process on the other trace.

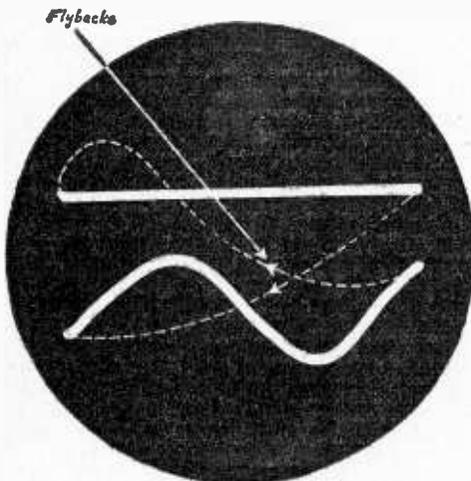


Fig. 14a: Producing two traces from a single-beam c.r.t.: one trace completed, then followed by second trace.

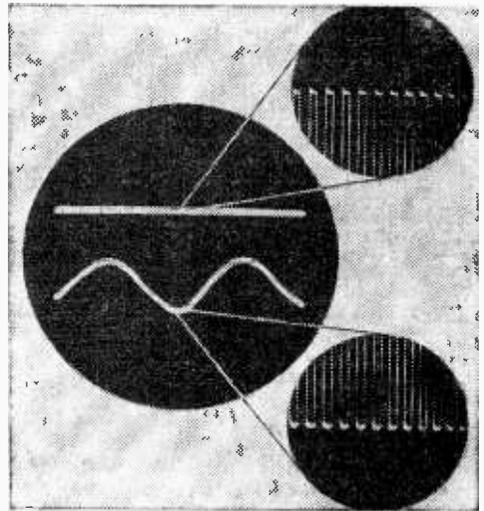


Fig. 14b: Producing two traces from a single-beam c.r.t. "sampling" method.

The circuit can operate in any of these "modes".

As each trace has to carry different information there must be two Y inputs, switched or gated so that they are each applied to the Y deflectors only when the correct trace is being drawn. The existing amplifiers are used for this purpose, controlled by the square-wave output from a multivibrator.

The Trace-switching Circuit

Fig. 16(a) shows a balanced multivibrator, and Fig. 16(b) indicates the waveform it develops. The multivibrator is a two-stage, resistance-coupled amplifier in which the output of the second stage is coupled to the input of the first; the circuit oscillates by virtue of the positive feedback arising out of this coupling. During one half cycle one triode carries a heavy anode current whilst the

—continued on page 61

FOR READERS OF "PRACTICAL WIRELESS" AT REMARKABLY LOW COST!

RADIO, TELEVISION & ELECTRICAL REPAIRS



AMAZING 'KNOW HOW' BOOK Saves You Pounds

Here is just the practical, at-a-glance guidance YOU need, whether you wish to know how to service radio and TV sets, install lighting points, or repair any domestic appliance, from a bell or an iron to a vacuum cleaner or washing machine. Explains basic principles and working of modern radio and TV sets and electrical appliances. Shows how to test for faults, carry out maintenance and repairs by the most modern methods. Special section on the operation and servicing of frequency modulated receivers. 480 pages. Over 400 illustrations. Amazing VALUE—Standard Edition, 21/-; De Luxe, leathercloth, 23/-. Or on easy terms: 5/- down and 3 monthly instalments. (Total credit prices: Standard, 22/-; De Luxe, 24/-.)

ALL THIS—AND MORE IN ONE GREAT VOLUME!

Comprehensive Contents Include:

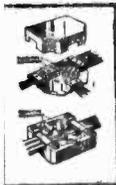
Current, Voltage and Resistance. Coils, Capacitors and Valves. Basic Radio-receiver Circuits. Preliminary Tests. Instruments for Set Testing. Locating Faults. Dynamic Testing. Tuned Circuit Alignment. Noises, Interference, Distortion and Instability. Components. Loudspeakers. Pick-ups. Gramophone Motors. Frequency Modulation. Television Circuits and Test Gear. Television Faults, Symptoms and Cures. Aerials and Pre-Amplifiers. Maintenance of Domestic Electric Wiring. Small Appliances. Fires and Space Heaters. Vacuum Cleaners and Polishers. Rewinding Small Motors. Cookers and Boiling Plates. Washing Machines. Refrigerators. Electric Water Heaters. Battery Charging. Testing and Repairs, etc.]

ESSENTIAL TO EVERY SERVICE ENGINEER, ENTHUSIAST AND HANDYMAN!

Getting the best from RADIO AND TV SETS

Here is expert advice that will enable you to make the necessary adjustments or repairs in order to get the best possible performance from any radio or TV set.

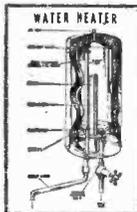
All you need to know about DOMESTIC WIRING



Learn from these helpful pages how to carry out all kinds of installations and extensions—with efficiency and safety! Complete guidance on conductors, insulation, safety regulations, conduits, cables, earthing, practical work, fuses, flexible cords, etc.

BASIC RADIO CIRCUITS

All you want to know about circuits, so that you can find your way around modern sets without hesitation. How components form various types of set; gives circuits for 1-valve receiver, 3-valve receiver, battery TRF receiver 4-valve superhet, Universal sets, etc.



FIRES & SPACE HEATERS

Full, easy-to-follow instructions for servicing small domestic fires—whether of the radiant, reflector or convector type.

WATER HEATING

All you should know about the various types of electric water-heaters and how to install them and keep them in perfect working order. Advice that will save you POUNDS!

TRACKING DOWN TROUBLE

This grand book is invaluable for tracing faults in radio and TV sets. Tells you all you want to know—from how to carry out Preliminary Tests to how to align R.F. and I.F. circuits. Shows how to carry out Dynamic Testing. Also shows how to trace the causes of Noises, Distortion, and Instability and deal with the trouble. Gives detailed information on Components and Loudspeakers and how to deal with any faults that may develop.



DO THIS NOW!

Simply complete form, indicating Edition preferred and post in a 2½d. stamped, unsealed envelope to Dept. E.B.35, Odhams Books Ltd., Basted, Sevenoaks, Kent. Offer applies in the U.K. and Eire only. Hurry! Make sure of your copy.

FULL SATISFACTION GUARANTEE

SEND NO MONEY NOW!

To: Dept. E.B.35, Odhams Books Ltd., Basted, Sevenoaks, Kent.

WITHOUT OBLIGATION reserve me "Radio, Television and Electrical Repairs" and send Special Invoice with "100% Satisfaction or No Charge" Guarantee.

Cross out edition NOT required: STANDARD/DE LUXE
Tick method of payment preferred: CASH TERMS
BLOCK LETTERS BELOW

NAME _____

Full Postal ADDRESS _____

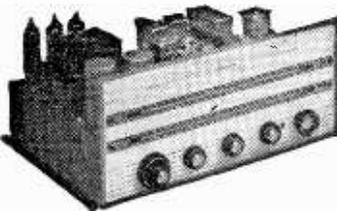
E.B.35/Nov.63 _____

See how to maintain Vacuum Cleaners and Floor Polishers, Refrigerators, Cookers and Boiling Plates, Washing Machines, etc.
Do your own BATTERY CHARGING
Here are clear, complete instructions.

**INEXPENSIVE
BASIS OF
A COMPLETE
HI-FI SYSTEM
OR TOP QUALITY
RADIOGRAM**

Armstrong

**STEREO 55
TUNER AMPLIFIER
CHASSIS**



One compact chassis combines AM and FM tuners, Stereo Control Unit and two High Fidelity Amplifiers. For mono reproduction the two amplifiers are used together so that up to 10 watts output is available. Provision for tape recording and playback is made with a choice of inputs for crystal or ceramic pick-ups including the Decca Deram. The facilities are also available for use with a tape deck and its associated pre-amplifier.

PRICE _____ £29.18.0



**AF 208 AM/FM
CHASSIS**

A high quality tuner amplifier chassis which can be used for the conversion of an existing radiogram or as the basis for building a new radiogram or reproducing system. A system which can include tape recording and play back as well as the normal AM and FM radio and record reproduction.

PRICE _____ £21.4.0

Write for descriptive literature to

ARMSTRONG (Dept. PNC.)
Walters Road, London, N.7. Tel: NORth 3213

ERSIN MULTICORE SOLDERS

for a first class joint every time

Wherever precision soldering is essential, manufacturers, engineers and handymen rely on MULTICORE. There's a MULTICORE SOLDER just made for the job you have in hand. Here are some of them.

**THE NEW HANDY
DISPENSER**

Easy to find in the tool box—simple to use. The solder is in a continuous coil which can be used direct from the handy free-standing dispenser—in fact, it is virtually a third hand for those tricky soldering jobs. Containing 15 feet 6-core 18 s.w.g.

Ersin Multicore Savbit alloy. 2/6



**HOME CONSTRUCTORS
2/6 PACK**



The Home Constructors Pack contains 32 ft. of 22 s.w.g. 60/40 alloys, which is especially suitable for printed circuits soldering.

**BIB WIRE STRIPPER
AND CUTTER**

Strips insulation without nicking wire, cuts wire cleanly, splits extruding flex. 3/6 each



MULTICORE SOLDERS LTD

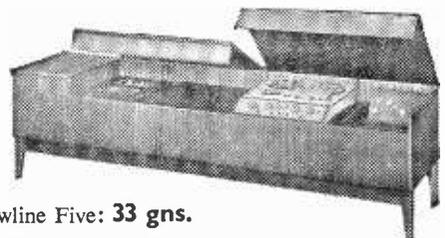
MULTICORE WORKS, NEMEL HEMPSTEAD, HERTS. (BOXMOOR 3636)

CMMS.11

**HOUSING
HI-FI?**

This is one of a wide range of furniture for every hi-fi purpose—speakers, equipment, tapes and records. Soundly designed, superbly finished, sensibly priced. Send for illustrated catalogue and name of local stockist.

One of the Record Housing range of 25 models



Lowline Five: 33 gns.

RECORD HOUSING

(Dept. P.W.11), Brook Road, London N22.
Telephone: BOWes Park 7487/8

—continued from page 608

other triode is cut off; then the situation reverses for the other half cycle. This behaviour makes the circuit ideal for controlling the "gating" amplifiers.

As can be seen from Fig. 16(b), each cathode of the multivibrator carries a large positive voltage for half its operating cycle. In practice, (Fig. 17), each cathode returns to earth via the cathode bias resistor of one of the amplifiers "A1" "A2". In this way, one amplifier is always cut off at any given time while the other is operating normally, feeding the trace.

The "Double-beam" position of the Y selector switch (S4) connects the outputs of both amplifiers in parallel across the deflector plates, and switches on the multivibrator. It does one other thing; it connects the *other* Y deflector plate (conventionally known as "Y2") to the slider of a potentiometer (VR10) forming the anode load of one side of the multivibrator (through what has been up till now the Y-plate bypass capacitor); the purpose of this is to separate the two traces.

When the trace-splitting circuit is built into the oscilloscope, the output capacitors of the two amplifiers (C27 of Fig. 12) should be shorted out and removed. If this is not done, the capacitor of the quiescent amplifier will act as a frequency dependent shunt across the plates. The only effect this action will have on normal operation is a movement of the trace when switching from "Plates" to "Amplifiers", and this can easily be corrected using the appropriate shift control.

Once the circuit has been set up, there will normally be little need to touch the intensity-balance control (VR11), so a "preset" type of rheostat is

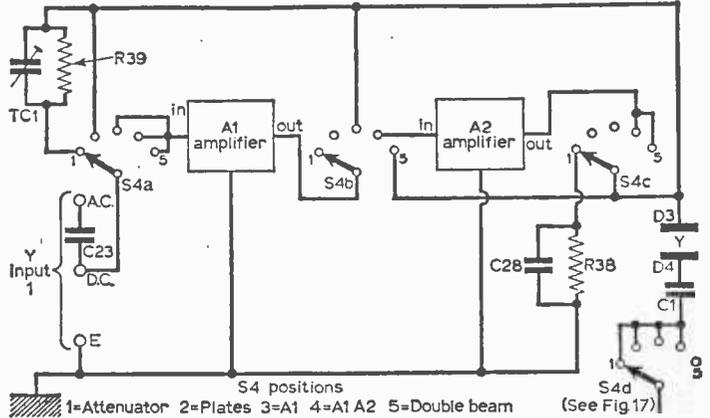


Fig. 15: Selector switching (with beam switching). Otherwise as Fig. 13b.

quite adequate here. However, occasions may arise in which this control could prove useful; for example, where one trace shows a waveform of much greater amplitude than the other. For this reason, it is worth while mounting this VR11 on a simple aluminium angle-bracket bolted near to the edge of the chassis just clear of the case (to the rear of hole "H" in Fig. 2, for example). Here, it could be operated when necessary by passing the blade of a screwdriver through a matching hole in the outer case.

Operating the Circuit

The two inputs are fed to the X and Y terminals respectively.

Any of the three previously mentioned operating modes can be set up with this circuit. For mode (1), the multivibrator is synchronised at *half* the timebase frequency; for mode (2) it runs freely at a much *higher* frequency than that of the timebase (or it can be synchronised at a high multiple of the

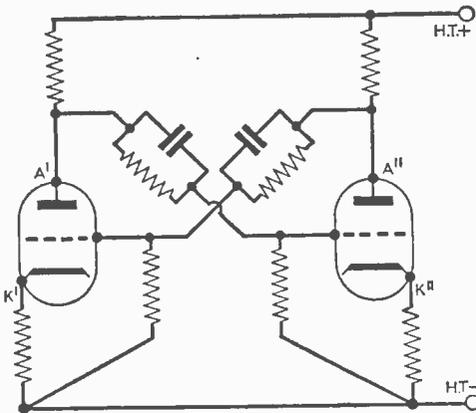
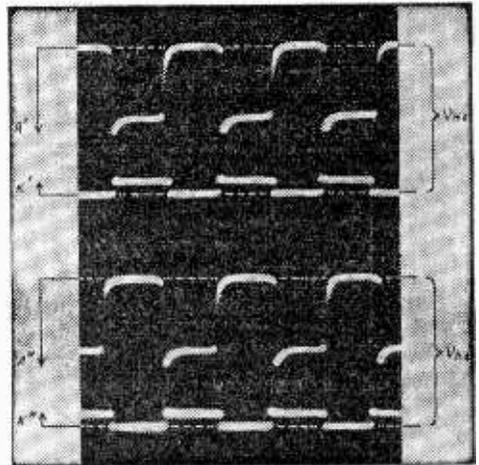


Fig. 16a (above): A balanced multivibrator. Fig. 16b (right): Waveform generated by circuit of Fig. 16a.



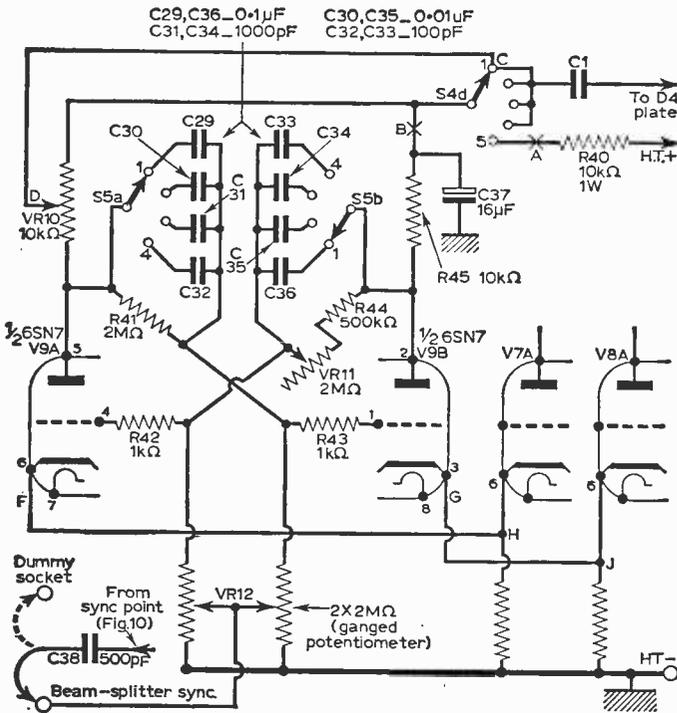


Fig. 17: The trace-splitter circuit, V9a and V9b.

timebase frequency); for mode (3) it is synchronised at a *sub* multiple of the timebase frequency.

The first mode is the one most commonly employed. The "sampling" mode can find use at very low timebase frequencies where flicker become a major problem. Mode (3) has serious disadvantages, but it is useful at very *high* timebase frequencies, when phase shift in the trace-switching circuit sets an upper limit on its useful operating frequency.

Yet a fourth mode of operation is possible. In this, the two traces are displayed *side-by-side*. To set this up, the multi vibrator is synchronised at the *same* rate as the timebase and the trace-separation control turned down to zero. This mode can be useful in comparing amplitudes, if the gain settings of the amplifiers are taken into account.

To avoid damaging the Y selector switch, the instrument should be switched off before switching to or from the "Double-beam" position.

COMPONENTS LIST FOR INSTRUMENT TYPE 4 (trace-splitter version Figs. 15 and 17)			
Resistors:			
R40	10kΩ	R43	1kΩ
R41	2MΩ	R44	500kΩ
R42	1kΩ	R45	10kΩ
All 10%, 1/2W carbon			
VR10	10kΩ potentiometer		
VR11	2MΩ potentiometer		
VR12	2 x 2MΩ twin-ganged potentiometer		
Capacitors:			
C29	0.1μF paper		
C30	0.01μF paper		
C31	0.001 μF ceramic or mica		
C32	100pF ceramic or mica		
C33	100pF ceramic or mica		
C34	0.001μF ceramic or mica		
C35	0.01μF paper		
C36	0.1μF paper		
C37	16μF electrolytic 350V		
C38	500pF ceramic or mica		
Valve:			
V9	6SN7		
Switches:			
S5	2-pole 4-way wafer type rotary		
S4	4-pole 5-way wafer type rotary		

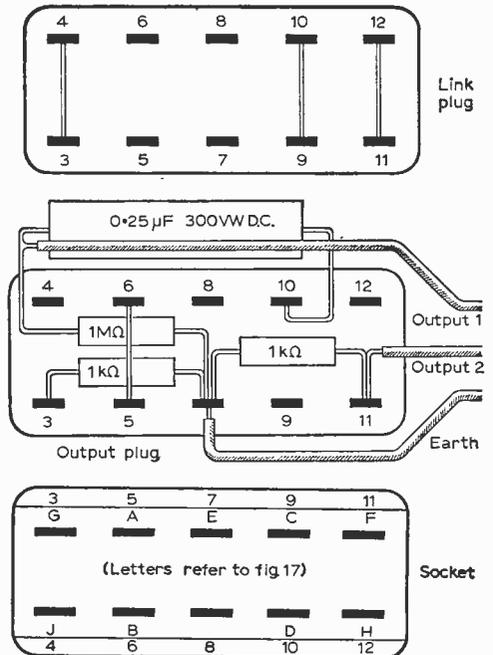


Fig. 18: Link-plug connections for squarewave generator using 10-way Jones plug.

The Controls

There are five controls governing operation of the trace-splitter circuit (see Fig. 17): the Y-selector switch (S4); the trace-splitter frequency switch (S5); the trace-separation potentiometer (VR10); the trace-splitter sync potentiometer (VR12) and the intensity-balance rheostat (VR11).

This last mentioned control has two functions: when the circuit operates in mode (1), it can correct any tendency for one trace to repeat at the expense of the other; in the other two modes it can be used to increase the *brilliance* of one trace relative to the other. As with the timebase, the sync control should be set at the lowest level at which it is effective.

Using the Circuit as a Square-wave Generator

A square-wave generator is useful for such tasks as checking the frequency response of amplifiers or filter networks. In order to use the trace-splitter circuit as a square-wave generator, a number of circuit changes must be made on each occasion. By far the easiest way of making these changes automatically is to use the link-plug method.

Fig. 19: Trace-splitter sync sockets.

For this, a socket is necessary on the oscilloscope. There is not likely to be much room for this on the panel, and it could just as well be mounted on the chassis near to the multivibrator and facing a hole cut into the outer case. A ten-way Jones type connector is ideal for this job, with the *female* member mounted on the instrument to prevent shocks should it be handled accidentally.

The circuit of Fig. 17 must be modified by removing the two leads joining the cathodes of the multivibrator to those of the amplifiers and also that joining the slider of the trace-separation potentiometer (VR10) to the Y selector switch (S4d). These points are then wired to the link socket as shown in Fig. 18.

During normal operation, a link plug is left in this socket; but when a square-wave output is required this plug is removed and replaced by another plug carrying the output leads.

Warning: About 250V d.c. can exist between pin 10 of the square-wave output plug and one of the leads under certain circumstances *after the plug has been removed*. This will persist until the charge on the capacitor has leaked away.

In this condition, the frequency and sync controls retain their original functions. However, the trace-separation control now becomes an amplitude control for Output 1 and the intensity-balance control determines the waveform of the outputs, particularly the "mark-space" ratio.

With the output plug in position, the Y selector switch can operate in any position except "Double-beam", which is now out of action.

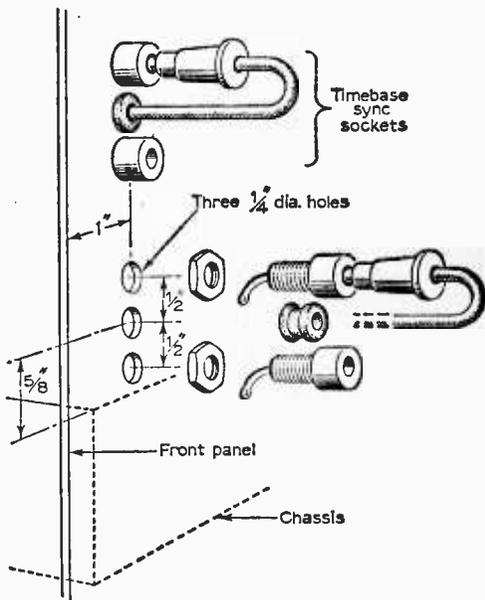
The sync input is fed from a socket on the front panel so that the trace-splitter circuit can be

synchronised from an external source if desired. To save using a switch, the timebase generator synchronising waveform is brought to another socket by a wander plug, which can be transferred to a dummy socket when using external sync.

This plug and socket arrangement is similar to that used for selecting either internal or external sync for the timebase generator. Details of the additional drilling required are given in Fig. 19. It will be seen by referring to Fig. 1 that the trace-splitter sync sockets are located immediately below those for the timebase generator.

Oscillography

Many excellent oscillograph cameras are available for use with cathoderay oscilloscopes. These are not an economic proposition for the amateur,



however, and it is proposed to conclude the present series by describing a simple method of using an ordinary 35mm. still camera.

Only recurrent displays will be dealt with, as transient waveforms demand either a motor-driven camera or an oscilloscope equipped with a single-sweep timebase. But it should be remembered that the term "recurrent display" covers not only waveform on a linear timebase, but any kind of steady pattern: Lissajous figures, valve and transistor characteristics, amplifier input/output characteristics and the like.

The screen of an oscilloscope is a very small target for a normal camera, so to obtain any results worth having, the lens must be brought close to the screen. The first problem, then, is to focus the camera at this short range. The simplest method is to use a "No. 3" or +3 diopter supple-

—continued on page 657

V. E. HOLLEY describes

the conversion of a CAR RADIO for A.C. Mains Operation

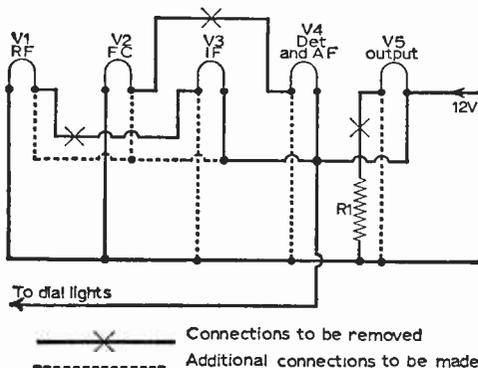
A SIMPLE AND INEXPENSIVE CONVERSION WILL PROVIDE A HIGH QUALITY DOMESTIC RECEIVER

NOW that most car radios of current manufacture employ transistors, the older valve type receivers can often be picked up quite cheaply secondhand. These car radio receivers incorporate an r.f. stage and the gain, selectivity and a.g.c. performance are all better than average kind of broadcast receiver. It is only necessary to provide a mains power pack and a reasonable aerial, to produce a domestic receiver which will give a good account of itself and will be especially useful in areas where reception conditions are poor. Conversion is a simple task which may be undertaken with confidence.

Valve Heaters

Virtually the only alteration required in the receiver itself is to the heater wiring. The heaters will almost certainly be wired in series pairs, a series resistor being used on one valve to complete the pairs for 12V operation. The heaters must be paralleled for 6.3V working. The original circuit will look something like Fig. 1 (solid lines) which shows the connections to be removed and the additional ones to be made. The 12V dial lights will, of course, need to be replaced by 6.3V bulbs.

Fig. 1 (below): A typical heater chain circuit of a car radio.



H.T. Requirements

The h.t. requirement will be between 60 and 70mA as a rule, at a voltage somewhere between 200 and 250. The voltage can be determined within close limits by examination of the output stage.

For example, in the prototype conversion, the output valve, an EL42, was found from the valve list to require an anode voltage of 225. Allowing for bias and for voltage drop in the primary of the output transformer, an h.t. voltage of 235 was deduced. The power pack was designed accordingly to the circuit of Fig. 2. Here, a valve rectifier, 6X4, is used in a full wave circuit and the d.c.

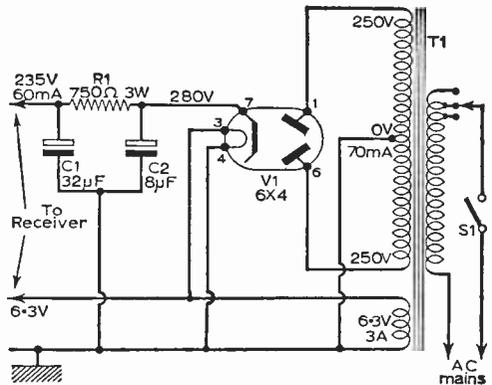


Fig. 2: The circuit of the mains power pack.

voltage available at its cathode is 280 with an 8uF reservoir capacitor. About 45V must therefore be dropped in the smoothing resistor R1. Reference to valve lists showed that the h.t. consumption of the receiver should be about 60mA, and R1 was therefore given a value of 750 Ohms, which, in association with the capacitors C1 and C2, provides adequate smoothing.

The transformer used had only a single 6.3V winding. If a separate rectifier winding is available, it is good practice to use it and so avoid having a large difference of potential between the rectifier heater and cathode. The power supplies

can be fed into the receiver through the socket to which the original power pack was connected.

transformer primary. The original wiring to the switch should, of course, be removed.

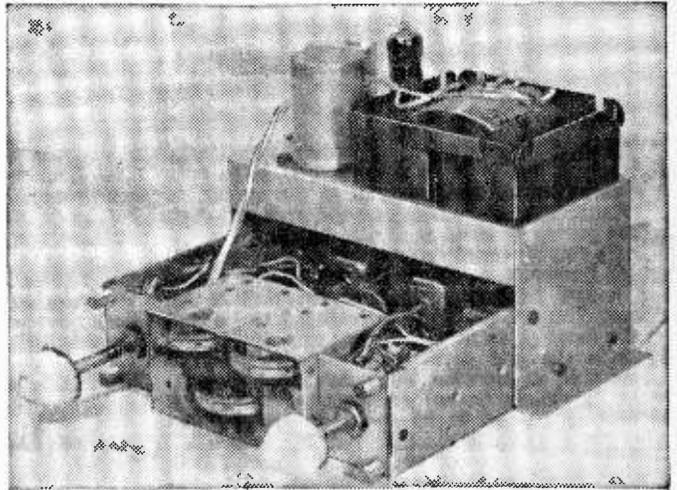
Construction

It is convenient if the new pack can be built on to the receiver to form a single complete unit, and this was accomplished in the writer's case by constructing the pack on a chassis of 18s.w.g. sheet aluminium, fitted over the rear of the receiver as shown in the photograph. This chassis provides support for the new components, covers the rear of the receiver which would otherwise be unprotected after removal from its original case, and leaves

Testing

Before putting the converted receiver into service, the h.t. voltage should be checked at the anode of the output valve and the value of the smoothing resistor altered if necessary to bring the line voltage to within $\pm 10V$ of the correct value. In this connection, it should be noted that some of the older car radios carry a smoothing resistor and

A car radio converted by the author to operate from a.c. mains.



a space available above the receiver controls to accommodate a 7in. x 4in. elliptical loudspeaker.

Unless the set to be converted is a very old one, it will conform to the standard car radio measurements of 7in. x 7in. x 2in., and the chassis dimensions given in Fig. 3 will hold good.

The arrangement of the components is entirely a matter of convenience—Fig. 3 gives an idea of the prototype layout together with details of the wiring. The mains supply should be taken into the receiver chassis close to the on/off switch, passed through the switch and taken thence to the mains

capacitor in the receiver chassis and if these are found to be present, their equivalents, R1 and C1 (Fig. 2), may be omitted from the new power pack.

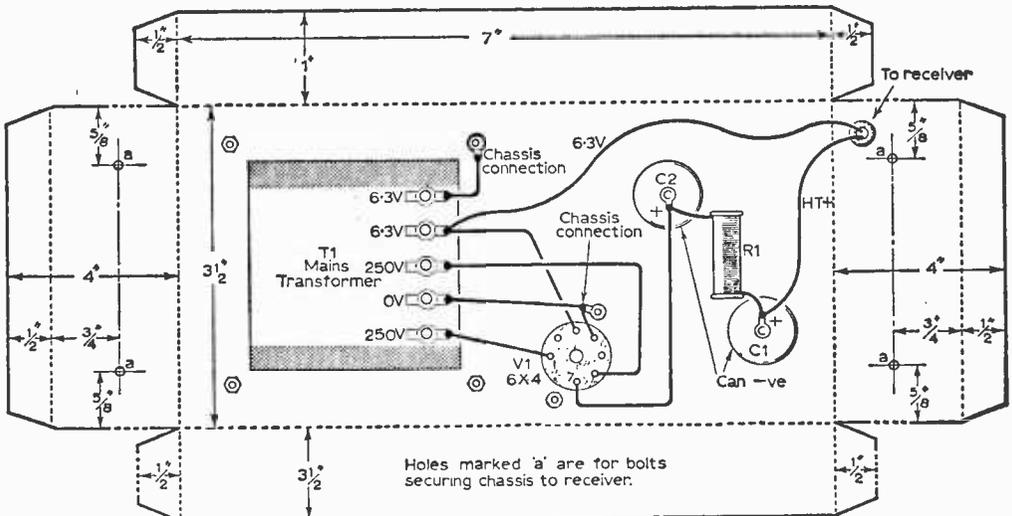


Fig. 3: The wiring diagram and chassis details.

electronic DOOR CHIMES and BURGLAR ALARM

By R. Bebbington

MANY variations are possible on the electronic chimes theme to be described. It is as well therefore to discuss these at the outset so that constructors may weigh up the pros and cons before getting involved in circuit details.

In its entirety the circuit consists of two sections, a high frequency oscillator for the burglar alarm and a low frequency oscillator to produce the chimes. The h.f. oscillator is arranged to be just on the point of oscillation so that any slight variation in the grid capacitance, for example the presence of an intruder, will cause oscillations to cease. This allows the second triode to conduct and to operate a relay in its anode circuit, and the relay contacts supply the chime oscillator with h.t.

Should the constructor already possess door chimes, these can be operated by connecting the relay contacts in place of, or across the existing bell-push. This would, of course, dispense with the circuitry of V2. Alternatively a dummy bell-push could be used consisting of a metal plate connected to V1 grid circuit. As the hand approaches this, the chimes would sound in anticipation, as it were, of the now bewildered caller.

Many other novel uses of this proximity device spring to mind, including displays for bazaars, etc. The relay contacts may be wired to operate bells, bulbs or more ingenious devices.

For the constructor who decides that he is burglar-proof or perhaps has nothing worth stealing, the chime circuit alone is well worth constructing. As this constitutes the heart of the circuit we shall now consider it in some detail.

Basic Hartley Chime Oscillator

Designed around the ubiquitous 12AU7 double-triode, this Hartley oscillator is capable of realistic

chime effects; the basic circuit being shown in Fig. 1. The frequency determining components are the centre-tapped coil and the 0.05μF capacitor across it. The formula for calculating the required values of these components for a given frequency is the

well known $f = \frac{1}{2\pi\sqrt{LC}}$. This is less formidable if both sides are squared, and values of L and C can then be easily found by interpolation.

$$\text{For example: } f^2 = \frac{1}{4\pi^2 LC}$$

$$\text{therefore } L = \frac{1}{4\pi^2 f^2 C}$$

$$\text{and } C = \frac{1}{4\pi^2 f^2 L}$$

Thus for C' at 524c/s using 0.05μF the choke required would be

$$L = \frac{1}{4\pi^2 f^2 C} \approx 200\text{mH.}$$

It will be noted that this is only calculated approximately, as component tolerances and the self-capacitance of the choke would need to be taken into account for accurate calculation.

Coupling to the valve is via the 0.005μF capacitor and is so small that valve characteristics and h.t. supplies have little or no effect on frequency. This important feature is exploited in the method employed to give the notes their chime-like sound. These are characterised by a rapid initiation of the note and a sustained decay time; the 8μF capacitor in the anode circuit gives rise to the latter effect. On release of the push-button the capacitor tends to charge through the valve and maintains oscillations for a period depending upon the value of this capacitor. As the frequency is substantially independent of the h.t. supply the note remains at the same pitch as it decays. The 8μF gives a decay time of about 1sec.

It will be realised from the foregoing that this circuit could usefully be employed in electronic organ circuits with the sustain capacitor switched in for special effects.

Practical Chime Circuit

For those interested primarily in the chime oscillator a practical circuit is shown in Fig. 2.

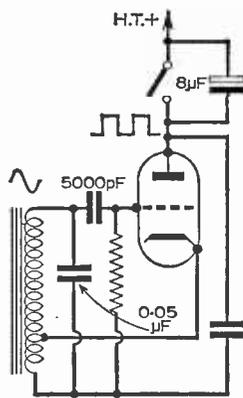
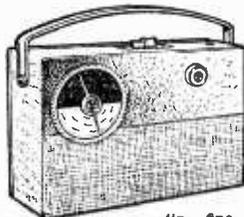


Fig. 1: The basic Hartley oscillator circuit.

KELCO PRICE IS THE RIGHT PRICE!

KELCO 7 TRANSISTOR PORTABLE OR CAR RADIO

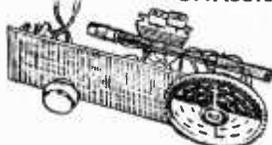


Will work anywhere, any time, giving wonderful countrywide reception and volume of all stations on both MEDIUM AND LONG WAVEBANDS. Brand new parts including 7 first grade transistors, big 7 x 4in. fine tone speaker, ferrite rod aerial, socket for car aerial, push button wave change, large easy to read dial. Attractively styled wooden case covered in two-tone washable vinylite with gilt fittings and carrying handle. Size 10 1/2 x 7 1/2 x 3 1/2 in. Uses long life PP6 or DT9 battery. Not a pocket set, but a top quality full size portable and ideally suitable for use as a car radio. All parts supplied with full building instructions.

OUR PRICE £5.50 P. & P. 4/-
ALSO AVAILABLE READY BUILT AND TESTED AT..... £7.5.0. P. & P. 4/-.

KELCO 7 TRANSISTOR RADIO CHASSIS

As above, fully aligned and tested, complete with dial, knobs and 7 x 4 in. speaker.



OUR PRICE £6.00 P. & P. 4/-.

THE "KELSON" HIGH FIDELITY SPEAKER CABINET

Size 23 1/2 in. high x 11 1/2 in. deep x 13 1/2 in. wide, including plinth. Beautiful semi-matt medium walnut finish with Tygan covered front. Accommodates 8in. speaker with 1 1/2 x 10 1/2 in. space below for fitting amplifier if desired.

OUR PRICE £5.50 Carr. 7/6

SPECIAL OFFER !! The "Kelson" cabinet complete with 8in. speaker and our 5 watt Amplifier, described on this page, supplied at the **SPECIAL INCLUSIVE PRICE OF ONLY £9.5.0.** Carriage Paid.

KELCO 5 WATT AMPLIFIER

An excellent amplifier with high gain pre-amplifier stage, volume and tone controls, negative feedback, 3 ohm output transformer. Ready for immediate use. Ideal for Guitars, Record Players, P.A. systems in small halls.

OUR PRICE £4.10.0 plus P. & P. 4/-

KELCO 2 WATT AMPLIFIER

Twin stage, printed circuit amplifier for A.C. 200/250 volts operation. Volume and tone controls. 3 ohm output transformer. Ready wired, guaranteed and supplied complete with 6in. round speaker and knobs. Will fit any record player cabinet.

OUR PRICE £3.15.0 plus P. & P. 4/-

SHORT WAVE RECEIVERS

Span the world—the North Pole and Expeditions, etc., all at full strength.

We guarantee that if you are not delighted with results we will not only refund your money but also your postage.

NOT a toy but a super sensitive all wave world Radio in use by Professionals and Amateurs alike. Easy to construct, complete with all components, and full instructions.

OUR PRICE WHILE STOCKS LAST £3.15.0 P. & P. 4/-

SPECIAL OFFER! Famous make of CAR RADIO AERIAL

Complete with coax lead and plug, 3 section heavy chromed telescopic (17in. closed extending to 43in.). Simple one-hole fitting, wing mounting.

OUR PRICE 21/- P. & P. 2/-

SPEAKERS

We can supply all types and sizes of 3ohm and 15ohm speakers by leading manufacturers, Rola-Celestion, etc. Prices from 10/- to £4.

Examples:

7 x 4in. 12/-; 8 x 5in. 16/-;
8 x 3in. 12/-; 6 1/2 in. 12/-; 8in. 18/-.
P. & P. 1/6 up to 6in.; 2/6 over 6in.

TRANSISTORS

All makes and types available, our stocks too large to list. Very competitive prices. Sent by return.

Example:

SET OF 6 TRANSISTORS AND DIODE. Brand new. Beautifully boxed, complete with circuit.

OUR PRICE 15/- Post Free.

DO IT YOURSELF!

BUILD A RECORD PLAYER THE "KELCO" WAY AND SAVE MONEY!



Famous Autochanger or Single Player units supplied with brand new two tone de-luxe Portable Cabinets 17 x 15 x 8 1/2 in. Strong carrying handle, gilt finish clips and hinges as used by famous make for 20 gms. models, ready cut out Motor Board 14 x 13in. Front baffle with 7 x 4in. High Flux loudspeaker and three watt amplifier. Amplifier ready built on metal chassis with output transformer. Volume and tone controls. All items fit together perfectly. Special instructions enable assembly in 30 minutes, only five wires to join. Twelve months' written guarantee. Available separately or package deals as above.

KELCO PRICES FOR COMPLETE KITS

Auto Changer Kits (as above)
B.S.R. UA14 £11. 5. 0. P. & P. 5s. 6d.
Collaro £11.10. 0. P. & P. 5s. 6d.
Garrard Auto-slim £12. 0. 0. P. & P. 5s. 6d.
Single Player Kits (as above)
Garrard SRP10 £11. 0. 0. P. & P. 5s. 6d.
E.M.I. Auto Stop £11. 0. 0. P. & P. 5s. 6d.

INDIVIDUAL PRICES FOR THOSE WHO WISH TO PURCHASE SEPARATELY

Record Player Cabinet with cut out board... £3. 0. 0. P. & P. 3s. 6d.
Amplifier with 7 x 4 speaker £3.15. 0. P. & P. 2s. 6d.

Autochangers

B.S.R. UA14 £5.19. 6. P. & P. 5s. 6d.
Garrard Auto-slim £6.17. 0. P. & P. 4s. 6d.

Single Players

E.M.I. Auto Stop £5. 7. 6. P. & P. 4s. 6d.
Garrard SRP10 £5. 7. 6. P. & P. 4s. 6d.
E.M.I. separate pick-up £3. 5. 0. P. & P. 3s. 6d.

Transcription Units—Stereo—Mono

Garrard 4HF £18. 0. 0. P. & P. 5s. 0d.
Philips AG1016 £12. 0. 0. P. & P. 5s. 0d.
Garrard AT6 £10. 5. 0. P. & P. 5s. 0d.

Replacement Stylus available:

Sapphire from 3s. 0d. Crystal from 4s. 6d. Stereo from 39s. 0d.

KELCO (RETAIL)

219A EAST INDIA DOCK RD.
LONDON E14. Tel. EAST 3226

PLEASE NOTE! REGRET MAIL ORDER ONLY AT THIS ADDRESS

New premises opening shortly with facilities for CALLERS. Telephone for details

A SIMPLE EXPLANATION OF TRANSISTOR RADIOS FOR THE APPRENTICE ENGINEER



Starting with a description of the basic properties of semiconductors, the action of a transistor is explained in detail and without recourse to complex mathematics. The circuits used in transistor radios are described, and the techniques for servicing these sets are considered.

CONTENTS INCLUDE:

Semiconductor materials; Transistor action; Transistor circuits; Servicing, etc. In all, seven chapters with the emphasis always on practical considerations.

U.K. PRICE 5/-

Published by Mullard Ltd. Get your copy from your radio dealer or send remittance with direct order (Postage and packing 6d. extra).

MULLARD LIMITED · DEPT. B · MULLARD HOUSE · TORRINGTON PLACE · LONDON WC1

MVM1021

It's so easy to build TAPE EQUIPMENT with a MARTIN RECORDAKIT ...such honest value!

With a Martin Recordakit you can either build a complete tape recorder (in which case you can have it with deck and portable type case if desired) or assemble a pre-amp to connect the deck to existing amplifier system. There are Recordakits for two or four track Collaro, Magnavox and B.S.R. decks. When finished, you will enjoy performance and quality of wonderfully high standards more usually associated with far costlier equipment.

- Printed circuit board sections supplied complete, tested and with valves in position.
- All kits complete down to last screw and measured length of wire.
- Leads attached in position at one end.
- Full assembling and operating instructions.

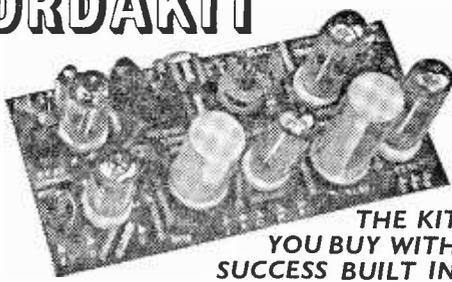
AMPLIFIER ASSEMBLIES

- 8311V**—2 Tr. for Collaro 3 sp. deck with valves, transformers, knobs, etc. **11 gns.**
- 8311-4-V** as above, but for 4-track deck. **12 gns.**
- Kit 'D' with 8311-4-V amp., case, and 9" x 5" speaker. **34 gns.**
- Kit 'A' with 8312-4-M amp. B.S.R. deck, case and spkr. **24 gns.**

PRE-AMP ASSEMBLIES

- 8312-BP** for B.S.R. 2 Tr. **8 gns.**
- 8312-4-BP** for B.S.R. 4 Tr. **9 gns.**
- 8312-CP** for Collaro 2 Tr. **8 gns.**
- 8312-4-CP** for Collaro 4 Tr. **9 gns.**
- Pre-amps with deck and polished wood cabinet from **17 gns.**

MARTIN ELECTRONICS LTD., 154/155 HIGH ST., BRENTFORD, M'SEX
Phone: ISLeworth 1161/5885



**THE KIT
YOU BUY WITH
SUCCESS BUILT IN**

- AMPLIFIERS FOR COMPLETE INSTRUMENTS
- PRE-AMPS TO ADD TO HI-FI
- 2 TRACK AND 4 TRACK
- AND NOW MARTIN AUDIOKITS

In course of production, a wonderful new range of transistorised audio kits—coupon reserves advance details.

MARTIN ELECTRONICS LTD., 154/155 High Street,
Brentford, Middlesex.

Full details of Martin Recordakits, please, and Martin Audiokits when ready.

NAME _____

ADDRESS _____

(Block letters)

PW11

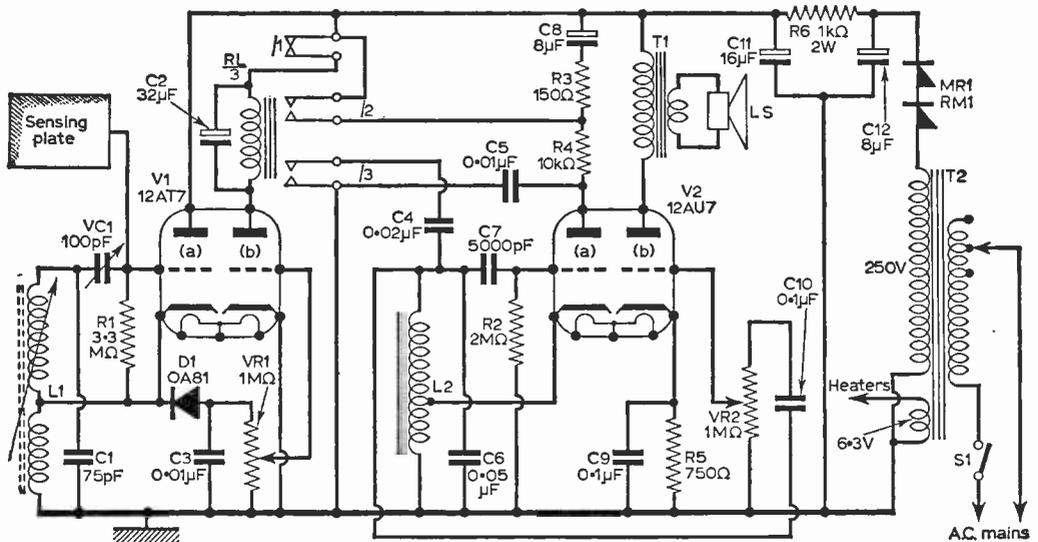


Fig. 3: The circuit of the combined door chimes and burglar alarm.

restored by the removal of the additional capacity, i.e. the intruder.

The other relay contacts switch the chime circuit. Contact /2 provides h.t. and /3 alters the pitch by placing an auxiliary tuning capacitor C4 across the coil L2. As the relay energises, this capacitor will cause the lower note to sound, whilst on release the upper note will ring out due to the sustaining action of C8, and the fact that C4 is not now in circuit.

Power Supplies

The valve heaters may be fed from either a 6.3V or 12.6V winding as convenient. Pins 4 and 5 should be connected to a 12V winding, but if a 6V supply is used pins 4 and 5 should be strapped to one side of the winding and pin 9 used for the

other side. The remainder of the power pack calls for little comment, two RM1 rectifiers being used in an orthodox half-wave circuit.

Construction

Very few restrictions are necessary in the methods of construction and layout with regards to the circuits described. Suffice to say that the grid leads for V1 should be kept reasonably short to keep stray capacitances to a minimum. The 100 μ F variable trimmer VC1 should also be mounted clear of the chassis as neither side goes directly to earth. The chime oscillator section is by no means temperamental and consequently does not dictate any set disposition of components. So plug in that soldering iron and "sound out" these novel circuits!

COMPONENTS LIST

COMBINED CHIMES AND BURGLAR ALARM (FIG. 3)

Resistors:

R1	3.3M Ω	R4	10k Ω
R2	2M Ω	R5	750 Ω
R3	150 Ω	R6	1k Ω 2W

All $\frac{1}{2}$ W carbon unless otherwise stated

VR1 1M Ω carbon potentiometer
VR2 1M Ω carbon potentiometer

Capacitors:

C1	75pF mica or ceramic
C2	32 μ F electrolytic 250V
C3	0.01 μ F paper
C4	0.02 μ F paper
C5	0.01 μ F paper
C6	0.05 μ F paper
C7	5000pF ceramic or mica
C8	8 μ F electrolytic 250V
C9	0.1 μ F paper
C10	0.1 μ F paper

C11	16 μ F electrolytic 250V
C12	8 μ F electrolytic 350V
VC1	100pF air spaced trimmer

Miscellaneous

L1	L.W. coil with iron dust core (Repanco RA1).
L2	Tapped coil 200mH approx., iron core (Repanco AF2).
S1	ON/OFF switch
T1	Standard output transformer (Repanco MOT1).
T2	Mains transformer, secondaries: 250V, 60mA; 6.3V 0.6A or 12.6V 0.3A.
V1	12AT7 or ECC81.
V2	12AU7 or ECC82.

Rectifiers:

D1	OA81 Germanium diode.
MR1	Metal rectifier. 2 x RM7 (125V 60 mA).

Showtime Round-up

A summary of the new models seen at the recent series of trade exhibitions. The tables show brand new models only and do not represent the complete range of the manufacturers concerned. See the November *Practical Television* for details of the new TV sets.

TRANSISTOR PORTABLE RADIOS

It was difficult to detect any startling external changes in the wide ranges of transistor radios to be seen, but the tiny "personal" receivers seem to be on the decline and the trend is towards larger receivers with better sound quality.

The number of transistor sets giving short-wave coverage and facilities for receiving the v.h.f.-f.m. programmes is slowly increasing, but even so in these, and almost all other varieties, prices remain keenly competitive and many sets seen represent extremely high value for money. Readers will also note in the details below the appearance of

several extremely advanced transistor sets in the higher price bracket.

Some "features" of several years ago are virtually standard fittings nowadays—such things as car aerial sockets and tape recorder sockets. From the presentation point of view more models are appearing with solid wooden cabinets.

THE RADIOGRAM

One of the most obvious impressions gained from the tour of exhibitions was that the radiogram is back with a bang! For some time the radiogram, once almost abandoned, has been

TRANSISTOR PORTABLE RADIOS

Model	Wavebands	Price	Notes
ALBA 111 Starling	LW, MW	11 gns.	3" speaker. Carrying case.
777 Swan	LW, MW	11½ gns.	Wood case, press buttons.
COSSOR CR1310T	LW, MW	13 gns.	Wood cabinet. Push buttons
DANSETTE Herald	LW, MW	15 gns.	Wood case.
Stanmore	LW, MW	16 gns.	Wood case.
Imp	LW, MW	11 gns.	Measures 8 x 3½ x 1½".
International	LW, MW, SW	19 gns.	
EKCO PT426 Valentine	LW, MW	16 gns.	8 semiconductors.
PBT425 Varsity	LW, MW	19 gns.	8-transistor mains/battery receiver.
PT424 New Verity	LW, MW, VHF	22 gns.	9 transistors.
FIDELITY Fairline	LW, MW, SW	17 gns.	12 transistors, meter-type tuning indicator, battery level indicator, dial illumination, etc.
GRUNDIG 99 Transonette	LW, MW, SW, VHF	45 gns.	9 transistors, 1W to 6 x 4" speaker.
203 Export Boy	SW1, SW2, SW3, MW	37 gns.	9 transistors, 1W to 6 x 4" speaker.
Automatic Boy	LW, MW, SW, VHF	£63	Internal batteries or 6/12V car supply, AFC on f.m., T and B tone controls, 2W to 7 x 5" speaker.
TR17	LW, MW, SW1, SW2, SW3, VHF	77 gns.	Two speakers, AFC on f.m., B and T controls, 1.5W output, sockets for ext. aerial, car aerial, pickup, tape recorder, phones and speaker.
KOLSTER-BRANDES WP21 New Lyric	LW, MW	13 gns.	Will amplify incoming 'phone calls and can be used as a baby alarm.
PAM 5215	LW, MW	12½ gns.	
5217	LW, MW	17 gns.	Push buttons.
5219	LW, MW	19 gns.	10 semiconductors.
PERDIO Mini-77	LW, MW	10 gns.	With leather carrying case.
Strand de luxe	LW, MW	12 gns.	With leather carrying case.
PHILIPS 214T	LW, MW	13 gns.	4" speaker. Wood cabinet.
REGENTONE BT22	LW, MW	15 gns.	Measures 11 x 3 x 6½".
BT23	LW, MW	9½ gns.	Measures 8½ x 2½ x 5".
R.G.D. B62	LW, MW	15 gns.	400mW to 4" speaker.
STELLA ST430T	LW, MW, VHF	23 gns.	Separate a.m. and f.m. tuning
ULTRA 6114	LW, MW, VHF	15½ gns.	

		RADIOGRAMS			
Model		Wavebands	Stereo or Mono	Price	Notes
ACE	Continental	LW, MW, VHF	Mono	45 gns.	Bass and treble controls. 6V. 10 x 4½" speaker.
	Slimline	LW, MW, VHF	Stereo	59 gns.	B and T controls, 5W per channel.
	Nordic	LW, MW, SW, VHF	Stereo	89 gns.	Two Axion 110 speakers. 40-15000c/s freq. response.
COSSOR	CR1504A	LW, MW, VHF	Stereo	TBA	3W per channel via 8 x 5 speakers.
DANSETTE	RG250 Sonata	LW, MW, VHF	Mono	59 gns.	8 x 5" speaker.
	RG133 Imperial	LW, MW, VHF	Stereo	110 gns.	8 x 5" speakers.
	RGS144 Concerto	LW, MW, SW, VHF	Stereo	72 gns.	Decoder for Multiplex.
ELIZABETHAN	RGI	LW, MW, VHF	Stereo	67 gns.	10 x 6" speakers. FM multiplex output.
FALCON	Manhattan 800	LW, MW, SW, VHF	Stereo	59 gns.	Model 600 is an a.m.-only version at 51 gns.
	Tudor 60FM	LW, MW, VHF	Mono	35 gns.	Model 50A is an a.m. version (LW, MW, SW) at 32 gns.
	Consort	LW, MW, SW, VHF	Stereo	49½ gns.	
	Carmel F24	LW, MW, SW, VHF	Stereo	45 gns.	The F23 is an a.m.-only version at 39 gns.
G.E.C.	G985	LW, MW	Mono	TBA	8 x 5" speaker.
GRUNDIG	MS20 Hilton	LW, MW, SW, VHF	Stereo	119 gns.	Decoder for multiplex. Provision for reverb.
	MS10	LW, MW, SW, VHF	Stereo	93 gns.	As above.
	KS80 Baroque	LW, MW, SW, VHF	Stereo	370 gns.	Switchable AFC, 3 tone controls, multiplex decoder, reverb., etc.
	MS100 Kingsley	LW, MW, SW, VHF	Stereo	395 gns.	15W per channel, 6 speakers, multiplex decoder, reverb. unit.
	PH3030	LW, MW, SW, VHF	Mono	62 gns.	3W via 8½ x 4½" speaker. Table gram.
KOLSTER-BRANDES	WG15 Polonaise	LW, MW, SW, VHF	Stereo	66 gns.	
MASTERADIO	D573	LW, MW, VHF	Stereo	TBA	3W output via 8 x 5" speakers.
MURPHY	A881SR	LW, MW, VHF	Stereo	85 gns.	7 valves and 12 semiconductors. 10 x 6" and 4" speakers in each channel.
PAM	5212	LW, MW, VHF	Mono	42 gns.	Cabinet only 8½" deep.
	5210	LW, MW, VHF	Stereo	57½ gns.	
PHILIPS	420	LW, MW, VHF	Mono	56 gns.	
	526	LW, MW, SW, VHF	Stereo	129 gns.	11 valves.
	530	LW, MW, VHF	Stereo	77 gns.	Two 8" dual-cone speakers.
REGENTONE	ARG22	LW, MW, SW	Mono	37½ gns.	Cabinet only 29 x 14 x 29½".
	SRG23	LW, MW, VHF	Stereo	55 gns.	
R.G.D.	209	LW, MW, SW, VHF	Stereo	75 gns.	
	210	LW, MW, VHF	Mono	55 gns.	
SOBELL	SG674	LW, MW	Mono	TBA	8 x 5" speaker.
STELLA	319A	LW, MW, VHF	Mono	56 gns.	8" dual-cone speaker.
	325A	LW, MW, VHF	Stereo	67 gns.	8 x 5" speakers.
	326A	LW, MW, VHF	Stereo	86 gns.	8" dual-cone speakers.
ULTRA	3606	LW, MW, VHF	Mono	45 gns.	
	3608	LW, MW, SW, VHF	Stereo	59 gns.	

making a come-back. But this year there are more new radiograms than any other type of product. Even companies normally confining themselves to smaller items are now producing radiograms.

The accent was on the "long, low look" type of housing, which has obviously been influenced by

the need for wide cabinets in the stereo models. And here it might be mentioned that in all stereo equipment the separate speaker unit idea is fast going out. No doubt manufacturers have discovered that the lady of the house, who often decides ultimately what to buy, dislikes the

PORTABLE RECORD PLAYERS

Model	Player unit	Price	Notes
DANSETTE Monarch	BSR UA15	24 gns.	3½W output via twin 8" speakers, B and T controls, adaptable to stereo.
ELIZABETHAN Pop-20	Garrard Autoslim	27 gns.	Two 8 x 5" speakers in parallel, B and T controls, Tape and Mic. sockets, speakers detachable from unique styled cabinet.
KOLSTER-BRANDES WRP10 Popette	BSR	15 gns.	
RRP20 Rhythm	BSR	19½ gns.	
MASTERADIO D576	BSR UA14	TBA	2W output via 7 x 4" speaker.
D577	BSR UA15	TBA	7W push-pull via 8 x 5" speaker. High and low level tape outputs, straight-through amplifier facilities.
McMICHAEL M177	BSR UA15	TBA	7W push-pull via 8 x 5" speaker. Straight-through amplifier facilities, tape sockets, T and B controls.
PAM 5200	4-speed	16 gns.	7 x 4" speaker.
PHILIPS AG4126	4-speed Philips	15 gns.	Operates from six 1.5V batteries.
REGENTONE AHG33	BSR	14½ gns.	4½" speaker.
AHG44	BSR	16½ gns.	8 x 5" speaker. B and T controls.
HG15	BSR	9 gns.	5" speaker.
R.G.D. 165	BSR	17 gns.	8 x 5" speaker, B and T controls.
SILVERTONE AP18	BSR UA15	28 gns.	6W push-pull output to 8 x 5" speaker, B and T controls, adaptable to stereo.

TAPE RECORDERS—

Model	Deck	Tracks	Speeds	Price	Features
COSSOR CRI621	Own	2	1½	26 gns.	Battery operated, weighs 8 lb. Provision for mains unit.
DANSETTE Empress	BSR	4	1½, 3¾, 7½	33 gns.	Many.
ELIZABETHAN LZ27	BSR	2	3¾, 7½	27 gns.	3.5W to 7 x 4" speaker, monitor, ext. amp. facilities, etc.
FIDELITY Playmaster	BSR	2	3¾	20 gns.	3W output to 8 x 3" speaker, 3 inputs, monitor facilities. 4-track version at 23 gns.
GRUNDIG TK6	Own	2	3¾, 1½	65 gns.	Level meter, monitor, battery operated (transistorised), battery level indicator.
LEE PRODUCTS 802 Shaftesbury		2	3¾	26 gns.	Output 3W.
804 Shaftesbury		4	3¾, 1½	33 gns.	Digital counter, monitor facilities.
MASTERADIO D502	BSR	2	3¾	TBA	2.5W to 7 x 3½" speaker.
PHILIPS EL3586	Own	2	1½	25 gns.	Battery operated with provision for mains unit. 500mW to 4" speaker.
STELLA ST471	Own	2	1½	26 gns.	Weights 8 lb. Battery operated. Mains unit available.

untidiness caused by having odd pieces of equipment external to the main unit. There was also a noticeable trend towards the more compact type of cabinet, representing a return to a style that lost favour in recent years.

Most of the new radiograms have f.m. facilities, though there were a few a.m.-only models. Most are for stereo record reproduction but a few mono-only radiograms make their debut.

The prospect of a decision on Multiplex stereo radio broadcasting has prompted several thoughtful manufacturers to produce models wired up for the easy fitting of a decoder unit whenever stereo broadcasting becomes a regular service.

PORTABLE RECORD PLAYERS

These continue to play an important part in the manufacturers' catalogues and a number of new, attractive models were shown for the first time. Most of them are mono, though some are wired for stereo conversion if required. Some have added facilities such as straight play-through. One breaks new ground from the design point of view.

TAPE RECORDERS

The tape recorders on show were not entirely typical of the complete range of products available

—continued on page 657

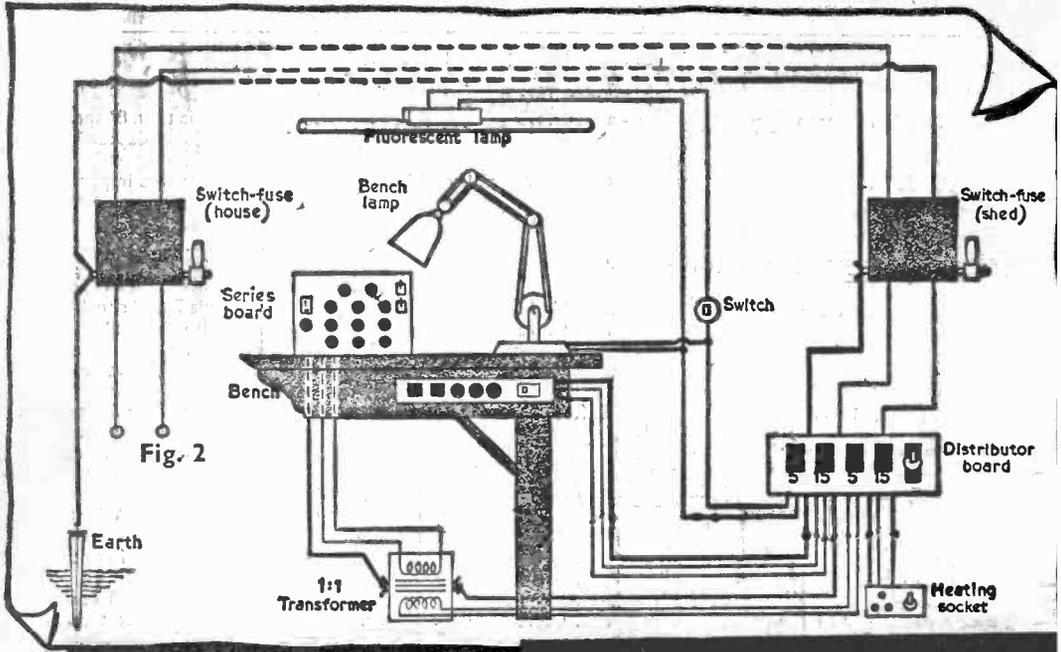


Fig. 2

NOW that the increased constructional activity of the winter months is approaching, the radio and television enthusiast will be checking over his would-be den, remembering the fine plans for conversion that were formulated in his mind during the summer. At this stage, those plans seem a little ambitious. Converting the potting shed to a workshop has a number of unforeseen snags. The following notes are an attempt to discuss as many of those snags as can be uncovered, and to offer a few solutions.

Supply Regulations

First consideration is the power supply. To comply with the regulations, it must be a

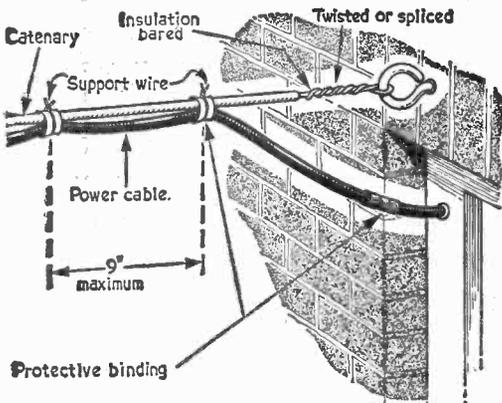


Fig. 1: Using a catenary to carry the power line to the workshop.

WIRING U

separate circuit, completely isolated, fused and switched. This means a switch-fuse at the meter board, a correctly installed run of cable adequate for the proposed load, and a switch-fuse with outlets at the other end. And the local Electricity Board will not connect your switch-fuse to the incoming power line until they are satisfied it complies with both the I.E.E. Regulations and any local interpretations of these.

If one is tempted to by-pass these restrictions, and save time and trouble by plugging the house end of the feed cable into a convenient power point, it should be remembered that in the case of any accident—fire or personal hazard—no insurance company would consider a claim on an uncertified installation.

Perhaps it would be as well for us to know, at the outset, which of the I.E.E. Regulations apply to our conversion of the potting shed. The figures in brackets are those regulations which cover our circumstances, and which will be referred to as we go along. For a more detailed exposition, see I.E.E. Regulations, 13th Edition, 1955, Regulations for Electrical Equipment of Buildings, obtainable from the Institution of Electrical Engineers, Savoy Place, London, W.C.2., price 6/- (paper bound), including postage.

The Mains Supply Cable

There are three ways in which we can run the cable from the house to the shed—ignoring such local variations as cleated wiring and insulator

supported tough rubber, now frowned upon by many authorities.

First, the cable can be metal-sheathed and run underground, at a depth of at least 18in., (229 B(i)). This is perhaps the best method, but certainly the most expensive, and hardly suitable for the job we are undertaking.

Second, the cable can be run through conduit, (229 B(ii)). Again, this is a satisfactory installation, providing the conduit is of the correct dimensions and properly earthed. But as this is only suitable for a comparatively short run, and there must be no joint in the conduit, and the problem of expense also arises, this method is not so attractive as the next.

Third, a catenary system. By this method, the cable is supported by a separate wire, isolated from the electrical circuit, (229 B(iv)). The wire that forms the catenary must be properly secured at each end, with the minimum of sag. For a short run, it is only necessary to bind the catenary wire to firmly anchored supports, then fix the power cable to it. A longer run may need some form of pulley at one end to strain the loaded catenary into a safe position when the traverse has been completed.

13A fused sockets can be used, (114 B) and if a sub-circuit is wired as a 'ring', up to 10 outlets can be connected to a 30A input, using 7/029 conductors. Allow a minimum of 100W per lampholder and a current of at least $\frac{1}{2}$ A at each 2A outlet.

Taking a practical example, for a small workshop that contains a single bench for radio and television repairs and experiments, we can subdivide the services as shown in Fig. 2. Here we have four separate lines, fed from a distributor board, each line fused, with a common switch that completely isolates the shed wiring. In addition, there is a fused switch at the house end, (112 A and B). The four lines are:

Lighting.

Heating.

Bench Power.

Isolated supply.

The lighting, in this case, need only be a fluorescent fitting of some 40W, augmented by a bench-lamp, 60-100W. Total power requirements, $100 + 100 = 200$ W. (see above).

Heating can be provided by a single-bar space heater of a maximum 1,000W. Use a 13A socket and at least a 10A fuse in the distributor panel.



By Henry Maxwell

Bench Power

Here we need a soldering iron, possibly two, one 25W or less for work on printed circuits and in confined spaces, and one of 100W for those occasional large jobs where the smaller iron is inadequate. The latter will only be plugged in when needed, but calculations must allow for it. There will also be a drill, again used only occasionally, and mains-powered bench instruments, such as the signal generator, oscilloscope, valve-voltmeter and stabilised power supply. Total power requirements, about 1,500W, with separate fused outlets and a common 15A fuse.

The isolated line feeds a 1:1 transformer of 250W rating, which supplies a number of outlets (for convenience), and is used for connection of the apparatus under bench test. The reason for this has been stressed often enough in these pages: universal, a.c./d.c. equipment has the chassis connected to one side of the mains input, and thus there is a danger of the operator completing the circuit to true earth via his body and receiving a shock that could at best be unpleasant; at worst, fatal. The distributor fuse will be 5A.

Switch-fuse

The switch-fuse, which should be mounted separately on a panel near the entrance and preferably at a height of at least four feet above floor level, will have a 15A fuse, and 7/029 twin cable with 3/036in. earth provides the power supply.

Binding the power cable to the catenary is, again, a matter for local specification. The general method, with PVC cable, or the tough-rubber-sheathed (TRS) stipulated by the original I.E.E. Regs., is to bind the power cable to the catenary with a few turns of adhesive tape, and finish with a twist of galvanised wire. For 7/029 cable, the bindings must not be more than 9in. apart; for larger power cables, a 12in. spacing is used, with a 15in. interval on vertical runs, (210 C). Fig 1 shows the method described.

Choice of power cable depends on the expected load. For a typical small workshop, a 15A supply would be sufficient, for which 7/029, twin-plus-earth capothene covered cable would be suitable. For higher power loading, 7/044 can be used, capable of taking a 30A loading. If the earth wire is run separately, it must be capable of carrying three times the current of the fuse rating, (Reg. 406).

Determining the Load

To calculate the loading, let each service that is wanted, i.e. lighting, heating, bench supply, etc., be reckoned as if the consumption was at the maximum.

For example, a full current rating should be assumed for a 15A outlet, (113) but for a consumption of between 15 and 30A several

It will be noted that two multiple boards were mentioned in the above description. This is entirely a matter of choice. The author has fitted out several small workshops for his own use and found that the initial expense of a dozen different outlets is more than compensated by the later convenience. Nothing is more frustrating than

can give an immediate indication of faulty brushes, commutators, and armatures. The double lamp position provides 300W in series with the appliance and is used for larger vacuum cleaners, washing machines, etc., and can be handy for indicating those sudden short-circuits in television sets that would normally blow the fuses. Many applications will occur to the reader; testing flexible leads, acting in place of surge limiters for new electrolytic capacitors, checking double-load appliances, such as fan heaters and fires.

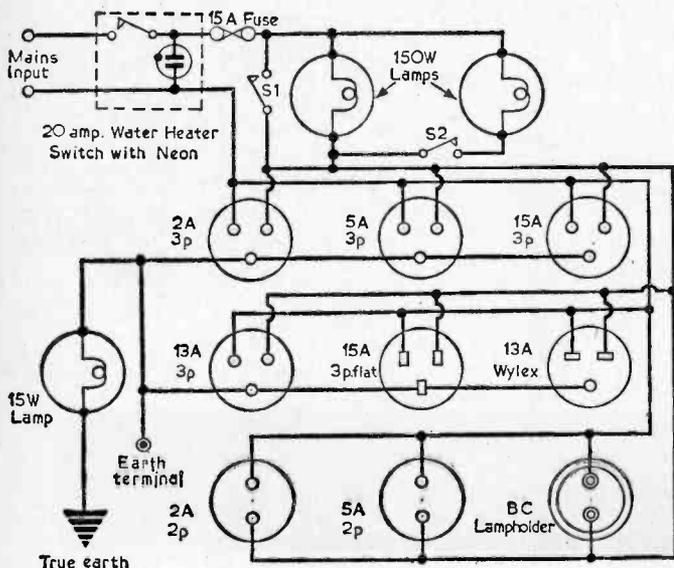


Fig. 3: Details of the series board.

having to remove and replace a plug for the sake of a five-minute test. Outlets are wired in parallel, with live and neutral poles correctly positioned and earth added where appropriate.

The Series Board

A refinement that is very little trouble to make, but can prove a great boon, is the Series Board shown in Fig. 3.

Basically, this merely includes a couple of 150W lamps, with shorting switches, in series with the live line of the incoming mains. (In the case of the set-up of Fig. 2, this would be the mains from the isolating transformer.) When S1 and S2 are closed, the live line is continuous, and the outlets receive direct continuity. If S1 is now opened, the two lamps are paralleled and in series with the live line: thus, if a piece of equipment with a dead short-circuit is plugged into any of the sockets, the lamps will light to full intensity. If S2 is now opened, only the left-hand series lamp is in circuit.

The purposes of this board, apart from the protection against short-circuited equipment, cover the testing of motorised appliances, vacuum cleaners, drills, etc., of heaters, lamps, radio and television receivers. The single lamp position gives sufficient loading to test small motors, noting the regularity of illumination, which, with practice,

Earth Leakage Indicator

A small lamp in series with the earth lead, while retaining the safety aspect, acts as an indication of earth leakage in a set or appliance. By fitting a take-off terminal on the 'hot' end of the lamp circuit, two-pin appliances can also be tested by connecting their casing directly to this point.

It should be noted that the system earth, as shown in Fig. 2, although carried through the whole of the wiring, is best augmented by a separate earth at the workshop end. A long earth can give protection against heavy leakage, but is very often a source of radio noise, especially noticeable when the receiver under test needs a good earth and aerial. This is understandable

when we consider that 11ft. of 7/029 will give a 1V drop if a.c. is applied.

Aerial Installations

Much could be said about aerial installation for the small workshop, but all depends on the

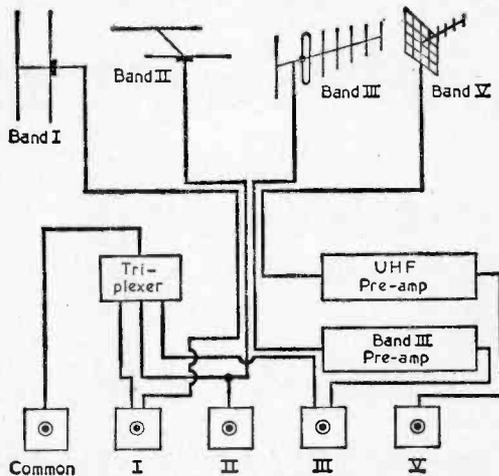


Fig. 4: Typical aerial wiring.

amount of testing and experiment that is to be done.

Fig. 4 shows a sample of the aerial wiring for one 'den' that the author recently equipped. Note that the aerial leads (coaxial feeder) were brought in separately. Although more expensive, this method has definite advantages for the workshop, especially if signal strengths are to be monitored. The Band I and II signals were both sufficiently strong not to need pre-amplification, but Band III has its own pre-amplifier and the wiring is laid in for the u.h.f. band, although there is, as yet, no signal available.

One small refinement is the addition of a triplexer and 'common' aerial socket, which can save a lot of time when a television receiver is being tested. Changing leads every time the channels are switched can be frustrating—and does not do the sockets any good either.

As a final note, remember that aerial feeders must be protected at the vulnerable points where they pass sharp edges, tiles, gutters, brick angles, etc. Fig. 5 shows a specimen run from rooftop through window-frame. Tile clips and gutter clips can be purchased quite cheaply, and a good, secure aerial installation pays for itself in the end.

It will, at least, enable the owner to sit and

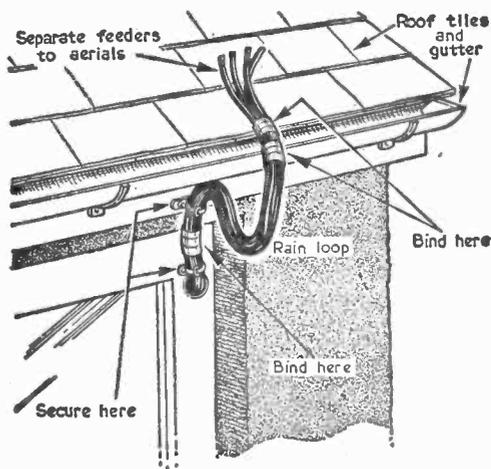


Fig. 5: Protecting aerial feeders.

view in comfort when those gales of winter come howling around again. ■

INSIDE NEXT MONTHS

FREE PRACTICAL WIRELESS

Big DOUBLE SIDED BLUEPRINT

with instructions to build

CRYSTAL-CONTROLLED Short-Wave TRANSMITTER

Covers all Amateur Bands from Top Band to Twenty. Plus invaluable Guide to Short Wave Transmitting.

ORDER YOUR COPY TO-DAY!



The Progressive PORTABLE

By R. F. Graham

THIS receiver is particularly intended for beginners, because it can be made initially with two transistors only, in its original simple form, the extra stages being added one by one afterwards. As construction proceeds, there are thus only single stages to complete and test, and if any faults should be present, they can easily be located. As the receiver is developed, almost no changes have to be made to the sections already completed. The finished portable uses six transistors, and will give very good results.

As the receiver is a working unit from the very beginning, it is built in such a way as to accommodate the loudspeaker and battery, and the complete unit can be inserted intact in a suitable cabinet, without need to remove control knobs or any other items. It can as readily be lifted from the cabinet, for further constructional work.

When the receiver is out of its cabinet, it is so designed that it will stand upright, in the normal

This receiver is built in successive stages, each new stage adding to the performance of the set and culminating in a six-transistor, two-waveband portable.

working position, so that it can be aligned and tested. It will also stand on either side, or may be placed flat, either way up, without any possible damage to components. This means that it can easily be handled, or turned over, while building is in progress.

As it is necessary to have components on both sides of the insulated panel, there is sometimes a little difficulty in checking leads which pass from one side to the other. To avoid this possible cause of wiring errors, a clear Perspex panel is used. All wires and parts can thus be seen from either side, and it is at once apparent where all leads go. The use of a transparent panel, in this way will be found very helpful.

To simplify wiring, etc., the set is first put into working condition for medium waves only, but the long wave band can be added at any time.

In the early stages of construction, the output is insufficient for a loudspeaker, so headphones are used. The receiver is, of course, very good indeed for headphone reception, and it may be desired to keep headphones, for personal listening, even when the output stage and loudspeaker have been added. It is also possible to add an external aerial, which is sometimes an advantage when the set is used in a screened locality, such as a vehicle. Running from a small 9V battery is also in order, though a large type 7½V battery can be accommodated, and has a very long working life.

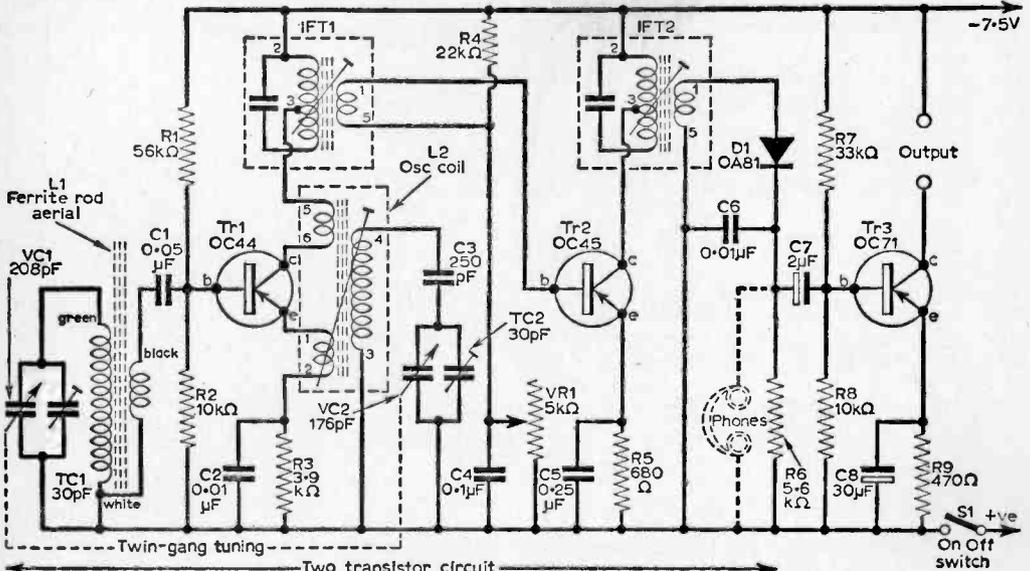


Fig. 1: The 3-transistor circuit for m.w. reception.

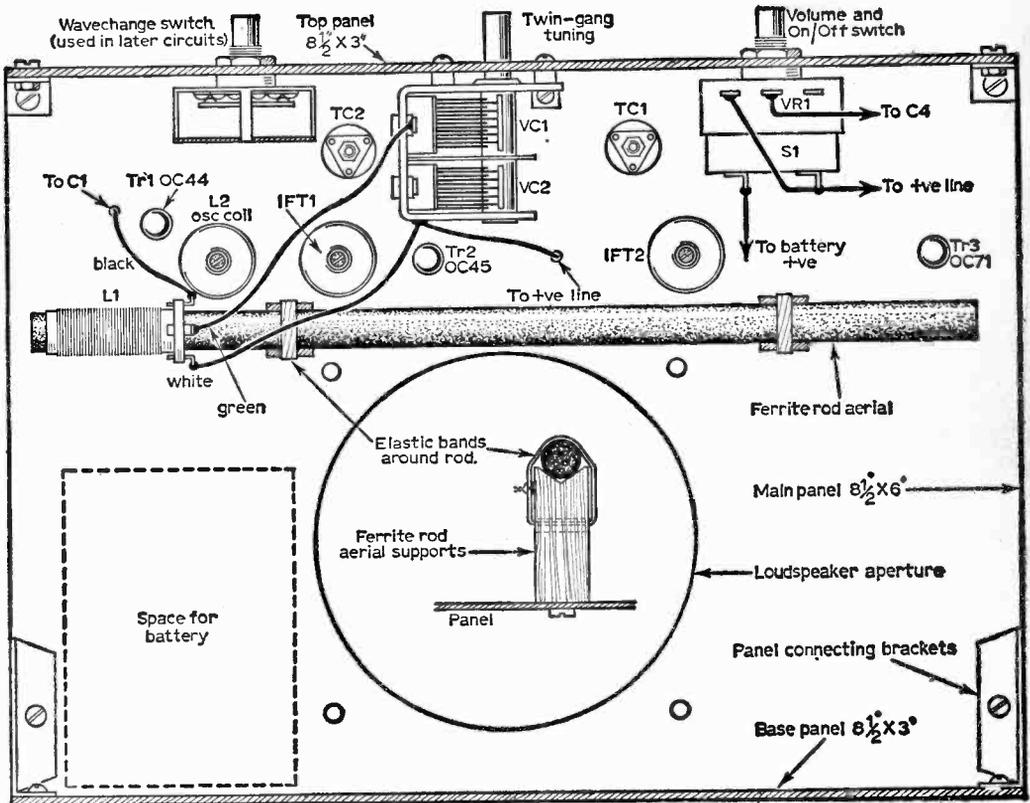


Fig. 2: The wiring on one side (the rear) of the 3-transistor panel.

Progressive Stages

Brief details of the circuits, in the order in which they can conveniently be used, are as follows:

- (1) Two transistors, as frequency changer and i.f. amplifier, with diode detector. This allows the f.c. and i.f. circuits to be aligned and got into proper working order at the earliest stage. Volume is controlled by adjusting the i.f. transistor base voltage, and the set is for headphone reception.
- (2) An audio amplifier is added, providing a three transistor circuit. This circuit gives very good headphone results, and the a.f. stage will later act as a driver for the output stage.
- (3) A Class A output stage is added, making four transistors in all. This gives sufficient output to drive a loudspeaker unit.
- (4) The second intermediate frequency stage is added, to obtain a five transistor circuit. The receiver then has a high degree of sensitivity, with good volume from quite a number of stations.
- (5) The last transistor is fitted, giving a six transistor set with Class B push-pull output. This allows greater volume than the single transistor output stage.
- (6) A long wave coil and trimmers, etc., are added, to permit both long wave and medium wave reception.

As mentioned, the set is complete, self-con-

tained, and in working order, through all the stages given above.

The Perspex Panel

The Perspex panel is 6in. x 8½in. and ¼in. thick. The loudspeaker opening, 3¼in. diameter, is cut first. This is centrally placed and ½in. from the bottom of the Perspex, as shown in Fig. 2. An adjustable washer cutter is most satisfactory, the cut being to about half depth each side. A fretsaw or similar saw could of course be used instead. It is also possible to drill a ring of holes, remove the centre disc, and clean up with a half round file, though this is more laborious. The loudspeaker is then rested in position, and the four securing holes are marked and drilled.

A line is drawn 1½in. from the top of the Perspex, and the oscillator coil and i.f. transformer are located along this line. The oscillator coil is 1½in. from the edge. The first i.f. transformer centre is 1in. from the oscillator coil centre, and it is 3in. from the centre of the first i.f. transformer to the centre of the third i.f. Assuming that the full six transistor receiver will be made eventually, the second i.f. will be fitted centrally between first and third i.f. transformers.

Hold the cans with the pins in the position shown in Fig. 3. The exact location of the pins

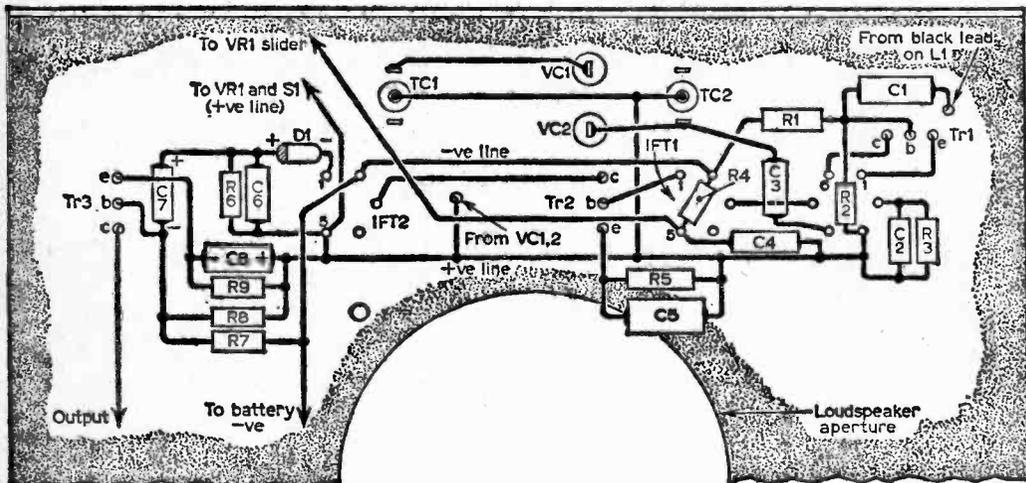


Fig. 3: The front of the panel showing the wiring.

will be seen, and can be marked with a sharp tool. Holes for the can tags and pins are then drilled.

Two mounts for the 8in. ferrite rod are made of insulated material, about 1½in. long. A groove is filed or cut to receive the rod, as in Fig. 2. Screws hold the supports to the Perspex, these screws being 2¼in. from the panel top edge. Each support has a hole drilled through it, so that an elastic band can be placed round the rod, as shown. The ends of the band are joined with thread or a short piece of copper wire.

When the receiver is standing upright, out of its cabinet, it rests on a piece of 3-ply 3in x 8½in. This is held in place by the two brackets shown in Fig. 2. This piece of 3-ply also serves as a shelf to carry the battery.

The control knob panel is of Paxolin, preferably polished, and is also 3in. x 8½in. It is held by three small brackets, one each end, and one near the tuning capacitor, as in Fig. 2. Holes for the volume control and switch are 2in. from the panel ends.

To avoid hand-capacity effects, a piece of aluminium foil about 2½in. x 6in. is cemented to the control knob panel, before fixing the volume control, switch, or tuning capacitor. This also serves to earth the bushes of the volume control and switch.

Holes are drilled directly over the capacitor tags. The control knob panel and 3-ply base should be fitted to the Perspex, as it is then possible to turn the receiver and rest it in any position. There is ½in. space at the front of the panel, to accommodate capacitors up to ½in. in diameter.

To clarify wiring, it is a good plan to use red sleeving for all "earth" or positive circuits, and black sleeving for all negative circuits. Some other colour can then be employed for all the remaining connections. Tinned copper wire, of about 26s.w.g. will be found convenient throughout.

Three Transistors

As the a.f. amplifier is extremely simple, it is included in Fig. 1. To use the receiver with two

transistors only, omit Tr3, C7, R7, R8, R9 and C8. Alternatively, it may be preferred to build the three transistor set at once, as any fault in the a.f. stage can at once be checked by connecting headphones across R6.

Thin coloured flex is soldered to the aerial winding tags, for easy identification. Black is one end of the base winding. Green is the tuned winding. Both windings are joined at one end, and the white lead is taken from this point.

Wiring of the rod aerial is shown in Fig. 2. Black passes through a hole to C1. Green goes to the front section of the tuning capacitor. White is taken to the capacitor frame, and a wire passes down from the frame to the "earth line" in Fig. 3.

The trimmers TC1 and TC2 are mounted by passing their tags through holes. Both centre tags go to the earth line, the remaining tags going to VC1 and VC2, as in Fig. 3.

Note that the white spot i.f. transformer is used in the first position, and the blue spot transformer in the final i.f. stage. All the can securing tags are joined, and serve as earth or M.C. connecting points, as in Fig. 3. Pin 4 on each IFT is unused, but should not touch other parts or wires.

There are relatively few parts and connections, and wiring should be quite easy. All transistor leads can be at least 1½in. long. Solder these quickly, to avoid overheating. With the transistors mentioned, the red spot indicates the collector lead, shown by "C" in Fig. 3. The centre lead is the base, marked "B" while the remaining lead is the emitter, "E".

The diode and electrolytic capacitors should be connected in the polarity shown. The diode leads should be at least ½in. long, and soldering should be completed rapidly.

If a receiver has never been constructed before, it will be very helpful to copy the circuit diagram in pencil. As a component is added, or a connection made, draw over the appropriate circuit elements in ink. There should then be no possibility at all of any mistake being made, and if a lead has been omitted, this will be obvious.

HOME CONSTRUCTORS LOOK!

AT THESE OUTSTANDING ADDITIONS TO THE WIRECOMP RANGE !!



THE SKYROVER

7 TRANSISTOR PORTABLE RECEIVER

THE SKYROVER

De Luxe 7 TRANSISTOR PORTABLE



GENERAL SPECIFICATION FOR BOTH MODELS

7 transistor and 2 diode superhet—6 waveband portable receiver, covering the full Medium Waveband (180-576 M) and Short Waveband (31-94 M) and in addition 4 separate switched Band Spread Ranges on 13M, 16M, 19M, and 23M/bands—with manual Band Spread Tuning for accurate Station selection. I.F. frequency 470 Kc/s. Output 500 MW. 5in. Ceramic Magnet P.M. Speaker. Telescopic and internal Ferrite Rod Aerial. All Mullard Transistors and Diodes. The coil pack and tuning heart is completely factory assembled, wired and tested. The remaining assembly can be completed in under three hours from our detailed and easy to follow instructions. Operates on four 1.5V torch batts. (U2 or equivalent).

THE SKYROVER Individual Details—controls: Waveband Selector. Volume Control with on/off switch. Tuning Control with easy to read Dial Scale. In attractive plastic cabinet, size: 10 x 6½ x 3½in., with metal trim and carrying handle.

MAY BE BUILT FOR £10.19.6

All Parts Sold Separately.

THE SKYROVER De Luxe. Tone Control Circuit is incorporated with separate Tone Control in addition to Volume and Tuning Controls and Waveband Selector. In sturdy wood cabinet, size: 11½ x 6½ x 3½in., covered in washable material with plastic trim and carrying handle. Also Car Aerial socket.

MAY BE BUILT FOR £12.19.6

All Parts Sold Separately.

Circuit diagram and data for each set 2/6 extra, free if all parts bought. Four U2 batteries 2/8 extra. Four Leak-Proof Batteries 3/4 extra. Add 5/- P. & P. on each set.

THE 'REALISTIC 7'

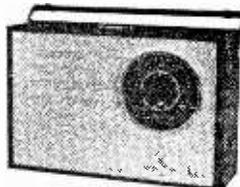


A fully transistorised Portable Receiver made to the highest professional standards—is now available to the home constructor. Comprises 7 Mullard Trans. OC44, 2 OC45's, OC71, OC81D, and 2 OC81's plus OA70 Crystal Diode. Delivers 350 milliwatt output to 4in. high flux speaker—I.F. frequency 470 Kc/s.—fully tunable over medium and long wavebands. All components mounted on single printed circuit board, size 5½ x 5½in. Attractive two-tone plastic cabinet with carrying handle—size 7 x 10 x 3½in. with easy to read dial and socket for car aerial, choice of Red/Grey, Blue/Grey or all Grey. Complete with full instructions. All parts sold separately.

WIRECOMP'S PRICE ONLY £5.19.6 Battery 3/9 extra.

P. & P. 4/6 extra. (Circuit diagram 2/6, free if all parts bought.)

AND THE 'REALISTIC 7' De-Luxe



A "De Luxe" version of the well proven "Realistic 7" is now available, with the same specification as the standard model. PLUS a restyled superior wood cabinet covered in attractive washable material, with chrome trim and carrying handle. AND ALSO a full vision circular tuning dial (externally mounted) to further improve this wonderful set.

Only £1.0.0 extra

P. & P. etc. as Standard Model.

THE COOVER '6'



This superhet receiver uses the very latest circuitry, 6 transistors and two diodes and is fully tunable over both medium and long wavebands. First stage uses three Mullard AF.117 alloy diffused transistors with OA79 and OA91 diodes, output—OC81D and two OC81's in push-pull. I.F. frequency 470 Kc/s. Large internal ferrite rod aerial gives excellent reception over all ranges. 3 inch high flux speaker has a maximum output of 330mW. Operates on four 1.5 v. pen torch batteries. All components are mounted on a single printed circuit board. Attractive plastic case with carrying handle—fitted sockets for personal earpieces, tape recorder and car aerial. Size 6½ x 4 x 1½in.

MAY BE BUILT FOR £5.7.6 All parts sold separately.

P. & P. 4/- extra. (Data and instructions 2/6, free if all parts bought.)



THE 'SPRITE'

A unique Wirecomp offer. The Sprite is a Six transistor superhet Miniature Pocket Radio of Commercial Quality—offered to you in three main pre-assembled units—which together with simple wiring—enable you to build it in only one hour! Fully tunable over Long and Medium wavebands. Uses printed circuit and High sensitivity internal ferrite rod aerial. I.F. frequency 470 Kc/s. Transistors: 3 Philco 2067's, 2 Mullard OC81M, OC81DM and OA90 diode, 3 inch speaker. Works on single PPD battery. Supplied with the complete R.F. and I.F. stages. Driver and Output stages, ready built and mounted on the printed circuit; for final assembly you only have to fit the wave-change switch, tuning condenser and drive, volume control, earphone socket and aerial rod. In very attractive plastic case, size 4 x 2½ x 1½in.

COMPLETE AS ABOVE 79/6 All parts sold separately.

Real Calif Leather Case, wrist strap and Personal EarPhone with case and battery 12/6 extra.

P. & P. 3/6 extra. (Data and instructions 2/6, free if all parts bought.)

WIRECOMP ELECTRONICS

378 HARROW ROAD, LONDON, W9.

TEL: CUNNINGHAM 9530

Hours of business: 9 a.m. to 6 p.m. Open all day Saturday, Opposite Paddington General Hospital. Buses 18B and 36 pass the door.

SPECIAL WIRECOMP OFFERS TO THE READERS OF "PRACTICAL WIRELESS"

SPEAKERS 6 x 4in. 3Ω 8/9. 5in. Round 3Ω 8/9
 B.S.R. UA 14 Autochangers £5.19.6
 COLLAR Studio Tape Decks £10.12.6
 Post FREE.

WEYRAD

6-TRANSISTOR 2-WAVE SUPERHET RECEIVER MODIFICATIONS NOW AVAILABLE FOR 500 mW OUTPUT

ROD AERIAL—RA2W

6 in. long, $\frac{3}{8}$ in. diameter, connections to tags on Coils. For 208pF tuning capacity. Complete with Car Aerial Coil 12/6

OSCILLATOR COIL—P50/1AC

M.W. covered with 176pF tuning capacity, L.W. by extra padder 5/4

I.F. TRANSFORMERS

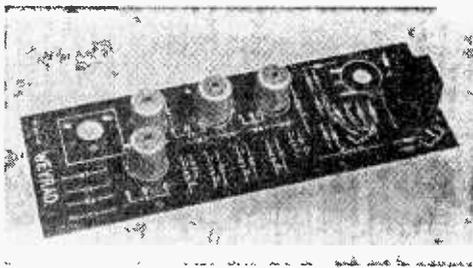
1st and 2nd Stage—P50/2CC 5/7
(2 required)

3rd Stage—P50/3CC 6/-

DRIVER TRANSFORMER—LFDT4 9/6

OUTPUT TRANSFORMER—OPT1 10/6

PRINTED CIRCUIT—PCA1 9/6



In response to many requests we have redesigned the output stages to give 500 mW and to enable a standard 3 ohm Speaker to be used. Full details of the simple changes are given on a separate leaflet available on receipt of stamp.

CONSTRUCTOR'S BOOKLET WITH FULL DETAILS 2/-

TRANSISTOR A.F. AMPLIFIER TYPE A.F.1—LOW IMPEDANCE INPUT, 3-TRANSISTOR, 500 mW OUTPUT, FULLY ASSEMBLED WITH VOLUME CONTROL 83/6

WEYMOUTH RADIO MANUFACTURING CO., LTD.
REGENT FACTORY, SCHOOL STREET,
WEYMOUTH, DORSET

40,000 Readers CAN'T BE WRONG!

This is the approximate number of readers who have purchased and use our catalogue, and the number grows daily. The reasons are not hard to find, but to highlight a few: 200 Pages, over 800 Illustrations, over 5,000 Components described and priced (all except 14 actually in stock) backed with a By-Return Mail Order Service.



Post Coupon Today
with P.O. for 3/6
To include P. & P.

PLEASE WRITE YOUR NAME AND ADDRESS IN BLOCK CAPITALS

NAME

ADDRESS

HOME RADIO LTD. Dept PW, 187 London Rd. Mitcham

COMPONENTS LIST FOR COMPLETE SIX TRANSISTOR DUAL-WAVE RECEIVER

Resistors:

R1	56k Ω	*R13	39 Ω
R2	10k Ω	R14	56k Ω
R3	3.9k Ω	R15	1.2k Ω
R4	22k Ω	R16	8.2k Ω
R5	680 Ω	R17	4.7k Ω
*R6	5.6k Ω	R18	3.9k Ω
R7	33k Ω	R19	1k Ω
R8	10k Ω	R20	1k Ω
R9	470 Ω	R21	470 Ω
*R10	2.7k Ω	R22	6.8k Ω
*R11	12k Ω	R23	220 Ω
*R12	2.2k Ω	R24	100k Ω

All 10%, $\frac{1}{4}$ W carbon, except where otherwise stated

VR1 5k Ω potentiometer with s.p. switch (S1)

Capacitors:

C1	0.05 μ F paper
C2	0.01 μ F paper
C3	250pF mica or ceramic
C4	0.1 μ F paper
C5	0.25 μ F paper
C6	0.01 μ F paper
C7	2 μ F paper
C8	30 μ F electrolytic 15V
*C9	8 μ F electrolytic 15V
*C10	50 μ F electrolytic 15V
C11	8 μ F electrolytic 15V
C12	56pF mica or ceramic
C13	18pF mica or ceramic
C14	0.25 μ F paper
C15	50 μ F electrolytic 15V
C16	100 μ F electrolytic 15V
C17	180pF mica or ceramic
VC1	208pF } Two-gang variable with internal
VC2	176pF } screen (Jackson 00)
TC1	30pF beehive trimmer
TC2	30pF beehive trimmer
TC3	60pF compression type trimmer
TC4	60pF compression type trimmer

Semiconductors:

TR1	OC44	TR4	OC72
TR2	OC45	TR5	OC45
TR3	OC71	TR6	OC72

(TR4 and TR6 should be matched pair)

DI OA81 diode

Inductors:

L1	8 in. ferrite rod aerial with medium (and long if required) windings (Osmor)
L2	Oscillator coil (Osmor)

Transformers:

T1	Push-pull output transformer with 3 Ω secondary (Osmor)
T2	Push-pull driver transformer (Osmor)
IFT1	470kc/s i.f. transformer—white spot (Osmor)
IFT2	470 kc/s i.f. transformer—blue spot (Osmor)
IFT3	470 kc/s i.f. transformer—white spot (Osmor)

Switches

S1	Single-pole on/off (see VR1)
S2	Single-pole changeover switch

Miscellaneous:

LS1	Loudspeaker 3 $\frac{1}{2}$ in. diameter, 3 Ω impedance
	Headphones, low resistance (for Circuit Fig. 1 only)
	Cream fluted knobs, two 1 in. and one 2 in. dia.
	Sheet of perspex $\frac{1}{8}$ in. x 6 in. x 8 $\frac{1}{2}$ in. Paxolin panel 3 in. x 8 $\frac{1}{2}$ in. Plywood 3 in. x 8 $\frac{1}{2}$ in. Battery connectors, brackets, etc.

Cabinet:

Plywood 6 $\frac{1}{2}$ in. x 3 $\frac{1}{4}$ in. x $\frac{1}{4}$ in.; 8 $\frac{1}{2}$ in. x 3 in. x $\frac{1}{4}$ in.; 8 $\frac{1}{2}$ in. x 6 $\frac{1}{2}$ in. x $\frac{1}{4}$ in. Hardboard 9 in. x 6 $\frac{1}{2}$ in. Material for covering, handle, etc.

7 $\frac{1}{2}$ V battery (Vidor L5048, or Ever Ready AD38)

The components marked * will not be required for the final 6-transistor receiver which will be described in a future issue.

SUMMARY OF REQUIREMENTS FOR FIRST STAGE OF CONSTRUCTION

Three Transistor M.W. Circuit (Fig. 1)

Resistors:	R1-R9, VR1
Capacitors:	C1-C8, TC1, TC2
Transistors:	Tr1, Tr2, Tr3, DI
Inductors:	L1 (m.w. winding), L2
Headphones (low resistance) are required for this circuit	

Testing 3-Transistor Set

Medium or high impedance headphones, of moderately low d.c. resistance (say up to about 250 Ω) can be connected directly from Tr3 collector to battery negative. Do not leave Tr3 in circuit with nothing connected to the collector. For example if Tr3 is wired in, but the first two stages are to be tested by wiring phones across R6, join a 1k Ω or similar spare resistor from Tr3 collector to battery negative.

Alignment follows usual methods, except that there are only two i.f. transformers. VR1 should be turned about one quarter way up only, and should be turned back, if volume is too great. It is easier to find accurate trimming positions when volume is kept down.

With the three transistors and a 7 $\frac{1}{2}$ V supply, a meter in one battery lead should show about 4mA. If a signal generator can be obtained, align the

IFT's at 470kc/s, trim at 210m, and adjust oscillator coil core and aerial winding position at 500m.

Assuming that no signal generator is available, satisfactory adjustments can be obtained fairly readily, if the job is undertaken in the correct manner. The air-spaced beehive trimmers can be rotated with a length of ebonite tube, or similar material, cut at the end to engage the trimmer top. If compression trimmers are fitted instead, make sure these can open to a low capacity. For the coil and transformer cores, file a plastic knitting needle, or strip of insulating material, so that it will fit the core slots. Trying to work with a metal blade will only cause trouble (a suitable trimming tool is often supplied with these components).

If alignment is to be undertaken with no signal generator, first unscrew both trimmers TC1, TC2

—continued on page 669

A SIMPLE WAVETRAP

ELIMINATING ADJACENT STATION INTERFERENCE

BY G. J. KING

A BIG medium-frequency reception problem is adjacent station interference. This is troublesome mostly after dusk and towards the high-frequency (low wavelength) end of the medium waveband. It manifests either as a whistle or whistles of varying *intensity* as the wanted station is tuned in and the tuning control is adjusted in an endeavour to clear the background of so-called "monkey chatter".

How the Interference is Caused

Whistles are caused by nearby unwanted signals beating with the wanted signal. When there is only one unwanted signal within audio distance of the wanted signal the two signals produce a troublesome third signal. Let us suppose that the interfering signal is, say, 2 kc/s away from the wanted signal. No ordinary domestic receiver could possibly discriminate between such closely spaced signals, so such a receiver responds to them both.

They both arrive at the detector whose non-linear function cause one of them to be modulated upon the other, and it is here that a signal at the difference frequency is created. This signal "looks" to the rest of the set like true audio—which, of course, it is—and it thus gets through the receiving circuits along with the modulation of both the wanted and unwanted signals.

A 2 kc/s whistle is thus superimposed upon the wanted audio and the unwanted modulation and extremely distressing interference results. As each station is fixed in frequency the frequency difference always remains the same and the whistle holds at its original pitch even when the tuning control is adjusted. All that happens is that the intensity of the whistle varies as *both* signals are brought within the embrace of the receiver response.

Several whistles at different pitches result when more than one interfering carrier or signal falls within the passband of the receiver, but on most modern superhets the response to signals removed by about 6 kc/s or more from the wanted signal is so small as not to cause trouble. Moreover, even if a 6 kc/s plus beat found its way into the audio section very little output would result owing to the treble limitation of the majority of domestic audio sections.

This is not meant to be derogatory of design, but simply to illustrate the wastefulness of designing for a wide audio passband when it could never be used on the medium frequencies owing

to adjacent station interference problems. In radio-grams and models with v.h.f.-f.m. facilities, of course, an extended audio section is extremely desirable, but even so quite a bit of treble cut is demanded to reduce the annoyance value of whistles when working at the top end of the medium waveband—such as on Radio Luxembourg.

Monkey Chatter

Monkey chatter is the effect which is produced by sidebands of an unwanted modulated signal breaking into the narrow spectrum to which the set is tuned. It can be demonstrated by carefully detuning, say, the l.w. Light Programme of the BBC when a good quality "live" programme is being broadcast. As the set is detuned away from the carrier so only the sideband signals of the transmission will be heard, and as the detuning is continued only the high order sidebands produce an output as they "splash" into the receiver's response. Transistor portables are ideal for demonstrating the effect owing to the relatively sharp cut-off characteristics of transistors.

Thus, in addition to whistles, adjacent stations produce monkey chatter symptoms and the combined effect, especially when it is related to several interfering signals, can be very disconcerting. The BBC's solution to the problem, of course, is v.h.f.-f.m. transmissions in Band II, and where possible these should always be used for local programmes. However, the medium frequencies still have to be employed for more distant stations and for Radio Luxembourg, so it is worth while to explore the possibilities of, at least, alleviating the interference effects.

Series-Tuned Rejector

What is wanted is some means of putting a sharp, narrow trough into the overall response curve at the interfering frequency point; but before we go into that let us investigate the overall response curve of an average receiver. Such a curve is depicted in Fig. 1. The overall response extends pretty well 12 kc/s either side of the tuned frequency, but at that displacement the response is zero so an interfering station 12 kc/s away from the carrier would not cause any trouble. In any case, it is unlikely whether the set would give an output at 12 kc/s (as this is very high audio).

However, at 6 kc/s either side of the tuned

RADIO CLEARANCE LIMITED

27 TOTTENHAM COURT ROAD, LONDON W.1

THE OLDEST COMPONENT SPECIALISTS IN THE TRADE

TRADE ENQUIRIES INVITED

Telephone: MUSEUM 9188

EST. 35 YRS.

BUY NOW WHILE THEY LAST

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	Diameter in inches	Gauss in lines	Imped. in ohms	Price
2	7000	60	8/-	4	6000	3	8/-	5	6000	5	8/-	5	9500	5	10/6
2½	7000	35	8/6	4	7000	3	8/6	5	7000	3	8/6	5	10000	3	11/6
2½	7000	60	8/6	4	7000	25	11/6	5	7000	5	8/6	5	9500	25	11/6
2½	7000	60	8/-	4	6000	35	10/6	5	7500	3	9/-	6½	7000	3	11/-
3½	8500(E.M.I.)	3	8/6	4	7000	35	11/-	5	8500	3	9/6	6½	7000	5	11/-
3½	7000	35	8/6	4	9500	35	11/6	5	8500	5	9/6	6½	7000	3	11/6
3½	9500	60	10/6	5	6000	3	8/-	5	9500	3	10/6				

Elliptical Size	Gauss in lines	Imped. in ohms	Price	Elliptical Size	Gauss in lines	Imped. in ohms	Price	Elliptical Size	Gauss in lines	Imped. in ohms	Price	Elliptical Size	Gauss in lines	Imped. in ohms	Price
5 x 3	6000	3	7/6	5 x 3	9000	25	11/-	7 x 4	7000	3	10/-	8 x 2½	9500	4	10/-
5 x 3	7000	3	8/-	5 x 3	9000	35	11/-	7 x 4	8500	3	10/6	8 x 2½	9500	5	10/6
5 x 3	9000	3	8/6	6 x 4	6000	3	8/6	8 x 2½	6000	3	8/6	8 x 5	6000	3	8/6
5 x 3	9000	4	8/6	6 x 4	7000	3	9/-	8 x 2½	7000	5	9/6	8 x 5	7000	3	9/6
5 x 3	9000	5	8/6	6 x 4	8500	3	9/6	8 x 2½	8500	5	9/6	8 x 5	8500	3	9/6
5 x 3	6000	25	9/6	6 x 4	9500	3	10/-	8 x 2½	9500	3	10/-	10 x 6	10000	3	10/6
5 x 3	7000	25	10/-	7 x 3½	9500	3	10/6								

ALLOW 2/- each Speaker for postage and packing, and please specify the exact requirements—the nearest available will be sent.

OVER 50,000 SOLD & STILL THE DEMAND CONTINUES FOR OUR 'HEAVENLY TWINS'

Ask for a demonstration in the shop.

"CAPRI"

Sensitive!
Super-selective!
Superb Speaker!
New Price
NOW ONLY
79/6



(2/- p. & pkg.)
Pocket Super-het MW and Droitwich LW
Size 4½ x 2½ x 1½ in.
Constructional data 1/9 Post Free.

The best and easiest transistor build-yourself sets available.

Send S.A.E. for FREE PARTS LIST

6 First Grade MULLARD Transistors Diode(s) and all components BRAND NEW and GUARANTEED

Choice of a dozen stations in daylight . . .

"CONTESSA Mk. III"
"QUEEN OF THEM ALL"

ONLY

£9.19.6

(3/6 p. & pkg.)

PORTABLE CAR RADIO
2 WAVEBAND SUPER-HET

Construction manual 2/10 Post Free.



Inclusive price for all associated components, case, battery and instruction Book complete in every detail.
ANY PARTS SOLD SEPARATELY ON THE BUILD-AS-YOU-BUY SCHEME

CONTESSA III £9.19.6 (plus 3/6)
CAPRI (Battery 2/6 extra) 79/6 (plus 2/-)

SELECTED GUARANTEED BARGAINS—

Beautifully geared AM/FM 2 Gang Condensers, 4/8; AM/FM IFT's 465kc/s and 10.7 Mc/s, 4/6 pair; Magnavox Crystal Tape Recorder Mikes, 12/6; Double-tuned Transistor ferrux IPT's Q120, 470 kc/s, 5/6 pr; 3 matched IFT's and oscillator coil for Mullard transistor circuits, 10/6 the set; Plessey-Brayhead turret tuners 34/38 Mc/s, valued 8/6 each; 3 watt Stereo Amplifiers, complete, ready to switch on 70/6; Sentinel rectifiers R32D-D3-2-1Y, 2/6 each. DIODES—OA70, OA79, OA81, OA90, CG36H, ORP60, GD10 2/- each. TRANSISTORS: Set of 6 (RF and LF) including 1 watt matched pair, heat sink and diode. 13/6 the set; OC44 (or equiv.), 9/9. OC45 4/8, OC81 5/8; matched pair 12/-, PXC 101A 4/8, matched pair 9/6, PXA 101 3/9, AF 115 4/8. SB 305 2/-, Submin.Germanium diode 1/3. Please send STAMPED and ADDRESSED envelope with any enquiry. We regret no catalogues—out stocks move too quickly! Kindly make provision for additional postage and packing charges to avoid delay.

TERMS: CASH WITH ORDER or C.O.D. ON ORDERS OVER 10/-

Make Your Ability PAY

UNLIMITED OPPORTUNITIES exist today for "getting on" . . . but only for the fully trained man. Let I.C.S. tuition develop your talents and help you to success.

STUDY IS EASY with I.C.S. guidance. The courses are thorough. Printed manuals, fully illustrated, make study simple and progress sure.

YOUR ROAD TO SUCCESS can start from here—today. Complete this coupon and post it to us, for full particulars of the course which interests you. **MODERATE FEES INCLUDE ALL BOOKS.**

Take the right course now . . .

ADVERTISING & ART

Copywriting
Layout & Typography
Commercial Illustrating
Oil & Water Colour

BUILDING & CIVIL ENGINEERING

Architecture, Bricklaying
Building Construction.
Builders Draughtsman
Interior Decoration
Quantity Surveying
Heating & Ventilation
Carpentry & Joinery

COMMERCE

Book-keeping
Accountancy & Costing
Business Training
Office Training
Purchasing, Storekeeping
Secretaryship
Shorthand & Typing
Computer Programming
Small Business Owners

DRAUGHTSMANSHIP

Architectural, Mechanical
Drawing Office Practice

ELECTRONICS

Computer & Maintenance
Electronic Technicians
Industrial Electronics

FARMING

Arable & Livestock
Fig. & Poultry Keeping
Rabbits & Chickens

GENERAL EDUCATION

G.C.E. subjects at Ordinary & Advanced Level
Good English
Foreign Languages

INTENSIVE COACHING for all principal examinations —G.C.E., Secretaryship, Accountancy, Engineering, Work Study, Management, Radio, Architecture and Surveying.

Member of the Association of British Correspondence Colleges

Start today the ICS way!

INTERNATIONAL CORRESPONDENCE SCHOOLS (Dept. 172)

Intertext House, Parkgate Rd., London, S.W.11

Send FREE book on _____

Name _____

Address _____

Occupation _____

11.63

INTERNATIONAL CORRESPONDENCE SCHOOLS

HORTICULTURE

Home Gardening
Park Gardening
Market Gardening

MANAGEMENT

Business Management
Hotel Management
Industrial Management
Office Management
Personnel Management
Works Management
Work Study
Foremanship

MECHANICAL & MOTOR ENGINEERING

Engineering Maths.
Diesel Engines, Welding
Industrial Instrumentation
Workshop Practice
Refrigeration
Motor Mechanics, etc.

POLICE

Entrance Examination

PHOTOGRAPHY

Practical Photography

RADIO, TV & ELECTRICAL

Servicing & Engineering
Radio Operation (with Kits)
P.M.G. Certificates
Telecommunications
Electricians
Electrical Contractors

SELLING

Company Reps.
Sales Management
Marketing

WRITING FOR PROFIT

Short-story Writing
Free-lance Journalism



ADAMIN- by LITESOLD

These new ADAMIN micro soldering instruments supplement the well-known LITESOLD models for special applications and still further extend our very comprehensive range of specialised soldering equipment.

Bit sizes now 1/16 in. to 1/4 in.

A POPULAR ADAMIN MAINS MODEL

The C10L (shown on bench stand) is probably the smallest mains voltage model in the world. Bit dia. 3/32in., length 7in., weight 1oz. (less flex). Heats in 30 secs.

Brochure No. S10 sent free on request.

Sole proprietors and manufacturers:

LIGHT SOLDERING DEVELOPMENTS LTD 28 Sydenham Road, Croydon, Surrey

Phone: CROydon 8589

Grams: Litesold Croydon



LOWEST EVER PRICES

SPECIAL!! "LAFAYETTE"

7in. Std. 1,200ft., 12/6
7in. L.P. 1,800ft., 15/-
7in. D.P. 2,400ft., 25/-

EXCLUSIVE TO GEE'S!

AMERICAN "SHAMROCK"

Professional quality
7in. L.P. 1,800ft., 15/6

SPARE SPOOLS, 4in.
5in., 5 1/2in., 2/- each;
7in. 2/6; 8 1/2in. 5/-.



5in. Std.	600ft.	...	8/6
7in. Std.	1,200ft.	...	12/6
5in. L.P.	900ft.	...	10/-
5 1/2in. L.P.	1,200ft.	...	12/6
7in. L.P.	1,800ft.	...	15/-
4in. D.P.	600ft.	...	9/-
5in. D.P.	1,200ft.	...	15/-
5 1/2in. D.P.	1,800ft.	...	22/6
7in. D.P.	2,400ft.	...	25/-

AMERICAN "CBS" TAPE

5in. Std.	600ft. (CIP-6)	..	13/-
5 1/2in. Std.	900ft. (CIP-9)	..	16/-
7in. Std.	1,200ft. (CIP-12)	..	21/-
5in. L.P.	900ft. (LP-9)	..	16/-
5 1/2in. L.P.	1,200ft. (LP-12)	..	19/6
7in. L.P.	1,800ft. (LP-18)	..	28/6
5in. D.P.	1,200ft. (CMXP-12)	..	32/-
5 1/2in. D.P.	1,800ft. (CMXP-18)	..	37/-
7in. D.P.	2,400ft. (CMXP-24)	..	47/-

P. & P. 2/- per order (over £3 post free). Other types available. S.A.E. for Bumper Tape and Accessories list.

Obtainable only from:— **GEE BROS. (RADIO) LTD., Dept. P.W.11**
15 LITTLE NEWPORT ST., LONDON W.C.2
(Adjoining Leicester Sq. Tube) GER 6794/1453

frequency the response is about 50 per cent of maximum. This is essential, of course, if the medium frequency audio sidebands are to be retained and there is not to be too much treble suppression in the r.f./i.f. stages of the set. This means, therefore, that any interfering signal displaced up to, say, 6 kc/s from the tuned frequency will cause a response or output.

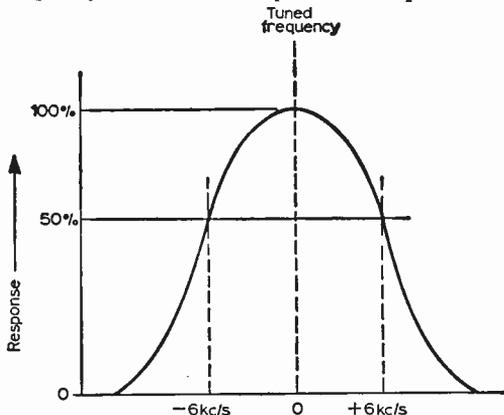


Fig. 1: Response curve of an average receiver. An interfering signal about 12kc/s away from the tuned frequency would not cause any trouble, but a signal 6kc/s away would result in a 6kc/s whistle due to beating as explained in the text.

Now, if the response is narrowed still further, as shown in Fig. 2, although the response to interference 6 kc/s either side of the tuned frequency is only about 5 per cent (26dB down), treble sidebands of the modulation would also be suppressed by the same amount and the reproduction would be very poor indeed.

Suppression of the order of 26dB is not sufficient to "kill" the whistle effect completely, though it goes a long way towards minimising it, and if the treble response of the set is down audio-wise at

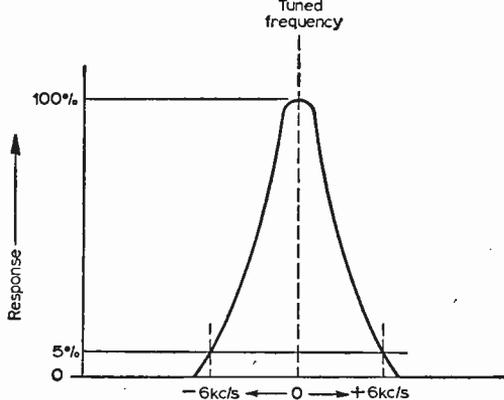


Fig. 2: If the overall response is narrowed as shown here the sideband components of the modulated signal would be severely attenuated and bad treble cut would spoil the reproduction. This is not a solution to the problem of adjacent station interference.

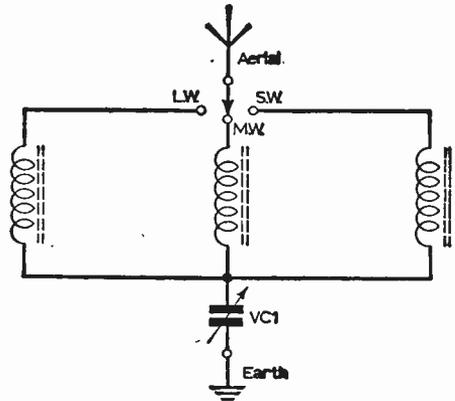


Fig. 3: A simple series-tuned wavetrap or rejector circuit. The coils should have a Q value of preferably not less than 250 and the capacitor should have a maximum value of 500pF for all-wave use, 300pF for m.w. use or 100pF for s.w. use. Connection should be either across the aerial and earth sockets of the set (across the operating frame aerial or ferrite rod winding in the case of a portable) or between the metal chassis of the set and the signal grid on the frequency changer valve. On a.c./d.c. sets capacitive isolation is essential to avoid the risk of electric shock.

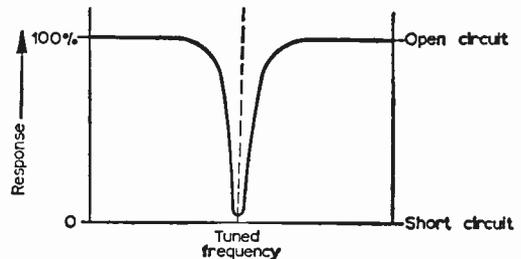


Fig. 4: The type of trough introduced by the rejector. 6 kc/s, then the two attenuating factors together would almost certainly eliminate the disturbance; but narrowing of the overall response is not generally a practical way out of the trouble.

If there is only one interfering signal, the resulting whistle can almost certainly be cleared by a high-Q series-tuned rejector of the kind shown in Fig. 3. Such a rejector "looks" to signal at the tuned frequency as pretty well a dead short, while to signals at frequencies outside the narrow response there is virtually zero attenuation. The idea is shown in Fig. 4.

To get the system to work, the narrow response of Fig. 4 must be superimposed at the point of interfering signal upon the response of Fig. 1, as shown in Fig. 5. Here it is supposed that the interfering signal is plus 4 kc/s away from the wanted signal. Thus, the flylead of Fig. 3 would be connected to the appropriate coil or coil section and VC1 would be adjusted until the rejector is tuned exactly plus 4 kc/s from the wanted signal. As VC1 is tuned over the wanted carrier, the signal would dip, would then rise and close by would be a point where the whistle would disappear almost completely—how well depending

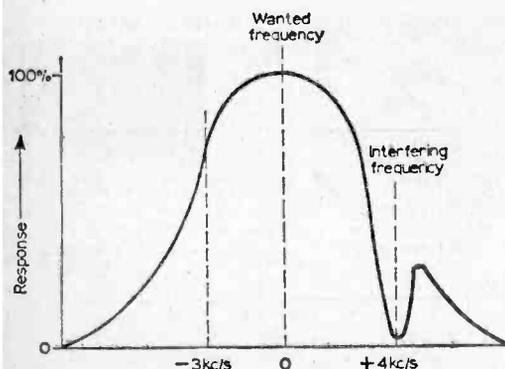


Fig. 5: Here is shown the retractor adjusted to suppress an interfering carrier plus 4kc/s from the tuned frequency of a receiver. The degree of attenuation to the unwanted signal given by the retractor is governed by the efficiency or Q value of the circuit.

upon the efficiency, or Q value, of the retractor circuit.

If there are several whistles, it is not feasible to employ a number of retractor circuits as they tend to interact with each other, and unless the circuits are expensively designed it is virtually impossible to improve matters. Nevertheless, even with several whistles, quite a relief is secured by getting rid of the strongest one.

Connecting the Retractor

The retractor circuit is often best connected between the aerial and earth sockets of the receiver or tuner, but if this results in too much loading across the circuit and a reduction of effective Q, the combination can be tried between the signal grid of the frequency changer valve and the metal chassis of the set.

It is perfectly in order to use the retractor with portable sets. Here it should be connected to chassis on the capacitor side of the retractor and to the slider of the aerial wavechange switch on the other side, so that irrespective of waveband to which the set is tuned the retractor is always effectively across the operating winding of the frame or ferrite rod aerial. On a.c. d.c. receivers care *must* be taken to prevent electric shock—particularly to the uninitiated and the young in the family—and no connection whatsoever should be made direct to chassis. 250 volt a.c. working capacitors of not greater than 1,000 pF should always be used for isolation.

Construction

Construction is very straightforward and needs little comment. The retractor can easily be housed in a coffee, cocoa or tobacco tin. The capacitor and coils should be mounted inside with an outside knob for tuning and a couple of sockets or terminals for connecting to the set.

With an all-wave (or long wave and medium wave) version it is desirable to employ a simple wave-change switch to avoid having to alter coil taps when changing band. Mainly, however, the device is designed to tune the medium waveband

only, in which case a high-Q medium wave coil and a tuning capacitor (preferably air spaced) of 0.0003 μ F are required. Suitable high-Q coils and capacitors are readily available from most of our component advertisers. The coil should have a Q of 250 or so.

The retractor has been used in conjunction with a high-quality a.m. tuner to eliminate most of the mush and whistles around 208 metres with considerable success.

For Television

A similar retractor for suppressing pattern interference due to an unwanted carrier close to the vision frequency on Band I channels can be made along similar lines. A suitable circuit, with construction details, is given in Fig. 6.

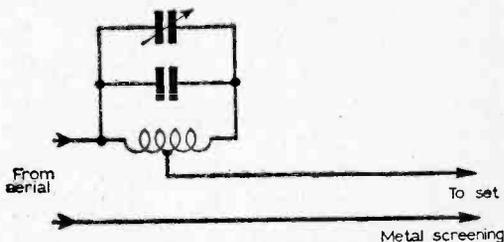


Fig. 6: A simple TV retractor circuit for clearing pattern interference produced by an interfering r.f. signal within the vision passband. The coil is 2 turns of 18s.w.g. tinned copper wire, $\frac{3}{8}$ in. diameter, self-supporting, tapped at $\frac{1}{2}$ -turn from aerial end.

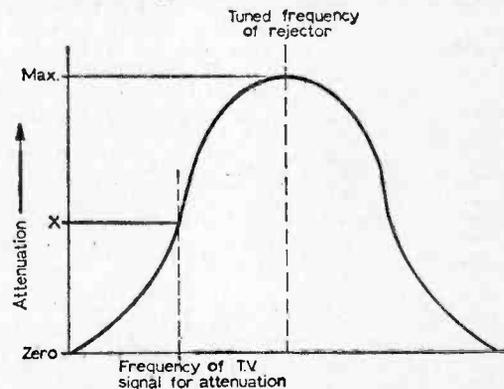


Fig. 7: Showing how the retractor of Fig. 6 can be used as a signal equaliser. Point X on the curve reveals the degree of attenuation.

The idea can also be extended for equalising the signals in Bands I and III at the end of a television downlead. Usually the Band I signal is several times stronger than the Band III signal, meaning that the Band I signal requires a few decibels of attenuation relative to the Band III signal. By using a retractor of the type shown in Fig. 6 is can be adjusted on the Band I channel to introduce sufficient attenuation as to balance with the Band III signal, as shown in Fig. 7. Here the retractor is tuned to one of its sloping sides until the required degree of signal attenuation is introduced.

Infra-Red Heaters

Make up one of these latest type heaters ideal for bathroom, etc. They are simple to make from our easy-to-follow instructions—uses silica encased elements designed for the correct infra-red wavelength (3 microns). Price for 750 watt element and metal casing as illustrated 19/6, plus 2/6 post and insurance.



CABINET & PICK-UP

Made for a famous company intending to make a Battery Record Player but changing their minds. This is an extremely fine looking cabinet, must have cost at least £2 to make. It is complete with handle and fasteners as illustrated. Also included in the parcel is a Cosmocord pick-up with crystal cartridge and sapphire stylus. Both items new and perfect. Only 19/6, plus 4/6 post and insurance.



Speaker Bargain

12in. High-fidelity loudspeaker. High flux permanent magnet type with standard 8 ohm speech coil. Will handle up to 12 watts. Brand new, by famous maker. Price 27/6, plus 3/6 post and insurance.

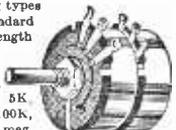


Limited Quantity Only

Waterproof heater wire, 16 v.d. length, 70 watts. Self-regulating temperature control. 10/-, post free.

Morganite Potentiometers

Single and 2-gang types available. Standard size with good length spindle, all new and boxed. Single types, 1/- each, values available: 5K, 10K, 25K, 50K, 100K, 250K, 1 meg., 2 meg. Gang type 3/- each—values available: 5K ± 5K, 100K ± 100K, 1 meg. ± 1 meg., 2 meg. ± 2 meg.



Microphone Inserts

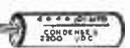
American made. Dynamic type. Real bargain at 3/6, plus 6d. postage.

Crystal type 5/6.



Suppressor Condenser

Stop your drill or other appliances interfering with your or your neighbours' radio or television. Simple instructions given. 1/6 each. 12/- dozen.



Beginner's Superhet

As supplied to many schools and colleges. A simple basic superhet—easy to understand and which can be progressively extended—ideal for students—components include—valves—metal rectifier tuning condenser—I.F. transformers, etc. In fact complete superhet except speaker. Price £3 plus 3/- post and insurance. Data included free or sep. 1/6.



TV CAMERA LENSES

16 mm. lens in mount, f8.5 and triple anaestigmatic suitable for vidicon tube, £3.10.0.

Cabinet Snp

This fine cabinet as illustrated but less control knobs is available this month at a special snip price of 12/6, plus 3/6 post and insurance. Size is 13 1/2 in. x 9 in. x 4 in. and it is nicely covered in two tone I.C.I. fabric.



Bargains For Callers

We always have plenty, e.g. T.V. Cabinets, ideal for shelves etc., 2/6 each.

DO YOU EVER FORGET ?

This Pocket Secretary could eliminate the trouble (often embarrassment) your forgetfulness causes —she will stay in your jacket pocket and as fast as you can think she will capture and store—ideas—notes—formulas—appointments—anything you can say or sing! Then at your command she will play them all back to you.



Undoubtedly one of the smallest precision tape recorders made. Entirely controlled by push buttons, you can record and play back with the instrument in your pocket. It is a full-function machine using standard 1/4 in. tape and easy to replace batteries. Speaking and playing back is from the same (crystal) microphone. Specifications: Dimensions: 6 1/2 x 2 1/2 x 1 1/2 in. Weight: 14 oz. Recording time: 12 mins., rewinding time 4 mins. Recording system: D.C. Bias. Erasing system: Magnetic erasing, wow and flutter: Within 2%, and frequency response: 500-1,200 c/s (within -6db). Price £9.19.6. Complete ready to work.

THIS MONTH'S SNIP

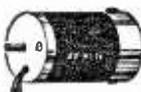


Tape Recorder for Spares. This month, if you act quickly, you can have a complete transistorised tape recorder at a "give away" price. The tape recorder has not been used but may be slightly faulty. We therefore sell it for its spare value only. It contains among other things: Tape head, suitable for dual track working. 4 transistor push-pull amplifier. 2 1/2 in. P.M. speaker. 3 volt

tape motor with pulleys and drive mechanism, volume control, record—erase—playback—off lever action switch. All assembled in a plastic case with carrying handle. Every item listed above is warranted in good working order and if not so, will be replaced free of charge. The whole offered at less than the value of the amplifier alone, namely 45/-, plus 2/6 carriage.

MAINS MOTOR

Suitable to drive fan, small model drilling machine etc. A.C. only self starting. Size 2 1/2 in. diameter by 2 1/2 in. long (plus spindle). Only 9/6, plus 2/6. Tape recorder type motor synchronous working 230 volts, 12/6, plus 2/6 post. Ditto but more powerful 20/-, plus 2/6.



"CORONET" Mk. III

An excellent pocket size set using 3 MAT transistors for the oscillator and I.F. stages and 3 junction types including a matched pair for the output stage. It fully covers the medium-wave band and that part of the long-wave band to bring in B.B.C. light. The circuit includes a highly efficient slab aerial and Plessey tuning condenser incorporating wave change switch. Overall size approximately 4 1/2 x 2 1/2 x 1 1/2 in. Supplied complete with carrying case, this two-wave pocket set is available whilst stocks last at the very low price of £3.12.6.

MULTI-METER BARGAIN

Model number EP10K. Extra wide scale fitted corner wise for compactness, extra accurate as it uses 1% components. Sensitivity 10,000 ohms per volt A.C. and D.C. ranges. D.C. voltage up to 1.2KB in 6 ranges. A.C. voltage up to 1.2KV 5 ranges. D.C. current up to 300mA 3 ranges. Resistance up to 2 meg. Capacities .005 to 15 mfd and decibels. Complete with full instructions and test probes and battery for ohms range. A real bargain not repeatable once stocks cleared. Price £3.18.6. Carriage and insurance 5/-.

BUILDING THE DOUBLE BEAM 'SCOPE ?

We can supply VCR517 brand new, 9/6, plus 6/6 carriage and packaging, also 1750 v. mains transformer, 22/6, plus 6/6 carriage and packaging. Other parts in stock, send for list.

Hi-Fi Speakers

E.M.I. Ceramic magnet 12,000 lines, size 13 x 8 in. (roughly equivalent to 12in. round speaker). Bass frequency 40-60 c/s. Handles up to 10 watts. Price 33/6, plus 5/- carriage and ins. State whether 15 ohm or 3 ohm.

Fluorescent Light Bargain

Kit of parts comprising: choke, two lamp holders, a starter holder and a starter. 40 watt, 19/6; 80 watt, 27/6. Plus 2/6 post and insurance.



Building A 'Scope?



3in. oscilloscope tube. American made type No. 3EP7, 6.3 v. 0.6 amp. heater, electrostatic deflection, brand new and guaranteed with circuit diagram of scope, 15/- each, plus 2/6 post and insurance.

Adjustable Thermostat



Suitable for industrial or domestic purposes, such as controlling furnace oven, immersion heater etc. Can also be used as a damperstat or fire alarm. Made by Sunvic these are approximately 17in. long and adjustable over a range 0 to 550 F. The contacts are rated at 15 amps, 230 volts, and the adjustment spindle, which comes to the top, can be fitted with a flexible drive for remote control or just a pointer knob for local control. Listed at £3 or £4 each, these are offered at only 8/6, plus 2/6 postage and insurance.

Ice-Stat

This is a small thermostat which cuts on and off at around freezing point. Has many uses, one of which could be an ice warning device to be fitted under your motor car. Price 7/6. Post 1/-.

SIMMERSTAT HEATER REGULATOR

Suitable to control elements, heaters, soldering irons and boiling rings up to 2,500 watts. Complete adjustable, normal price 55/- each, special snip price 12/6, plus 1/6 postage and insurance.

15 amp. Thermostat

Adjustable over a fairly wide range of temperature but set for 70°F., suitable for wall mounting to control room heaters. Exceptional bargain at 9/6, plus 1/- post and insurance.

ELECTRONICS (CROYDON) LTD

266 LONDON ROAD, BROADGREEN, CROYDON

(Opposite SAVOY CINEMA)

IMPROVED

STANDARDS OF

ACCURACY AND RELIABILITY

Modern styling in light grey with legible black engraving.

Constructed to withstand adverse climatic conditions.

Ever ready case, including leads, prods and clips.

Improved internal assemblies.

Re-styled scale plate for easy rapid reading. 2 basic scales, each 2.5 inches in length.

New standards of accuracy, using an individual calibrated scale plate d.c. ranges 2.25% f.s.d. a.c. ranges 2.75% f.s.d.

Available accessories include a 2500V d.c. multiplier and 5, 10 and 25A shunts for d.c. current measurement.



Mk 4 MULTIMINOR

The Mk. 4 MULTIMINOR is an entirely new version of this famous Avo instrument and supersedes all previous models. It is styled on modern lines, with new high standards of accuracy, improved internal assemblies, and incorporating climatic properties.

The instrument is supplied in an attractive black carrying case, which also houses a pair of leads with interchangeable prods and clips, and an instruction booklet. It is packed in an attractive display carton. Robust real leather cases are available, if required, in two sizes one to take the instrument with leads, clips and prods, and the other to house these and also a high voltage multiplier and a d.c. shunt.

D.C. Current: 100µA f.s.d. —1A f.s.d. in 5 ranges RESISTANCE: 0-2MΩ in ranges using 1.5V cell.
 A.C. Voltage: 10V f.s.d. —1,000V f.s.d. in 5 ranges SENSITIVITY: 10,000Ω/V on d.c. Voltage ranges.
 D.C. Voltage: 2.5V f.s.d. —1,000V f.s.d. in 6 ranges. 1,000Ω/V on a.c. Voltage ranges.
 D.C. Millivolt range: 0 —100mV f.s.d.

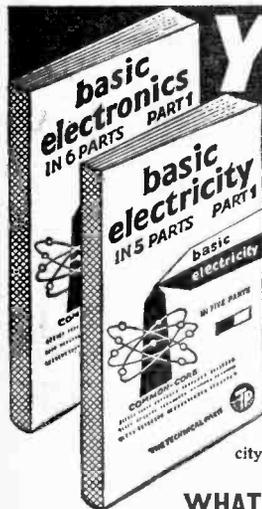
For full details of this great new pocket size instrument, write for descriptive leaflet.

AVO LTD

AVOCET HOUSE - 92-96 VAUXHALL BRIDGE ROAD - LONDON, S.W.1 - Tel.: VICTORIA 3404



MM17



YOURS FREE FOR 7 DAYS

The New 'Picture-Book' way of learning **BASIC ELECTRICITY (5 VOLS.)** and **BASIC ELECTRONICS (6 VOLS.)**

You'll find it easy to learn with this outstandingly successful new pictorial method—the essential facts are explained in the simplest language, one at a time; and each is illustrated by an accurate, cartoon-type drawing.

The books are based on the latest research into simplified learning techniques. This has proved that the **Pictorial Approach** to learning is the quickest and soundest way of gaining mastery over these subjects.

The series will be of exceptional value in training mechanics and technicians in Electricity, Radio and Electronics.

WHAT READERS SAY

"Learnt more in part 1 than the previous 2 years." L.M.J., Durham. "I am convinced that I am on to something really worth while." J.L.P., Fife. "Without doubt they are the easiest to follow books I have ever studied." W.J., Aylesbury. "Congratulations on a well planned easy to learn series." M.K., Horsham. "First class, I cannot praise them too highly." J.J., Taunton.

A TECHNICAL PRESS PUBLICATION

To Selray Book Co.,
60 Hayes Hill, Hayes, Bromley, Kent

Please send me Without Obligation to Purchase, Basic Electricity/Basic Electronics on 7 Days Free Trial. I will either return set, carriage paid, in good condition within 8 days or send down payment of 10/- (Basic Electricity) followed by 6 fortnightly payments of 10/-. Down payment of 12/- (Basic Electronics) followed by 6 fortnightly payments of 12/-. Alternatively, I will send 63/- (Basic Electricity—5 parts), 75/- (Basic Electronics—6 parts) post free. This offer applies to United Kingdom only.

Tick against set required (only one set allowed on free trial).
BASIC ELECTRICITY **BASIC ELECTRONICS**
 Signature _____
 (If under 21, signature of parent or guardian)

BLOCK LETTERS BELOW
 Name _____
 FULL POSTAL Address _____

POST NOW FOR THIS OFFER!!

AUDIO LEVEL INDICATOR

By C. MORGAN.

A directional aid for setting up microphones and loudspeakers

THE noise level indicator described in this issue was developed mainly for the setting up of a recording studio. Since then many other practical uses for this very versatile indicator have been discovered. Some of the uses have been to test the sound absorbed by certain materials in use in the studio, setting up of the loudspeakers in a display field so that all sections of the audience receive good information (badly needed in certain open-air displays) and laying out of the stereo loudspeakers to get the best effect possible.

Other applications include the monitoring of recordings, thereby dispensing with the monitoring headphones, leaving the ears free, and enabling the operator to stop the recording when the sound level is too faint to be recorded.

It can also be used with an extended microphone on an umbrella to give a directional effect from one position only.

Although sound reflectors are available the price may be beyond the pocket for some enthusiasts, but if an old umbrella is pressed into service, with the microphone positioned as shown in the drawing (Fig. 4), a very directional effect can be produced. This is so effective that the writer has abandoned his solid reflector in favour of a small umbrella which is very portable, takes up little room and can be stowed away when not in use.

The Circuit Construction: Sound Amplifier Stage

The microphone is of the moving-coil variety, the one in use being an ex-Army hand-set type which requires the use of a step-up transformer. If the intending constructor does not wish to use a moving coil type a crystal type will work just as well but due to the higher output the step-up transformer will not be required.

The output of the transformer, or the crystal microphone, is fed into a two-stage transistor amplifier, the output of which is coup-

led to a rectifier into a moving-coil meter. The battery supply is 9V, miniature deaf aid type.

No special requirements are specified as to the layout of the wiring, except to keep the connecting wires of the transistors cold when soldering them into position. The use of heat shunts, in the form of a pair of flat-nosed pliers, will suffice.

The mounting of the battery is simplicity itself. Two small pieces of $\frac{1}{8}$ in. thick paxolin were obtained from a run-down 90V battery, the brass clips were taken from a 4½V torch battery and bent to suit. These were then clipped to the paxolin with paper staples and a blob of solder placed on each one and marked (-) and (+).

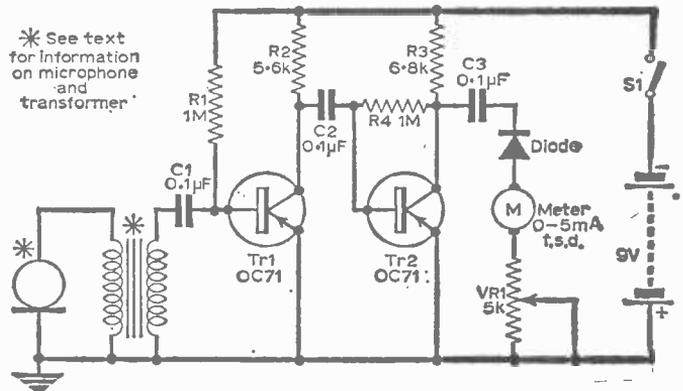


Fig. 1: The circuit diagram.

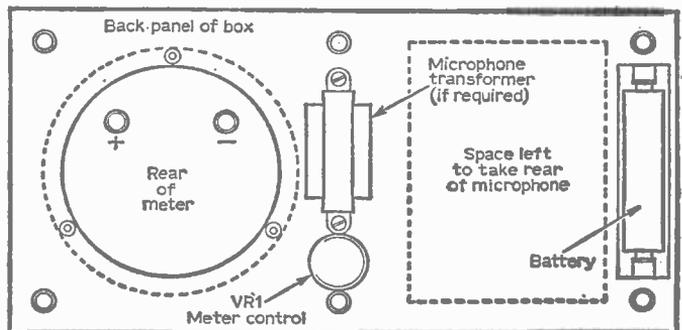


Fig. 2: A view of the assembled unit.

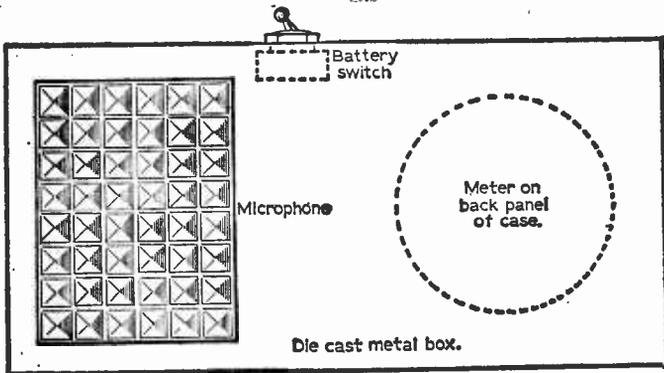


Fig. 3: Details of the front of the case.

The second piece of paxolin was then fitted, two pieces being held in place while the holes to take two self-tapping screws were drilled. The reason why two pieces of paxolin were used is to prevent the connections to the battery (carried by the top piece) shorting out to the case. If the level indicator is to be used with other than gentle hands the battery can be taped into position.

Using the Umbrella as a Sound Reflector

Two types of umbrellas were tried out, the first being a large conventional cloth one. This had a marked directional effect but a lot of sound was lost due to the porosity of the material covering the frame. Painting the inside with a silver paint reflected the sound rather better but also reflected the sun's rays so well that it damaged the plastic container of the mike.

Anyone intending to experiment with the sole purpose of solar heat in mind will have no difficulty in obtaining heat in the order of 112°C+.

The second type of umbrella tried was an Empire one of conventional size, the diameter being only 2ft 6in. across. It is made of plastic, which is an almost perfect medium for reflecting sound, and unless coated with a surface reflecting

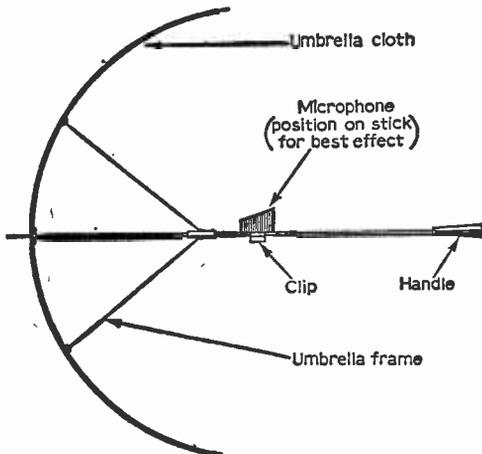


Fig. 4: Details of the modified umbrella.

paint will not damage the microphone.

One other very good point in favour of the Empire umbrella is that the rod supporting the ribs, etc., is made of hollow light metal. When the sound focal point has been found in the umbrella (about 5in. from centre) the handle and the point that projects through the frame can be sawn off. The microphone leads can then be fed through the rod and in that way making a far neater job.

If a 3/4in. diameter "Terry" clip is secured to the microphone with the assistance of a small self-tapping screw the microphone can be slid along the rod to widen or narrow the sound angle.

If, then, the termination of the microphone is plugged into the noise level indicator, and the reflector is beamed on to a distant sound, the meter will indicate when the maximum sound has been obtained.

COMPONENTS LIST

Resistors:

- R1 1MΩ
- R2 5.6kΩ
- VR1 5kΩ miniature potentiometer
- R3 6.8kΩ
- R4 1MΩ
- RJ-R4 are 1/4 watt

Capacitors (paper):

- C1 0.1μF
- C2 0.1μF
- C3 0.1μF

Semiconductors:

- TR1 OC71, or equivalent
- Tr2 OC71, or equivalent
- DI Any suitable germanium diode

Miscellaneous:

Moving coil microphone and matching transformer. Die cast metal box to suit either internal or external microphone, as desired. Indicator knob and reference dial marker. 9V deaf-aid battery. Paxolin and brass connectors. Self-tapping screws. Insulated connecting wire, etc.

This set-up can also be used for the transmission of sound in mainly one direction only. A miniature (2 1/2 in.) loudspeaker was installed in place of the microphone and connected to the tape recorder extension loudspeaker socket. A microphone was set up at a distance of 100yd, using the described noise level indicator.

The loudspeaker was placed into position approximately in the centre of the umbrella and then pointed in the direction of the indicator, when maximum signal reading was obtained in that position. The loudspeaker was then moved in and out of the umbrella and a position was obtained on the rod where, if the reflector was taken away, a loss of two-thirds of the total volume was indicated.

—continued on page 662

TEST METERS



DOOROB TYPE 1035 DOUBLE BEAM OSCILLOSCOPES. A few units of these modern scopes overhauled and in perfect order ONLY **£45.** Further details on request.

AMERICAN DESK TELEPHONE complete with handset. Non-dial type, but has internal bell. Ideal for extension or inter-com. BRAND NEW. ONLY **£0/-**. (Post 4/-).

ACOS 39/1 STICK MIKE with screened lead and table stand. ONLY **£8/6**. (Post 1/6).

80,000 OHMS PER VOLT MODEL TP-58 (Illustrated). Reads voltages 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 500 mA; Resistance to 10 Megs. Capacitance to 0.1µF; Decibels from -30 to +36. Size 3 1/2 x 5 1/2 x 1 1/2 in. **£5.19.6.**

2000 OHMS PER VOLT MODEL TP-10. Reads A.C. and D.C. volts up to 1,000; D.C. current to 500 mA; Resistance to 1 Meg.; Capacitance to 1µF; Decibels from -20 to +36; Output Jack for Audio measurements. Size 3 1/2 x 5 x 1 1/2 in. **£3.19.6.**

80,000 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 60 Megs; Decibels from -20 to +56. Sizes 3 1/8 x 5 1/8 x 2 1/8 in. **£8.19.6.**

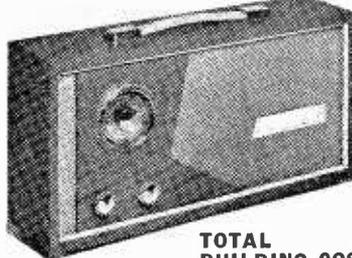
LAVOIE UHF WAVEMETER MODEL 106. Coverage 375/725 Mc/s. Complete with correct Calibration Chart. First-class condition. Battery operated and portable. Size 11 x 8 x 7 1/2 in. ONLY **£2.19.6** (carriage 7/6).

HRO SENIOR TABLE MODEL RECEIVERS. Complete with 9 coils sets covering 50 Kcs to 30 Mc/s. Used, very good condition, aerial tested. A few late Model 5T with I.O. valves, **£22.10.0** (carriage 30/-).

DOUBLE BEAM OSCILLOSCOPE TUBES. Another purchase of Type CV 1596, equivalent to Cosor 09D as used in Oscilloscopes by Cosor (389 series) and Hartley & Erdine (13 series). Listed **£12.** Brand new in maker's crates, **25/-** (carr. 5/-).

CRYSTAL DESK MIKE with screened lead and built-in stand. ONLY **15/-**. (Post 1/6).

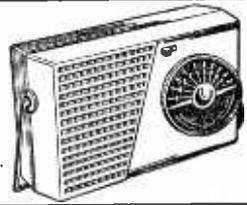
P.W. "CELESTE 7" RECEIVER



Build this latest P.W. seven transistor portable, as described in June and July issues. Medium and Long waves, with output of 1 watt from large 7 x 4 in. loud-speaker. Internal high gain aerial with car aerial socket. All components sold separately—parts list S.A.E.

TOTAL BUILDING COST £9.19.6

"POCKET 4" TRANSISTOR RECEIVER



Uses miniature speaker, proper tuning condenser, and volume control. Built-in aerial makes unit efficient and portable. Ideal for the beginner. Full medium wave coverage. All components and case for only **42/6** (P. & P. 2/6). Ten-piece constructional book free with parts or separately **1/6**. S.A.E. for parts price list.

"Practical Wireless" 6 transistor Personal Receiver. 2 band printed circuit, etc. Building cost **£7.19.6**. "Pocket 4" Transistor Personal. Ideal for beginner. Building cost **42/6**. All components sold separately, price lists for either of above S.A.E.

MINIATURE MOTORS. Ideal for models. Operates on 3-6 volts D.C. Size 1 1/2 x 1 x 1 1/2 in. plus 3 in. spindle. BRAND NEW, 5/- or 5 for 25/-; 20/- CONSTRUCTOR'S PANEL. Assorted colours wiring wire, solder, resistors, condensers, volume controls, tag panel. ALL NEW (Post 2/6). RESISTORS. 100 assorted values our choice. NEW 10/-; CONDENSERS. 100 assorted mica and silver mica. NEW 12/6.

HARRIS ELECTRONICS (LONDON) LTD.

138 GRAY'S INN ROAD, LONDON, W.C.1 Telephone TR6minurs 7937 Please include carriage costs on ALL items. Open until 1 p.m. Saturdays. We are 2 mins from High Holborn (Chancery Lane Sta) and 6 mins bus from King's Cross

FOR COMMUNICATION RECEIVERS

Manufactured by Pye and Philips. One of the Army's most versatile and sensitive sets. RF stage and 2 of IF using 6 British I.O. type valves. Large 180 degrees Illuminated and Calibrated Dial. Flywheel tuning with locking device. Aerial trimmer. Tone- and volume controls. Band switch from panel jacks for speaker or phones. In black metal case, size 17" L x 8" H x 10" D. Model PCRE covers 6-22 Mc/s, 200-550 metres, and 860-2000 metres, **£5.19.6**. Model PCRS. As PCR2 but has 2 Short Wave Bands, 2.0-7.0 Mc/s and 17.0-23.0 Mc/s and Medium Wave Band 190-350 metres, ONLY **£8.8.0**. Every receiver aerial tested before despatch. Add 10/6 carr. Both types used, but excellent condition. Designed to operate from bulky external power supply, but any set can be fitted with BRAND NEW COMPONENTS INTERNAL PACK for 200/250 v. A.C. at extra cost of **£2.** S.A.E. for illustrated leaflet.

NEW VALVES!

Guaranteed Set Tested
1R5, 1S5, 1T4, 354, 3V4, DAF91, DF91, DK91, DL22, DL26, SET of 4, DAF96, DF96, DK96, DL96, SET of 4, 24/-

OA2	4/6	DL33	7/3	PCF80	5/6
1D5	6/9	DL35	6/6	PCF82	6/6
1R5	4/6	DL92	4/9	PCL82	7/-
1S5	4/6	DL94	5/6	PCL83	3/6
1T4	2/6	DL96	6/-	PCL84	4/9
354	4/9	EY81	7/-	PF36	8/6
3V4	5/6	EBC41	7/-	PL81	7/3
5U4G	4/3	EBF80	7/-	PL82	5/6
5Y3GT	4/3	EBL21	9/-	PL83	5/3
5Z4G	7/-	ECC40	7/6	PL84	6/6
6K8G	3/9	ECC81	3/9	PY31	6/6
6X5GT	5/6	ECC85	7/-	PY32	8/9
6Q7G	4/6	ECC83	4/6	PY80	6/6
8V8G	3/9	EY84	6/-	PY81	5/6
6X5GT	5/6	ECC85	7/-	PY82	5/3
12K7GT	3/11	ECC80	6/3	PY83	6/3
12K8GT	5/6	ECC82	7/6	U25	8/9
12Q7GT	3/11	ECH42	7/9	U28	7/6
12SN7GT	5/6	ECL80	6/-	UACB80	5/6
15L5GT	7/6	EFL41	6/9	UAF42	7/6
35Z4GT	4/9	EF80	4/-	UBC41	6/6
85A2	6/6	EF85	4/9	UBF80	7/6
AC/PT	19/6	EF88	6/3	UC885	6/6
A231	6/9	EF89	4/3	UC842	7/3
CL33	3/9	EF91	2/9	UCH81	7/3
DAK32	8/6	EL41	7/6	UC882	8/6
DAF91	8/6	EL84	5/6	UCL83	9/6
DAF96	6/-	EY51	6/-	UF41	6/9
DF31	8/6	EY86	6/-	UF89	6/6
DF91	2/9	EZ40	5/9	UL41	7/6
DF96	6/6	EZ30	4/6	UL84	6/3
DH77	4/6	EZ81	4/3	UL84	6/3
DK32	8/9	KTW61	5/-	U08	12/6
DK91	4/6	MU14	5/-	UY21	9/-
DK92	6/9	PC94	5/9	UY41	5/-
DK96	6/6	PCC39	7/6	UY85	4/3

Postage 6d. per valve extra. Any Parcel Insured Against Damage in Transit 6d. extra Any C.O.D. Parcel 4/3 extra. Office address, no callers.

GERALD BERNARD

83 OSBALDESTON ROAD, STAKE NEWINGTON, LONDON, N.16

THE AMATEUR RADIO HANDBOOK

by R.S.G.B., 3rd edition, 34/-, postage 2/6. Transistor T.V. Receivers, by Towers, 55/-, Postage 2/6. Short Wave Receivers for the Beginner, new edition by Baldwin, 6/-, Postage 6d. Radio Amateur Operators Handbook, new edition, by Data, 4/6. Postage 6d. Electronics Pocket Book, by Hawker, 21/-, Postage 1/-. Tested Short Wave Receiver Circuits using Micro Alloy Transistors, 5/-, Postage 6d. How to Listen to The World 1963/4, by Johansen, 14/6. Postage 1/-. Understanding Amateur Radio, by A.R.R.L., 19/-, Postage 1/-. Special offer of Micro Alloy Transistors etc. Send for List.

UNIVERSAL BOOK CO.

12 Little Newport Street, London, W.C.2 (adjoining Lisle Street)

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, 48/9; Wall mounting 1+3, 56/3; 1+5, 63/9; Chimney 1+3, 63/9; 1+5, 71/3.

F.M. (BAND 2). Loft S/D, 12/6; "H", 30/-; 3 Element, 52/6. External units available. Coax cable 8d. yd. Coax plugs 3/3. C.W.O. or C.O.D. P.P. 3/-. Send 6d. stamps for illustrated lists. Band IV 625 line Aerials also available.

K.V.A. ELECTRONICS (Dept. P.W.) 3B Godstone Road, Kenley, Surrey. CRO 2527

2 METRES 4

The thrills of VHF Amateur Radio can now be yours for as low as 39/6, complete kit, by post 2/6 extra. Tunable range 70-150 Mc/s. Write today for interesting literature, s.a.e. please. If a newcomer to Short Wave Radio, ask for free copy of world-famous "Globe-King" Short Wave Kits and other receivers. Stamp for post please, not s.a.e.

JOHNSONS (Radio) St. Martins Gate, Worcester

Noughts and Crosses Machine Full circuit and instructions for our fabulous design, 3/6. Cannot be beaten! 18,000 o.d.v. Multimeter Kit. Now only 65/-; Stamp brings full circuit etc. Weston 0-50 Microamp Meter with multimeter scale, as used in above, 32/6, post 1/6. 1% High Stab Resistors, 1W, 2/-; Good stocks all standard values, and many special multimeter values. List on request. 1W, 1% 100Ω, 1K, 10K, 100K, 1/6 each; 1W, 2% 100Ω, 1M, 1/- each. TX Chassis. Small batt., 6 valve, 65 parts inc. mike tran., 1.5p valves, 2/6, post 1/9. Assorted Surplus High Stab Res. 1%, 3/-; 2%, 2/-; 5% 1/3 dozen, post 1/-. List of available values on request. Precision Wirewound Resistors, 1W, 1 to 5K, 1%, 3/-; to 20K, 1%, 4/3, 1%, add 3d. Your value wound to order. Shunt Resistors. Wound to order. 2W Resistors, type RMA1, 250 assorted for 12/6, post paid.

PLANET INSTRUMENT CO., 25, Dominion Ave., Leeds 7

TEST GEAR techniques

PART 9 OUTPUT METERS AND THE G.D.O.

H. W. Hellyer

IT was the intention, at the outset of this series, to devote the final article to a fleeting review of the rarely used instruments that augment such test gear as has already been described. In particular, the output meter requires brief discussion. The various forms of bridge, Q-meters, transistor testers and waveform oscillators and the handy but little-used G.D.O. were covered in my original synopsis.

But the Editor has pointed out that many of these instruments have been discussed in these pages, and in *Practical Television*, either in constructional articles or during the course of description of more elaborate gear. For example, the Grid-Dip Meter is covered to some extent in an article by A. W. Hartley, in *Practical Television* for August 1963; F. G. Rayer's article on "Amateur Band Frequency Checking" in the September issue of this magazine brings in some valuable information on Absorption meters and Crystal Calibrators; articles by J. H. B. Gould, currently appearing, deal with adjuncts to the oscilloscope, timebases, a.c. amplifiers, square wave generator, etc., as have also the previous series on oscilloscope design by M. L. Michaelis in both magazines, and some handy practical notes on these can also be referred to in *Practical Television*, January 1961, "Oscilloscope Faults", by W. Cleland, as well as in the more recent constructional series "The Henlow Wide-Band Oscilloscope", by D. R. Bowman, (*Practical Television*, June-October 1963).

In the April issue of this magazine, R. P. Hubbard described "A Cathode Ray Level Indicator", with application as visual signal tracer, a.c. bridge null indicator and G.D.O. absorption indicator. The May issue brought us a "Miniature Test Oscillator" by R. Leyland and a "Pocket Signal Injector" was covered in the July issue by R. W. Kneeshaw.

Regular readers will need no reminding of the many other instruments that have been dealt with in past years. My aim, in this concluding article of the series, will be to concentrate on two types of instrument only: the output meter, and the grid-dip oscillator.

Output Measurement

Too often, during alignment, the engineer or constructor "short-circuits" the approved method and uses his ear as an output monitor, instead of the vastly more accurate output meter.

Whereas the human ear is a fallible—even gullible—instrument, which reacts to changes, in intensity at different efficiency, according to the pitch and relative loudness of the sound, and varies widely between individuals, the meter can give a much more accurate assessment of power levels and their small variations. Even the simplest setup of an a.c. meter across the secondary of the audio output transformer will give us a quicker indication of sound intensity changes than we can hear for ourselves. And remember, absolute accuracy of power output is not essential for general alignment: normally, we are adjusting tuned circuits for a maximum reading, and the actual figure on the dial need only be a relative one.

In practice, the sound of a tuning note can become terribly wearisome, and it is better to disconnect the loudspeaker. When this is done it is necessary to provide a dummy load so that the output transformer "sees" the correct matching. Failure to do this will generally end with the screen grid of the output valve glowing red-hot.

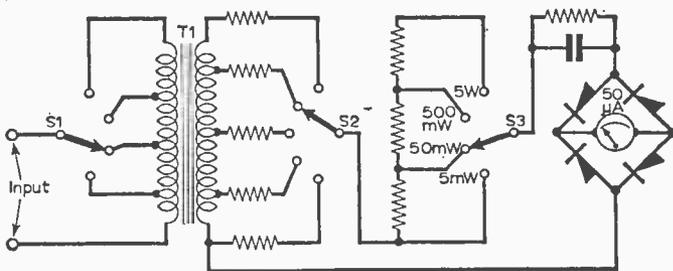


Fig. 1: Circuit of a commercial high and low output meter. S1 is the impedance multiplier, S2 the impedance selector and S3 the meter multiplier. T1 is a tapped a.f. transformer.

Although the meter across the secondary may be thought to be sufficient load in itself, it is nevertheless good practice to shunt a resistor of the appropriate value across the secondary, taking off the a.c. voltage variation with the meter. It should be remembered, too, that output meters usually have variable impedance tapplings, and many are suitable for connection to the primary of the output transformer (via a d.c. blocking capacitor, say 0.1 μ F). The circuit of a typical meter of this style is shown in Fig. 1.

A tapped transformer is incorporated, with multiplier tapplings, augmented by wire-wound resistors, in the primary winding, and an impedance selector switch in the secondary. A meter multiplier feeds the bridge circuit, allowing the meter, which may be a 50 μ A movement, to read

off rectified d.c. as output values between 5mW and up to 5W. This type of instrument gives accurate readings for comparative measurement over a fairly wide frequency range. An example of quoted specifications: level within 1dB (\pm) from 50 to 10,000c/s.

The Decibel

Having mentioned decibels, it may be as well to deal briefly with their use. Several articles on the decibel have appeared in these pages and it is not intended here to waste too much space on basic theory; but as the alignment data published by manufacturers usually states output in dB, some notes may be applicable.

The decibel is a ratio, either between two powers or two voltages. It is important not to confuse the two quantities.

The power ratio is based on the fundamental sensitivity of the ear. When volume is increased, the impression relayed to the brain is proportional to the logarithm of the ratio of the energy of the sound levels. The common log of the two powers gives their relationship in Bels. The Bel is too clumsy a unit, however—the whole range of human hearing from the threshold of hearing to the threshold of pain is covered by only 13 Bels, so this device is divided by ten, becoming the decibel.

Mathematically, $N \text{ dB} = 10 \log_{10} (P_2/P_1)$, where P_1 is the input and P_2 the output power. More practically, P_1 may be the first reading, and P_2 the second reading, when an alteration in input to the amplifier is made.

For example, suppose the receiver is supplying 1W to the loudspeaker with a specified input, and this input is increased until the output is 2W. We could say the output has doubled, but it would be more accurate (to measure intermediate changes also), to specify a 3dB increase. In actual fact, the figures do not work out quite so neatly, and the increase is really 3.01dB.

Halving the power would give a 3dB decrease, or, a change of -3dB . As our meter gives a readable indication of fractions of a decibel and the smallest change in sound intensity that our ear will discern is about 1dB, depending upon the character of the sound, it becomes apparent why alignment with the aid of an output meter is preferable to judgement of power level with the ear alone. For example, a normal "quiet" listening level of 1.9W increased to 3W gives a 2dB change, readily noted on the meter scale but quite difficult to judge accurately with a single tone of say, 400 cycles, which is modulating the signal generator input.

Voltage and Current Ratios

This ratio, the decibel, is also extensively used for comparison of voltages and currents, but must not be confused with the *power* dB scale of our output meter.

For voltage comparison, it is necessary to specify the resistance across which the voltages are taken. Where the resistance is the same $N\text{dB} = 10 \log_{10} (V_2^2/V_1^2)$.

Remembering that a number squared is equivalent to its logarithm X2, we can express this as $N\text{dB} = 20 \log_{10} (V_2/V_1)$.

Where receiver sensitivity is being considered, we are concerned with this ratio, the gain of a stage being the increase of the output on the input.

Thus, we can speak of a stage having 20dB gain, meaning that the output is 20dB up, compared with the input, or a ratio of 10:1 (for an input of 0.1V, an output of 1V is obtained). Similarly, a 20dB attenuator would decrease 1V by 10 times, or to $\frac{1}{10}\text{V}$.

Other useful ratios are 10dB, actually 3.162 to 1, but near enough 3:1 for normal purposes, and 6dB, the ratio of 2:1, which is widely used in audio work and alignment.

The usefulness of the decibel comes into play when we consider the added gains of several stages. Instead of unwieldy multiplication or division sums, we simply add or subtract the dB ratios. Thus a three-stage amplifier with stage gains of 2, 3 and 10 would have an overall gain of $2 \times 3 \times 10 = 60:1$. In dBs, this becomes, $6 + 10 + 20 = 36\text{dB}$.

From the foregoing, it is obvious that to say an output is 10dB means nothing unless we relate our figure to the input. For alignment purposes, a reference output of 50mW may be used, and dB ratios are calibrated on the output meter scale above and below this reference point.

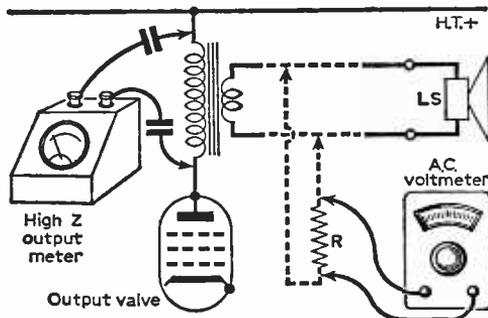


Fig. 2: Methods of connecting the output meter.

Using an A.C. Voltmeter

In practice, it is often desirable to use the output meter across the primary of the output transformer, suitably isolated, as shown in Fig. 2 in which case a direct wattage reading or dB measurement is obtained. The method used in cases where only occasional check on output has to be made is to connect a multimeter, switched to its 0–10V a.c. range across a resistor which is fitted to replace the loudspeaker, or simply across the transformer secondary, leaving the loudspeaker in circuit. The resistor should be equivalent to the impedance of the transformer secondary and preferably wire-wound, to handle the wattage. To calculate this wattage, divide the square of the measured a.c. voltage by the resistance of the output, thus $W = V^2/R$. For example, an indication of 3V across a 2.5Ω load represents a power output of 3.6W.

Transistorised Equipment

Alignment of transistorised equipment sometimes needs a different approach. Output circuits have been developed which employ no output transformer. To disconnect the loudspeaker of such a circuit is impractical, and the meter should be connected across the loudspeaker speech coil as shown in Fig. 3(a) and (b). A 50Ω speech coil

ANOTHER TAPE RECORDER BARGAIN

Mfrs. end of production Surplus Offer



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 B.S.R. Twin Track Monardeck Type TD2.

Valve line up EF86, ECL82, EM84, EZ280 and Silicon Diode.

- 2 tone Cabinet and 8" x 8" Speaker. **£3.10.0** +5/- Carr
 - Wired Amplifier complete with 4 Valves, Size 14" x 10 1/2" x 7 1/2". **£5.12.6** +3/6 Carr.
 - B.S.R. Monardeck Type T.D.2 Accessories—Mike, Tape, Screened Lead, Plugs, etc. **£7.7.0** +4/6 Carr.
 - COMPLETE KIT** comprising items above **£1.0.0** +2/- Carr.
 - 15 gns.** +10/- Carr.
- Leaflet, circuits, instructions, 2/- post free.

NEW BRITISH RECORDING TAPE

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

Standard (PVC base)	Long Play (PVC base)	D'ble Play (Mylar base)
3in. 150ft. 3/3	900ft. 4/3	300ft. 8/6
3in. 600ft. 11/6	900ft. 15/-	1200ft. 25/-
5 1/2in. 850ft. 14/8	1200ft. 17/8	1800ft. 32/8
7in. 1200ft. 17/8	1800ft. 22/8	2400ft. 42/8

Post and Packing—5in. Reels, 6d. Each additional Reel, 3d. 7in. Reels 1/- Each additional Reel, 6d.

EMPTY TAPE REELS (Plastic): 3in. 1/3, 5in. 2/-, 5 1/2in. 2/-, 7in. 2/3. PLASTIC REEL CONTAINERS (Cases): 5in. 2/1, 6in. 2/1, 7in. 2/3.

Condensers—Silver Mica. All values 2pF to 1,000pF, 6d. each. Ditto, Ceramics 9d. Tub. 450V T.C.C. etc. 0.001 mFd to 0.01 and 0.1/350V. 9d. 0.02-0.1/500V. 1/-, 0.25 Hunte 1/8, 0.5 T.C.C. 1/8 etc. etc. Close Tol. S/Micas—10% 500pF, 8d. 600-5,000pF, 1/-, 1% 2pF-100pF, 9d. 100pF-500pF, 11d. 678pF, 3,000pF, 1/8. Resistors—Full Range 10 ohms-10 meg. ohms 50% 1/4 and 1W, 3d. 1W, 5d. (Midget type modern rating) 1W, 6d., 2W, 9d. Hi-Stab. 5% 1W, 1/6. 6d. (100 ohms-1 meg). Other values 9d. 1% 1W, 1/6.

TUB-ELECTRICALS—CAN 25/25v. 50/118v. 119; 8+8+450v. 4/8; 50/50v. 100/25v. 2/-; 32+32/275v. 4/8; 8/450v. 4/350v. 2/3; 50/50/350v. 6/8; 16+18/450v. 5/8; 60/250/875v. 12/8; 32+32/450v. 6/8; 100+200/875v. 12/8

Volume Controls—5K-2 Meg. ohms. 3in. Spindles. Morganite Midget Type 1 1/2in. diam. Gram. 1 year. 1.0G or LIN ratios less 5v. 3/-. 1.1P, Sw. 4/8. Twin Stereo less 8v. 6/8. DP, Sw. 8/-. Specials to order.

JASON FM TUNER UNITS. Designer-approved kits of parts. PMT1, 5 gns. 4 valves, 20/-; FM2, 27. 5 valves, 37/8. JTV MERCURY 10 gns. JTV2 218.18. 4 valves, 32/8. NEW JASON FM HANDBOOK, 2/8. 48 hr. Alignment Service, 7/8. P. & P. 2/8.

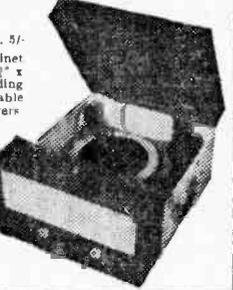
TRIMMERS. Ceramic (Compression Type)—30pF, 50pF, 70pF, 9d.; 100pF, 150pF, 1/3; 200pF, 1/8; 600pF, 1/8. PHILIPS. Bee Hive Type (conc. air spaced)—2.5pF, 1/-; 3-30pF, 1/-. KNOBS—Modern Continental types: Brown or Ivory with Gold Ring, 1 1/2 dia., 9d. each; 1 1/2, 1/- each; Brown or Ivory with Gold Centre, 1 1/2 dia., 10d. each; 1 1/2, 1/3 each. LARGE SELECTION AVAILABLE. METAL RECTIFIERS—STC Types—RM1, 4/8; RM2, 5/8; RM3, 7/8; RM4, 18/-; RM5, 21/-; RM4B, 17/8.

BARGAIN CORNER Brand New Mfrs. 1st grade—1 OC44 & 2 OC45, 15/6, 1 OC18D & 2 OC81, 15/8. All above and OAR1, 32/8. Post free. 4 Meg. VOL Controls D.P. Sw. 1/- fatted spindles. Famous Mfrs. 4 for 10/- post free.

RECORD PLAYER CABINETS 59/6 Carr. & Ins. 5/-

Contemporary style, rexine covered cabinet in two-tone maroon and cream. Size 15 1/2" x 14 1/2" x 8 1/2". Fitted with all accessories including baffle board and Vinyla! free. Space available for all modern amplifiers and auto-changers etc. Uncut record player mounting board 14" x 13" supplied.

2-VALVE 2 WATT AMPLIFIER. EZ80 and Twin Stage ECL82 with vol. and neg. feedback tone control. A.C. 200/250V with knobs, etc., ready wired to fit above cabinet. £2.17.6. P. & P. 1/6. 7" x 4" Speaker and trans., 22/-, P. & P. 2/-.



COMPLETE R/PLAYER KIT AS 111. inc. BSR UA 10 Special Lew Bargain Price Now Only £11.10.0. 7/6 carr.

COAX 80 OHM CABLE High grade low loss Cellular air spaced Polythene—1in. diameter. Stranded cond. Famous mfrs. Now only 6d. per yard. Bargain Prices—Special Lengths—20 yd. 9/-. P. & P. 1/6. 40 yd. 17/8. P. & P. 2/-. 80 yd. 25/-. P. & P. 3/-. Coax Plugs 1/-. Sockets 1/-. Couplers 1/8. Outlet Boxes 4/8.



Est. 1949

MULLARD "3-3" HI-FI AMP-LIFIER. 3 VALVES 3 WATT



3 ohm and 15 ohm Output. A really first-class Amplifier giving Hi-Fi Quality at a reasonable cost. Mullard's latest circuit. Valve line up: EF86, EL84, EZ81. Extra HT and LT available for Tuner Unit addition. This is the ideal companion Amplifier for FM tuner units.

TECHNICAL SPECIFICATION—Freq. Response: + or - 1 dB 40 c/s-25 Kcs. Tone controls: Max. Treble Cut 14 dB. at 80 c/s. Sensitivity: 100 Mv. Distortion: Hum and Noise Level: At least 70 dB. below 3w.

12 dB. at 10 Kcs. Max. Bass Boost 14 dB. for 3w. output. Output Power (at 400 c/s): 3w. at 1% total harmonic distortion. Hum and Noise Level: At least 70 dB. below 3w.

COMPLETE KIT (incl. valves, all components wiring diagram and special quality sectional Output Trans.), ONLY £6.19.6. Carr. 4/8. Complete wired and tested, 8 gns. Wired power O/P socket and additional smoothing or Tuner Unit, 10/8 extra.

Bronze Escutcheon, Printed Vol. Treble, Bass, On-Off, supplied with each kit. Recommended Speakers—WB, HF 1012, £4.7.6. Goodmans AX10M 10, £6.5.0. Sin. AXIETTE £5.5.0 or similar.

TYGAN FRET (Contem. pat.), 12 x 12in. 2/-; 12 x 18in. 3/-; 12 x 24in 4/- etc.

BONDACUST Speaker Cabinet Acoustic Wadding. 12in. wide, any length cut 1/8 ft. 1/4-yd.

EXPANDED ANODISED METAL. Attractive gilt finish 1in. x 1in. diamond mesh 4/6 sq. ft. Multiples of 6in. cut. Max. size 4ft x 3ft. 47/6 plus carr.

ENAMELLED COPPER WIRE—1lb. reels 14g-20g, 8/8; 22g-25g, 3/7; 30g-54g, 3/8; 36g-58g, 4/3; 38g-40g, 4/8, etc.

Soldering Irons. Mains 200/220V. or 230/250V. Solon 25 watts inst., 22/8. Spare Elements, 4/8. Bits, 1/-, 65 watt, 27/8 etc.

Alumin. Chassis. 18g. Plain Undrilled, folded 4 sides, 2" deep, 6" x 4", 4/8, 8" x 5/8, 10" x 7", 6/8, 12" x 6", 7/8, 12" x 8", 8/- etc.

Alumin. Sheet. 18g. 6" x 6", 1/-; 6" x 9", 1/8; 6" x 12", 2/-; 12" x 12", 4/8 etc.

JACK PLUGS. 2 1/2" Igranic type 2/8. Screened ditto 3/3, 1/3 Screened 2/-, Transistor type Min. & Sub. Min. 1/3.

JACK SOCKETS. Moulded Igranic, Type open 3/8; Ditto closed, 4/8. Fax. type open 2/8. Ditto closed 3/-. Transistor type closed Min. & Sub. Min., 1/8.

Phono Plugs 1/-. Phono Sockets (open), 1/-. Ditto Closed, 1/8. Twin Phono Sockets (open), 1/8.

TRANSISTOR COMPONENTS

Midget I.F.'s.—465 Kcs 1/2in. diam. 5/6
Osc. coil M. & L.W. 5/8
Midget Driver Trans. 3.5: 1 6/8
Midget Output Trans. Push-Pull—3 ohms— 6/8

Elect. Condensers—Midget Type 1 mfd.-50 mfd. ea. 1/9, 100 mfd. 2/-, 12V.

Condensers 150 v. working: .01 mfd., 0.02 mfd., .03 mfd., .04 mfd. 9d.; .05 mfd., 1 mfd., 1 1/2, .25 mfd., 1/3; .5 mfd., 1/8, etc.

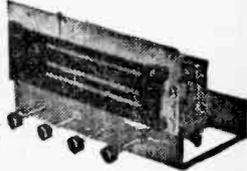
Midget Tuning Condensers. J.B. 220pf. and 105pf. conc. slow motion 10/8. 365 pf. single 7/8. Sub. Min. 4in. Dia. Min. 100 pf., 300 pf., 500pf., 7/- each.

FERRITE AERIALS. M. & L.W. car aerial coil 9/3.

Midget Vol. Control with edge control knob, 5 K/ohms with switch 4/8. Ditto less switch 3/8. Speakers: P.M.: 2in. Pleashey 75 ohms 15/8. 2 1/2in. Continental 8 ohms, 13/8. 7 x 4in. Pleashey 50 ohms, 23/8. Ear Plug Phones—Min. Componential type 3ft. lead, Jack plug and socket. High Imp., 8/-; Low Imp. 7/8.

7 VALVE AM/FM RADIOGRAM CHASSIS

Valve line-up ECC85, ECH81, EF89, EA890, EL84, EM81, EZ80. Three Waveband and Switched Gram positions. Med. 200-650 m. Long 1,000-2,000 m. VHF/FM 88-95 Mc/s Philips Continental Tuning insert with permeability tuning FM and combined AM/FM I.F. transformers. 460 Kcs. and 107 Mc/s. Dual core tuning all coils. Latest circuitry including AVC and Neg. Feedback. Three watt output. Sensitivity and reproduction of a very high standard. Chassis size 13 1/2 x 6 1/2 in. Height 7 1/2 in. Edge illuminated glass dial 1 1/2 x 3 1/2 in. Vertical pointer. Horizontal station names. Gold on brown background. A.C. 200/250 v. operation. Magic-eye tuning.



Aligned and tested ready for use **£13.10.0** Carr. & Ins. 7/6. Complete with 4 Knobs—walnut or ivory to choice. Indoor FM aerial 8/8 extra 3 ohm P.M. Speaker only 8/8. Recommended Quality Speakers 10in. Elec H/D 30/-, 15in. x 8in. E.M.I. "Fidelity" 36/-, 12in. B.A. with cone. Tweeter, 52/8. Carr. 2/6.

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

RADIO COMPONENT SPECIALISTS

70 Brixton Rd., Thornton Heath, Surrey. Hours: 9 a.m.-6 p.m., 1 p.m. Wed. THO 2188. Terms C.W.O. or C.O.D. Post and Packing up to 4lb. 9d.; 1lb., 1/3; 3lb., 2/3; 5lb., 2/9; 8lb., 3/6.

TERRIFIC VOLUME !!

WITH THE

P.W. 6-TRANSISTOR

Medium and Long Wave Pocket Superhet
THE CONTINUED POPULARITY OF THIS FAMOUS SET IS PROOF OF ITS VERY HIGH QUALITY AND FINE PERFORMANCE

- 700 mW Push-Pull Output on 2 $\frac{1}{2}$ in. P.M. Speaker.
- Printed Circuit.
- Guaranteed first grade Miniature Components.
- High Φ Internal Ferrite Rod Aerial.



BUILDING PLANS 2/- (Free with Kit) **£7.19.6** P.P. 2/- Complete.

The 'NORPAK'

MAINS POWER PACK KIT FOR TRANSISTOR RADIOS

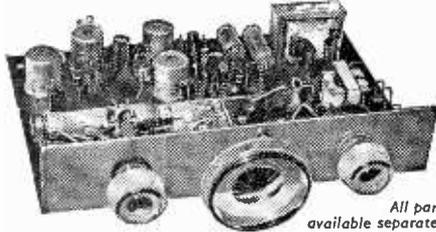
Boosts and greatly extends life of old batteries. In attractive two-tone plastic case. Assembled in an hour. Miniature Size 4 x 2 x 1 $\frac{1}{2}$ in. Normal output 9 v. 100 mA. Full Mains Transformer. Full wave germanium diodes. Cartridge fuse.

Complete Kit with Plans

Runs Radio direct from mains. **35/-** Plus 1/6 P.P. (Ready assembled 45/-).

"NOMAD"

SEVEN TRANSISTOR TWO WAVEBAND BRAND NEW DESIGN FOR CAR RADIO AND GENERAL PURPOSE GIVING ONE WATT OUTPUT WHEN CONNECTED TO ANY STANDARD 3 ohm SPEAKER



All parts available separately

Size: 7 x 5 x 1 $\frac{1}{2}$ in. Building Plans 2/6 (Free with kit).

This versatile unit has been designed to fit into a variety of cases and all components, down to control knobs and battery clips, are supplied together with clear illustrated plans. It gives a superb performance with dozens of stations including Luxembourg when connected to a 9 volt battery and speaker.

ONLY **£6.19.6** COMPLETE P.P. 2/-.

TIMBER (LEATHERETTE) RADIO CABINETS

Attractive Grey with gilt grill, Ivory trim and carrying handle. (14 x 7 x 4 inches). **BARGAIN AT 30/-** Knobs 3/9.

NORCOL LTD. 147 LONDON ROAD, YORKTOWN, CAMBERLEY, SURREY

Phone: CAMBERLEY 3743

VALVES SAME DAY SERVICE

NEW! TESTED! GUARANTEED!

SETS 1R5, 1S5, 1T4, 3S4, 3V4, DAF91, DF91, DK91, DL92, DL94 .. Set of 4 for 17/-
DAF96, DF96, DK96, DL96 4 for 25/6

1A7GT 9/-	6SN7GT 4/9	CL33 9/6	ECH81 6/9	PC97 8/6	U50 4/8
1D5 7/6	6U4GT 9/9	CY1 12/6	ECL80 6/3	PCC84 6/3	U52 4/3
1H5GT 8/6	6V6G 3/11	CY31 5/9	ECL82 7/9	PCC85 7/6	U78 4/-
1N5GT 8/9	6V8GT 6/6	DAC32 8/6	ECL86 9/-	PCC89 8/-	U191 11/-
1R5 5/-	6X4 4/-	DAF91 4/-	EF37A 5/6	PCF80 5/9	U281 6/6
1S5 4/-	6X5GT 6/9	DAF96 6/6	EF38 3/9	PCF82 5/6	U282 14/8
314 3/-	6/30L2 8/6	DCC90 6/9	EF40 11/-	PCF84 11/9	U291 9/-
3A5 6/9	7B7 8/-	DF33 8/9	EF41 7/3	PCF86 3/3	U301 12/6
3C4 5/9	7C5 7/9	DF91 3/-	EF42 5/9	PCL82 7/6	U801 18/-
3S4 5/-	7C6 7/6	DF96 6/6	EF80 4/3	PCL83 9/-	UABC80 5/9
3V4 5/9	7H7 5/9	DH76 4/3	EF86 5/-	PCL84 5/-	UAP42 8/-
6U4G 4/6	7S7 9/-	DH77 4/9	EF89 4/6	PCL85 8/6	UBF41 6/11
5Y3GT 5/-	7Y4 6/-	DK32 9/-	EF91 3/3	PENADD 19/6	UBF80 7/9
5Z4G 8/9	10C1 9/6	DK91 5/-	EF92 2/6	PENAA 11/6	UBF89 7/3
6A8G 6/9	10C2 13/-	DK92 6/9	EF95 8/6	PEN95C 8/-	UBL21 13/8
6AL5 2/-	10L1 10/9	EK96 7/-	EL184 8/9	PL36 8/9	UC92 7/6
6AX8 3/3	12A7E 4/9	DL33 7/3	EL33 7/6	PL38 17/-	UCC84 9/9
6AQ5 6/-	12A7T 4/3	DL35 6/9	EL41 7/9	PL81 7/6	UCC85 6/9
6AT6 4/9	12AU7 4/9	DL92 5/-	EL42 8/6	PL82 5/6	UCF80 10/3
6BA6 5/3	12AX7 4/9	DL94 5/9	EL84 5/6	PL83 5/6	UCH42 7/6
6BE6 5/3	12KXGT 4/3	DL96 6/6	EM34 7/3	PL84 6/9	UCI81 8/9
6BC6G 13/6	12SGT 8/9	EABC80 6/-	EM80 6/9	PX4 9/-	UCL82 8/9
6BH6 5/9	12Q7GT 4/3	EAF42 8/-	EM81 7/9	PX25 8/6	UCL83 10/3
6BJ6 5/6	12Z3 8/6	EB91 2/-	EM84 8/3	PY32 9/-	UF41 7/3
6CD6G 26/6	19HG6G 13/6	EBC33 5/-	EM85 9/3	PY33 10/-	UF89 6/3
6E1 9/6	20L1 15/-	EB41 7/3	EM87 9/6	PY80 5/9	UL41 10/8
6E13 9/6	20P4 14/9	EBF80 7/3	EY51 6/-	PY81 5/9	UL46 9/6
6F14 9/6	20P5 14/9	EBF89 6/9	EY86 6/-	PY82 5/6	UL84 6/3
6F23 9/6	25L6GT 6/-	EEL21 9/3	EZ40 6/-	PY83 6/6	UY7 3/6
6K7G 1/6	25U4GT 10/6	ECC40 7/6	EZ41 7/6	PY86 9/9	UY21 11/-
6K7GT 4/3	30L15 10/3	ECC81 4/3	EZ80 4/6	TH12 12/6	UY41 5/6
6K8G 4/3	30P11 10/9	ECC82 4/9	EZ81 4/6	TH23 11/6	UY85 4/9
6K8GT 7/9	30PL13 10/6	ECC83 7/-	KT32 5/6	TH33 11/3	VP4B 9/6
6L6G 5/9	35A5 14/-	ECC84 6/3	KT36 14/-	TY86F 16/3	VP41 4/-
6LD20 5/6	35L6GT 7/9	ECC85 7/3	KT61 7/6	U22 6/-	W76 4/6
6P25 7/9	35Z4GT 4/11	ECC80 7/-	MU14 5/-	U25 9/-	W77 2/6
6P28 8/6	AZ1 7/6	ECF80 7/9	N18 7/-	U26 8/-	W79 14/8
6Q7G 4/9	AZ31 7/6	ECH35 8/6	N37 10/-	U37 7/9	Z77 3/3
6Q7GT 7/9	B36 5/11	ECH42 8/3	PC85 9/-	U47 9/9	
6SL7GT 5/9					

FIRST-CLASS RADIO AND T/V COURSES...

GET A CERTIFICATE!

After brief, intensely interesting study—undertaken at home in your spare time—YOU can secure a recognised qualification or extend your knowledge of Radio and T.V. Let us show you how.

FREE GUIDE

The New Free Guide contains 120 pages of information of the greatest importance to both the amateur and the man employed in the radio industry. Chambers College provides first rate postal courses for Radio Amateurs' Exam., R.T.E.B. Servicing Cert., C. & C. Telecoms., Grad. Brit. I.R.E. Guide also gives details of range of diploma courses in Radio/T.V. Servicing, Electronics and other branches of engineering, together with particulars of our remarkable Guarantee of

EFFORT OR NO FEE

Write now for your copy of this invaluable publication. It may well prove to be the turning point in your career.

FOUNDED 1885—OVER 150,000 SUCCESSSES

CHAMBERS COLLEGE
(Incorp. National Inst. of Engineering)
(Dept. 461), 148 HOLBORN
LONDON, E.C.1

READERS RADIO

24 COLBERG PLACE, STAMFORD HILL
LONDON N.16 STA. 4587

Post 6d. per valve extra.
Any Parcel Insured Against Damage in Transit 6d. extra.
Any C.O.D. Parcel 4/3 extra.

needs the meter switched to its 5—10V a.c. range, and a 5Ω loudspeaker requires a range of 1—2V a.c. for the most accurate readings.

An alternative method is to insert a d.c. milliammeter in the battery lead, as shown. The quiescent current of the average set would be between 7 and 10mA, and the current at average listening level from 15 to 25mA. This depends upon the receiver, and reference should be made to maker's specifications when in any doubt.

Grid-Dip Oscillator

This instrument does not receive much use in the radio service department, for the obvious reason that it is quicker to replace a coil than to rewind it, and easier to trust the manufacturer's design of tuned circuits than to modify them in the course of repair. But the amateur is in the happier position of having plenty of time to experiment—and it is worth remembering that in the history of radio, it is his experiments that have brought about the majority of advances. Whereas

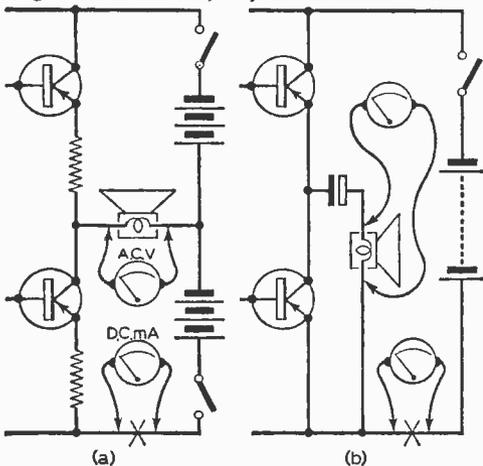


Fig. 3: Alternative methods of transistor output stage measurement.

the position may have changed in the field of television and advanced electronics, where experiment is an expensive business (although not entirely closed, as a survey of our companion magazine, *Practical Television*, will show) there is still plenty of original work going on in the audio field.

From the foregoing remarks it may be thought that the G.D.O. is very much a home-constructed instrument. In fact, there are several quite elaborate pieces of test gear on the market. Typical of the general-purpose design is the Q-Max GD02. This retailed (in 1960) at 15 guineas, with extra coils at 7s. 6d., and covered a frequency range of 1.5 to 300Mc/s with eight plug-in coils. The circuit was built around a double-triode valve, one half as a Colpitts oscillator, the other as h.t. rectifier. The tuning capacitor is driven by a 5:1 slow motion drive, with hair-line cursor, direct calibration and a logging scale. It is mains powered and can be used as resonant frequency tester, in the normal way, as absorption wavemeter, phone monitor (a jack is provided), oscillating detector and simple signal generator.

Another popular model, covering a 1.7 to 250Mc/s range, in six steps, is the Grundig 701. A four-position switch changes the function of the instrument to (a) a receiver supplying an a.f. signal to a pair of phones; (b) a wavemeter; (c) standard grid-dip oscillator; and (d) modulated signal generator.

Reference to the August 1963 issue of *Practical Television* will show how readily the G.D.O. design can be made up into a practical unit. A. W. Hartley has given explicit constructional details, and it is not my purpose to repeat his information. The following notes on basic design and applications should prove that the G.D.O. is a useful and comprehensive instrument.

Design Details

Whereas the Colpitts oscillator is considered more suitable for a wide frequency range, the alternative simple circuit, as shown in Fig. 4(a), employs a Hartley oscillator and may be more readily constructed from the spares box.

This circuit is deceptively simple. The valve used in the prototype was a 955, but other convenient triodes could be employed. The one component that requires special selection is the capacitor C1, which is a 5pF air-spaced variable with an insulated shaft. C2 and C3 are ceramic capacitors, 50pF and 25pF respectively, R1 is 18kΩ, and L is four turns of 16s.w.g. silvered wire on a ½in. low-loss former. Spacing and spreading the coil turns gave a coverage of 150—200Mc/s with a quite good indication of resonance on the 500μA meter movement.

Fig. 4(b) shows a little more complicated design that had to be developed to widen the range from 130—270Mc/s. C1 was a 35—35pF split stator, C2 and C3 are both 50pF ceramic, and the decoupling capacitors, C4, C5 and C6 are all 1,000pF ceramics. R1 is 22kΩ and R2 is 68kΩ. The coil is simply 1½in. of silvered 14s.w.g. bent into a ½in. U-shaped loop.

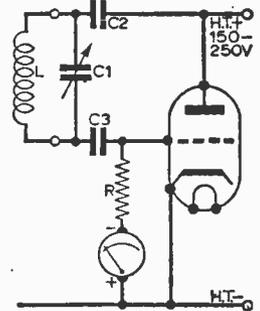
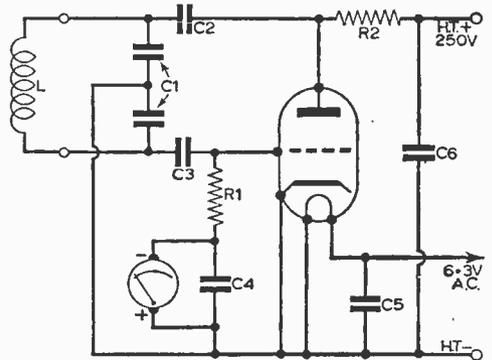


Fig. 4a (right): Hartley and b (below) Colpitts oscillators used as basis of G.D.O.'s.



Calibrating the G.D.O.

Calibration can be carried out in several ways. For high frequencies it is necessary to make up Lecher wire transmission line, which can be two parallel wires of 18s.w.g., insulated at each end from their supports and spaced 2in. apart, fixed as taut as possible.

A single turn loop is soldered across one end of the pair of wires for coupling to the G.D.O. and a knife-edge metal shorting bar placed across the two wires at right angles to alter the length. The coil of the G.D.O. is held close to the loop of the Lecher wires and the shorting bar slid along until a position is found where the grid current reading on the meter dips. The bar is moved along again until another dip is noted. The distance between the two dips is half a wavelength, and the G.D.O. resonant frequency is calculated from the formula

$$f \text{ (in Mc/s)} = \frac{150}{\text{distance}} \text{ in metres, or} \\ \frac{5905}{\text{distance in inches.}}$$

This method is suitable for laboratory work but as length of 40ft or more may be needed, is not practical for the amateur, who may prefer matching the G.D.O. resonant frequency to a known standard from a signal generator or received signal.

First, tune the receiver accurately to the frequency estimated. Note the tuning of known signals and scale off the difference, making allowance for discrepancies of the dial, etc. Better still, inject a known signal from a crystal oscillator or signal generator and listen for zero beat at marker frequencies. After tuning the receiver accurately, couple the G.D.O. loosely to the aerial input circuit and swing the tuning capacitor of the G.D.O. until zero beat is obtained with the marker switched off—that is, with the G.D.O. used as heterodyne frequency meter. Keep the receiver gain down and check for the position of maximum response, to avoid confusion with image frequencies. For further information, refer also to the method used by Mr. Hartley, page 508, August 1963 *Practical Television*.

G.D.O. Applications

The principal use of the G.D.O. is to determine the resonant frequency of a tuned circuit. This is performed as follows.

First, insert a coil covering the possible range, switch off the receiver under test, to prevent damping of the tuned circuits by the grid-cathode capacitance of valves. Couple the G.D.O. loosely to the circuit under test and tune for maximum dip. Too tight a coupling will cause the meter reading to pull and experiment will be needed. Check also

References

- Radio and Television Test Instruments, by Gordon J. King.
- Television Receiver Servicing, by E. A. W. Spreadbury.
- Radio Laboratory Handbook, by M. G. Scroggie.
- Admiralty Handbook of Wireless Telegraphy, Sect. K.
- The Practical Radio Engineer, Vol. 16, No. 3.
- Radio Retailing, Vol. XV, No. 9.

that spurious results are not obtained by unwanted coupling with adjacent circuits by short-circuiting the tuned circuits individually and noting that the wanted one should upset the G.D.O. meter reading most.

If connections are not easily reached, the tip of a pencil touched on the "live" circuit connections will give quite observable results. If the circuit under test is completely screened, it may be desirable to leave the can in place, and an auxiliary coupling can be made with a piece of p.v.c. wire, twisted around one terminal of the G.D.O. coil and the "live" terminal of the tuned circuit. The wire should be twisted around these points with only its insulation touching, not making a direct connection.

To check closely coupled circuits, such as i.f. transformers, fit a swamping resistor, about 10k Ω , across the circuit *not* under test. Check by the pencil test as stated above.

Testing r.f. chokes and capacitors is best done by short-circuiting their ends and loosely coupling the G.D.O. An open-circuit choke will give an indication of its parallel resonance, a short-circuited choke, its series resonance. Capacitors used as bypass components in r.f. and i.f. circuits may act perfectly well as capacitors but have unwanted inductive effects at the higher frequencies, and if the short-circuiting connections are approximate to the length of the connecting leads *in situ* the G.D.O. will enable us to judge at what frequencies these inductive and capacitive effects cancel, giving the optimum bypass.

To measure inductance, connect the coil across a capacitor of known value and loosely couple the G.D.O. tuning for a dip. Then the inductance in microHenries=

$$25,300$$

$$C \text{ (pF)} \times f \text{ (Mc/s)}$$

To measure capacitance requires a calibrated variable capacitor to first tune an appropriate coil to a frequency determined by the G.D.O. setting. Then the unknown capacitor is connected across the variable and again a frequency measurement taken. The difference in the two settings for resonance is equal to the value of the unknown capacitor. If a coil of known value is available, this can be used directly by connecting the unknown C across it and tuning the G.D.O. for resonance, transposing the above formula so that

$$C = 25,300$$

$$L \times f.$$

Aid to Aerial Construction

Aerial checking can be carried out by coupling the G.D.O. as for a tuned circuit, but certain precautions have to be taken. A centre-fed dipole is current-fed on its fundamental frequency and thus the coupling point is shorted out and the G.D.O. coupled by proximity, or with a single turn loop. But on its second harmonic, the aerial is voltage-fed and half sections must be checked individually with the coupling point open-circuited. A single-ended aerial, such as a radio whip-type, is fed at the low impedance point; and the feeder is removed and replaced by a single-turn loop.

Constructing a multi-element array is aided by the G.D.O. by first coupling to the dipole and tun-

—continued on page 653

CRYSTALS & COMPONENTS LTD



TEL: TEM 1189 Dept: P.W. 14 2. 4 EARLHAM STREET, W.C.2.

Near Cambridge Circus. A few minutes' walk from Leicester Square or Tottenham Court Road Underground Stations
HOURS OF BUSINESS: 9 to 6. Saturdays 9 to 1. OPEN ALL DAY THURSDAY

VIBRATOR POWER SUPPLY UNIT

6 volts D.C. input, 250 volt 100 mA A.C. output and 6 V. L.T. out. Fully smoothed, with OZ4 rectifier valve. Brand new in steel case with pilot light, on/off switch and Snydlok fuse on front panel. Measures 8 1/2 x 6 x 5 1/2in. 39/6 plus 6/6 post and packing

BARGAIN PACKS

Assorted packets of 100 brand new Resistors including miniature and high stab. 12/6 POST PAID. All useful values. Condensers, 100 assorted, including mica, ceramic, metal tubular, etc., 15/- post free. 12 Assorted Potts. All new and useful sizes 12/6, post paid. Components Package containing 3 useful size potts, 3 wafer switches, 50 assorted resistors and condensers including electrolytic and ceramics. AS NEW 15/- plus 2/- P. & P.

TYPE 68 TRANS/RECEIVER

3 to 5.2 Mc/s. Portable station with range up to 10 miles under good conditions. Complete with valves, hand mike and aerial rods, all in good condition, 70/- plus 6/6 carriage and packing. Require 150V. H.T. 3V. L.T. and 9V. G.B.

B.C. 221 FREQUENCY METERS

In perfect condition but slightly soiled exterior. Complete with calibration chart but no crystal, 27.10.0, plus 17/6 P. & P.

VIBRATORS

8V. 4 pin. 3/6 plus 1/6 post and packing.
 6V. 7 pin. 3/6 plus 1/6 post and packing.
 12V. 7 pin. 4/6 plus 1/6 post and packing.

TYPE 38 TRANS/RECEIVERS

Brand new. Operating on 7.4 to 9 Mc/s. Trans/Receivers. Complete with headphones, throat microphone, junction box and aerial rods. Operate on 150 volts HT & 3 volts LT dry batteries. Complete less batteries and not tested. 42/6 per set plus 6/6 post. Or 24 per pair plus 10/- post and packing.



VARIABLE AIR-SPACED CONDENSERS

150 pFd with 1in. spindle. 4/6 each.
 75% 76 pFd with 1in. spindle. 4/6 each.
 100 pFd with 1in. spindle. 2/6 each.
 100 pFd pre-set. 2/- each.
 50 pFd pre-set. 1/6 each.
 4 Gang H.R.O. Variable 300 pFd. 12/6 each.

MICA CAPACITOR

In cast metal and ceramic .0002 Mfd 6000V. working. 2/6 plus 1/6 P. & P. each.

TERMS OF BUSINESS
 CASH WITH ORDER. Handling charge of 1/6 on all orders under 20/- where P.P. is not otherwise stated. Postage charges indicated apply to U.K. only. C.O.D. orders min. £1.

TF.14G STANDARD SIGNAL GENERATOR

85 Kc/s to 26 Mc/s. Fully serviced and in perfect condition. 236 post paid.

WOBBULATOR FREQUENCY MULTIPLIER

Band 1. Channels 1-13, with 50 micro/ammeter and 0-80 dB attenuator. 28. P. & P. 10/-.

CRYSTALS!!!

LARGE RANGE OF 10X, 10XJ, FT243, FT241 CRYSTALS ALWAYS IN STOCK

Send stamped and addressed envelope for our free, comprehensive list.

ON VIEW IN OUR SHOP FOR CALLERS ONLY. VERY LARGE RANGE OF TEST GEAR including

Signal generators, Decade resistance boxes, Pen recording Voltmeters and thermometers, Electronic Tuning Forks, etc.

SPECIAL OFFER OF 6in. METRO-VIC FREQUENCY METERS

ALL AT ONE PRICE 25/- FOR CALLERS ONLY

including
 0/20/50 mA. 0/100 mA. 0/15 mA. 0/500 mA.
 0/30 mA. 0/800 volts D.C. 0/30 volts D.C.
 0/50 volts. 0/100 volts. 0/5 Kv. 0/500 volts, and many others. All in perfect condition (surface mounting).

E.H.T. TRANSFORMERS

E.H.T.1. Input 200/250 volts 50 C/s. Output 2kV. 10 mA 4 V. 1A. 0-2-4V. 1.5A.. 22/6. P. & P. 5/-.
 E.H.T.2. Input 200/250 volts 50 C/s. Output 2.5 kV. 10 mA. 6.3V. 3A. 2V. 1.5A. 3.5 kV. D.C. Wks., 22/6. P. & P. 5/-.
 E.H.T.4. Input 200/250 volts 50 C/s. Output 2,000V. 16 mA. 4 V. 1.5A. 0-2-4V. 2A.. 22/6. P. & P. 5/-.

WIRELESS SET NO. 19

Complete with original power supply unit for 12 volts input. Transmitter/Receiver covering 2-8 Mc/s and V.H.F. and 240 Mc/s. 6 valve superhet receiver and 6 valves in Transmitter. Using I.F. of 465 Kc/s. For voice and C.W. In good condition not tested. 24.17.6. Plus 1/- packing and carriage. Microphone and headset for this set 17/6 plus 2/6 post and packing. 19 Set Variometers, 17/6 plus 2/6 post and packing, and packing. Booklet with circuits and instructions free with set or separately 2/6 post paid.

METERS

0-1 mA Meters, moving coil 3in. diameter surface mounting by Sangamo Weston. 30/- plus 2/- P. & P.
 0-750 Microammeters. Brand new, blank scale. Flush mounting 3/4in. diam. Moving coil. 49/6 each plus 2/- P. & P.

H.T. TRANSFORMERS

Type (350/120) Tapped 200/250 V. input 350-0-350 V. 120 mA. 6.3 V. 31 amp. 5 V. at 2 amps.. 16/6. P. & P. 3/6. Type 5K Pri. 200/250 V. Output 350/0/350 V. 350 mA. 5 V. 3 amps. Tapped 4 V. 2 V. 2 amp. 10 kV. Ins. 20 V. 1 amp. 7.5 V. 1 amp. 5 kV. 5 mA. Price 25/- Post & Packing 6/-.

L.T. TRANSFORMERS

Pri.: 240 volts. Output 6.3 volts 5 amps. 8/6, post 2/6. Pri.: 240 volts. Output 17 volts 1 amp. 9/6, post 2/-.

SELENIUM F.W. HIGH CURRENT BRIDGE RECTIFIERS

18 v. 8 amps. 4 1/2 in. sq.	Price	19/6
18 v. 18 amps. 7 1/2 in. sq.	Price	39/6
18 v. 36 amps. 7 1/2 in. sq.	Price	79/6
18 v. 54 amps. 7 1/2 in. sq.	Price	117/6
36 v. 8 amps. 4 1/2 in. sq.	Price	39/6
36 v. 18 amps. 7 1/2 in. sq.	Price	79/6
36 v. 36 amps. 7 1/2 in. sq.	Price	119/6
36 v. 54 amps. 7 1/2 in. sq.	Price	235/-
54 v. 8 amps. 4 1/2 in. sq.	Price	59/6
54 v. 18 amps. 7 1/2 in. sq.	Price	117/6
54 v. 36 amps. 7 1/2 in. sq.	Price	235/-

Voltages indicated are maximum input volts and amps. are max. current out. Supplied brand new and guaranteed. Not government surplus.

A GEARED ELECTRIC MOTOR

FOR ONLY 9/6. Post and Packing 2/6. Due to bulk purchase we are able to offer these 24 V. Rotary Convertors at this fantastic price. Easily modified for mains operation (full simple conversion details supplied). Complete with 400 to 1 reduction gearbox.

FIELD STRENGTH METERS

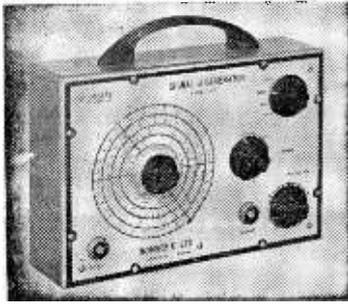
100-150 Mc/s. Contains 0-1 mA meter, 185 valve, chrome telescopic aerial, etc. New condition in black crackle case. Operates on 1.5 V. and 90 V. batteries. Dimensions: 7 x 7 x 7 in. 45/- P. & P. 2/6.

SILICON RECTIFIERS

Westinghouse 1,000 P.I.V. 500 mA. 9/- each
 800 P.I.V. 500 mA. 7/6 each. 400 P.I.V. 200 mA. 3/6 each.



Control box for 19 set. 10/- plus 2/- post



Wide-range Transistorised
SIGNAL GENERATOR—Model 27
 Range 150 Kc/s to 350 Mc/s.

- ★ Accuracy better than 2%
- ★ Directly calibrated
- ★ Battery operated
- ★ Compact and light

£7.18.6

with lead test and battery.
 Post and Packing 3/6 extra.

Trade and Export Enquiries Invited

NOMBREX INSTRUMENTATION

Wide-range Transistorised
AUDIO GENERATOR—Model 63
 Range 10—100,000 c/s.

- ★ Laboratory Standard Specification
- ★ Sine and Square Wave
- ★ Direct Frequency Calibration
- ★ Accuracy and Low Distortion
- ★ Calibrated Output Voltage
- ★ Battery Operated and Compact

£15.0.0 complete with
 test lead
 Battery 2/3. Post and Packing 3/6



Wide-range Transistorised
C.R. BRIDGE—Model 62
 6 Ranges: 1Ω to 100MΩ
 1pF to 100μF

- ★ Visual null indicator
- ★ Power Factor check
- ★ Electrolytic leakage test
- ★ Battery operated

£7.2.3

including battery.
 Post and Packing 3/6 extra.

S.A.E. for full technical leaflets

NOMBREX LTD. Instruments
 Division 65

ESTUARY HOUSE, CAMPERDOWN TERRACE,
 EXMOUTH, DEVON. Phone: 3515.

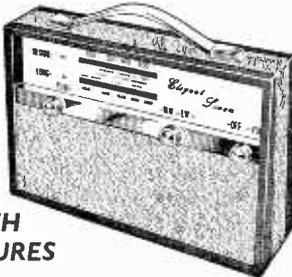
SPECIAL OFFER!

OBTAINABLE ONLY FROM R. & T.V.
 THE

Elegant Seven

COMBINED
 PORTABLE
 AND
 CAR
 RADIO

THE RADIO WITH
 THE STAR FEATURES



- ★ 7-transistor superhet. Output 350 mW. ★ Two-tone grey wooden cabinet, fitted handle with silver coloured fittings. Size 12½ x 8½ x 3½ in. ★ Horizontal tuning scale, size 1½ x 2 in., in silver with black lettering. ★ All stations clearly marked. ★ Ferrite-rod internal aerial. ★ IF 470 Kc/s. ★ Operated from PP9 battery. ★ Full comprehensive instructions and point-to-point wiring diagram. ★ Printed circuit board, back-printed with all component values. ★ Fully tunable over medium and long waveband. ★ Car aerial socket. ★ Full after sale service.

PARTS LIST AND CIRCUIT DIAGRAM 2/6. FREE with parts.

PLUS 5/6
 POSTAGE & PACKING

ONLY £5.9.6

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

RADIO & T.V. COMPONENTS LTD.
 21c HIGH STREET, ACTON, LONDON, W.3.

EXPRESS ELECTRONICS

32 SOUTH END CROYDON SURREY
 TEL. CRO 9186

VALVES NEW TESTED AND GUARANTEED
 FOR THREE MONTHS

1C1	4/9	6BE6	7/-	12AU7	8/9	DH77	5/-	EF96	9/-	PL83	7/-
1C2	7/6	6BH6	5/9	12AX7	8/9	DH142	8/6	EF91	4/-	PY33	10/-
1C3	6/6	6B36	5/9	12B50	8/6	DH150	10/-	EP92	5/6	PY81	8/9
1P1	6/6	6BR7	8/9	12BH7	10/6	DK91	4/9	EL41	9/6	PY82	7/6
1P3	2/9	6BW6	6/6	12K8GT1/-	DK96	6/6	EL64	7/-	PY83	7/6	
1FD1	6/6	6BW7	7/-	12Q7GT	7/6	DL92	5/6	EM85	10/-	R19	8/6
1PD9	4/-	6D2	4/-	12SN7	8/6	DL94	8/-	EY51	7/6	86A1	9/6
1P1	6/6	6F12	4/-	18A5	9/-	DL96	6/6	FY81	10/-	U52	7/6
1P10	5/6	6HG6T	5/-	18AQ5	8/6	EB91	4/-	EZ40	5/6	U78	7/6
1P11	6/-	6J7GT	7/6	25A6G	7/6	EB041	7/6	EZ80	6/-	U78	5/-
1R5	4/9	6K7G	5/6	25L6GT	7/6	EBF80	8/6	EZ81	6/9	U142	7/6
1R5	4/-	6K8G	6/-	30C1	7/6	ECC81	4/-	HVR2	9/6	UBC41	8/6
1T4	2/9	6Q7G	5/6	30L1	7/6	ECC82	6/9	KT300	6/-	UC143	9/6
1U5	5/6	6S17GT	6/-	35L6GT	7/6	ECC83	6/9	N17	5/6	UF41	8/6
3Q4	5/6	6S27GT	7/6	35W4	8/6	ECC84	6/6	N18	5/6	UL41	8/6
3S4	5/6	6V6G	7/6	35Z4GT	8/-	ECC85	7/6	N19	6/-	UY41	7/6
3V4	6/-	6X4	5/-	5763	7/6	ECP80	8/6	N709	7/-	W17	3/-
5Y3GT	5/-	6X5G	5/9	80	6/-	ECP82	7/6	PC384	7/6	W76	4/6
5Z4G	7/6	787	9/6	DAF91	4/-	ECH42	9/-	PCF80	7/6	W143	8/6
6AK6	5/6	8D3	4/-	DAF96	8/6	ECH81	10/-	PCF82	6/6	X17	4/9
6AL5	4/-	9D7	9/6	DCC90	12/6	ECL80	8/6	PCL82	6/9	X143	9/-
6AM6	4/-	12AD6	11/6	DF91	3/-	ECL82	7/6	PC184	9/-	X150	9/-
6AT9	5/-	12AR9	10/-	DF96	6/6	EF41	9/-	PL81	9/6	Z77	4/-
6BA6	5/-	12AT7	4/-	DH76	7/6	EF80	8/-	PL82	7/6	ZD17	4/-

ASK FOR RESISTOR AND CAPACITOR COLOUR CODE
 FREE WITH EVERY PURCHASE

High Stability Resistors 1/4W 5% 50Ω to 1M. 9d. Midset Ceramics 500 v., 9d. Coal Super Quality 1/4W, 6d, 3/6 Pings 9d. Sockets 9d. Siloon H.T. Rects. 250 v. 300 mA 1/4 in. 3/6. Contact Cooled 250 v. 50 mA 6/6. 35 mA 8/6. NEW TRANSISTORS BY MULLARD. OC19, OC26, OC66, 25/-; OC44, OC45, 5/-; OC70 8/-; OC71, 8/-; OC72, 8/-; OC72 matched pair, 12/-; OC74, OC75, OC78, 7/6; OC81, 8/-; OC81 Matched pair, 12/-; OC170, OC171, 8/6.

VALVES MATCHED IN PAIRS

EL34 27/6, EL84 18/6, N709 15/-, 6V6G 15/-, 6BW6 14/- per pair. Push-Pull O.P. Transformer for above 3/15 14/6, P. & P. 1/6. 12in. P.M. Speakers 3Ω 24/6. Baker's "Selhurst" 12in. 15Ω 15W Stalwart 80/-, 12in. Stereo Model 26.15.0.

SETS OF VALVES

DK91, DF91, DAF91, DL92 or DL94.....	18/6	ECH42, EF41, EBC41,
DK96, DF96, DAF96, DL96.....	26/-	EL41, EZ40.....
1C3, 1F1, 1FD1, 1P1.....	28/-	ECH42, EF41, EBC41,
1R5, 1T4, 1R5, 3S4 or 3V4.....	18/6	UL41, UY41.....

Postage and packing 6d.

Over all post free. Q.O.D. 4/-

Design for a Dual-Impedance Loudspeaker

A useful accessory for the workbench.

By K. Berry

IN the course of testing radios, television receivers and amplifiers, a general purpose loudspeaker is often needed for experimental purposes. Sometimes, a low impedance loudspeaker is required and at other times a high impedance instrument will be needed. On such occasions, it is usually necessary first to find a loudspeaker, also an output transformer and then to connect them together and to the equipment under test. This will always be a time consuming and tedious business and to overcome this problem, the author constructed a dual-impedance loudspeaker.

The idea, which is very simple, is as follows. An ordinary low impedance extension loudspeaker was obtained, and an output transformer screwed securely inside the case. In the top of the case were fitted two terminals and a 2-pole change-over toggle switch.

The circuit is shown in Fig. 1, and the finished instrument in Fig. 2. The loudspeaker when thus modified, can be set for high or low impedance operation at the turn of a switch.

The output transformer was one taken from an old radio receiver and matches 8,000Ω to 3Ω. It is recommended that a transformer capable of carrying a primary current of about 50mA is used, as some equipments will pass such a current through the transformer.

Since, in this circuit, the voice coil of the loudspeaker is connected to the primary of the output transformer (when switched for high impedance operation), the loudspeaker chassis or frame could be at a high voltage with respect to earth, and accordingly care should be taken to ensure that accidental contact cannot be made with the loudspeaker chassis.

This device has proved to be such a great asset in testing and experimenting that the author wonders how he ever managed without one!

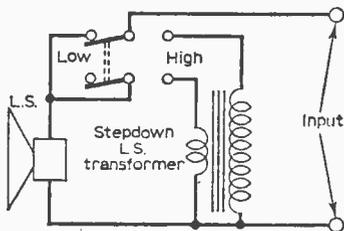


Fig. 1: The simple circuit arrangement of the unit.

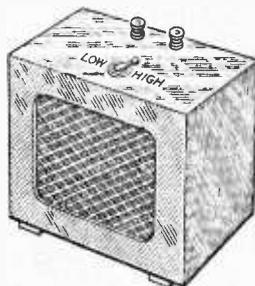


Fig. 2: The finished unit.

TEST GEAR TECHNIQUES

—continued from page 650

ing for resonant frequency. Then, without altering the G.D.O. setting, the additional elements can be added, spaced and adjusted for length until resonance is again obtained. One point worth mentioning is the effect of the earth on tuning. As the array is tuned relative to earth, adjustments should normally be made at the height above

ground that it is intended to be used.

These are only a few of the more obvious applications of the G.D.O. A complete article could be devoted to its very versatile capabilities as signal generator and absorption type wavemeter. Various modifications and adaptations can be made to extend the range and sensitivity of the instrument.

Fig. 5 shows one such extension of the previous circuits, where a second valve is used as a d.c. amplifier with a bridge network to enable more accurate readings to be obtained with loose coupling. Here, the valve functions as one arm of a bridge, with the potential developed across the G.D.O. grid leak applied to its grid. As this potential drops, the grid voltage becomes less negative and the resistance of the anode-cathode path decreases. This upsets the balance of the bridge and results in a good, positive indication. R5 is used to set the meter zero.

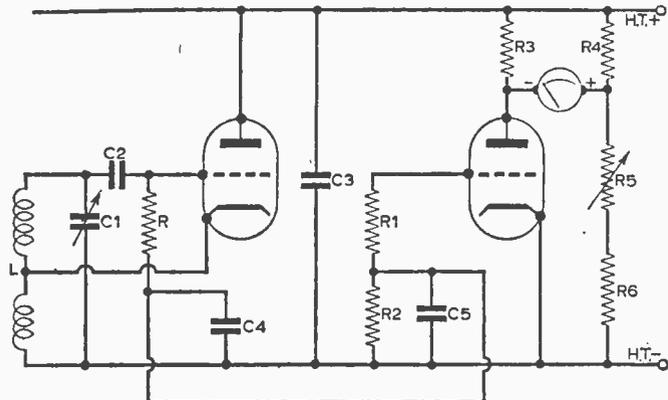
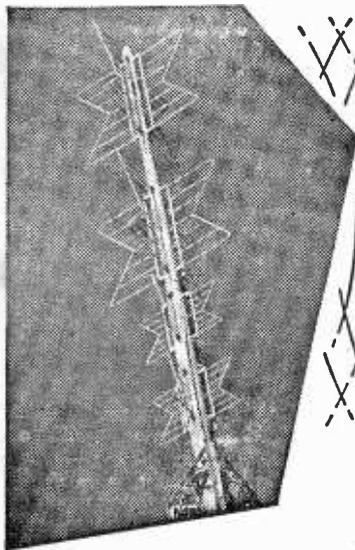


Fig. 5: G.D.O. suitable for v.h.f. with bridge-connected d.c. amplifier for more accurate readings.

In conclusion, the author would like to thank those readers who have written, discussing the subject matter and occasionally pointing out discrepancies. It is regretted that sufficient space is not available to enter fully into the several questions that have arisen. Perhaps later . . .



On Your Wavelength

By THERMION

(and, even more serious, the rod aerial) will be 'live' at the full mains voltage.

A Second Fatality Reported

Within a few weeks of receiving information concerning the above case I read of another fatal accident, where a youth was electrocuted in a bathroom. His death was attributed to a mains adaptor which was coupled to a transistor radio. A radio engineer giving evidence at the inquest stated that this particular adaptor (of German manufacture) would be regarded by many in the trade as potentially lethal. Now it was certainly wrong to use a mains powered receiver in a bathroom; frequent warnings are given about this and nobody should be in ignorance on this matter. But this cannot in any way excuse the makers, for if the facts as reported were correct, the power unit was inherently dangerous and had exposed metal which could readily become 'live'.

I would urge all who have any dealings with devices of the nature to examine carefully each particular type that comes into their hands and satisfy themselves that the circuitry, components and mechanical construction are sufficiently sound for the proposed application; check especially that there is no risk of fire due to overheating nor any chance of 'live' parts being touched under normal working conditions.

British Standards Safety Requirements

It is pertinent, finally, to mention some of the safeguards that are embodied in equipment conforming to BS415.

In this Standard certain requirements are laid down for 'non-isolated apparatus'—where direct connection is made between one side of the mains supply and any structural part of the apparatus. (A familiar example is, of course, the a.c./d.c. type receiver). It is stipulated that all terminals and sockets used for making external connections be effectively isolated from those parts of the circuit likely to be at mains potential. Good quality mica or paper dielectric capacitors of at least 750V working are specified for this purpose. In the case of receivers designed for use with an external aerial, the capacitor connected to the aerial socket must be shunted by a resistor of reasonably high value to prevent the accumulation of static charges on the aerial, because such charges could in time cause a breakdown in the isolating capacitor.

The apparatus should be housed in a cabinet or case of adequate strength and well insulated from the live parts. Any openings for ventilation must be of such a size as to prevent live parts within being touched by a finger. Control knobs must be securely fastened so that no portion of the metal spindles remains exposed; if grub screws are used, these must be well countersunk and, preferably, the holes sealed with an insulating substance.

I FEEL compelled to give warning of dangers that may arise from the use of certain mains adaptors with battery type transistor receivers. How widespread this practice has become, I do not know, but I am aware of two recent cases of electrocution caused by transistor receivers operating from a.c. mains supplies through such devices.

In both tragedies, the adaptors were of foreign origin and it is all too obvious that neither of these meet the requirements laid down by British Standards Institute with respect to safety from electric shock and fire.

Mr. J. Robson, of Newcastle, has recently drawn attention to one case of electrocution reported in the press, and he also forwarded a circuit diagram of a Japanese made mains operated power unit which he suspects to be of similar type to the unit involved in this fatality. On studying this diagram I find myself sharing the indignation expressed by this reader. That such a piece of apparatus should be made available to the general public without adequate instructions and warning concerning its use is little short of scandalous.

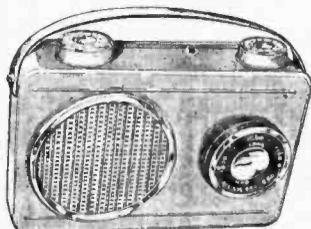
The unit referred to consists of a metal rectifier fed from the a.c. mains through a capacitor. The h.t. plus output line is separated from one side of the a.c. mains only by a resistor.

Now a very dangerous state of affairs arises when this kind of power unit is connected up to a transistor portable receiver equipped, as so many are nowadays, with a socket for an external aerial and maybe a retractable rod aerial as well. In the majority of cases the aerial socket will be directly connected to the receiver h.t. plus line (signal 'earth')—but this presents no hazard when the receiver is powered by its normal internal battery. Should a mains operated power unit of the type just described be employed as substitute for the battery, the aerial circuit will then be connected to either the neutral or the line side of the mains, depending upon which way round the plug is fitted. There is thus a 50/50 chance that the aerial socket

PORTABLE TRANSISTOR RADIOS

BACKED BY SUPER AFTER SALES SERVICE

ROAMER SIX



● 8 stages—6 transistors and 2 diodes.

Listen to stations half a world away with this 5 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 6½ x 4½ x 1½ in.

Total cost of all parts now only **£4.19.6** P. & P. 3/6.

Parts Price List and easy build plans 3/1.

TRANSONA SIX

NEW!



● 8 stages—6 transistors and 2 diodes.

This is a top performance receiver covering full Medium and Long Waves and Trawler Band. High-grade powerful magnet 3in. speaker makes listening a pleasure. Push pull transformers for ample power. 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 1½ in. (Uses PP4 battery available anywhere). (Carrying strap, 2/- extra).

Total cost of all parts now only **59/6** P. & P. 3/6

Parts Price List and easy build plans 1/6

ROAMER SEVEN Mk. III

● 9 stages—7 transistors and 2 diodes

Covers Medium and Long Waves, Trawler Band and two Short Waves to approx. 17 metres. Push-pull output for room filling volume from rich toned heavy duty 5in. speaker. Ferrite rod aerial for M & L waves and telescopic aerial for S Waves. Air spaced ganged tuning condenser ensures wonderful station selection. Simulated hide 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 PP9 battery available anywhere.)

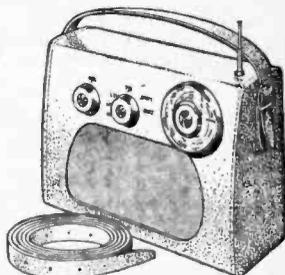
5 WAVEBAND PORTABLE OR CAR RADIO

Amazing performance and specification

Total cost of parts now only

£5.19.6 P. & P. 5/6

Parts Price List and easy build plans 3/-



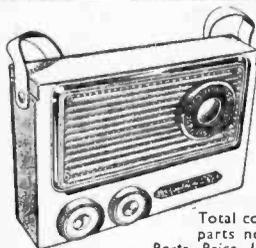
SUPER SEVEN

● 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 aerial for wonderful reception. Special circuit incorporating 2 R.F. stages, push pull output. 3in. speaker (will drive larger speaker). Size 7½ x 5½ x 1½ in. (Uses PP6 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/-



MELODY SIX

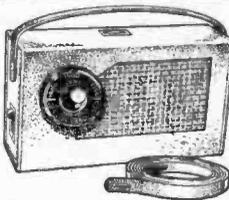
"... amazed at volume and performance... has really come up to my expectations."
S.U., Stockton-on-Tees.

● 8 stages—6 transistors and 2 diodes.

Our latest completely portable transistor radio covering medium and long waves. Incorporates pre-tuned circuit board. 3in. heavy duty speaker, top grade transistors, 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 1½ in. approx., with gilt speaker grille and supplied with hand and shoulder straps.

Total cost of all parts now only **£4.9.6** P. & P. 3/6.

Parts Price List and easy build plans 2/-



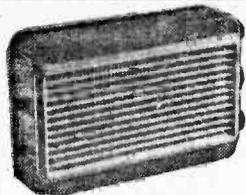
TRANSONA FIVE

● 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 speaker etc. Attractive case. Size 6½ x 4½ x 1½ in. 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/-



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 super sensitive Ferrite Rod Aerial and fine tone 2½ in. moving coil speaker, built into attractive black case with red speaker grille. Size 5½ x 1½ x 3½ in. (Uses PP4 battery available anywhere.)

Total cost of all parts now only **42/6** P. & P. 3/6.

Parts Price List and easy build plans 1/6



All components used in our receivers may be purchased separately if desired. Parts price lists and easy build plans supplied free with sets of parts or available separately at prices stated.

Radio Exchange Co.

27 HARPUR STREET, BEDFORD
Phone 2367 ● Opposite Co-op. ● 10-1 p.m. Sats.

"THE CONSTRUCTOR'S PARADISE"
BEAR HUDSON LTD.

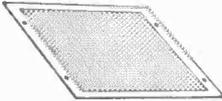
63, GOLDHAWK ROAD, SHEPHERD'S BUSH, LONDON, W.12
(Next to Goldhawk Road, Metropolitan Stn.) Phone SHE 2581 4794
Open all day Saturday

COMPONENTS - HI-FI - BOOKS - SERVICE

- 24-HOUR MAIL ORDER SERVICE with all goods guaranteed.
- ★ FREE POSTAGE on orders over 20/-; add 1/- postage if under.
- ★ HI-FI INSTANT COMPARISON ARRANGEMENTS.
- ★ COMPREHENSIVE TECHNICAL SERVICE for Customers.
- ★ BULK PURCHASING DEPT. and own manufacturing facilities mean LOWEST PRICES.

TSL "KITBOARD"

THE NEWEST THING FOR THE TRANSISTOR CONSTRUCTOR



better than a printed circuit board!

Perfect for assembling modern subminiature components into the smallest possible arrangements. Perforated 10 holes to the inch. Strong, light. Suitable for all transistor equipment.

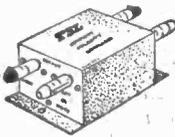
Size 1 x 4 1/2 x 3/6 4in. Size 2 x 2 1/2 x 2/6 4in.

TRUE HI-FI FROM CRYSTAL P.U.s.

TSL

CONSTANT VELOCITY EQUALISER

This remarkable new TSL development enables quality almost as good as the finest professional magnetic pick-ups to be obtained from crystal or ceramic types. With it, even cheap record players become first-class instruments. With good equipment results are astonishing. Ideal for B.S.E., Collaro, Garrard and Acos. With plugs for mono or stereo. 3 years' guaranteed. Ready for use.



30/-
POST FREE

HI-FI by GARRARD, JASON, LEAK, LORENZ, QUAD, RADFORD, TSL, WHARFEDALE W.B., etc.

THE FANTASTIC SINCLAIR 'SLIMLINE' VEST-POCKET RECEIVER



All parts (except bat.) come to

49/6

POST FREE
With full instructions.

This fantastic receiver, using latest Micro-Alloy Transistors brings in countless stations (med. wave) with truly superb quality and sensitivity. Absolutely self-contained with printed circuit board and all parts for easy building. With special ear-piece.

AMPLIFIERS

NEW VALVE AND ALL-TRANSISTOR TYPES

13 WATT integrated hi-fi valve amplifier with full range of controls. Built and tested. **£9.19.6**
In Kit form; with valves, instructions, etc. **£7.17.6**

TODAY'S SUPREME VALUE IN AMPLIFIERS! BRITISH MADE GORBER TYPE AMPLIFIER GS12005

All-transistor subminiature quality amplifier 60-16,000 c/s ± 3dB, 70-14,000 c/s ± 1dB. 5mV in for 1 watt out at 6v. Built and tested. **59/6**
In Kit form. **47/6**

Send now for details of these Amplifier Bargains

M.A.T. MICRO-ALLOY GOLD-PLATED TRANSISTORS

Phenomenal Performance

A revolutionary advance in transistor technique and performance. Will operate up to 150 Mc/s with current gains of better than 350. With a single "MAT" stage gains as high as 10,000 times are possible. Absolute minimal voltage and current collector requirements; ultra low-noise, gold-plated leads. FULL DATA SHEETS FREE. Also 22 Tested Circuits using MAT's covering S.W., H.F., Personal and TV applications (size 10 1/2 x 7 1/2in.) 5/- post free.

MAT 100	7/9
MAT 120	7/9
MAT 101	8/6
MAT 121	8/6

ADT.140 New wonder transistor with cut off at 500 Mc/s. **15/-**

100/0 HI-STAB RESISTORS

1 and 1/2 W. 10 to 10 Q meg., 6d. each. 5/- per doz. State values required. Specially recommended for transistors.

BERNARDS BOOKS FOR TRANSISTOR CONSTRUCTORS

- 184** Tested Transistor Circuits using Modules. **2/6** Post free.
 - 185** Tested Shortwave Receiver Circuits using (MATs) **5/-** Post free.
 - 186** Tested Superhet Shortwave and Communication Receiver Circuits using (MATs). **6/-** Post free.
- Send 6d. for full catalogue of Bernard's Books. We stock the Parts You Need for the Circuits too!

YOUR CAREER in RADIO?

Big opportunities and big money await the qualified man in every field of Electronics today—both in the U.K. and throughout the world. We offer the finest home study training for all subjects in radio, television, etc., especially for the CITY & GUILDS EXAMS. (Technicians' Certificates); the Grad. Brit. I.R.E. Exam.; the Radio Amateur's Licence; P.M.G. Certificates; the R.T.E.B. Servicing Certificates; etc. Also courses in Television; Transistors; Radar; Computers; Servo-mechanisms; Mathematics and Practical Transistor Radio course with equipment. We have OVER 20 YEARS' experience in teaching radio subjects and an unbroken record of exam. successes. We are the only privately run British home study College specialising in electronic subjects only. Fullest details will be gladly sent without any obligation.

To: BRITISH NATIONAL RADIO SCHOOL, Dept. 2
RADIO HOUSE, RUSSELL ST., READING, Berks.

Please send FREE BROCHURE to:

NAME Block

ADDRESS Caps.

..... Please send

BRITISH NATIONAL RADIO SCHOOL

Step over the border to Good Component Buying, by visiting—

★ BERWICK ★ ELECTRONICS LTD.

70 BERWICK STREET, LONDON W.1
Telephone: GERrard 8152

(Open Weekdays 9-5.30. Sat. 9-12.30)

Branches NOW OPEN at—

67 LONDON ROAD | 100 TIB STREET
CROYDON | MANCHESTER 4
Tel.: CROYdon 1512 | Tel.: Blackfriars 4416

(Open Weekdays 9-5.30. Wed. 9-12.30)

LOOK! LOOK! LOOK!

A 12 IN. DUAL-CONE HI-FI SPEAKER we can offer at only **£4.17.6** (RF 30ED)

THE MM4 TRANSISTORISED MICROPHONE MIXER UNIT for the amazingly Low Price **59/6**

Many other interesting bargains for your inspection.

You are cordially invited to call, phone or write for further details to your nearest branch.

DOUBLE-TRACE OSCILLOSCOPE

—continued from page 613

mentary lens, either of which can be purchased from a photographic dealer for a few shillings. A supplementary lens is designed for fixing immediately in front of the camera lens in the same way as a filter, and enables the lens to focus down to short distances.

"No. 3" lenses vary somewhat in power according to the manufacturer but a focusing table is available with the lens giving all necessary information. The data for a +3 diopter lens used with a normal type of 35mm. camera are as follows:

TABLE 4: SETTING-UP DATA FOR +3
DIOPTER SUPPLEMENTARY LENS

Camera Scale Reading	Distance from Lens front to Screen	Approximate Field Size
3.5 ft.	10 in.	4½ x 7 in.
3 m.	25 cm.	12 x 18 cm.
∞	13.1 in.	5 x 7½ in.

If the camera has a focusing control it should be set at 3.5ft. or 3m., otherwise the "∞" figures can be used.

Special oscillograph film is available, but only in bulk quantities. However, it is quite possible to use whatever film happens to be in the camera at the time, using the exposures given in Table 5.

These values can only be approximate, as the setting of the "Intensity" control on the oscillo-

TABLE 5: AVERAGE EXPOSURE TIMES FOR
AN APERTURE SETTING OF f/11

Film Speed			Time
BSI Scheiner	DIN	ASA Weston	
25°	15°	25	60 sec
32°	22°	125	15 sec
34°	24°	200	8 sec
37°	27°	400	4 sec

scope will have a considerable effect on the result. However, modern films provide quite a wide latitude for error.

With exposure times of this order, the camera cannot be held by hand, and a tripod (or a pile of books at the very least) will be necessary to support it during the exposure. If the camera is equipped with a cable release this should be used.

The actual exposure is best made in a darkened room or with the tube face screened from direct light, otherwise the oscillogram will lack contrast.

If the camera has no "Time" exposure, it may be possible to bring the times given in Table 5 within the range of shutter speeds available on the camera by increasing the aperture of the lens (i.e. reducing its stop number). Here, the rule is to halve the exposure time for each stop by which the aperture is increased. If this is done, however, extra care will be needed in setting up the camera, as the depth of field will be that much less (a permissible error of about a quarter of an inch at f/3.5, as against more than an inch at f/11). ■

SHOWTIME ROUNDUP—continued

since they represent, in the main, the more popularly priced models and do not take in the majority of the more specialised manufacturers.

However, the new models seen showed a general improvement both technically and in presentation. With newer and better tape decks, higher quality audio circuits, more facilities and greater flexi-

bility, today's "popular" tape recorder represents extremely good value.

MAINS OPERATED RADIOS

Although there are proportionately few valve mains radio sets, some makers still keep them in production and a few new ones turned up at Showtime.

MAINS OPERATED RADIO

Model	Wavebands	Price	Notes
EKCO U428	LW, MW, VHF	25 gns.	Push button pre-set tuning of up to four VHF stations. Manual tuning for LW and MW.
PHILIPS 417U	LW, MW, VHF	28 gns.	6 x 4" speaker.
4X23A	LW, MW, SW, VHF	37 gns.	Two 5" speakers, push-button tone control.
STELLA ST154U	LW, MW, VHF	27 gns.	6V, 6 x 4" speaker.
ST160A	LW, MW, SW, VHF	37 gns.	7V, two 5" dual-cone speakers.
UNITRA Goplana	LW, MW, SW, VHF	26½ gns.	Piano-key switching. Wood cabinet.
Alfa	MW, VHF	15½ gns.	Wood cabinet. 1.3W output.
Figaro 3	LW, MW, SW	9 gns.	1.5W output. Plastic cabinet. Wood cabinet version, 9½ gns.
Ramona	LW, MW, SW, VHF	26½ gns.	Unusual cabinet design.

THREE-WATT AMPLIFIER

BY J. D. HASKELL

SPECIFICATION

Total output is 3W at better than 1% total distortion. Frequency response at maximum output 30—20kc/s better than ± 1 dB. Hum and noise better than -80 dB at full output. Sensitivity with the loudness control in circuit is about 200 mV and this can be provided by any normal type pre-amplifier.

FOR enthusiasts who are satisfied with 3W of good quality, the following amplifier should suffice. The amplifier is good so far as stability, distortion and frequency response is concerned, and is adequate for all but the most discriminating listener.

The circuit is based upon three valves, these being a 6BR7, and EL84 and an EZ80. Precautions have been taken to ensure adequate valve life, and

maximum rating figures are never exceeded. The circuit has three negative feed-back loops; one of these is frequency selective, the other provides current feedback, and the third is a voltage feedback loop.

Loudness Control

Very few, if any, of the cheaper commercial amplifiers on the market have loudness controls.

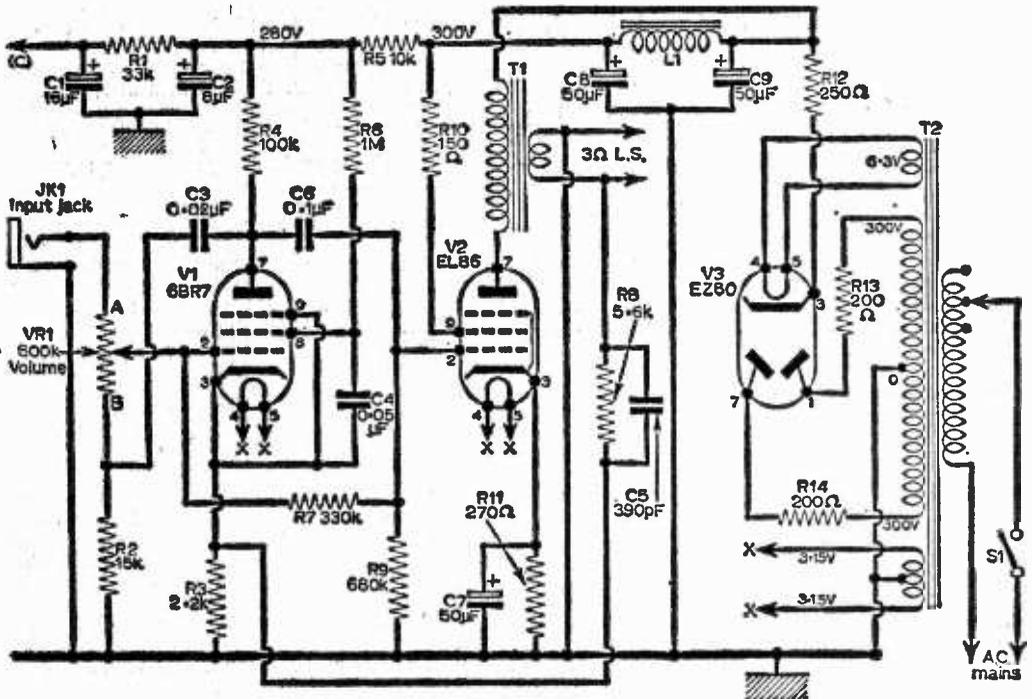


Fig. 1: The complete circuit diagram of the amplifier.



SEND FOR OUR 1963/4 COMPONENTS CATALOGUE

48 pages of valves and accessories. Send 1/- in stamps for your copy.
Trade catalogue also available, for which please attach your business letter heading.

CHASSIS

Aluminium Undrilled with Reinforced Corner, available in the following sizes:
6in. x 4in. x 2 1/2in. ... 4/6 each
8in. x 6in. x 2 1/2in. ... 6/3 each
10in. x 7in. x 2 1/2in. ... 7/3 each
12in. x 3in. x 2 1/2in. ... 5/9 each
12in. x 5in. x 2 1/2in. ... 6/9 each
12in. x 6in. x 2 1/2in. ... 8/6 each
14in. x 3in. x 2 1/2in. ... 6/- each
14in. x 9in. x 2 1/2in. ... 12/- each
16in. x 6in. x 2 1/2in. ... 9/3 each
16in. x 10in. x 2 1/2in. ... 14/- each
All are four-sided—ideal for radio receivers, amplifiers, power packs, etc.

GRAMOPHONE UNITS

BSR TU12 unit, with Mono TC8H cartridge, £3.19.6.
BSR GU7 unit, with TC8M or TC8H cartridge, Mono, £4.15.0.
BSR GU7 unit, with TC8S cartridge, stereo, £5.5.0.
Garrard Autoslim, automatic, with GC8 Mono cartridge, £7.15.0.
Garrard Autoslim, automatic, with EV26 Stereo cartridge, £8.10.0.
Garrard Autoslim, de luxe, with GC8 Mono Cartridge, £11.5.0.
Garrard Autoslim de luxe, with EV26 Stereo Cartridge, £12.0.0.
BSR Monarch UA14, with TC8 Mono Cartridge, £6.6.0.
BSR Monarch UA14, with TC8S Stereo Cartridge, £7.7.0.
BSR Monarch UA16, with TC8 Mono Cartridge, £4.19.6.
BSR Monarch UA16, with TC8S Stereo Cartridge, £7.19.6.

METAL RECTIFIERS

Alpha Range of Guaranteed Bridge Rectifiers suitable for Battery Chargers 6 and 12 volt output:
2 amp. ... 7/-
4 amp. ... 12/6
6 amp. ... 15/6

ADASTRA 3-3 AMPLIFIER

Specification: Controls—Volume, Treble, Bass with on/off. Valves—EZ80 rectifier, ECL86 amplifier and output. Output power—3 watts at 3.5 ohms impedance. Input sensitivity—200 millivolts. Frequency response—75-20,000 c/s. Hum and noise—70 db. Feedback—10 db. For 200-250 volts A.C. 50 c/s. Well finished in blue with a smart panel with gold markings. Soundedly made of good components and perform exceptionally well for the price, £4.19.6.

REPANCO MINIATURE TRANSISTOR COMPONENTS

An entirely new range of Miniature Transistor Transformers, size 3in. x 3in. x 3in., high permeability nickel iron core. Suitable for printed circuits.

TRANSISTORS AND DIODES

Mullard	Price
AC107 ...	14/6
AD140 ...	25/-
AF102 ...	27/6
AF114 ...	11/-
AF115 ...	10/6
AF116 ...	10/-
AF117 ...	9/6
AF118 ...	20/-
AF124 ...	10/-
AF125 ...	10/6
AF126 ...	10/-
AF127 ...	9/6
OC16W ...	35/-
OC19 ...	25/-
OC26 ...	25/-
OC42 ...	8/-
OC44 ...	9/3
OC48 ...	9/3
OC44M ...	9/3
OC45 ...	9/-
OC45M ...	9/-
OC70 ...	6/6
OC71 ...	6/6
OC72 ...	8/-
2-OC72 ...	16/-
OC74 ...	8/-
OC75 ...	8/-
OC78 ...	8/-
OC81 ...	8/-
OC81M ...	8/-
OC82 ...	10/-
OC83 ...	6/-
OC170 ...	9/6
OC171 ...	10/6

DIODES

BY100 ...	13/-
OA70 ...	3/-
OA79 ...	3/-
OA81 ...	3/-
OA90 ...	3/-
OA91 ...	3/-
OA95 ...	3/6
OA210 ...	9/6
GEX34 ...	4/-
GEX35 ...	4/-
GEX36 ...	10/-

SETS OF TRANSISTORS

Set 1. Comprising OC44, 2 x OC45, matched pair OC81 ... 32/6 set
Set 2. Comprising OC81 Driver, matched pair OC81 ... 15/6 set

TT45. DRIVER TRANSFORMER

For double ended push-pull output stage, Ratio 4.5 to 1 + 1. Secondaries bifilar wound, 5/-.

TT46. PUSH-PULL OUTPUT TRANSFORMER

For double ended output matching to a 3 ohm speaker. Ratio 4 + 4 to 1, 5/-.

TT47. DRIVER TRANSFORMER

For single ended output stage matching to a 35 ohm speaker. Secondaries bifilar wound. Ratio 4.5 to 1 + 1, 5/-.

TT49. L.F. TRANSISTOR COUPLING TRANSFORMER

Suitable for interstage coupling in simple L.F. amplifiers. Ratio 4.5 to 1, 5/-.

MINIATURE DOUBLE TUNED I.F. TRANSFORMERS

455 to 475 kc/s. Can size 3/4in. sq. x 3/4in. Ferrite pot and core construction. Suitable for 1st and 2nd I.F.T. giving better selectivity than single tuned I.F.T.s. Can be used with normal R.F. transistors. Extra sensitivity when used with diffused alloy 4 element transistors. (Boxed with circuit.) Coil ratios: Total primary to collector tap—2.5 to 1. Collector tap to secondary tap—7.3 to 1, 6/9.

PAXOLIN SHEET

Paxolin sheet 1/4in. thick, 6 x 6in., 1/- each
Paxolin sheet 1/4in. thick, 12 x 6in., 2/- each
Paxolin sheet 1/4in. thick, 12 x 12in., 4/- each

EMPTY PLASTIC TAPE SPOOLS

Empty tape spools 3in. ... 1/6 each
Empty tape spools 4in. ... 2/- each
Empty tape spools 5in. ... 2/- each
Empty tape spools 5 1/2in. ... 2/6 each
Empty tape spools 7in. ... 3/- each

PERSONAL EARPHONE

A really sensitive dynamic earphone of exceptionally fine quality. Provides clear reproduction of music as well as speech. Fully guaranteed and complete with ear insert, 3 feet cord, sub-miniature plug. Model CR.5. Crystal Earpiece, high imp. Model MR-4. Magnetic Earpiece, low imp. 6/- each.

VALVES

DK96 ...	7/9	UL41 ...	7/6
DAF6 ...	6/9	UABC80 ...	7/6
DF96 ...	6/9	EY51 ...	8/-
DL96 ...	6/9	PL81 ...	8/6
ECC81 ...	5/-	PL36 ...	9/6
ECC82 ...	5/6	PCL83 ...	9/6
ECC83 ...	6/-	PCL82 ...	9/6
ECC84 ...	7/6	PCL82 ...	9/-
ECC85 ...	7/6	6V6G ...	4/-
ECH81 ...	7/6	6K7G ...	2/-
EGC41 ...	7/6	6AM6 ...	3/6
EF41 ...	7/6	EB91 ...	3/-
ECL80 ...	7/6	1R3 ...	5/3
PCF80 ...	7/6	1T4 ...	3/6
PCC84 ...	7/6	1S5 ...	4/6
PL82 ...	7/6	354 ...	5/6
PY83 ...	7/6	354 ...	5/6
UABC80 ...	7/6	6K8G ...	4/9
UA4F2 ...	7/6	6L6G ...	7/6
UBF80 ...	7/6	6Q7G ...	5/6
UCH42 ...	7/6	6X5G ...	5/-

TERMS: Cash with Order or C.O.D. Postage and Packing Charges extra. Single valves 9d., Minimum Parcel Post charges 2/-. Please include sufficient postage with your order. Minimum C.O.D. fees and postage 3/6. These Postal Rates apply to U.K. only. For full terms of business see inside cover of catalogue. Personal shoppers 9 a.m. to 5 p.m. Mon. to Friday, Saturday 10 a.m. to 1 p.m.

ALPHA
RADIO SUPPLY CO.

103 LEEDS TERRACE
WINTOUN STREET
LEEDS 7

VALVES FOR RADIO, TV AND AUDIO APPLICATIONS
All valves sold by us are first quality, unused, and guaranteed for three months.

WHEN ORDERING BY MAIL, PLEASE ADD 2/6 IN \$ FOR HANDLING AND POSTAGE. MINIMUM CHARGE 1/6 PER ORDER.

Table of vacuum tube types and prices, including 0A2, 0A3, 0B2, 0R3, 0C3, etc.

Z & I AERO SERVICES LTD.

Retail Shop: 85, TOTTENHAM COURT ROAD, W.1

Tel. LAMGham 8498

Head Office and Warehouse now in new premises at: 44A WESTBOURNE GROVE, W.1

Tel. PARK 5641/8/3.

Please send ALL correspondence and Mail Orders to the Head Office.

Table of electronic components and prices, including RLL8, TT15, U191, etc.

OUR NEW PRICE LIST OF VALVES AND CATRODE RAY TUBES IS NOW READY. PLEASE SEND 6d. STAMP FOR THIS AND FOR LEAFLETS OF MAIL ORDER ITEMS.

SEMI-CONDUCTOR RECTIFIERS
GERMANIUM, STUD MOUNTED: GJ6M, 800 p.i.v., 500 mA D.C. unmounted, 1A D.C. mounted on heat sink

SILICON JUNCTION, WIRE ENDED
Mullard BY100, 700 p.i.v., 400 mA D.C. ... SILUCAS DD068. This is a diffused junction device capable of operating at a p.i.v. of 800 v. and a maximum current of 500 mA D.C.

Table of electronic components and prices, including Mullard, OC35, OC45, etc.



The PUNCH you need!

HOLE PUNCHES

Table of hole punch specifications, including Instant Type, Screw-up Type, etc.

Complete Set £8.15.0.

No extra charge for postage and packing in the U.K.

Oliver & Randall Ltd
Dept. 7
7 KELSEY PARK ROAD
BECKENHAM, KENT
Tel.: Beckenham 8262

H.A.C. SHORT-WAVE EQUIPMENT AND SHORT-WAVE KITS

Famous for over 25 years for 'Quality' S.W. Receivers and Kits of 'Quality'.

H.A.C. are the original suppliers of SHORT-WAVE RECEIVERS KITS for the amateur constructor. Over 10,000 satisfied customers—including Technical Colleges, Hospitals, Public Schools, Hams, etc.

Improved designs with Denco coils: One-valve Kit, Model "C", Price 25/-. Two-valve Kit, Model "E", Price 50/-. New Addition: Model "K". Super sensitive "All Dry" Receiver. Special inc. price. Complete Kit, 77/-.

All kits complete with all components, accessories and full instructions. Before ordering call and inspect a demonstration receiver, or send for descriptive catalogue and order form.

POST THIS COUPON NOW!

"H.A.C." SHORT-WAVE PRODUCTS (Dept. TH), 44 Old Bond Street, London W.1

Please send me FREE and without obligation your 1963 literature.

Form with fields for NAME, ADDRESS, and a dashed line for return address.

UNDERSTANDING AMATEUR RADIO PRINCIPLES-CONSTRUCTION OPERATION

A New A.R.R.L. Publication Postage 1/3

HOW TO LISTEN TO THE WORLD 1963/4. World Pub: No. 6. 14/6. Postage 1/-.

A BEGINNER'S GUIDE TO RADIO, by F. J. Camm. 7/6. Postage 6d.

RADIO & TELEVISION TEST INSTRUMENTS, by G. J. King. 25/-. Postage 1/3.

BASIC RADIO COURSE, by J. T. Frye. 30/-. Postage 1/-.

TRANSISTOR RADIOS Circuitry and Servicing, by Mullard. 5/6. Postage 6d.

TELECOMMUNICATIONS PRINCIPLES (in M.K.S. Units), by R. N. Renton. 45/-. Postage 2/-.

TRANSISTOR MANUAL, by Intar G.E.C. 16/-. Postage 1/2.

NEW 1963 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 6 days 9-6 p.m.

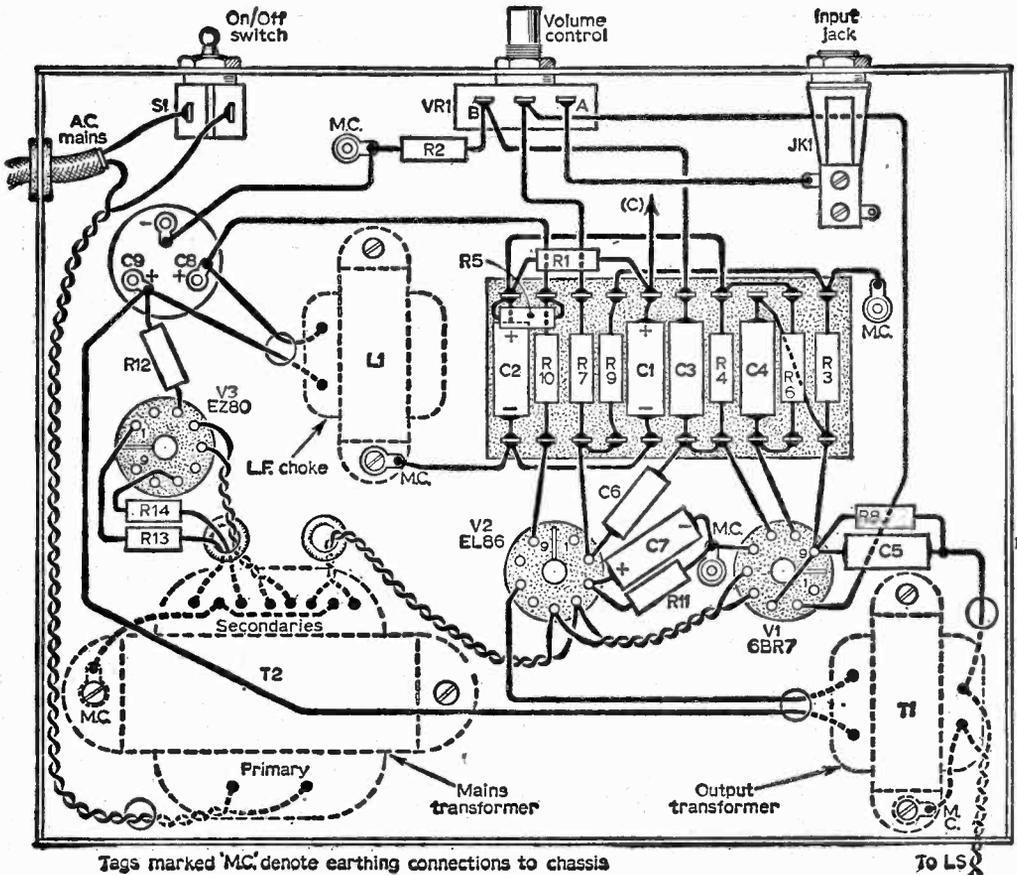


Fig. 2: A suggested layout for the amplifier.

In brief, this is a device which compensates for bass deficiency at low output levels. The loudness control functions as follows:

As the slider of the volume control is moved down towards "B", i.e. volume decreased, the amount of resistance in series with C3 is reduced and therefore more signal voltage is applied as negative feed-back to the grid. Due to the size of C3 the higher frequencies are readily passed—but very little at the lower frequencies.

H.F. Attenuation

This selective feedback results in attenuation of the high frequencies. It should now be clear that the boost is obtained at the expense of the high frequencies and hence adequate balance may be obtained by varying the setting of VR1. The resistor R2 prevents a short circuit to earth when the slider is at B. The values of C2 and R3 govern the frequency at which this control becomes effective. The adjustment of this control will be dealt with later on in this article.

Feedback

Some current feedback is applied at V1 by

omitting the normal cathode by-pass capacitor, and this gives a gradual low frequency rolloff and prevents the amplifier being overloaded at low frequencies. Some additional feedback is applied to the cathode of V1 from the output transformer secondary, via R8 and C5; the latter prevents high frequency ringing and instability and will suffice for any good quality output transformer. If a cheap type of output transformer is used a value of 1,000pF should prove suitable for C5. More feedback is applied to the grid of V1 from the grid of V2 via R7 and this keeps distortion at a minimum. The value of R4 has been chosen to give an essentially flat response up to at least 20kc/s.

Large Coupling Capacitor

The power handling capacity of an EL84 is well known, and hence a large coupling capacitor C6 was chosen to give an adequate bass response. It should also be remembered that if C6 were small in value a noticeable amount of transient distortion will occur due to phase lag in the capacitor. R11 should preferably be a 5% component.

COMPONENTS LIST

Resistors:

R1	33k Ω	R8	{ 5.6k Ω 5% (for 3 Ω LS)
R2	15k Ω		{ 12k Ω 5% (for 15 Ω LS)
R3	2.2k Ω	R9	680k Ω
R4	100k Ω	R10	150 Ω
R5	10k Ω	R11	270 Ω 3W
R6	1M Ω	R12	250 Ω 5W w.w.
R7	330k 5%	R13	200 Ω 1W
		R14	200 Ω 1W

All 10%, $\frac{1}{2}$ W carbon, except where otherwise stated.

VR1 500k Ω carbon potentiometer, log.

Capacitors:

C1	16 μ F electrolytic
C2	8 μ F electrolytic 350V
C3	0.02 μ F paper 600V
C4	0.05 μ F paper 600V
C5	390pF \pm 10% silver mica
C6	0.1 μ F paper 600V
C7	50 μ F electrolytic 25V

C8	50 μ F electrolytic 350V
C9	50 μ F electrolytic 350V

Transformers and choke:

T1	Output transformer: Primary impedance: 5k Ω ; secondary 3 Ω or 15 Ω (Partridge P4073, or Parmeko P2661).
T2	Mains transformer: Tapped primary. Secondaries: 300-0-300V 8mA; 6.3V 1A; 6.3V (centre tapped) 1A.
L1	Smoothing choke. 5H 75 Ω 60mA.

Valves:

V1	6BR7
V2	EL86
V3	EZ80

Miscellaneous:

Single pole on/off switch (S1). Input jack and socket. Three 9A valveholders. One 10-way groupboard. Chassis: 10in. x 8in. x 3in. approx.—(16s.w.g. aluminium.)

Output Transformer

Regarding the output transformer, no expense should be spared here, and the specified component should be bought if possible.

Adequate decoupling and smoothing is provided by C2, R5, C8 and C9, and hum is at least 80dB below full output. The resistors R13 and R14 are to limit the anode current on the plates of V3, but may be omitted, since the valve is working well within its maximum input rating.

A separate rectifier winding is preferable, though not essential, and if a common winding is to be used it should have a 2A rating. The heater winding in the circuit is centre-tapped to reduce the hum level, but again this could be of the ordinary variety without a centre tap and in this case one side of the winding should be earthed.

Wiring: Good wiring practice should be adhered to and all earth connections are to be made to a bus-bar, this being earthed at the input

jack only. A suggested layout is given in Fig. 2.

Setting up: After testing for any possible short-circuits the mains can be applied and about 15 sec. should be allowed for the amplifier to warm up. If you are using it in conjunction with a pre-amplifier the tap for the h.t. is taken from point C in the circuit, about 10 mA is available.

The loudness control is turned to the maximum position and the volume control on the pre-amplifier is adjusted for normal listening level or, better still, for full output. The tone controls are now adjusted to match room acoustics. The pre-amplifier volume control should be left at that setting and the volume of the amplifier adjusted by means of the loudness control; adequate balance will be maintained down to about 1W of output.

Summing up, the above amplifier will compare very well with the best on the market in this price bracket and should provide good quality and trouble-free performance when used with a good quality, correctly housed loudspeaker. ■

Audio Level Indicator

—continued from page 642

The signal supplied to the miniature loudspeaker was a 1,000c/s note obtained from a b.f.o. and recorded on tape, the output to the loudspeaker being in the order of 2W. A dB meter could be used to obtain exact figures of gain and loss.

The position of the loudspeaker and the microphone when mounted on the rod differed very little but the reflected sound from the loudspeaker is masked due to the physical size of the instrument. If one is experimenting in this field of very interesting work it is well to remember that both the loudspeaker and microphone should face the umbrella reflector and not the sound.

Using the Noise Level Indicator Meter.

When the instrument has been completed and is ready for testing first switch on the instrument, then gently tap the microphone. The meter

should give some indication by an upward movement. If the instrument is placed with the microphone facing a constant level audio signal the control VR1 can be rotated to give maximum reading.

The noise level indicator is very sensitive and will pick up a slight whisper at a few feet or more, so that when testing adjust the control VR1 if necessary to prevent the meter pointer wrapping itself around the end stop.

If an external microphone is being used, remember to turn down the gain control on the indicator so that if the microphone happens to get a sudden bang the meter will not suffer as a result.

The meter is not calibrated in terms of dB as this would necessitate the use of a decibel meter and a constant signal source, neither of which were available to the author. However, by experimenting a little with the results obtained the constructor will soon be able to use this instrument to a very surprising degree of accuracy in recording sound and setting up for stereo, etc. ■

No. 19. 2-8 Mc/s TRANSMITTER RECEIVER



This most famous Army Transmitter Receiver covers 2-8 Mc/s (150-97 meters in two bands). Has an intercom amplifier. Designed for 12 and 24 volt operation but supplied with "P.W." Mains conversion details. Uses a 6 valve superhet receiver, I.P. being 465 Kc/s, and a 6 valve transmitter designed for voice and C.W. operation. Incorporates test and tuning meter for voltages, aerial loading and current tests. Panel Controls: Frequency tuning, P.A. tuning, Gain control, MCW CW, R/T switch, Ret-tone netting, Off-on Quench aerial. AVC LT-HT—Drives tests. Supplied complete with instructions book. **ONLY 75/-.**

12ft. WHIP AERIAL (U.S.A.), 10/-.

MT.1000 TAPE RECORDER



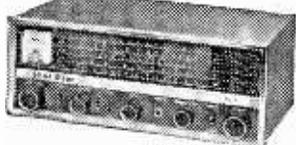
The smoothest performing battery model available, uses 4 transistor plus diode push-pull amplifier with built in speaker stop/record/playback/rewind switch, volume control speed control, pause switch. Size only 7 1/2" x 6 1/2" x 3 1/2". Attractive two-tone case. Complete with mike, earphone, batteries, tape and instruction manual. **ONLY 29.10s.**

12in. THREE-WAY SPEAKER Model CR.30AE.



Designed and engineered to satisfy the most discriminating listener. The CR.30AE achieves full 3 speaker performance through its advanced triaxial design. The woofer, midrange radiator and tweeter are all axially mounted within a single speaker system. Rigid low alloy die cast frame ensures perfect alignment and minimum space. Brief Specification: Freq. Response: 30-16,000 c.p.s. Capacity: 10 watt, Peak 20 watt. Impedance: 16 ohm. Crossover Frequency: 18,000 c.p.s., 5,000 c.p.s. **PRICE 10 KRS.**

EAGLE DE-LUXE 4 BAND SHORT WAVE COMMUNICATION RECEIVER RX.60.



4 band power-packed Superheterodyne circuit Covers Broadcast Band (850-1600 Kc/s) and Short Wave from 1.6-30 Mc/s in 3 bands. Electrical Bandspread. Built-in "S" meter. A.V.C. noise limiter, B.F.O., Phone Jack. Built-in 5in. speaker. Never before such fantastic value in Short Wave receiver, beautifully styled, features a precision electrical Bandspread dial, 0-100 logging scale for easy self calibration. Separate bandspread tuning condenser and calibrated "S" meter for accurate tuning. Sensitive circuit features A.V.C. to minimise blasting and/or fade out. A.N.L., to reduce annoying interference. **FOR THE BUY OF YOUR LIFE SEND S.A.E. FOR FURTHER DETAILS.**

RELDA EXCLUSIVE!!!

100,000 O.P.V. MULTI-TESTER



MODEL EP.100K. A handy size high sensitivity multi-tester with a shock-proof meter of 9.5μA. Incorporates three germanium diodes and simplified meter scale for easy reading. **RANGES:** D.C. Volts: 0.5V, 2.5V, 10V, 50V, 250V. (100,000 ohm/V), 500V, 1,000V, (35,000 ohm/V), A.C. Volts: 2.5V, 10V, 50V, 250V, 1,000V. (12,500 ohm/V). D.C. Amps: 10μA, 250μA, 2.5mA, 25mA, 250mA. Ohms: 0-20K ohm, 0-200K ohm, 0-2M ohm, 0-20M ohm. Centre—160 ohm, 1.6K ohm, 16K ohm, 160K ohm. L.L.: 18μA, 180μA, 1.8mA, 18mA. L.V. 3V.

Decibels: minus 20db—plus 62db. Size: 5 1/2" x 3 1/2" x 2 1/2".

ORIGINALLY £14.14.0.

OUR PRICE £6.19.6 COMPLETE

SIGNAL INJECTION PROBE IT.I.



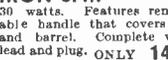
Push button operation. Ideal for making rapid checks on radios, TV, Amps tuners, etc. **PRICE 42/6**

A MINIATURE TAPE RECORDER IN KIT FORM ONLY



Exclusively offered complete with all accessories. No extras to buy. Consisting of three transistor amplifier, record-play, volume control, miniature speaker, forward-stop-rewind switch, reel of tape and spare reel, motor, attractive coloured case, Mic. and earphone sockets, pick-up coil mike, earphone and carrying handle supplied. Standard battery operated. Simple to put together in less than one hour. Brand new and guaranteed.

PORTABLE MAINS SOLDERING IRON SP.1.



30 watts. Features removable handle that covers tip and barrel. Complete with lead and plug. **ONLY 14/6**

R.F. FIELD INDICATOR



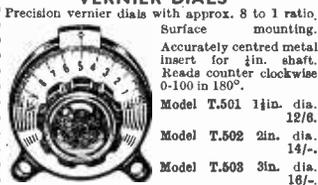
RF.40. Designed for checking the radiation from a transmitting antenna. The sensitivity can be controlled by adjustment of panel control or by increasing distance from the radiator. Freq. range 1-250 Mc/s. 200μA D.C. Meter. Complete as illustration with instructions. **Price 69/6.**

PICK-UP ARM COMPLETE



Transcription type. Wired for stereo and complete with LP/78 Stereo/Mono turn-over cartridge. **Price £37.0.**

VERNIER DIALS



Precision vernier dials with approx. 8 to 1 ratio. Surface mounting. Accurately centred metal insert for in. shaft. Reads counter clockwise 0-100 in 180°. **Model T.501 1 1/2in. dia. 12/6.** **Model T.502 2in. dia. 14/-.** **Model T.503 3in. dia. 16/-.**

SA.80 INTEGRATED STEREO AMPLIFIER



4 x 4 watt. The perfect choice for a low cost, Hi-Fi stereo system. Dual pick-up and tune inputs. Tone control. Independent volume controls. 15 ohm speaker output. Supplied complete for only **£9.10.0**

SA.150 INTEGRATED STEREO AMPLIFIER

A brilliant stereo and monaural performer with the wide range response, low distortion, low hum and noise characteristics you would expect of amplifiers many times its price. Engineered to supreme professional standards for your listening pleasure. 15 watts output. SIX Inputs. Tuner. Pick-up Magnetic. Pick-up Crystal. Tape, Mike and Aux. Controls: Volume, Balance, Bass Treble, On/off. Mode control and Function control for Stereo, Reverse Stereo, Mono A, Mono B, Mono A and B. Impedance: 4 and 16 ohms. Freq. response +1db. 40-15000 c.p.s. AC 200/250 v. Size 11 x 3 1/2 x 7 1/2in. Price complete with operating manual, £16.10.0.

TD.79. TAPE HEAD DEMAGNETIZER

The TD. 79 is a compact easy to handle, truly professional quality tape head demagnetizer to completely remove magnetism from tape heads, permitting improved tape recordings and through frequent use reduces harmonic distortion and noise level. 250 v. AC complete with instructions. **PRICE 29/6.**

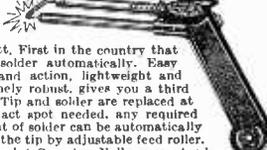
RC.12 AUTOMATIC RECORD CLEANER

Now you can protect your valuable records from dirt and dust—the professional way. The RC.12 record-cleaner is easily fitted to any pick-up arm, either autochanger or transcription type and there is absolutely no change on needle pressure. The brush contains many hairs different in thickness, length and set towards different directions. Thus removing dirt and dust over the entire record which is absorbed on a rotating roller. Complete with adjustable mounting bracket to fit all arms. **Complete with instructions. PRICE 16/6**

INEXPENSIVE HI-FI RADIO JACK GT.50.

Full medium wave coverage. Ideal for all tape recorders, amplifiers etc. No batteries required—just plug in. You will be amazed at the reception this pushes into your equipment. **ONLY 29/-**

AUTOMATIC SOLDERING IRON S.F.I.



30 watt. First in the country that feeds solder automatically. Easy one hand action, lightweight and extremely robust, gives you a third hand. Tip and solder are replaced at the exact spot needed, any required amount of solder can be automatically fed to the tip by adjustable feed roller. Standard A.C. mains. Fully guaranteed. **ONLY 52/6**

MAIL ORDERS TO (DEPT. P), 32a COPTIC STREET, LONDON W.C.1.



CALLERS WELCOME AT 87 TOTENHAM COURT ROAD, LONDON W.1. MUS 9606

WHARFEDALE SUPER 8/RS/DD

"Strikes the right note"

SAYS DONALD ALDOUS

In a review of the Wharfedale Super 8/RS/DD in "Audio & Record Review", Donald Aldous reported as follows:—

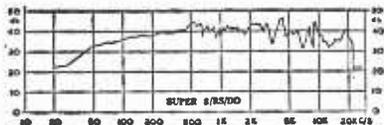


The latest Wharfedale Super 8/RS/DD speaker strikes the right note the moment it is removed from its box. It is beautifully made and finished and looks right.

The unit was tested in a corner enclosure approximately 1½ cu.ft. with the interior heavily lined with carpet felt and a vent of 1½ in. wide across the front at the bottom. The bass radiated with this enclosure was smooth and at an ideal level to give balance with the extended top response.

The music signals and tone bursts confirmed that the speaker is free from any obvious discoloration.

Summary—We agree entirely with the view of Gilbert Briggs expressed to us as "his humble opinion", that the Super 8/RS/DD unit is easily the best 8 in. model Wharfedale has ever produced. A stereo pair in small enclosures gives sound quality that will come as a revelation to any listeners wedded to massive enclosures. This can easily be matched to 2-5 ohms with the WMT1.



Impedance 10-15 ohms.
CERAMIC MAGNET Flux density 14,500 oersteds.
Total flux: 60,000 maxwells.

PRICE 134/2 incl. P.T.



**WHARFEDALE
WIRELESS
WORKS LTD**

IDLE BRADFORD YORKSHIRE
Telephone: Idle 1235/6 Telegrams: 'Wharfed' Idle, Bradford

SPEAKERS

by GOODMAN, ELAC,
PLESSEY, etc. P. & P.
4in. square 12/- 1/6
8in. round 12/- 1/6
7 x 4in. elliptical.. 13/6
8 x 5in. 16/6 2/-
10 x 6in. 23/6 2/-

GRAM-TAPE DECK MOTORS!
Special offer of famous manufacturers' motors. P. & P. 2/- 19/6 each.
TAPE HEAD ASSEMBLIES
Bramatic, as fitted to Collaro Studio deck; (Erase & Record) Playback heads, complete on mounting plate. P. & P. 1/6 39/6 each.

TRANSISTORISED MIXERS
Limited number of 3-channel mixers (Hi-impedance). P. & P. 2/- 69/6 each.
TUNING CONDENSERS
500 pF Plus FM Twin gang (gear drive). P. & P. 2/- 10/6 each.
BATTERY CHARGERS by "LINEAR" P. & P. 4/- 14 amp. .49/6 ea. 3 amp. .75/- ea.

CAR AERIALS!
High quality 3-section 42in. extended, complete with fittings. P. & P. 1/6 19/6 each.
Cable 1/- per yard extra.
METAL RECTIFIERS. 300v. 300 mA. Few only 9/6 each. P. & P. 2/-
PVE co-ax Miniature Plugs and sockets. P. & P. 1/- pair. 5/6 per pair.

OUR FAMOUS READIPACKS

- No. 1 100 resistors iw to 5w 10 ohm to 50 meg.
 - No. 2 25 condensers 1pf to 1000pf 5% to 20% .01mfd
 - No. 3 20 condensers 1000pf to .01mfd
 - No. 4 12 condensers .01mfd to 1mfd
 - No. 5 25 Hi-stab resistors 1.2 and 5% 10 ohm-25meg.
 - No. 6 10 w/w Resistors 6 ohm-82K ohm
 - No. 7 4 Carbon controls volume, tone, etc.
- All at 8/6 each. POST FREE

SWITCHES FOR MULLARD CIRCUITS

- to specification and Mullard approved"
- TR3 3V Pre-Amp. 12/6
 - TR3 3V Pre-Amp. 12/6
 - TR4 3V Pre-Amp. Lo/Pass Filt. 10/6
 - TR5 3V Pre-Amp. Hi/Pass Filt. 8/4
 - TR6 3V Tape Amp. Rec/Play 18/6
 - TR7 3V Tape Amp. Eqz. 7/4
 - TR8 Tape Pre-Amp. Rec/Play 16/6
 - TR9 Tape Pre-Amp. Eqz. 7/4
 - TR10 Stereo Pre-Amp. Selector 18/6
 - TR11 Stereo Pre-Amp. Ch/B 9/6
 - TR12 Stereo Pre-Amp. Stereo Mono 9/6
- P. & P. 1/- per switch.

TELE-RADIO (1943) LTD

189 EDGWARE ROAD, LONDON W.2
PADDINGTON 4455

COMMUNICATION RECEIVERS

CR100/SMOD. Covers 60 kc/s-30 Mc/s in 6 bands. 11 valves 2 R.F. and 3 I.F. stages. Crystal gate, B.F.O., etc. Ready for 200/250 volt a.o. mains. 24 watt output for 30 speaker. BRAND NEW, in original packing, £35 carr. £2 S.A.E. for illustrated details.

HRO SENIOR RECEIVERS. Complete with 9 coils. £17.10.0. S.A.E. for full details.

PCR-3 RECEIVERS. 3-wave bands, medium wave and 2 short wave, from 120-13 metres. Good condition, tested 8 gns. Carr. 10/-. A.C. mains internal power supply £2 extra.

SILICON RECTIFIERS. Type 1E2 (1 x 1in.) will handle 250 volts at up to 500 mA. Replaces any TV metal rectifier. 7/6.

MOVING COIL PHONES. Finest quality Canadian with Chamois ear muffs and leather-covered headband. With lead and jack plug. Noise excluding, supremely comfortable. BRAND NEW.....£2/6, post 1/6

AVO WIDE RANGE SIGNAL GENERATORS. Six turret operated ranges covering 50 Kc/s to 80 Mc/s. For use on standard A.C. mains. Packed in original transit cases with accessories. Post-war type in new condition. £15. Carriage 10/- REAL BARGAIN.

RECEPTION SETS R280/R220. Consists of TWO identical receivers in one cabinet. EACH receiver is complete with 14 modern miniature valves (3 x 6AK5, EF91, 3 x EF92, 2 x EB91, 2 x 12AT7, Q570/20, EL91 and 5U4G) its OWN stabilised AC mains power supply and speaker. Intended for reception of one fixed frequency between 60-100 Mc/s according to crystal used but ideal for modification to 72 Mc/s or 144 Mc/s. Price complete £7.10.0 (Carr. £1) or individual receivers (less cabinet) £3.18.0 (Carr. 7/6). Circuit supplied.

AR-88 SPARE VALVES. Complete set of BRAND NEW individually boxed original valves (14). 50/- P. & P. 2/6.

RCA AR-88 SPEAKERS. 30 8in. P.M. speaker in heavy gauge black cracked steel cabinet 11 x 10 x 6in., with rubber feet. A SUPER QUALITY unit. BRAND NEW, for ONLY 65/- P.&P. 5/-.

AR-88 VIBRATOR PACKS. For 6 v. operation. Complete with vibrator and OZ4 rectifier. BRAND NEW in original cartons, 17/6. P. & P. 5/-.

MULTIMETER SPECIAL MODEL CT-500. 20,000 Ω/V. DC volts: 0 to 2.5-10-50-250-500-5,000 (20K Ω/V). AC volts: 0 to 10-50-250-500-1,000 (10K Ω/V). DC Current: 0 to 50μA, 5 mA, 50mA, 500mA. RESISTANCE: 0 to 12K Ω, 120K Ω, 1.2M Ω, 12M Ω. Mid scale 60, 600, 6K, 60K ohms. Decibels -20 to +82. In neat moulded case 5 1/2 x 3 1/2 x 1 1/2 in., with leather carrying handle, complete with batteries, leads and instructions. BRAND NEW. Fully guaranteed. 95/- P. & P. 2/6.

CHARLES BRITAIN (RADIO) LTD.
11 UPPER SAINT MARTINS LANE, LONDON, W.C.2
TEmple Bar 0545 Shop Hours 9-8 p.m. (9-1 p.m. Thursday).
Open all day Saturday.



LETTERS TO THE EDITOR

EARN YOUR TICKET!

SIR,—If carried to its logical conclusion your correspondent's views on democracy (October '63) would make life quite interesting, no driving tests, no pilots tickets, no building restrictions, perhaps all our problems would then be solved by the undenied right of the amateur physicist to test his home produced H-bomb (power limited to one megaton of course) in his own back yard.

With the arrival of this free radio age the present transistor portable craze among teenagers would be extended to transreceivers with the kids on high street all calling "CQ" to every blonde who walks down the street.

Now as one of the initiated few who managed to pass the "highly technical examination" (I left school 26 years ago at the age of 14). I would like to point out to R.L.J. that if he so desires, and if he has the enthusiasm and willpower to spend a little time in study he too will not find it difficult to become one of the initiated few, otherwise my advice to R.L.J. is to take up bird watching or possibly politics. — C. M. PARRY, GW3PHH, (Tonypreafail, Glam.)

PERMANENT VALVE IDENTIFICATION

SIR,—All amateur radio enthusiasts know the frustration of finding second-hand valves which, although probably mechanically sound, cannot be used because their type numbers have been removed by constant handling. Numerous remedies for this problem have been suggested in the past but none seem to be really permanent. However, I think I have found the answer by etching the number on to the valve envelope with acid.

I first cover a small area of the envelope with wax and then "write" the type number in the wax with a suitable stylus. Next I rub into the number just enough sodium fluoride to fill the depressions. Then I apply a couple of drops of concentrated sulphuric acid—which must be handled with the utmost care—and leave the valve undisturbed overnight. The wax can be removed the following morning, when the type number of the valve will be permanently etched on the envelope.—J. H. TURNER (Norwich).

CORRESPONDENTS WANTED

SIR,—A friend and I, aged 12 and 14 years respectively, would like to correspond with other readers of P.W. who are about the same age. We are keen S.W.L.s and are already interested in many aspects of radio and electronics and would therefore be pleased to hear from any young readers of P.W. having similar interests. — P. GASKELL, 131 Greenfield Road, St. Helens, Lancs.

Whilst we are always pleased to assist readers with their technical difficulties, we regret that we are unable to supply diagrams or provide instructions for modifying commercial or surplus equipment. We cannot supply alternative details for receivers described in these pages. WE CANNOT UNDERTAKE TO ANSWER QUERIES OVER THE TELEPHONE. If a postal reply is required a stamped and addressed envelope must be enclosed with the coupon from page iii of the cover.

The Editor does not necessarily agree with the opinions expressed by his correspondents

Sir,—I would be grateful if any reader could sell or loan me . . .

. . . the October 1958, the August, September and October 1959, and the February and December 1962 issues of P.W.—J. R. AULT, 17, Hollyhedge Road, West Bromwich, Staffs.

. . . the January and February 1962 issues of P.W.—P. WARREN, 6 Lime Grove, St. Neots, Huntingdonshire.

. . . the February 1961 issue of P.W.—S. MATTHEWS, 13 Wensley Gardens, Leeds 7, Yorks.

. . . the circuit and/or manual for the Hallicrafters S-40B receiver.—M. J. WICKSTEAD, 99 Earlsfield Road, London SW18.

. . . the June and August 1961 and May 1963 issues of P.W.—M. HERRING, 59 Groundwell Road, Swindon, Wilts.

. . . the August 1962 issue of P.W.—D. DAVIDSON, c/o Clark, 43 Acrehill Street, Glasgow E3.

. . . the circuit diagram of a three-waveband H.M.V. receiver, type 482. — P. K. TARLING, 9 Guithavon Street, Witham, Essex.

. . . the issues of P.W. giving data on the No. 19 set and any other information available.—J. SCANLAN, 22 Sidland Road, Barmulloch, Glasgow N1.

. . . the circuit and wiring diagram of the No. 19 set supply unit No. 2.—D. R. BROOKS, 61 Elmsleigh Gardens, Bassett, Southampton.

. . . the issues of P.W. containing information on the R.1155 receiver.—W. DAVIES, 78 Lapwing Lane, Brinnington, Stockport, Cheshire.

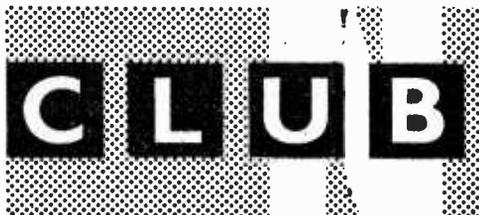
. . . a service sheet for the Sharp transistor receiver, model No. BX-326.—G. STEWART, 12 Baronhill, Cumbernauld, Glasgow.

. . . the April 1953 issue of P.W.—A. J. HILLS, 89 Cornwallis Road, Cowley, Oxford.

TREMOLO OR VIBRATO

SIR,—There seems to be some confusion in the minds of some of the contributors to your magazine, with regard to the use of the term "tremolo unit" in describing various devices associated with guitar amplifiers and electronic organs. The confusion seems to arise from a misinterpretation of the musical terms tremolo and vibrato.

—continued overleaf



ISLE OF WIGHT RADIO SOCIETY

Hon. Sec.: Capt. E. C. Dolling, "Sweet Briars", New Road, Wootton Bridge, I.W.

At recent meetings members have been preparing for the increased activity which the approaching winter months will bring. Now that the Society has obtained its own call sign, all efforts are being made to get on the air as soon as possible from their new premises of the Unity Hall, Wootton Bridge.

LOUGHTON AND DISTRICT RADIO CLUB

Hon. Sec.: D. J. Penny, G3PEN, 175 Burrow Road, Chigwell, Essex.

This Club has only recently been formed and at the moment members meet fortnightly at the Loughton Community Centre, Dabden, Essex. Separate meetings are held for younger members when instruction on radio theory and Morse is given.

MELTON MOWBRAY AMATEUR RADIO SOCIETY

Hon. Sec.: D. W. Lilley, G3FDF, 23 Melton Road, Asfordby Hill, Melton Mowbray, Leicestershire.

On the 19th September the Annual General Meeting of this Society was held in Melton Mowbray. The main item on the agenda was the programme of activities for the winter session, which was discussed and compiled during the evening.

MITCHAM AND DISTRICT RADIO SOCIETY

Hon. Sec.: Alan Thurlley, 50 Bruce Road, Mitcham, Surrey.

On 13th September a junk sale was held at the Society's H.Q. The Society is making preparations to co-operate with the Mitcham District Scouts in the forthcoming Boy Scouts "Jamboree-on-the-Air" which will be held in October. Members for the Society will be operating equipment on the h.f. and 2m bands during this two-day event.

NORTHERN HEIGHTS AMATEUR RADIO SOCIETY

Hon. Sec.: A. Robinson, G3MDW, Candy Cabin, Ogden, Halifax, Yorkshire.

On 11th September Northern Heights members were hosts to visiting members of the Manchester Radio Society for a Pea and Pie Supper. Later in the month on the 25th, K. Walton (G3IKS) gave a lecture on "Lightning", explaining its nature and effects. G3IKS illustrated his lecture with dramatic demonstrations using a 1/2 million volt discharge to produce some considerable "flashes".

Preparations are going ahead to organise a coach party of 40 to visit this year's International Communications Exhibition.

READING AMATEUR RADIO CLUB

Hon. Sec.: R. G. Nash, G3EJA, "Peacehaven", 9 Holybrook Road, Reading, Berkshire.

The only meeting for September was held on the 28th when "Transistor Power Supplies" was the subject of the lecture given by G8SC.

SCARBOROUGH AMATEUR RADIO SOCIETY

Hon. Sec.: P. B. Briscoe, G8KU, "Roseacre", Irton, Scarborough, Yorkshire.

The month's activities began with a sale of surplus gear on 15th September. On the 12th members made "at home" visits to G8KU, G3NRI, G3NRS and G3JTG.

A week later, "Antennas and Couplers" was the topic under examination, and on the 26th a quiz provided the evening's entertainment.

SHEFFIELD AMATEUR RADIO CLUB

Hon. Sec.: D. A. Justice, G3PYL, 314 Stannington Road, Sheffield 6.

The Club meets on every second and fourth Friday in the month when new members will be welcomed. Members and prospective members are asked to note the new address of the Club secretary as shown above.

WESSEX AMATEUR RADIO GROUP

Hon. Sec.: G. J. Fowle, 138 Surrey Road, Branksome, Poole, Dorset.

It is intended to record all the Group's activities this year on 8 mm. colour cine film.

On 12th September members visited Pool power station and on the 16th an informal get-together was held at the President's house.

At the last meeting for the month, members took part in a quiz and also heard a talk on "Railway Signalling and Communications" which was given by G. J. Fowle.

WEST KENT AMATEUR RADIO SOCIETY

Members operated a 2m station for 24 hours when V.H.F. National Field Day was held on 7/8th September.

The second meeting for the month was devoted to the first of a series of talks and discussions entitled "100 Years of Wireless".

WIMBLEDON AND DISTRICT RADIO SOCIETY

Hon. Sec.: R. G. Baker, G6QN, 1 Boundary Road, Colliers Wood, London S.W.19.

This society has recently been re-established, after a considerable number of years, by the efforts of a small body of local enthusiasts. A pro tem committee will continue to function until December, when a properly constituted panel of officers will be elected.

Local radio enthusiasts are invited to attend any of the meetings which are held on the second Friday of each month at the Community Centre, St. George's Road, Wimbledon, London S.W.19.

WIRRAL AMATEUR RADIO SOCIETY

Hon. Sec.: A. Seed, G3FOO, 31 Withert Avenue, Bebington, Wirral, Cheshire.

September activities began with a sale of surplus equipment. This was followed by a talk on "Valve Uses", given on the 18th.

The first meeting in October was the Annual General Meeting, held on the 2nd.

R.S.G.B. Contests for October. R.A.E.N. Rally (6th October); 7Mc/s DX Contest—phone (15th to 20th October) and Second 420Mc/s Contest (27th October).

Correction. We draw the attention of readers to the fact that the South Shields and District Amateur Radio Club's Mobile Rally, which was reported on the September Club News page as having been held on 7th July, did not, in fact, take place, due to an unforeseen incident.

LETTERS TO THE EDITOR

—continued from previous page

The tremolo effect describes the slight variations of frequency which may be produced by an instrument to add "colour" to an otherwise steady note and is, in fact, frequency modulation of the note. The vibrato effect, however, describes the variations in amplitude which may be produced, and is, in fact, amplitude modulation of the note.

The tremolo effect is produced mechanically in the case of a guitar, by changing the tension in the strings by means of a lever and spring system, commonly called a "tremolo arm". The vibrato effect is usually produced electronically in the amplifier system by some sort of amplitude modulator such as described in the March 1963 issue of P.W. In the case of electronic organs both effects may be produced by modulating the oscillators producing the fundamental notes.

The devices described in Practical Wireless for use with guitar amplifiers are amplitude modulation devices and the term "tremolo unit", although used by some manufacturers to describe these units, is quite incorrect and misleading. These devices are "vibrato units". I for one would be very interested to see an electronic device which produces a true tremolo effect with guitar amplifiers!—PETER A. ROE (Aspley, Nottingham).

RETURN-OF-POST SERVICE

We offer a really efficient Mail Order Service on all items stocked. All cash orders are dealt with on the day of receipt. ★ Hire purchase orders are subject to slight delay but this is kept to the absolute minimum.

● 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, GEC912 Plus. Fully detailed list on any of these sent upon request.
Instruction Manuals: All Mullard Audio Circuits in "Circuits for Audio Amplifiers". 9/5. GEC912, 4/6. All post free.

● TRANSISTOR YOUR CRYSTAL SET

We have two new designs for Transistor amplifiers which can be used to greatly improve the signal from any crystal set. RLD4 Kit, one stage 10/6; RLD5 Kit, two stage 17/6, both post free. The kits are easy to build and very detailed instructions are supplied. Leaflet available.

● CLOSE TOLERANCE CONDENSERS

Radiospares first grade Silver Mica. Tolerance—up to 39pf. ± 1pf. 47pf. up to 1%, 4.7, 10, 15, 18, 22, 27, 33, 39, 47, 50, 56, 68, 75, 82, 100, 120, 150, 180, 200, 220, 250, 270, 300pf. All 9d. each. 330, 390, 470, 500, 560, 680, 750, 820. All 1/2 each. 1000, 1500, 1800, 2200, 2700, 3600, 4700, 5000pf. All 1/9 each. Postage extra.

● MINIATURE WIRE WOUND RESISTORS

5 watt, 5% tol. Size 1 x in. 15, 25, 30, 39, 50, 68, 75, 100, 125, 150, 180, 200, 220, 250, 270, 300, 350, 400, 470, 680, 750, 820 ohms, 1k., 1.2k., 1.5k., 1.8k., 2.2k., 2.7k., 3k., 3.3k., 3.9k., 4.7k., 5.6k., 6.8k., 8.2k., All 1/6d. each. Postage extra on all above.

● NEW MULLARD CONDENSERS

Mullard Miniature Foil and Polyester condensers as used in the latest TV and Transistor sets.
Miniature Foil, 30 volt working for Transistor sets. .01mfd, 74d.; .022mfd, 9d.; .047mfd, 39d.; .1mfd, 11d.
Polyester Tubular Capacitors. Moulded outer case designed to withstand accidental contact with the soldering iron. Tolerance 10%. 125v. range: .01mfd, .022mfd, .047mfd, all 9d. each. .1mfd, 1/2; .22mfd, 1/3; .47mfd, 1/6; .1mfd, 3/-.
400v. range: .001mfd, .0022mfd, .0047mfd, .01mfd, .022mfd, all 9d. each. .047mfd, 1/2; .1mfd, 1/3; .22mfd, 1/6; .47mfd, 2/5. Postage extra.

● MINIATURE ELECTROLYTIC CONDENSERS

Latest miniature types by Mullard and Radio spares.
RADIO SPARES. All 15 volt, 2mfd, 4mfd, 5mfd, 8mfd, 10mfd, 16mfd, 32mfd, 50mfd, 100mfd, all 2/3 each. Postage extra.
MULLARD. 2mfd, 10v. 1/8; 4mfd, 4v. 1/8; 10mfd, 16v. 1/8; 16mfd, 10v. 1/8; 25mfd, 4v. 1/8; 25mfd, 25v. 1/3; 32mfd, 2.5v. 1/8; 32mfd, 40v. 1/8.

● "SYNCHROPAPE" RECORDING TAPE

Low priced British tape, all reels fitted with leaders.
Standard Play: 600ft. (5") 13/6; 850ft. (5 1/2") 17/-; 1,200ft. (7") 21/-.
Long Play: 900ft. (5 1/2") 17/-; 1,200ft. (5 1/2") 20/-; 1,800ft. (7") 30/-.
All Post Free.

● TAPE RECORDING EQUIPMENT

TAPE DECKS Hire Purchase
ALL CARRIAGE FREE Cash Price Deposit Mthly/Pmts.
COLLARO STUDIO, Latest model. Two track. Bradmatic Heads .. £10.19.6 £2. 3.6 12 of 16/4
Four Track, Marriott Heads .. £17.17.0 £3.12.0 12 of 26/2
W. MARTIN TAPE AMPLIFIER KITS

Tape Amplifiers
For Collaro 8311-V 2-Track £11.11.0 8311-4-V 4-Track £12.12.0
Tape Pre-Amplifiers
For Collaro 8312-CP 2-Track £8.8.0 8312-4-CP 4-Track £9.9.0
Drop through assembly for mounting 8312 Pre-Amp under Collaro Deck. £11.6.0
Carrying Cases with speaker. For Collaro Deck and 8311 Amplifier £5.5.0.

H.P. 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.

● LOUDSPEAKERS

GOODMANS: Axlette 8in., £5.5.7; Axiom 10in., £6.5.11; 12in., Axiom 20, £10.7.0; 12in., Axiom 301, £14.10.0; 12in., Audiom 51 Bass, £8.14.0; 12in., Audiom 61 Bass, £13.14.0; Treble Tweeter, £6.4.0; X05000 Crossover unit, £1.19.0.
WHITELEY: HF1016 10in., £7.0.0; HF1012 10in., £4.7.6; HF816 8in., £6.0.0; T816 8in., £5.13.6; 110 Tweeter, £4.8.3; T333 Tweeter, £1.10.8; CX3000 Crossover unit, £1.11.6; CX1500 Crossover unit, £2.0.0. H.P. Terms available on all speakers.

● STEREO COMPONENTS

Morganite lagged potentiometers as specified for the Mullard circuits. ★ Log/Anti-Log, 500k, 1 meg., 2 meg. ★ Log/Log, 50k, 250k, 1 meg., 2 meg. ★ Lin/Lin 250k, 500k, 1 meg., 2 meg. All 10/6 each. Postage extra.

● TRANSISTORS

MULLARD. Current production types, not rejects. All in makers' boxes. Postage 3d. on each.
AF114, 11/-; AF115, 10/6; AF116, 10/-; AF117, 9/6; OC44, 9/3; OC45, 9/-; OC70 and OC71, 6/8; OC72, 8/-; OC72 Matched Pairs, 16/-; OC78, 8/-; OC81, 8/-; OC170, 9/6; OC171, 10/6. Any other Mullard type obtained promptly. Ask for quotation.

● JASON F.M. TUNERS

We stock all parts needed for the construction of these excellent tuners. All parts can be supplied separately but we can offer attractive reductions in price if all items are purchased at same time as follows:

FMT1, £6.12.6; FMT2 (less power), £7.15.0.
FMT2 (with power), £9.12.6; FMT3 (less power), £9.9.6.
FMT3 (with power), £11.7.6. Mercury 2, £10.14.6.
JTV2, £14.12.6.

Hire Purchase Terms available. Ask for list.

● P.W. STRAND, MAYFAIR & SAVOY UNITS

We stock parts for the P.W. Strand Amplifier, Mayfair Pre-Amplifier and Savoy FM Tuner. Detailed price lists are available.

● LATEST TEST METERS

	Cash Price	Deposit	Hire Purchase Mthly/Pmts.
AVO Model 8 Mark II ..	£24. 0.0	£4.16.0	12 of £1.5.2
AVO Model 7 Mark II ..	£21. 0.0	£4. 4.0	12 of £1.10.10
AVO Multimeter Mark 4 ..	£5.14.0	£1.8.0	12 of 1/4
T.M.K. TP10 ..	£3.19.6	£1. 3.6	3 of £1.2.0
T.M.K. TP5s ..	£5.19.6	£1.15.6	3 of £1.11.4
T.M.K. Model 500 ..	£8.19.6	£1.15.6	12 of 13/8
TAYLOR MODEL 127A ..	£10.10.0	£2. 2.0	12 of 15/8
CABY A10 .. (Post 1/9)	£4.17.6	£1. 7.6	3 of £1.6.8
CABY B-20 ..	£6.10.0	£2. 0.0	3 of £1.13.4
CABY M-1 .. (Post 1/3)	£2.14.0	—	—

Full details of any of the above supplied free on request.
The AVO models 7 and 8 are both latest models from current production—not to be confused with Government Surplus.

● OUTPUT TRANSFORMERS

GILSON: W0666A, W0696B, 50/6, post 2/6. W0710, 55/6, post 2/6. W0822, 62/3, post 2/9. W0767, 27/-, post 1/6. W01796A, 57/6, post 2/6. W01832, 48/-, post 2/6.
PARTRIDGE: P3667, 75/-, post 2/9. P4131, 75/-, post 2/9.
PARMEKO: P2629, 47/6; P2642, 45/-; P2643, 47/6. All plus post 2/9; P2641, 29/6, post 2/-; P2628, 17/-, post 2/-; P2632, 41/-, post 2/6.
ELSTONE: O7/ML, 49/6, post 2/9; O7/3, 27/6, post 2/6.

● MAINS TRANSFORMERS

GILSON: W0741A, 63/-, post 4/-; W0639, 48/9, post 2/6; W01326, 58/6, post 3/6; W01288, 58/-, post 3/6; W01566, 80/-, post 4/6; W01341, Choke, 30/-, post 2/-.
PARMEKO: P2630, 35/-, post 2/9; P2630, 54/9, post 3/3; P2644, 76/6, post 4/-; P2630, 41/-, post 3/-; P2631, 56/6, post 3/3.
ELSTONE: MT/MU, 48/6, post 3/3; MT/3M, 38/6, post 3/-; MT/510, 46/3, post 3/3.

● GRAMOPHONE EQUIPMENT

ALL LATEST MODELS Hire Purchase
ALL POST FREE Cash Price Deposit Mthly/Pmts.

RECORD CHANGERS
GARRARD AUTOSLIM (Mono PU) .. £7. 2.6 £1. 8.6 12 of 11/8
GARRARD AUTOSLIM De-luxe AT6 (Mono PU) .. £11. 9.0 £2. 6.0 12 of 16/11
GARRARD AUTOSLIM AT6 (Stereo/Mono PU) .. £12. 5.4 £2. 9.4 12 of 18/-
B.S.R. UA14 (TC8 Mono PU) .. £28.19.6 £1. 7.6 12 of 11/-
B.S.R. UA14 Monarch (TC8S Stereo/LP78) .. £7.19.6 £1.11.6 12 of 12/4
B.S.R. UA16 (TC8 Mono PU) .. £7.19.6 £1.11.6 12 of 12/4
B.S.R. UA16 (TC8S Stereo/LP78) .. £8.19.6 £1.15.6 12 of 13/8
SINGLE RECORD PLAYERS
B.S.R. TU12 (TC8 Mono PU) .. £3.17.6 £1. 4.8 3 of £1.1.0
B.S.R. GU7 (TC8 Mono PU) .. £4.18.8 £1. 8.8 3 of £1.6.8
GARRARD SRP10 (Mono PU) .. £5. 9.11 £1.12.11 3 of £1.9.0

TRANSCRIPTION UNITS
GARRARD 4HE (483 PU) .. £16.12.6 £3. 6.8 12 of £1.4.5
PHILIPS AG1016 (S/M PU) .. £12.12.0 £2.10.0 12 of 15/8
Many of the above can be supplied for stereo working. See our Gramophone Equipment List for details.

★ TERMS OF BUSINESS

Cash with order or C.O.D. We charge C.O.D. orders as follows: Up to £5, minimum of £2. Over £5 and under £10, 2/6. Over £10, no charge. Postage extra on CASH orders under £5 except where stated. Postage extra on overseas orders irrespective of price.

WATTS RADIO

(MAIL ORDER) LTD.

54 CHURCH ST., WEYBRIDGE, SURREY

Telephone: Weybridge 47556

Please note: Postal business only from this address
Callers welcome by appointment

★ HIRE PURCHASE TERMS

Available on any item. Repayments over 3, 6 or 12 months as below. Three months: Deposit 6/- in the £. Service charge 5%. minimum charge 10/-. Six months: Deposit 5/- in the £. Service charge 7%. minimum charge 15/-. Twelve months: Deposit 4/- in the £. Service charge 10%. minimum charge 20/-.

Lewis have the Cabinet for you

We can supply any cabinet to your own specification

This is only one example of—
THE LARGEST RANGE OF CABINETS IN THE COUNTRY

Equipment is also our speciality.



The Grosvenor
Price 18 gns.



The Lowboy
Price 24 gns.

LEWIS radio

100(P113) Chase Side, Southgate,
London, N.14. Tel 3733/9666

Send today for the two new
Lewis Catalogues

Designed to assist your choice of
cabinet and equipment.

THE New Lewis Radio Cabinet Catalogue—the most comprehensive ever prepared. THE unique 64 page equipment catalogue.

Please send your two new catalogues enclosed in P.O. for 3/6 which will be credited against any purchase I make.

Name

Address

BLOCK CAPITALS PLEASE

Tens of thousands of enthusiasts have learned the basic facts from these two inexpensive books . . .



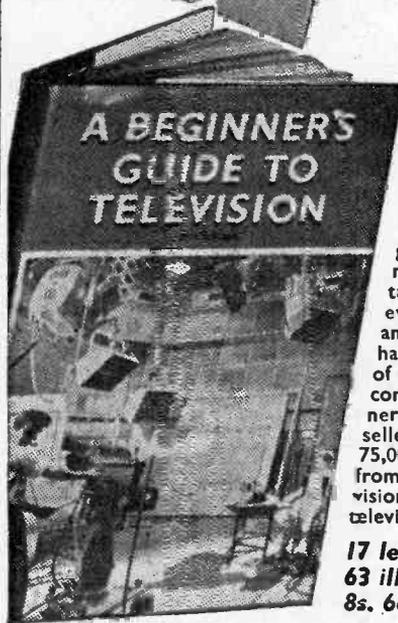
A BEGINNER'S GUIDE TO RADIO

This famous practical book is specially written for those who are taking up studies in radio transmission and reception and for those seeking a "refresher" course. Written in non-technical language it covers every aspect and each new term as it occurs is clearly and fully explained. Practical experiments are described to explain the theory including information on building and modifying a simple receiver—with explanations as to the function of each part.

27 lessons. 5th Edition

100 illustrations

7s. 6d. (8s. 6d. by post)



A BEGINNER'S GUIDE TO TELEVISION

The modern miracle of television is here explained in a series of seventeen lessons. Written in non-technical language which the veriest beginner can understand, the reader is taken by easy stages through every aspect of TV transmission and reception. A further lesson has been added on the conversion of 405 to 625 line pictures. It is a companion volume to the "Beginner's Guide To Radio", a best seller which has already sold over 75,000 copies. Covers everything from scanning and persistence of vision to colour and stereoscopic television.

17 lessons. 3rd Edition

63 illustrations

8s. 6d. (9s. 6d. by post)

**Make sure of
Your Copies
TODAY**

FROM ALL BOOKSELLERS

or, in case of difficulty, at post prices from George
Newnes Ltd., Tower House, Southampton Street, London
W.C.2.

NEWNES

The Progressive Portable

—continued from page 633

and rotate the oscillator coil and IFT cores until they are about level with the tops of the screening cans.

With the volume control advanced about one quarter, as mentioned, try to tune in the local station. If it is heard, tune it in as well as possible, and adjust the IFT cores for best volume. Signals may become much too loud, in which case the volume control should be turned back.

It should then be possible to tune in some transmission near the high frequency (low wavelength) end of the band; that is, with the variable capacitor nearly open. Rotate the trimmers to bring this transmission up to best volume.

A station of high wavelength (capacitor nearly closed) is then sought. The aerial winding is then pushed along the ferrite rod, to bring this up to best volume.

Repeating the procedure once or twice, with weak signals, should give correct ganging, as shown by full sensitivity throughout the whole tuning range.

If the local station cannot in any circumstances be heard, attach a few feet of wire, as an external aerial, to the green lead tag. This should give a signal allowing rough adjustments to be made. It should then be possible to hear the station with no external aerial, and alignment can then proceed as mentioned.

Adjustment to this part of the receiver will remain approximately correct, even when the other stages are added. In view of the simple nature of the circuit, no particular difficulty should arise in aligning. The most probable faults are wrong band coverage.

If the set does not tune to a high enough wavelength, even with the capacitor fully closed, this can be corrected by screwing the oscillator coil in slightly, and pushing the aerial winding a little farther on the rod.

Should the receiver fail to reach a low enough wavelength, with the tuning capacitor fully open, this indicates that the trimmers are screwed down too far. Unscrew both by an equal amount, then re-trim as explained.

TO BE CONTINUED

★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

★ SEND A "PRACTICAL" CHRISTMAS ★
★ GIFT! ★

★ You're holding the ideal Christmas gift in your hands ★
★ now. Yes, PRACTICAL WIRELESS. Why not send a ★
★ year's subscription for this invaluable magazine to ★
★ friends who are radio enthusiasts. It's a present you ★
★ know they'll appreciate. And each new issue will be ★
★ a renewal of your best wishes . . . month in, month out, ★
★ right up until Christmas 1964. ★

★ Simply send your friends' names and addresses, ★
★ together with your own and remittance * to cover ★
★ each subscription to The Subscription Manager (G.I), ★
★ PRACTICAL WIRELESS, Tower House, Southampton ★
★ Street, London, W.C.2. We will despatch first copies ★
★ to arrive in time for Christmas, and send an attractive ★
★ Christmas Greetings Card in your name to announce ★
★ each gift. ★

★ * RATES (INCLUDING POSTAGE) FOR ONE YEAR ★
★ (12 ISSUES): U.K. AND OVERSEAS £1. 9s. 0d., ★
★ U.S.A. \$4.25. ★

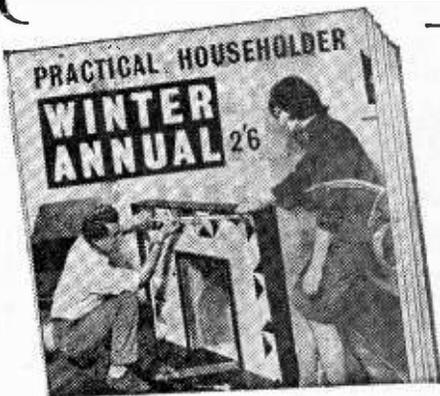
★ To make sure of your own copy why not place a regular ★
★ order with your newsagent? ★

★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

JUST OUT!

PRACTICAL HOUSEHOLDER

WINTER ANNUAL



Your Guide to a Better, Brighter, Warmer Home

Make this your cosiest, brightest winter yet with the help of this invaluable new PRACTICAL HOUSEHOLDER annual. It's stacked with ideas on winterproofing and improving your home, with expert instructions and how-to-do-it illustrations that show you how to tackle every job—at a big money saving. Make sure of your copy!

Special Sections include:

HEATING INSTALLATIONS. Frost precautions—double glazing—heating and insulating the whole house—modern fires and stoves—improving hot water supply—fuel storage.

DAMP-PROOFING, REPAIRS. Weather protection of exterior walls—dealing with condensation—roof slating, asphaltting, felting—new look for rough walls.

LIGHTING, FIRES, FIREPLACES. Fluorescent installation—2-way switching—porch lighting—building tiled or stone fireplaces—how to choose electric fires.

PLUMBING, SANITATION. Luxury in the bathroom—fitting bedroom basins—drainage system—re-designing hot water system—WC repairs.

POWER TOOLS. How to choose and use them—use and maintenance of electric saws—building a small forge, wrought iron work, key cutting.

PLANS AND DIAGRAMS. To build a kidney dressing table, drop-leaf wall table, divan headboard, child's chair and toys, workbench, garden equipment, etc.

2/6 from all Newsagents and Bookstalls.

BIG DEMAND! Go for Yours Now!

**RADIO SOCIETY OF GREAT BRITAIN
GOLDEN JUBILEE YEAR
1913-1963**



International

**RADIO
COMMUNICATIONS
EXHIBITION**

**SEYMOUR HALL, SEYMOUR PLACE
MARBLE ARCH W.1**

**OCTOBER 30th to NOVEMBER 2nd
10 a.m. to 9 p.m.**

FIFTY YEARS OF RADIO DISPLAY

**BRITISH BROADCASTING CORPORATION
POST OFFICE ENGINEERING, ROYAL AIR FORCE
ROYAL NAVY & ARMY DEMONSTRATIONS
COMPETITIONS OF HOME CONSTRUCTION EQUIPMENT
LATEST RECEIVING & TRANSMITTING SETS
NEW TV & V.H.F. AERIALS and MASTS
TECHNICAL BOOKSHOPS DISPLAY. MOBILE EQUIPMENT**

**Win £185 Hammarlund HQ 170
Communication Receiver**

(EXCHANGE THIS ADVERTISEMENT FOR COMPETITION ENTRY FORM)

ADMISSION 3/-

D. & B. TELEVISION

(WIMBLEDON) LIMITED. PHONE: CHE 3955

131 & 131a, KINGSTON ROAD,
SOUTH WIMBLEDON, LONDON, S.W.19.

"COMPARE OUR PRICES WITH ANY OTHERS"

For the FINEST SERVICE in the COUNTRY. We are open from 9 a.m. to 5 p.m.—1 p.m. on WEDNESDAYS. For any information or problems you have, call or phone, we are always pleased to help.

LINE OUTPUT TRANSFORMERS AND SCAN COIL SPECIALISTS

ALL TYPES IN STOCK. See Previous Lists or send S.A.E. Enquiries.

FERGUSON 992—994—996—998 L.O.P.T.s. BRAND NEW 27/6 each. P.P. 3/-.

FYE SCAN COILS and L.O.P.T.s. V4, V14, V7, V17. Used part in perfect working order 25/- each. P.P. 3/6.

90° SCAN COILS BRAND NEW, 12/6 per pair. P.P. 3/-.

110° SCAN COILS, 15/- per pair. P.P. 3/-.

MISCELLANEOUS SURPLUS L.O.P.T.s. NEW £1.0.0 each. P.P. 3/-.

FIREBALL TURRET TUNERS. 38 Mc/s. Ex. Equipment. Perfect, 25/- each. P.P. 8/-.

CLYDON AND BRAY HEAD TURRET TUNERS, 38 Mc/s. 10/- each. P.P. 3/-.

SURPLUS AND SECONDS G.E. TUBES 12in. 25/-, 14in. 45/-, 17in. 65/-, All Guaranteed. Carriage 25/- extra.

MAINS DROPPERS, modern Sat type, 1/6 each. P.P. 6d.

SURPLUS MAINS DROPPERS, Bound. 100 ohms, 420 ohms, 110 ohms. Tapped 200V., 234V., 250V. (Brand New) 1/6 each. P.P. 3d.

EDGE TYPE PRE-SET POTS. 500 K., 1 meg., 100 K., 250 K., 2 meg., 50, each. Unused. P.P. 3d.

38 Mc/s. NEW CHANNEL COILS, 1/6 pair, most channels.

LATEST GIVE AWAY BARGAINS

SLIMLINE T.V. CATHODE RAY TUBES
17in. 110°, 19in. 110°, 21in. 110°, 23in. 110°
MANUFACTURERS' REJECTS, SLIGHTLY IMPERFECT
NEW AT 47/6 each.

BRAND NEW T.V. CABINETS
17in., 19in., 21in., 23in. 15/- each.

VALVES CHEAPEST IN THE COUNTRY, SEND FOR LISTS, S.A.E. PLEASE

GLASS RADIO DIALS. Long and Medium Wave. 1/6 each. P.P. 9d.

RADIO DIALS, V.H.F. PRESPEX Volume Tone Tuning, suitable for car radios (new), 1/- each. P.P. 6d.

RADIO DIALS. Long and Medium Wave. Approx. 2 1/2in. diameter. Printed Black/Red on Gold. 6d. each. P.P. 3d.

PRESPEX DIALS. Direct Drive Type. Black/Red on Gold. 1/6 each. P.P. 3d.

OO-AXIAL SOCKETS ON PANEL. NEW. 6d. each. P.P. 3d.

M.E.S. NEW DIAL LAMP HOLDERS. 2d. each.

K.E.T. LEADS, complete with Cavity Clip, 6d. each. P.P. 3d.

SLOW MOTION INDICATOR SPRINGS. 1/- each. P.P. 3d.

TAG STRIPS (17). 6d. each.

WE CAN ALSO SUPPLY ALL TYPES OF NEW AND USED L.O.P.T.s, SCAN COILS AND T.V. SPARES FOR ALL MAKES AND MODELS. SEND S.A.E. FOR YOUR REQUIREMENTS FOR RETURN POST QUOTATION.

TRANSISTOR RADIO CABINETS. Two-Tone. Very attractive, 2 sizes, 2 1/2 x 3 1/2 x 1 1/2in. or 3 1/2 x 3 1/2 x 1 1/2in., will take 2 1/2 x 3in. Speakers. ONLY 6/6 each. P.P. 2/-.

RADIO CABINETS. Finished in Grey covering, 13 x 7 1/2 x 6in. Very smart, 10/- each. P.P. 4/-.

REPLACEMENT RECORD PLAYER MOTORS. Tapped. 200V., 230V., 250V., 12/6 each. P.P. 3/-.

SERVICE SHEETS

Although we are new in this field, we can now supply almost any service sheet from stock. And if not we will get it for you. Radio and T.V. 4/- each. P.P. 3d.

THESE AND MANY MORE BARGAINS ALWAYS AVAILABLE.
CALLERS ALWAYS WELCOME.

WE ARE PLEASED TO ASSIST WITH ALL YOUR PROBLEMS! NOTHING IS TOO MUCH TROUBLE. IF WE HAVE NOT GOT WHAT YOU WANT, WE'LL DO OUR BEST TO GET IT.

TERMS: S.A.E., ALL ENQUIRIES C.W.O., 5/- EXTRA FOR C.O.D.

POSTAGE ON VALVES 6d. EAQW.

SATISFACTION ASSURED.

RETURN POST SERVICE (SUBJECT TO STOCK).

COMING SHORTLY IN

THE Radio Constructor

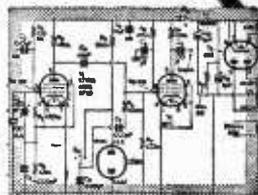
NOVEMBER

Double-Superhet Communications Receiver by F. A. Baldwin. A first class 11-valve receiver designed for a.m., s.s.b., and c.w. operation over the short wave frequencies.



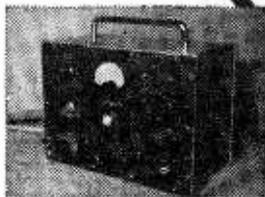
NOVEMBER

Crystal Marker by F. G. Rayer. A harmonic amplifier enabling a wide range of frequencies to be easily calibrated; a neon modulator identifying the r.f. signal.



NOVEMBER

Bench Power Supply Unit by D. Noble and D. H. Price. Voltage stabilised, this design makes an ideal unit for both practical and experimental work.



THE Radio Constructor

TO BE PUBLISHED ON 26th. OCTOBER, PRICE TWO SHILLINGS, BY DATA PUBLICATIONS LTD., 57 MAIDA VALE, LONDON W.9.

NOW THREE LOW COST COURSES TO HELP YOU BECOME AN EXPERT IN RADIO, ELECTRONICS, OR TELEVISION

Our now famous Electronic Course won instant acclaim when offered just over one year ago. NOW WE ARE PROUD TO BE ABLE TO OFFER TWO NEW COMPANION COURSES IN RADIO AND T.V. FOR THE SAME REASONABLE COST.

The lessons are crystal clear, practical, easy to master and use. Every lesson makes fundamentals clear even to the beginner, while other lessons will give you the practical "know-how" of an expert! These are real home-study courses that have been printed in large volume and bound into one giant 6 x 11in. manual to reduce cost. Compares favourably with some courses costing ten times as much. By receiving all lessons at one time you save letter writing, additional postage, and other expenses.

Everyone can benefit from these practical courses. No old fashioned ideas used here. Just straightforward easy to understand explanations to help you get ahead in radio, electronics or television. Modern wireless and t.v. sets use complex circuits, but their functions is based on surprisingly few principles. These principles can easily be mastered when explained clearly. That is the object of these courses. Soon you will be well on your way to becoming a first-class radio, electronics, or t.v. technician.

More and more people are needed every day to repair wireless sets, amplifiers, VHF/UHF radios, televisions and electronic equipment. Are YOU prepared to get your share of the money to be earned?

Just clip the coupon indicating the course required. You must be convinced that this is the best value you have ever seen in electronic, radio and t.v. training otherwise you can return the manual (or have your money refunded if sent with order) after you have examined it in your own home for a period of seven full days.

The price? Only 36/- per course, plus postage. YOU CAN QUALIFY FOR A CERTIFICATE. Details sent with each course ordered.

FREE DATA HANDBOOK WITH EVERY ORDER

FREE TRIAL OFFER

TERMS ONLY 5/- PER WEEK!

To SIM-TECH TECHNICAL BOOKS Dept. WA3, West End, Southampton, Hants.

Send ELECTRONICS COURSE
 RADIO COURSE
 TELEVISION COURSE

for a full seven days' free trial. If not delighted I may return the course post paid without further obligation on my part. Otherwise I will pay cash or 5/- weekly until paid. (No extra for interest if paid regularly.)

Tick here if enclosing full price (we pay postage). Same 7 day money-back guarantee. Postage charges 1/6 per course. Overseas customers please send full amount (including Ireland).

Name
 Address
 City County

90 DAY GUARANTEE ABSOLUTELY BRAND NEW VALVES ALWAYS IN STOCK

DAF91 5/3	EL84 7/3	U801 22/6
DAF96 7/9	EY61 8/3	UABC80 8/3
DF91 5/3	EY86 8/3	UCH81 8/6
DF96 7/9	EZ40 6/-	UCL83 12/3
DK91 6/9	EZ80 5/9	UF89 7/3
DL92 6/9	PCC84 8/-	UL41 8/-
DK96 7/9	PCF80 8/-	UL84 7/9
DL92 6/9	PCL82 8/6	UU8 17/-
DL94 7/-	PCL83 10/6	1T4 5/3
DL96 7/9	PCL85 10/6	1R5 6/9
ECC81 5/9	PL81 10/3	354 6/9
ECC82 7/3	PL83 7/9	3V5 7/-
ECC83 7/3	PY33 12/-	5Y3GT 7/9
ECC84 7/3	PY81 7/-	6V6G 5/9
ECC85 7/3	PY82 6/6	20L1 18/6
ECH81 7/3	PY800 9/6	20P4 20/-
ECL80 7/6	U25 11/3	30FL1 9/9
EF80 5/-	U26 9/6	30FL1 10/6
EF86 9/9	U191 11/9	30PL13 10/3
EL41 8/-	U301 17/-	185BT 19/6

IF VALVE NOT LISTED SEND S.A.E.

AMPLIFIERS

Individually made in our own workshop. From 500 m/w output to 75 watts output. These amplifiers can also be made to your own specification if required. Mono or Stereo. Please send S.A.E. for all enquiries. Condensers Resistors - Diodes Potentiometers Speakers - Metal Rectifiers - All Types of Radio and TV Spares - L.O.P.T.S - F.O.P.T.S - Line and Frame Blocking Ccs., T.X. We specialise in second-hand spares TECHNICAL Advice Always Available by Phone. TERMS: C.W.O. plus 6d. postage per valve. C.O.D. S.A.E. for all enquiries. We offer Green Shield stamps

Satisfaction Assured - Return Post Service
WITWORTH T.V. SERVICE
 32a, All Saints Road, London, W.11
 Tel. PARK 9972 Open all day Mon-Sat. inc.

Lyons Radio Ltd.

3 Goldhawk Road, London W.12

BATTERY CHARGER or POWER UNIT for MODEL RAILWAY. Make your own using our top grade Rectifiers and Transformers, wiring diagram supplied.

RECTIFIERS. Full wave bridge type for outputs up to 12 v. D.C. 1 amp size 5/3; 2 amp 8/9; 4 amp 12/6; 6 amp 14/6. Postage, see below.

TRANSFORMERS. Pri. 200/250 v. A.C. mains. Sec. tapped 9 and 17 v. for producing 6 or 12 v. respectively when used with above rectifiers. 1 amp size 10/-, 2 amp 14/6; 4 amp 18/6; 6 amp 25/9. Postage (up to 10/-) 2/6, over 3/6.

BATTERY CHARGERS. Ready made for charging 6 or 12 volt batteries at 3 to 4 amps. Housed in neat metal case fitted with ammeter, mains lead, battery lead with bulldog clips and voltage selector socket. Fully guaranteed. Genuine Bargain. PRICE ONLY 55/-, post 4/6.

AERIAL RODS. Set consists of 3 compressed tapering steel sections each 4ft. making up a 12ft. aerial or the ever popular fishing rod. PRICE ONLY 7/6, carriage 3/6.

1/4 H.P. ELECTRIC MOTORS. 200/250 v. A.C. mains, split phase induction type by Crompton Parkinson. Spindle 2 x 1/4 in. dia. 1440 r.p.m., reversible, with standard mounting plate and bosses for vertical or horizontal mounting. As new and unused. BARGAIN. PRICE ONLY 75/-, carriage 9/-.

AUTO TRANSFORMERS. Input 200 v. Output 230 v., 275 watts. Fully shrouded with fixing feet, overall size 4 x 3 1/2 in. Manufacturers surplus, brand new condition. SNIP PRICE ONLY 7/6, post 3/6.

POSTAL BARGAINS CATALOGUE. Send stamp for your free copy.

RADIO BOOKS

BASIC ELECTRICITY ELECTRONICS
 TESTED SHORT WAVE RECEIVER
 CIRCUITS USING M.A.T.s 5/6
 TESTED SHORT WAVE SUPERHIT
 RECEIVER CIRCUITS USING MICRO-
 ALLOY TRANSISTORS 6/6
 22 TESTED CIRCUITS USING
 Micro-Alloy Transistors 5/6

AT A GLANCE Valve and T.V. Tube equivalents 4/-
BRITISH Transistor Directory 9/-
OSCILOSCOPE Book 5/6
USING an Oscilloscope 7/-
OSCILOSCOPE Equipment 5/6
MULLARD Transistor Radios 5/6
MULLARD Ref. Transistor Circuits. 13/6
EXTRA Equipment Tape Recorder 6/6
Civil Design and Construction 5/6
TRANSISTOR Audio Amplifiers 6/6
TRANSISTOR Circuits for Radio Control of Models 8/-

RADIO Servicing Instruments 5/6
Book of Crystal Radio 3/-
SERVICING Transistor Receivers 8/-
ELECTRONIC Novelties 5/6
ELECTRONIC Gadgets 5/-
RADIO Valve Data "Wireless World" 7/6
BRITAINERS' Guide to Radio 8/-
MODERN Transistor Circuits for Beginners 4/-
TRANSISTOR Test Equipment 8/-
TRANSISTOR Circuits for the Constructor (Brace Nos. 3 and 4) each 3/-
 All orders include postage - List S.A.E.

SELRAY BOOK CO.
 69 HAYES HILL, HAYES, BROMLEY KENT. Tel. HURSTway 1918

PADGETTS RADIO STORES

OLD TOWN HALL,
 KNOWLER HILL,
 LIVERSEDEGE, YORKS.
 Telephone: Cleckheaton 2866

ARMY SET TYPE 19 Mk. III. Complete with one 6K3, four 6K7, one 6B8G and one 6V6 valves. The Receiver side of the set is complete in every way, including the 500 micro-amp meter. The valves and a few parts have been removed from the 'B' set. Clean inside, solid Nos. 3 and 4, with offering fine class receiver at the special price of 32/-, carriage 10/-. Grade II, 20/-, carriage 10/-.

Tube Unit in new Condition. Complete with VCR138 tube. All valves and panel meter 38/-, Carr. 12/-.

Valves Removed from TV Sets. Tested on a Mullard Valve Tester, and are 100% as new. Three months unconditional guarantee. POST FREE.

ECL80 2/-	10C2 1/5-	PL82 5/-
ECC82 3/-	10P1 1/5-	PY80 5/6
EY51 2/6	10P13 5/-	PY81 4/6
EBF80 4/6	10P14 5/-	PY82 5/-
EB91 9d.	20D1 3/-	P230 4/6
EF91 9d.	20L1 5/6	PCC84 4/6
6SN7 2/6	20P4 8/6	PCC84 4/6
6P1 1/-	185BT 8/6	EA50 1/6
6P13 2/-	U21 5/-	PL83 5/6
6P14 5/-	U282 5/-	PL33 4/-
6P15 5/-	U329 5/-	PL38 8/6
6L1D 5/-	KT35 5/-	B38 4/6
PCL32 5/-	PL81 5/-	N37 5/-

EF80 1/8 or 10/- per doz. Grade II, EF80 for test purposes. 4/- doz.
New Valves Ex. Units. POST FREE.
 6K7 1/8, doz. 12/-, 6K8 2/6, doz. 22/-, 6V6 2/6, doz. 22/-, 30T U.S.A. 9/-, 6Y3/250, (PK) 5/-, AC2PEN (PEN) 6/-, 5U3 3/-, 6SN5 3/-, 6V6GT 4/6, EF91 1/8, EL91 1/8, 6F6 2/-, 5Z4 5/6, 5Y3 4/6, 6X5 4/6, EF50 1/-, 6I- doz. ARP12 1/6, 6 for 5/6. Box of 50 19/-, 1T4 2/-, ARTP2 2/-, ART4 2/-, APP37 2/-, AR8 2/-

P.M. Speaker all Perfect. Ex. TV Sets. POST FREE BARGAINS. All 3 ohms. Rola 6 x 4in., 5/-; Goodmans 7 x 4in., 7/-; R. and A., 7 x 4in., 6/-; Philips 8in. round, 6/6; R. and A., 8in. round, 5/-; 10in. round, 12/6; 12in. round with Tweeter new, 28/6. Special price for more than one speaker.

New Boxed 12 volt Vibrator Packs, with spare vibrator. Type P.C.R., 250 volts at 150 M.A. 18/-, Carriage 7/6.
13 Channel 14in. TV Sets. Untested. 30/-, Carr. 10/-, 13 Channel 17in. sets, untested. 50/-, Carr. 10/-, Well packed sent at owners risk.
TV Tubes, completely rebuilt and refaced. 12 months guarantee. Sizes up to 17 inch. Special trade price of 75/-, Carriage and Insurance 7/6.
Reclaimed Tubes. 14in., 30/-, Carr. 7/6, 6 months guarantee.

TELEPHONE HANDSETS 15/6 pair.
G.P.O. standard pattern. House to Workshop, garage, inter-office, etc. Works off any small battery. P. & P. 4/6.

DUKE & Co (London) Ltd
621/3 ROMFORD RD.
MANOR PARK, E.12
ILford 6001/3
Liverpool St. Stn. to Manor Park only 10 mins.

MINIATURE JACK PLUGS AND SOCKETS.
1/9. Post free.

STANDARD JACK SOCKETS. 1/6. Post free.

SPARES!

Condensers: 100, 10/-, New Assorted electrolytics & P.Fs.

Resistances. 100—5/-, Assorted sizes, watts, grades.

Volume Controls. 40, 10/-, New, TV or Radio, Assorted P.P. 2/6.

VOLUME CONTROL S/W, with side knob. Miniature transistor type. 2/- each, 12 for 20/-. Post on one, 6d., 12—1/6.

VALVES 9d. each. 40—£1. Thousands of Valves available P.P. on 1-4 6d., 12 1/6.

LATEST LIST (stamps only).

TELEVISION TUBES Ex. Maintenance
REGUNDED. Guaranteed 1 Year. Tested. Satisfaction Guaranteed.
21in. 17in. 15, 14 and 12in.
99/6 79/6 59/6
15/- 36/24, 14KP4 141, 121, 31/74
Ins. and Carr. 10/6. Add 10/- refundable on OLD TUBE. 110° Tubes in Stock. and others. Carr. 5/-.

17" — £11.10.0
14" — £7.10.0

12 months' Full Written Guarantee.

Channels for all areas.

Demonstrations daily in our Shop.

Personal collection advised. Insured.

Carr. 14in., 20/-, 17in., 30/-.



HOW?

How do we sell at this low price? Sets are ex Rental. Already well maintained. We regun tubes ourselves. Valves and Parts are manufacturers' surpluses. All sets have a written guarantee covering tube, valves and all components. Only Duke's can offer this.

LISTEN TO THE WORLD on TELSTAR our I-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/-.

R.C.S. TRANSISTORISED TAPE TUNER

Wonderful reproduction of all your favourite programmes. Covers full medium wave band. Special circuit incorporating ferrite rod aerial and tuning condenser gives COMPLETE STATION SEPARATION. Attractive case size 9 1/2 x 2 1/2 x 1 1/2 in. deep. NO EXTERNAL AERIAL OR EARTH REQUIRED. Chassis and components colour coded for easy construction. All parts supplied with step by step instructions.



ONLY 25/- P. & P.
(VT3 battery 2/6 extra).

THE R.C.S. PERSONAL SET

For Private Listening

An amazing little set, with built-in ferrite rod aerial bringing in medium wave at wonderful volume. Sturdy case. Size only 2 1/2 x 2 1/2 x 1 1/2 in. Fits into the palm of the hand. Drilled chassis colour coded for easy assembly. Total Building Costs (including earpiece) 30/- P. & P. 2/-.



R.C.S. CRYSTAL RECEIVER

Covering medium wave band. Ideal for the beginner! All components in- 8/6 P. & P. 1/6. cluding case. (Suitable headphones 9/6.) Easily converted to 1-transistor or 2-stage transistor receiver.



All parts available separately. Send S.A.E. for free layout plans and parts lists of any of the above sets.

R.C.S. PRODUCTS (RADIO) LTD.
11 OLIVER ROAD, LONDON, E17

(Mail Order Only)

AN AEI PRODUCT



6 ft. flexible lead with cordgrip

Will give a lifetime of service

Heats up from cold in 2 1/2 mins

25 watt model for radio work

Heat concentrated in bit

Anatomy of a Superior Soldering Iron

The Solon range of electric soldering irons includes 15 and 25 watt models for radio, TV and electronic equipment; 65 watt models for household and workshop use. Larger models up to 240 watt also available.

Select a **SOLO**
TRADE MARK

Used in industry for over 30 years
Obtainable from your usual radio or electrical supplier

MISCELLANEOUS

YOUR KIT—Amplifier, Radio, etc., professionally assembled, wired, tested. Moderate charges. Prompt attention. Write to M. JOHNSON, Ivy Cottage, Astwood Bk, Redditch.

ELECTRONIC MUSIC?

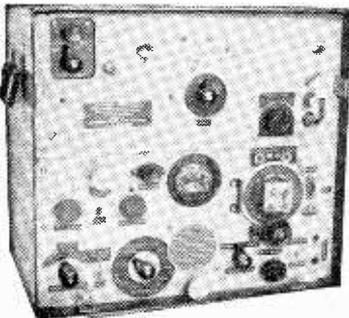
Then how about making yourself an electric organ? Constructional data available—full circuits, drawings and notes! It has 5 octaves, 2 manuals and pedals with 24 stops—uses 41 valves. With its variable attack you can play Classics and Swing.

Write NOW for free leaflet and further details to C. & S., 20 Maude Street, Darlington, Durham. Send 2d. stamp.

KITS BUILT, repairs, alignment, S.A.E. Leaflet for detail. S. KINDER, 6 Hooker Road, Heartsease, Norwich, Norfolk.

RECEIVERS & COMPONENTS

EXCEPTIONAL VALUE: Picture Tubes, brand new. Mazda 19in., CME1901, Mullard 19in., AW47-90/91, £4/10/-; Mullard 23in., AW50/90, £6/10/-; carriage (insured) paid. 12 months' guarantee. Note: All brand new. We also supply most other sizes completely regunned at £4/17/6, guaranteed 12 months. TOMLINS, 156 Lewisham Way, New Cross, SE14. TID 3857.

MARCONI CANADIAN RECEIVER
No. 52 (Brand New)

AMATEUR SHIPPING BROADCAST Magnificent 10 Valve Receiver, 3 wave band 1.75-16Mc/s. (19-170 metres), with 3 valve Xtal calibrator, speaker and phone outputs, complete for 250/250 AC mains or 12V DC. Fully tested before dispatch. **BRAND NEW £12.19.6.** Carr. £1. W.S. No. 19 Mk. 3 TXR, 2-8Mc/s. with economy power pack 12/24V DC. Excellent condition. 80/-, carr. 25/- Set only 55/-, carr. 15/- all parts available.

COMMAND RECEIVERS. BC454-B (3-6Mc/s.), BC455-B (6-9.1Mc/s.) each at 90/-, post 5/- **BRAND NEW.**

ROTARY TRANSFORMERS. 12V DC input, 300V, 120mA output, note size only 4 1/2 x 2 1/2 in., 15/-, post 2/6.

MOVING COIL H/phones, BRAND NEW. Chamois padded with lead and jack plug 15/6, post 2/6.

SET OF VALVES for 52 receiver, 13 in all with vibrator, 12/6, post 2/6. Ditto for No. 19 set including 807, 22/6, post 2/6.

HRO POWER PACKS. 115/250V AC. 25/-, NEW 35/-, post 5/-.

Many other bargains. List 6d. Stamp inquiries.

A. J. THOMPSON
"FILING LODGE"
CODICOTE, HITCHIN, HERTS.
Phone: Codicote 242

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)

NEW VALVES! GUARANTEED!

EBF80	7/3	EY51	6/6	PL81	7/9
EBF89	7/6	EY98	6/6	PY33	10/-
ECC81	4/3	EZ40	5/6	PY81	6/-
ECC82	4/9	EZ80	5/6	PY82	5/6
ECC83	6/3	PCC84	6/3	UC25	9/9
ECL80	5/9	PCC89	8/-	UCC85	6/8
ECL82	7/9	PCF80	6/3	UCH42	7/6
EF80	4/3	PCF82	6/9	UCH81	7/6
EF83	5/-	PCL83	9/-	UY85	5/9
EF86	6/9	PCL84	5/9	EBW6	7/6
EL84	6/-	PL36	9/3	GX4	4/3

Postage 6d. per valve extra.

S.A.E. for full lists and discounts.

LEWIS ELECTRONICS

16 GLENWOOD GARDENS, GANTS HILL, ILFORD, ESSEX.
Telephone: Crescent 5685.

VERSATILE D.T. OSCILLOSCOPE. S.A.E. for price list. AJAX ELECTRONICS, 572 Fulham Road, London, SW6.

TRANSISTORS now half-price. Unmarked but tested packets of 16; unmarked untested packets of 40; duds suitable as diodes, packets of 80. All packets 10/- each, postage 1/-.

Four packets post free. C.W.O. K. R. WHISTON (Dept. PWT), New Mills, Stockport.

DIRECT TV REPLACEMENTS LTD., largest stockists of TV Components in the U.K. Line Output Transformers, Frame Output Transformers, Defector 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 GIPsey Hill 6166. 126 Hamilton Road, West Norwood, SE27.

"HEATHKITS" can now be seen in London and purchased on easy terms. Free brochure. DIRECT TV REPLACEMENTS LTD., Dept. PW7/9, 126 Hamilton Road, West Norwood, SE27. GIPsey Hill 6166.

SPEAKER REPAIRS. Cones/Fields fitted. Clock coils wound. L. S. REPAIRS, Pluckley, Ashford, Kent.

GWM RADIO LTD.

12 volt MOBILE RECEIVERS

Cover approx. 80 to 100 Mc/s. Originally crystal controlled, crystal not supplied. Suitable for conversion to tunable 4 tube receiver. Rotary for 250V 60mA H.T. supply. In good used condition complete with 5 EF91, 3 EF92, 1 EL91, £2, post 7/6. Matching 3 ohm speaker in crackle case, 7/6, post 2/6. Marconi CR100, 60 Kc/s to 30 Mc/s. In good condition and working order, £18.10.0, carriage £1.

Control Units No. 1 Canadian for 52 set. Complete with chamois padded low resistance headphones, microphone, Morse key, hand generator and bell, etc. Brand new at 27/6, post 7/6.

40/42 PORTLAND ROAD, WORTHING

RECEIVERS & COMPONENTS

(continued)

CONDENSERS. Fantastic Bargain! 500,000 Miniature Condensers, 1/4 in. long, 1/4 in. diameter. Tested 750V. Capacity .0001 to .04µF. 7/6 per 100, post free. Ideal for transistor sets. MILWARD, 17 Peel Close, Drayton Bassett, Staffordshire.

VALVES 5/-. Components, Recorders, Players, Transistors. Bargain lists. Mail only. 98 Greenway Avenue E17.

A1 POST-FREE BARGAINS. Guaranteed Secondhand set Tested Valves: EF80, EB91, 10F1 9d. each, 3 for 1/6; L83 2/-; ECL80 2/6, 3 for 6/-; PZ30, PY81, EL38, PL33 3/6; PL83, PL82, PY80, PY82, PCF80 4/-; KT36, N37, B36, PY31, U281, U282, 20P1, 27SU 4/6; EB41, EB41, EB41, ECC81, ECC82, EL42, PL81, U31, UB41, UF41, UF42, UL41, UL44, UL46, UY41, 6C13, 10C2, 6L20, 20L1 5/-; 20P4, 53KU, EL33, PL36, U07 7/-. Thousands of Valves in stock, including obsolete types. Ex-Service, reclaimed and all new B.V.A. types and makes. A1 RADIO COMPONENTS, 14 The Borough, Canterbury, Kent.

GET COMPONENTS, aerials, tubes, etc below wholesale from ELECTRONIC CONSTRUCTORS, Sutton Montis, Yeovil, Somerset. CATALOGUES.

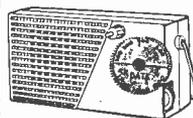
TAPE DECKS, Recorders, Bargains. Valves 5/- each. Lists. Mail only. 98 Greenway Avenue, Walthamstow, E17.

REMARKABLE NEW PI-MODE 10W +10W stereo amplifier: 16 Mullard transistors and heatsinks. 95/- A KOVACS, 65 Alexandra Road, Hendon NW4.

DATA TRANSISTOR
POCKET KITS

NO SOLDERING OR DRILLING, COMPLETELY SELF CONTAINED

NO AERIAL REQUIRED - MEDIUM & LONG WAVE - ASSEMBLY TOOL PROVIDED - CAN BE BUILT BY ANYONE



DATA 55
5 SEMI-CONDUCTORS
5 STAGES
MOVING COIL
SPEAKER

50/- P.P. 2/9
extra.
Battery 2/3 extra.

5 1/2 x 3 x 1 1/2 in.

DATA 427, 4 TRANSISTORS, 2 DIODES, 7 STAGES, MOVING COIL SPEAKER

65/-

Battery 2/3 extra. P.P. 2/9 extra.

All Parts Supplied Separately



SPECIAL OFFER
£4.19.6.
Post Free.

"DATROLA" transistor ELECTRONIC ORGAN. 2 octave. Complete and ready to play, with instructions and music. Size 14 1/2 x 6 in.

DATA ELECTRONICS LTD.

6 HILLSIDE GDNS., EDGWARE, Middlesex.

RECEIVERS & COMPONENTS

(continued)

E. R. NICHOLLS

No. 1 BUMPER PARCEL

- 100 Assorted Resistors.
- 50 Assorted Condensers.
- 1 5in. 3 ohm Elac Speaker.
- 1 Isolating Transformer.
- 4 Terminal Blocks.
- 2 Rotary Toggle Switches.
- 1 Small Chassis containing 60 components.
- 2 Westectors.
- 2 Thermistors.
- 100 Cartridge Fuses.

No. 2 BUMPER PARCEL

- 1 Pair Test Prods, retractable with leads and spares.
- 17 4in. 3 ohm Speaker.
- 6 Assorted Valves.
- 8 Assorted Potentiometers.
- 6 Assorted Valve Bases.
- 2.5-way Plugs and Sockets with leads.
- 4 Mixed Plus of Sockets.
- 100 Cartridge Fuses.
- 1 Inductance Variometer.

One for 20/- Post Free, or any two parcels 35/- Post Free.

20ft. Steel Telescopic Mast, 50/- High Stab Resistors 6d. each.

List now ready for Paper Block Condensers, Valves, Oscillators, Test Sets. S.A.E. Please.

AR88 Jack Sockets with Isolating Switching, 4/-

Crystal Adaptors, 1/6

1 amp Cartridge Fuses, 5/- per 100.

D.P. D.T. Toggle Switches, 3 amp, 2/6; 5 amp, 3/6.

Muirhead 500V fixed condenser at 5 kV working, 2/6.

Red Bezels for Panel Lamps, 1/- doz.

Clydon 500 + 500pF Tuners, 2/-

Assorted Instrument Knobs, 5/- doz.

3 assorted Thermistors, 7/6.

Plessey 2.5-way Plug and Socket ex new unit, 5/- pr.

Low Loss B.C. Locking Coax Plug and Socket, 3/- pr.

EX T.V. VALVES

MONEY BACK GUARANTEE

ECL60, EY86, PC84, PCF80, PL81, PY81, all at 5/- each.

Paper Block Condenser, 4 mFds at 800 volts, 4/6.

Mixed New Resistors, 1 watt, 1 watt, 5/- per 100.

Transistors OC901 A.I.D. Tested, 100%, 15/- each.

Tantalum Castanet Sub Min. Disc Capacitor, 50 mFd—at 70 volts working, 8/- each.

Copper Laminate Board, single or double sided, 5/- per sq. ft. cut to your size.

Electro methods printed circuit connectors, 31-way, 4/6. Gold-plated contacts. Other sizes in stock.

19 Set Variometer, 5/-.

Special 0.5 ohm w.w. Resistor Sub Min. 6d. each.

Contract clearance of Speakers, 3 ohm P.M. 8in. 5/-, 8in. 6/-, 7 x 4in. 7/-, 8in. 8/-, 10in. 14/6.

TRADE ENQUIRIES WELCOME FOR ANY ITEMS ABOVE.

Mail Orders and Retail Shop:
46 LOWFIELD ROAD,
or SHAW HEATH,
STOCKPORT, CHESHIRE

NEW VALVES GUARANTEED!

CIC	5/-	PEN 36C	5/-	6SA7m	5/-
ECL33	7/6	PEN 46	2/6	6SG7m	5/-
CY31	7/6	OZ4	5/-	6SJ7m	5/-
ECC85	5/-	VP23	4/-	PCL82	7/11
HL23DD	4/-	1D5	5/-	6 x 4	3/6
KT33C	5/-	1T4	2/6	6 x 5G	5/-
MU14	5/-	6K7G	1/3	R19	9/6
PCL84	5/-	6AG5	2/6	PY83	6/11
PEN A4	7/6	6BW7	5/-	25L6GT	4/6

Cash with order only. Postage 6d. per valve. Any parcel insured against damage in transit 6d. extra.

A.D.A. MANUFACTURING Co.,
116 Alfreton Road, NOTTINGHAM.

WANTED: VALVES, TRANSISTORS, Etc.
Bought for Cash.

FOR SALE

D.F. TEST OSCILLATOR. Type 46. Radiates a continuous note. Range 23,500 Kc/s-1,250 Kc/s (12-240 Metres) in 5 switched bands, using a VR21 valve, slow motion tuning; enclosed in grey metal case, rod aerial base on side. Power 2 volts and 90-120. BRAND NEW 50/-. Used 35/-, set 5/-.

6 VOLT VIBRATOR PACK to 150 Volts at 80 mA D.C. New Tested, 15/-, post 2/6.
TAYLOR OUTPUT METER. Type 4. Resis. 20,000 ohms. Range (1) 0-20 milliwatts. (2) 0-80 milliwatts. 4 1/2in. Meter in wood case with lid. 50/-. post 2/6.

MULLARD C. & R. BRIDGES. 0.1 ohm to 10 meg. ohms in 4 ranges. 10 pF to 10 mF in 3 ranges. Calibrate, open bridge, and % ranges. For 100-250 A.C. Tested. £5.10.0, post 2/6.

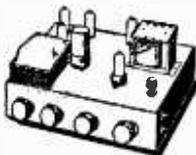
19 SET RECEIVER POWER UNIT KIT. 200-50 input mains, to 275 v. D.C. 12v. LT, choke smoothed with connector to set, (state 6 or 12 pin), 45/-, post 5/-. Mike and Headset, new 17/6. Connectors, 12-12 pin, 8/6, 6-6 pin, 5/-, post both 1/6.
CONTROL BOX, 6/-. MK2, 8/6, post both 1/6. 220 Yds. of P.V.C. Telephone Wire on drums, 22/6, post 2/6.

J. T. SUPPLY Dept. N

150 MEADOW LANE, LEEDS 11.
CALLERS WELCOME

RED SPOTS 1/6. White 1/8, Mullard OC44 5/3. OC45 5/6, OC71 3/9, OC72 5/3, OC81 5/-, OC170 5/9. OC171 6/-, postage extra. Transistor Notes 1/-.
M. E. SUPPLIES, 8 Granville Street, Sheffield 2.

GUITAR AMPLIFIERS WITH TREMOLO



Hi Fi 15 watts. Valves ECC83, ECC83, ECC83, EL84, EL84, EZ81. Four jack inputs. Six controls: two volume, bass, treble, tremolo speed, tremore. Remote

plug. 3 and 15 ohm outputs. Real value. Kit £8, ready built £11. Similar 30 watt. Valves ECC83, ECC83, ECC83, EL34, EL34, EZ81. Kit £11, ready built £14. Similar twin input less tremolo 15 watt (illus.). Kit £6.10.0, ready built £9. 30 watt, Kit £9.10.0, ready built £12. Add carr. 7/6 any amplifier. Send for free leaflet.

STROUD AUDIO
Bath Road, Stroud, Glos.

FOR SALE

(continued)

Receiver Type R220. Mains input, stabilised power supply. Made by Marconi. Crystal controlled 14 valve set. Instructions for simple modifications and circuit with set.
ALL THIS FOR £3.10.0, post paid.

ON STOCK NOW 600,000 High Stab Resistors. ER1E, 10 ohms to 1 meg insulated 1w, 1.2 5%. Welwyn 1w, 1.2 5%, 10 ohms to 10 meg. Example 1 or 1w Welwyn 5% 6d., 2% 9d., 1% 1/-.

SPECIAL OFFER Sub Min. Coax Plug and Socket, made by M.E.C. 4/6 pair, also other items include Adaptors, Connectors, Junctions, Elbow Plugs, all by M.E.C.
Complete list on application.

Type 55 Power Pack. Stabilised Mains Input. Outputs below.
+200 volts at 120 mA, stabilised, DC H.T.
-120 volts at 15 mA, stabilised, DC Bias.
4.25 volts at 3 amp, 5 volts at 2 amp.
6.54 volts at 18 amp, 115 volts + 115 volts.
90/- SEND FOR FURTHER DETAILS.

BREAKDOWN UNITS
Transmitter Receiver Control Box containing 7 instrument knobs, 4 toggle switches, 3 rotary switches, 20 small potentiometers, 2 Plessey Sockets, bases rough but components O.K. 6/- each, post paid or 2 for 10/-.

Control Box Type 725. New in Sealed Boxes. Containing 5 Dble. Throw Dble. Pole Toggle Switches, 1 Low Voltage Reversing Motor with Reduction Gear Train, 3 Potentiometers with Multirad Control Knobs, 2 Sealed Relay, 1 Meter Water Switch, 1 pair Min. Plug and Socket, in smart Alloy case, 25/-, post paid.

Control Box for Photo Flash. Mk. 1, containing 4 Toggle Switches, 2 Panel Lamps, 1 11-way 3-bank Water Switch, 2 Digital Counters, Electro magnetic 0 to 99 with 100 ohm coil, 4 Press-button Switches, etc. 18/-, post paid.

Filter Unit, Type 504. New, boxed in separate alloy case. Setable from 34 Mc/s to 86 Mc/s, with 6 Digit Counter. Complete Unit, 11/6, post paid.

MISCELLANEOUS

Diamond H Sealed Relay. 150 ohms, 4 pole double throw, 5/6. 115 volt AC Relay, P.O. Type H.D. 4 make 7 break, 7/6. Chrome handles 8in., 4/- pr; 4 1/2in., 3/- pr; 1 1/2in., 10/- pr.

Mixed Valve Bases, 5/- for 24, includes latest PTFE types. Perspex 360 degree scale 10 1/2in. dia. x 1 1/2in., 4/6. Perspex Disc, 10 1/2in. dia. x 1/2in., 2/6.

Government Valves. KT33C 3/-, EB34 1/6, 5U4 4/-, EF39 2/-, ECH35 5/-, L83 3/-, 6V6 4/-, 6J5 3/-, 6J7 4/-, 6SN7 4/-, 6X5 5/-, 907 8/-, G233 3/-, 12E1 8/-, 5Z4G 5/-, 6AC7 4/-, GT1C 4/-, 6AM6 1/6. All Post Free.

Capacitors. Plessmin. 2 mFd, .25 mFd, 100 volts. 2/- each. Plessey Tantalum, 5 mFd at 6 volt. 1/6; 10 mFd at 150 volt. 2/- each. Min. Paper Dielectric 0.1 mFd 150 9d., .01 mFd at 400 1/- each. Lead through capacitor, 1000 pF 750 volts, 1/6.

Latest Type Panel Lamps, MES red bezel 1/6 Arco Electric Panel Indicator Lamps, red, clear, amber, 4/6.

E. R. NICHOLLS

Mail Order and Retail Shop:
46 LOWFIELD ROAD
or SHAW HEATH, STOCKPORT
CHESHIRE

FOR SALE (continued)

ETCHING PRINTED CIRCUIT KIT

Consists of Plastic Bath and Case. Size 9 x 5 x 2 in. Contents: Solvent, Etchant, Resist, 100 sq. in. Copper Laminate Board. Comprehensive book gives examples and circuit layouts. 18/6 inc. post.

RADIOCENTRE

94 Hurst Street, Birmingham. Dept. P

EXCEPTIONAL Transistor Portable Tape Recorder, value £6/19/6, complete with crystal microphone, earphone, spools, tape, batteries, instructions, presentation box (extra tapes 100ft. 4/6). Ideal gift, £6/19/6. Satisfaction guaranteed. Postage, packing 2/6. TOMLINS, 156 Lewisham Way, New Cross, SE14.

VICTORY

G YOU can be ON THE AIR by Dec. By using the RHYTHM METHOD of Morse tuition a student, starting from scratch, has passed his Morse Test in just 13 DAYS by faithfully following the instructions given in this fantastic course. You could pass the test NEXT MONTH. For explanatory booklet, send 6d. in stamps to:—
**45 GREEN LANE,
PURLEY, SURREY**

250 "12 DRAWER UNITS". New ex-works, £4/15/-, carriage paid (mainland). Each drawer 5 1/2 in. wide. 5 1/2 in. high, 10 1/2 in. long. Stove enamelled green, heavy gauge perfect steel. 12 dividers free. Catalogue free. (Dept. Z4), N. C. BROWN LTD., Eagle Steelworks, Heywood, Lancs.

LOWEST PRICES—HIGHEST GRADES—ALL FULLY GUARANTEED

MULLARD TRANSISTORS

OC44, OC45, OC71, OC81, OC81D, 3/6 each, 36/- doz. OC170, OC171, AF117, 4/- each, 44/- doz. OC26, OC35, 10/- each. BY100 or OA210 Diodes 5/6 each, 60/- doz.

MAZDA TRANSISTORS

XA101, XA102, XA112, XB103, XB104, XB113, XC101, 2/- each, 20/- doz. Red and White Spots, 1/- each, 10/- doz. XU611 Diodes, 4/- each, 45/- doz. XC141 (11 watt), 6/- each, 64/- doz.

Sub-min. I.F.s (3) plus osc. coil 460/475 kc/s, 10/- set.

DIODES

G.E.C. GEX941/2, 9d. each, 6/- doz. Mazda Sub-min. XD201, 9d. each, 6/- doz.

UNBRANDED TRANSISTORS

XA101, XA102, XA112, XB103, XB104, XB113, 1/3 each, 12/- doz. 100 mixed, 75/-, 1,001 Other Snips. S.A.E. List.

B.W. CURSONS

78 BROAD STREET,
CANTERBURY, KENT

FOR SALE (continued)

SPECIAL OFFERS — NO INTEREST TERMS

GARRARD Autotism Changer Cash £7.17.0
or 18/- dpt. and 12 pymts. of 11/9 monthly.
GARRARD AT6/FV26A Cash £12.5.5
or 25/5 dpt. and 12 pymts. of 18/4 monthly.
ARMSTRONG AF208 Chassis Cash £21.4.0
or 42/- dpt. and 12 pymts. of 31/10 monthly.
ARMSTRONG Stereo 55 Chassis Cash £29.18.0
or 59/- dpt. and 12 pymts. of 44/11 monthly.
A. L. STAMFORD Ltd. (Dept. H29)
Phone: SR0 5003.
98 WEYMOUTH TERRACE, LONDON E.2.

240^{WATT} ELECTRIC POWER ANYWHERE

ANYTIME from 12^{WATT} CAR BATTERY

WITH THE AMERICAN DYNAMOTOR UNIT
Type 123, output 240/250w. at 150 to 220v. with
Perfect for TELEVISION, POWER TOOLS and all
numerous AC/DC ELECTRICAL EQUIPMENT, gives
wonderful results. Price ONLY £8 + 9/- carriage.
Send stamped envelope for full illustrated details
W. SCIENTIFIC PRODUCTS, CLEVELY, LEAS.

A COMPLETE PORTABLE RADIO
(Peto-Scott Model B.P.41) for less than
the cost of the 4 valves included—
DK91, DF91, DAF91, DL92. Uses 90 V.
and 1 1/2 V. batteries. A SNIP AT 39/6
(P. & P. 7/6). ACT FAST—THEY
WON'T LAST LONG.

E.S.C.

25, Christleton Road, Chester, Ches.

WANTED

WANTED: NEW VALVES and Transistors, any quantity. S. N. WILLETS, 43 Spon Lane, West Bromwich, Staffs. Tel. WES 2392.

WANTED VALVES ONLY

Must be new and boxed
Payment by return.

WILLIAM CARVIS LTD.

103 North Street, Leeds 7

WANTED: TEST GEAR, Meters, Valves, Components, Communication Sets, Amplifiers. Letters only. HUGGETT'S LTD., 2-4 Pawsan's Road, West Croydon, Surrey.

NEW VALVES WANTED

Any type, any quantity

CASH PAID

R.S.T. Valve Mail Order Co.,

211A Streatham Road

Mitcham, Surrey

Telephone: MITCHAM 6202

A PROMPT CASH OFFER for your surplus brand new Valves and Transistors. R.H.S., Beverley House, Mannville Terrace, Bradford 7.

SERVICE SHEETS

SERVICE SHEETS, Radio and Television, 3/6, post paid. VEST AND EMERY, 17 Halgarth Street, Durham.

SERVICE SHEETS (continued)

SERVICE SHEETS, also Current and Obsolete Valves for sale. JOHN GILBERT TELEVISION, 1b Shepherd's Bush Road, London, W12. Phone: SHE 8441.

SERVICE SHEETS: Radio, TV, 5,000 models. List 1/- S.A.E. inquiries, TELRAY, 11 Maudland Bank, Preston.

SERVICE SHEETS, Radio and TV 4/- each, 1963 List now available at 2/-. All orders dispatched on day received. Also Manuals for sale and hire. List 1/- S.A.E. please. SULTAN RADIO, 29 Church Road, Tunbridge Wells, Kent.

FREE ADVICE by former manufacturer's engineer to Service Sheet purchasers. S.A.E., Faults 4/- to HANDLEY, 112 Baysham Street, Hereford.

S.P. DISTRIBUTORS is now under New Management. Try our streamlined service. We supply **SERVICE SHEETS** for Radios, Televisions, Tape Recorders, Amplifiers, etc etc, by RETURN OF POST at 4/- each, plus postage. Send s.a.e. with inquiries. New 1963 list now available at 1/6 plus postage. Mail orders only please to S.P. DISTRIBUTORS, 44 Old Bond Street, London W1.

TRADE SERVICE SHEETS offered by retired engineer. If I haven't got it you won't get it. All 4/- each by return. Please include large S.A.E. Mail orders only. ETIZIONI, 80 Merrion Avenue, Stanmore, Middx.

FAULT-FINDING FILES showing common faults that each receiver is prone to and other useful servicing information, 2/- each. Mail orders only. S.P. DISTRIBUTORS, 44 Old Bond Street, London, W1.

S.E.S. Service Sheets for all TV, Radio, including Transistors, Tape Recorders, Echo Units, Amplifiers, Record Players and Autochangers, etc., also various domestic appliances. List 1/- S.A.E. Mail order only. SUN ELECTRICAL SERVICES, 38 St. Georges Road, Hastings.

SERVICE SHEETS 1/9; Makers' Manuals 3/9; Back Numbers P.W. 1/6. All post paid. List S.A.E. SHAW, 64 Standish Street, Burnley, Lancs.

SERVICE SHEETS for all makes of Radio and TV, 1925-1963. Prices from 1/- with free fault-finding guide. S.A.E. inquiries. Catalogue of 6,000 models, 1/6. 125 Radio/TV sheets covering many popular models 21/-. Valves, modern and obsolete. Radio/TV books. S.A.E. lists. HAMILTON RADIO, Western Road, St. Leonards, Sussex.

SOUND RECORDINGS

A UNIQUE BUY! Recording Tape, top brand, 5 1/2 in., 1,200ft. 19/6; 7 in. 2,400ft. D.P. 28/6. P. and p. 1/6 per spool. Bargains in all sizes. S.A.E. for list. E. C. KINGSLEY AND CO., 132 Tottenham Court Road, London, W.1. EUSTON 6500.

HAVE YOU EVER SEEN T.V. TROUBLES?

That is "Pin-Point T.V. Troubles in 10 minutes" we mean! Thousands of *Practical Television* readers already own and use "T.V. Troubles" every day. Designed for use by amateur or expert, this amazingly practical manual shows you how to find the trouble in any T.V. circuit FAST!

A simple cross-index tells you where you'll find cause of trouble, handy check charts then help you accurately locate the EXACT trouble spot! You will eliminate hours of aggravation, cut out waste time, because this new Coyne system will help you get right down to the heart of the trouble in minutes.

Over 700 trouble spots are covered in the 340 cross-index pages. Included are 50 time saving check charts as well as 280 diagrams and photos together with explanations of circuits and designs.

YOU CAN USE THIS BOOK RIGHT ON THE JOB—NO NEED TO MEMORISE!

This Pin-Point Book was designed especially for on-the-job trouble shooting. You simply turn to the indexed section, locate the circuit description and check-charts, and in minutes you have the trouble spot located and ready for repair.

NO COMPLICATED THEORY OR MATHEMATICS. Just practical circuit description, service methods and trouble shooting techniques to help you make faster t.v. repairs.

EVEN AN EXPERT CAN SAVE TIME BY USING "T.V. TROUBLES"

Here is a way to reduce "thinking time".

All the logical reasons for each problem are stated in black and white—you use your skill to take it from there!

Don't miss out any longer. Time wasted now locating t.v. faults could be saved by quick reference to this lightning fast t.v. problem answer book. Send for your trial copy now, then when you decide to keep it (as we are sure you will), pay only 5/- per week until completed.

The price? Only 38/6 plus postage.

FREE ELECTRONIC DATA HAND-BOOK WITH EVERY ORDER IRONCLAD GUARANTEE

This book must be able to earn you more than its cost within two weeks or your money refunded!

FREE TRIAL OFFER!

TERMS ONLY 5/- PER WEEK!

To SIM-TECH TECHNICAL BOOKS
Dept. WTT2
West End, Southampton, Hants.

Please send "T.V. Troubles" for a full seven days' free trial. If not delighted I may return the manual, post paid without further obligation on my part. Otherwise I will pay cash or 5/- weekly until paid. (No extra for interest if paid regularly.)

Tick here if enclosing full price (we pay postage). Same 7-day money back guarantee. Postage charges 1/6 extra. Overseas customers please send full amount (including Ireland).

Name

Address

City..... County.....

ULTRA VIOLET BULBS

Easy to use source of UV for dozens of practical and experimental uses.
12 volt 36 watt AC/DC SBC 8/6. 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. 12 volt A.C. 60 watt. 22/6. P. & P. 3/6.

Set of 4 colours FLUORESCENT Paint. Red, Orange, Green and Blue in 4 oz. tins. Ideal for use with the above Ultra Violet Bulbs. 9/6. P. & P. 1/6.

BUILD AN EFFICIENT STROBE UNIT FOR ONLY 37/6.

The ideal instrument for workshop, lab, or factory. This wonderful device enables you to "freeze" motion and examine moving parts photographically. We supply a simple circuit diagram and all electrical parts including the NSP2 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 motor circuits bring price down to 37/6 plus 3/- P. & P.

NSP2 CV2286 STROBOTRON FLASH-TUBE made by Ferranti, brand new. I.O. base. Price 15/-. P. & P. 1/-.

MAGNETIC COUNTERS

10 IMPULSES PER SECOND
Very latest HIGH speed type ex. P. & P. guaranteed perfect. type No. 100B. coil 2,300 ohms, for 48 volt D.C. operation (will work on 36 volt), overall size 4 x 1 x 1 1/2 in. Also available, type 101A which can be used as an interesting accessory with our Strobe unit. Either type price 15/-. P. & P. 1/6.



VARIABLE VOLTAGE TRANSFORMER

Input 230 v. A.C. Output 0-260 v. at 2.5 amp. Fully shrouded. New. 25.19.6. inc. carriage. Also available from stock, 5, 8, 10 and 20 amp. Write for details.

4,000 Ohm Headphones, brand new (imported). 12/6 each pair. P. & P. 1/6.
SIEMENS H.S. RELAY. Very latest type, sealed. H96E. 1,700 ohms plus 1,700 ohms. 3 pin C/O contacts. Price 16/8 each, plus 1/- P. & P.

6 VOLT 40 A.H. ACCUMULATOR, in metal case with leather carrying handle. New. Price 27/6, carriage 8/-.

500 MICROAMP SUB-MINIATURE M/C METER. 1 1/2 in. diameter, flush mounting, single hole fixing. Scaled 0-1 mA. Supplied with Resistor for use as 1mA if required. 29/6 plus 1/- P. & P.

230 VOLT A.C. GEARED MOTORS
Type B16G 80 r.p.m., 26 lb. inch. £119.6. P. 2/-.
Type D16G 5 r.p.m., 1.7 lb. inch. £2.9.6. P. 2/6.
Type D16G, 13 r.p.m., 1.45 lb. inch. £2.12.6. P. P. 2/6.

LIGHT SENSITIVE SWITCH
Kit of parts, including ORP .12 Cadmium Sulphide PhotoCell, Relay, Transistor and Circuit, etc., price 25/- plus 3/6 P. & P. Additional ORP.12, 8/6 each plus 1/- P. & P. (Regret not supplied separately.)

AVO METER MODEL 7. Individually tested on all ranges and guaranteed. Inclusive of Test Leads. £11.0.0. P. & P. 5/-.
MINIATURE LEAD ACID ACCUMULATORS. (Brand New). 2V, 1.5 A.H. Size 4 x 1 1/2 x 1 1/2 in. Wt. approx. 1 lb. 16/8 for 3. P. & P. 1/6. 12V, 0.75 A.H. Size 4 x 3 x 1 1/2 in. Wt. approx. 2 lb. (can be used as double 6V). 15/6 each. P. & P. 1/6.

TRANSISTORS			
OC30	10/-	OC75	7/-
OC41	7/-	OC76	6/-
OC45	5/-	OC77	6/-
OC45	9/-	OC139	12/-
M/Pair		OC140	19/-
OC71	5/-	OC171	10/6
OC72	7/-	OC200	10/6
OC72	14/-	OC221	25/-
M/Pair		Get 104	8/-
OC73	6/-	Get 105	10/-
		Get 573	12/6
		Get 573	25/-
		M/Pair	20/-
		2N458	25/6
		SB345	7/6
		TK20B	4/-
		AF114	11/-
		AF115	10/6
		AF116	10/-
		AF117	9/6

SERVICE TRADING CO.

All Mail Orders also callers.
47-49 High Street, Kingston on Thames
Tel: KINGston 9450
Personal callers only
9 Little Newport Street, London W.C.2
(off Leicester Square)
Tel: GARrard 0576.

JAG ELECTRONIC CABINET MAKERS LTD

No. 9 Workshops, Grayes Place, Slough, Bucks.

VALVES SURPLUS OR EX-EQUIPMENT

EB91	2/-	PCL82	4/6	6F1	3/-
EBF80	4/6	PCL83	5/-	6F12	2/-
EBF89	5/-	PCL84	6/6	6F13	5/-
EC435	6/-	PL33	7/-	6F14	5/-
ECC81	3/6	PL36	7/-	6F15	6/-
ECC82	3/6	PL38	10/-	6L1	7/-
ECC83	4/6	PL81	6/-	6L18	6/6
ECF80	4/6	PL82	4/6	6P25	5/-
ECF82	5/-	PL83	5/-	6P28	8/-
ECC84	5/-	PY31	6/6	10F1	3/6
ECL80	4/6	PY32	7/6	10P13	6/6
ECL82	6/-	PY33	7/6	10P14	6/6
EF80	2/-	PY80	3/6	20D1	4/3
EF85	4/6	PY81	3/6	20F2	6/-
EF91	1/6	PY82	3/6	20L1	8/-
EL33	5/-	PY83	6/-	20P1	7/6
EL84	4/6	PZ30	7/-	20P3	7/6
EY51	3/-	U24	6/-	20P4	12/6
EY86	4/6	U25	6/-	20P5	17/-
EZ80	4/-	U26	6/-	30P4	7/6
EZ81	4/6	U191	7/-	6C9	10/-
GZ32	5/-	U301	9/-	10C2	10/-
KT33C	4/-	U801	14/-	10C1	10/-
KT36	7/-	UBC41	5/-	ECH42	6/6
PC84	4/6	UC84	7/6	UF42	2/6
PCF80	4/6	UCF80	7/6	UAF42	5/-

Many other Types.

LINE OUTPUT TRANSFORMERS FOR MOST TV SETS SURPLUS OR EX-EQUIPMENT.

SPEAKER CABINETS 5in. 9/-, 6in. 10/6, 8in. 15/-, 10in. 18/-, 12in. 25/-, WITH SLOPING FRONTS. ALL COLOURS.

GRAM CABINETS FOR SINGLE PLAYERS AND AUTOCHANGERS SINGLE PLAYER £2. AUTO-CHANGER £3.

TRANSISTOR CABINETS 17/6 each. Two-tone.
TV TABLES 12 x 18in., 19/6 each.

TRADE ENQUIRIES INVITED FOR CABINETS. WE MAKE A COMPLETE RANGE OF CABINETS OR WILL MAKE TO YOUR SPECIFICATION.

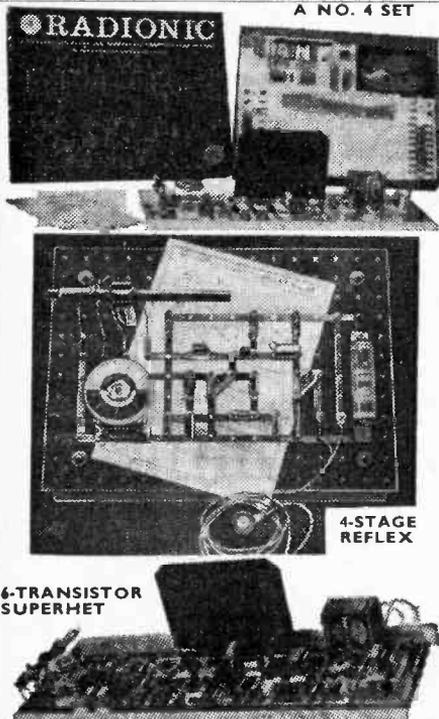
SPEAKERS EX-EQUIPMENT. 5in. 5/-, 7 x 4in., 7/6, 8 inch 7/6.

S.A.E. WITH ALL ENQUIRIES PLEASE.

TERMS. C.W.O.

POSTAGE.

VALVES. Please add 6d. P. & P. for each valve.
GRAM CABINETS. Please add 5/- carr.
SPEAKER CABINETS. Please add 2/6 up to 8in, 3/- 10 inch and 3/6 12 inches.



RADIONIC CONSTRUCTIONAL AND EXPERIMENTAL SYSTEM

(SELECTED BY THE COUNCIL OF INDUSTRIAL DESIGN FOR
THE DESIGN CENTRE, LONDON)

The Radio and Electronic construction system you have been waiting for. With top quality components mounted on colour-coded plastic bases, perforated transparent panel, perforated brass connecting strip and bolt-up connections for positive contact you can quickly build-rebuild any circuit and check it at a glance. Peak performances achieved. Already used by many schools and technical colleges for instructional purposes. **NO SOLDERING—NO SPECIAL SKILLS—NO MAINS—FULLY ENGINEERED—FIRST CLASS COMPONENTS—MULLARD TRANSISTORS—PROGRESSIVE—FLEXIBLE—EXPERIMENTAL—INSTRUCTIONAL—IDEAL RESEARCH FACILITY—RADIONIC NEWS LETTER.**

Set No. 1. £5.18.6.

14 Circuit Sheets.
Diode Detector and two Amplifier stages;
Transistor Detector and Amplifier; Multi-vibrator;
Regenerative Receivers;
Earphone operation.

Set No. 2. £6.19.6.

20 Circuit Sheets.
Circuits of Set No. 1 plus capacity reaction;
T.R.F. and Reflex Receivers;
Earphone operation.

Set No. 3. £10.19.6.

22 Circuit Sheets.
High quality Push-Pull Amplifier and 11,000 lines 7x4 inch 3Ω loudspeaker convert circuits 1-20 to loudspeaker operation.
Amplifier can be operated from microphone or gramophone pick-up.

Set No. 4. £14.19.6.

26 Circuit Sheets.
Builds high quality six transistor superheterodyne receivers, as well as circuits of sets 1-3.

Postage and Packing extra on each of the above.

Sets or Separate Components available from authorised Retailers or direct from Radionic Products Limited

TRADE ENQUIRIES ARE INVITED.

Full Details and price lists from:

RADIONIC PRODUCTS LIMITED

ADASTRAL HOUSE, NUTFIELD, Nr. REDHILL, SURREY
Telephone: Redhill (RL6) 5050 Telex: 21433

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 £25 a week, send for your copy of “ENGINEERING OPPORTUNITIES” today—FREE.

BRITISH INSTITUTE OF ENGINEERING
TECHNOLOGY

(Dept. SE/21), 29 Wright's Lane, London, W.8

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.I.
A.I.O.B.
A.F.R. Ac. S.
B.Sc.
A.M. Brit. I.R.E.
City & Guilds
Gen. Cert. of Education
Etc., etc.

PRACTICAL EQUIPMENT

Basic Practical and Theoretic Courses for beginners in Radio, T.V., Electronics, Etc.,
A.M. Brit. I.R.E. City & Guilds
Radio Amateurs' Exam.
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 _____

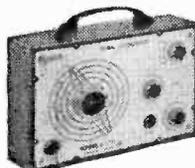
SUBJECT OR EXAM
THAT INTERESTS ME _____

SE/21

THE B.I.E.T. IS THE LEADING ORGANISATION OF ITS KIND IN THE WORLD

FROM STOCK We can supply a complete range of Valves, Crystals, Transistors, Diodes, Miniature and Standard Components.
 The largest range of Components and Equipment in the Country.
 Latest 68 page Illustrated Catalogue 2/- post free. Includes new HI-FI Section. Price Reductions.

NEW MODEL TRANSISTOR PORTABLE SIGNAL GENERATOR



PRICE **£7.18.6**

With battery and test probe P.P. 2/-.

A 1st class Signal Generator covering 149 Kc/s to 350 Mc/s in 8 ranges. Radio broadcasts and I.F., Amateur, VHF, Shipping, TV, etc. R.F., I.F., A.F., modulated R.F. outputs. Easy to read and use with full details. Within 2% accuracy. Size 6½ x 4½ x 2in.

12 MONTHS' GUARANTEE Leaflet on Request.

● **TRANSISTORISED CAPACITANCE/RESISTANCE BRIDGE.** 1 Ohm to 100 Meg. 1 pF to 100 mfd. Visual Null Indicator, leakage test etc. (Appearance as Above Generator). Leaflet on Request.
 PRICE **£7.2.3**. P.P. 2/-.

● **SUBSTITUTION BOXES**
 ● Capacitor Box. Provides 9 standard values from 0.001 to 0.22 mfd at 600 volt working, 29/6.
 ● Resistor Box. Provides 24 standard values at 1 watt. 15 ohms to 10 meg., 37/6.

Each box fully calibrated with insulated leads. Invaluable for service and design.

½ Track Record/Playback Tape Heads. 2 KΩ impedance, 15/-.

SILICON RECTIFIERS 500mA
 200 PIV 3/6 1000 PIV ... 10/-
 300 PIV 4/6 100 PIV 1 amp ... 4/6
 400 PIV 5/- 200 PIV 6 amp ... 12/6
 800 PIV 9/6
 Complete list free on request

100 Kc/s QUARTZ CRYSTALS
 2 Pin: OCTAL or 3 Pin 15/- ea.
 500 Kc/s 2 Pin ... 15/-
 455 Kc/s (AR88) ... 12/6
 5000 Kc/s 2 Pin ... 10/-
 10 Mc/s 2 Pin ... 15/-
 Complete list free on request

● **WATT 4 TRANSISTOR AMPLIFIER**
 ● Improved Version.
 1½ watt peak output.
 ± 3dB 70 c/s to 12 Kc/s.
 Output to 3 ohm speaker 9 volt operated.
 Details on request.

Built and Tested Kit of Parts
59/6 OR 52/6
 P.P. 1/6 P.P. 1/6

FIELD STRENGTH METER
 Five channels cover 1 Mc/s to 200 Mc/s. Fitted 200 microamp meter for CW or R.F. Indication and Earphone for A.F. monitoring. Designed for checking all types of transmitters. Size 4 x 2½ x 2½ in. Complete. Ready to Use, with instructions and telescopic aerial, 69/6. Post Free.

TRANSISTOR BABY ALARM As previously advertised. **£5.10.0**
TELEPHONE AMPLIFIER Speaker output from G.P.O. phone **£5.10.0**

RADIO CONTROL
 Special Offer of Miniature 3rd Overtone 27.255 Mc/s Crystals.
 Usually Twice the Price **15/-**
 DL68 Valve 5/- Only

TYPE 38, TRANSMITTER RECEIVER
 Complete with 5 valves. In new condition. These sets are sold without guarantee but are serviceable. **22/6** P.P. 2/6
 7.4 to 9 Mc/s. 2/6
 Headphones 7/6 pair. Junction Box 2/6. Throat Mike 4/6. Aerial Rod 2/6.

DEAC RECHARGEABLE BATTERIES
 (a) 18 volt 100mA/H 4 x 1in. diameter. Brand new sleeved, 30/-.
 (b) As above but 150mA/H, 35/-.
 (c) 3.9 volt 450mA/H, 12/6.
 All types easily split into any multiple of 1.2 volt. Brand new.

Crystal High Impedance Contact Microphone for Guitars, 12/6. P.P. 9d.

RUN YOUR RADIO OR AMPLIFIER FROM MAINS BATTERY ELIMINATORS AND CHARGERS

1. For PP3 or equivalent 9 volt Pocket Radio Battery, 18/6. P.P. 1/-.
2. For PP4, PP7, PP9, PP10, 9 volt Portable Radio and Equipment Supplies up to 300 mA. 49/6. P.P. 2/-.
3. De Luxe version of No. 1 also charges PP3 type batteries. 24/-, P.P. 1/-.
4. Rechargeable PP3 battery. Runs as long as 100 batteries. Complete with charger unit, 25/-, P.P. 1/-.

LIGHTWEIGHT HEADPHONES
 ● 2,000 OHMS 12/6
 4,000 OHMS 14/6
HIGH EFFICIENCY



WELL KNOWN "MINY" TWO TRACK RECORDER. Features 4-Transistor push-pull amplifier, 2 motors, single switch operation, pause, speed, wind/rewind, record/playback. Can be used horizontally, vertically, carried or table top. Take it anywhere.
 Reduced from 12 gns. NOW **£8.19.6**. P. & P. 2/6.
 Fully guaranteed—complete with microphone, tape, batteries and fully detailed booklet.

MULTI-METERS



THL33, 20,000Ω/V. (Illustrated).
 0/10/50/250/500/1,000 volts A.C. and D.C.
 0/500μA/10/250 mA. D.C.
 0/10k/1000k/1 meg. etc., etc.
 Size 5 x 3½ x 1½ in.
75/- P.P. 1/6.

ITI-2, 20,000Ω/V.
 0/5/25/250/500/2,500 volts A.C./D.C.
 0/50μA/0/2½/250 mA. D.C.
 0/6k/6 meg. etc.
 Size 4½ x 3½ x 1½ in.
5 gns. P.P. 1/6.

TP55, 20,000 Ω/V.
 0/10/50/250/500/1,000 volts A.C./D.C.
 0/50μA/0/5/50 mA. D.C.
 0/10k/100k/1 meg./10 meg. etc.
 Size 5½ x 3½ x 1½ in.
£5.19.6 P.P. 1/6.

EPI0K, 10,000Ω/V.
 0/5/25/100/500/1,000 volts A.C. and D.C.
 0/100μA/250 mA. D.C.
 0/30k/3 meg., etc.
 Size 3½ x 4½ x 1in.
89/6 P.P. 1/6.

EP30K, 30,000Ω/V.
 0/½/1/10/50/250/500/1,000 volts A.C. and D.C.
 0/50μA/10 mA./250 mA. D.C.
 0/10k/1 meg./10 meg. etc.
 Size 4½ x 3½ x 1½ in.
£6.19.6 P.P. 1/6.

EP50K, 50,000Ω/V.
 0/10/50/250/500/1,000 volts A.C. and D.C.
 0/25μA./2½/250 mA. D.C.
 0/10k/100k/1 meg./10 meg. etc.
 Size 6½ x 4½ x 2½ in.
£9.19.6 P.P. 2/-.

500, 30,000Ω/V.
 0/½/1/2½/10/25/100/250/500/1,000 volts A.C. and D.C.
 0/50μA/5/50 mA. D.C.
 0/12 amps: short test etc.
 0/60μ/6 meg./60 meg. etc.
 Size 6½ x 4½ x 2½ in.
£8.19.6 P.P. 2/-.

TRANSISTORS A SPECIALITY
 Let us quote

METER BARGAINS
 50 Microamp 2½ in. square MC ... 30/-
 0/100 Microamp 2½ in. Flush Round ... 32/6
 1 mA 2½ in. Flush Round ... 30/-
 2½ in. Moving Coil double range Voltmeter centre zero. 30-0-30 and 3-0-3 volts. Ideal for transistor tester or voltage measurements, 12/6. Post Free.

0/500μA 2in. ... 15/-
 0/500μA 2½ in., flush-mounting. D.C. 20/-
 2½-0-2½ mA. 2½ in. flush D.C. ... 12/6
 0/15 volt M.I.2½ in. FR. A.C. ... 8/6

Miniature Panel Meters
 *0/50μA (D.C.) 39/6 *0/5mA (D.C.) 27/6
 *0/500μA (D.C.) 32/6 *0/300V (D.C.) 27/6
 *0/1 mA (D.C.) 27/6 *50 Meter 35/-.
 All Brand New Boxed. * Available Clear Plastic Front or Black Moulded. State which.

D.C. to A.C. CONVERTER. Converts 12 volts D.C. i.e. Car Battery, up to 230 volts A.C. 15 watts. Uses 2 power transistors in special circuit. Kit 62/6. P.P. 1/6. **A REPANCO Design.**

Henry's Radio Ltd
 PADdington 1008/9
 303 EDGWARE RD., LONDON W.2
 Open Monday to Sat. 9-6. Thurs. 1 o'clock.

PLEASE TURN TO BACK PAGE

Practical Wireless

BLUEPRINT SERVICE

ALL 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

Each blueprint in this series contains details of two separate instruments or items of equipment.

The Strand Amplifier	}	*	5/-
The PW Signal Generator			
The Savoy VHF Tuner	}	*	5/-
The Mayfair Pre-amplifier			
The Berkeley Loudspeaker Enclosure	}	*	5/-
The Luxembourg Tuner			
The PW Troubadour	}		7/6
The PW Everest Tuner			
The PW Britannic Two	}	*	6/-
The PW Mercury Six			
The PW Regency	}	*	5/-
The PW International Short Wave Two			

RECEIVERS

The Tutor *	3/-
The Citizen *	5/-
Junior Crystal Set	PW94 2/-
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 PW Roadfarer *	5/-
The PT Band III TV converter	1/6
The Mini-amp *	5/-
The PT Olympic *	7/6
The PT Multimeter *	5/-

SOME EARLIER DESIGNS

THE following blueprints include some pre-war designs and are kept in circulation for those constructors who wish to make use of old components which they may have in their spares box. The majority of the components for these receivers are no longer stocked by retailers.

Experimenter's Short Wave	PW30a 2/6
Midget Short Wave Two	PW38a 2/6
Simple S.W. One-valver	PW88 2/6
Pyramid One-valver	PW93 2/6
BBC Special One-valver	AW387 2/6
A One-valver for America	AW429 2/6
Short-Wave World Beater	AW436 3/6
Standard Four Valve S.W.	WM383 3/6
Enthusiast's Power Amplifier	WM387 3/6
Standard Four Valve	WM391 3/6
Listener's 5-Watt Amplifier	WM392 3/6

QUERY COUPON

This coupon is available until 7th November, 1963, and must accompany all queries in accordance with the notice on our "Letters to the Editor" page.

PRACTICAL WIRELESS, NOVEMBER, 1963.

COMPONENTS EQUIPMENT HI-FI

SEE OUR NEW 68 PAGE 10 x 7½ in. FULLY DETAILED AND ILLUSTRATED CATALOGUE, TRANSISTORS, COMPONENTS, VALVES, CRYSTALS AND EQUIPMENT

2/-
POST FREE



TOTAL COST
OF ALL PARTS

£9.19.6 P.P. 3/6.

All parts sold separately.

● Attractive Appearance—Reliable Design—Quality Performance. ●

UNBEATABLE FOR QUALITY AND VALUE

Fully Detailed and Illustrated Leaflet on request.

"THE CONTESSA"

★ COMBINED PORTABLE AND CAR RADIO ★

AMAZING SENSITIVITY AND SELECTIVITY ON MEDIUM AND LONG WAVEBANDS

★ The easiest Superhet Radio to build on the market. Features clearly-marked printed circuit and packaged components with full illustrated building instructions. Full tuning of medium and long wave bands with unbeatable sensitivity and selectivity. Excellent tone and volume with over 600mV push-pull output.

★ Clearly marked horizontal station dial with slow motion tuning. Two colour Blue or Beige cabinets with Gold handles, grilles and fittings. Size 10½ x 7½ x 3½ in., includes car aerial socket, recording sockets.

★ 6 Mullard Transistors and 2 Diodes.

Guaranteed the Best Obtainable.

"CAPRI" POCKET RADIO 6-TRANSISTOR SUPERHET



Size only
4½ x 2½ x 1½ in.

REALLY
POCKET
SIZE!

The most compact 6-transistor and diode radio with speaker available to the

home constructor. Features the latest in miniature components and circuitry. Supplied with Mullard transistors and two-tone moulded cabinets in red-white or blue-white with gold fittings. All components are supplied in packets and clearly identified. A printed circuit is used with fully illustrated building instructions. Push-pull output coupled with a sensitive and selective circuit make the "CAPRI" hard to beat. Fitted Earphone/Record Socket. Full tuning on medium waves with long wave Light. All parts sold separately.

TOTAL COST **79/6** P.P. 2/-
OF ALL PARTS (Battery 2/6 extra. Earphone 6/6 extra.)

Illustrated leaflet on request.

● Slip it into your Pocket ●

10 WATT TRANSISTOR HI-FI AMPLIFIER

Ideal for all Mono and Stereo Hi-Fi systems.
Call for demonstration—any time.

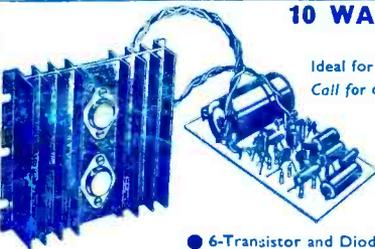
● 40 C/S TO 20 KC/S ± 1dB

● LESS THAN 0.3% TOTAL DISTORTION

● 100mV INPUT FOR 10 WATTS OUTPUT

● 6-Transistor and Diode built onto 4 x 2½ in. printed circuit. Latest high gain high stability design. No bulky transformers. Total average current 300mA on 24 volts. Can be used with batteries or our optional mains unit. Supplied complete with circuits and details. Ideal for portable or domestic Hi-Fi systems, Loudhailers, modulators, cine equipment etc. (40 volt 15 ohm version £6.5.0 pp 2/-)

COMPLETE BOOKLET FREE ON REQUEST.
PERFORMANCE EQUIVALENT TO VALVE AMPLIFIERS OF FOUR TIMES THE PRICE AND MANY TIMES THE SIZE



Built ready to use

£5.19.6 P.P. 2/-.

OR KIT
£5.15.6 P.P. 2/-.
(Mains Unit
69/6 P.P. 2/6.)

FULL FUNCTION HI-FI TRANSISTOR PREAMPLIFIER



● 6 position input selector—Treble—Volume—Bass—Filter controls.

● 9 to 40 volts mains or battery. Without change in performance.

● + 12 db boost at 50 c/s and 15 kc/s. — 15 db cut at 50 c/s and 15 kc/s

A new high gain two-transistor printed circuit preamplifier designed for use with the 10 watt transistor Hi-Fi amplifier or any valve or transistor amplifier. Built and ready to use. Panel size 9 x 2½ inches. Input sensitivities 1.5mV up to 150mV.

Complete with circuit and details **£5.10.0** P.P. 2/-.
or kit 99/6. P.P. 2/-.

7-TRANSISTOR RECORD/PLAYER/RADIOGRAM AMPLIFIER



Built and Ready to Use
£5.19.6

P.P. 2/-.
(Complete with full descriptive Booklet)

● TWO VERSIONS AVAILABLE
(12/18 volt for 15 ohm speakers (mains unit 80/- extra).
9/12 volt for 3 ohm speakers (mains unit 49/6 extra).
● Size only 6" x 2½" x 2".
Ideal for mains or battery, portable or domestic record player, grams, etc.

● Booklet Free on Request ●

Call for demonstration.

"MINIRANGER"

3-Transistor Plus 2 Diodes. Smallest radio to build yourself. Printed circuit; full tuning. ONLY 3 x 2 x 2 in. Over 20 stations. Diagrams Free.

TOTAL **49/6** P.P. 1/6.

Both Models as Previously Advertised.

● All Parts Sold Separately.

ALSO IN STOCK.

"QUINTET" POCKET RADIO

Diagrams Free. Size 5½ x 3 x 1½ in. 5-Transistor MW/LW to build. P.P. 2/- **79/6**



P.P. 2/-

● Booklets Free on Request.

Sinclair Slimline, 49/6. P.P. 1/6.

PW-6 Superhet, £7.19.6. P.P. 2/-.

STEREO AMPLIFIERS—BRAND NEW

(a) 2 watts each channel	...	...	...	79/6
(b) SA80 4+4 watts, full controls and inputs	...	...	...	£9.10.0
(c) SA150 7+7	...	...	...	£16.10.0
(d) SA300 15+15	...	...	...	£32.10.0

Items b, c and d, complete in cabinets with multi-range controls and inputs. Leaflets on request—Speakers—Microphones—Amplifiers.

4-WAVEBAND COMMUNICATIONS RECEIVER. MODEL RX60.

● 550 kc/s to 30 Mc/s.—BFO—AVC—Noise Limiter—Bandspread—"S" Meter—Telescopic Aerial. Full World Wide Coverage. Now only **£24** Carriage etc. 15/- With Full Instructions. BRAND NEW IN CARTONS.

P.W. CELESTE £9.19.6
P.W. SPINETTE £10.19.6

HI-FI SPEAKERS

12in. 15 ohms, 12,000 Gauss ... 35/-
13½ x 8½ in., 3 ohm 32/6
8in., 15/16 ohm (BA7) 78/6
12in. 15/16 ohm (CR30AE) ... 10gns

BRAND NEW—GUARANTEED

Henry's Radio Ltd.

303 EDGWARE ROAD, LONDON, W.2

PADDDINGTON 1008/9

Open Monday to Sat. 9-6. Thurs. 1 o'clock.

We can supply from stock most of the components and items specified on circuits published in this and other magazines and radio books. Let us quote for your circuit.

← PLEASE TURN PAGE