

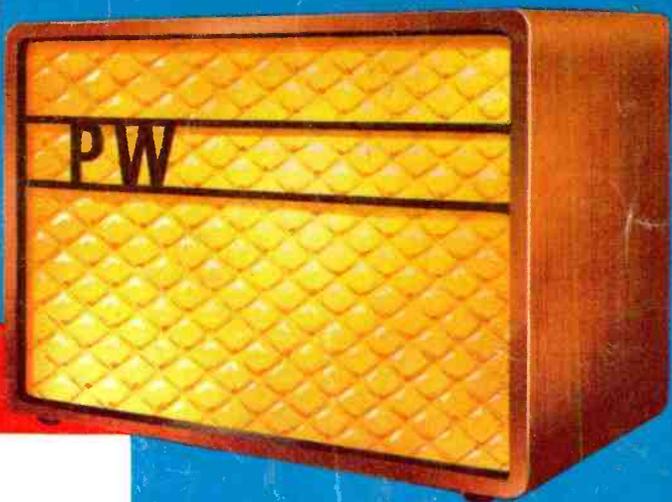
PRACTICAL WIRELESS

MAY 1964

2⁺



The PW 35 WATT GUITAR AMPLIFIER



FREE INSIDE

DOUBLE-SIDED

BLUEPRINT

TO BUILD THIS

GUITAR AMPLIFIER

ALSO A SIMPLE
2-STAGE AMPLIFIER

Fringevision Ltd

**ELCOT LANE
MARLBOROUGH · WILTS**

TELEPHONE: 657 and 658



**WIDE BAND
UHF AERIALS
for BBC2 now
and ITV 2**

FIVE STAR QUALITY AERIALS

- ★ Anodised elements for protection. ★ Modern plastic moulding techniques used for convected reflector and parasitic elements giving longer life. ★ Staggered spaced elements for maximum performance with all channel band width. ★ Multi-element reflector giving high back to front ratio ★ Maximum efficiency of matching by using laboratory developed collector plate—without any other matching device.

Model	Description	Gain DB	B/F Ratio DB	Retail Price
UF/H3	3-ELEMENT, HEAD ONLY with CLAMP	7.0	18.0	31/6
UF/H5	5-ELEMENT, HEAD ONLY with CLAMP	8.25	19.5	36/6
UF/H7	7-ELEMENT, HEAD ONLY with CLAMP	10.5	24.5	41/-
UF/H10	10-ELEMENT, HEAD ONLY with CLAMP	12.5	26.0	47/-
UF/H12	12-ELEMENT, HEAD ONLY with CLAMP	13.5	28.0	51/-
UF/H14	14-ELEMENT, HEAD ONLY with CLAMP	15.0	29.0	55/-
UF/H18	18-ELEMENT, HEAD ONLY with CLAMP	16.25	30.0	70/-
UF/H22	22-ELEMENT, HEAD ONLY with CLAMP	17.0	31.0	85/-

PLEASE STATE LARGE OR SMALL CLAMP REQUIRED

ADCOLA
SOLDERING EQUIPMENT

SOLDERING EQUIPMENT

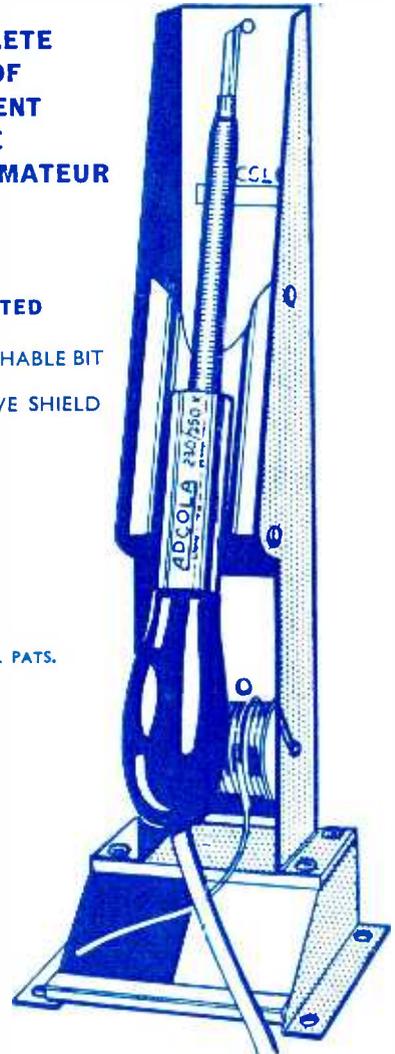
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TOTAL PERFORMANCE

A COMPLETE RANGE OF EQUIPMENT FOR THE RADIO AMATEUR

ILLUSTRATED

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



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00-AK, low loss, 6d. vol. 25 vds., 11/8, 30 vds., 22/1, 100 vds., 42/6. Co-ax plugs, 1/3. Wall-mount boxes 3/8.

SPECIAL C.R.T. OFFER Due to huge Bulk Special Purchase we are offering MW 31-74 Tubes at...

LOUDSPEAKERS. 3Ω Top Makes 0 1/2 in. 7/6 5 in. 8/6 8 in. 7 x 4 in. 8/6

CONNECTING WIRE P.V.C. Bright colours. Five 2/1 feet, coils only

3 VALVE AMPLIFIERS Kit of new parts, consisting chassis, mains and output transformers, valves (P91, 6X4, 6X5) and all components.

MAINS TRANSFORMERS Excellent Quality Guaranteed. Upright mounting 250-0-250 V 60ma. 6.3V, 3A (80ma) 12/6 611ta semi-shrouded 9/6

13 CHANNEL T.V.s Table Models. Famous Makes. Absolutely Complete. These sets are unequalled in value due to huge purchase direct from source.

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100 RESISTORS 6 6 Excellent. Sizes 1-3 watt.

100 CONDENSERS 9 6 Miniature Ceramic and Silver Mica Condensers, 3 pF to 5,000 pF. LIST VALUE OVER 4/6

25 TAG STRIPS 4/1- 2, 4, 6, 8 way etc. Unused.

100 HI STABS 9 6 1/2 to 2 1/2, 100Ω to 5MΩ

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TRANSISTORS GUARANTEED TOP QUALITY

Huge reduction. Red Spot 1/6 standard L.P. type now only White Spot R.F. 2/-

Mullard Matched Output Kits (OC81D and 2-OC81S) 12/6 R.F. Kits (OC44, OC45 (2), 3 transistors) 12/6

Table of transistor types and prices: AF114 8/- OC14 5/6 AF115 7/8 OC45 5/6 AF116 7/8 OC72 5/6 AF117 7/- OC81 5/6 AF127 9/6 OC81D 5/6 OC26 12/6 OC82 6/- OC38 14/- OC170 8/6 OC171 8/6

GERMANIUM DIODES General Purpose miniature detector. A.V.C., etc. 8d.

Gold Bonded highest quality, individually tested. 1/-

SILICON RECTIFIERS Guaranteed performance. Top Make. Tested 250V working.

100mA 3/9 250mA (3 for 9/8) 3/9 18/6 (3 for 18/6) 7/6

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4 watt AMPLIFIER

excellent amplifier with high gain preamp stage, 10F3 driving 10K14 output stage, complete with 8in. speaker. In attractive 2-tone case. Tone control, amazing volume and clarity, ideal for guitars, record players, p.a. in small halls, baby alarms, etc. Easily worth 45/6

ENQUIRIES WELCOMED Quantity Prices or Quotes for items not listed, particularly rare values. TELEPHONE C.O.D. ORDERS DISPATCHED THE SAME DAY.

★ GUARANTEED VALVES ★

by return of post THE MOST ATTRACTIVE COMPETITIVE VALVE LIST IN THE COUNTRY All valves are new and unused unless otherwise advised

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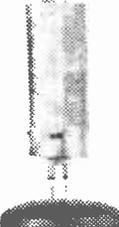
Main table of vacuum tube types and prices: 0Z4 4/6 6K7G 2/- 20D1 8/9 DL75 6/- EY86 5/6 SU2150 4/6 1A7GT 9/6 6K7GT 4/6 20F2 9/6 DL82 9/1 T41 6/9 1C6GT 7/8 6K8G 5/- 20L1 15/- DL92 5/- E240 5/6 TDD4 7/4 1D5 7/- 6H3GT 8/3 20P1 9/6 DL94 6/6 E241 5/6 U14 7/6 1D6 9/6 6X23 8/1 6B3P3 11/- DL95 17/- E250 5/6 U12 7/6 1H5GT 8/9 6L1 9/6 20P4 15/- EA50 1/3 E281 4/6 U92 6/9 1L4 3/- 6L6 7/6 20P5 11/6 EA50C80 0/- FC4 8/- U24 12/6 1LD5 3/6 6L6G 6/6 25A9G 8/- EA91 4/- FW4/500 7/- U25 8/- 1L8S 4/- 6L18 7/8 25LUGT 8/- EA94 6/9 GT1C 12/6 U26 7/- 1N6GT 8/9 6L19 12/6 25Y5G 8/- EA94Z 8/3 G232 10/- U31 7/- 1R5 5/6 6L2D20 7/8 25Z4G 7/- EB34 9/- G234 9/- U33 13/- 1U5 6/- 6N7 7/6 25Z5 8/- EB41 5/- HK90 9/6 U35 12/6 1S4 7/6 6P1 9/6 25Z6G 8/- EB91 2/- HL41D 8/- U37 26/- 1S5 3/9 6P25 8/6 27SU 17/6 EB93 4/9 HK909 19/6 U50 4/9 1T4 3/9 6P28 9/6 30C1 5/- EB94 6/- HVR2 8/- U52 4/9 2D21 5/6 6Q7G 4/6 30C15 0/6 EB95 6/6 K735 6/9 U76 4/- 3A4 4/- 6Q7GT 8/- 30F5 10/6 EB96 6/6 K736 6/9 U78 4/- 3A5 6/- 6R7G 9/- 30F11 10/6 EB98 7/6 K738 14/- U107 12/6 3Q4 5/- 6SA7 6/9 30L1 5/- EB99 6/9 KT44 8/- U191 9/6 3S4 5/- 6SC7 4/9 30L15 12/6 EB121 11/- K751 10/6 U281 8/6 3V4 5/- 6SQ7 4/9 30B1 9/6 EB131 17/- K752 8/6 U282 14/- 3Y4G 8/- 6SJ7 4/6 30P12 7/- EC52 4/9 U283 4/6 U301 12/- 5Y4G 8/- 6SJ7 4/6 30P14 14/- EC91 4/6 K768 12/- U309 6/6 5Y4G 8/- 6SK7 5/- 30P11 10/6 EC92 8/6 K768 8/6 U329 8/6 5V4G 7/6 6SL7GT 5/9 30P13 12/6 EC93 7/6 K738 10/- U339 11/6 5Y3G 4/9 6SN7GT 4/6 30P14 12/6 EC93C 4/6 K7681 5/9 U342 14/- 5Y3GT 4/- 6SS7 3/6 35L6GT 7/- EC93A 9/- K7683 5/- UAB30 5/- 5Y4G 9/6 6U4GT 8/- 35W4 5/- EC93S 5/- K7423 11/- UAF42 8/- 5Z4G 7/6 6V6G 4/6 35Z4GT 6/- EC94 6/6 L63 3/- UB41 7/- 5Z4GT 9/6 6V6GT 6/- EC95 4/6 EC95A 4/6 LNI52 6/6 UB41 7/- 6Y30L2 9/6 6X5 4/6 6/6 EC96 4/6 U114 7/- UB41 7/- 6Y30L2 9/6 6X5GT 5/- 4/6 EC98 4/6 N37 10/6 UBFO 6/6 6Y30L2 9/6 6X5GT 5/- 4/6 EC98A 6/6 N73 13/- UB99 7/6 6A8G 5/- 7B6 9/- 50C5 8/6 EC98S 6/- N108 13/- UB121 9/- 6A8GT 12/6 7B7 5/6 50LGT 8/6 EC98 11/6 N152 8/6 UB121 9/- 6A67 3/9 7C6 7/6 61B1 17/6 EC98E 6/- P41 3/6 UC94 9/- 6A67 6/9 7H7 5/- 61SPT 11/- EC98I 11/- PAB30 7/- UC96 8/6 6AK5 4/3 7R7 12/- 2B7 13/6 EC98J 6/- PC88 10/- UC97 8/6 6AL5 3/3 757 8/9 75 5/6 EC98K 6/- PC97 7/6 UC98 8/6 6AM6 3/- 7Y4 5/- 80 5/- EC98L 6/- PC98 5/- UC98 8/6 6A05 5/- 8D3 3/- 83 6/6 EC98M 6/- PC98 5/- UC98 8/6 6AT6 6/- 10C1 9/- 135T 19/6 EC98N 6/- PC98 11/6 UC98 10/- 6AV6 5/9 10C2 15/- 185BTA 19/6 EC98P 13/6 PC98 11/6 UC98 10/- 6B7 8/6 10E7 7/6 807A 5/- EC98Q 10/- PC98 11/6 UC98 10/- 6B8G 3/6 10F8 10/6 807E 4/9 EF22 6/- PC98Z 10/- UF85 7/- 6BA6 4/9 10F18 10/6 813 4/9 EF36 3/6 PC98A 10/- UF86 12/- 6BE6 5/- 10LD11 14/6 832 14/- EF37A 6/- PC98B 6/- U141 7/6 6BG6G 15/- 10P13 12/6 866A 12/6 EF39 3/3 PC98E 6/6 UL44 14/- 6BF6 5/- 10P14 9/6 8C4 3/9 EF40 9/6 PC98 6/- U145 7/6 6BR7 8/6 12A8 2/- 956 2/- EF42 4/6 PC98A 7/- UL46 8/- 6BR8 9/6 12A8S 9/- 1025 5/6 EF50-BR18 PC98 9/- UR1C 7/6 6BW6 5/- 12A8H 11/- 5763 7/- EF50A 12/6 PEN25 3/9 U06 8/6 6C4 2/3 12AT7 5/6 9002 2/6 EF54 3/6 PEN46 4/6 U07 9/6 6C5 5/6 12AU6 9/- 9003 5/6 EF55 6/6 PEN45 8/6 U08 11/- 6C6 3/6 12AU7 6/- ATP4 2/6 EF58 6/- PL38 8/- UY21 8/6 6C9 11/- 12AV6 6/3 AZ21 6/- EF59 4/6 PL38 10/- UY41 5/6 6C9G 6/6 12AX7 6/6 AZ41 7/- EF61 3/- PL81 6/- UY42 7/6 6CH6 6/6 12BA6 6/- B36 4/3 EF92 3/- PL82 5/6 UY85 5/6 6D2 3/6 12BE6 6/6 C1C 8/- EF183 8/- PL83 6/- VP4B 9/- 6D3 9/6 12BH7 8/9 C1C35 12/- EF184 8/- PL84 6/- VP4C 9/- 6D6 3/- 12C3 5/6 C1C3 9/- EK32 6/- PL85 6/- VP4D 5/9 6E1 4/9 12C5 7/6 C21 7/6 EL32 3/9 PM8 6/6 VR105 6/6 6F5 7/6 12H6 1/9 D77 3/3 EL33 6/- PX4 8/- VR150 6/6 6F13 4/3 12J56T 3/3 DA30 11/6 EL34 10/- PX25 8/- W76 3/- 6F6G 3/6 12J76T 8/- DAC32 9/6 EL35 6/- PY31 8/- W81 7/3 6F14 6/6 12K7GT 4/6 DAF91 4/6 EL38 12/6 PY32 10/- X65 8/6 6F15 9/6 12K8 9/6 DAF96 8/- EL39 3/- PY81 6/- X65 11/6 6F19 6/- 12K9GT 9/6 DPF33 8/9 EL41 8/- PY80 6/6 X66 7/6 6F32 4/9 12Q7GT 4/6 DFF91 3/- EL42 8/9 PY81 4/9 X81M 9/6 6F33 4/- 12SA7 6/3 DFF6 6/- EL44 4/6 PY82 5/6 Y63 6/6 6H6 1/8 12SG7 4/6 DFF97 7/6 EL55 9/9 PY83 5/6 Y63 4/9 6F15 4/9 12S9 7/6 DFF98 5/6 EL56 8/6 PY84 8/6 Y63 8/6 6J5G 3/- 12SJ7 5/6 DFF98 4/6 EL55 5/- PY80 6/6 6J5GT 4/3 12SK7 2/9 DK32 9/6 EM84 8/9 PY80 6/6 6J6 2/6 12SN7GT 6/9 DK31 5/6 EM86 6/6 PZ30 9/6 6J7 8/6 12SQ7 7/6 DK92 6/6 EM81 6/6 9/9 PY81 9/6 6J7G 4/9 12S9 7/6 DK96 8/6 EM81 6/6 9/9 PY81 9/6 6J7GT 7/6 1457 14/6 DL33 7/6 EM85 8/- SP41 2/3 6K6GT 6/- 19A05 7/9 DL35 7/6 EN31 16/- SP61 2/3 6K7 5/9 19B6G 14/- DL63 9/- EY51 7/- SU25 16/-

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FANTASTIC BUY!**STEREO DYNAMIC MICROPHONE MODEL SM.D100**

A truly revolutionary new stereo dynamic microphone, ideal for the tape recording and audio enthusiast who has an eye for quality and value. Brief specification—Frequency response 60-15,000 c/s. Output impedance 50K ohms, sensitivity—40dB. Size: 2 1/2" high, Mike 2 1/2" dia. Base 4 1/2" dia. Mike can be removed from table stand and used with floor stand if desired. Supplied complete with table stand and 10ft. of screened lead in display carton.

PRICE **9 Gns.** S.A.E. for leaflet.

**DM.614. 50K DYNAMIC SUPER SENSITIVE DESK OR NECK MICROPHONE**

Never before at such high quality at such low price. Complete with carrying cord and desk stand. Lightweight. PRICE 45/-, Complete in presentation pack.

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For true highidelity reproduction of the upper middle and top frequency ranges in multi-unit speaker installations. Pressure unit type utilizing a spun aluminium diaphragm. Output 10 watts. Frequency response 1500-1800 c.p.s. Impedance 16 ohm.

Finished in matt black, flanged and drilled for baffle mounting.

PRICE **29/6**

MINIATURE PORTABLE TAPE RECORDER MODEL TC.601

★ Fully transistorised.
★ Dual track



★ Combined microphone/speaker.
★ Size only 10 1/2" x 3 1/2" x 2 1/2"

Completely portable, self-contained, full function miniature tape recorder utilising advanced transistor circuitry with 4-transistor push-pull output stage to give you quality reproduction you would only expect from units three times the price. Simple control or rewind/stop/playback/record, and variable volume control. Attractive tan and gold high impact poly-vinyl case with transparent snap-on plexiglas top enabling unit to be operated with top lid position. Complete with dual purpose microphone-speaker. 200 ft. of tape, batteries and instruction book.

PRICE **£8.19.6**

SUBSTITUTION BOXES

Fully calibrated complete with insulated leads. Model O.M.G RESISTANCE BOX provides 24 standard values at 1 watt, 15 ohms to 10 meg. Price 37/6.



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4-TRANSISTOR PUSH-PULL AUDIO AMPLIFIER

Model **REG.2004**

Not a kit—a ready built miniature amplifier incorporating 4-transistor 9 volt battery amp coil (or Power) speaker and volume control connection leads. The most useful amplifier ever produced. Complete with instructions and circuit diagram. Ideal for making powerful transistor radios, using battery powered record players, intercom etc. Must be heard to be appreciated.

ONLY **42/6**

AMT.31 3-TRANSISTOR SUB-MINIATURE AM TUNER

Covers full broadcast band 4 transistors—3 IF and 1 Osc. Ferrite rod antenna completely wired and self circuit on printed circuit board. Complete with instructions. Price **84/1**

H402 ULTRA SUB-MINIATURE TRANSISTOR COIL SET.

Smallest 2 gang variable condenser 1 1/2" dia. square x 1/2" deep. 3 1/2" x 1" and Osc. coil 1/2" square x 1/2" high. Ferrite rod with medium wave coil ready wound. All supplied with suggested 6 transistor set circuit and parts list. Matched coils shielded and impregnated high O 455 Kc/s. All slug tuned. Tuning dial and knob fits securely on shaft. ONLY **24/6** complete.

UD.19H UNIDIRECTIONAL DYNAMIC MICROPHONE

The very latest microphone creation, designed to take the professional and enthusiast the last word in unidirectional performance.

Designed to provide the speed component from the periphery, thus eliminating all previous common unidirectional design defects. Exclusive features include high sensitivity and excellent frequency characteristics achieved by use of an aluminium wire voice coil. High stability by use of polyester film for the diaphragm. Extremely effective in minimising feed-back problems. Dual high and low impedance, wind adaptor and shielded cable. PRICE **£14.14.0.**

DS.1 MICROPHONE DESK STAND

5 1/2" dia., grey plastic base. 3 1/2" x 1/2" dia. rod (27 threads). PRICE **10/6**

HAWAIIAN PORTABLE RECORD PLAYER Model HN707

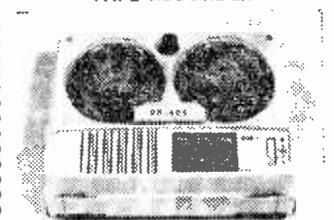
Uses a unique pick-up, turntable and special speaker to give amazing volume and reproduction with the use of valves or transistors. Battery operated, plays up to 12" records at 33 1/3 or 45 c.p.m. Separate line speed and volume control. 4 1/2" wind adaptor and stroboscope. Durable plastic cabinet fully waterproof with carrying handle and record storage compartment. Size 9 1/2" dia. x 3 1/2" deep. Weight 2 1/2 lb. 0 oz.

SPECIAL OFFER ONLY £4.19.6

NOW! HI-FI SOUND

With the **K430 RADIO AMPLIFIER**

Designed for use with transistor radios, valve radio-car radios, amplifiers where quality reproduction of sound is required. Plug into earpiece output socket of nearly all miniature sets. The cabinet is finished in beige leather with contemporary gold buttons at each end. Complete with 12ft. extension cord fitted with miniature plugs, individually cartoned and guaranteed. Size: 9 1/2" x 3 1/2" diameter.

NEW! PUSH BUTTON PORTABLE TAPE RECORDER

MODEL **UN.406.**

The latest in transistor portable recorders incorporating 4 transistor amplifier two motors, adjustable speed control, twin track recording, big 2 1/2" dynamic speaker, simple push button stop/record/play and rewind controls. Volume control. Attractive two-tone case with carrying handle and lead. Complete with remote control microphone, 200 ft. of tape. Earphone. Batteries and instruction book.

PRICE **10 Gns.**

HI FI SPEAKER

MODEL **C.R. 12AE.** Two-way true Hi-Fi and super stereo at low cost, response: 30-16,000 c.p.s. 10-watt 16 ohms. PRICE **£8.8.0.**

SF.20 RADIO EARPHONES

Hi-impedance 2,000 ohms general use headset. Black and Ivory plastic cased electro-magnetic units with adjustable headband for comfortable fit. Individual listening for all types of applications. Individually packed, with flexible cord attached.

PRICE **12/-**

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RF 40. Designed for checking the radiation from a transmitting antenna. The sensitivity can be controlled by movement of panel control, the antenna length or by increasing distance from the radiator. Freq. range 1-250 Mc/s. S.W.G.A. Ltd.

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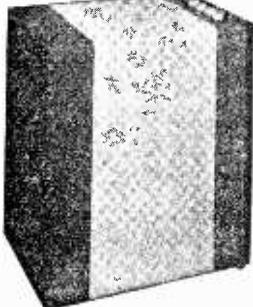


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THE R.S.C. BASS-MAJOR 30 WATT GUITAR AMPLIFIER

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

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



- ★ Incorporating two 15in. heavy duty 25-watt high flux (17,000 lines) loudspeakers with 3in. 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.

39½ Gns.

Send S.A.E. for leaflet.
OR DEPOSIT of £4.30 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 complementary shades of Rexine/Tygan. 200-250 A.C. mains. **£8.19.6** Or DEPOSIT £1 and 9 monthly payments of 41s. 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 or amplifier. Controls are Speed (frequency of interruptions), Depth (for heavy or light effect), Volume and Switch. Three sockets are for two inputs and Foot Switch. **ONLY 4 Gns.**

R.S.C. SENIOR 15 WATT LEAD or RHYTHM GUITAR AMPLIFIER

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 ups can be used at the same time. Loudspeaker is a heavy duty high flux 12in. 20 watt model with cast chassis. Chassis is well made and finished as Junior Model. Size approx. 18 x 18 x 8in.

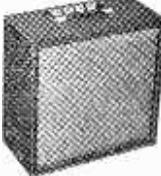
Only **18 Gns.** Carr. 10/-

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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 a 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 200-50 c.p.s. A.C. mains.

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29½ Gns. Or Deposit **£3.2.0** and 12 monthly payments of 51/8. Carr. 17/6.



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D.C. SUPPLY KIT. 12 v. 1 a. consisting of a partially drilled metal case, mains trans. F.W. Bridge Rectifier, 2 fusesholders 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.

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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
CONTACT COOLED. 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 **£7.19.9** Carr. 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.

DERBY Now open at 26 Osment Road The Spot

HEAVY DUTY LOUDSPEAKERS IN SUBSTANTIAL REXINE COVERED CABINETS. Type BG1. Suitable for Bass Guitar. Speaker Unit 15in., High Flux, 15 ohms, 30 watts. Cabinet size approx. 24 x 21 x 13in. (only 19s) Carr. Or Deposit 37/9 and 12 monthly payments of 31/6. Type BG32. Suitable Bass and Lead Guitar. Two 12in. high flux 15 ohm 25 watt speakers, one with aluminium speech coil and dual cone 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 keyboard 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. units. Or Deposit 25/9 and 9 monthly payments 25/9. Size 30 x 30 x 18in. cut for 15in. or 18in. speaker 13gns. or Deposit 30/4 and 9 monthly payments 30/4. Suitable speakers available.

FANE EXTRA HEAVY DUTY LOUDSPEAKER 15in. TYPE 153 40 watts. Total flux 375,000 lines. Extremely high sensitivity. 15 ohm voice coil. Only 18 gns. or Deposit 37/9 and 12 monthly payments of 31/6.

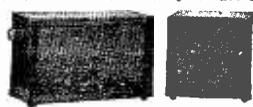
FANE EXTRA HEAVY L/SPEAKER 18s. 18in., 15 ohms, 60 watts, 3in. diam. Speech Coil. Total Flux 375,000 lines. High sensitivity. ONLY 24 gns. or Deposit 37/9 and 12 monthly payments of 42/9. Send S.A.E. for leaflet on 153 and 183.

EX. GOVT. SMOOTHING CHOKES. 200 mA, 3-5 H, 50 ohms, Parmeko 8/9; 150 mA, 10 H, 50 ohms 9/9; 80 mA, 20 H, 50 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, 5-10 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 5 x 2 1/2in. Stove 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 INTER-COMM. 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. Controllable at both units. An intercomm. of this class would normally cost £20-£30. Only 99/6, carr. 5/- or assembled ready for use 8 gns.



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

R.S.C. (Manchester) Ltd.

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

MAIL ORDERS to 54 Wellington St, 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.

R.S.C. (Manchester) Ltd.

LEICESTER 32 High St.
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SHEFFIELD 13 Exchange St. (Castle Market Bldgs.)
 Half-day Thursday

HULL 51 Savile St., Hull
 Half-day Thursday

LIVERPOOL 73 Dale St. Liverpool 2
 Half-day Wednesday

BRADFORD 56 Morley St. Above Alhambra Theatre) Bradford
 Half-day Wednesday

MANCHESTER 8-10 Brown St. (Market Street) Manchester 2
 No half-day

LEEDS 5-7 County (Mecca) Arcade Briggate, Leeds
 No half-day

DERBY 26 Osmaston Road THE SPOT

FANE HEAVY DUTY HI-FI SPEAKERS

12in. 15 ohms. Cast chassis. Exceptionally robust 2in. diam. Voice Coil Assemblies. 122/10 20watt. 5 gns. 122/10A 20watt. 6 gns. 122/12 20watt. 7 gns. 122/12A 20watt. 8 gns. 122/14 22watt. 9 gns. 122/14A 22watt. 10 gns. 122/17 25watt. £11.17.6 25watt. £12.17.6 15in. 15 ohms. Cast chassis. Exceptionally robust 2in. diam. Voice Coil Assemblies. 152/12 20watt. 12 gns. 152/12A 20watt. 13 gns. 152/14 27watt. 14 gns. 152/14A 27watt. 15 gns. 152/17 35watt. 16 gns. 152/17A 35watt. 17 gns. "A" indicates dual cone type. 30-17000 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 ± 3 dB 30-30,000 c/s. A specially designed sectionally wound ultra linear output transformer is used with 807 vacuum valves. All components are chosen for reliability. Six valves are used EF86, EF86, ECC83, 807, 807, GZ34. Separate Bass and Treble Controls are provided. Minimum input required for full output is only 12 millivolts so that ANY KIND OF MICROPHONE OR PICK-UP IS SUITABLE. The unit is designed for CLUBS, SCHOOLS, THEATRES, DANCE HALLS, OUT-DOOR FUNCTIONS, etc. For use with Electronic ORGAN, GUITAR, STRING BASS, etc. For standard or long-playing records. OUTPUT SOCKET PROVIDES L.T. and H.T. for RADIO FEEDER UNIT. An extra input with associated vol. control is provided so that two separate inputs such as Gram and "Mike" can be mixed. Amplifier operates on 200-250 v. 50 c/s. A.C. Mains and has output of 15 ohm 30 watt speakers. Complete kit of parts with fully punched chassis and point-to-point wiring diagrams and instructions. It required perforated cover with carry handles can be supplied

11 Gns. Carr. 10/-

for 19/9. The amplified 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 3/9. Suitable microphones and speakers available at competitive prices.

ARMSTRONG, DULCI, LINEAR, ROGERS, LEAK and JASON EQUIPMENT, GOODMAN'S, W.B. and FANE SPEAKERS, GARRARD and GOLDRING T/ TABLES CASH or H.P.

SUPERHET FEEDER UNIT. Design of a high quality Radio Tuner (specially suitable for use with our Amplifiers). Delayed A.V.C./I.C. Controls are Tuning W/C and Vol. Only 250 v. 15 mA. H.T. and L.T. of 8.5 v. amp. required from amplifier. Size approx. 9 x 6 x 7 1/2 in. Simple alignment procedure. Point-to-Point wiring diagrams, instructions and price parts list with illustrations. 2/6. Total building cost £4.15.0. S.A.E. for leaflet.

R.S.C. BATTERY TO MAINS CONVERSION UNITS

R.S.C. BATTERY TO MAINS 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. 46/6.



P.M. SPEAKERS. 10in. W.B. "Stentorian" 30; 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). 59/9.

TWEETERS. R.A. 3 ohm. 25/9; 15 ohm 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 cost of parts including valves, Tuning dial. Eschutecon, etc., £6.19.6.

LINEAR L45 MINIATURE 45 WATT QUALITY AMPLIFIER. Suitable for any record playing unit and most microphoned Negative feedback 10-point Servo Bass and Treble Controls. For mains 200-250 v. 50 c/s. Output for 2-3 ohm speaker. Mullard valves E230, ECC83, EL34. Size only 7 x 5 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 2/6.

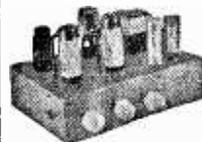
12in. 16 WATT HIGH QUALITY LOUDSPEAKER



18 x 14 x 10in. Fin. sh. as above. Terms: Deposit 17/9 and 9 monthly payments of 17/9. Only £7.19.6. Carr. 8/6.

For larger types see preceding page. **LINEAR LG34 GRAM AMPLIFIER.** High quality. Separate Bass and Treble Controls. Handsome appearance. Complete kit enclosed. Black/Gold Frontplate 5 gns.

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



A highly-sensitive 4-valve quality amplifier for the home, small club, etc. Only 50 millivolts input is required for full output so that it is suitable for use with the latest high fidelity pick-up heads, in addition to all other types of pick-ups and practically all "mikes". Separate Bass and Treble Controls are provided. These give full long-playing record equalisation. Hum level is negligible being 71 dB down. 15 dB of Negative feedback is used. H.T. of 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. Output for 2-3 ohm speaker. Chassis is not alive. Kit is complete in every detail and includes fully punched chassis (with bassplate) 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.

GLASGOW — LONDON — EDINBURGH

326 ARGYLE STREET
 Now Open

238 EDGWARE ROAD
 Opening Shortly

133 LEITH STREET
 Now Open

THE SKYFOUR T.R.F. RECEIVER. A design for 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, 5P61, 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.

R.S.C. BASS REFLEX CABINETS, JUNIOR MODEL. Specially designed for W.B. HF102 Speaker, but suitable for any good quality 10in. speaker. Acoustically lined and ported. Polished walnut veneer 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 20 x 15 x 13in. For vertical or horizontal use. £3-19.6. Set of legs with brass ferrules. 19/6.

R.S.C. JUNIOR HI-FI REPRODUCER. The very latest Goodman Axlette 8 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. **8 Gns.** Carr. 4/6. Ideal for Stereo.

MULTI-METER, CABY MI. Sensitivity 2,000 ohms per volt. A.C. and D.C., 54/- A.10. Basic Meter sensitivity 155 microamps A.C. and D.C. ranges £4.17.6. B.20. Sensitivity up to 10,000 ohms per volt A.C. and D.C., £5.10.0. 30,000 ohms per volt, with overload buzzer. £8.18.6.

R.S.C. CORNER CONSOLE CABINETS

Polished walnut veneer finish. Pleasing design. **JUNIOR MODEL.** Size 20 x 11 x 8 in. for 6in. speakers. £25.9. **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 7 gns.



AUDIOTRINE HI-FI SPEAKER SYSTEMS. Consisting of matched 12in. 12,000 line, 15 ohm high quality speaker; cross-over network consisting of choke condenser, etc.) and Tweeter The smooth response and extended frequency range ensure surprisingly realistic reproduction. Standard 10 watt rating £4.19.9. Carr. 5/- or Senior 15 watt. £6.19.9. Carr. 7/6.

AUDIOTRINE EQUIPMENT CABINETS

Size 36 x 15 x 18in. Beautiful walnut veneered finish. Elegant contemporary design. Robust construction. Uncut, removable baseboard. **Denr.** above (only 121 gns. Carr. 15/-) Terms: Dep. 25/9 and 9 monthly pymts. 20/9.



kit of parts with diagrams and instructions. 49/9, or ready for use. 59/6.

AUDIOTRINE HI-FI TAPE RECORDER KIT 25

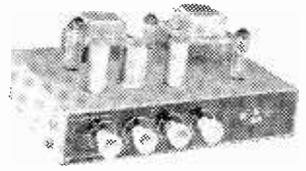
REALISM AT INCREDIBLY LOW COST. CAN BE ASSEMBLED IN AN HOUR
 Incorporating the latest Collaro Studio Tape Transcriber, The Audiotrine High Quality Tape Amplifier with negative feedback equalisation for each of 3 speeds. High Flux P.M. Speaker, empty Tape Spool, a Reel of Best Quality Tape and a Handsome Portable Carrying Cabinet attractively finished in durable two-tone Polychrome size 14 1/2 x 15 x 8 1/2 in. high and circuit. Total cost if purchased individually approximately £40. Performance equal to units in the 330-330 class. S.A.E. for leaflet.
TERMS: Deposit £2.13.9 and 12 monthly payments of 44/-. Cash price if settled in 3 months.



HIGH FIDELITY 12-14 WATT AMPLIFIER TYPE A11

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

Two input sockets with associated controls allow mixing of "mike" and gram, as in A10 High sensitivity. Includes 5 valves, ECC83, ECC83, EL84, EL84, EZ81. High Quality specially 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 STRING BASS, LEAD OR RHYTHM GUITARS, etc.
OUTPUT SOCKET with plug provides 300 v, 30 mA, and 6.3 v, 1.5 a. For supply of a RADIO FEEDER UNIT. Size approx. 12 x 9 x 7 in. For A.C. mains 200-250 v, 50 c.p.s. Output for 8 and 15 ohm speakers. Kit is complete to last nut. Chassis is fully punched. Full instructions and point-to-point wiring diagrams supplied. Only **8 Gns.** Carr. 10/-. (Or factory built 51/- extra.)
 If required louvered metal cover with 2 carrying handles can be supplied for 13/9. **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 Lin., 3 1/2 in., 7 in. 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, EZ81. Outputs for 2-3 ohm speakers. Point-to-Point wiring diagrams and instructions supplied. Send S.A.E. for leaflet. Full constructional details and price list 2/6. Carr. 10/-. ready to use for 59/6 extra.



Kit can be supplied assembled and

ONLY 3 PAIRS OF SOLDERED JOINTS PLUS MAINS

R.S.C. GRAM AMPLIFIER KIT. 3 watts output. Negative feedback. Control Vol., Tone and Switch. Mains operation 200-250 v. A.C. Fully isolated chassis. Circuit, etc., supplied. Only 39/9. Carr. 3/9.
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 39/6. B.S.R. Stereo 39/9.
GRAMMITE RECORDING HEADS. High Impedance Record/Playback 22/-. Low Impedance Erase, 12/6.
MARRIOTT RECORDING HEADS. High Impedance. Record/Playback 15/-. Low Impedance. Erase, 10/-.
CRISTAL PICK-UPS. Complete and with latest Acos/Hi-Fi Turnover Cartridge 29/11.
CRYSTAL MICROPHONES. Hand Type NP110 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. Lapel type 29/9.
COLLARO TUNING. 4-speed Single Player Unit and Crystal Pick-up with hi-fi Turnover head Only 23-19.6.
B.S.R. UA14 4-sp'd AUTO-CHANGERS with hi-fi turnover head. £6-19.6. Carr. 4/6.
GARRARD AUTO-SLIM 4-SPEED AUTO-CHANGERS with high fidelity Pick-up. Latest model. For 200-250 v. A.C. mains. £7-17.6. Carr. 4/6.
GARRARD AT6 AUTO-SLIM DELUXE 4-SPEED AUTO-CHANGERS. Turnover GC8 head, for 200-250 v. A.C. mains. £11-9.0.
GLSA MINIATURE 2-3 WATT GRAM AMPLIFIER. For use with any single or auto-change unit. Output for 2-3 ohm speaker. For 200-250 v. A.C. mains. Size 11 x 2 1/2 x 2 1/2 in. Controls: Vol. and Tone with Switch. Only 59/6.

SENSATIONAL STEREO OFFER

A complete set of parts **4 Gns.** to construct a good quality Stereo amplifier with an undistorted output of total 8 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.
HEAVY DUTY CHARGER KIT. 6 1/2 v. 6 amps., variable output. Consisting of Mains Transformer, 0-200-230-250 v.; P.W. (Bridge) Selenium Rectifier; Ammeter, Variable Charge Rate Selector Panels, Fuses, Fuses, Fuseholder and circuit. 59/9. Carr. 4/6.



HEAVY DUTY CHARGER KIT. 6 1/2 v. 6 amps., variable output. Consisting of Mains Transformer, 0-200-230-250 v.; P.W. (Bridge) Selenium Rectifier; Ammeter, Variable Charge Rate Selector Panels, Fuses, Fuses, Fuseholder and circuit. 59/9. Carr. 4/6.

R.S.C. MAINS TRANSFORMERS (GUARANTEED)

Interleaved and Impregnated. Primary 200-230-250 v. 50 c/s. Screened TOP SHROUDED "DROP THROUGH"
 250-0-250V. 70mA. 6.3v. 2a. 0-5-6.3v. 2a. 17/9
 350-0-350V. 80mA. 6.3v. 2a. 0-5-6.3v. 2a. 18/9
 250-0-250V. 100mA. 6.3v. 2a. 6.3v. 1a. 21/9
 250-0-250V. 100mA. 6.3v. 3.5a. C.T. 27/9
 350-0-350V. 100mA. 6.3v. 4a. 0-5-6.3v. 3a. 25/9
 300-0-300V. 130mA. 6.3v. 4a. C.T. 1a. for Mullard 510 Amplifier. 29/9
 300-0-300V. 100mA. 6.3v. 4a. 0-5-6.3v. 3a. 26/9
 350-0-350V. 150mA. 6.3v. 4a. 0-5-6.3v. 3a. 26/9
FULLY SHROUDED UPRIGHT
 250-0-250V. 80mA. 6.3v. 2a. 0-5-6.3v. 2a. Midget type 21 x 3 x 3 in. 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
 300-0-300V. 150mA. 6.3v. 4a. C.T. 6.3v. 1a. for Mullard Amplifier. 33/9
 300-0-350V. 100mA. 6.3v. 4a. 0-5-6.3v. 3a. 27/11
 350-0-350V. 150mA. 6.3v. 4a. 0-5-6.3v. 3a. 35/9



Kit can be supplied assembled and

R.S.C. BATTERY CHARGING EQUIPMENT

All for A.C. Mains 200-250v., 50 c/s.
ASSEMBLED 6 1/2 v. 6 amp. Fitted Ammeter and variable charge rate selector plug for 6 v. or 12 v. Louvered metal case with stoved grey hammer finish. Fused and ready for use with mains and output leads and battery clips. Carr. 4/6. **59/9**
CHARGER KIT, 12 v. 14 AMP or 24 v. 7 AMP Consisting of mains trans. 200-230-250 v. P.W. (Bridge) selenium Rectifier. Ammeter. Fuses, Variable Resistor, Heavy Steel Stove enamelled case and Circuit. Only £9-19.6. Carr. 15/-. Please state if 12 v. or 24 v. kit required.



ASSEMBLED 6 1/2 v. 6 amp. Fitted Ammeter and selector plug for 6 v. or 12 v. Louvered metal case with stoved grey hammer finish. Fused, ready for use with mains and output leads. Carr. 3/9. **39/9**
 6 1/2 v. 6 amp. 27/9 Less meter.

FULLY SHROUDED (continued)
 425-0-425V. 200mA. 6.3v. 4a. C.T. 5v. 3a. 55/9
 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. 69/9
OUTPUT TRANSFORMERS
 Midget Battery Pentode 681 for 3S4, etc. 4/6
 Small Pentode 5,000Ω to 3Ω 4/6
 Small Pentode 75,000Ω to 3Ω 4/6
 Standard Pentode 5,000Ω to 3Ω 5/9
 Standard Pentode 7,000Ω to 3Ω 5/9
 10,000Ω to 3Ω 5/9
 Push-Pull 8 watts, EL84, or 6V6 to 3Ω or matched to 15Ω 9/9
 Push-Pull 10-12 watts to match 6V6 or EL84 to 3-8 to 15Ω 19/9
 Following types for 3 and 15Ω 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 25/9
 Push-Pull 20 watts, sectionally wound. 6L6, KT66, EL34, etc. 49/9

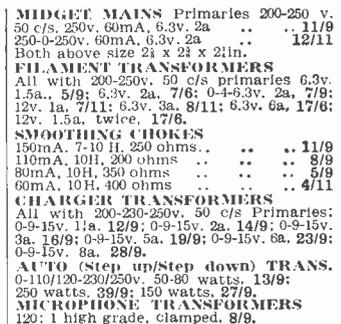


Kit can be supplied assembled and

Guaranteed 12 months.

BATTERY CHARGER KITS Consisting of Mains Transformer, P.W. Bridge, Metal Rectifier, metal ventilated steel case, Fuses, Fuseholders, Grommets, panels, Heavy Duty Clip, circuit. Carr. 3/6 extra.
 6 v. or 12 v. 1 amp. 22/9
 As above, with Ammeter 25/9
 6 v. or 12 v. 2 amps. 19/9
 6 v. or 12 v. 2 amps. inclusive of Ammeter 35/9
 6 v. or 12 v. 4 amps. with Ammeter and variable charge rate selector 52/9
CHARGER AMMETERS 0-1.5 a. 0-4 a. 0-7 a. 8/9 ea.
CHARGER KIT, 12v. 10 Amp. with variable charge rate adjustment and ammeter. £4-19.6. Carr. 10/-.

MIDGET MAINS Primaries 200-250 v. 50 c/s. 250v. 60mA. 6.3v. 2a. 11/9
 250-0-250V. 60mA. 6.3v. 2a. 12/11
 Both above size 2 1/2 x 2 1/2 in.
FILAMENT TRANSFORMERS
 All with 200-250v. 50 c/s primaries 6.3v. 1.5a. 5/9; 6.3v. 2a. 7/6; 0-4-6.3v. 2a. 7/9; 12v. 1a; 7/11; 6.3v. 3a; 8/11; 6.3v. 6a; 17/6; 12v. 1.5a. wire, etc. 17/6
SMOOTHING CHOKES
 150mA. 7-10 H. 250 ohms. 11/9
 100mA. 10H. 200 ohms. 8/9
 80mA. 10H. 350 ohms. 5/9
 60mA. 10H. 400 ohms. 4/11
CHARGE TRANSFORMERS
 All with 200-230-250v. 50 c/s Primaries:
 0-9-15v. 1a. 12/9; 0-9-15v. 2a. 14/9; 0-9-15v. 3a. 16/9; 0-9-15v. 5a. 19/9; 0-9-15v. 6a. 23/9; 0-9-15v. 8a. 28/9.
Auto (Step up/Step down) TRANS. 0-110-230-250v. 50-80 watts. 13/9;
 250 watts. 39/9; 150 watts. 27/9.
MICROPHONE TRANSFORMERS 120-1 high grade, clamped, 8/9.



Kit can be supplied assembled and

EQUIPMENT FOR RADIO
"AMATEURS" COMMUNICATIONS



INSTRUMENTS FOR TEST,
SERVICE AND WORKSHOP

SAVE MONEY . . . AND ENJOY YOURSELF BUILDING THE WORLD'S BEST KIT-SETS — 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



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

£41.10.0 assembled. **£32.12.6** Kit
PORTABLE 'SCOPE. Model OS-1. A compact portable oscilloscope, ideal for servicing and general work. Printed circuit board. Case: 7½ x 4½ x 12½in. long. Wt. only 10½ lbs.

£29.8.0 assembled **£21.18.0** Kit

10-12U

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

£18.10.0 assembled **£12.18.0** Kit



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

£19.18.6 assembled **£13.18.6** Kit

V-7A

RF PROBE. 309-CU extends range to 100 Mc/s. Indication to 300 Mc/s.

£1.13.6 Kit

HV PROBE, HV-336 measures up to 30,000V d.c.

£2.19.6 Kit

RF SIGNAL GENERATOR. Model RF-1U. Up to 100 Mc/s fundamental, 200 Mc/s harmonics. Up to 100 mV output on all bands.

£19.18.0 assembled **£13.8.0** Kit

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

£18.11.6 assembled **£12.18.0** Kit

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

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, horizontal control, ducted port reflex cabinet.

Horizontal or vertical (without legs)

Incl. P.T. **£10.17.6** Kit

Horizontal or vertical (with matching legs)

Incl. P.T. **£11.12.0** Kit

"AMATEUR" EQUIPMENT

AMATEUR BANDS RECEIVER

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

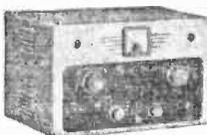
£39.6.6 Kit
Assembled **£52.10.0**



RA-1

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

Assembled **£104.15.0** **£79.10.0** Kit



DX-40U

AMATEUR TRANSMITTER

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

£33.19.0 Kit
Assembled **£45.8.0**

Other kits in the amateur range include: SSB Adaptor SB-10U, £39.5.0 Variable Freq. Oscillator VF-1U, £12.10.0 Balun Coil Unit B-1U £4.15.6. Grid-Dip Meter GD-1U £10.19.6. Q Multiplier QPM-1, £8.10.0. Wide range of model: under American Mail Order Scheme.

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.

Incl. P.T. **£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.

Incl. P.T. **£12.11.0** Kit

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

Incl. P.T. **£19.17.6** Kit

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

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



GC-1U

SEND FOR FREE BRITISH CATALOGUE
OVER 50 MODELS TO CHOOSE FROM

DAYSTROM LTD.

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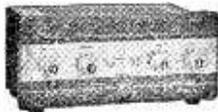
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Millions of Heathkit models are in use throughout the world because:—

- ★ 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 kit-set design.
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HI-FI AMPLIFIERS



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



18W STEREO AMPLIFIER. Model S-99. Ganged controls. Stereo/Mono gram, radio and tape recorder inputs. P/B selection.
 £27.19.6 Kit
 £37.19.0 Assembled

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

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. **£14.19.6** assembled. **£10.19.6** Kit

TAPE RECORD/REPLAY AMPLIFIER KITS. Will operate with most tape decks. Send for details.
 TA-1M (Mono), £19.18.0. Kit TA-1S (Stereo), £25.10.0 Kit

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. **£15.18.0** Assembled. **£11.18.0** Kit

OTHER MODELS

DE-LUXE LARGE SCALE VVM KIT. Model IM-13U. a.c. and d.c. volts 0.1-1500v in 7 ranges. Ohms to 1000MΩ in 7 ranges. 6" Meter. Modern styling with unique gimbal mount.



£18.18.0 Kit. **£26.18.0** Assembled



PUBLIC ADDRESS AMPLIFIER, PA-1. For vocal and instrumental groups, guitars, etc. 50 W r.m.s., 100 W pk output. 4 inputs, 2 loudspeakers in one compact unit. Send for full details.

£74.0.0 Assembled **£54.15.0** Kit

Set of 4 Legs 17/6 extra.

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

£53.0.0 Assembled. **£39.16.0** Kit



SELF SUPPORTING AERIAL TOWER KIT. Model HTI. Ideal for Amateur Radio or TV reception, etc. Strong steel construction, height 32 ft. tapered square section 3ft. x 3 ft. at base. Kit **£29.15.0** Oxide Painted. **£35.15.0** Galvanised.

Accessories available. Send for details.

GOTSWOLD SPEAKER SYSTEMS

STANDARD MODEL
 Acoustically designed enclosure in the white 26 x 23 x 15 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 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.

Total **£15.18.0** 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.

FM-4U
 Total **£26.10.0** Kit

EQUIPMENT CABINETS



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

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

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Full details of model(s)

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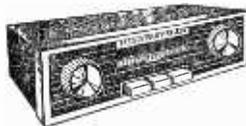
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0A2	4/6	6BR8	2/1	6V6G	3/0	2011	12/6	AC2PEN	EP5CC	10/-	EL32	3/6	K788	28/-	QK150/159/6	CS0	4/6	AF123	10/6	
0B2	6/-	6BR7	26/-	6V6GT	5/0	2011	12/6	DD 12/G	EL10F	10/6	EL33	6/8	K7W01	4/0	R12	5/0	CS2	4/6	AF129	10/-
0Z4C/T	4/3	6BR6	6/0	6X4	8/0	20P3	12/6	AC4PEN	E1148	1/0	EL31	3/6	K7W63	5/0	R16	20/-	CS7	4/6	AF127	9/6
1A3	2/6	6BR7	5/0	6X5	4/0	20P4	12/6		E1149	1/6	EL35	1/0	K7W63	5/0	R17	17/6	CS8	4/0	BY213	11/6
1A3	5/-	6BR6	3/0	6Y94	6/0	20P5	12/3	AC5PEN	E1150	6/0	EL37	12/3	K7Z41	4/0	R18	8/6	CS4	10/6	GB3	9/6
1C1	4/-	6C5	4/-	7A7	12/6	2106T	6/0	AC6PEN	E1151	3/0	EL42	7/6	L1152	6/0	R32	9/6	CS1	10/6	G11	10/-
1C2	6/0	6C9	8/-	7B0	10/6	2146T/12/6	6/0	ACHLD3	E1152	6/0	EL41	8/6	L1309	7/0	R41/240A	6/0	CS1	9/6	GET109	8/6
1C3	6/0	6C8	3/-	7B7	7/-	255 V5	6/0	AC7PEN	E1153	6/0	EL44	1/6	L1319	9/6	64/-	CS1	9/6	GET103	7/6	
1C5	6/0	6C9	10/6	7C5	7/6	255 V3	7/0	AC8PEN	E1154	4/0	EL44	4/0	L1319	9/6	64/-	CS1	9/6	GET104	10/-	
1C7	7/6	6C4	2/3	6Z4	6/0	2646G	7/0	AC9PEN	E1155	6/0	EL45	7/6	L1319	9/6	64/-	CS1	9/6	GET106	10/6	
1D1	4/-	6C5	4/-	7A7	12/6	2106T	6/0	AC6PEN	E1151	3/0	EL42	7/6	L1152	6/0	R32	9/6	CS1	10/6	G11	10/-
1D2	6/0	6C9	8/-	7B0	10/6	2146T/12/6	6/0	ACHLD3	E1152	6/0	EL41	8/6	L1309	7/0	R41/240A	6/0	CS1	9/6	GET109	8/6
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1F2	6/0	6C9	8/-	7B0	10/6	2146T/12/6	6/0	ACHLD3	E1152	6/0	EL41	8/6	L1309	7/0	R41/240A	6/0	CS1	9/6	GET109	8/6
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1M1	4/-	6C5	4/-	7A7	12/6	2106T	6/0	AC6PEN	E1151	3/0	EL42	7/6	L1152	6/0	R32	9/6	CS1	10/6	G11	10/-
1M2	6/0	6C9	8/-	7B0	10/6	2146T/12/6	6/0	ACHLD3	E1152	6/0	EL41	8/6	L1309	7/0	R41/240A	6/0	CS1	9/6	GET109	8/6
1M3	6/0	6C8	3/-	7B7	7/-	255 V5	6/0	AC7PEN	E1153	6/0	EL44	1/6	L1319	9/6	64/-	CS1	9/6	GET103	7/6	
1M5	6/0	6C9	10/6	7C5	7/6	255 V3	7/0	AC8PEN	E1154	4/0	EL44	4/0	L1319	9/6	64/-	CS1	9/6	GET104	10/6	
1M7	7/6	6C4	2/3	6Z4	6/0	2646G	7/0	AC9PEN	E1155	6/0	EL45	7/6	L1319	9/6	64/-	CS1	9/6	GET106	10/6	
1N1	4/-	6C5	4/-	7A7	12/6	2106T	6/0	AC6PEN	E1151	3/0	EL42	7/6	L1152	6/0	R32	9/6	CS1	10/6	G11	10/-
1N2	6/0	6C9	8/-	7B0	10/6	2146T/12/6	6/0	ACHLD3	E1152	6/0	EL41	8/6	L1309	7/0	R41/240A	6/0	CS1	9/6	GET109	8/6
1N3	6/0	6C8	3/-	7B7	7/-	255 V5	6/0	AC7PEN	E1153	6/0	EL44	1/6	L1319	9/6	64/-	CS1	9/6	GET103	7/6	
1N5	6/0	6C9	10/6	7C5	7/6	255 V3	7/0	AC8PEN	E1154	4/0	EL44	4/0	L1319	9/6	64/-	CS1	9/6	GET104	10/6	
1N7	7/6	6C4	2/3	6Z4	6/0	2646G	7/0	AC9PEN	E1155	6/0	EL45	7/6	L1319	9/6	64/-	CS1	9/6	GET106	10/6	
1O1	4/-	6C5	4/-	7A7	12/6	2106T	6/0	AC6PEN	E1151	3/0	EL42	7/6	L1152	6/0	R32	9/6	CS1	10/6	G11	10/-
1O2	6/0	6C9	8/-	7B0	10/6	2146T/12/6	6/0	ACHLD3	E1152	6/0	EL41	8/6	L1309	7/0	R41/240A	6/0	CS1	9/6	GET109	8/6
1O3	6/0	6C8	3/-	7B7	7/-	255 V5	6/0	AC7PEN	E1153	6/0	EL44	1/6	L1319	9/6						

STERN-CLYNE

Great Britain's Greatest Electronic Hobbies Organisation

NEW LOW PRICES — NOW YOU CAN AFFORD A CAR RADIO



THE 'HIGHWAYMAN'
OUR QUALITY CARRADIO
TO BUILD YOURSELF AT
A NEW LOW PRICE

Look at these features:
★ Attractive styling. ★ Push-pull output. ★ Three latest types EBFB3 and ECHB3. ★ No Buzz, high output and sensitivity. ★ Printed circuit (latest type). 7 x 4in. high flux p.m. speaker and baffle. ★ Medium and Long Waves. ★ Push button for finkertip 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 2in. deep. ★ Easy assembly, supplied with dial and drive already mounted.

Special inclusive price of ONLY **£7.19.6** Plus 5/- 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 "TRAVLER" MkII
Introducing our new ready-built transistorised car radio for ONLY



9½ Gns. P. & P. 5/-
Including 7 x 4" speaker fitted to baffle, fixing brackets, filter unit, all nuts and bolts with fitting instructions

H.P. Terms: Dep. **£2.19.6** and 7 monthly payments of £1.2.6. (Plus 5/- P. & P.)

Star Features ★ Handsomely Styled. ★ Mullard Valves and Transistors. ★ Push Buttons. ★ 11 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 the cars on the road). ★ Dimensions 7 x 2 x 7" depth.

Optional extras, 3 section chromium plated weatherproof telescopic aerials type 1 17/44", 19/6, type 2, 27/43", 29/6, both plus P. & P. 2/6 if purchased separately.

THE WORLD AT YOUR FINGERTIPS!!

THE HE-30 4-BAND COMMUNICATION RECEIVER



One of the finest general coverage bandspread Receivers available at this price. Covering 350Kc/s—1800Kc/s. 4.8Mc/s—14.5Mc/s, 1.6Mc/s—4.8Mc/s. 10.5Mc/s—30Mc/s. Illuminated slide rule dial, calibrated every 5Kc/s on 80 and 40 metres. Edgewise S-meter, 0-100 logging scale, coverage from 0.55—30 Mc/s, 8 valve plus Rectifier superhet circuits. RF Stage with B.P.O. control Q-multiplier. Controls: Function Switch, Audio Gain, Selectivity (Q-multiplier) Frequency (BFO), Band Selector, IF Gain, Trimmer, AVC-MVC Switch, Ant Switch, Main Tuning, Bandsread Tuning and Head-Phone Jack. Selectivity—60dB at 10Kc/s, 0.8Kc/s at 6dB (with Q-Multiplier) IF—65Kc/s. External P.M. speaker reqd. 4 or 8 ohms impedance, Output 1.5 watts, 8 modern Miniature BTG Base Valves and 5Y3 Rectifier. Size 15 x 10 x 7in. Grey crackle finish. 220/240 volt A.C. mains, 50-60 cycle operation. Full instructions and circuit diagram supplied. Send S.A.E. for leaflet.

PRICE **40 Gns.** Carriage Paid.

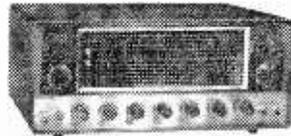
THE HE-40 4-BAND COMMUNICATION RECEIVER



Completely built and ready to go. High sensitivity Superhet receiver covering 550Kc/s—1,300 Kc/s, 1.6 Mc/s—4.4 Mc/s, 4 Mc/s—11 Mc/s, 11 Mc/s—30 Mc/s. Electrical Bandsread tuning. Slide rule type tuning dial. Internal ferrite rod aerial for medium waveband reception and 1 5/8in. 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 BTG base valves. Head-Phone socket (may also be used for external loudspeaker). ANL, BFO, built-in "S" meter, 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 1/2in. x 8 1/2in. x 5 1/2in. (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. Send S.A.E. for leaflet.

PRICE **£24.15.0** Carriage Paid.

THE NEW HE-80 COMMUNICATION RECEIVER

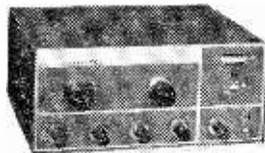


The HE-80 has outstanding sensitivity 0-100 logging scale for instant re-set built-in "S" meter special recording Jack, remote Control Socket allowing simultaneous control with transmitter, 100Kc crystal oscillator circuit providing accurate harmonic signals of either 4 or 8 ohms impedance. Two headphone sockets, one high, one low.

TECHNICAL SPECIFICATIONS.
Frequencies Coverage: Band 1 540—1665Kc; Band 2 1.6—4.8Kc; Band 3 4.8—14.5Mc; Band 4 10.5—30Mc; Band 5 14—146 Mc/s. Band Spread (Ham Band directly read): 80 Metre Band; 40 Metre Band; 20 Metre Band; 15 Metre Band; 10 Metre Band. Sensitivity: 1 micro-volt for 10dB signal to noise ratio. Selectivity: Normal 10Kc at —75dB, 1.25Kc at —6dB. With Q-Multi: variable to 700 e.p.s. at 6dB. Operation: AM, SSB, CW and FM. AM diode detector. SSB/CW product detector (BFO). FM gated band detector. Power Source: 240 volts 50/60 Cycles A.C. Power Consumption: 60 watts. Audio Output: 1.5 watts, 8 or 500 ohms impedance. Auxiliary Circuit: Electrical Bandsread, Q-Multiplier, ANL, AVC-MVC, BFO, 100Kc crystal calibrator. Valve Line-up: 4—6AQ5, 6BE6, 3—6BA6, 2—6BE6, 6AL5, 6AQ5, OA2, 6CA4. Dimensions: 17in. wide, 6 1/2in. high, 10in. deep.

PRICE **59 Gns.** Carriage Paid.

"STARFLITE TRANSMITTER"



Designed to meet the needs of most amateurs the Starflite has single-knob band-switching, front panel switch to select any of five crystal positions with provision for an external VFO. Controlled carrier modulator permits almost 100% of the CW input to be used on AM peaks. Grid-block keying provides chirp-free operation. A full wave silicon diode power supply effects extremely low output ripple for cleaner CW transmission, electron-coupled Pierce Oscillator, capacitance bridge neutralization of the final and a three-stage low-pass filter. An illuminated edgewise D'Arsonval panel meter. Pi-network output provides the correct impedance match between the plate circuit and any 50-72 ohm co-axial feeder. Easy to follow point-to-point instructions supplied with each set of components. When constructed the Unit is housed in a heavy gauge steel Cabinet finished in grey crackle.

SPECIFICATIONS: Power Input—90 watts peak; Operation: C.W., AM Phone—crystal or VFO Control; Band coverage: 80-10 metres; Coupling: Pi-network; Valve Line-up: 6146, (2) 6CL6, 12AX7, 6DE7 Low Pass Filter. Size 13 1/2in. wide x 12in. deep (inc. knobs) x 6 1/2in. high (inc. rubber feet). Weight 26 lbs. Power Requirements, 220/240 v. 50-60 C/Ps, 225 watts.

MAY BE BUILT FOR **35 Gns.** Carriage & Insurance 15/-

SEE FOLLOWING PAGES FOR ADDRESSES AND OTHER ITEMS

STERN-CLYNE

Great Britain's Greatest Electronic Hobbies Organisation

MULLARD 2-VALVE PRE-AMPLIFIER TONE CONTROL UNIT

Employing two EF86 valves and designed 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. ★ Inputs for Crystal Pickups 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.

KIT OF PARTS £6.60 AND TESTED £9.10.0 (Carr. & Ins. 5/-)

Instruction book and detailed price list (free with kit) available separately at 2/- Post Free.



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 160 c/s. low pass filter 5-9 Kc/s. Totally enclosed in case Size 11 1/2" x 4 1/2" x 4 1/2".

KIT OF PARTS £10.00 (Carr. & Ins. 5/-) AND TESTED £13.13.0

Instruction book and detailed price list (free with kit) available separately at 3/6 Post Free.



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

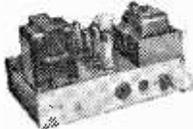
COMPLETE KIT £10.00 (Parmeko Output Trans.)

ASSEMBLED AND TESTED £13.10.0

(Carr. & Ins. 6/6).

ABOVE incorporating PARTRIDGE OUTPUT TRANS. £1.6.0 extra.

Instruction book and detailed price list (free with kit) available separately at 2/- Post Free.



COMBINED PRICE REDUCTION

MULLARD 5-10 Main Amplifier and 2 valve Pre-Amp. Kit £16.15.0. C. & I. 3/6. Built and tested, £21.10.0. C. & I. 10/-

MULLARD 5-10 Main Amplifier and 3 valve Pre-Amp. Kit £19.10.0. C. & I. 8/6. Built and tested, £25.10.0. C. & I. 10/- With Partridge Transformer £1.6.0 extra.

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 800 mV. Specified components and new MULLARD VALVES. Includes PARTRIDGE MAINS TRANSFORMERS and choice of PARMEKO or PARTRIDGE Output Transformers. Surplus Power available for Tuner.

COMPLETE KIT £12.0.0

ASSEMBLED AND TESTED £16.0.0 (Carr. & Ins. 7/6).

With PARTRIDGE OUTPUT TRANS. £1.6.0 extra.

Instruction book and detailed price list (free with kit) 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.

KIT OF PARTS £8.8.0

ASSEMBLED AND TESTED £11.10.0 (Carr. & Ins. 6/6).

Complete to the MULLARD specification including PARMEKO OUTPUT TRANSFORMER. Switched inputs for 78 and



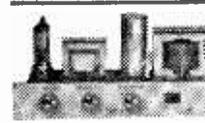
L.P. records plus a Radio position. Extra power to drive a Radio Tuning Unit is also available. Please state L.S. impedance.

Instruction book and detailed price list (free with kit) 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 (free with kit) available separately at 2/6 Post Free.

CHASSIS BARGAIN



A 6 valve Superhet Radiogram Chassis of outstanding quality covering MW 200-550 Metres. LW 1200-2000 Metres. VHF 87-100 Mc/s.

Incorporating internal Ferrite Rod Aerial and the famous Gortler Tuning Heart for VHF Pickup input suitable for most modern Record Players. Power output 10 watts, valve line up E200, EABC80, EF86, ECH81, EL84, ECC83. Volume ON/OFF and Tone Control, attractive black Tuning Dial size 15" x 6" with gold lettering and contrasting cream and gold knobs. A.C. 200/250 v. Size 13 x 7 1/2 x 6 1/2". P. & P. 5/-.

PRICE 16 Gns. Or £2.9.0 deposit (plus P. & P.) and 4 monthly payments of 12/6.

MODEL CR3/S TAPE RECORDER



MODEL CR3/S incorporates HF/TR3 Mk. II Tape Amplifier (described below) and the Collaro "Studio" Twin Track 3-speed Deck operating at 1 1/2 in., 3 in., and 7 1/2 in. speeds. Complete with microphone and 1,200ft. tape.

KIT OF PARTS £33.8.0

ASSEMBLED AND TESTED £43.0.0 (Carr. & Ins. 15/- 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 Control. Includes separate Power Unit. **KIT OF PARTS £22.0.0** (Carr. & Ins. 9/6) **ASSEMBLED £28.0.0**

Instruction book and detailed price list (free with kit) 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. **KIT OF PARTS £14.0.0** (Carr. & Ins. 7/6). **ASSEMBLED £19.10.0**

Instruction book and detailed price list (free with kit) available separately at 3/6 Post Free.



MULLARD TAPE AMPLIFIER

MODEL HF/TR3/MK.II Based on Mullard's Type 'A' design and suitable for most 1 track Mono Tape Decks. Incorporates Ferro-cube Treble Inductor, Gison Output Transformer, and 3-speed Equalisation. Includes separate Power Unit, using PARTRIDGE Mains Transformer. **KIT OF PARTS £13.13.0** (Carr. & Ins. 7/6). **ASSEMBLED £19.0.0**

Instruction book and detailed price list (free with kit) available separately at 3/- Post Free.



COMBINATION TAPE UNITS

All our Tape Units can be supplied specially matched to any Tape Deck such as Collaro, Brennel Mk.5 Series II, also the Warrite. Specimen prices as below.

Kit Assembled	Kit Assembled
STP-1 Pre-amp with Collaro Studio Tape Deck.....	£26. 0.0 £42. 0.0
Assembled with L.ack switch fitted, £44.2.0.	
STP-1 with Brennel Mk. 5 Series II with Track switch fitted.....	£28. 0.0
STP-1 with Brennel Mk.5 Series II, 1 Track Deck.....	£24.15.0
Type "C" Pre-amp with Collaro Studio Tape Deck.....	£24.10.0 £30. 0.0
Assembled with deck wired and matched, £32.2.0.	
Type "C" Pre-amp with Brennel Mk.5 Series II Deck.....	£46.11.0 £53. 1.0
Assembled with deck wired and matched, £55.8.0.	
HF/TR3 with Collaro Studio Tape Deck.....	£24. 3.0 £29.10.0
Assembled with deck wired and matched, £31.12.0.	
HF/TR3 with Brennel Mk.5 Series II Deck.....	£49. 4.0 £51.11.0
Assembled with deck wired and matched, £53.13.0.	

Carr. & Ins. 15/- on above units. Send S.A.E. for comprehensive price list.

SEND FOR CURRENT PRICE LIST OF ALL LEADING RECORDING TAPES AND ACCESSORIES

SEE PRECEDING PAGE FOR OTHER STERN-CLYNE PRODUCTS

STERN-CLYNE

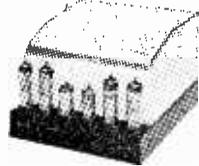
Great Britain's Greatest Electronic Hobbies Organisation

THE TUDOR STEREO HI-FI SYSTEM



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

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 dial 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 522-1630 Kc/s, LW 145-270 Kc/s, 100mV output mains supply 105/240 A.C. Valve line-up, ECC85, ECH81, EBF89, 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 90K, ohm source inputs—Microphone, 5 mV, Tape 5.3 mV, R.A., 4.3 mV flat 250 mV. Tuner 2—EF86, 4—ECC83. Power Amplifier—14 watts per channel, sensitivity 1 volt r.m.s. for 14 watts output, frequency response $\pm 0.5dB$ 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—6X4.



100 mV. Valve line-up: 2—ECC83, 4—EL84, 1—6X4.

DOUBLE FEATURE PRE-AMPLIFIER AND JLI0 POWER AMPLIFIER

A new conception in the field of audio engineering by Stern-Clyne development engineers. The most up-to-date circuitry is used in the Double Feature Pre-amplifier. It has matched inputs for microphone, crystal or magnetic pick-ups and radio tuner and in addition offers full facilities for tape recording and high fidelity replay. This unique feature means that should you wish to include tape in your hi-fi system at a later date all that is required is a suitable tape deck.

★ J.L.I0 POWER AMPLIFIER



Incorporates the latest triode-pentode ECL36 valves in push pull. PARTIDGE ultra linear output transformer, PARTIDGE mains transformer and smoothing choke. 10 watts power output, surplus power available for tuner. Output impedance 3—7.5—15 ohms.

KIT OF PARTS **11 Gns.** C. & I. 7/6.
READY BUILT **14 Gns.**

★ DOUBLE FEATURE PRE-AMPLIFIER



Inputs for microphone, crystal or magnetic pick-ups, tuner unit, Push-button switching for 3 tape speeds equalised. Tape erase Bias Oscillator circuit incorporating ferro-cube transformer. Function switch, separate base, treble and volume controls, level control and latest EM87 magic eye level indicator. The pre-amplifier is totally enclosed in a silver hammer finish steel case, and an attractive perspex front panel completes the presentation.

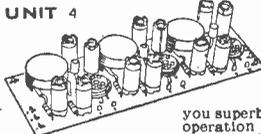
enclosed in a silver hammer finish steel case, and an attractive perspex front panel completes the presentation.

KIT OF PARTS **£17.0.0** READY BUILT **£21.0.0** C. & I. 5/-.
PRICES: If both above units purchased together: C. & I.
KIT OF PARTS **£27.10.0** READY BUILT **32 Gns.** 10/-

SEND STAMP FOR COPY OF OUR INTERESTING LITTLE BOOKLET "What is High Fidelity?"

MARTIN Fully Transistorised AUDIOKITS

These ingeniously designed sub-assembled kits enable you to build a transistorised Hi-Fi system by simply linking together your choice of units. No technical knowledge or special tools are needed to build with complete success. All units are supplied on printed circuit boards ready to mount and connect. Latest type transistors used in conjunction with the specially developed circuits give you superb reproduction. For battery operation or can be used on A.C. mains with Martin power supply unit.



Following Audiokits available:—
Unit 1.—5-Stage Matching Input Selector Unit. 47/6.
Unit 2.—Pre-Amplifier with Master Volume Control. 37/6.
Unit 3.—3-Channel Mixer. 79/6. (Plus in matching adaptors for above, 3/6 each).
Unit 4.—Combined Pre-Amplifier and Tone Control Unit. 62/6
Unit 5.—10 watt Main Amp. (3 ohm o/p imp. only at present). 55/12.6.
Unit 6.—Power Supply Unit. 22/12.6.
P. & P. extra on above items. Full range of attractive perspex enclosures available. Send S.A.E. for fully descriptive literature.

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", complete with Tommy Bar, Tapered Reamer, Price **49/6** P.&P. 3/6



HI-FI STEREO HEADPHONES

For the connoisseur who requires perfection. Each Earphone consists of a 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—25-15,000 c.p.s. Imp. Impedance—16 ohms. Power rating—4 watt. Weight—13 ozs.

PRICE **5 Gns.** P. & P. 2/6.
(Junction box 15/- ex.)



MONAURAL STETHOSCOPE HEADSETS

Suitable for Radio, Tape Recorders, or monitoring tape recordings, magnetic low impedance or Crystal High impedance. Complete with 4ft. of lead and miniature Jack Plug. PRICE **10/6** P. & P. 1/6

AGOS MONAURAL STETHOSCOPE HEADSETS

Suitable for Tape Recorders, or monitoring tape recorders, 100 ohm impedance magnetic. Complete with 12/6 P. & P. 1/6 lead. (Originally 21/-). OUR PRICE

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| (Premier Radio) | 23 Tottenham Court Road, W.1. | MUSEum 3451/2 | Half-day Thurs |
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| CITY: | 109 Fleet Street, E.C.4. | FLEet St. 5812/3 | Half-day Sat |
| NORTH LONDON: | 162 Holloway Road, N.7. | NOrrh 8161/5 | Half-day Thurs |
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CLEAR PLASTIC PANEL METERS

First grade quality. Moving coil panel meters. available in 1 1/2" sq. front. S.A.E. for illustrated leaflet. Discounts for quantity. Available as follows. Type MR. 38P.

100µA 32/6 1A. DC 22/6
200µA 29/6 5A. DC 22/6
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10mA 22/6 150V. DC 22/6
50mA 22/6 300V. DC 22/6
100mA 22/6 500V. DC 22/6
150mA 22/6 750V. DC 22/6
200mA 22/6 15V. AC 22/6
300mA 22/6 50V. AC 22/6
500mA 22/6 150V. AC 22/6
750mA 22/6 300V. AC 22/6
1000mA 22/6 500V. AC 22/6

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100-0-100µA 42/6 300V. AC 32/6
300V. AC 32/6

Type MR. 65P. 3 1/4" sq. front. 50µA 59/6 1mA 35/-
100µA 49/6 10mA 35/-
500µA 39/6 100mA 35/-
50-0-50µA 59/6 1A. DC 35/-
100-0-100µA 49/6 300V. AC 35/-
POST EXTRA 300V. AC 35/-

Type MR. 65P. 3 1/4" sq. front. 50µA 59/6 1mA 35/-
100µA 49/6 10mA 35/-
500µA 39/6 100mA 35/-
50-0-50µA 59/6 1A. DC 35/-
100-0-100µA 49/6 300V. AC 35/-
POST EXTRA 300V. AC 35/-

Type MR. 65P. 3 1/4" sq. front. 50µA 59/6 1mA 35/-
100µA 49/6 10mA 35/-
500µA 39/6 100mA 35/-
50-0-50µA 59/6 1A. DC 35/-
100-0-100µA 49/6 300V. AC 35/-
POST EXTRA 300V. AC 35/-

Type MR. 65P. 3 1/4" sq. front. 50µA 59/6 1mA 35/-
100µA 49/6 10mA 35/-
500µA 39/6 100mA 35/-
50-0-50µA 59/6 1A. DC 35/-
100-0-100µA 49/6 300V. AC 35/-
POST EXTRA 300V. AC 35/-

Type MR. 65P. 3 1/4" sq. front. 50µA 59/6 1mA 35/-
100µA 49/6 10mA 35/-
500µA 39/6 100mA 35/-
50-0-50µA 59/6 1A. DC 35/-
100-0-100µA 49/6 300V. AC 35/-
POST EXTRA 300V. AC 35/-

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100µA 49/6 10mA 35/-
500µA 39/6 100mA 35/-
50-0-50µA 59/6 1A. DC 35/-
100-0-100µA 49/6 300V. AC 35/-
POST EXTRA 300V. AC 35/-

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100µA 49/6 10mA 35/-
500µA 39/6 100mA 35/-
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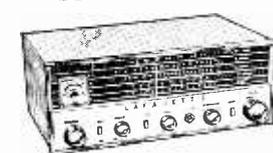
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100-0-100µA 49/6 300V. AC 35/-
POST EXTRA 300V. AC 35/-

HE-40 DE LUXE 4-BAND COMMUNICATION RECEIVER



Frequency coverage 550Kc/s to 30 Mc/s continuous. Operation 220/240 volt. AC/DC. The perfect receiver for short wave listening. Special features include: Slide tuning dial—electrical band-spread—0-100 logging scale—improved selectivity—built in "S" meter—A.V.C.—Noise limiter—B.F.O.—Phone jack built in 5in. speaker—tone control—standby switch—supplied with three aeriels, ferrite loop for broadcast band, adjustable 58in. whip for short wave and wire aerial. Smartly styled durable metal cabinet. Supplied brand new and guaranteed with manual. £24.15.9 carriage paid. S.A.E. for full details. Part exchanges welcome.

control—standby switch—supplied with three aeriels, ferrite loop for broadcast band, adjustable 58in. whip for short wave and wire aerial. Smartly styled durable metal cabinet. Supplied brand new and guaranteed with manual. £24.15.9 carriage paid. S.A.E. for full details. Part exchanges welcome.

MODEL ITI-2 MULTITESTER 20,000 O.P.V.

20,000 o.p.v. D.C. 10,000 o.p.v. A.C. specifications:
D.C. V: 0-5-25-250-500-2500 V.
A.C. V: 0-10-50-500-1000 V.
Current: 0-50µA-25mA-250mA
Resistance: 0-60K-∞M Ω.
Capacity: 0.01-0.3µF (at AC 10 V)
Decibel: -20dB +22dB
Output range: 0-10-50-500-1000V
Battery: 1.5 V U12
Size: 3 1/2 x 4 1/2 in.
Supplied complete with batteries, leads instructions, 82/6. Post 2/6.



MARCONI TF144G 4 STANDARD SIGNAL GENERATORS

First release of this late mark. 85Kc/s to 25Mc/s ±1%. Output variable from 1µV to 1 volt. Internal sine wave modulation 100c/s up to 75%, depth. Operation 200/250 volt A.C. Offered in really excellent condition, like new fully tested and guaranteed. £25. Carr. 30/-.

TE-20 RF SIGNAL GENERATOR

Accurate wide range signal generator covering 120Kc/s—260Mc/s on 8 bands. Directly calibrated. Variable RF attenuator. Operation 200/240 V. A.C. similar in appearance to TE-46 CR Bridge. Brand new with instructions. £12. Carr. 5/-. S.A.E. for details.

COSSOR DOUBLE-BEAM OSCILLOSCOPE 1035

4in. tube. Calibrated Y1 amplifier from 50mV to 50V. Bandwidth 10Mc/s. Calibrated Y2 amplifier from 5V. to 500V. with bandwidth up to 100Kc/s. Directly calibrated X shift providing time measurements from 15 microseconds to 150 milliseconds. Supplied in guaranteed perfect condition. £27.10.0 each. Carr. 30/-. Spare Tubes. TYPE 80D. Brand New. 59/8 each. P. & P. 4/6.

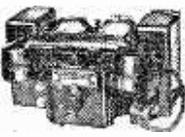
ERSKINE TYPE 13 DOUBLE BEAM OSCILLOSCOPE

Time base 2c/s—750Kc/s. Calibrators at 100Kc/s and 1Mc/s. Separate Y1 and Y2 amplifiers up to 5.5Mc/s. Operation 110/230 volt A.C. Supplied in perfect working order. £27.10.0. Carr. 20/-.

CR.100 COMMUNICATION RCVRs.

60Kc/s to 30Mc/s on 6 bands. 200/250 volt A.C. operation. Supplied in perfect working condition. £21 each. Carr. 30/-.

FIELD TELEPHONES



Type "L". Two line connection, generator bell ringing. Complete telephone intercom. Supplied in excellent condition, fully tested and complete with batteries. Only 49/6 per pair. Carr. 5/-. Type "F". As above but moulded bakelite case (as illustrated). Supplied complete with wooden transit case for field use. £4.19.6 per pair. Carr. 5/-.

MICROAMMETERS

0-500 microamp. 2 1/2in. circular flush panel mounting. Dials engraved 0-15, 0-600 volts. Brand new, boxed, 15/-, P. & P. 1/6.

MINE DETECTOR NO. 4A

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

GEARED SLIDER RHEOSTAT

1.2 ohms 12 amp. 15/6. P.P. 3/6.

FIELD STRENGTH METERS

Fitted with 200 microamp meter. Supplied with telescopic aerial, earpiece and instructions 69/6 post paid.

9 TRANSISTOR TRANSCIEVERS TWO-WAY RADIOS

Average range up to 5 miles. Frequency 27 Mc/s. Band. Supplied complete with telescopic aeriels. Batteries. Personal Leathers carrying cases and instructions. Brand new, guaranteed. £25. pair. S.A.E. for details.



SEMI AUTOMATIC BUG KEY



Super speed key. 7 speed adjustments, 10 WPM to as high as desired with scale for reproducible settings. Precision tool anti rust nickel plated brass and stainless steel operating parts. Size 6 1/2 x 3 x 2 1/2 in. Brand new. £4.12.6. Post paid.

SILICON RECTIFIERS

SCR. 400V. P.I.V. 4.7 amp 7/6
200V. P.I.V. 6 amp 5/6
800V. P.I.V. 500mA 5/6
400V. P.I.V. 500mA 3/6
70V. P.I.V. 1 amp 3/6
95V. P.I.V. 1 amp 4/6
0A302 miniature silicon rectifiers 1/- each. Special Discounts for quantities. Please add postage.

PLUGS AND SOCKETS

Painton 15-pin in-line printed circuit connectors. 7/6 pair. Large quantities available. Unifers. 4 pin. 2/6 pr; 8 pin 3/6 pr; 12 pin 4/6 pr; 18 pin 4/6 pr. Painton Miniature Jones. 4 pin 3/6 pr; 6 pin 4/6 pr; 8 pin 4/6 pr; 12 pin 5/6 pr; 18 pin 7/6 pr; 24 pin 10/6 pr; 33 pin 12/6 pr. Post extra.

AMERICAN BLOCK PAPER CONDENSERS

Very high quality. 10mF. 600V. 8/6; 10 mF. 1kV 10/8; 12 mF. 1.5kV 15/-. Post extra.

L.T. METAL RECTIFIERS

FULL wave bridge connected. 12/18V 1A 3/9 24/36V 1A 7/3
12/18V 2A 4/3 24/36V 2A 13/6
12/18V 4A 8/6 24/36V 15A 45/6
12/18V 6A 12/6 36/48V 6A 32/6
12/18V 10A 22/8 Post extra.

L.T. TRANSFORMERS

For changers, models etc. All primaries tapped 200/250V. (1) 3.5, 9 or 17V., 1 amp, 9/6; (2) ditto 2A., 14/3; (3) ditto 4A., 16/6; (4) ditto 6A., 26/6; (5) 3, 4.5, 6, 8, 10, 12, 15, 18, 20, 24 or 30V., 2 amp, 18/6; (6) ditto 4A., 30/6; (7) ditto 5A., 37/6; (8) 50V., 1 amp, 13/6; (9) 50V., 1 amp, 15/6. Post extra.

AUTO TRANSFORMERS

Step up or step down. Tapped 0/115/200/230/250V. 20W. 9/1; 60W. 12/6; 75W. 15/6; 150W. 18/6; 200W. 27/6; 300W. 42/6; 500W. 67/6; 1,000W. 90/-; 1,500W. 128.18.6; 3,000W. 177.10.0; 7,500W. £15 (only tapped 0/110/230V.) Post extra.

30,000 O.P.V. TEST METER 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. Incorporates internal buzzer for audible warning of direct shorts and blocking condenser for A.F. output measurements. Size 3 1/8 x 6 1/8 x 2 1/2 in. PRICE £8-17.6.



CONSTANT VOLTAGE TRANS.
95/130V. Input. 115V. Output.
500 watts. Can be used in series
for 230V. £4 each. Carr. 10/-.

**DUMONT KIOSIPI DOUBLE
BEAM C.R.T.**
Twin gun. 6.3V. new. boxed.
59/8. P.P. 3/6.

MAINS ISOLATION TRANS.
230V. to 230V. 50V. 10/6. P.P. 3/-.
3/-: 100W. 29/6. P.P. 3/6: 1,000W.
£5. Carr. 10/-.

TM-59 'er 'S' METER



Signal strength meter using VTVM principles. Calibrated in S units. Sensitivity and zero adjustments. For any superhet receiver with AVC. Requires 150/200V. and 6 or 12V. Complete with valve and full instructions. 82/6. P.P. 2/6.

VARIAC TRANSFORMER
24 amp. Pri. 230V. Sec. 185/250V. £12.10.0. Carr. 10/-.

MAINS MOTORS 220 240V
90 watts. 5,000 r.p.m. 4 1/2 in. spindle 22/6. P.P. 2/-.

**MINIATURE LEAD ACID
ACCUMULATORS**
Brand new. 2V. 1.5A. 4 x 1 x 1 1/2 in.
5/8. P.P. 1/3. 12V. 0.75A.
4 x 3 x 1 1/2 in. 15/6. P.P. 1/6.

TWIN MOTOR BARGAIN
200/250V. A.C. Twin concentric spindles. Either motor reversible. 1400 r.p.m. Brand new. 12/6. P.P. 2/6.

MINIFLEX 1/2 TRACK TAPE HEADS
Set of 3, record. playback, erase. ONLY 29/6 set. P. & P. 9d.

**COLLARO/MAGNAVOX. STUDIO
TAPE TRANSCRIBER**
Brand new. 3 speeds. 11. 31. 71
i.p.s. 3 motors, digital counter.
Complete with 2 spools. Instructions.
10 gm. Carr. paid.

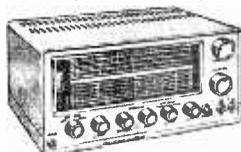
**4-CHANNEL TRANSISTORISED
MICROPHONE MIXER**
Add musical lights and additional 3 c.u.n.d. effects to your recordings. The MM-4 permits mixing of four signals such as microphone, records, tuner, etc. into single output. Inputs and output take standard plugs. Fully transistorised and self contained in handsome case. PRICE 59/6 Post Paid.



HEAVY DUTY POWER SUPPLIES
Input 200/250 volt A.C. Three H.T. outputs 2 x 400V. 175mA and 350V. 225mA. All fully smoothed. 2 x 6.3V. 5 amp. 6.3V. 4 amp. 12V. 0.5 amp. Supplied in perfect condition. £5.10.0. Carr. 20/-.

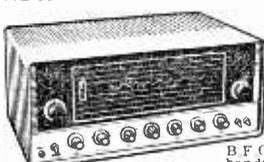
**PRECISION PORTABLE
VOLTMETERS**
Polished wood case. 8in. scale with knife edge pointer. A.C. and D.C. volts: 0-180 volts. 59/8. 0-180-320 volts. £5.18.6. P.P. 3/6.

HE-30 SUPER AMATEUR COMMUNICATION RECEIVER



4 bands covering 550Kc/s to 30Mc/s continuous. Operation 200/240 volt A.C. Special features include: Easy to read illuminated slide rule dial—Built in Q multiplier—Aerial trimmer—calibrated electrical bandspread on amateur bands—0-100 logging scale—noise limiter—AVC/MVC selector—stable, 1000 Hz multiplier—clear CW and 85b re-p.e.p. meter. Output for phones or STD speaker. Supplied brand new and guaranteed with manual. £42 carr. paid. S.A.E. for full details. Part exchanges welcome.

HE-80 14-VALVE AMATEUR COMMUNICATION RECEIVER



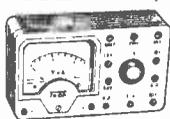
550Kc/s to 30Mc/s 2 Metre Band. 144 to 146M/c/s. Two receivers in one. Continuous coverage from 550Kc/s to 30Mc/s and 144 to 146M/c/s. Dual conversion on 2 metres, with extra RF and Mix stage. Special features include "S" meter. Crystal calibrator "Q" multiplier. B.F.O. Bandspread on all amateur bands. Large illuminated dial with logging scale. Improved A.N.L. regulated power pack. Output for phones or speaker (8 or 500 ohms). Operation 200/250 volt A.C. Valve line-up 4 x 6AQ8, 3 x 6BA8, 2 x 6BE6, 1 x 6BE1, 8AL5, 8AQA, 6CA4, and OA2. Attractive grey steel cabinet. 17 x 7 x 10in. Supplied brand new and guaranteed complete with instruction manual. 59 gm. Carriage paid. S.A.E. for full details. Part exchanges welcome.

**NATIONAL H.R.O. RECEIVERS
SENIOR MODEL.** Complete with a full set of 9 coils covering 50Kc/s to 30Mc/s. Each receiver thoroughly checked and tested before despatch. Dual purpose rack model for table or phone or speaker. Extremely good used condition. £18.18.0. Carr. £1. 200/250 volt A.C. power supplies for H.R.O. also sold separately. 59/8. Carr. 5/- S.A.E. for full details.

P.C.R.2 COMMUNICATION RECEIVERS

Excellent 6 valve receiver. Frequency coverage on 3 bands. 200-2,000 metres. 100-550 metres and 8-22Mc/s. Output for phone or speaker. Supplied in perfect condition. £5.19.6 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.

MODEL PT-34 1,000 O.P.V. MULTI-TESTER



Dependable and Easy to Read SPECIFICATIONS:
D.C. V. ... 0-10-30-250-500-1000 V
A.C. V. ... 0-10-50-250-500-1000 V
Current ... 0-1-100-500mA
Resistance: 0-100K Ohm Battery: 1.5V U12.
Size: 3 1/2 x 2 1/2 x 1 1/2 in.
Supplied complete with batteries, leads, instructions. 39/6. Post 1/6.

MODEL PV-58 VACUUM TUBE VOLTMETERS

Latest design with special circuit for stable and accurate measurements. Resistors used are all within 1% tolerance. Specially designed 8in. 200uA meter. 11 Mcv. inputs. Ranges:
-D.C. V. 0-1.5-5-15-50-150-500-1500V.
+D.C. V. 0-1.5-5-15-50-150-500-1500V.
A.C. V. 0-1.5-5-15-50-150-500-1500V. RMS.
-0-1-4-14-40-140-400-1300-1000 P.P.
Resistance: 2 ohm to 1,000 megohm.
Decibels: -10dB to +65 dB.
Operation 220/240 volt A.C. Size 7 x 4 1/2 x 4in.
Supplied brand new and guaranteed complete with probe and instructions. £13.19.6. P.P. 3/6.



TE-46 CAPACITY-RESISTANCE ANALYSER



* Factory wired and tested.
* Capacitance bridge circuit.
* Direct reading scales for capacitance and resistance.
* Magic eye null indicator and meter.
* Checks opens, shorts, leakage and intermittents.
* Determines power factor of electrolytics.
* 2 Turns ratio scales.
* Measures impedance.
Capacity 4 ranges 2pF-2,000 pF. Resistance 4 ranges 2 ohm-200 meg. ohm. Turns, ratio and impedance ranges. Read insulation resistance direct on meter. 200 meg. Size 10 1/2 x 7 x 5 1/2 in. Operation 200/250 V. A.C. Supplied brand new with instructions. £15. Carr. 7/6.

COMMUNICATION RECEIVER SPEAKER



3 x 5in. speaker in grey steel case to match HE-30 or HE-80. 8 ohm imp. Size 7 1/4 x 3 1/2 x 5 1/2. 55/- each. P.P. 2/6.

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RECORDING TAPE**

First grade quality American tapes. Brand new and guaranteed. Discounts for quantities.
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5in. 1200ft. D.P. mylar 15/-
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5in. 1800ft. D.P. mylar 22/8
7in. 1200ft. std. mylar 12/6
7in. 1800ft. L.P. acetate 15/-
7in. 1800ft. L.P. mylar 22/-
7in. 2400ft. D.P. mylar 25/-
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STRENGTH METER**



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Supplied complete with battery telescopic aerial. £7.7.0 each. P.P. 2/6.

HEADSET & BOOM MICROPHONE
American type, low impedance. padded. 49/6. P.P. 2/6.

R.C.A. HEADSETS
Low imp. Fitted with std. jack plug. 15/6. P.P. 1/6.

ROTARY TRANSFORMERS
12V. D.C. input. Output 310/360V. D.C. 30mA. New boxed. 10/- P.P. 2/-.

200 KΩ INSTRUMENT POTS.
Wirewound. 3/4in. dia. 5/8 each. P.P. 1/3.

R.C.A. PLATE TRANSFORMERS
200/250V. pri. 2,000-1,500-0-1,500-2,000V. 500mA. New, boxed. £6.10.0. Carr. £1.

PHOTO VOLTAGE AMP. UNITS
Fitted with twin selenium photo cells. Tinsley mirror valve. £9.19.6 each. Carr. 7/6.

500 VOLT BRIDGE MEGGERS
Evershed Vignoles series 11. Supplied in as new condition, complete with leather case. £40 each. Guaranteed.

**PRECISION COMBINATION
VOLTMETER AMMETER**
Two separate instruments housed in polished wood case. 6in. scales with knife edge pointers. Ranges as follows: A.C. and D.C. volts: 0-180-300-600 volts. A.C. and D.C. Current: 0-25-50-150-200 amps. Supplied complete with shunts, leads and leather carrying case. Brand new condition. £9.19.6 each. Carr. 7/6.

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For HALF TRACK

Tape Amplifier for Studio Deck with ready wired printed circuit control and input panels, mains and output transformers, knobs, plans, screws, etc. EP86, ECC83, EZ80, EM85 and 2 EL84. 3 watts output. Magic eye, radio and Mic. inputs. Ext. speaker socket. Tone and Monitor controls. Can be used as an amplifier. £11.11.0
 Collaro Studio Deck. Very latest model, 3 speeds, 7in. spools. £10.19.6
 Case for above, with 8 x 5in. speaker, two tone grey. £5.5.0
 Complete Kit with Tape and Microphone. £29.5.0

B.S.R. Monardeck TD2, latest model 5 1/2in. spools £29.9.0
 Tape Amplifier for B.S.R. Deck, printed circuit ready wired with ECC83, ECL82, EM85 and EZ80. Complete with all plugs, sockets, panels, knobs, etc. Mounts under deck making a self-contained unit. £8.8.0

For QUARTER TRACK

Collaro Studio Deck, Marriott "X" heads. £17.17.0
 Tape Amplifier for Studio Deck, described above, but quarter track. £12.12.0
 Case, with speaker, two tone grey. £5.5.0
 Complete Kit with Tape and Microphone. £35.0.0

Dep.	&	Mthly pmts. of
24/-	12	19/-
22/-	8	27/3
58/-	12	48/2
20/-	9	21/-
37/6	12	28/5
37/-	12	20/8
70/-	12	58/2

B.S.R. TD2 Deck with Marriott "L" Series heads £11.11.0
 Tape Amplifier for B.S.R. deck, as over, but quarter track. £9.9.0

TAPE PRE-AMPLIFIER

For Studio Deck, with power supplies, ECC83, ECL82, EZ80 and EM84. Mic. and Radio socket, gives full equalised output of 400 mV/ohms. Half Track £8.8.0
 Quarter Track £9.9.0
 Building Instructions available at 2/6 each Kit (refunded on purchase Kit).

TAPE HEADS

MSS Quarter track. Record/Playback and Erase per set. £3.3.0
 Bradmatic Half track Record/Playback head only £1.12.6
 Bradmatic Half track Record/Playback and Erase per plate. £1.19.6
 Collaro pressure pad for third head position. 4/-

BRENELL

Mk. 5 Series 2 Deck, Half track 4 speed. £32.11.0
 Mk. 5 Series 2 Tape Amplifier with power pack £26.0.0

Dep.	&	Mthly pmts. of
24/-	12	19/-
20/-	9	21/-
20/-	8	21/-
20/-	9	21/-
65/-	12	54/-
52/-	12	43/2

GRAMOPHONE UNITS, MOTORS, PICK-UPS

Decca Deram Arm and Plug-in Shell. £5.5.0	—	—	—
Decca Deram Transcription Cartridge. £4.14.6	—	—	—
Decca Dram Auto Cartridge. £3.13.6	—	—	—
Garrard SRP10 with GCS cartridge, Mono, single player. £5.9.11	—	—	—
B.S.R. UA14 with TCS cartridge, Mono, 4-speed changer. £6.19.6	20/-	6	23/3
Garrard Autotrim, Mono GCS cartridge, 4 speed changer. £7.17.0	20/-	7	22/6
Garrard A16 Autotrim de Luxe, GCS Mono cartridge. £11.9.0	26/6	9	24/9
Garrard 4H/F with Mono GCS cartridge. £17.0.0	34/-	12	28/2
Garrard Lab Type "A" Transcription auto-changer, with GCS cartridge, mono. £19.14.0	39/6	12	32/9
Garrard 301. £20.12.2	43/2	12	34/-
Garrard 301 Strobe. £22.0.0	44/-	12	36/6
Philips A61016, Stereo cartridge, will change 7in. records (adapter 10/- extra). £12.12.0	27/-	12	29/6
Goldring GL58 with arm, less cartridge. £17.1.9	36/-	12	28/2
Goldring GL70 with arm, no cartridge. £27.9.4	55/-	12	45/8
Goldring "88" Transcription, no arm. £18.18.5	41/-	12	31/1

MONO AMPLIFIERS

Linear L45, 3 watt, 3 valve. £5.19.6	—	—	—
Linear Diatonic, 12 watt, suitable Mic. or guitar. £12.12.0	27/-	12	20/8
Linear Conchord, 20 watt, ideal guitar amp, with case. £18.0.0	38/-	12	29/10
Dulci GA5, integrated amp, 5 watt, ECL86 valve £13.2.6	28/6	12	21/6
Dulci PA15, 15 watt with 2 valve pre-amp. £26.5.0	52/6	12	43/6
Tripletone Hi-Fi Major with pre-amp. Suitable for Guitar or Mic. etc. £15.19.0	35/3	12	28/1
Leak TL12, 10 watt Main amp. only. £18.19.0	40/6	12	31/1
Leak Variotape pre-amplifier. £15.15.0	31/6	12	26/1
Quad, 15 watt Main amplifier only. £22.10.0	45/-	12	37/4
Quad pre-amplifier, Mono. £19.10.0	39/-	12	32/4

ARMSTRONG - NEW TUNER-AMPLIFIERS

MONO

AF208 A.M./F.M. Radio chassis, bass and treble controls, P.V. inputs, etc. £21.4.0	48/-	12	34/10
BT3 Mk. 2 A.M./F.M. Self-powered tuner. £25.12.0	53/-	12	42/4
227M Q.M./F.M. Radio chassis 10 watts. £23.18.0	70/6	12	56/1
225 A.M./F.M. Self-powered (Tuner only). £23.15.0	67/6	12	47/9
224 F.M. only, Self-powered Tuner. £22.10.0	45/-	12	37/4

STEREO

Stereo 55 A.M./F.M. Radio chassis, with Stereo gram inputs. £29.13.0	62/6	12	49/5
227 A.M./F.M. Radio chassis, Stereo gram, 10 watts each channel. £29.15.0	97/6	12	81/1
228 A.M./F.M. Radio chassis, Stereo gram, 10 watts each channel, Filter, etc. £58.0.0	112/-	12	93/2

OTHER TUNERS

Tripletone F.M. Tuner, less power. £13.19.6	28/-	12	23/2
Tripletone F.M. Tuner, self-powered. £15.14.6	31/6	12	28/1

STEREO AMPLIFIERS—VARIOUS

Armstrong 222, Integrated, 10W per channel. £27.10.0	55/-	12	45/8
Dulci GA505, Integrated. £18.18.0	40/6	12	31/1
Rogers Cadet Mk. 2 with pre-amplifier, 4 ECL86 valves. £28.15.0	53/6	12	44/5
Leak Stereo 20, Main amplifier. £30.9.0	64/6	12	50/3
Leak Variotape stereo pre-amplifier. £25.0.0	50/-	12	41/6
Quad 22 Stereo Control Unit. £25.0.0	50/-	12	41/6

For Quad Main Amplifiers see Mono section.

JASON F.M. AND TV SOUND TUNERS

FMT1, complete with 4 EF81 valves. £7.4.6	21/-	7	20/6
FMT2, less power, complete with 4 EF80 valves. £9.4.6	20/-	9	20/6
FMT2, with power, complete with 4 EF80 and 1 EZ40. £11.4.6	22/6	9	24/9
MT3, Surrey, complete with valves, less power. £10.19.0	22/-	8	27/3
FMT3, with power, complete with all valves. £12.19.0	26/-	12	21/6
JTV/2, switched F.M. and TV sound, self powered, all valves. £15.12.6	33/6	12	25/8
Mercury II, as JTV/2 but less power, all valves. £11.0.0	22/-	8	27/3
Instruction book included in all kits. Available separately. 2/6 and 3/6.	—	—	—
JTV/2, ready built, state channels. £22.5.0	44/6	12	36/11
Monitor, ready built (as Mercury II). £16.15.6	33/6	12	27/9

LOUDSPEAKERS

Goodmans Axlette 3. £5.5.7	—	—	—
Goodmans Axiom 10. £5.5.11	—	—	—
Goodmans 5K/20/XL. £7.7.0	—	—	—
Goodmans XO 5000 cross-over. £2.0.11	—	—	—
Goodmans Axiom 291 12in. Unit. £10.17.4	22/5	12	17/11
Goodmans Axiom 301 12in. Unit. £15.4.6	30/6	12	25/3
Wharfedale Super 5/8S/DD. £8.14.2	—	—	—
W.B. HF1012 10in. £4.7.8	—	—	—
R.T.C. 12in. Unit, 15 watt. £5.15.0	—	—	—
R.T.C. Hi-Fi Master. £8.8.0	20/-	8	21/-
Wharfedale W12/EG 12in. 15 watt Lead Guitar speaker. £10.10.0	21/-	12	17/5
Wharfedale W15/EG 15in. 15 watt Base Guitar speaker. £17.10.0	35/-	12	29/-
Wharfedale Super 10/RS/DD 10in. high quality unit. £15.18.0	23/8	12	17/11
Wharfedale RS19/DD 12in. 15 watt. Hi-Fi. £11.10.0	27/6	9	24/9

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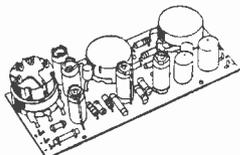
With these ingenious new MARTIN AUDIOKITS you can build an ALL-TRANSISTOR Hi-Fi Assembly to suit your personal requirements exactly. When built, you will have a modern, powerful, high quality assembly with ALL the features of a de-luxe hi-fi assembly. Building is easy, and you will save pounds. Designed for simple panel mounting. Easily doubled up for stereo. Full instructions with every kit. Leaflets free on request.



UNIT 1 FIVE STAGE SELECTOR

Enables up to 5 inputs to be connected and correctly switched to following pre-amp stage. With transistor, resistor and capacitors mounted on printed circuit board. Long spindle for adding stereo when required. With Mazda AC136 Transistor.

Size 3 1/2 x 3in. For Magnetic and crystal P.U.s, Radio Tuner, Microphone, and output from tape head. Requires 9-15 V. **47/6**

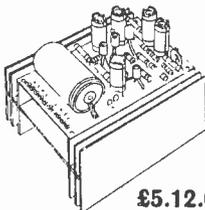


UNIT 4 COMBINED PRE-AMPLIFIER AND TONE CONTROL UNIT

Three stages of audio control—base control operating between -10 to +10 dB; treble control between -16 to +12 dB; volume control with on-off switch to serve power supply to complete installation. With all components mounted on printed circuit board. 6 1/2 x 2 1/2in. 9-15V. With Mazda AC176 Transistor. **62/6**

UNIT 5 MAIN AMPLIFIER

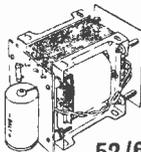
Complete with heat sink, on which the six transistor printed-circuit amplifier is built. Transformerless output gives maximum of 10 watts into 2-ohm speaker, operating from 24 volt supply. Pre-tested by makers. Transistor due-up: Mazda AC136, AC113, AC184, AC157, 2xN KT461, AA120. Wharfedale 3: 15 ohms Matching Transformer. **13/6**



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UNIT 6 POWER SUPPLY UNIT

Operates from 200-250 volts, A.C., giving D.C. output at 24 volts for main amplifier and tappings for power to other Martin Audiokit Units. Incorporates heavy duty transformer, full smoothing and latest type rectification. Elegant front Control Panel for above ready for fitting. **10/6**



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**● TAPE ENTHUSIASTS — SEE DETAILS
OF MARTIN RECORDAKITS — Page Opposite**

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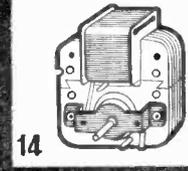
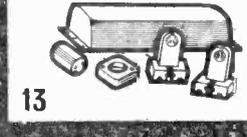
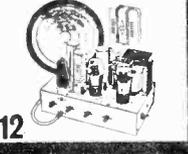
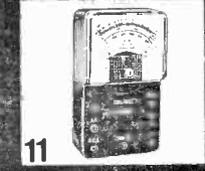
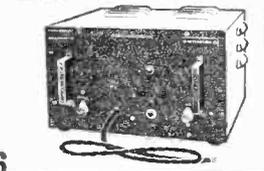
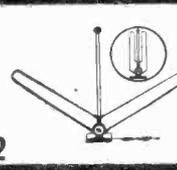
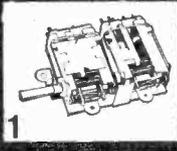
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2. 625 INDOOR AERIAL. Complete with stand, fully extendable, can also be used for 405, T.V. BBC and FM. 10/6, plus 1/- P. & P.
3. A.C./D.C. POCKET MULTI-METER KIT. 2in. moving coil meter scale, calibrated A.C./D.C. volts, ohms and milliamperes. Voltage range A.C./D.C. 0-50, 0-100, 0-250, 0-500. Milliamps 0-10, 0-100. Ohms ranges 0-10,000, 0-100,000, 19/6. P. & P. 2/-. Wiring diagram 1/- free with parts.
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5. SIGNAL GENERATORS. Cash £5.5.0. P. & P. 6/6. Coverage 120 Kc/s to 84 Mc/s. Case 10 x 6 1/2 x 4 1/2 in. Size of scale 6 1/2 x 5 1/2 in. 2 valves and rectifier. A.C. mains 230-250v. Internal modulation of 400 c.p.s. to a depth of 30 per cent, modulated or unmodulated R.F. output continuously variable 100 millivolts. C.W. and mod. switch variable A.P. output and moving coil output meter. Accuracy ±2 per cent.
6. FIXED FREQUENCY SIGNAL GENERATOR. Crystal control in metal case, size 10 x 6 x 4 in. Incorporating two PU13 valves, mains transformer, metal rectifier, choke, indicator lamp, crystal and numerous components. Modulated and unmodulated output sockets. Originally used for 1 T.V. frequencies. Brand new. 39/6, plus 6/- P. & P. A.C. Mains 200/250 volts.
7. 50 MICRO-AMP METER movement by world famous manufacturer. Size 3 x 2 1/2 in., 50/-, post free.
8. The MOTORISTS' REV. COUNTER. Kit of parts comprising 270 degree 5in. moving coil movement. Manufacturer's present price of this movement would be at least £7. Complete with full instructions and circuit diagram. Scale calibrated up to 8000 r.p.m. Can be used with any 4 or 6 cylinder car. 29/6, plus 3/6 P. & P. Meter movement only 22/- post paid.
9. CHANNEL TUNER I.F. 16-19 Mc/s. Continuously tunable from 174-216 Mc/s. Valves required—PCP80 and PCC84 (in series). Cover BBC and ITA ranges. Also Police, Fire and Taxia, etc. Brand new by famous maker, 10/-. P. & P. 3/-.
10. B.S.R. MONARCH UA14 WITH FULL-FI HEAD. 4-speed, plays 10 records, 12in., 10in. or 7in. at 18, 33, 45 or 78 r.p.m. Intermixes 7in., 10in. and 12in. records of the same speed. Has manual play position: colour brown. Dimensions: 12 1/2 x 10 1/2 in. Space required above baseboard 4 1/2 in., below baseboard 2 1/2 in. Fitted with Full-Fi turnover crystal head, £5.19.6. P. & P. 6/6.
11. POCKET MULTI-METER. Size 3 1/2 x 2 1/2 x 1 1/2. Meter size 2 1/2 x 1 1/2 in. Sensitivity 1,900 O.P.V. on both A.C. and D.C. A.C. and D.C. volts: 0-15, 0-150, 0-1,000. D.C. current: 0-150 mA. Resistance 0-100K Ω. Complete with test prods, battery and full instructions. 35/-, P. & P. 1/6
12. 8-watt PUSH-PULL 4 VALVE AMPLIFIER PLUS METAL RECTIFIER. A.C. mains 230-250 v. Size 10 1/2 x 6 1/2 x 2 1/2 in. 4 valves. For use with all makes and types of pick-up and mike. Negative feed back. Two input, mike and gram, and controls for same. Separate controls for Bass and Treble lift. Response flat from 40 cycles to 15 kc/s. 2 dB down to 20 kc/s. Output 8 watts at 5 per cent total distortion. Noise level 40 dB below full hum. Output transformer tapped for 3 and 15 ohms speech coils. For use with Std. or L.P. records, musical instruments such as guitars, etc. Suitable for small halls, £3.19.6. P. & P. 7/6. Crystal mike to suit, 15/-, P. & P. 2/-. 8" x 5" P.M. Speaker to suit, 12/6. P. & P. 2/-.
13. FLUORESCENT LIGHT KIT. 40 watt fluorescent lighting kit comprising Siemens Choke, 2 pin holders, starter holder and starter. 11/6, plus 3/- P. & P.
14. A.C. MAINS MOTOR. Silent running by famous manufacturer. A.C. Mains 230-250, shaded pull start. 1440 r.p.m., size 2 1/2 x 5 1/2 x 1 1/2 in. approx. 7/6, plus 1/6 P. & P.

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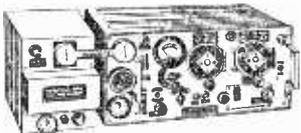
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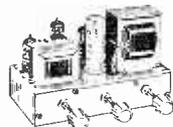
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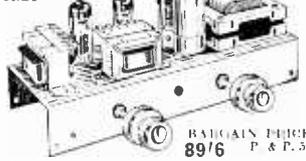
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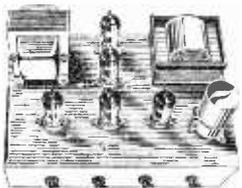
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1FD1	7/6 6BW7	7/8	12Q7GT	7/8	DL94	6/-	EY31	7/8	R19	6/8
1FD9	5/8 6D2	4/-	12SN7	4/6	DL98	7/8	EY31	10/-	SSA1	9/8
1P1	7/6 6FP12	4/-	16A5	9/8	EH91	4/-	EZ40	5/8	U52	7/8
1P10	5/8 6H6GT	2/-	19A5	9/8	EH41	7/8	EZ80	6/-	U76	7/8
1P11	6/- 6J7GT	7/8	25L6GT	5/-	EBF80	8/8	EZ81	8/9	U78	5/-
1R5	5/8 6K7G	5/8	30C1	7/8	EC81	4/-	HV12	9/8	U142	7/8
1S5	5/8 6K8G	6/-	30L1	7/8	EC82	6/9	KT33C	8/-	UBM1	8/8
1T4	2/- 6Q7G	5/8	35L6GT	7/8	EC83	8/9	KT95	13/6	UC142	8/8
1U5	5/8 6SL7GT	6/-	35W4	8/8	EC84	6/8	N17	5/8	UF41	8/8
3Q4	5/8 6SN7GT	7/8	35Z4GT	8/-	EC85	7/8	N18	5/8	UL41	8/8
384	5/8 6V6G	7/8	5763	7/8	ECF80	6/8	N19	6/-	UY41	8/8
3V4	6/- 6X4	5/8	80	8/-	ECF82	7/8	N709	7/-	W17	2/-
5Y8GT	5/- 6X5G	5/8	19AF91	5/8	ECH42	9/-	PC84	7/8	W78	4/8
EZ40	6/8 7X4	5/-	19AF96	7/8	ECH81	10/-	PCF80	7/8	W142	8/8
6AK6	5/8 8D3	4/-	DC90	12/8	ECL90	6/8	PCF82	6/8	X17	5/8
6AL5	4/- 9Y7	9/8	DF91	2/-	ECL92	7/8	PCL82	6/8	X142	9/8
6AM6	4/- 12AD6	7/8	DF96	7/8	EF41	9/-	PL84	5/8	X150	9/-
6AT6	5/- 13A18	10/-	DH76	7/8	EP80	8/-	PL81	8/8	Z77	4/-
6BA6	5/- 12AT7	4/-	DH77	5/-	EP86	9/-	PL82	7/-	ZD17	5/8

**ASK FOR RESISTOR AND CAPACITOR COLOUR CODE
FREE WITH EVERY PURCHASE**

High Stability Resistors 1W 5% 50Ω to 1M. 9d. Midret Ceramics 500 v. 9d. Coax. Super Quality 1in. 6d. 9d. Plus 9d. Sockets 9d. Silicon H.T. Resist. 250 v. 300 mA 1in. x 1in. 8/6. Contact Cooled 250 v. 50 mA 6/6. 85 mA 8/6. NEW TRANSISTORS BY MULLARD. OC19, OC26, OC66, 25/-; OC34, OC45, 5/-; OC76, 6/-; O77, 5/-; OC72, 6/-; OC72 Matched pair, 12/-; OC74, OC75, OC78, 7/8; OC81, 6/-; D94 Matched pair, 12/-; OC170, OC171, 7/8.

VALVES MATCHED IN PAIRS

FLM4 27/8. EL84, 15/-; N709 15/-; 6V6G 15/-; 6AW6 14/- per pair. Push-Pull O.P. Transformer for above 315Ω 14/6. P. & P. 1/6. 12in. P.M. Speakers 3Ω 24/6. Baker's "Sehurst" 12in. 15Ω 15W Staiwart £5.50. 12in. Stereo Model £8.15.0.

SETS OF VALVES

DR91, DF91, DAF91, DL92 or DL91, 17/6 ECH42, EF41, EBC41, DK96, DF96, DAF96, DL96, 28/8 EL41, EZ40, 37/8
FR8, 6K7, 6Q7, 6V6, 3Z4 or 6X5G, 19/6 EY142, EF11, ER341,
1B2, 1T4, 1S5, 384 or 3V1, 17/6 UL41, 1Y11, 35/-
Postage and packing 6d. Over £1 post free. C.O.D. 4/-

● **SCOOP! Transistor Tape Recorder.** The best obtainable by very famous manufacturer. Brand new, boxed, guaranteed. Reduced from 12 gns. **OUR price £7.10.0.** P.P. 3/6. Complete with microphone, tape, batteries and operational booklet. Features push-pull amplifier, two motors, single switch operation, pause, speed, wind, rewind, record, play back. Can be used in any position, indoor or outdoor.

**DO IT
YOURSELF**

Famous Autochanger or Single Player Units supplied with brand new, two-tone, de-luxe portable cabinets, 17 x 15 x 8½in. Strong carrying handle, gilt finish clips and hinges are used by famous make for 22 gn. model. Ready cut out motor board, 14 x 13in. Front baffle 7 x 4in. High flux loudspeaker and 3 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 5 wires to join. 12 month's written guarantee. Available separately or package deals as below.

L.K. PRICES FOR COMPLETE KITS:

Autochanger Kits as above

B.S.R. U.A.14 £10.17.6 P.P. 5/6
Garrard Autoslum £11. 7.6 P.P. 5/6

Single Player Kits as above

Garrard S.R.P.10 £10.12.6 P.P. 5/6
E.M.I. Autostop £10.17.6 P.P. 5/6
Individual Prices for those who wish to purchase separately.
Record Player Cabinet with Cut-out Board... £2.15.0 P.P. 3/6
Amplifier with 7 x 4in. speaker £3.10.0 P.P. 2/6

Auto-changers

B.S.R. U.A.14 £5.10.0 P.P. 5/6
Garrard Auto Slim £6.15.0 P.P. 4/6

Single Players

E.M.I. Auto-Stop £5. 7.6 P.P. 4/6
Garrard S.R.P.10 £5. 5.0 P.P. 4/6
E.M.I. Separate Pick-up £3.0.0 P.P. 3/6

Transcription Units—Stereo Head—Mono

Garrard 4 H.F. £14.10.0 P.P. 5/-
Phillips A.G.10/16 £12. 0.0 P.P. 5/-
Garrard A.T.6 £9.19.6 P.P. 5/-

● **SCOOP! Tapes.** We are reducing our huge stocks of Paper, Acetate, Mylar. All sizes. Spare spools also available. Let us quote you at our expense. Special Prices for lots of 1 doz. and over.

● **SCOOP! A Limited Number only. Tape Decks by B.S.R. Latest Model, AC/200/240v.** Brand new and boxed. **Our price £6.10.0 only.** P.P. 4/6.

Please send for complete list of Tape Decks.

THE CHEAPEST, THE BEST, THE QUICK-EST SERVICE.

IF NOT ADVERTISED IT IS STILL IN STOCK

**MAIL ORDER ONLY — TO ADDRESS
OPPOSITE PLEASE**

● **SCOOP! 1964 Radiogram Chassis. Stereo,** 3 wave bands, long medium and short. 5 watts per channel. 6 valves. Latest Mullard. AC 200-250v. Ferrite aerial. Glass dial, horizontal wording, concentric controls. isolated chassis size 13½ x 9in. high x 5in. deep. Product of famous national manufacturer. Brand new and boxed. Maker's guarantee. **OUR price £13.10.0.** List price £19.8.0. P.P.5/6. *Our chassis list quotes prices the keenest in the trade. We are main agents for the complete range of Brittamer chassis and amplifiers. Brittamer makers of radiogram chassis to the top names in radio.*

● **SCOOP! A Stereo Amplifier** by world famous amplifier designers. 5 watts per channel. fascia panel in black and silver. Assembled, tested, guaranteed. Even leads and plugs supplied. Maker's package unopened.

OUR price £7.10.0. List price £15.15.0. P.P. 5/6. *Please send for our Amplifier and Hi-Fi lists they are FREE. Our prices the most competitive in the trade.*

● **SCOOP! Microphones.** Complete Lead Coax Plug, dynamic. Brand New. Our Price, 5/- only. P.P. 1/6.

Build a Record Player and save Pounds

The Cheapest Way The L.K. Way

● **SCOOP! 10in. Speakers** by W.B. of Mansfield. A beautiful Hi-Fi speaker, magnet flux density, 12,000 lines gauss. Brand new in maker's carton. Fully guaranteed. **OUR price 42/- only.** P.P. 1/10. *Please send for our Speaker Lists. Our prices are the most competitive in the trade.*

● **SCOOP! B.S.R. U.A.14 Autochangers.** Brand new and boxed. Wired for stereo. Note **OUR price £5.7.6.** P.P. 5/-.

● **SCOOP! Garrard Autoslims.** Brand new and boxed. Wired for stereo. Note **OUR price £6.0.0 only.** P.P. 5/-.

● **SCOOP! Diodes**—over 1,000,000 in stock—ideal substitute O.A.81 vision detector. Note **OUR price £1.0.0 per 500.** P.P. 2/-. (In 500 lots only). All guaranteed.

● **SCOOP! Now available our Short Wave Receiver Mk. II** in kit form. A wonderful little set, dry battery operated. Radio Australia received in Surbiton, Surrey at reasonable strength. Coverage 3.5Mc/s to 12Mc/s, 11Mc/s to 30Mc/s. Note **OUR price 42/- only.** All components guaranteed. P.P. 2/3.

● **SCOOP! Record Player Amplifier.** Product of national manufacturer. 2 valve, A.C. mains, output 3 watts. Complete with speaker, output transformer, valves, knobs, etc. Fully wired, tested and guaranteed. Mounted on baffle board ready for cabinet. Note **OUR price 50/- only.** P.P. 2/-.

TRANSISTOR SECTION

● **SCOOP! A first-class 2 wave-band 6 transistor superhet chassis** by world famous manufacturer. Fully built, aligned, tested, guaranteed. Full coverage long and medium waves.

Note **OUR price £4.4.0 only.** Suitable speaker 10/6. A few cabinets can be supplied at 22/6 each.

OUR price for the package deal £5.5.0 only.

● **SCOOP! As above, 7 transistor.** **OUR price £4.15.0 only.** Suitable speaker 10/6, Cabinet (very attractive), 22/6.

OUR price for the package deal £5.14.0 only.

● **SCOOP! As above, 8 transistor.** **OUR price £5.4.0 only.** Suitable speaker 10/6 Cabinet (very attractive two-tone), 22/6.

OUR price for the package deal £6.3.0 only.

● **SCOOP! 'Noton' Mains Power Pack Kit** for transistor radios. Boosts and generally extends life of old batteries, in two-tone plastic case. Assembled in 1 hour. Miniature size, 4 x 2 x 1½in. Normal output 9v. 100mA. Full wave germanium diodes. Cartridge fuse. Runs radio direct from mains. Complete kits of parts with full instructions. all parts guaranteed.

OUR price 30/- only. Ready assembled 40/-, P.P. on all the above, 2/-.

● **SCOOP! Set of 6 transistors and diode.** Brand new in presentation case with circuit. **OUR price 15/-.** P.P. 1/-.



L.K. ELECTRONICS

27 OLD BOND STREET, LONDON, W.1.

THE TRIPLETONE HI-FI MAJOR

Price £15.18.9 Complete

Guaranteed for 12 months.

QUALITY AMPLIFIER

- Power Output (R.M.S.) 12 watts
Distortion 0.15%
Negative Feedback 32dB
Inputs for 10 watts: Gram: 250mv. Mic: 10mv.
Bass Control: Variable +18dB to -18dB at 30 c/s.
Middle Control: Variable +15dB to -15dB at 400 c/s.
Trebble Control: Variable +18dB to -18dB.
* Mic. Pre-amp Stage
* Boost on Treble, Middle and Bass
* Mixing on Mic. and Gram
* Power for AM or FM Feeder
* Push-Pull Output Stage
* Plays 78, 45 and 33 1/2 Records
Size: 12" x 5 1/2" x 6 1/2" high.
Valves: 12AX7, 12AX7, EL84, EL84, E281.
Output Impedance 16 or 15 ohms
Frequency Response: 20-20,000 c/s.
Hum and Noise -80dB
Mains: 200-250 volts A.C. Fully isolated.
De Luxe Case: 14" x 9" x 7 1/2", 30/- extra.

New Boxed VALVES 90-day Guarantee

Table with 4 columns: Valve type, Price, Valve type, Price. Includes items like 0Z4, 1R5, 1S6, 1T4, 2X2, 384, etc.

NEW ELECTROLYTICS

Table with 3 columns: Tubular, Tubular, Can Types. Includes items like 1/350V, 2/3 100/25V, 4/350/25V, etc.

TELESCOPIC CHROME AERIALS, 15 to 43in., 8/6.
TRIPLEXERS Bands I, II, III, 12/6. COAX PLUG, 1/-
LEAD SOCKET, 2/-. PANEL SOCKETS, 1/-
OUTLET BOXES (surface or flush), 4/-
BALANCED TWIN FEEDER 78, 6d. 80 or 300 ohms.
TWIN SCREENS, 100 pF, 7d. 80 ohms out.
Wirewound Ext. Speaker Control, 10 Ohm 3/-. 25 Ohm 6/6.
WIRE-WOUND POTS, 3 WATT. Pre-set Min.
TV Types. All values to 10 ohms to 20 K., 3/-
30K., 4/- Carbon 30 K to 2 meg., 8/-.
WIRE-WOUND 4 WATT. Pot. Long spindle.
Value, 30 ohms to 50 K., 6/6; 100 K., 7/6.
PHILIPS TRIMMERS, 0.10 pF., 3.30 pF., 1/-.
TRIMMERS, Ceramic, 30, 50, 70 pF., 9d., 100 pF., 15d.
pF., 1/3; 200 pF., 1/6; 500 pF., 75d. pF., 1/9.
TV etc. TRIMMER, 1000 pF. with knob, 2/-.
RESISTORS, Preferred values, 10 ohms to 10 meg.,
1 w., 4d.; 1 w., 4d.; 1 w., 6d.; 1 1/2 w., 8d.; 2 w., 1/-.
High Stability, 1 w., 1/2; 2/-. Preferred values
100 to 10 meg. Ditto 1/2, 1/3, 1/4, 1/5, 1/10 to 22 meg., 9d.
RESISTORS, C71, 3/6; C72, 2/6; C73, 1/6.
5 watt } WIRE-WOUND RESISTORS } 1/3
10 watt } 10 ohms-10,000 ohms } 2/-
15 watt } }
12.5 K to 25 K 10 w. ... 3/-

Volume Controls 80 ohm COAX Cable
Linear of Log Tracks Semi-air spaced 4in.
Long spindles, 15/6 40 yds. 25/-
5 K ohms to 2 Meg. 6d yds. 25/-
S. 3 1/2 p. 4/6
Stereo L ines, D.P. 4/6
1m. log. + 1m. A. log. 7/8
Ideal 625 lines
Low loss 5dB
100ft. 50 Mc/s 1/6 yd.

MAINS TRANSFORMERS 200/250 v. A.C.
Voltage 2/- each transformer.
STANDARD, 250-0-250, 50 mA, 6.3 v. 3.5 A.
Tapped 4 v. 4 A. Rectifier, 6.3 v. 1 A., 5 v.
2 or 4 v. 2 A. 22/6. ditto, 350-0-350 ... 29/6
MINIATURE 200 v. 20 mA, 6.3 v. 1 A. 10/6
MIDGET, 220 v. 35 mA, 6.3 v. 2 A. ... 15/6
SMALL, 230-0-230, 45 mA, 6.3 v. 2 A. ... 17/6
STD. 250-0-250, 65 mA, 6.3 v. 3.5 A. ... 17/6
HEATER TRANS. 6.3 v. 1 1/2 A. ... 7/6
Ditto, tapped 1.4, 2, 3, 4, 5, 6.3 v. ... 8/6
Ditto, wcc. 6.3 v. 4 amp. ... 10/6
GENERAL PURPOSE LOW VOLTAGE, 2 amp.
3, 4, 5, 6, 8, 10, 12, 15, 18, 24, 30 v. ... 22/6
AUTO TRANSFORMERS, 150 v. ... 22/6
0, 110, 200, 230, 250 v. 500 w. ... 82/6
MULLARD "510" Mains Transformer ... 38/6
PARMCO MAINS TRANSFORMER. The
ratings can safely be doubled. Primary 0-110-
210-230-250 v. H.T. 300-0-300 v. 30 mA. L.T.
6.3 v. 1.8 amp. ... 17/6

INTERVAL TRANSFORMERS, 3:1 or 5:1, 9/-
O.P. TRANSFORMERS Heavy Duty, 5/6. Multi-
plication, 7/6. Multitap heavy duty push-pull, 10 w.,
15/6. Battery 4/6. Sub. min. 5/8.
10w. O.P. matching trans., 3, 7, 15 Q, 12/6.
I.F. CHOKES 15 10H., 50-65 mA. 3/-; 10H., 55 mA.
10H., 130 mA, 10/6.
TINNED COPPER WIRE 16 to 22 swg., 1lb., 3/6.
ENAMEL COPPER WIRE 16-22, 2/9; 24-30, 3/6;
32-40, 4/6. D.C. 25, 34, 30 swg., 2oz., 3/6.

I.F. TRANSFORMERS 7/6 pair
465 Kc/s Slug Tuning Miniature Can, 2 x 1 1/2 in.
High Q and good bandwidth. Data sheets.
Standard size Weyrad, 10/6 pair.

FULL WAVE BRIDGE SELENIUM RECTIFIER:
2, 6 or 12 v. 1 1/2 amp., 8/9; 2 A., 11/3; 4 A., 17/6.
CHARGER TRANSFORMERS. Tapped input 200V,
250 v. for charging at 2, 8 or 12 v. 1 1/2 amps., 15/6;
2 amps., 17/6; 4 amps., 22/6. Circuit included.
4 AMP CAR BATTERY CHARGER with am-
meter, Leads, Fuse Case, etc., for 6 v. or 12 v., 6/9

BOOKS list S.E.A.
Boys' Book of Crystal Sets. ... 2/6
"W.W." Radio Valve Data. ... 6/-
High Fidelity Speaker Enclosure ... 5/-
Valve and TV Tube Equivalents ... 9/6
TV Fault Finding ... 5/-
Mullard Amplifier Manual ... 2/6
Radio Valve Guide, Books 1, 2, 3 ... 8/6
4 or 5 ... 5/- each
Transistor Superhit Receivers ... 7/6
Practical Radio Inside Out ... 3/6
Master Colour Colour Guide ... 7/6
Transistor Controlled Models ... 7/6
Principles of Colour TV ... 16/-
International Radio Stations ... 2/6

4 TRANSISTOR PUSH-PULL AUDIO
size 3 x 1 1/2 in. AMPLIFIER
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
Price 47/6. Instructions and circuit.
9v. Batt. 2/3. 2in. Speaker 15/-
Toggle Switches, S.P. 2/-; d.p. 3/6.
d.p.d.t. 4/-. Min. Slide d.p.d.t. 3/6.

1964 RADIOGRAM CHASSIS
THREE WAVEBANDS FIVE VALVES
S.W. 16 m - 30 m. LATEST MCZ80
M.W. 200 m - 200 m. ECR51, EP90, EBC51,
1.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 out, 5 watts. (Glass
dial, horizontal wording, size 13in. x 4in.
Aligned and calibrated. Isolated Chassis, size
13 1/2 in. x 9 in. high x 5 1/2 in. deep.
£9.15.6 Carr. & Ins. 4/6

BAKERS SELHURST LOUDSPEAKERS



- 12in. Baker, 15w. 24watt
3 or 15 ohms, 40-15,000
c/s. ... 5.62s.
12in. Stereo, Foam sus-
pension, 12w., 35-16,000
c.p.s. ... 7.62s.
12in. Standard H.D. 20w.
40-14,500 c.p.s. ... 7.62s.
12in. De Luxe 15w. 25-
17,000 c.p.s. ... 9.06s.
12in. Base 25w. 20-18,000
c.p.s. ... 12.82s.
15in. Auditorium, 35w., 20 c.p.s. to 12 kc/s. Idea
Guitars, etc., 15.92s.

LOUDSPEAKERS P.M. 3 OHM. 24, 3, 4, 5in.,
7 x 4in., 15/6; 64in. Rola, 16/6; 8in. Pleacey, 17/6;
9 x 6in., 8 x 5in., 21/-; 10 x 6in., 22/6; 10 in. Rola,
30/-; 12in. R.A., 30/-; EMI double cone, 13 x 1 1/2in.,
45/-
STENTORIAN HF101, 10in. 3 to 15 ohms, 10w. 87/6;
8in. HF42, 72/-; Tweeter, T359, 30/-; Cross-over
CX3000 30/-
EXTENSION SPEAKER CABINETS, 5in., 15/6;
9 1/2in., 18/6; 8in., 19/6; 10in., 26/6; 12in., 30/-

C.R.T. BOOSTER TRANSFORMERS
for heater cathode short circuit, or
tubes with failing emission. Full
instructions supplied, mains input.
Type A optional 25% and 50% boost
2v. or 4v., 6.3v. or 10v., or 12.5v.
State voltage required. PRICE 10/6.

TWIN GANG TUNING CONDENSERS, 385 pF.
miniature 1in x 1 1/2in., 10/-; 500 pF Standard
with trimmers, 9/-; midget, 7/6; with trimmers, 9/-
500 pF slow motion tuning, standard or midget, 9/-
Transistor gang 208 + 176 pF with trimmers, 10/6.
SMALL 3 gang 100 pF, 17/-; SINGLE 300 pF, 7/6.
SINGLE 10 pF, 25 pF, 50 pF, 75 pF, 100 pF, 160 pF
5/6. Mold dielectric 100, 300, 500 pF, 3/6.
CONDENSERS. New stock. 0.001 mfd, 7 kv.
1/3C, 5/6; D20, 20 kv, 9/6; 0.1 mfd, 7 kv, 9/6;
Tubular 330 pF, 0.001 to 0.05 mfd., 9d.; 0.1, 1/-;
0.25, 1/6; 0.5/350 v., 1/6; 0.1/250 v., 9d.; 0.1/2,000 v.,
0.1/1,000 v., 1/8; 0.1 mfd, 2,000 volts, 3/6.
CERAMIC COND. 500 v. 0.3 pF to 0.01 mfd., 9d.
SILVER MICA CONDENSERS, 10% 1 pF to 500 pF,
9d.; 500 pF to 3,000 pF 1/- Close tolerance
(±1 pF) 2.2 pF to 47 pF, 1/- Ditto 1% to 50 pF
to 315 pF, 1/-; 1,000 pF to 5,000 pF, 1/9.

465 Kc/s SIGNAL GENERATOR
Price 10/6, ready made with valve ISS.
DIPKETS SIZE 21 x 4 1/2 x 1 1/2 in. One resistor
to change. Full instructions supplied.
Battery 8/6. 89V +13V. Details Free.

WAVECHANGE SWITCHES
p. 4-way 2 water long spindle ... 6/6
2 p. 2-way or 2 p. 6-way long spindle ... 3/6
3 p. 2-way or 4 p. 3-way long spindle ... 3/6
3 p. 4-way or 1 p. 12-way long spindle ... 3/6
Wavechange MAKITS. Wafers Avail-
able: 1 p. 12 way, 2 p. 6 way, 3 p. 4 way,
4 p. 3 way, 6 p. 2 way, 1 wafer switch, 8/6
2 wafer switch, 12/6; 3 wafer switch, 16/-;
additional wafers up to 12, 3/6 each extra.

CRYSTAL MIKE INSERTS, 9/6
High output. Size 1 1/2 in. dia. x 1 in.
ACOS MIC. 14 insert 1 1/2 in. dia. x 1 in., 8/6
ACOS MIC. DE LUXE STICK MIKE 55/-
TSLI 41 ALPINE STICK MIKE ... 25/-
TELEPHONE TAPE MIKE ... 10/6
GUITAR CONTACT MIKE ... 15/6
MOVING COIL MIKE ... 59/6
FLOOR STANDS ... 57/6

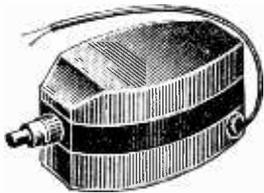
Valveholders, EA50, 6d. B12A, CRT, 1/3.
Engl. and Amer. 4, 5 and 7 pin. 1/1.
MOULDED Mazda and int. oct., 6d.; 6B7,
B8A, B8C, B9A, 9d., 6V7 with can, 1/6. B9A
with can, 1/9. Ceramic EF50, 6V7, B8A,
int. oct., 1/-; 6V7, B9A cans, 1/- each. Valve
plugs BT, B9A, int. cans, 2/3.

HIGH GAIN TV PRE-AMPLIFIERS
B.B.C. Channel 1 to 5. Gain 18dB.
EC93A valve. Kit price 29/6 or 49/6
with power pack. Details 6d. (PC83A
valves 1d preferred). Coils only 9/6.
H.A.N.D. II I.T.A. - Same prices.
Tunable channels 3 to 13. Gain 17dB.
Circuit and coils only 9/6. Chassis 4/9.

RADIO COMPONENT

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

THE "INSTANT" BULK TAPE ERASER AND RECORDING HEAD DEMAGNETIZER



200/250 v. A.C. **35/-** Leaflet S.A.E.

PLASTIC RECORDING TAPE

Double Play	7in. reel, 2,400ft. 42/-	Spare Plastic Reels
	5in. reel, 1,200ft. 25/-	
Long Play	7in. reel, 1,800ft. 22/8	3in. 1/6
	6in. reel, 1,200ft. 17/6	4in. 2/-
	5in. reel, 900ft. 15/6	5in. 2/4
Standard	7in. reel, 1,200ft. 17/6	5in. 2/6
	5in. reel, 600ft. 11/6	7in. 2/6

"EASISPLICE" Tape Splicer 5/-.
Leader tape 4/6; Splicing tape 3/-.

CRYSTAL SET BOOKLET 1/-
CRYSTAL DIODE G.E.C. 2/-, GEX 34, 4/-, OA81, 3/-, HIGH RESISTANCE PHONES, 4,000 ohms, 15/-, p. MOVING COIL PHONES, 100 ohms, 10/-, SWITCH CLEANER. Fluid squirt stout, 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.
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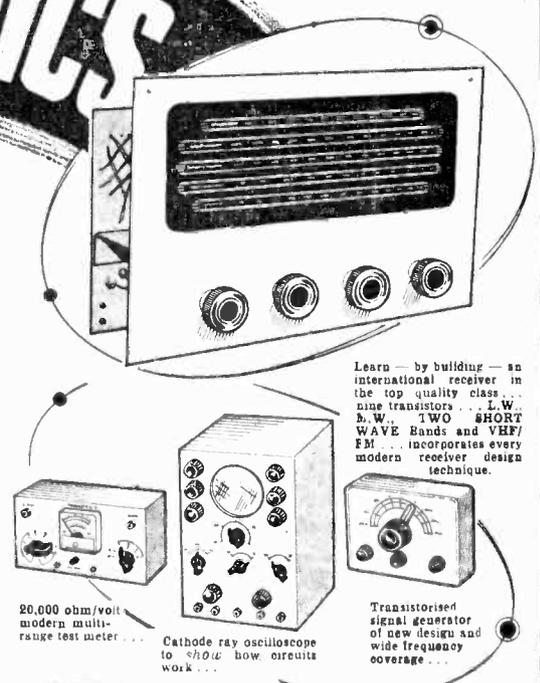
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British National Radio School

Practical Wireless

Vol. XL No. 687 MAY, 1964

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Leaders Galore!

"THE Editor asks for a leader. He must be slipping!"—thus begins one of the contributions to the Leader Competition. Another suggested that as nobody ever reads the leader, his entry was so much waste of time and effort. From these two comments alone, it will be obvious that readers not only accepted the challenge but took the opportunity to get in a few sly digs at the same time!

The number of entries was much larger than anticipated and we were very impressed with the high general standard—two factors which made the judging extremely difficult. It was doubly gratifying that the response was so good, for the prizes offered were nominal and most readers were obviously stimulated to take part through pure interest and enthusiasm.

And what an extraordinary variety of entries came in! There were unabashed lighthearted leaders and stern censorious ones. There were leaders on the past, the present and the future. Many took the theme of space and electronics. Others looked at valves and transistors. Some concerned themselves with various aspects of design and construction. One was addressed to contributors; another spoke of writing for PRACTICAL WIRELESS. Several developed the richness and variety of our hobby, but another warned of the narrowness of outlook of those too fully wrapped up in radio. Then there were articles on kits, on amateur bands, on home movies, and on many other practical or abstract subjects. Hardly anything or anyone escaped this literary onslaught!

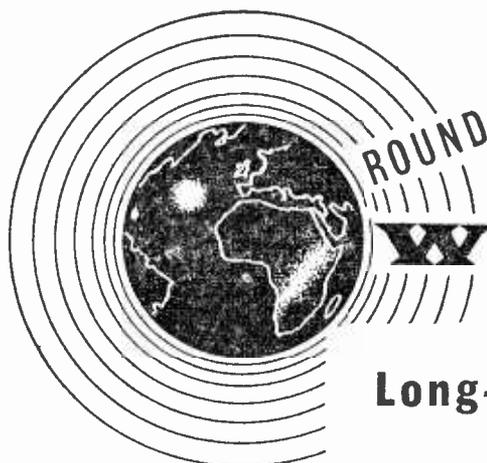
Not only was there a vast range of subjects and attitudes, but participation from all age groups. The youngest and oldest (known) contributors were 14 and 70 years old respectively.

This flood of material presented a formidable task to the judging panel. A process of elimination began. Personal viewpoints of the judges were not, of course, allowed to influence selection or rejection, but some entries were obviously unsuitable subjects for leaders and others failed because the writers did not develop a good original theme or were sidetracked.

This preliminary thinning out still left a considerable number of survivors which was eventually reduced to a final "short list" of ten—and here, the panel ran into trouble for these were all good enough to take the winning positions. The selections finally made are printed on pages 61 and 62, together with a list of "highly commended" entries.

Very many thanks to everyone who co-operated. It was a fine effort. Every entry received was carefully considered and even those which were rejected early on often showed considerable merit. And now that he knows so many readers look at the leader column, your Editor will have to be particularly careful what he writes in future!

Our next issue dated June will be published on May 7th



of WIRELESS

**NEWS AT HOME
AND ABROAD**

New Submarine Cable Links U.K. and Germany

UP until recently, all telephone connections between this country and Western Germany have had to be routed through Belgium and the Netherlands. Now, with the inauguration in February of the first direct, large capacity, submarine telephone cable linking Britain and the Federal Republic, 120 new telephone circuits become available, any one of which will carry 24 telegraph circuits.

The new cable connects Winterton, in Norfolk with Borkum Island, from where it is taken to Leer on the German mainland. Two ships were employed in the 200 nautical mile long, cable laying operation; the G.P.O.'s H.M.T.S. "Monarch" and the Danish cables ship "Peter Faber". The cable was manufactured by Standard Telephones and Cables Limited, who also supplied the repeaters and equalisers.

Apart from British/German traffic, a number of channels in the cable will be allocated to United States/German connections, and by linking up with the existing TAT 3 U.K./U.S.A. cable, will thus provide direct circuits between the U.S.A. and West Germany.

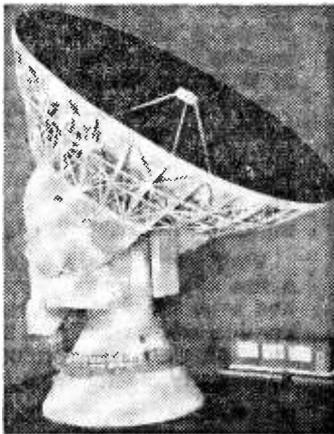
A second Anglo-German cable will be in service later this year.

Long-established Institution Changes Its Title

FROM the very early days of the British Institution of Radio Engineers (founded in 1925) there have been those who advocated the inclusion of "electronic" in its title. After the War the Institution's name again came under discussion with the increasing recognition of the amount of activity in the Institution which was covered by the term "electronics". This fact has steadily become more apparent and now, nearly three years after the Institution was incorporated by Royal Charter, the Queen was pleased, at a Privy Council held by her Majesty on 26th February, 1964, to make an Order in Council allowing amendments to the Charter of The British Institution of Radio Engineers changing its name to "The Institution of Electronic and Radio Engineers".

RADIO TELESCOPE FOR DSIR

THE Ministry of Public Building and Works recently placed a contract with the Electronics Group of Associated Electrical Industries Limited, for the design and installation of a radio telescope for the Department of Scientific and Industrial Research at Chilbolton in Hampshire.

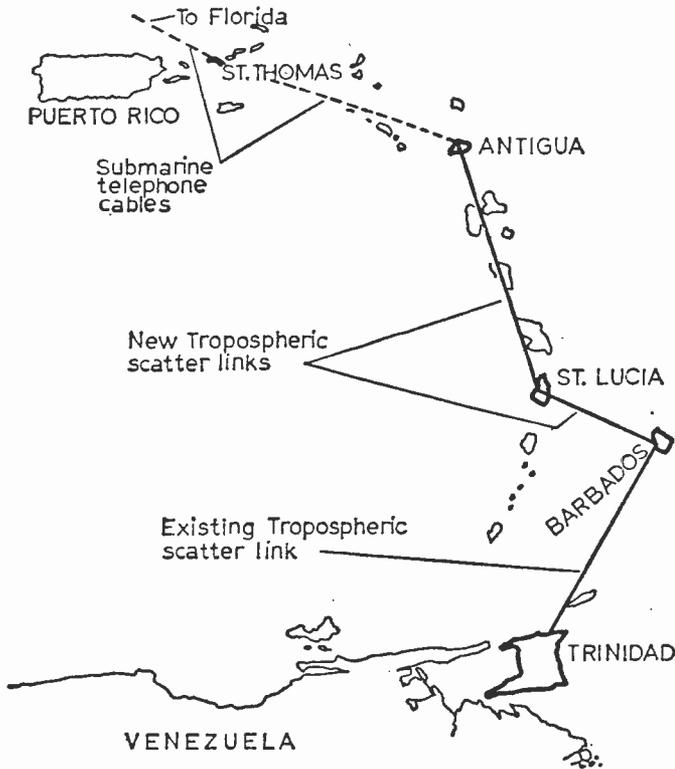


Backed by considerable experience in the design of steerable aeriels, AEI's Electronics Group has designed the new aerial to be steered with a pointing accuracy of two minutes of arc, in winds of up to 45m.p.h. The drive motors which will steer the aerial's 82ft. dish—which together with the rest of the moving structure will weigh approximately 300 tons—will be supplied by AEI's Motor and Control Gear Division.

The DSIR eventually plans to use the new telescope in its study of radiation and radio signals pick-up.

A model of the new 'steerable aerial to be supplied by AEI to the DSIR.

EQUIPMENT FOR CARIBBEAN LINKS



A map of the Eastern Caribbean showing existing and planned tropospheric scatter links and submarine cables.

EQUIPMENT for the multi-channel tropospheric scatter and microwave link system to be established in the islands of the Eastern Caribbean (see Round the World of Wireless last month) is to be the responsibility of the Marconi Company Ltd.

The two new tropospheric scatter links will connect Antigua to St. Lucia and St. Lucia to Barbados, distances of 220 and 112 miles respectively. The Antigua-St. Lucia installation will be a Marconi 900Mc/s tropospheric scatter link, providing 64 telephone channels. At each end of the link, two 30ft. diameter dishes will be erected with parametric amplifiers to give a low noise factor. The 2,000Mc/s tropospheric scatter link between St. Lucia and Barbados, will be of American manufacture by the Radio Engineering Laboratories Inc., and will carry 80 channels. A Marconi 900Mc/s link is already in existence providing communication between the final two terminal islands in the system—Barbados and Trinidad—but under the contract, the capacity of this link will be increased from 12 to 64 channels.

Short overland connections in Antigua, St. Lucia and Barbados will be necessary to complete each section of the system. At Antigua and Barbados these connections will be provided by twin path 7,000Mc/s microwave links manufactured by Pye Telecommunications Limited, carrying 64 and 92 telephone channels respectively, to link, in the first case, the St. Thomas-Antigua submarine cable to the Antigua-St. Lucia 900Mc/s link, and in the latter case to link the Barbados terminals of the second and last legs of the tropospheric scatter link. On St. Lucia will be a short, v.h.f. link, providing a 32 channel path between the first and second legs.

Irish Islands Get Telephone Service

BY linking four islands off the western and southern coasts of Ireland with mainland telephone exchanges, v.h.f. radiotelephone equipment made by the Automatic Telephone and Electric Company Limited, will bring a public telephone service to the islands' inhabitants for the first time.

The equipments—known as "Country Sets"—are capable of operating from 12V battery supplies, providing exactly the same service as a conventional land-line system. Transistorised circuits help minimise power consumption which at the mainland terminals of the links can be provided for by either mains or battery supplies.

The Country Sets operate on 54—88Mc/s or 156—184Mc/s and these particular installations will link Inishmeane with Bunbeg, Inishturk with Cleggan, Achill Beg with Achill Sound and Long Island with Baltimore.

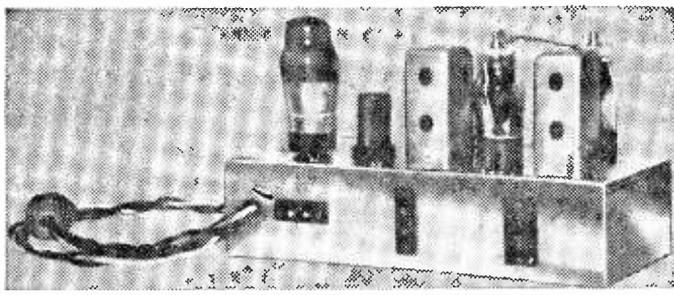
RADIO TELEPHONES FOR DANISH POLICE

THE whole of Denmark is to be covered by a radio telephone network which will link mobile units of the Danish police to fixed stations at their headquarters. The contract for this installation has been awarded to Pye Telecommunications Limited by the Danish State Police after extensive field trials.

Police cars and motorcycles will be equipped with radio telephones employing transistorised receivers and instant heating transmitting valves.

Pye in India

A NEW radio receiver factory opened recently in Bombay under the administration of the Tata Group of India and National Ecko Radio and Engineering Limited of Bombay, and the British firm, Pye of Cambridge. Pye will collaborate with the Tata Group to produce eventually more than 200,000 radio receivers a year from this one factory, which will be the largest of its kind in India.



The Hillingdon RADIOGRAM

BY J. B. WILLMOTT

CONTINUED FROM PAGE 1164 OF THE APRIL ISSUE

THE circuit of this switch-tuned a.m. radiogram was described in last month's issue along with details of chassis construction. The next step is to assemble and wire up the two chassis.

MOUNTING THE COMPONENTS

Reference should be made to Fig. 5, which shows the layout of components and wiring underneath the chassis. It is recommended that components be mounted in the following order:

First of all fit a rubber grommet in the $\frac{3}{16}$ in. diameter hole on the rear chassis runner which is to allow for entry of the six-way power supply cable. Using 6B.A. nuts and bolts, the aerial, earth, pick-up and loudspeaker sockets can now be mounted on the rear runner, also the four-way tagstrip TS4 adjacent to the grommeted hole previously referred to.

Now mount the four octal valveholders, noting particularly the orientation of the locating spigots. Again use 6B.A. nuts and bolts and at the same time include the tagstrips TS1 and TS2 on one fixing bolt of V1 and V2 respectively, also the solder tag on fixing bolts of V4 and V3.

The i.f. transformers can next be mounted, not forgetting to include the tagstrip TS3 on one mounting bolt of T2. The output transformer is also mounted beneath the chassis.

The tone control and volume control may now be secured to the front chassis runner and finally the coilpack unit. Handle this component with care and make sure that it is fixed with the "green" and "red" tags nearest the top (open) edge of the chassis runner (see Fig. 5). The fixing nuts of these three components should be screwed up really firmly, preferably using shakeproof washers between the nuts and chassis surface.

Turning now to the power supply chassis, the position of the various components should be easily seen from the drilling diagram (Fig. 3) given last month. The mains transformer is mounted above chassis and the choke and smoothing capacitors below. The power output socket is on the end runner nearest the rectifier valve V5. Rubber grommets should be fitted in all holes marked "B" as in each case these provide for current-carrying leads passing through the chassis.

WIRING UP

It is strongly recommended that the power supply chassis be wired up first in order that when the constructor has completed the more complex wiring of the main chassis he already has the power unit complete and ready to connect up and test the completed job without further delay.

Wiring of the power supply calls for no special comment; reference to the theoretical circuit in Fig. 1 should make it perfectly clear. Extreme care must be used in wiring the power take-off socket, adhering strictly to the pin numbering as shown. It is a good plan to carry out the wiring of the octal plug as the next operation whilst the socket wiring is fresh in the mind.

The exact length of cable required to reach from main chassis to power pack depends on the positioning of the two units in the cabinet, but it is better to allow too much lead rather than "just enough". It is recommended that the six-way cable be made up of a twisted red/black, a twisted yellow/blue (or any other pair of colours differing from red/black) and a flat twin length of plastic insulated flex. These leads are terminated on the octal plug as follows:

Pin 1.—No connection.

Pin 2.—Blue flex (earthed side of 6.3V heater supply).

- Pin 3.—One lead of flat twin flex.
- Pin 4.—Other lead of flat twin flex.
- Pin 5.—No connection.
- Pin 6.—Red flex (h.t. positive line).
- Pin 7.—Yellow flex (live side of 6.3V heater supply).
- Pin 8.—Black flex (h.t. negative and chassis).

The cable can be plaited together or bound at intervals with insulating tape. Thread the end of the cable through the grommets on the rear chassis runner of the main chassis and anchor the leads to the four-way tagstrip TS4 as shown in Fig. 5, again taking extreme care not to make any errors in the colour coding. The remaining leads are connected to the on/off switch on VR2.

valve are earthed to chassis and form the heater supply return. The tagstrips TS1, TS2 and TS3, the volume and tone controls and the coilpack can next be wired up. The various anode, screen and cathode connecting components should be secured to their respective valveholder pins, their other ends being left "free" for later connection to busbar or h.t. rail.

A heater supply for the indicator lamp is connected in parallel with the heater of V2 and taken through the chassis via the ¼ in. hole adjacent to the V2 valveholder. The indicator lamp is not fixed to the chassis but is on a fly-lead long enough to permit its being mounted on the surface panel of the completed radiogram.

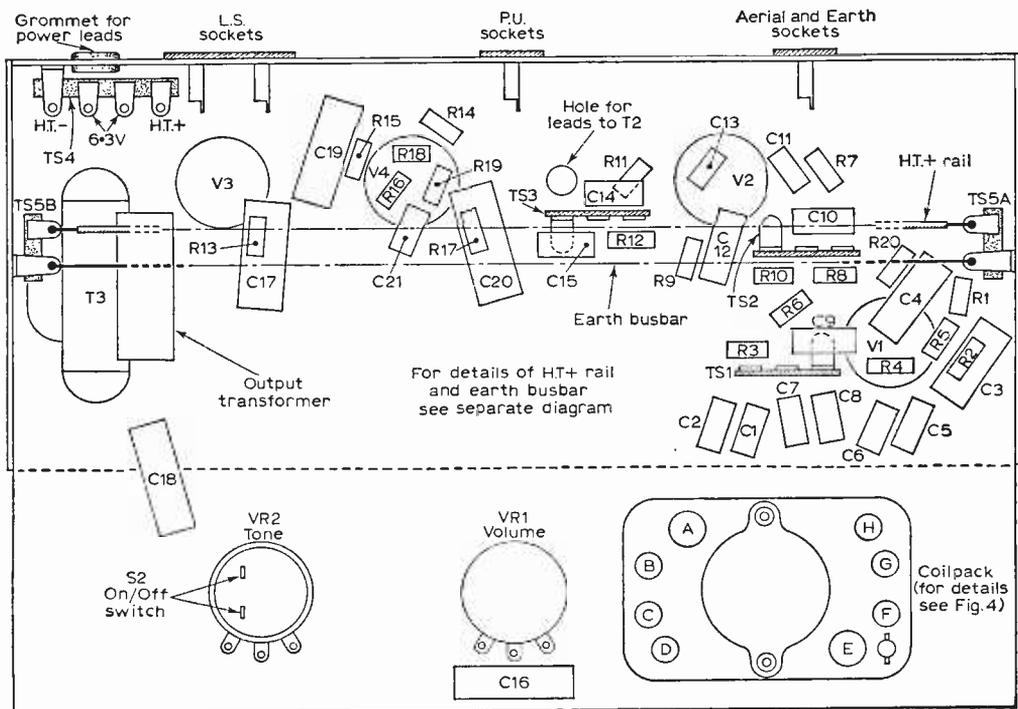


Fig. 5: The relative positions of components mounted beneath the chassis main.

Make a careful check of all wiring and then proceed to the wiring up of the main chassis. A feature to note here is the provision of a main negative busbar and an h.t. positive rail stretched across the full length of the chassis (see Fig. 5). Most of the voltage dropping and cathode bias resistors, together with their associated decoupling capacitors, are anchored at one end to the earth busbar, their other ends going to the appropriate valveholder pins. This makes assembly much simpler and the result is both neat and efficient and greatly facilitates testing and servicing should this prove necessary at some future date.

Before the busbar and h.t. rail are put in position, however, wire up the heater supply to pin 7 of each valveholder. Pins 1 and 2 on each

The negative busbar, comprising a length 14 or 16s.w.g. tinned copper wire, is now stretched tightly across the chassis between the earthed tags of TS5(a) and TS5(b) and the appropriate components soldered to it.

A further length of wire is now measured off to stretch from the insulated tag of TS5(a) to that of TS5(b), but this is provisionally soldered into position at one end only. Short lengths of insulating sleeving are then slid on, leaving gaps at appropriate distances to permit the connection of voltage dropping resistors and "red" leads to T1 and T2 (see Fig. 6). The wire is then secured at its free end and the appropriate connections made to this h.t. rail.

This should complete all wiring and a careful

check should be made. It is a good plan to colour in each wire on the theoretical diagram as it is checked. Make sure that where screened leads are used the screening braid does not foul any nearby tags or components and that where the braid is shown as "earthed" it is securely anchored to the tag in question. A screened lead was used in the prototype for the connection between T51, below chassis, and the top cap grid of V1 as a precautionary measure. It is conceivable that unwanted coupling between this rather lengthy lead and that going from the top of T2 to the grid of V2 might cause instability.

If a multirange testmeter is available routine tests can now be carried out to ensure that there are no short-circuits existing between the h.t. line and chassis or between the live heater line and

driver to the "live" pick-up socket on the rear panel; a loud and healthy "brrrr . . ." from the speaker should result which should vary in intensity with the setting of the volume control.

This test proves the correct working of the audio stages V3 and V4. Now turn the selector switch to any one of the "radio" positions and tap the top cap of V2 with the screwdriver with volume control at maximum position; a sharp "click" should be audible. Repeat this by touching first the top cap of V1, then the aerial socket on the rear panel. If the desired response is obtained it is fair to assume that no serious wiring errors have been made and some attempt can be made to receive a signal.

Actually, when received from the manufacturers, the coilpack will probably be found to have been

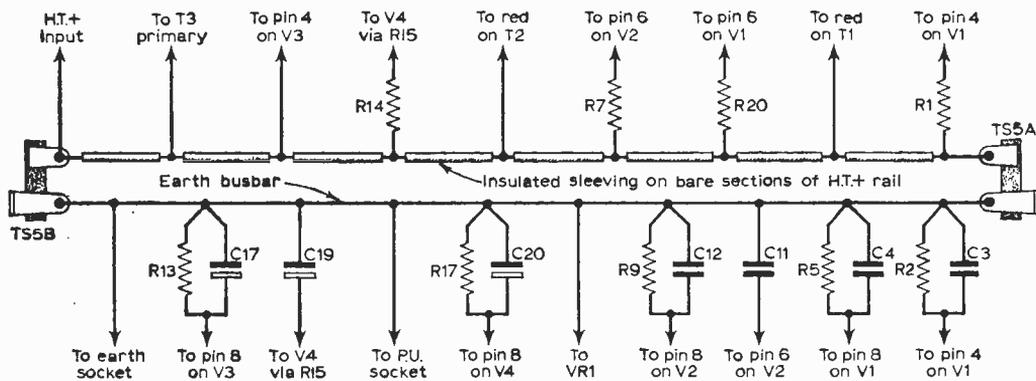


Fig. 6: Component wiring to the earth busbar and h.t. rail.

chassis. If all is in order the completed receiver can now be tested.

TESTING AND ALIGNMENT

Plug the main chassis into the power supply unit (never operate the latter without a suitable "load" on the h.t. supply, in actual fact the inclusion of the on/off switch on the main chassis renders it impossible to switch on the power unit without the two chassis being connected). Insert the valves into their appropriate valveholders, not overlooking the fact that the 6J5, which is V4 on the circuit diagram, actually occupies the position between V2 and V3 on the main chassis, and connect the loudspeaker to the sockets provided on the rear chassis runner.

Set the selector switch on the coilpack to the "gram" position, fully clockwise, and with the volume control at minimum (anticlockwise) switch on by turning VR2 until the "click" of the switch is heard.

Watch and listen carefully for any signs of overheating; the pilot lamp should come on immediately and the valve heaters glow after a few seconds. Gradually advance the volume control to maximum—a slight "breathing" sound should be audible from the speaker or possibly a very faint mains hum. Now advance the blade of a screw-

roughly aligned to the BBC London Home, Light and Third programmes. In the case of the prototype, signals were audible at all four positions of the switch as soon as an aerial was connected up, prealigned 465kc/s i.f. transformers having been used in construction.

However, for those possibly less fortunate here is the procedure for alignment. If a signal generator is available alignment of the i.f. transformers to 465kc/s can be carried out as the first operation. As the method of doing this will almost certainly be already known to anyone possessing a signal generator it will not be repeated here.

Those without such an instrument need not despair as with reasonable care and patience this receiver can be satisfactorily aligned without the use of instruments.

Turn the selector switch fully anticlockwise: this is the position in which the BBC Light Programme (on 247m where coilpack CP4/MG is used or on 1,500m where CP4/LG is used) should be received. Insert a suitable trimming tool through the hole in the front panel giving access to the core of coil "E" and screw slowly in or out until the signal can be heard. Now transfer the trimming tool to the core of coil "A" and adjust for maximum volume.

Next carefully adjust the cores of the i.f. transformers in turn, beginning with T1 primary and

working through to T2 secondary for maximum volume. Not more than one or two turns either way from the setting in which the components were originally supplied (provided prealigned ones have been ordered) should be necessary.

Repeat the adjustments a second time to see if any further improvement can be obtained. Naturally without a signal generator there will be no guarantee that the i.f. transformers will be aligned exactly to 465kc/s, but as no ganging of tuned circuits by a variable capacitor is involved this is not of great consequence.

Now return to the adjustment of cores "E" and "A" as a further improvement will no doubt be now obtainable.

Turn the wavechange switch to position 2 and in this position adjustment of cores "F" and "B" should enable the B.B.C. Third Programme on 464m to be tuned in. Similarly in position 3 the Home Service should be located and on position 4 Radio Luxembourg on 208m, by adjustment of cores "G" and "C" and "H" and "D" respectively.

The position of the various tuning cores is clearly shown on the data sheet supplied with the coilpack (Fig. 4, last month).

INSTALLING THE CHASSIS

When fully satisfied with the alignment the chassis can be fitted into the cabinet.

The screened pick-up lead from the record player unit should be terminated by a red wander plug for the inner lead and a black wander plug for the screening braid; these, of course, plug into the appropriate sockets on the rear panel of the main chassis.

The gramophone motor can be conveniently connected by a length of twin flex across the primary tags of the mains transformer on the power unit chassis. This will then ensure that when the radio receiver switch is in the "off" position the gram motor is simultaneously disconnected from the mains.

It will be found that a very pleasing standard of reproduction will be obtainable from records, with more than adequate volume for all domestic needs. The maximum output obtainable approaches 4W.

Normally the tone control will require setting at the minimum position (anticlockwise) as the V4 stage already provides enhanced bass response, but it may, of course, be advanced slightly to counteract surface noise on the older type 78 records. ■

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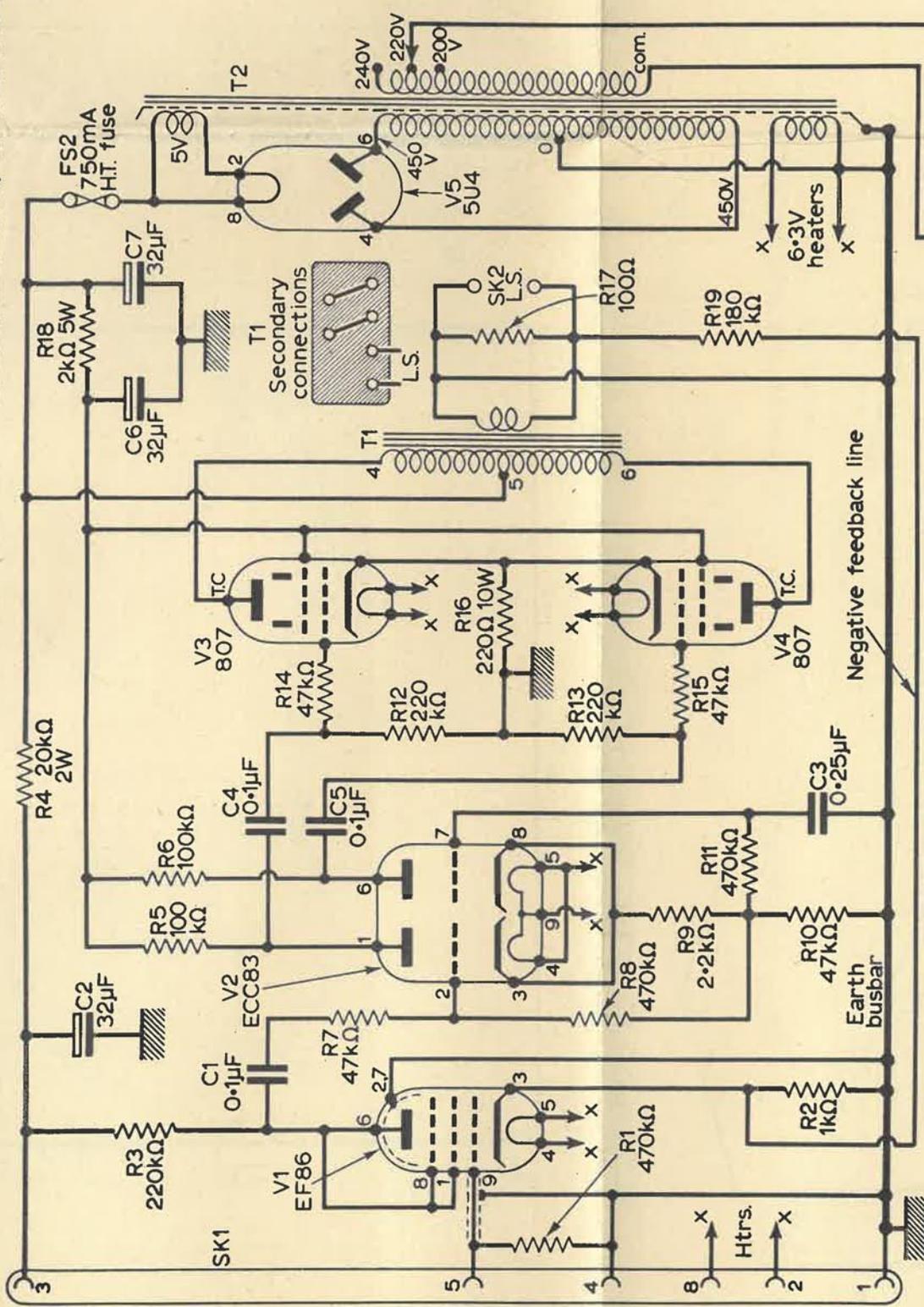


FIG. 1 CIRCUIT DIAGRAM

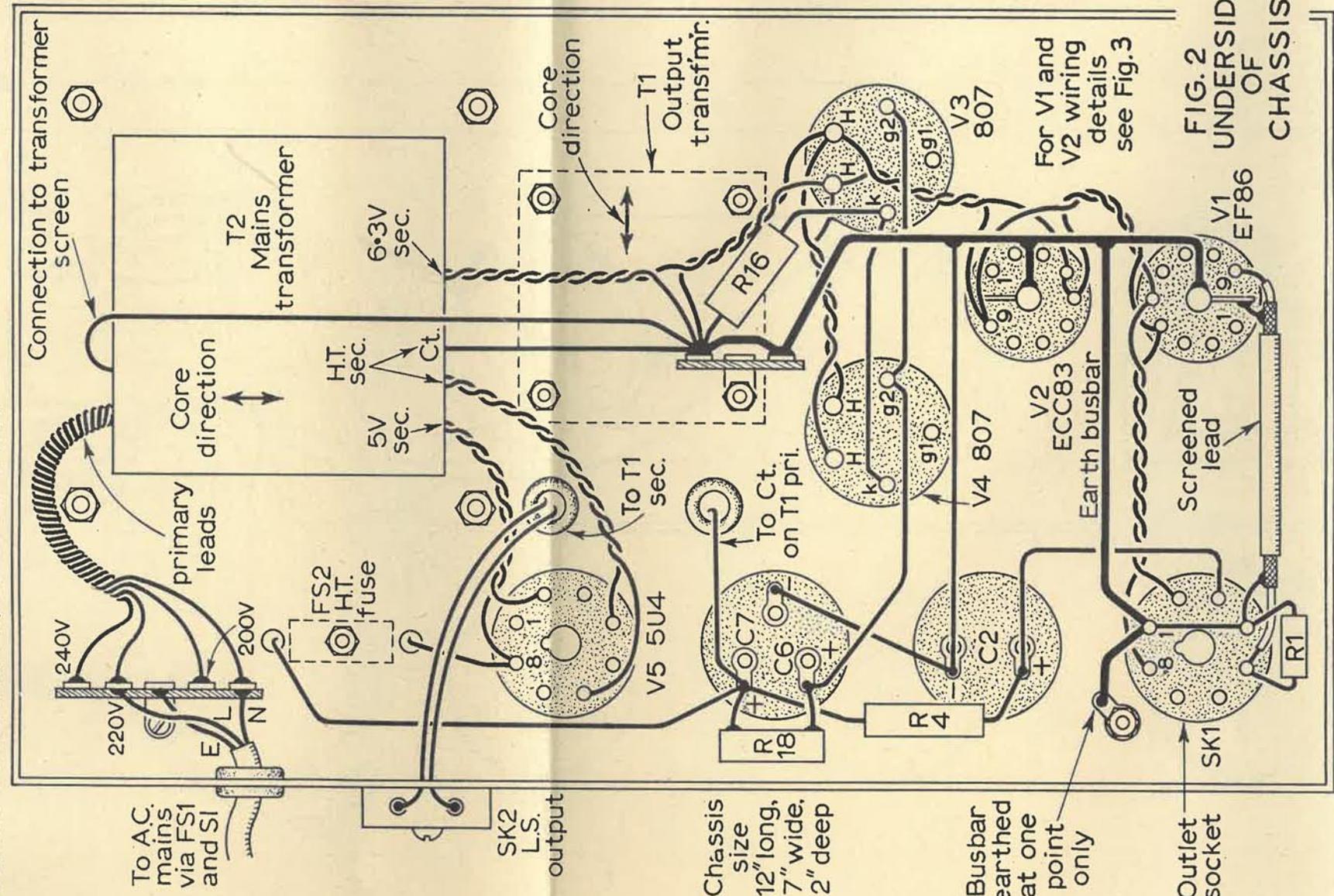


FIG. 2 UNDERSIDE OF CHASSIS

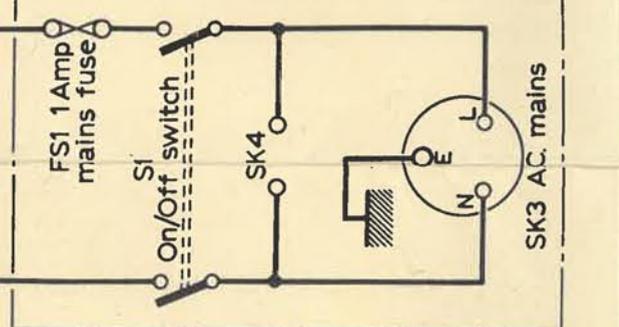
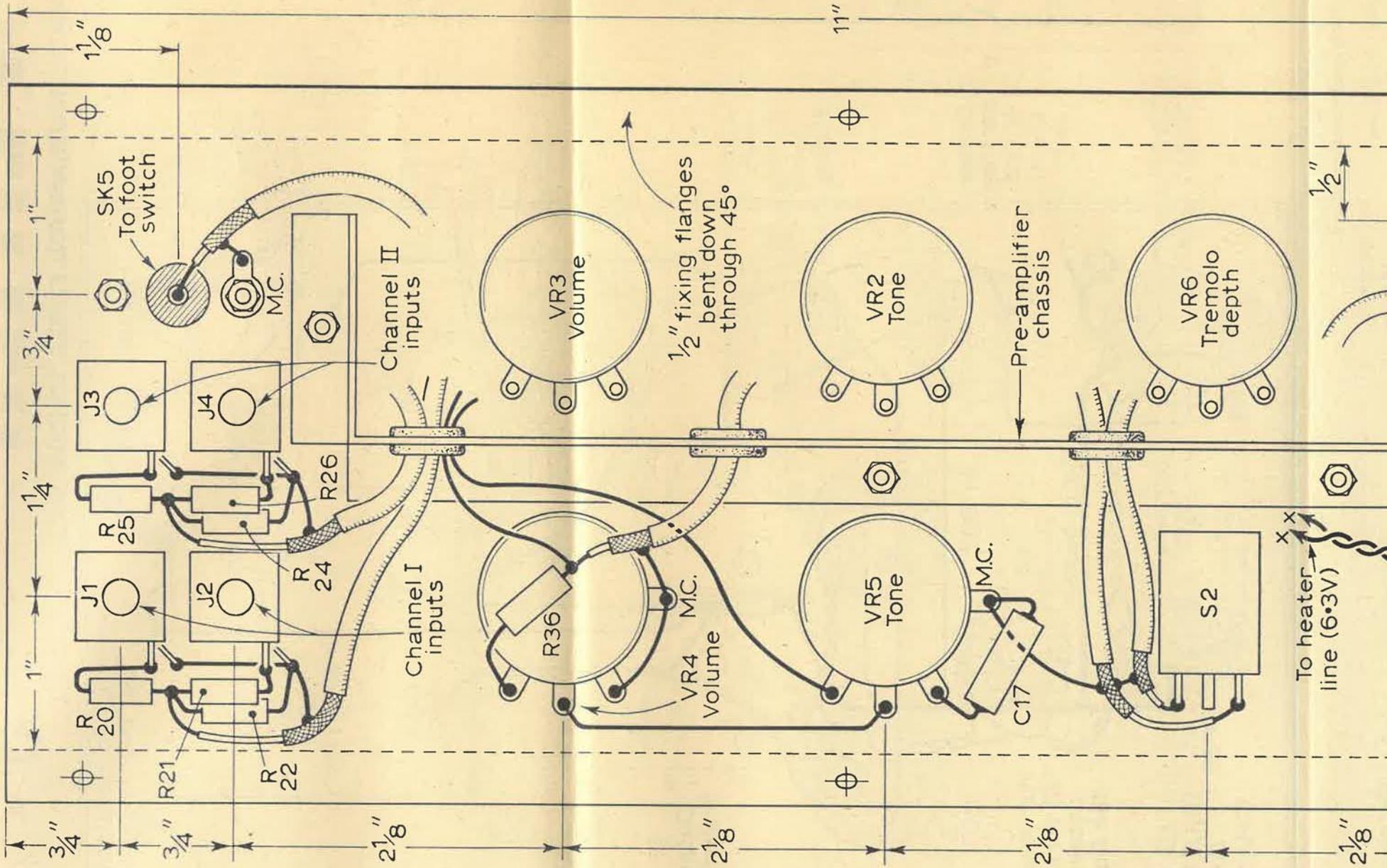


FIG. 3 WIRING AND COMPONENTS

POWER UNIT AND OUTPUT STAGES

PRE-AMPLIFIER Contd.



CABINET CONSTRUCTION

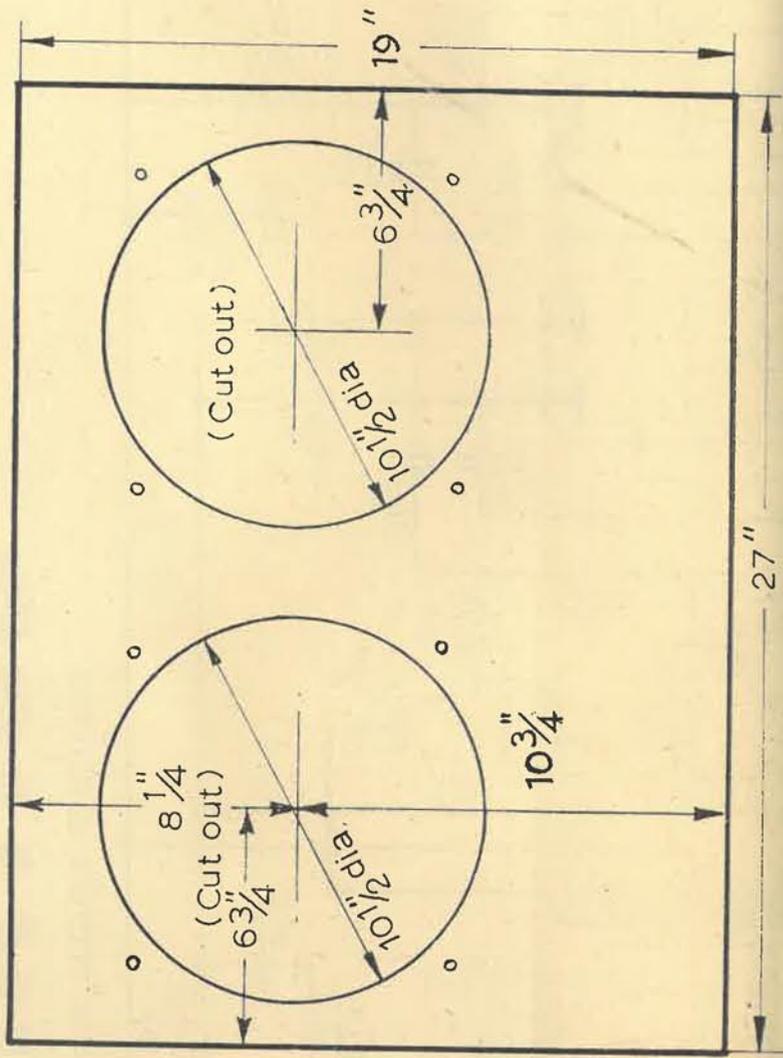


FIG. 8

FRONT CABINET PANEL SHOWING SPEAKER CUT-OUTS

Material 1/2 plywood (Drill mounting holes to suit speakers used)

Cut-out for pre-amp. chassis & panel

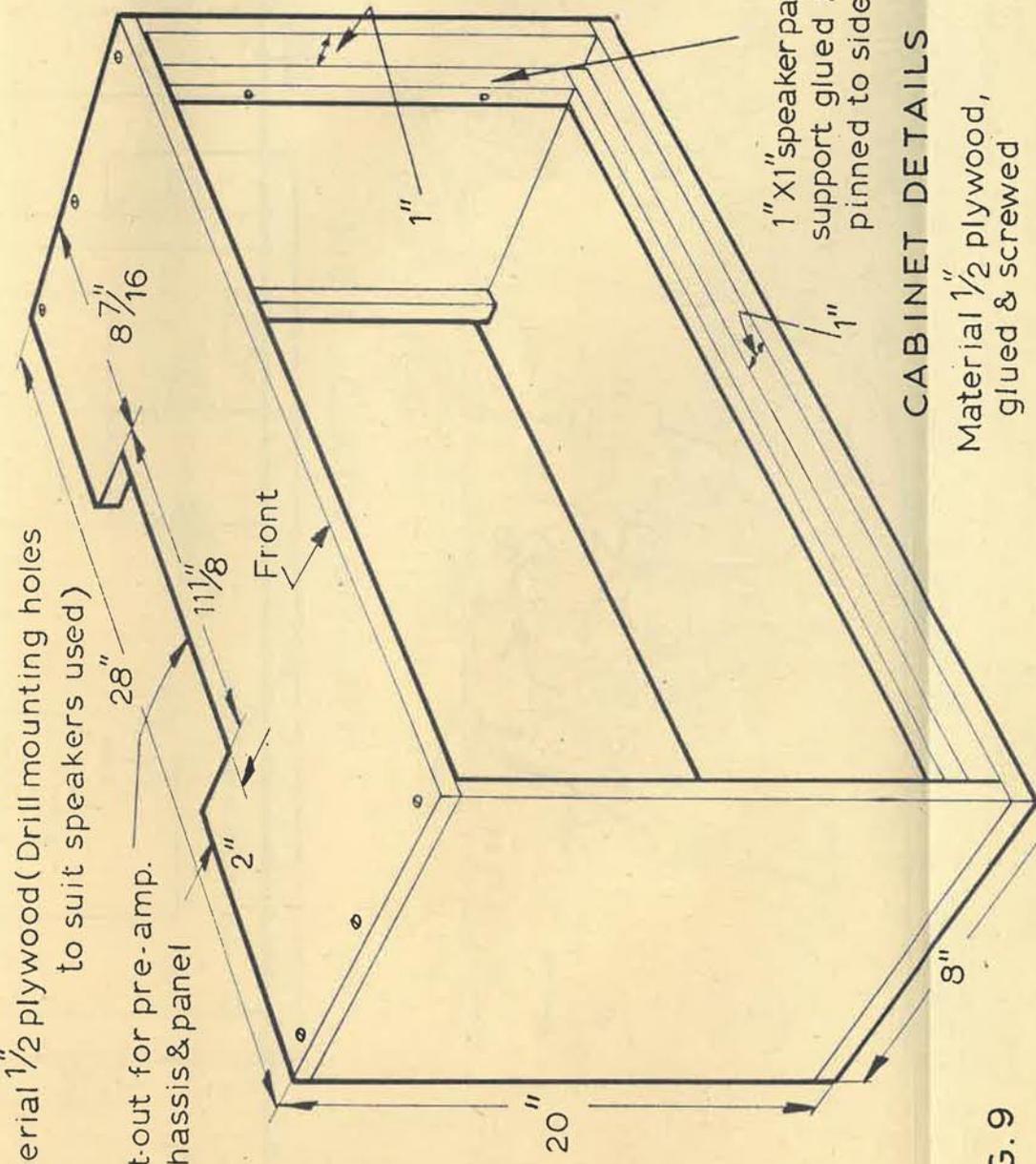


FIG. 9

CABINET DETAILS
Material 1/2 plywood, glued & screwed

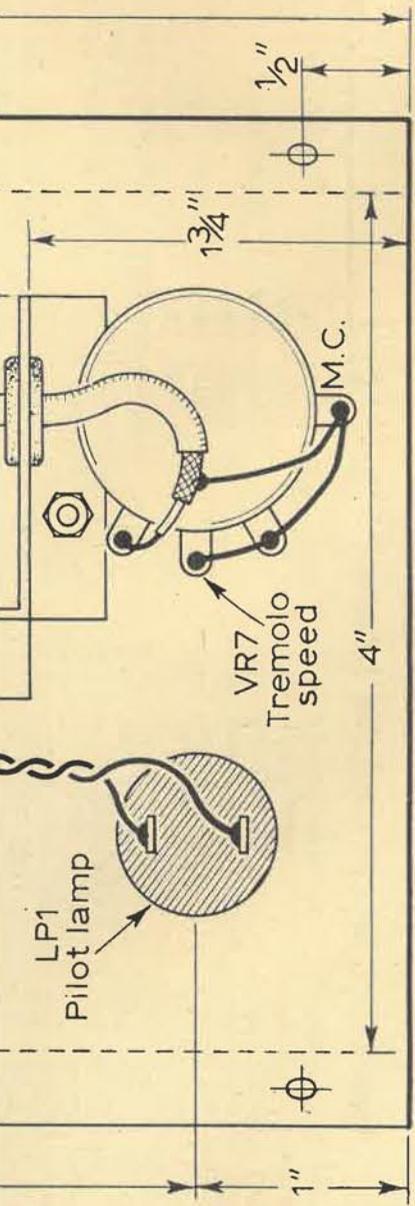
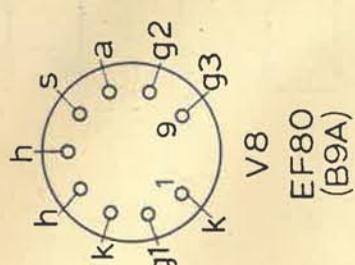
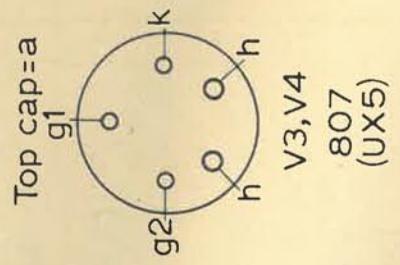
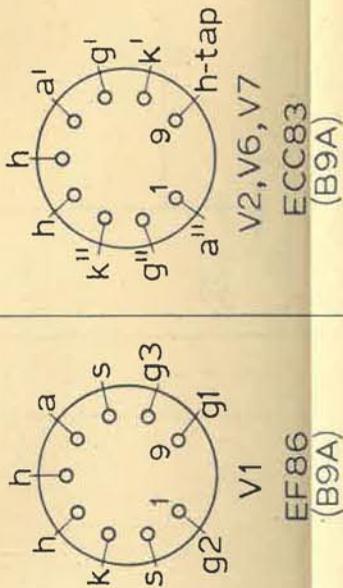
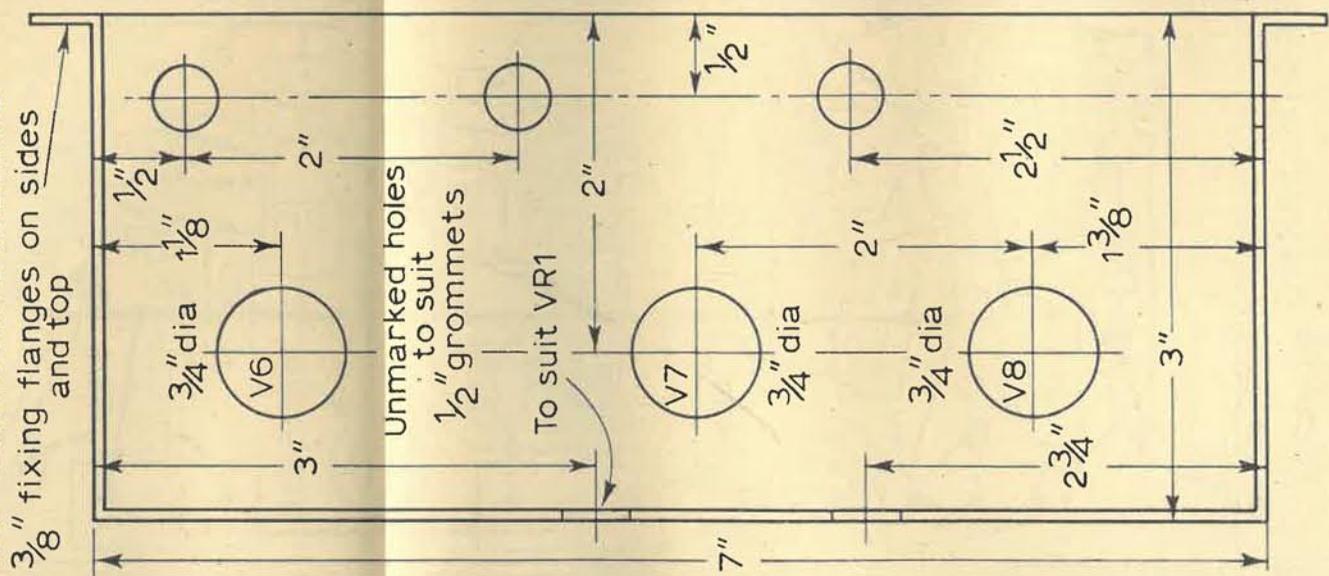


FIG. 6 CONTROL PANEL WIRING

FIG. 7 CHASSIS DRILLING



VALVE BASE DETAILS

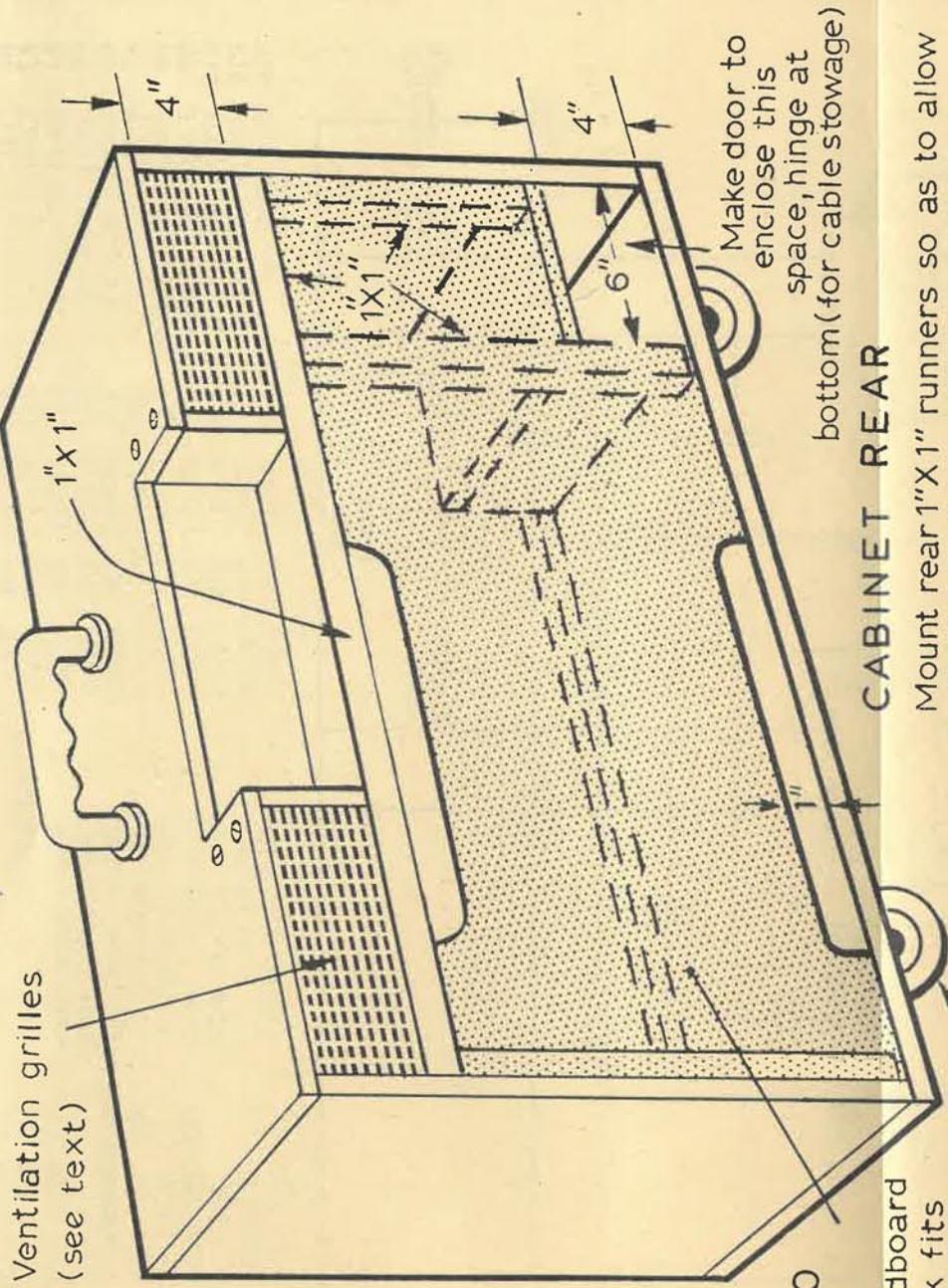


FIG. 10

CABINET REAR

Mount rear 1"X1" runners so as to allow depth of hardboard back to fit flush

Do not forget bottom vent, on hardboard back

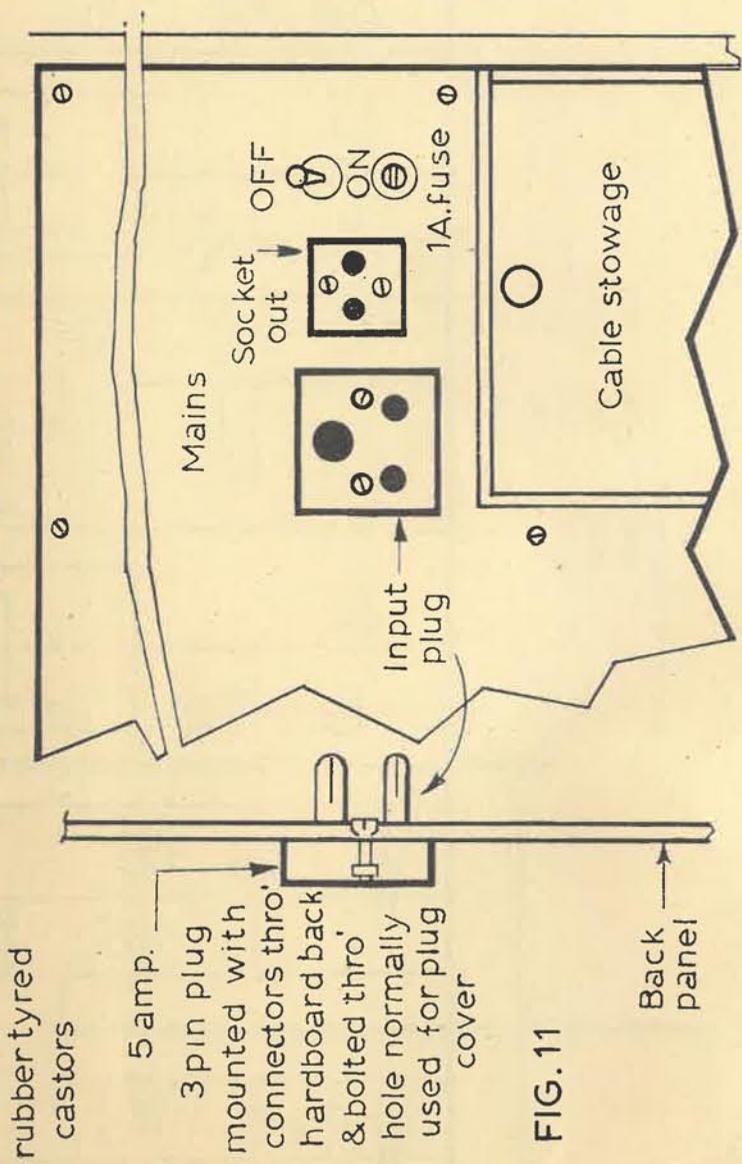
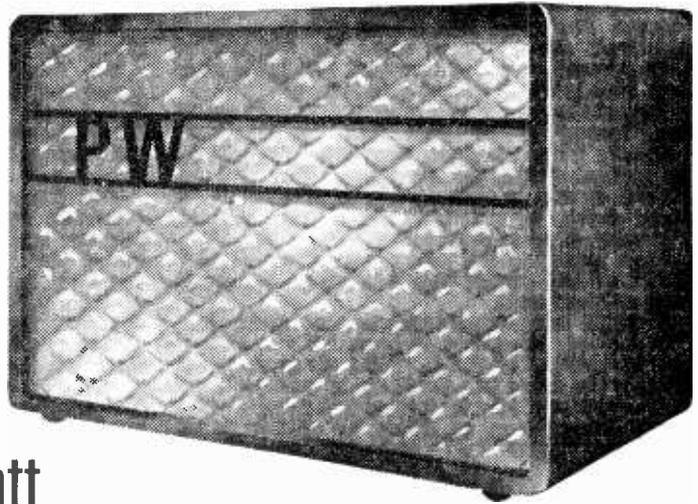


FIG. 11

BACK PANEL showing mains connectors, fuse and switch

Design by
B. L. Phillips



The P.W. 35 Watt GUITAR AMPLIFIER

A QUALITY INSTRUMENT FEATURING
SEPARATE TONE CONTROLS, TREMOLO
FACILITY AND A 20 c/s-20 kc/s RESPONSE

THERE has been a lot of interest shown recently in amplifying equipment for use with the electric guitar and guitar bass. There are, of course, numerous amplifier units available commercially for use with the guitar, but the better types are expensive, and information available to the home constructor is somewhat difficult to obtain, making it rather difficult to build an amplifier from "scratch" unless the constructor has had some experience in this field.

The requirements of an amplifier for use with guitar and guitar bass are rather different in a number of respects to units used exclusively for music or speech reproduction. Using an ordinary amplifier with a guitar invariably gives poor results much to the dismay of the user; apart from the danger of damage to the amplifier itself and the loudspeaker.

Two of the major requirements needed in this application are, a high transient power output over a wide frequency range at low distortion, and an extremely good low frequency response together with high sensitivity. Apart from the amplifier, various electronic "gimmicks" are required, such as the "tremolo" facility, which are not found on ordinary sound amplifying equipment.

Together with the electrical side there is the mechanical layout to consider. The unit must be rugged, the loudspeaker(s) able to handle the full output without distortion or risk of damage, and the whole equipment must be able to stand being run at high outputs for long periods of time. Transportability is another requirement.

After some considerable experimenting and design work, the PRACTICAL WIRELESS Guitar Amplifier was evolved. This amplifier has been compared with the most expensive guitar amplifiers available and will be found as good as anything that can be purchased commercially. Particular attention has been paid to rugged cabinet construction and the use of high quality components—this does tend to make the amplifier somewhat expensive to build, but the final results will more than repay the cost and work involved. *Disappointing results may be caused by using inferior or faulty components that have been lying in the "spares box" some considerable time.*

Most constructors will have no difficulty with building this equipment, for the diagrams with the Blueprint enclosed with this issue of PRACTICAL WIRELESS have been made as clear as possible to enable the amateur to obtain successful results. One point that needs mentioning is that the recommended layouts *must* be used for optimum performance—any old chassis available will just not do. To avoid unwanted feedback, hum, etc., components must be laid out as shown in the diagrams.

It is surprising the number of constructors who cannot get satisfactory results from equipment published in these pages purely because they have not followed the practical layouts given, *The practical layout is as important as the electrical circuit it contains.*

Specification

The PRACTICAL WIRELESS Guitar Amplifier has the following specification:

- 1 Independent twin-channel amplification; separate tone and volume controls; two inputs per channel, four inputs in all.
- 2 Variable speed and depth tremolo facility on one channel, with optional foot switch control.
- 3 A 35W power amplifier with heavy negative feedback and a response of 25c/s to 20,00c/s \pm 3dB.
- 4 Twin heavy duty 12in. loudspeakers, mounted in line.
- 5 Robust cabinet built to allay resonance, even when used at full output with a bass guitar.
- 6 Mains voltage outlet panel for additional attachments such as an echo unit.

Construction of the guitar amplifier will be described step by step, the first part to be dealt with being the power unit and main amplifier.

Power Supply and Output Stages

The power supply and output stages of the amplifier are combined on one chassis entirely separate from the pre-amplifier section. This unit consists of the mains power pack, output stages, the phase inverter and driver valve.

Type 807 valves have been used in the output due to their ease of supply, cheapness and excellent results when used in this circuit. The fact that the anode connections of the 807 are brought out to a top cap, makes amplifier stability easier to arrange as the anode circuits are automatically placed well away from earlier circuit parts.

The complete circuit of the power supply and output stages is given in Fig. 1, and the practical layout of the wiring and components is given in Fig. 2 and Fig. 3. Particular attention should be given to the way the earth busbar is run, with only actual chassis connection being at the outlet socket to the pre-amplifier.

Actual dimensions of the transformers and their mounting feet have not been given as some constructors may wish to use components to hand, the only important point being that the transformers are mounted basically as shown (and, of course, that they are of the correct ratings as specified).

It is suggested that the heater wiring is run first. Only one side of the heater wiring is grounded and this is performed at the earth busbar near the mains transformer. There should be no other earth to the heater wiring. If the heater winding has a centre tap, this should be grounded in place of one side of the supply.

Fig. 3 shows a closer view of the components around the V1 and V2 valveholders, and this layout must be closely followed for stable results. Pay particular attention to the grid stoppers R14 and 15, these are wired close to the 807 grid pins; the wire end from resistor to grid pin not being longer than $\frac{1}{4}$ in.

The cathode bias resistor R16 being a 10W type is rather large in bulk, and if the type with a hole running the entire centre of the component is available, it may be mounted on the chassis by placing a 4BA bolt through it and mounting to the

chassis side. A fibre washer at each end will hold the resistor without damage.

It is rather difficult to show in a simple line drawing such as Fig. 3 the true physical layout of all components exactly as they appear when wired up. Some of the components have, of necessity, been moved further away from their actual positions so their connections can be clearly followed.

The main point to remember when making up this chassis is to keep all signal leads as short as possible, i.e. the signal side of all resistors should be no longer than $\frac{1}{2}$ in., the capacitors being placed so that as little connecting wire as possible is used. All capacitors are wired with the outside foil (usually marked on the component with a black line or the letters "O.S."), towards the earthy side of the circuit. Use plastic or "Systoflex" sleeving over all bare connections, and make sure all soldered connections are well made to avoid dry joints.

All main components such as valveholders, electrolytic capacitors and transformers should be soundly bolted down, preferably with shake-proof washers under all nuts. There is a high level of vibration in the completed cabinet, especially when used with the bass guitar, so all bolted parts need to be very secure.

Transformers

The specified mains transformer is supplied as a double shrouded upright type. For use with this unit, one half of the shroud is removed by undoing the four retaining bolts temporarily. The transformer can then be mounted on the chassis as a half-shrouded, drop through type.

Some mention should also be made about the output transformer. Various types have been tried, and the best one for overall response and power handling qualities was found to be one made by "Radiospares". This particular transformer is known as the "De Luxe" model, and has an excellent specification, and a continuous rated output of 30W. The maximum d.c. current per primary being 125mA. Other output transformers can be used of course, providing they have the correct impedance match and can handle the power. The correct matching in this circuit is a primary impedance of 4k Ω per anode winding, to a 15 Ω secondary.

Testing the Main Chassis

To conduct tests, connect the mains supply to the power and output chassis by coupling direct to the mains transformer primary with a temporary lead.

TESTS:

After all assembly and wiring has been completed, double check all connections with the circuit diagrams, making sure that no earth faults exist on the h.t.+ rail.

Connect a loudspeaker across the output terminals, insert all valves, making sure to clip on the 807 top caps, and switch on.

Check the h.t. voltage, which should be around 450 to 470 volts above chassis. If on warming up a loud howl is heard, switch off and reverse the

negative feedback lead and earth connection to the speaker outlet.

When operating correctly, there should be no background noise heard, apart from just a faint "liveness" in the speaker. *Do not touch the grid input to the EF86, as the resulting intense hum generated may damage the speaker.*

If further tests are required, a crystal gramophone pick-up may be coupled to the valve (via a volume control) for actual sound tests.

DO'S AND DON'TS:

On no account should the amplifier be switched on without having a loudspeaker in circuit. Failure to observe this may destroy the output transformer. If special tests are required without a speaker being operated, then a 15Ω 20W resistor must be wired across the output transformer secondary as a dummy load.

The voltages present (both the mains and the 450V h.t.), are without doubt LETHAL, and the constructor is advised to take great care when running the unit whilst out of its cabinet. *In particular keep well away from the 807 top caps.* High peak voltages of many thousands are present here when a signal is present, and severe burns can be had if they are accidentally touched during use.

The next part to be described will be the pre-amplifier section.

The Pre-amplifier Unit

The pre-amplifier is the most important and critical section of the whole equipment as regards construction and wiring. Poor components or badly arranged wiring can cause untold trouble, such as pronounced hum, crackling and various noises which may take considerable pains to stop.

The inputs of the pre-amplifier are sensitive to about 4mV for a full 30W output, so it will be appreciated that care is needed to keep all noise levels well below this level by at least 40dB.

The worst offender usually in home constructed audio equipment is hum. Special care has been taken to keep this down to a very low level, and providing the instructions given are faithfully followed, the hum present should be negligible.

The circuit diagram is given in Fig 4, and before the construction is commenced, a description of the circuit operation will be given to enable a fuller understanding of the principles involved to be tied up with the practical circuit layout.

The Circuit

On the channel I (normal amplification), the two inputs are coupled to one half of an ECC83 twin triode valve (V6A), the amplified signal being taken via the tone control and volume control to the common outlet lead to the main amplifier unit. The resistive stoppers R20 and R21 in the input jack leads are to prevent interaction between two pick-ups when both are used on one channel.

The more complicated channel is the tremolo channel II. The inputs to this channel are coupled as above to the other half of V6, but in this case the amplified output at V6B anode is coupled to another triode V7A, which is the tremolo modula-

tor stage. Both halves of V7A and V7B are cathode coupled, and a low frequency signal is applied to the second triode from the phase shift oscillator V8.

This low frequency signal causes the cathode voltage on V7 to vary in sympathy, causing the gain of V7 to vary in direct proportion. The time constant of V7 cathode circuit is arranged so that it follows the high relative frequency of the audio signal, but allows the oscillator signal to be developed across the cathode resistor capacitor, R32, C23. At the output of V7A, there is both audio (now tremulant) plus some oscillator fundamental.

The oscillator content must be removed, otherwise a loud "thumping" will be heard in the output. This is accomplished by the high pass filter network C13, C14, C15 and R33, R34.

After filtering, the signal passes to the common outlet as for channel I, via its tone control VR2 or VR5. The variable resistor, VR1, is a preset gain control for V7, and by feeding back some of the output to the grid circuit, the overall gain of both V6 and V7 can be made identical to channel I.

An extra facility incorporated in this design and not often found in commercial amplifiers of this type, is a switch (S2) to remove completely the tremolo facility and make the response curve of the tremolo channel identical to that of channel I. The high pass network used in the tremolo circuit causes the audio response to be rather sharp, and although ideal for guitar use, with a microphone is rather too "toppy", thus this switch enables any channel to be used for high quality reproduction whenever so required.

V8 is the low frequency oscillator stage, and has a range of approximately 5 to 12c/s. The speed is controlled by VR7, and the depth or intensity controlled by VR6. A footswitch socket (SK5) is placed across VR5 and enables an instant on/off control of the tremolo effect remote from the amplifier. The 0.1μF capacitor C18 across this socket removes oscillator harmonics and also makes the switching electrically silent.

Note the rather high values of capacitance in the screen and cathode circuits of V8. This is, of course, for maximum efficiency at these very low frequencies.

Screened Leads

The pre-amplifier is built up from two sub-assemblies, a small chassis and a control panel which are bolted together.

There is, of necessity, a large amount of screened lead in the construction of the pre-amplifier unit, and where screened leads are specified they must be used. All connections must be correctly soldered, and the practical layout shown followed as closely as possible.

Particular attention must be paid to the heater wiring in the pre-amplifier unit, all leads being tightly twisted and kept as far away from the signal circuits as possible. On no account is the heater wiring to be made an "earth return" circuit.

The chassis layout is given in Fig. 5 and the drilling details in Fig. 7. The layout and wiring of the associated control panel is given in Fig. 6.

Cabinet Construction

Figs. 8 to 11 and the drilling details in Fig. 7 give full details of the cabinet. It is suggested that the front panel (Fig. 8) be made first, as this fits *inside* the cabinet, and it is important that adequate clearance be made for this panel to fit against the 1in. x 1in. supports when the speaker fret material is in place.

After drilling and cutting out the speaker apertures, the speaker units should be laid on the rear of the panel, making sure they line up centrally over these holes, and the mounting holes can be marked. Countersink these holes on the front of the panel, and using countersunk bolts, firmly bolt down the speakers, preferably with

the cabinet has been covered with *Vynide* or similar material. The panel is then pushed home and fixed as above. Cover the sides and bottom runner of the pre-amplifier cut-out.

In the connection of the cabinet, the two vertical dimensions in Fig. 8, 8½in. and 10½in. were incorrectly printed on a number of Blueprints as 8¼in. and 11¼in.

When covering is completed, make the hard-board back as shown in Fig. 10, and drill and mount the power input attachments as per Fig 11. When finished, a coat of very dark wood stain gives the back a clean finish.

The top ventilation grills are made from ordinary metal loudspeaker grill material, cut the width of apertures, with a length some 2in. greater

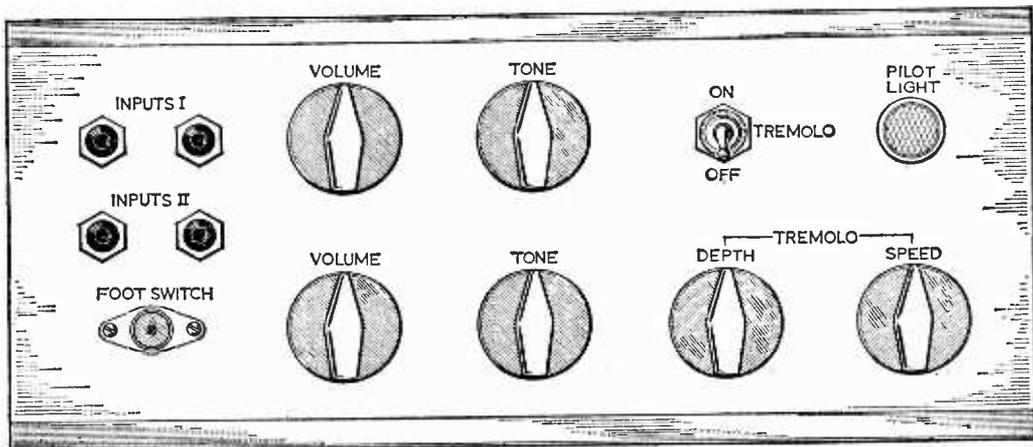


Fig. 12: Layout of the pre-amplifier control panel.

their terminals facing downwards. The next job is to cover the speaker panel front with suitable loudspeaker material such as "TYGAN". Close weave material is not recommended. Use an adhesive such as "EVOSTICK", spreading enough on the panel to produce a thin film (more will creep through the material) and place the material centrally on the panel. Allow about an inch overlap to the back, and keep tension on the edges of the material until dry. Then glue the edges down, removing any overlap at the corners of the panel with a sharp knife when the glue has thoroughly dried.

The remainder of the cabinet construction is not really difficult, apart from possibly the cable stowage compartment. This is a 3-ply box mounted on the cabinet floor on the right hand rear side. All joints should be glued and pinned, a piece of wood, 4in. by 6in. glued to the speaker panel rear makes an easy mounting for the side and top of this compartment. A door is made for the front of this compartment, hinged at the bottom, with a door catch fastener at the top. A small supboard knob completes the job.

Incidentally, the speaker panel may be screwed to the 1in. x 1in. supports, or may alternatively be glued and pinned. The last method gives the best visual effect as no screw heads are visible.

The panel should not be fixed until the rest of

than these openings. Bend one edge of the metal inwards for 1in. and screw to the cabinet side, then bend the other end to fit into the hole correctly. Do not be frightened to bend the material—it is easily straightened. This last edge is then screwed to the pre-amplifier cut-out side pieces. This operation is quite "fiddly" but once done need never be touched again.

Installing Amplifiers

The two loudspeakers must be of the heavy duty type. Several manufacturers produce speaker units specially designed for guitar amplifiers. Both speakers should be 12in. diameter, have 15Ω speech coils and be rated for 20 to 25W power handling capacity.

The first job here is to connect the speaker wiring, and to phase the speakers themselves.

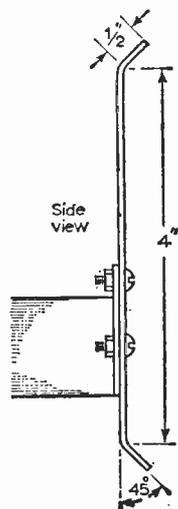


Fig. 13: The method used to fix the control panel to the cabinet.

Temporarily couple a 3V battery to one speaker and note whether the cone moves *in or out*. Mark the speaker terminal connected to the positive battery pole. Now, repeat the procedure on the second speaker, making sure it moves in the same direction as the first, and again mark the terminal which has the battery positive on it. Wire both speakers in parallel, ensuring the marked terminals are coupled together, and test finally with the battery again. Both speaker cones should move together in the same direction.

Place the power amplifier unit in the bottom of the cabinet, with the mains transformer roughly in the centre below the carrying handle. Check the cabinet for carrying balance, and alter the unit until the centre of gravity is as near the centre as practical.

Screw down the chassis mounting feet. Run the mains feed to the hardboard back and connect to the fuse and on/off switch there. Leave about 3ft. of flex between the two so the back can be removed and taken out of the way when servicing. Connect the loudspeaker leads to the outlet strip on the chassis.

After giving the completed pre-amplifier control panel a coat of paint (black gloss is suggested), place the knobs in position and slide the unit in place in the top cabinet cut-out. Screw down securely, and plug the flying lead into the main chassis socket. Make certain that the leads are well away from the power valves, and if necessary cleat to cabinet sides.

At this stage leave the back of the cabinet open to enable final adjustments to be made.

Final Tests

Turn gain controls to OFF and switch on. There should be hardly any noise level under these conditions, if there is, suspect a fault condition.

Make sure S1 is in the NORMAL position, and slowly turn channel II volume up. At maximum a fairly high noise level will be evident—mostly hiss with some hum. This is normal as the inputs are wide open. Shorting one input jack out should remove all the hum content.

Repeat on channel I, checking that tone controls operate.

If the noise level of channel II is far greater than channel I, adjust VR1 carefully (with S1 in tremolo position) until noise levels are identical.

If possible, couple a signal source, such as a radio set, to one input jack via a separate volume control to avoid overloading, and check the amplifier for power output and quality. Keep the input signal very low by adjusting the separate volume control, using the main amplifier controls for level adjustment.

The tremolo controls can be tried on this signal, and as there may be some snags here, some hints are given for curing any slight troubles encountered.

- 1 Tremolo satisfactory, but some "thumping" when depth control full: place additional 100k Ω resistor across R33, increase value of C18 to 0.2 μ F.
- 2 Tremolo depth satisfactory, but oscillator stops towards low end of speed range: check C24, C19 for leakage, change V8, alter R39 to 1M Ω . If possible test the equipment with a guitar and

make sure the gain of channel II is identical to channel I by adjusting VR1.

Fault Finding

It is quite possible some slight faults may exist after completion, and some common faults and possible cures are listed below.

HUM: Most likely induced from heater chain. If mains transformer has no centre tap, remove earth on one side of heater chain and connect "hum-dinger" control across the chain at mains transformer end, with centre slider to chassis. Adjust until hum is at its lowest level. A valve with a heater cathode short will give considerable hum as will faulty smoothing capacitors.

DISTORTION: Obviously, distortion does set in at very high outputs, or if the input signal is overloading the pre-amplifier, but if it is present all the time at low signal levels, suspect instability.

Check that all grid stoppers are the correct value, and that all screened leads are fitted as specified. Metal screens over early valves are not essential, but the fitting of them may assist in removing instability; the ECC83 on the power chassis is worth a try in difficult cases. In some circumstances earthing the loudspeaker frames to chassis can remove awkward and often difficult to cure instability. Generally though, instability is caused by poor layout conditions, unscreened leads, etc., and if the layouts shown are closely followed, no trouble of this nature should occur.

Always ensure that the output valves have similar anode currents, although a difference between them of 5 to 10mA is not important. A large discrepancy between them can, however, cause low output power with severe distortion. ■

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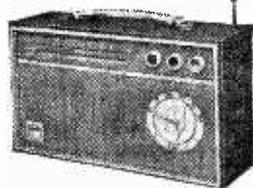
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TEST GEAR accessories

Part 4

BY C. MACKAY

CONTINUED FROM PAGE 1186 OF THE APRIL ISSUE

THIS month, the construction of an amplifier probe will be discussed. Reference to the circuit diagram given in Fig. 12 will show that the amplifier is quite conventional.

The anode load of the EF91 valve (R4) has a rather lower value than usual (10,000Ω), but this considerably improves the high-frequency response. The cathode decoupling capacitor, C4, is itself shunted by another capacitor, C3, to improve the high frequency decoupling.

The grid leak resistor R1 has the rather high value of 10MΩ. This gives a very high input

HIGH-FREQUENCY RESPONSE

The high-frequency response is excellent, and is substantially flat (± 3 dB) up to at least 40kc/s. The probe will pass a 30kc/s square wave with negligible distortion. This makes this unit particularly valuable for the testing of audio equipment with square waves and an oscilloscope.

Also, the overall voltage gain of the unit is 15 times approximately (about 25 decibels). As a d.c. battery is used for the heater supply and no other mains voltage is present inside the screening can, there is no hum pick up, and thus any low level phenomena which are being investigated will not be masked by hum.

The gain provided by this unit is still useful at 4Mc/s. and no sine wave distortion was observed at this frequency. This top frequency limit is fixed by the capacitance across the output due to the self capacitance of the coaxial feeder cable to the oscilloscope or measuring instrument.

BUILDING THE PROBE

This probe unit was built inside an old i.f. transformer screening can, similar to that used last

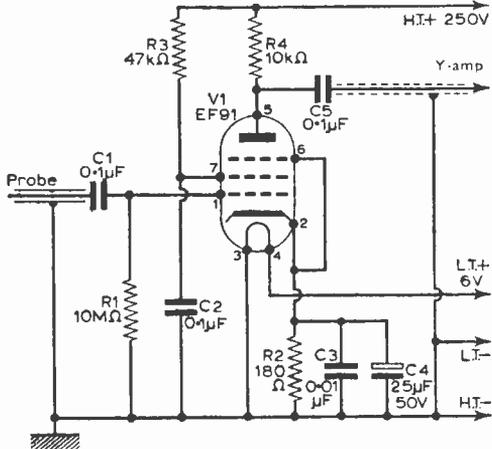


Fig. 12: The circuit of the amplifier probe unit.

impedance, but at the expense of low-frequency response. This is because, at low frequencies, the impedance of C1 becomes greater and since C1 and R1 form a potentiometer attenuator, the fraction of the input voltage which is applied to the grid is reduced whenever the frequency is reduced to the point where the impedance of C1 becomes comparable with that of R1. Thus, the response begins to drop off noticeably at about 40c/s.

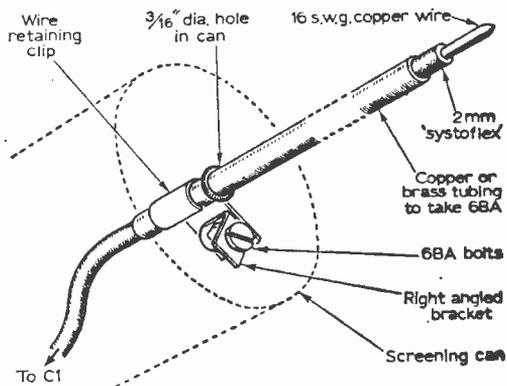


Fig. 13: Details of the probe assembly.

**COMPONENTS LIST
FOR AMPLIFIER PROBE UNIT**

- R1 10M Ω (may be reduced to 1M Ω)
- R2 180 Ω
- R3 47,000 Ω
- R4 10,000 Ω
- C1 0.1 μ F
- C2 0.1 μ F
- C3 0.01 μ F
- C4 25 μ F 50V
- C5 0.1 μ F
- V1 EF91 Mullard

Miscellaneous:

One B7G valveholder. Screening can. Paxolin or printed circuit board. 2 yards of coaxial cable. 2 yards of 3-core cable (for power supply). Systoflex, nuts, bolts.

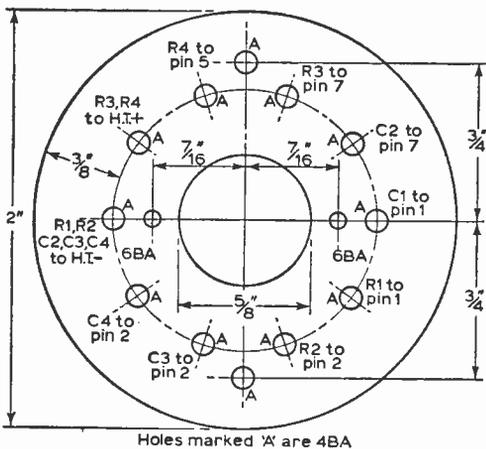


Fig. 15 (right): A suggested printed circuit layout for the panel.

month for the cathode follower probe, and the actual probe section was made in exactly the same way. The reader is therefore referred to last month's issue for further details if those shown in Fig. 13 are inadequate.

The main wiring is again built on to a circular piece of paxolin suitably drilled as in Fig. 14a.

PRINTED CIRCUIT TECHNIQUE

This method of construction lends itself easily to the use of a printed circuit board, and a suggested pattern is given in Fig. 15 for those interested in using copper clad board.

Drilling of the etched circuit should be very carefully carried out, and all drilling should be done from the laminated (copper) side of the printed circuit board. All large holes should be first drilled with a small bit, and progressively larger bits should be used to enlarge the hole until it is the correct size.

The board should, on no account, be bent or subjected to any stress or strain as the laminated copper may crack minutely giving either an open circuit or a very noisy contact.

The connecting cables should be connected

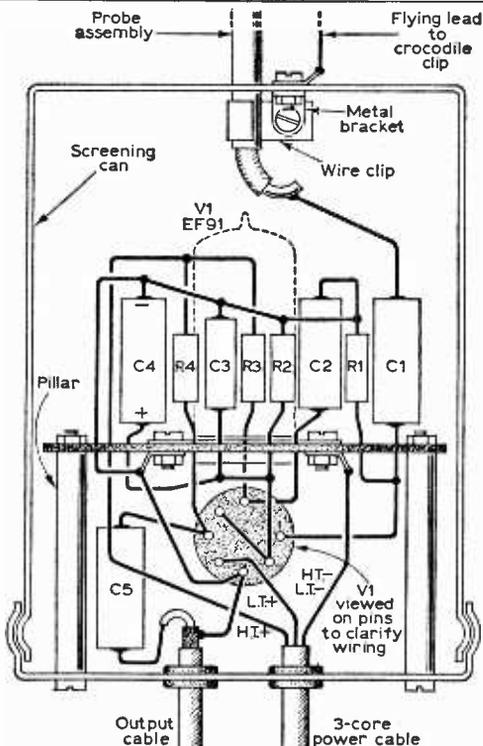
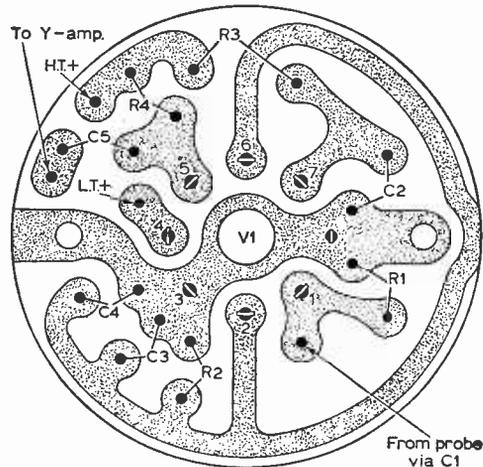


Fig. 14a (left): Drilling details of the paxolin panel for the amplifier probe.

Fig. 14b (above): Component layout and wiring inside the can.



directly to the printed circuit conductors. The whole unit is mounted within the screening can as shown in Fig. 14. No trouble was experienced with microphony, but in the event of such trouble

—continued on page 43

UNIT CONSTRUCTION BOARDS

A MODERN METHOD OF
"BREADBOARD" WIRING

BY R. R. SLANEY

MANY constructors, before finally assembling a circuit utilising transistors, prefer to build it temporarily in "breadboard" fashion in order to facilitate testing and experiment. This procedure has many advantages both for the beginner and the more experienced constructor, especially if it is desired to experiment with component values and circuit variations, apart from the basic need to determine whether the circuit as constructed will function correctly.

For the novice in particular, much disappointment and frustration can be avoided by following this method and much can be learned if the opportunity is taken of laying out the simpler circuits more in accordance with the theoretical rather than the space-saving necessities of the practical diagram.

There are, however, certain disadvantages and in the writer's experience these have been mainly due to the difficulties of providing convenient and satisfactory anchorage points for components and point-to-point connections. On-the-spot improvisations with whatever materials are handy tend to make for untidy work and unnecessary complications in layout and create conditions in which mistakes can easily be made.

Pre-drilled Insulating Board

It was considerations such as these that led the writer to experiment with the idea of unit

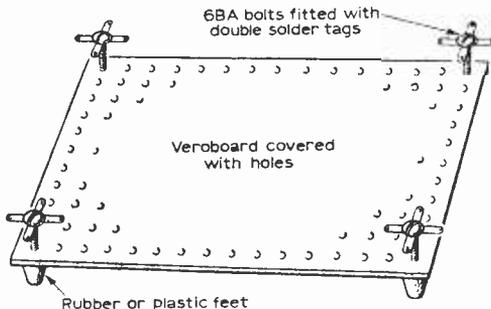


Fig. 1: The basic construction board with the positive and negative rails supports at each corner.

construction boards. In the first instance experimental boards were made from laminated plastic sheets (paxolin) obtained on the surplus market. Whilst these were satisfactory in every way their preparation involved a considerable amount of drilling. It is therefore suggested that Veroboard is used instead. As readers are no doubt aware this is a pre-drilled insulating board obtainable in a variety of sizes. The existing holes can easily be enlarged as required with a 6B.A. clearance drill.

The construction boards are simply prepared. The four corner holes are enlarged to take 6 B.A. bolts to which double solder tags are fitted. These bolts also hold in place four small rubber feet to allow components and wiring to be taken beneath the board of required, see Fig. 1. Heavy gauge wire is soldered lengthways between each pair of bolts to serve as positive and negative rails, although the position of these can be varied to suit any particular layout.

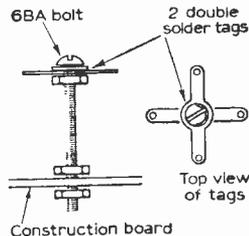


Fig. 2: The construction of a component anchorage point.

Anchorage Points

For supporting the smaller components and providing anchorage points, a number of 1/4 in. 6B.A. bolts should be prepared by fitting two double solder tags crosswise under the head, thus providing a four-way connecting point, see Fig. 2. A nut can also be run a short way up each bolt which is then ready for fixing to the board wherever it is needed by the addition of one nut, the appropriate hole or holes having been enlarged as described.

To allow transistors to be interchanged or different types to be tried experimentally in circuits, the small plastic holders now available are used. These are mounted on a paxolin bracket as shown in Fig. 3. Thin paxolin sheet 1/4 in. thick is used and each holder requires a piece approximately 1/4 in. x 1/4 in. The hole for the holder is cut

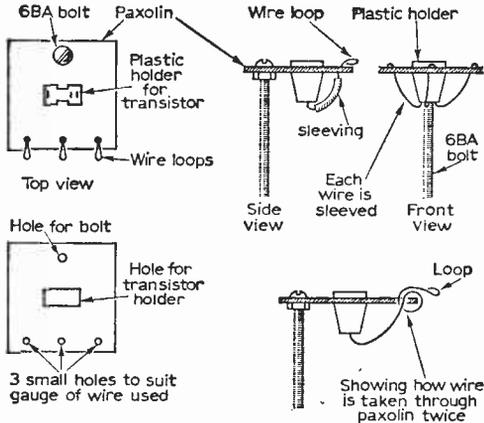
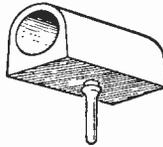


Fig. 3: Diagrams to illustrate the construction of transistor mounts, using plastic holders.

out with a penknife. It is better to start with a piece of paxolin somewhat larger than the finished size and cut it down afterwards. The plastic holder can either be glued or held in place with the metal clip provided.

To each of the three tags on the plastic holder a short length of tinned wire is soldered with a piece of sleeving

Fig. 4: A transistor holder for mounting directly into the construction board.



as shown in the diagram (Fig. 3). This is then taken up through one of the small holes previously made in the paxolin bracket, over the edge and up through the hole again to provide a firm anchor-

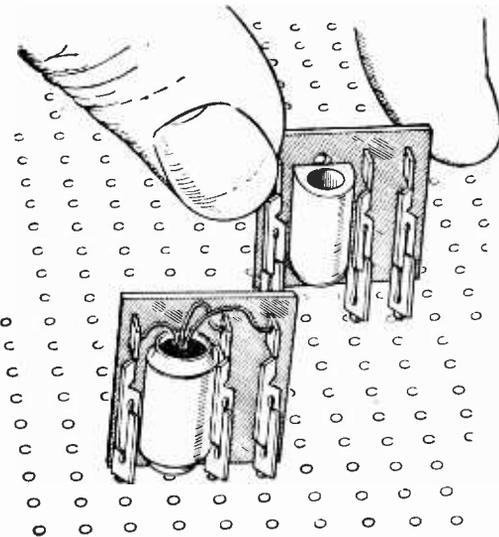


Fig. 5: Commercially available transistor mounts which plug into special sockets.

age. The end of each piece of wire is terminated in a flat loop. All soldered connections are made to these loops which, in effect, are solder tags.

Mountings for Transistors

For those who prefer to solder transistors directly into the circuit the *Lektrokitt* mounting in moulded p.v.c. is available. These holders make a push fit into the standard *Veroboard* holes, see Fig. 4. Alternatively a rather more professional and expensive design which plugs into sockets inserted into the *Veroboard* holes is available. As

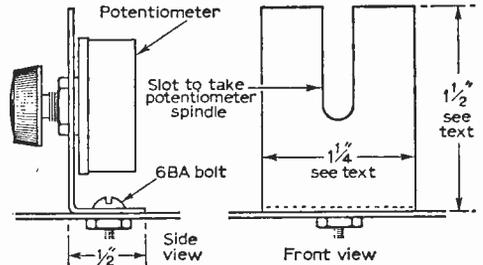


Fig. 6: Details of a suitable potentiometer mounting bracket.

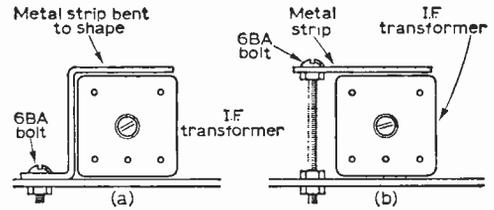


Fig. 7: Three methods of securing i.f. transformers.

will be seen from the illustration (Fig. 5) a diode holder is also available.

Simple brackets for mounting standard potentiometers can be made from aluminium as shown in Fig. 6. If necessary the upright member can be made longer to accommodate two potentiometers one above the other. The same brackets can also be used for standard 365pF tuning capacitors if suitable holes are drilled to enable the capacitor to be bolted to the bracket. If separate brackets are made for each of these components the one intended for potentiometers need be only 1/4 in. wide.

Coils, inter-stage and output transformers are bolted direct to the board, one bolt usually sufficing. Transformers which cannot be bolted

direct can be fixed to the board using one of the simple brackets described below.

Fig. 7a illustrates a bracket for securing i.f. transformers to the board. It will be noted that the transformers lie on their sides. This method permits of access to the pins for soldering and to the core for adjustments. An alternative bracket is shown in Fig. 7b. With a longer bolt the horizontal member can be adjusted up or down to accommodate different sizes of transformers. A further and effective alternative, using a Terry clip, is shown in Fig. 7c.

Clips for Rod Aerials

Terry clips, which are available in a comprehensive range of sizes, make excellent holders for varying shapes and sizes of ferrite rod aerials. The clips may be bolted direct to the board in any convenient position or stood off from the edge as shown in Fig. 8.

To complete the list of basic accessories a small but indispensable item is the soldering pin made by *Lektrokit*. These are used for simple point-to-point connections. Made of metal, they are $\frac{1}{16}$ in. tapered pins which will push securely into the standard *Veroboard* holes wherever they may be needed. One of these pins, greatly enlarged, is shown in Fig. 9a.

With regard to the construction boards themselves, their size will depend, of course, on individual requirements and some constructors may prefer to make several of different sizes. For others it may be a better plan to use boards of one standard size which can, if required, be joined to one another. This can be done quite simply

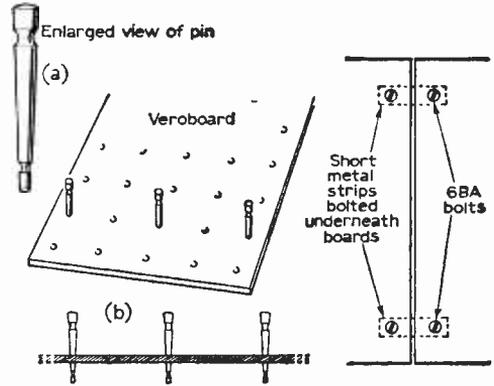


Fig. 9 (left): The soldering pins made specifically to fix into *Veroboard*.

Fig. 10 (right): The method of joining two construction boards.

to isolate one part of the strip from another by lightly drilling through.

Finally, in order to protect transistors from the possibly disastrous results of applying incorrect battery polarity during experiments the following procedure is suggested. A miniature jack plug and socket should be fitted with red and black flying leads, ensuring that when connected together the red goes to red. All that is then required is for the plug to be soldered direct to the circuit and the socket to the battery, correct polarity being observed in both cases. Once this is done complete protection is ensured, coupled with an effective and simple switching arrangement. ■

TEST GEAR ACCESSORIES

—continued from page 40

occurring, a special, antimicrophonic B7G type valveholder should be used.

POWER SUPPLY

The power supply required by this unit is:
250V d.c. at 15mA max.
6.3V at 0.3A.

The power unit described last month for use with the cathode follower probe is perfectly suitable for use with the amplifier probe. The no-hum advantage obtained by using a 6V battery for the heater supply is thought to be very necessary, as this completely eliminates the possibility of hum being introduced into the output.

COOLING THE UNIT

Several $\frac{1}{16}$ in. diameter holes should be drilled in the side of the screening can so that the valve can be well ventilated, and it should be found that the unit does not become unduly warm during operation.

The output cable should be of the screened, coaxial type, and the power cable should be well insulated.

This unit will work efficiently for long periods, and no trouble should be encountered in its operation.

Next Month Part 5

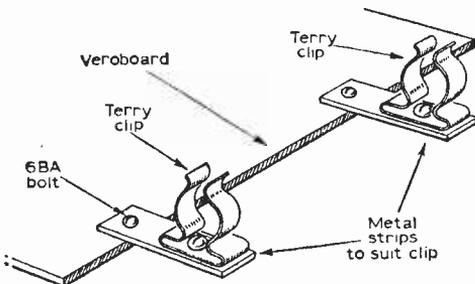
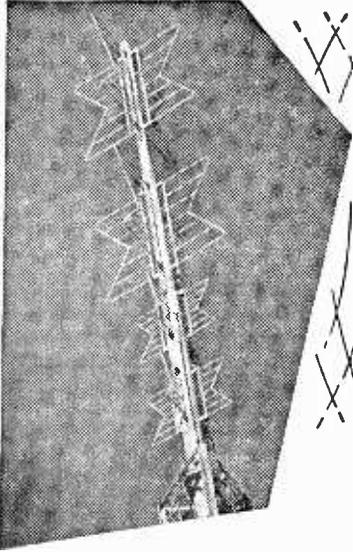


Fig. 8: A method of mounting ferrite rod aerials using Terry clips.

with two short metal strips drilled to take 6BA. bolts. The boards are then butted together as shown in Fig. 10. There is, of course, no reason why the boards should not be joined simply by overlapping one edge with another and bolting through. It is suggested that the two sides of each board should be clearly and permanently marked "positive" and "negative".

Copper Bonded Board

It will no doubt be of interest to many readers to know that *Veroboard* is also available with a series of copper strips bonded to it. Thus when a prototype circuit has been built and tested on a construction board it can be reduced to a more permanent and compact form, using the copper bonded *Veroboard* as a type of printed circuit. The lengths of copper strip can easily be broken



On Your Wavelength

By THERMION

THE expression "free as the air" conjures up a sense of absolute freedom perhaps more vividly than any other phrase. It is, of course, a quite fanciful image as far as we highly organised humans are concerned. How often do we learn to our amazement, and perhaps disgust, that some particular seemingly innocent activity is in fact "agin the law"?

This apart I don't doubt that there are those who would consider this a singularly inappropriate choice of words to signify freedom and liberty as they recall how their hopes of using the air wireless-wise have been balked by officialdom. Our "Letters to the Editor" page certainly has on occasions borne witness to the frustrations experienced by those unable for some reason or another to obtain the requisite licence to radiate electromagnetic waves in free space.

The medium through which radio waves are propagated may indeed be "free" in the unconfined sense, but the use of this medium for transmission or reception is at all times subject to governmental sanction. Or, to put it more plainly, you cannot legally operate any kind of wireless transmitter or receiver unless you hold the appropriate licence issued by the authority concerned, this being in the U.K. the Postmaster-General.

Receiving Licences

I imagine that to many the position regarding wireless licences is rather perplexing. This may be particularly so on the receiving side, where it is impossible or impractical to enforce any restriction on the tuning range of receiving apparatus in the possession of private individuals. The Broadcast Receiving Licence permits one to install and operate equipment for the sole or prime purpose of receiving matter sent from authorised broadcasting stations for general reception and from licensed amateur stations, as you can verify by looking at your licence. The holder of an Amateur Transmitting Licence is automatically

covered for the reception of signals from other amateur stations but not for the reception of broadcast programmes. The latter is, however, covered by any broadcast wireless licence issued to the same household.

The fact that we have no legal right to listen in to all and sundry in the way of wireless transmissions has been clearly demonstrated quite recently in the case relating to police radar. Some "enterprising" person or persons proposed to put on the market a device intended to give warning to the driver of a vehicle when he was approaching a police radar trap. The G.P.O. promptly squashed this by declaring such a device to be by definition a receiver and that they would not grant a licence for the installation and use of this kind of receiver.

An interesting point arises concerning communications receivers. These are presumably covered in the normal way by a broadcast receiving licence, although most of the receiver coverage might be outside the normal broadcasting bands. Supposing a communications receiver happens to have a range covering, let us say, this police radar, how can its use be prevented?

The answer is, I suspect, that the act of tuning in and listening to a non-broadcast transmission is not in itself an offence but that an offence would be committed immediately any use was made of information gleaned in this manner. It is obviously impossible to prevent people tuning in to any frequency, but the law does jump down heavily whenever anyone is discovered making use of intercepted signals and this includes the passing on to a third party of details of such transmissions.

This would then explain the ban on the anti-radar device since the sole purpose of this device was to make use of the information (i.e. radar signals) received.

Mention of cars brings to mind the questions that often arise regarding licences for car radios.

A separate licence (that is, additional to the household licence) is needed if the radio makes use of the car battery—this is regardless of whether the receiver is a permanent installation or not. The type of aerial used does not enter into the question. One of our readers inquired if it would be in order to couple a miniature transistor receiver to an audio amplifier and loudspeaker unit installed in the car, the a.f. amplifier only being powered from the car battery. I understand that the Post Office rule that such an arrangement would definitely require a separate licence. Anyhow a brave try . . .

Any other bright suggestions, legal, of course? The ingenuity of some of our readers often fills me with admiration but I am afraid that in a battle of wits the odds are very much on the G.P.O. boys!

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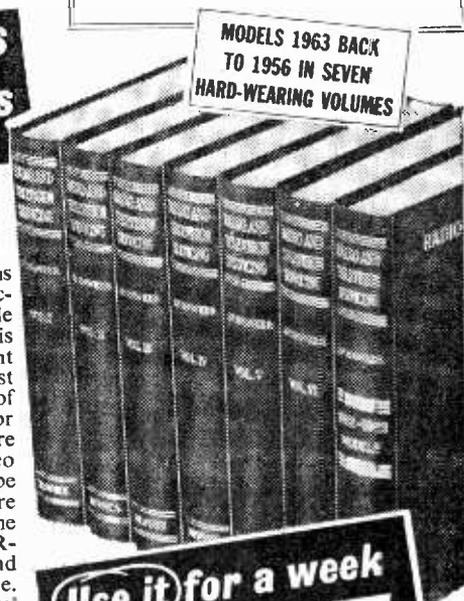
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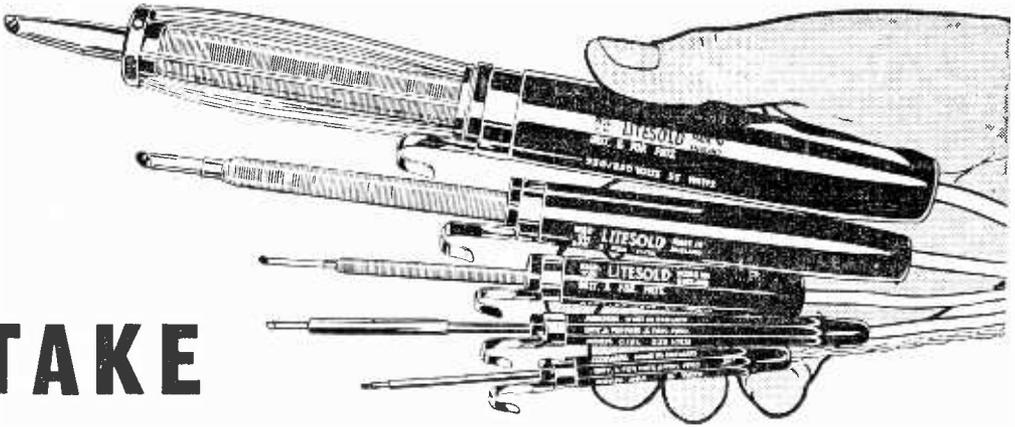
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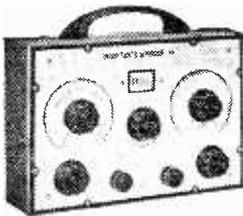
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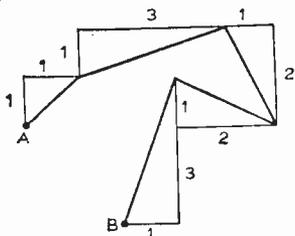
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this “j” business

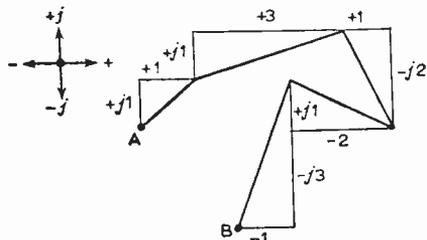
HAVING by now got some idea of what operator “j” is, let us see the kind of things we can do with it, especially with regard to circuit theory problems.

When we first learnt arithmetic at school, we were taught that $1+1=2$. Maybe it always does in the mathematics of *things*, but not in the mathematics of *measurement*. One foot forwards plus one foot backwards doesn't equal two feet in any direction. Neither does one foot up plus one foot across. This is where our labels, plus and minus, and j, come in. They are the symbols for direction, just as ordinary numbers are symbols for size.

Suppose you had to work out the distance between A and B in the sketch below. Would you find it easy or difficult?



Let us draw the figure again, and use labels in front of all the sizes to indicate their direction. To the right is +; to the left is -; up is +j; and down is -j. We now have a sketch like this:



To find the distance from A to B we simply add all the numbers together, like this:

$$\begin{array}{r}
 +1+j1 \\
 +3+j1 \\
 +1-j2 \\
 -2+j1 \\
 -1-j3 \\
 \hline
 \text{Total} \quad +2-j2
 \end{array}$$

Following on the general introduction given in last month's article, this final article shows how the “j” notation can be applied to problems relating to a.c. circuit theory.

By Roy Hartkopf

CONTINUED FROM PAGE 1194 OF THE APRIL ISSUE

We have written $j1$ instead of “j” to make it clearer. Actually $1j$ or $j1$ is exactly the same thing as j .

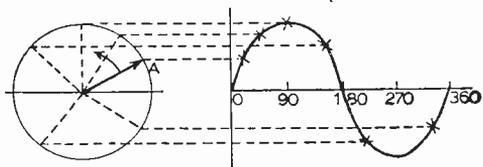
So the distance from A to B is two units to the right plus two units down. Simple, isn't it? You can check the result by drawing it on a piece of graph paper.

These double-barrelled quantities, which have direction as well as distance, are called vectors, and what we have just been doing is an example of vector algebra.

So far we have been talking about distances and directions in space, on a flat surface. But we can also have—though it sounds Irish—different “directions” in time. And it is here that the j notation is particularly useful to radio and electrical engineers.

The rotating vector

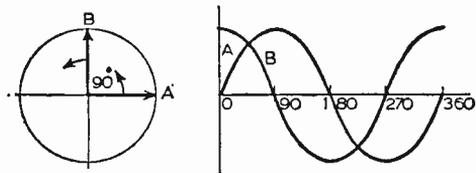
We all have a fair idea of what one cycle of a sine wave looks like, and we also know that this cycle repeats over and over again. Many will remember that it is called a sine wave because it can be shown to be the projection of a rotating line or rotating vector. The sketch below illustrates how this comes to be so.



The sine wave is really a picture of the height of the point A above or below the base line as the rotating line is swung round like the hand of a clock. When it has swung round 90° and is at right angles to the base line, the point A is as high as it can go. At 180° it is level again with the base line. At 270° it is at its lowest position, and at 360° it is back where it started from, having completed one cycle.

Suppose we have a second sine wave, of the same frequency but 90° out of phase with the first. The diagram below shows how these two waves could be represented by two rotating lines, 90° apart from each

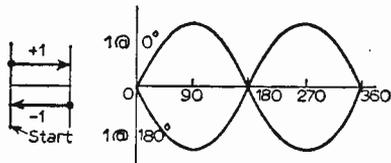
other, the one chasing the other like the wooden horses on a merry-go-round.



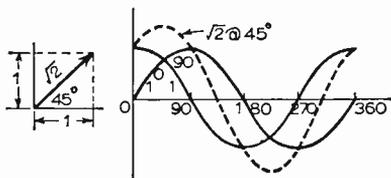
If we get this picture clearly in our minds we can begin to see where the "90° out of phase" fits in.

As far as the actual waves are concerned, it would be more correct to say they were a quarter of a cycle out of phase. But it is customary to talk about degrees out of phase, and it is a handy way so long as we remember they really represent fractions of a cycle, and not an actual angle.

We have already mentioned that in the mathematics of measurement, one plus one does not necessarily make two at all. The following sketches show how this happens both in ordinary vectors and in sine waves.



In the first case, when the directions are opposite they cancel out because they represent equal amounts in opposite directions. Another way of putting it would be to say that one line has been swung through 180°. And exactly the same thing happens with the sine waves. At each instant the one is equal and in the "opposite direction" to the other, they are 180° out of phase and so they cancel out. Let us take a second case where the vectors and the sine waves are 90° apart. They look like this:

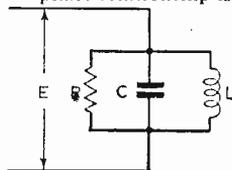


Here we find that the two vectors at right angles give us a resultant which is $\sqrt{2}$ or 1.4 units long at an angle of 45°. And if we plot the two sine waves and add them we will get exactly the same effect, another sine wave 1.4 times the amplitude and 45° out of phase with the two original waves.

All this boils down to the fact that we can treat sine waves in exactly the same way as we can treat distances and directions; that is label them with plus, or minus, or j, to indicate if and when they are out of phase, and just what their phase relationship is.

R, C and L in parallel

Let us take a case where we have a resistor, capacitor and inductor in parallel across an alternating voltage E.



We know that the impedance of the resistor is R, the impedance of the capacitor is:

$$\frac{1}{2\pi fC}$$

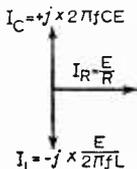
and the impedance of the inductor is $2\pi fL$.

By Ohm's Law:

$$I = \frac{E}{R} \text{ so } I_R = \frac{E}{R}, I_C = \frac{1}{2\pi fC} = 2\pi fCE, \text{ and } I_L = \frac{E}{2\pi fL}$$

We also know that the capacitive current is leading by 90° on the resistive current and the inductive current is lagging by 90°.

So we can draw a diagram of our currents like this, putting the appropriate label in front of them.



In working with j there is one fact which we must always remember for it crops up time and time again in calculations. This is that, since $j^2 = -1$, we can write $-j$ as:

$$-\frac{j^2}{j}, \text{ which is } -\frac{-1}{j}, \text{ which is } +\frac{1}{j}. \text{ So } \frac{1}{j} \text{ is equal to } -j, \text{ and also } j \text{ is equal to } -\frac{1}{j}.$$

Because of this we can write our inductive current, which is:

$$-j \frac{E}{2\pi fL} \text{ as } + \frac{E}{j2\pi fL}.$$

It is exactly the same thing.

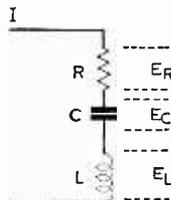
So, taking into account our j notation, the inductive impedance is $j2\pi fL$ and the capacitive impedance is

$$\frac{1}{j2\pi fC}, \text{ or if we prefer it, } -j \frac{1}{2\pi fC}$$

which again is exactly the same thing.

A Series Circuit

Let us see if these j labels automatically give us a sensible result in a series circuit containing R, C and L.

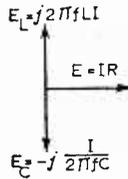


In this case, since the current can't disappear into thin air, the same current must flow through the three. Here we use Ohm's Law in the form $E = IR$,

to find the voltages across the three impedances.

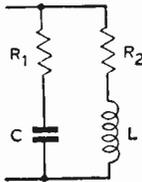
Thus $E_R=IR$, $E_C = -j \frac{1}{2\pi fC}$, $E_L=j2\pi fLI$

So E_R is plain, E_C has a $-j$ label, and E_L has a $+j$ label. The diagram would look like this.



At first sight things seem to be back to front. But if we look carefully we see it is the inductive voltage which is leading and the capacitive voltage which is lagging. This makes sense because if the inductive current is 90° behind the voltage, then the voltage is 90° ahead of the current. A similar argument applies to the capacity.

As a final example of what we can do with j notation let us consider the circuit shown below. It consists of resistance and capacity in parallel with resistance and inductance.



The impedance of the resistor-capacitor arm is

$$Z_{R1-C} = R_1 + \frac{1}{j2\pi fC} \quad \left(\text{or } R_1 - j \frac{1}{2\pi fC} \right)$$

The impedance of the resistor inductor arm is:

$$Z_{R2-L} = R_2 + j2\pi fL$$

As most of us know, the formula for two impedances in parallel is:

$$\frac{1}{Z_{total}} = \frac{1}{Z_1} + \frac{1}{Z_2}$$

$$\text{Which equals } \frac{Z_1 \times Z_2}{Z_1 + Z_2}$$

And turning it upside down we have:

$$Z_{total} = \frac{Z_1 \times Z_2}{Z_1 + Z_2}$$

Applying this directly to our case, we have,

$$Z_{total} = \frac{\left(R_1 + \frac{1}{j2\pi fC} \right) \times \left(R_2 + j2\pi fL \right)}{R_1 + \frac{1}{j2\pi fC} + R_2 + j2\pi fL}$$

Normally this would be the answer; and if we substituted numbers it would simplify down to a number plus (or minus) another number with a j label in front of it. (If it was pure resistance the j part would be zero and if it was purely inductance or capacitance the other part would be zero.)

In the case of our circuit we can simplify the formula if we make the two resistors equal. The formula now looks like this:

$$Z_{total} = \frac{\left(R + \frac{1}{j2\pi fC} \right) \times \left(R + j2\pi fL \right)}{2R + \frac{1}{j2\pi fC} + j2\pi fL}$$

Multiplying out the top we get:

$$\frac{R^2 + j2\pi fLR + \frac{R}{j2\pi fC} + \frac{j2\pi fL}{j2\pi fC}}{2R + \frac{1}{j2\pi fC} + j2\pi fL}$$

Rearranging the formula we get:

$$\frac{\frac{L}{C} + R^2 + j2\pi fLR + \frac{R}{j2\pi fC}}{2R + j2\pi fL + \frac{1}{j2\pi fC}}$$

Looking at this we see that, except for the term $\frac{L}{C}$ in the top line, there is a striking similarity between

the top and bottom lines. If we make $\frac{L}{C}$ equal to R^2 the formula looks like this.

$$Z_{total} = \frac{R^2 + R^2 + j2\pi fLR + \frac{R}{j2\pi fC}}{2R + j2\pi fL + \frac{1}{j2\pi fC}}$$

$$= \frac{2R^2 + j2\pi fLR + \frac{R}{j2\pi fC}}{2R + j2\pi fL + \frac{1}{j2\pi fC}}$$

$$= \frac{R \times \left(2R + j2\pi fL + \frac{1}{j2\pi fC} \right)}{2R + j2\pi fL + \frac{1}{j2\pi fC}}$$

$$= R.$$

So we have the very interesting result that in this circuit, if the two resistors are equal and the ratio of $\frac{L}{C}$ is made equal to R^2 , the circuit behaves like a simple resistance regardless of whatever the frequency may be. This example shows how the use of j notation can help us to see new possibilities in circuits as well as making practical calculations easier.

Now we should be in business—the j business. If in future we read an article splattered with j 's we shouldn't feel they represent some mathematical magic that we'll never be able to understand. Even if the detailed workings are too involved to follow, at least we'll have a solid general idea of what it's about. And this after all is the important aspect of understanding. ■

Medium Wave Aerial Data

COIL DESIGN DETAILS FOR FERRITE ROD AERIALS

By **RICHARD MARSH**

IT is well known that a ferrite rod with a suitable coil makes a very good aerial for small portable receivers. A great feature is their compactness coupled with efficiency.

The design of a suitable coil depends on complicated formulae but the average amateur need not be put off by this. Instead of using formulae the accompanying graph may be used for quickly deciding upon a suitable coil.

This graph relates to a standard round ferrite rod $\frac{3}{8}$ in. diameter, 8in. long. The coil must be close-wound on a low-loss former but about six layers of good, clean writing paper will do (with a

band with a 500pF variable capacitor and similarly for a 16-turn coil placed 0.65in. from the end of the rod.

(2) With a 300pF variable capacitor the centre of a 20-turn coil would be about 0.8in. from the end of the rod.

(3) With a 40pF variable trimmer used as a tuning capacitor coils of 60 or 70 turns could be used with their centres 1in. or 0.65in. respectively from the end of the rod.

(4) Push-button tuning. With, say, a 60-turn coil about 1in. from the end of the rod select a number of capacitors with a suitable trimmer for



few drops of gum in the last three layers to hold it together). Cover the outside with Durafix and wind on the wire, using Litz or bunched conductor wire.

Each curve on the graph is for a different number of turns from 10 to 100. A coil may occupy any position on the rod from the middle right out to the end. The distance "L" is the distance between the middle of the coil and the end of the rod. Note that the inductance of any coil may be reduced to almost half its maximum value by sliding it right to the end of the rod. This provides some useful adjustment that could enable a trimming capacitor to be omitted in some instances.

On the right there is a vertical scale with pairs of numbers at various intervals. These pairs of numbers represent the range of total capacitance required to provide tuning over the whole medium wave band (taken as 550kc/s to 1,500kc/s) for each coil. The way to use this scale is best illustrated with a number of examples thus:

(1) Suppose we have available a 500pF tuning capacitor. Take a horizontal line from 500 in the right-hand scale and note that it crosses the 20-turn coil and the 16-turn coil lines at points corresponding to distances 0.265in. and 0.65in. respectively. This means that a 20-turn coil placed so that its centre is 0.265in. from the end of the ferrite rod may be turned over the whole of the medium wave

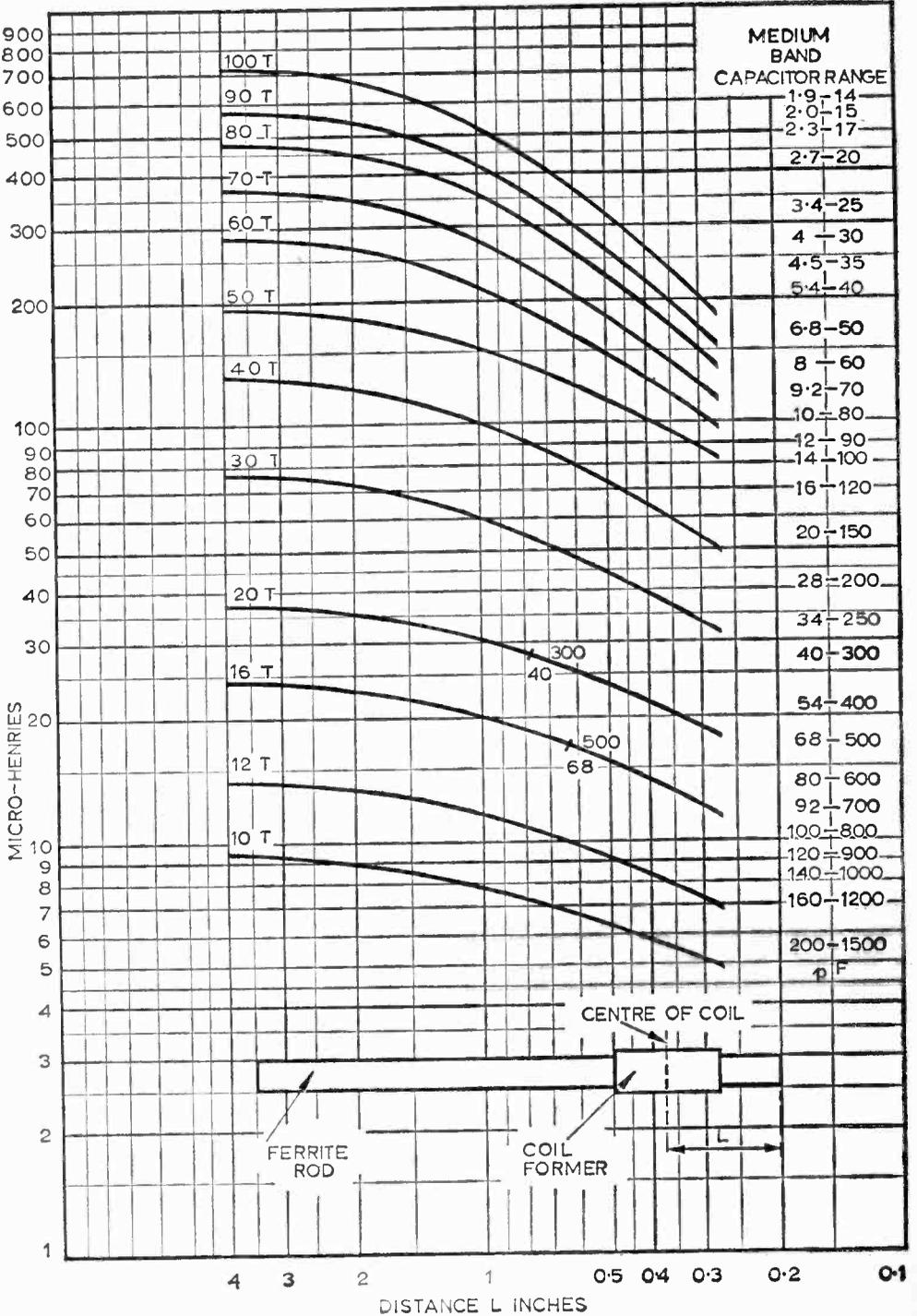
each and a suitable low-loss wafer or push-button switch with as many positions as needed for the stations chosen. Start with one station and adjust the coil position for best results, then fix the coil in that position with Durafix, etc., and for other stations adjust the capacitors.

The rod used is one commercially available and allowances must be made for possible variations of performance from one rod to another and also for the capacitance of the circuit. Rather than push a coil right to the very end of its rod it would be better to remove one or two turns and have it some $\frac{1}{8}$ in. or more further on the rod.

The Q of all coils tested was good. The 100-turn coil had the highest value, 262. The 50, 20 and 10 turn coils had 260, 202 and 130 respectively. These values for Q vary slightly with coil position and are a maximum with the coil centres in the region 1in. to 1 $\frac{1}{4}$ in. from the end of the rod.

Other Diameter Rods

As previously stated, this graph is directly applicable to a $\frac{3}{8}$ in. diameter ferrite rod. Other rods in common use have diameters of $\frac{1}{4}$ in., $\frac{5}{16}$ in. and $\frac{1}{2}$ in. When using any of these rods the data obtained from the graph should be considered as subject to slight modification. However, the optimum position for the coil will be readily ascertained when receiver alignment is performed. ■



THIS receiver is mains operated, and is constructed in an easily obtainable aluminium case measuring 12in. x 7in. x 3in., a small speaker being included. It operates from a telescopic aerial, and can thus be used anywhere where mains are available. An external aerial can be used in the normal way, though very good results are achieved with the telescopic aerial.

The receiver has six wavebands, covering medium waves, shore and shipping, amateur and short waves. The band coverage is approximately as follows:

Band	Frequency	Wavelength
1	30—20Mc/s	10—15 metres
2	21—10Mc/s	14—30 metres
3	10—4.5Mc/s	30—65 metres
4	4.5—2Mc/s	65—150 metres
5	2—0.9Mc/s	150—330 metres
6	900—450kc/s	330—650 metres

Reference to the circuit diagram (Fig. 1) shows that a single coil is used for each band. There is thus no trimming or aligning whatever to be performed, and any slight changes in the coils will have no effect on efficiency.

Circuit Description

Regeneration is used in the detector stage (V2), and this results in very high sensitivity. The r.f. stage is untuned, and serves to isolate the aerial, to avoid troublesome hand-capacity effects. VC1 is the band-setting capacitor, while VC2 is used for fine tuning. This arrangement has the effect of dividing each waveband into ten or more smaller bands, each of which is "spread" by VC2, thus allowing easy tuning.

The third valve, V3, provides two stages of audio amplification, giving sufficient volume for the 2½in. speaker. An external speaker can be used if a self contained, portable set is not required. V4 is the usual full-wave h.t. rectifier.

Latitude in Component Values

There is some latitude in component values, so items to hand may be fitted in some cases, for example: the 0.05μF by-pass capacitors may be 0.1μF; VR1 may be 20kΩ or 25kΩ; VR2 may be 50kΩ with R5 47kΩ or 68kΩ; or VR2 may be 200kΩ, with R5 220kΩ; VR3 may be 0.5MΩ. VR3 incorporates the mains on/off switch, but this could be in VR1 and VR2, or a separate toggle switch could be employed. C11 may be 50μF; C13 may be 32μF; C13 and C14 may be separate components, instead of a twin capacitor, and C7 may equally well be 8μF. C9 and C10 must be mica, or good quality high voltage paper, as leakage here will upset the 12AT7 grid bias values. C12 may be as large as 0.01μF.

SIX-BAND T.R.F. Receiver

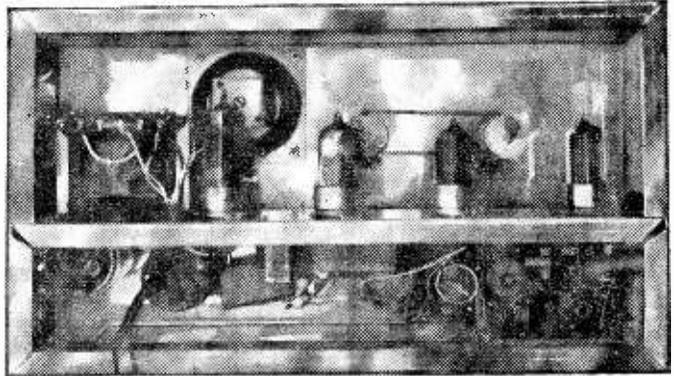
BY F.G. RAYER

There is no reason why the receiver should not be adjusted to suit any other metal case to hand. A wooden panel, or one of any kind of insulating material, is not recommended, unless it is backed by metal for screening purposes.

Wiring-up the Receiver

Fig. 2 shows the top of the chassis, and Fig. 3 is the underside. Heaters are wired first, the heater circuit wiring being against the chassis, and clear of grid leads. With V3, tags 4 and 5 are joined and taken to chassis.

All connections associated with V2 must be as short as possible. R4 and C5 should have very short leads to tag 1. C6 and C8 are earthed to a tag near V2. The same



An interior view of the finished receiver.

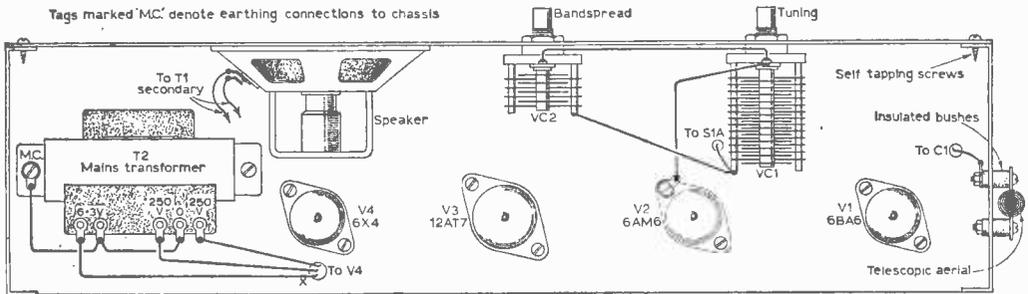


Fig. 2: The layout of the major components on the chassis.

bolt secures a tag on top of the chassis, and a lead goes directly from this tag to the moving plates tag of VC1, and from there to VC2. Switch leads must be short and direct, especially for bands 1 and 2. The telescopic aerial is fixed with 3/4 in. 6BA bolts insulated from the metal cabinet by means of fibre

near wires carrying a.c.

If a small smoothing choke is to hand this can be used instead of R13. If the set is used in an earthed situation, a 3-core mains cord is preferable, the metal chassis being earthed to the large pin of a 3-pin plug. A low rating fuse can be inserted in

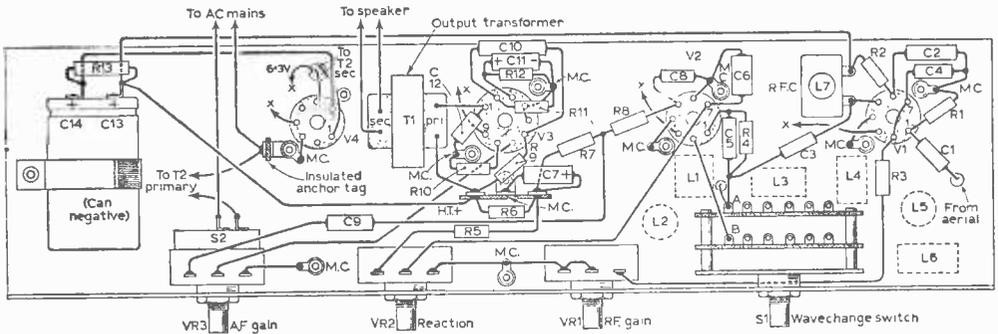


Fig. 3: An underchassis wiring diagram.

pillars and washers. If this type of aerial is not required, an insulated socket or terminal may be connected to C1.

The mains transformer and speaker leads pass through a hole in the chassis. An insulated tag forms an anchor point for the mains lead. Grid and anode leads must not be near each other, or

13A type plugs. If any tests are required, V1 may be eliminated by temporarily taking a short aerial to C3. This will allow the detector and a.f. stages to be checked.

Details of the Coils

Fig. 1 shows one coil only, but the coils for

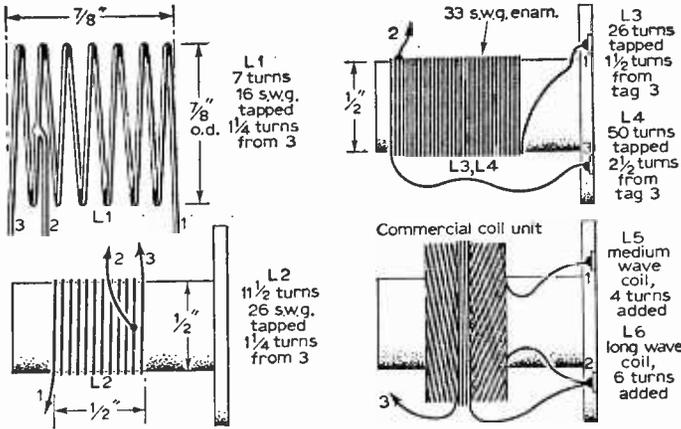


Fig. 4: Construction details of the coils.

other bands are connected in the same way, to consecutive tags on the switch. Medium wave coverage is useful for general listening, but band 6 may be omitted, if this is not required. The set is best tested with a single coil, then checked on other bands as the other coils are added.

Fig. 4 shows details of the coils, and with each the cathode tap 2 is very near the earthed end of the coil, 3. The exact position of this tap has an important effect. If the tapping is too near point 3, there will be insufficient regeneration. If the tapping is too far from point 3, oscillation will begin before V2 is providing anything like maximum gain. It may thus be worth while experimenting with the cathode taps, to suit the actual valve employed as a detector, though the tappings given below should generally be satisfactory.

The small coils are easily wound, as they have few turns. The larger coils, however, require many more turns, so can best be ready made, a few extra turns being added between points 2 and 3. Coupling or other unrequired windings should generally be removed, to avoid absorption, as the coils need only a single winding.

For range 1, 7 turns of 16s.w.g. wire are used, point 2 being $1\frac{1}{4}$ turns from point 3. The coil is self supporting, with the shortest possible leads, and is $\frac{3}{8}$ in. outside diameter, and $\frac{7}{8}$ in. long.

Ranges 2, 3 and 4 are wound on $\frac{1}{8}$ in. diameter coil formers. Range 2 has $11\frac{1}{2}$ turns of 26s.w.g. enamelled wire, occupying $\frac{1}{2}$ in. and tap 2 is $1\frac{1}{4}$ turn from point 3. Coil 3 has 26 turns of 33s.w.g. enamelled wire, close wound, the tapping being $1\frac{1}{2}$ turn from point 3. Coil 4 is also of 33s.w.g. enamelled wire, and has 50 turns side by side, the tapping 2 being $2\frac{1}{2}$ turns from point 3. A dust iron core is fitted in this coil.

Range 5 uses a medium wave coil. This coil would normally tune about 200-550m., but with the low capacity present the range is about 150-330m. Adjustment of the core allows the range to be modified as required.

On range 6 a long wave coil is used, turns being removed until suitable coverage can be obtained by adjusting the core position.

With range 5, 4 turns are provided between points 2 and 3. This is arranged by winding 4

extra turns of thin insulated wire on the original coil, point 2 being the junction of the original winding and new winding. With coil 6, 6 turns are required between points 2 and 3.

The coils are placed as in Fig. 3 and all switch connections are shown in Fig. 5.

Tuning Scales

Six scales are drawn on thin card and a wire pointer is fitted to VC1 to read against these. Scales and switch positions are numbered to agree. Markings may be in frequency or wavelength as preferred. VC2 being set at half capacity during this operation. Some type of signal generator is convenient, or the harmonics of a fixed frequency oscillator may be counted off, and the scales marked to agree. If preferred, the usual short wave bands may be marked, other markings being omitted.

A Bulgin 0-100 scale was fitted under the

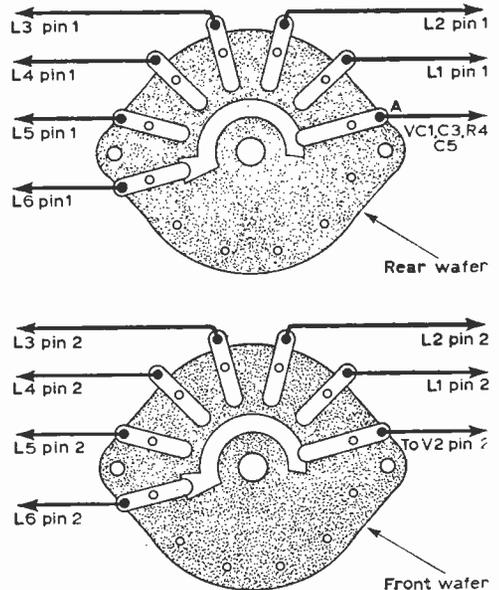


Fig. 5: S1 switch connections.

securing nut of VC2, and bandspreading can be read against this. All normal tuning on short wave bands is carried out by means of this control.

Operating Notes

VR3 is the audio gain control and is used in the normal manner. VR2 controls regeneration, and adjustment here is critical, for best possible long

—continued on page 90

communications

THROUGH THE GROUND

An interesting idea
for the experimenter

By C. R. Bradley

IT is well known that the ground is conductive—direct connection is often made to it and used as an “earth” or reference point for electrical equipment. Equipment is often earthed for safety and voltages are usually measured with respect to ground.

It is possible to send a morse or voice signal from one point to another by arranging to have either a direct or alternating current flowing between the different points. However, to achieve this two conductors are needed between the two points. For this reason, telephones are connected to the central exchange by a pair of wires (Fig. 1a).

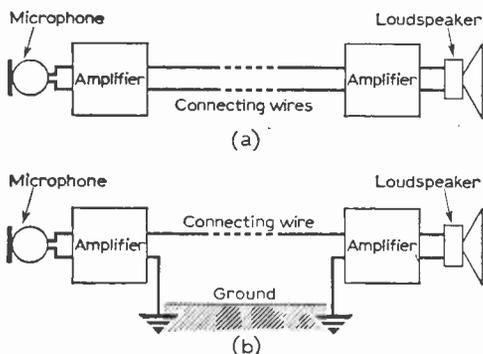


Fig. 1(a): A simple two-wire intercom; (b): a modified version which dispenses with one of the wires.

As the ground is conductive, one of the wires may be dispensed with and the terminals at each end of it earthed. Over long runs where wire is expensive, this reduces cost although the received signal may be weaker because of the resistance of the ground.

The system to be described makes use of the fact that the ground is not a perfect conductor and will show a resistance between any two points. The ground is in fact used to replace *both* conductors.

Consider a pair of earthing rods, A and B sunk several feet apart. A voltage X is applied between them. (Fig. 2).

The resistance of the ground may be regarded as an infinite number of “paths” between A and B. The shortest path AB (R_1) will have the lowest resistance and all the other paths will have a resistance proportional to their lengths. In theory, the voltage X would drive a current through each one of the paths.

If another pair of earthing rods are sunk, Y and Z, there will be a small current flowing through the ground between Y and Z, produced by the voltage X. If Z and Y are a mile or more from A and B, then this current will only be a tiny fraction of that flowing through R_1 . However, with sensitive equipment it may be detected.

There will be a certain voltage drop across the resistance YZ and this will be shown on a sensitive voltmeter.

PRACTICAL SYSTEM

If a strong audio signal is fed in at A and B, it may be received at Y and Z. The audio signal may be produced by an ordinary audio amplifier with microphone. A suitable receiver is a pair of headphones connected between Z and Y. In practice two, not four earthing rods are needed as the cold water main is used for earthing points A and Z.

It is most important that the earths B and Y

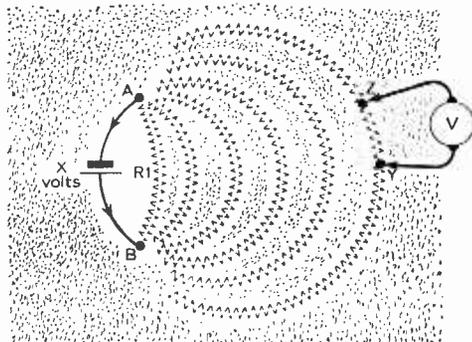


Fig. 2: Illustrating imaginary paths of resistance through which current produced by voltage X would flow.

make a good contact with the ground. An earthing rod may be used or a large piece of aluminium, copper or brass (not lead or iron since both will corrode). A piece of scrap piping or sheet is suitable; the only requirement is that the object should have as large a surface area as possible.

The earths B and Y at the transmitting and receiving ends respectively should be placed as far away from any water pipes as possible. As these usually follow the roads, the far end of a back garden is usually a good position.

The resistance between the earths and the water pipes is then measured at each end.

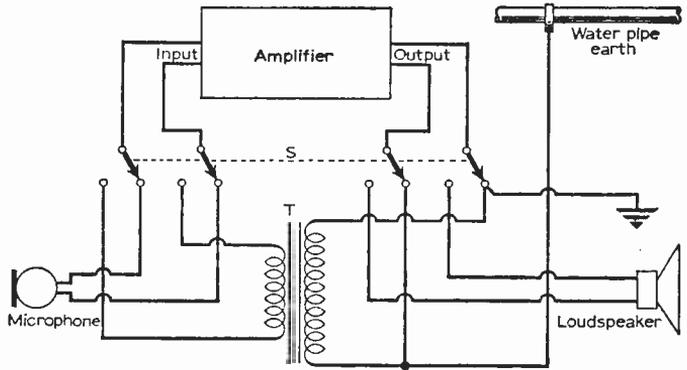


Fig. 4: A two-way station. The 4-pole switch S is shown in the send position. T is an output transformer with its primary connected to the amplifier input.

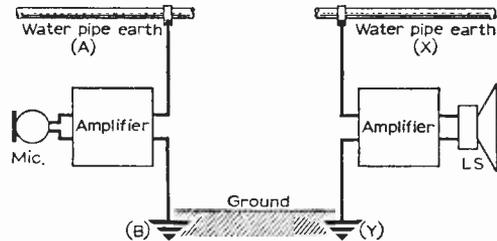
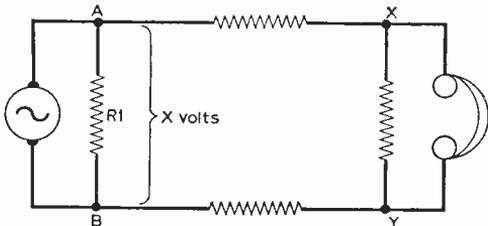


Fig. 3a (above): Diagram of a practical set up. Note that the water pipes are not used simply as conductors (the system would work even if the pipes at the transmitting and receiving ends were separate) but as convenient earthing points.

Fig. 3b (below): This shows how the resistance of the ground is used in the system of Fig. 3a. Only the current which flows in the direction AXYB is used; a much larger current flows through R1.



Depending on many factors, it may be anywhere between 100 and 3Ω.

If a pair of headphones are connected between the earth and the water pipes, a slight mains hum and an assortment of clicks and buzzes will be heard. This is all the equipment required at the receiving end. Both high and low impedance headphones work equally well.

An ordinary audio amplifier is used to provide the transmitted signal. The speaker output may be connected directly to the earth and the water pipes. The amplifier should be as powerful as possible; ranges of over a mile can be achieved with 8W amplifiers. Small low wattage transistor amplifiers

are no good for long distances. In spite of the mismatch at the transmitter, a clear signal should be received.

LONG DISTANCE RECEPTION

The received signal may be amplified if desired. Some kind of rough matching to the high input impedance of the amplifier would be required, and a loudspeaker output transformer connected in reverse would be suitable for this purpose.

EQUIPMENT REQUIRED FOR 2-WAY STATION

- 1 Audio amplifier, preferably 8 or more watts.
- 1 Output transformer, ratio unimportant.
- 1 Four-pole, two-way send/receive switch.
- 1 Earthing rod or substitute, see text.
- 1 Microphone.
- 1 Loudspeaker.
- 1 Water pipe earthing clip.
- 1 Long wire for connection to outside earth.

In case of difficulty, all these can be obtained from Electronic Constructors, Sutton Montis, Somerset.

Theoretically, for the best reception the earthing rod should be as far away from the nearest water pipes as possible at each end. Two earthing rods, as far apart as possible could be used instead of the earth-and-water pipe arrangement; this might reduce hum.

This method of communication is by no means a new idea but one that has been much neglected. There is much room for experimentation with multiple earth systems and tuned filters.

The writer hopes that anybody interested in this subject will write to him*; it would be interesting to start a "ground ham" club. This is an excellent medium for code practice as the received signal is very similar to that received on the short waves. ▀

* C. R. Bradley,
132 Horton Road,
Datchet,
Bucks.

on the Short Waves

A MONTHLY COMMENTARY BY J. GUTTERIDGE

AT some time or another when tuning around the short wave bands newcomers hear programmes mentioning DX, reception reports, short wave listeners and transmitting amateurs. The purpose of this feature is to help readers to get the best out of their short wave receivers.

The more experienced listeners will not be overlooked either. For them the latest information of frequency changes, new stations and unusual DX will be given. So that this feature can be as useful as possible we hope readers will write in and tell us of any news of interest and details of listening activities.

Where to listen

The first thing to know is where to listen. Bands of frequencies are allocated to different forms of broadcasting by international agreement. Amateur's operate in the 160 metre band (1,715—2,000kc/s); 80m band (3,500—3,800kc/s); 42m band (7,000—7,100kc/s); 20m band (14,000—14,350kc/s); 14m band (21,000—21,450kc/s); and 10m band (28,000—29,700kc/s).

On the short waves, broadcasting stations operate in the 125m band (2,300—2,498kc/s); 90m band (3,200—3,400kc/s); 75m band (3,950—4,000kc/s); 60m band (4,750—4,995kc/s and 5,005—5,060kc/s); 49m band (5,950—6,200kc/s); 41m band (7,100—7,300kc/s); 31m band (9,500—9,775kc/s); 25m band (11,700—11,975kc/s); 19m band (15,100—15,450kc/s); 16m band (17,700—17,900kc/s); 13m band (21,450—21,750kc/s); and 11m band (25,600—26,100kc/s). Not all stations adhere to these bands, however, and a number of stations can be heard outside them.

With a few minor variations, these bands are the same all over the world. These two main variations occur in North and South America. Here there are no 75 and 41 metre bands for general broadcasting. As a result the 80 and 42 metre bands have been extended to cover these frequencies.

Broadcasting Bands

Because of changes—daily, monthly and annually—in ionospheric conditions, the stations which can be heard in these bands are continuously changing. Here then is a run down on the present general situation in the various broadcasting bands. Amateur bands will be dealt with next month.

The 120, 90 and 60 metre bands are sometimes called tropical bands as they are mainly used for local domestic broadcasting by tropical countries. You will be extremely lucky to find a readable station on 120 and 90 metres. In the 60 metre band after dark careful tuning should find a number of South American stations and, particularly in the early evening, African stations. Morse (c.w.) interference usually makes things difficult.

Most of the stations in the 75 metre band are situated in Europe. They are at their best after dark. Long distance reception can also be achieved then.

During daylight hours 49 metres will produce mainly Europeans. After darkness almost anything can be heard. With the present night-time closure of most of the higher frequency bands many stations are using at least one outlet in this band. The result is a morass of stations broadcasting on top of each other. Freak things are happening and you may find the more unexpected stations coming out on top.

Worldwide Reception on 31 metres

Conditions on 41 metres are similar to those on 49, although the range of stations is slightly wider during daylight hours. World-wide reception is possible during the day on 31 metres. After dark this band is also giving good DX.

Conditions on 25, 19, 16 metres are basically similar. Good long distance DX during the daytime, North America being the most predominant continent in the 19 and 16 metre bands. As darkness falls 16 metre stations quickly disappear to be followed shortly by 19 metres. Twenty-five metres is now lasting well, many South American stations being audible during the evening.

The 13 metre band at present gives a very limited amount of long distance reception. As soon as darkness falls the band becomes useless. At present the 11 metre band is not worth bothering with at all.

Stations to watch for

Now to some news of stations. All times given here are G.M.T. The Radio Voice of the Gospel, P.O. Box 654, Addis Ababa, Ethiopia (call ETLF), says it is currently operating two 100kW transmitters. Although no programmes are beamed to Europe watch out for it after 1700 G.M.T. on 9,705kc/s when it has programmes to the Middle East and South Africa. Best chance of identification is from 1900-1930 when the programme is in English. You may also hear the English transmission to West Africa from 1830-1930 on 15,440kc/s. Full QSL verification is given for correct reports.

If you want to hear the latest in U.S.A. light and popular music try Radio New York World-wide, 4 West 58th Street, New York 19, N.Y., U.S.A. (call WRUL). Transmission to the British Isles is from 1230-1930 on 15,440kc/s and 1930-2145 on 9,710kc/s. If these frequencies are blocked try the continental European ones. These are 1230-1530 on 15,370kc/s; 1530-1830 on 15,385kc/s; 1830-2145 on 9,520kc/s. Finally, a good DX station in the 75 metre band. Watch out on 3,940kc/s after 2200 for the Voice of America relay station at Okinawa.

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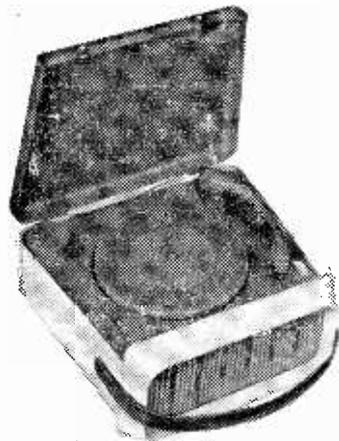
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- C** Portable two-tone case with handle, and expanded metal fret. (2/- P. & P.) **5/-**

Loudspeaker Bargains Still Available

Enormous purchases of Brand New and Guaranteed Plessey loudspeakers enable us to offer these units at THE LOWEST PRICES EVER! Don't miss this golden opportunity to obtain a first-grade permanent-magnet LOUDSPEAKER off the production line at LESS THAN THE MANUFACTURER'S COST! Read carefully the prepared list below and choose just the right speaker for the job—COMPARE THE PRICES ANYWHERE! SELLING FAST—STOCKS CHANGING RAPIDLY.

SCHEDULE OF LOUDSPEAKERS AVAILABLE

Diameter in inches	Gauss in lines	Imped. in ohms	Price	Diameter in inches	Gauss in lines	Imped. in ohms	Price	Diameter in inches	Gauss in lines	Imped. in ohms	Price	Diameter in inches	Gauss in lines	Imped. in ohms	Price
2	7000	80	8/-	3 1/2	9500	50	10/6	4	9500	35	11/6	5	8500	3	9/6
2 1/2	7000	35	8/8	4	7000	25	11/6	5	6000	3	8/-	5	9500	3	10/8
2 1/2	7000	50	8/8	4	6000	35	10/6	5	6000	3	8/8	5	9500	3	10/8
2 1/2	7000	80	8/8	4	7000	35	11/-	5	7000	3	8/8	6 1/2	7000	3	11/-
3 1/2	8500(E.M.L.)	3	8/8					5	7000	5	8/8	6 1/2	8500	3	11/6
3 1/2	7000	35	8/8					5	7500	3	9/-				

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	7/8	5 x 3	9000	25	11/-	7 x 3	9500	3	10/6	8 x 2 1/2	8500	3	9/6
5 x 3	7000	3	8/8	6 x 4	6000	3	8/8	7 x 3 1/2	9500	3	10/6	8 x 2 1/2	9500	3	10/-
5 x 3	9000	3	8/8	6 x 4	7000	3	9/8	8 x 2 1/2	6900	3	8/8	8 x 2 1/2	9500	4	10/-
5 x 3	6000	25	9/8	6 x 4	8500	3	9/8	8 x 2 1/2	7000	5	9/8	8 x 2 1/2	9500	4	10/-
5 x 3	7000	25	10/-	6 x 4	9500	3	10/-								

ALLOW 2/- each Speaker for postage and packing, and please specify the exact requirements—the nearest available will be sent.

OVER 50,000 SOLD AND STILL THE DEMAND CONTINUES FOR OUR "HEAVENLY TWINS"

Ask for a demonstration in the shop.

"CAPRI"
Sensitive!
Super-selective!
Superb
Speaker!
NOW ONLY 79/6



(2/- P. & PKG.)
Pocket Superbet MW and Drotwich LW
Size 4 1/2 x 2 1/2 x 1 1/2 in.
Constructional data 1/9 Post free.

The best and easiest transistor build-yourself sets available.

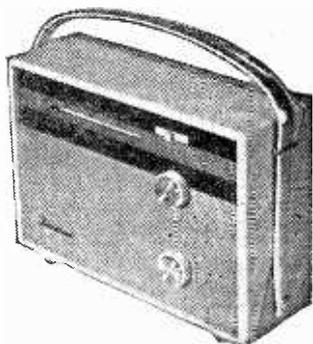
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6 First Grade MULLARD Transistors
Diode(s) and all components BRAND NEW and GUARANTEED

Choice of a dozen stations in daylight...

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"QUEEN OF THEM ALL"
ONLY **£9.19.6**
(3/6 p. & pkg.)

PORTABLE and CAR RADIO 2 WAVEBAND SUPERBET
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 £9.19.6 (plus 3/6 P. & P.)
CAPRI Battery 79/6 (plus 2/- P. & P.)

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Beautifully geared AM/FM 2 gang Condensers. 4/8; AM/FM IFT's 465 kc/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 pair; transistor sub min. 7 mm coil set (4) 4/6, the set; Plessey-Brayhead turret tuners 34/38 Mc/s. valves 8/6 each; 3 watt Stereo Amplifiers, complete, ready to switch on 79/6; Sentercell rectifiers R3/2D-D3-2-1Y. 2/6 each. DIODES—OA70, OA79, OA90, CG46H, GD10. 2/- each.
TRANSISTORS: Set of 6 (RF and LF) including 1 watt matched pair, heat sink and diode, 13/6 the set; OC45 4/6, PXA101 3/6, AF115 4/6. Submin. Germanium diode 1/3. M.1 diode 6d. each. Silicon diodes, 200 p.i.v. 200 mA. 1/- each. 400 p.i.v. 330 mA. 2/6 each.
Please send STAMPED and ADDRESSED envelope with any enquiry. We regret no catalogues—our 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/-

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ACCURACY AND RELIABILITY

Modern styling in light grey with legible black engraving.

Constructed to withstand adverse climatic conditions.

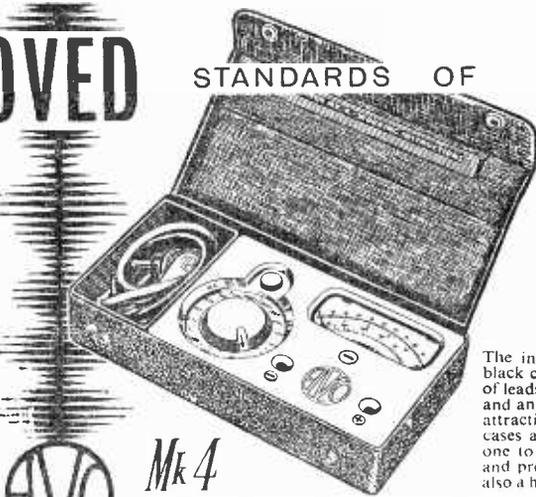
Ever ready case, including leads, prods and clips.

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 panclimatic 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
 A.C. Voltage: 10V f.s.d. — 1,000V f.s.d. in 5 ranges
 D.C. Voltage: 2.5V f.s.d. — 1,000V f.s.d. in 6 ranges
 D.C. Millivolt range: 0 — 100mV f.s.d.

Resistance: 0-2 MΩ in 2 ranges using 1.5V cell.
 Sensitivity: 10,000Ω/V on d.c. Voltage ranges.
 1,000Ω/V on a.c. Voltage ranges.

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 (12 lines)

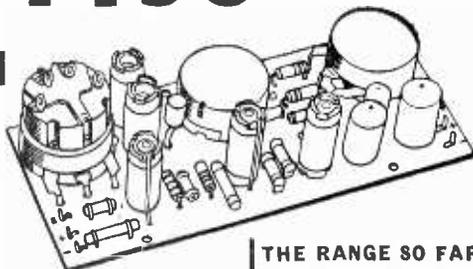


MM17

FORMULA 1456

THE NEW WAY TO BUILD HI-FI SAVES SPACE, TIME AND MONEY

Formula 1456 is the most popular combination of units in the brilliant new Martin Audiokit range, for it builds into a 10 watt hi-fi amplifier system complete with selector switch, tone-controls, power amp. and power supply. There are other units in the range, including a versatile 3-channel mixer, and all these units are adaptable to use in a great variety of applications. Performance standards are high, building is simple, costs are low—and once installed it is easy to add further Audiokits eventually up to stereo.



- ★ FULLY TRANSISTORISED
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UNIT 1 5-stage input selector	£2 7 6
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Matching adaptors for same, each	8 6
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UNIT 5 10 watt power amplifier	£5 12 6
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Kits complete with knobs, instructions, etc. Escutcheons available to requirement at 10/6 each.

MARTIN AUDIOKITS

KITS FOR TAPE ENTHUSIASTS, TOO

MARTIN RECORDKITS enable you to build a complete tape recorder (2 or 4 track) or pre-amp and deck assembly for use with hi-fi. LEAFLETS ON REQUEST.

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BLOCK LETTERS P.W.5

P.W.

Leader Competition

As already mentioned in this month's leader, page 25, the large number of entries to this competition and the high standard of many of them made the task of selecting the winners extremely difficult. Eventually, a short list of ten possible winners was drawn up. From these the winners were chosen; in fact the various contenders were so close that it was decided to add an extra prize for good measure. The winning two entries are reproduced on this page—they are printed as received and have not been altered in any way.

Debts of Gratitude

1

HOW often, I wonder, do any of our readers pause from slide-rule or soldering iron manipulation to hark back to their youth to recall the origin of the interest in radio and electronics that we all share? When I did this, recently, I came to realise that I probably owe unsettled debts of gratitude to a number of men whose names are now regrettably forgotten.

Submitted by

They lent or gave me wireless textbooks and magazines, taught me how to solder, allowed me into their "shacks", made my first "tatty" one-valver work, gave advice—in other words they fostered my interest. This did not cost them a great deal, in either time or money; however, the value of their help cannot be calculated—it grew to the extent of becoming my livelihood!

R. T. Pretty
Farnham
Surrey

In place of preoccupation with the problems of youth and public recitals of its shortcomings, would it not be a more positive step if some of us tried to repay our individual debts in this simple way? Merely letting the lad next door look over your shoulder while you set up one of the units you have built from a PRACTICAL WIRELESS circuit may give a youngster a glimpse of the career he wants, or bring him to one of the most satisfying hobbies there is.

Youth, Electronics and Educational Reform

FROM reading PRACTICAL WIRELESS and other publications it appears that large numbers of young people are actively interested in various branches of radio and electronics. In the towns and cities there are often radio clubs where the younger generation can benefit from the knowledge and experience of other older enthusiasts, but there are also large numbers who, because of isolation or other factors, work, read and acquire knowledge on their own. Thus the achievements of these individuals are limited.

All of these young people are potential electrical and electronics engineers. With new advances and developments in electronics, society will come to depend more on those qualified people than at present, and youth, with its assets of enthusiasm and talent, will have to meet the demand. Recent Government reports have indicated that there is a real shortage of engineers and technologists.

But is the educational system taking account of this? Most types of schools do not provide for modern sciences such as electronics at all, and often too much time is devoted to what are (to the prospective engineer) irrelevant subjects. If electronics was made a school subject the large numbers of teenage "lone wolves" of radio construction, as well as those belonging to radio clubs and societies, could broaden their knowledge and experience of electronics considerably and would be better fitted to pursue a career in this field.

More time must be given to practical work in schools because electronics, like almost all other modern sciences, demands the skilful co-ordination of hand and brain. It is the responsibility of teachers, parents and others who have influence in these matters to act immediately and prevent more time and talents being wasted, for this is a waste we can ill afford.

2

Submitted by

Charles Forbes
Strabane
Co. Tyrone
N. Ireland

And here is the extra prizewinner, awarded for being so close to the first and second entries.

Facts of Life

3

WE'RE a mixed bunch with many different interests in the various fields of electronics, but let us take another look at that little chappie who is the common denominator of all our activities.

Individually he's a pretty insignificant fellow, our mutual friend the Electron, but with his numerous pals he lights the world, broadcasts our views, entertains us, helps us run our trade and commerce and very often does our thinking for us.

Do we think enough about his reactions when he is pulled along under the influence of d.c., only to find himself suddenly squashed against the plate of a condenser, or again when being hurled across the vast space between cathode and anode? What are the effects as he struggles through the narrow confines of a resistor?

If we are to really enjoy and understand our hobby, whether it be amateur transmission, hi-fi, model control or any other of the sidelines catered for in this magazine a knowledge of what makes him tick is essential.

A number of people such as Ohm and Kirchoff spent their lives following his movements, checking on his relationships until at last a basic pattern of his behaviour was established.

These basic principles make up the common base from where all our separate paths lead. Let us remember to go back to base occasionally to replenish our store of knowledge and to meet again the hero of our story, the Electron.

Submitted by

Cyril M. Parry
Tonyrefail
Porth
Glamorgan

The judges felt that as the last ten to be considered were all serious contenders, some recognition of their merit should be given. Accordingly, here is a list of those entries—in no particular order—which came so close to winning one of the prizes:

Back to Basics: by A. S. Hussey, South Ockenden, Essex.

Endeavour: by K. L. Smith, London, E.17.

Satellites and the Ham: by F. Dawson, London, S.E.3.

Your Motive and Ours: by F. P. Mason, Sutton, Surrey.

Are We Becoming Earthbound?: by W. F. Clark, Chelmsford, Essex.

The Magic of Tomorrow: by R. Hodges, London, N.15.

Contributors: by R. A. Bower, Dunfermline.

Congratulations to the winners and to those with a "near miss", and many thanks to all those other readers who sent along entries for the competition. Space does not permit mentioning everyone by name but we hope that you will accept our appreciation for entering into the spirit of the contest.

Finally—

We thought readers would be interested in the entry published below. It could not be considered in the contest as the approach and viewpoint are not appropriate to a leader. However, it was so unusual—and the only one received from the wife of a reader—that we think it worth reproducing. After reading this, we ask married readers to search their consciences!

Grounds?

I AM a widow, a wireless widow. There are times when I wish Marconi had never been born. Still I suppose if it hadn't been Marconi it would have been someone else. When I sue for divorce I wonder what the Judge will say when I claim grounds for desertion and cite a radio as co-respondent.

I sit busy knitting or reading and then my better half looks up from the magazine he has been reading. "I say, do you know this firm only charges 1s. 9d. for a ferrite rod." Now what that is I have no idea, but murmur something appropriate. I needn't have bothered, he is already immersed in the magazine again.

We went to the local flower show last week or at least I thought that's where we were going. I might have guessed it. The first stop was the Amateur Radio Tent! The postman called yesterday. Ah! I thought, the magazine I was expecting. What a hope! it was the valves he had sent for.

This morning when I went to the door expecting to see the baker, it was a young girl. "Please can Mr. B. mend my radio, it is making funny noises." I make funny noises, only they are insides where no-one can hear them.

I settle at the sewing machine to make my new dress, and then pandemonium breaks out. The baby has got hold of a couple of valves and is busy banging them on the piano.

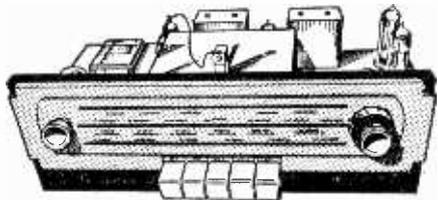
It's strange, but whenever I need to work in the kitchen there is always just one little wire which needs soldering! Thank goodness he knows nothing about TV. There are enough bits and pieces about now, not to mention the magazines and diagrams which I am constantly tidying up.

Submitted by

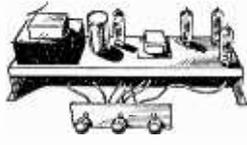
Mrs. Joyce Burdett
Leicester

4

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



Chassis size 15 x 6 1/2 x 5 1/2 in. high. New manufacture. Dia. 14 1/2 x 4 in. in 2 colours, predominantly gold. 200-250 v. A.C. only. Pick-up, Ext. Speaker, Acc. F., and Dipole Speakers. Five push buttons—OFF, L.W., M.W., F.M. and Gram. Aligned and tested. O.P. Transformer. Tone Control. 1000-1900 Mc.: 200-650 Mc.: 88-98 Mc/s. Valves EZ80 rect.; ECH81, EF89, BABC80, EL84, ECC85. Speaker 8 x 5 in. and Cabinet to fit chassis (table model), 47/6 (post 5/-). 10 x 6 in. ELLIPTICAL SPEAKER 25/- to purchasers of this chassis. TERMS: (4 chassis) £3.10.0 down and 5 monthly payments of £2.4.0. cheap Room Dipole for V.H.F. 12/6. Feeder 6d. per yard. Circuit diagram 2/6. ALTERNATIVE DESIGN. L.W. 1000-1900 M. S.W. (9-15 Mc/s): M.W. 190-475 Mc.; V.H.F. 87-100 Mc/s: Gram. position. Otherwise similar to above chassis. Price £15.15.0 (carr. paid). TERMS: £3.10.0 down and 6 monthly payments of £2.4.0.



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

Brand new 200/240 A.C. mains. Bass, treble and vol. controls, with valves EZ80, ECH83 and 2-EL84 giving full 8 w. Chassis 12 x 3 1/2 x 3 1/2 in. With o.p. trans. for 2-3 ohm speaker. Front panel (normally screwed to chassis) may be removed and used as "flying panel".

LAFAYETTE BRAND TAPES FULLY GUARANTEED AT RECORD LOW PRICES

MYLAR BASE	ACETATE BASE
5in. Double play, 1,200ft. . . . 16/-	5in. Long play, 900ft. . . . 10/-
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5 1/2in. Double play, 1,800ft. . . . 22/6	7in. Long play, 1,800ft. . . . 15/-
7in. Stand. play, 1,200ft. . . . 12/6	MESSAGE TAPES
7in. Long play, 1,800ft. . . . 10/6	3in.—150ft. 3/6
7in. Double play, 2,400ft. . . . 25/-	3in.—225ft. 4/11
F.V.G. BASE	3in.—300ft. 7/6
5in. Standard play, 600ft. 8/6	P. & P. 1/- extra per reel; 4 reels
5 1/2in. Standard play, 800ft. 11/6	and over Post Free.

Full range of triple play Lafayette tape now available on all size spools—prices on request.

SELF-POWERED VHF TUNER CHASSIS. Covering 88-95 Mc/s. Mullard permeability tuner. Dims. 10 1/2 x 4 1/2 x 5 1/2 in. high. Valves ECC85 and 2-EF89's plus 2 diodes with EZ80 rectifier. Mains transformer. Fully wired and tested. ONLY £7.17.6 (carr. paid). Room dipole 12/6. Feeder 6d. per yard.



SPECIAL OFFER PRINTED CIRCUIT AM-FM CHASSIS AT ONLY £9

A small quantity of Printed Circuit chassis by famous manufacturer. Valves UY85, UCH81, UF89, UAB80, UL84 and UCC85. O.p. trans. for 2-3 ohm speaker. Chassis 14 x 7 x 7 in. Front controls concentric, left—Vol. and Tone; right—W/e and Tuning "Gold" centre knobs provided. 2-dial Bulb Sockets. Acc. F. Ext. sp. P.L. Mains isolating transformer free. Covers Long, Med., VHF (87-101 Mc/s). Unused slightly tarnished, but not dirty; New Mullard Valves. Dial in gold and brown, size 13 x 3 1/2 in.



6-TRANSISTOR PORTABLE — Fully Built

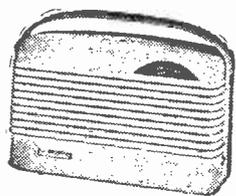
The "SCALA" for only £7.10.6, carr. paid. 8 1/2 x 2 x 5 1/2 in. high. Choice of colours. Resine. M.W. and L.W. Ferrite aerial. Battery 219 extra. Printed circuit. Nicely styled. A professional job. 3 1/2 in. speaker. Fully tunable M.W. and L.W. Superhet circuit.

100 mF. + 200 mF. ELECTROLYTIC. New 275 v. (350 v. surge). 4in. x 1 1/2 in. 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 no. (stamp will do) for 20 page illustrated catalogue. Delivery by return. C.O.D. 2/- extra. ALL ITEMS GUARANTEED 12 MONTHS. VALVES 3 MONTHS

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"SCALA", CAMP RD., FARNBOROUGH, Hants.
Farnborough 3871 CLOSED SATS.

"REALISTIC" 'SEVEN'



7 Transistor Superhet. 350 Milliwatt output, 4-inch speaker. All components mounted on a single printed circuit board size 5 1/2 x 5 1/2 in. in one complete assembly. Plastic cabinet, with carrying handle, size 7 x 10 x 3 1/2 in. 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. 4/6.

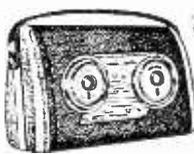
PP9 Battery 3/6. Data and instructions separately 2/6. Refunded if you purchase the parcel.
Any parts supplied separately.

4 TRANSISTOR MINIATURE PUSH-PULL AUDIO AMPLIFIER

PRINTED CIRCUIT. 5in. x 2in. x 1 1/2 in. over transformers. Output for 3-ohm speaker. Suitable for microphone, record player, guitar and radio input. 12 volt battery required. Frequency range 100 cps. to 25 Kcps. Push/pull output single ended. Instruction sheet provided. Fully wired ready for use. Three types. 200mW, 29/6; 500mW, 35/-; 1 watt, 41/- P. & P. 2/6.

THIS SUPERB SET for £9 (Carr. pd.)

6-transistor radio covered in provision-clean Duracour fabric, in latest two-tone shades, M.W. and L.W. ferrite rod, sponge for car aerial, 2-colour scale. With PP9 battery giving 300 hours use. Weighs under 4 lbs. With carrying handle. 12 x 7 in. high x 4 1/2 in. at base tapering to 2 in. at top. Brand new, fully guaranteed. 3 push buttons. Superhet circuit, 5in. L.S.



5 WATT AMPLIFIER

Our price ONLY 58/- (post 5/-); a few hundred only; valves EF91 and EL84 with metal rectifier; 6 x 4 x 1 1/2 in. high (5in. over EL84). Mains trans. and o.p. with vol. and tone controls; on-off; co-ax. input.

GRAMOPHONE AMPLIFIERS

1 1/2 watt type. With 5in. speaker. Baffle 12 1/2 x 6 in. 200-240 v. A.C. EL84 and Rectifier. Tone and Volume. On/off switch. Two knobs. Ready to play. Useful for Stereo, 49/6, post 5/-.
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HIGH QUALITY PUSH-PULL OUTPUT AMPLIFIER

Chassis 10 x 7 1/2 x 7 1/2 in. high over trans. Used, guaranteed and in excellent order. New valves EZ40, ECC83 and 2 x EL81; 8 watts. Mains trans. tapped 200-250 volts. O.p. Trans. for 3, 8 and 15 ohm. Choke smoothing. On-off/vol., and tone controls. For tuners, Record Players, etc., £8.15.0. P. & P. 6/-. We can modify for Guitar input for 15/- extra.

TRIPLE-FOUR STEREO PUSH-PULL OUTPUT AMPLIFIER

Chassis 10 1/2 x 4 1/2 x 4 1/2 in. high. New production. Valves 4 x ECL83 and 1—ECC83. Two metal rect. Mains trans. and 2 o.p. trans. Separate control panel 7 1/2 x 4 in. containing Mono/Stereo switch; balance; vol.; treble; bass. Brand new. £7.17.6. P. & P. 6/-.
4-SPEED AUTOCHANGERS

BRR-UA14	£5.19.6
GARRARD AUTOSLIM	£8.10.0
STEREO	£7. 5.0
AUTOSLIM DE LUXE A76	£10.19.6
STEREO	£11.10.0

Carr. 5/- each.

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For 4 Low Consumption Valves (96 ranges) 90v. 15 mA 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. 4 x 2 1/2 x 2 1/2 in. and 3 x 2 1/2 x 1 1/2 in.

13 x 8 in. LOUSPEAKER
Three ohm. Ceramic magnet of latest type. BRAND NEW.
42/6 (post 3/6)

HEATER TRANSFORMER

Mains input giving 6.3v. 2 amp. Size 2 1/2 x 2 x 1 1/2 in. (2 1/2 in. over winding) 5/8 ea. Loss 10% for 12, or 20% for 50. P. & P. 2/- for 1 to 6, post free more than six.



THE SKYROVER AND SKYROVER De Luxe

General Specification for both models

7 transistors and 2 diode superhet—6 waveband portable receiver, covering the full Medium Waveband (180-576M) and Short Waveband (31-94M) and in addition 4 separate switched Band Spread Ranges on 13M, 16M, 19M and 25M/bands—with manual Band Spread Tuning for accurate Station selection, I.F. frequency 470Kc/s. Output 300MW, 5in. Ceramic Magnet P.M. Speaker, Telescopic and internal Ferrite Rod Aerial. All Mullard Transistors and Diodes. The 301i Pack and tuning head 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 6 1/2 x 3 1/2 in., with metal trim and carrying handle.

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6A8E	7/-	68L7GT	4/8	25Z4G	6/8	EY31	5/8	EY89	12/-	GZ30	10/-	PL81	7/8	U4020	5/-	B9G	2/6	

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A SIMPLE 2-stage Amplifier

**A ONE-VALVE RECORD PLAYER AMPLIFIER DELIVERING UP TO 3.5W OUTPUT
BY G. J. KING**

THIS amplifier is designed to give good quality reproduction of disc records for the smallest possible outlay. Although it features a simple, single-ended output stage and a modest one valve, it is nevertheless capable of delivering a maximum of 3.5W of audio.

At 2W output the total distortion is less than 0.5%, but as with any small amplifier of this nature the distortion tends to rise rapidly towards full output. At 3W the distortion is a little below 3% and gets up to the 10% mark at full output of the valve.

For many domestic applications the peak power rarely exceeds 1 to 2W, for this is quite a loud noise from a sensitive speaker system, and within

($\mu = 100$) and the high slope of the pentode ($gm = 10mA/V$ at an anode current of 36mA) provide a remarkably high overall sensitivity. In a normal circuit the pentode section is fully driven from a 50mV signal applied to the grid of the triode section.

Thus, by the use of a crystal or ceramic pick-up, quite a large degree of negative voltage feedback can be applied overall and still the valve can be driven to full output. Hitherto such circuit technique has demanded the employment of a separate pre-amplifier valve or very little or zero negative feedback. This is one of the reasons why previous single-stage record reproducing amplifiers, such as those used in certain commercial instru-

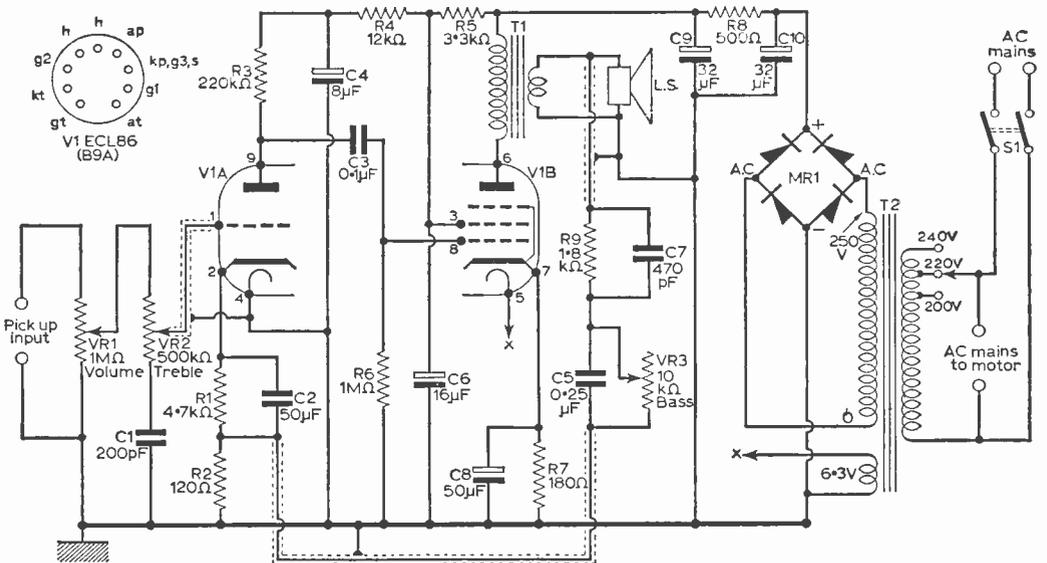


Fig. 1: The complete circuit of the amplifier.

this range of power the amplifier has several hi-fi attributes.

Audio Triode-Pentode Valve

The design is based on the Mullard ECL86, which is a fairly recent triode-pentode valve evolved specifically for audio applications. The high amplification factor of the triode section

ments of the popular price range, having quite a long way to go to give anything approaching hi-fi quality.

Apart from the valve, the quality of reproduction is tied closely to the design of the output or speaker transformer. The goodness of this component governs the amount of negative feedback which can be applied before the amplifier goes

unstable at certain frequencies where the phase shift is excessive. Preferably, the transformer should be free of resonances well above the audible spectrum. Bad resonances at the top end of the a.f. spectrum will tend to incite instability with full treble lift.

The Circuit

The circuit is based on a design by Mullard Limited, but with small alterations to suit the application in mind. As shown in Fig. 1, a completely isolated mains transformer is employed. It was decided to adopt this safer method rather than trying to cut costs by the use of an a.c.-d.c. arrangement, for it was thought that experimenters may wish to use the amplifier in conjunction with some other equipment, such as a tape recorder, in which case a "live" chassis would prove somewhat of an embarrassment.

To facilitate smoothing and to maintain the lowest possible hum level a bridge h.t. rectifier circuit was chosen. The bridge rectifier is a contact-cooled type with a current rating of 50-75mA. The power section, in fact, has a very wide safety margin, for the amplifier takes little more than 40mA. But this was thought desirable as it not only allows the amplifier to be operated continuously over long periods without heating up, but it also gives a bit of spare power should it be required to fit a pre-amplifier stage for a tape head.

The triode section is arranged as a voltage amplifier, with feedback applied to the cathode circuit from the output of the pentode section. The gain of the triode section is approximately 50 times. The pick-up signal is applied across the volume control VR1, and from here it goes to the treble control VR2 which, in conjunction with C1, forms a passive RC network, giving continuous treble cut from about 300c/s.

R3 is the triode anode load which is fed from the h.t. line through a two-stage filter R5, C6 and R4, C4. V1A is biased by the voltage drop across R1 and R2 in series, and R3 is bypassed by C2 to avoid degeneration due to negative current feedback. The feedback voltage is effectively applied across R2.

The signal at the anode of V1A is coupled to the control grid of V1B via C3, with R6 as the grid-leak. The screen of the pentode is energised at R5, C6 filter, while the valve is biased by the voltage dropped across the cathode resistor R7, with C8 as the bypass.

The pentode operates with an anode load of 7k Ω , so an impedance of this value must be reflected across the primary winding of the output transformer when the required speaker is connected (see List of Components). One side of the secondary is connected to chassis and the other side to the negative feedback and bass control loop. The secondary, of course, also connects across the speaker.

Negative feedback is taken through the network C5, C7, VR3 and R9. The parallel combination C5 and VR3 forms the bass control proper. This provides continuously variable bass boost from about 1,500c/s.

The main h.t. smoothing is achieved by C9 and C10 and R8. Note that it may be necessary to

adjust the value of R8 to give 275V on the h.t. line, relative to chassis.

Construction

A prototype amplifier was constructed in two sections—the amplifier proper and a separate control panel. This was considered desirable for it allows the control panel to be mounted almost anywhere in a cabinet, for accessibility of the controls, without having to bother too much about the positioning of the amplifier chassis.

The control panel is connected to the amplifier chassis through three cables, two of which are screened. A screened single conductor is employed to couple the grid of the triode to the treble control VR2, a screened double conductor for the negative feedback and bass control VR3, and a

COMPONENTS LIST

Resistors:

R1	4.7k Ω 5%	R6	1M Ω 10%
R2	120 Ω 5%	R7	180 Ω 2W ww 5%
R3	220k Ω 5%	R8	500 Ω 2W 10%
R4	12k Ω 10%	R9	1.8k 5%
R5	3.3k Ω 10%		

All 1W carbon unless otherwise indicated

Potentiometers:

VR1	1M Ω log. with two-pole on/off switch
VR2	50k Ω linear
VR3	10k Ω log.

Capacitors:

C1	200pF ceramic 10%
C2	50 μ F electrolytic 12V
C3	0.1 μ F paper 350V
C4, 6	8 + 16 μ F electrolytic 350V
C5	0.25 μ F paper 350V
C7	470pF ceramic 10%
C8	50 μ F electrolytic 25V
C9, 10	32 + 32 μ F electrolytic 350V

Miscellaneous:

- T1 Speaker transformer. Ratio 46 : 1 for 3 Ω speaker, or 21 : 1 for 15 Ω speaker. Primary inductance 10H. (Radiospares "Hygrade").
- T2 Mains transformer. Secondaries 0-250V 75mA; 6.3V 1.5A (Radiospares "Bridge" type).

V1 ECL86

MRI Bridge rectifier, 250V 75mA

One B9A valveholder, nylon loaded and with screening skirt. One two-way and one four-way tag strips. One two-way speaker socket. Soldering tags, 6 and 4 BA nuts and screws. Screened cable, single conductor and also double conductor. Connecting wire and flex. Three control knobs. Metal for chassis.

length of plastic flex for the circuit between the mains primary of T2 and the on/off switch S1, which is ganged to the volume control VR1.

The inter-connecting cables should not exceed about 18in. in length owing to the high impedance of the input circuit, and because of the high sensitivity of the ECL86 the utmost of care must be taken to avoid stray capacitive coupling between the grid of the triode section and the anode circuit of the pentode section. Excessive unwanted coupling here will result in instability which will increase in severity as the treble control is turned up. The negative feedback will also be adversely affected due to phase shift effects.

The connection to Pin 1 should, therefore, have

PORTABLE TRANSISTOR RADIOS

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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. Air spaced ganged tuning condenser. Ferrite rod aerial for M & L waves and telescopic aerial for S Waves. 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.)

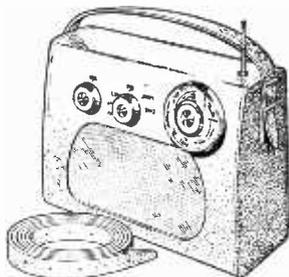
5 WAVEBAND PORTABLE OR CAR RADIO

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/-.



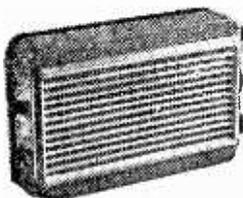
TRANSONA FIVE

Home, Light, AFN, Lw, all other stations, G.P., Busham

● 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 2 1/2in. speaker etc. Attractive case. Size 6 1/2 x 4 1/2 x 1 1/2in. with red speaker grille. (Uses 1289 battery available anywhere.)

Total cost of all parts now only **42/6** P. & P. 3/6.



Parts Price List and easy build plans 2/-.

TRANSONA SIX

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 Ferrite 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 6 1/2 x 4 1/2 x 1 1/2in. (Uses PP4 battery available anywhere). (Carrying strap 2/- ex.)

Total cost of all parts now only **59/6** P. & P. 3/6



Parts Price List and easy build plans 1/6

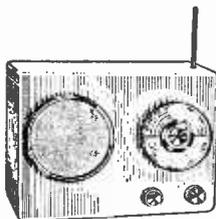
SUPER SEVEN

● 9 stages—7 transistors and 2 diodes

Covers Medium and Long Waves and Trawler band. Completely portable—has built-in Ferrite rod aerial for wonderful reception. Push-pull output, 3in. speaker (will drive larger speaker). Size 7 1/2 x 5 1/2 x 1 1/2in. (Uses 9v. battery, available anywhere.) (Telescopic Aerial for Trawler Band (optional) extra. 6/11.

Total cost of all parts now only **£3.19.6** P & P. 3/6

Parts Price List and easy build plans 2/-.



MELODY SIX

FREE!

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

Miniature Earpiece, plug and socket (value 9/6) and details of conversion to private listening.

● 8 Stages—6 transistors and 2 diodes.

Our latest completely portable transistor radio covering medium and long waves. Incorporates pre-tuned circuit board, 5in. 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 6 1/2 x 3 1/2 x 1 1/2in. approx., with gilt speaker grille and supplied with hand and shoulder straps.



Total cost of all parts only **£4.9.6** P. & P. 3/-.

Parts Price List and easy build plans 2/-.

ROAMER SIX

FREE! Miniature Earpiece, plug and socket (value 9/6) and details of conversion to private listening.

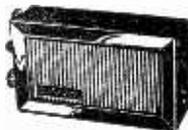
● 8 stages—6 transistors and 2 diodes.

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 6 1/2 x 4 1/2 x 1 1/2in.

POCKET FIVE

● 7 stages—5 transistors and 2 diodes.

Covers Medium and Long Waves and Trawler Band, a feature usually found in only the most expensive radios. On test Home, Light, Luxembourg and many Continental stations were received loud and clear. Designed round supersensitive Ferrite Rod Aerial and fine tone 2 1/2in. moving coil speaker, built into attractive black case with red speaker grille. Size 5 1/2 x 1 1/2 x 3 1/2in. (Uses 1289 battery available anywhere.)



Total cost of all parts now only **42/6**

P. & P. 3/-

Parts Price List and easy build plans 1/6

Total cost of all parts now only **£4.19.6** P. & P. 3/6.

Parts Price List and easy build plans 1/-.

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 fixed prices stated.

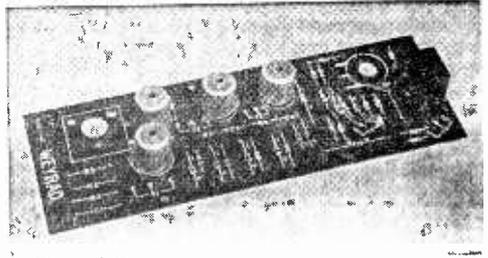
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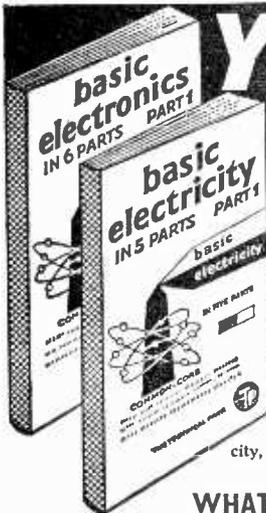
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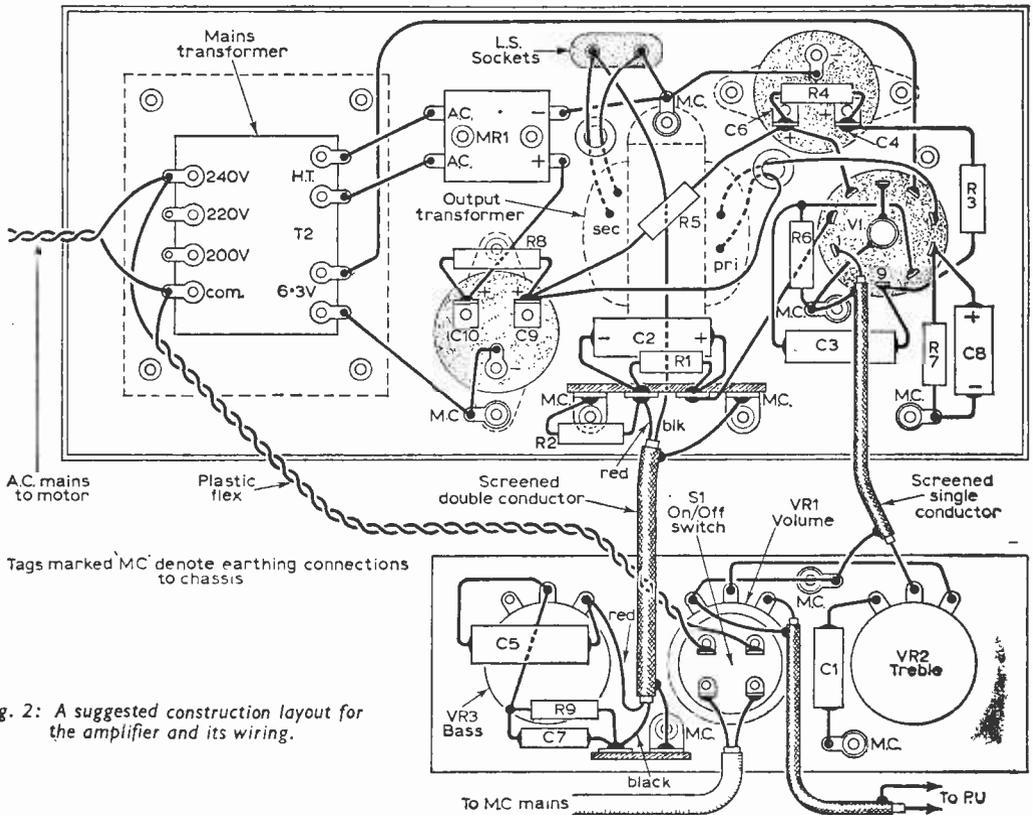


Fig. 2: A suggested construction layout for the amplifier and its wiring.

the shortest possible length of inner conductor exposed from the screened lead, while the screen itself must be bonded to chassis at the solder tag clamped underneath the valveholder securing nut. Further, the anode lead to pin 6 should be routed round the far side of the valveholder, as shown in Fig. 2.

Care must be taken to ensure that the inner conductors of the negative feedback and bass screened coupling are not inadvertently reversed during the construction. This can be avoided by the use of a screened double conductor in which the conductors are coloured red and black. Both screened cables must be bonded to chassis at their screens at both ends—at the amplifier and the control panel. Inefficient "earthing" will cause instability and a high hum level.

If the interconnecting cables are extra long the hum level may be higher than necessary, and in some cases it may be possible to minimise it by connecting a separate, fairly large diameter flexible conductor from a soldering tag on the amplifier (as close as possible to V1) to a similar tag on the control panel (as close as possible to the volume control). The screened outer conductor of a length of coaxial cable is highly suitable for this application, after first pulling out the polythene-covered inner conductor.

Component Layout

The layout of the components and the point-to-point wiring are given in detail in Fig. 2. The dimensions of the amplifier chassis will depend very much on the size of the mains transformer and output transformer, while the control panel can be any size to suit the application which the experimenter may have in mind. The controls on the latter, however, should be grouped as closely as possible together to avoid extra-long inter-connecting wires.

Both the chassis and the control panel can be made of 16s.w.g. aluminium sheet and, although the main amplifier can be built direct on to a flat piece of aluminium, for the sake of rigidity the sides of the chassis are best bent at right-angles to form a very shallow chassis with quarter-to-half-inch sides. In application, the chassis may then be mounted on pillars or wood strips.

In the prototype a through-chassis type of mains transformer was employed, as Fig. 2 shows, but there is no reason at all why a chassis-mounted type of transformer could not be used. Rubber grommets would then be employed to feed the transformer connections through the chassis.

The output transformer is mounted on the top

—continued on page 78

BOOKS REVIEWED

DISC RECORDING AND REPRODUCTION

By P. J. Guy. 256 pages, 5½ x 8½ ins. Price 42s.

RADIO RECEPTION

By H. Henderson. 256 pages, 5½ x 8½ ins. Price 42s.

Both published by Focal Press Ltd.

THE idea of a series of books, each one self contained, which dovetail to form a single authoritative work is an excellent one. Such a series is *The Technique of Sound Reproduction* which, edited by John Borwick, comprises six works covering the whole field of hi-fi sound recording and reproduction. Each book is written by a specialist and a uniform technical level has been aimed at throughout the series. Two books in this series are reviewed this month; we hope to review others in due course.

DISC RECORDING devotes the first six chapters (80 pages) to definitions of the nature of sound and to the theory and practice of modern disc recording from the microphone to the processing of records. The bulk of the book covers the component constituents of disc reproduction—stylus, pick-ups, motors, amplifiers, etc. Supplementary chapters deal with such aspects as stereo reproduction, hum and motor troubles, equalisers, response measurements, etc.

A valuable section is made up of five appendices which provide a wealth of design facts and formulae on such things as negative feedback, recording and reproducing equalisation, constant resistance faders, etc. This arrangement of grouping the mathematical material at the end of the book not only makes it a very useful reference section but permits the author to develop his main chapters without having to digress with formulae and calculations.

To sum up: For those who have progressed beyond the stage of simple amplifiers or wish to fill out their knowledge of the many factors involved in modern recording and reproduction of discs this will find a welcome place on the bookshelf.

RADIO RECEPTION is perhaps the "odd man out" in this series, for it is the only one not dealing exclusively in purely audio matters. Its inclusion, however, is justified in that radio tuners are needed to receive the high-quality v.h.f.-f.m. broadcasts.

The first three chapters deal with basic theory and your reviewer cannot quite decide whether this is to be applauded or condemned! There are so many books available covering these aspects in much greater detail that the space could well have been used to elaborate on more practical matters.

However, the chapters are very well written and will serve as a general "refresher" for those already conversant with basic theory. They also serve to point to the overall level at which the following chapters are aimed. These chapters deal with the r.f. amplifier, frequency changing, i.f. amplification, demodulation.

No audio circuitry is described, this being dealt with in a separate volume. These sections give data for both valve and transistor circuitry and practical values are given in many instances.

Alignment and Performance has just over five pages and, although it cannot be faulted as such, perhaps a more extensive and more practical treatment would have been beneficial. This is followed by a section on commercial receivers and tuners with circuit diagrams and descriptions. Here again some criticism: the circuit diagrams are obviously reprinted copies from manufacturers' literature and consequently they are all in different styles and in some cases are so small as to present a decided strain on the eyes. For the price of this book it would surely not be unreasonable to expect circuits to be redrawn to suit the space available. And one circuit has no component values shown at all!

Two good chapters follow—Receiving Aerials and Stereo Reception and Transmission. The book concludes with a short glossary and a bibliography.

A useful feature (both books) is the listing of main headings at the beginning of each chapter.—*D.C.*

SILICON CONTROLLED RECTIFIER DESIGNERS' HANDBOOK

Published by Westinghouse Electric Corp. Pennsylvania. 274 pages, 5½ in. x 8½ in. Price 16s.

THE purpose of this handbook is to familiarise circuit design engineers with the characteristics of npnp four-layer semiconductor devices such as the conventional silicon-controlled rectifier (SCR) and the gate-controlled switch (GCS).

Principles of operation, methods of construction, ratings and characteristics of these devices are described. In the large section dealing with applications of the SCR and the GSC the following are among the subjects treated to detailed analysis: switching circuits, d.c. to a.c., power inverters, ultrasonic generators, servo amplifiers, d.c. choppers and ignition systems.

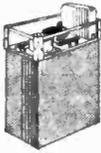
The section Design Data, or "working tool" information, as it is aptly sub-titled, comprises 40-odd pages of tables and curves all relevant to SCR, GCS and other rectifier circuits—a valuable compilation of data from widely scattered sources.

The handbook includes specifications giving the mechanical, electrical and thermal characteristics of each Westinghouse type currently available.

Distributors of this handbook in the U.K. are the Westinghouse Brake and Signal Co. Ltd., 82 York Way, King's Cross, London, N.1.—*F.E.B.*

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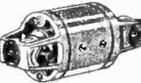
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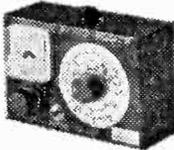
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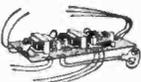
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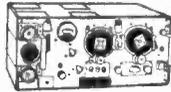


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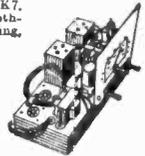
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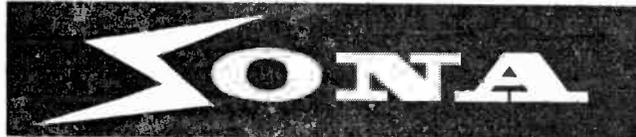
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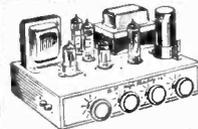
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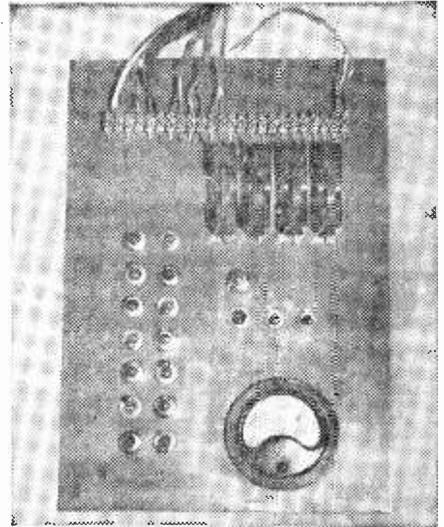
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A Mains Distribution Panel

BY G. R. SIMPSON



THE circuit diagram (Fig. 1) shows a simple mains distribution panel consisting of one fused mains input and three switched mains outputs with a neon indicator to signify that the board is alive, and a 0-300V a.c. voltmeter.

The purpose of the panel is to accept the current from one mains input and to redistribute it

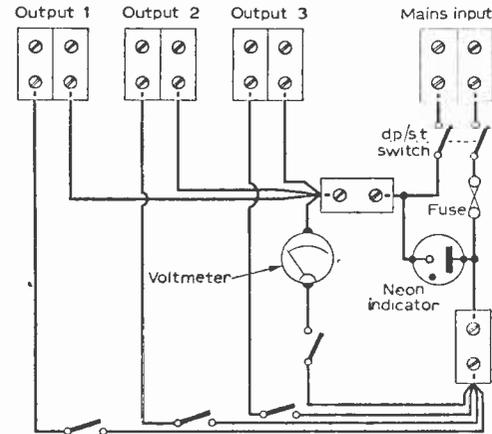
through switches to the three output terminals. More output terminals can be built in if desired.

Not only does the panel eliminate the need for double-adaptors, but enhances the appearance of the work-room layout and provides a central panel from where any piece of equipment can easily be switched on.

The chassis construction of the mains distribution panel is very simple. A small biscuit tin could be used, or alternatively, a laminated plastic on

plywood face, with 2in. x 1in. wood for the edges faced with laminated plastic and a plywood base-board with four small rubber feet.

A d.p.s.t. switch is used for the mains input while the output switches are s.p.s.t. The input and output terminals are provided by a row of 5A block connectors mounted on the surface of the panel. This row of connectors should be covered by means of a strip of plastic material to prevent the possibility of the live terminals being touched by hand. The fuse can either be the Sylok type or the flush panel mounting, and should be rated in such a way that if a short should occur, the panel fuse would be blown and not the house fuse.



through switches to the three output terminals. More output terminals can be built in if desired.

Not only does the panel eliminate the need for double-adaptors, but enhances the appearance of the work-room layout and provides a central panel from where any piece of equipment can easily be switched on.

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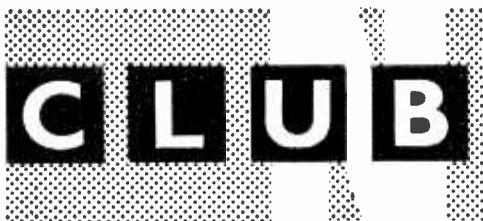
Fig. 1: The simple circuit of the unit.

plywood face, with 2in. x 1in. wood for the edges faced with laminated plastic and a plywood base-board with four small rubber feet.

A d.p.s.t. switch is used for the mains input while the output switches are s.p.s.t. The input and output terminals are provided by a row of 5A block connectors mounted on the surface of the panel. This row of connectors should be covered by means of a strip of plastic material to prevent the possibility of the live terminals being touched by hand. The fuse can either be the Sylok type or the flush panel mounting, and should be rated in such a way that if a short should occur, the panel fuse would be blown and not the house fuse.

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ACTON, BRENTFORD AND CHISWICK RADIO CLUB
 Hon. Sec.: G3GEH, 188 Gunnersbury Avenue, Acton, London, W.3.

Any local radio enthusiasts interested in joining this society are invited to attend the monthly meetings which are held at the A.E.U. Club, 66 High Road, Chiswick.

When the Club assembles for its next meeting—on 14th April—members will be carrying out some comparison tests on receivers.

BRADFORD RADIO SOCIETY

Hon. Sec.: E. G. Barker, G3OTO, 63 Woodcot Avenue, Baildon, Shipley, Yorkshire.

Society activities for March began with a junk sale on the 10th. A fortnight later however, came the more formal occasion of the Annual General Meeting, held on the 24th.

CLIFTON AMATEUR RADIO SOCIETY

Hon. Sec.: J. Rose, G3OGE, 63 Broomfield Road, Beckenham, Kent.

On 6th March members were entertained by G3IEQ, who was talking about his portable operation from Scotland.

Later in the month a number of members made a visit to Crystal Palace Amateur Radio Society in the first round of the inter-club quiz. On 3rd April it was the turn of Clifton to play hosts to Crystal Palace members, in the return half of the match.

FLINTSHIRE RADIO SOCIETY

Hon. Sec.: A. Antley, Fairholme, Fairfield Avenue, Rhyl, Flintshire.

After the usual practice period of slow Morse, the March meeting of this Society—held on the 31st—continued with the main part of the evening's programme which proceeded under the title "Animal, Vegetable or Mineral".

MELTON MOWBRAY AMATEUR RADIO SOCIETY

Hon. Sec.: D. W. Lilley, G3DFD, 23 Melton Road, Asfordby Hill, Melton Mowbray, Leicestershire.

At the meeting on 26th March, junior members of the Society brought along problems they had met as beginners to amateur radio, for discussion amongst other members at this open evening.

LIVERPOOL AND DISTRICT AMATEUR RADIO SOCIETY

Hon. Sec.: H. James, G3MCN, 448 East Prescott Road, Knotty Ash, Liverpool 14.

The Society's annual Hamfest was held on 7th March. This took the form of a dinner and dance and proved to be a memorable occasion for all members who attended. Three days after this members met to hold a Hamfest "post mortem".

The next two meetings were held on the 17th and 24th of the month and were respectively, a film show and a junk sale. Activities for the month ended with members taking part in a two-team quiz on the 31st.

NORTHERN HEIGHTS AMATEUR RADIO SOCIETY

Hon. Sec.: A. Robinson, G3MDW, Candy Cabin, Ogdon, Halifax, Yorkshire.

On 18th March, a group of members visited the Tape Recorder Centre in Halifax, where they were entertained by an interesting demonstration of hi-fi equipment.

A ragchew began the programme for the new month on 1st April.

READING AMATEUR RADIO CLUB

Hon. Sec.: R. G. Nash, G3EJA, "Peacehaven", 9 Holybrook Road, Reading, Berkshire.

The only meeting for March was held on the 28th and was devoted to gear for mobile operation.

SALOP AMATEUR RADIO SOCIETY

Hon. Sec.: K. E. Jones, G3RRN, Greystones, Shrewsbury Road, Church Stretton, Shropshire.

The lecturer at the meeting on 12th March was the Society's secretary, Dr. K. E. Jones, whose subject that evening was "Man, Medicine and Electrons".

SCARBOROUGH AMATEUR RADIO SOCIETY

Hon. Sec.: P. B. Briscoe, G8KU, "Roseacre", Irton, Scarborough, Yorkshire.

The full programme of events for March included a film show given on the 12th. This was followed a week later by a talk concerning simple formulae for the Radio Amateur's Examination.

At the final meeting for March, on the 26th, members were invited to deliver a five-minute address on any radio subject of their choice.

April began with a surplus sale on the 2nd.

SOUTH BIRMINGHAM RADIO SOCIETY

Hon. Sec.: T. W. Legg, Flat 3, 80 Alcester Road, Birmingham 23.

The March meeting of this Society was held on the 19th, when members who attended heard a tape recorded lecture.

SPEN VALLEY AMATEUR RADIO SOCIETY

Hon. Sec.: N. Pride, 100 Raikes Lane, Birstall, Leeds.

Members who attended the meeting on 7th March heard a lecture entitled "Communication Satellites". This was followed at the next meeting by a talk on "Silicon Semiconductors" given on 18th March.

STOCKPORT RADIO SOCIETY

Hon. Sec.: R. R. Diamond, G3SFN, 102 Chatsworth Road, Hazel Grove, Cheshire.

A recent innovation at meetings of this Society is the opportunity given to all junior members to discuss with a senior member, any questions or problems they have concerning their hobby. These discussions are held for 15 minutes before each meeting begins.

The highlight of the programme for March was the Ladies' Evening held on the 11th. At this event, members brought along their Y.L.'s and X.Y.L.'s for an evening's entertainment which had been organised for them, and for the opportunity to meet other members.

One of the oldest members of this Society, G2ARX, announced recently that he would present to the Society a Cup, to be awarded annually to the winner of an equipment construction competition.

STOURBRIDGE AND DISTRICT AMATEUR RADIO SOCIETY

Hon. Sec.: R. A. G. MacIntosh, 50 Field Lane, Oldswinford, Stourbridge, Worcestershire.

The Annual General Meeting of this Society was held on 10th March, when official Society business was reviewed.

UNIVERSITY OF KEELE RADIO SOCIETY

V. J. Reynolds, G3COY, 90 Prince's Road, Hartshill, Stoke-on-Trent, Staffordshire.

This Society is currently engaged with plans for its participation in the Midlands Mobile Rally, to be held at Trentham Gardens on 19th April. On this date, the Society will perform the duty of an out-station on the talk-in network on 160m. During the Rally the station will be on the air under call sign G3COY on 1960kc/s.

WEST KENT AMATEUR RADIO SOCIETY

R. Trevitt, 28 Dales Avenue, Tunbridge Wells, Kent.

Because of the Easter holiday, only one meeting was held during March, this being on the 13th. At this meeting members saw a demonstration of various pieces of test equipment.

MIDLAND MOBILE RALLY

This year's rally is to be held on 19th April at Trentham Gardens, Trentham, Nr. Stoke-on-Trent, Staffordshire. Talk-in stations will be provided on 160m, 80m and 2m.

Organised jointly by the Midland Amateur Radio Society and the Stoke-on-Trent Radio Society, this event should prove to be an enjoyable occasion for all those who attend. In addition to the rally of mobiles from all over the country, an exhibition of radio society and trade stands will be staged, and of special interest will be a display of amateur television.

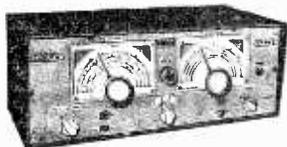
In the grounds, the R.A.F. mountain rescue unit will give demonstrations and there will be water skiing on the lake.

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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 640 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.



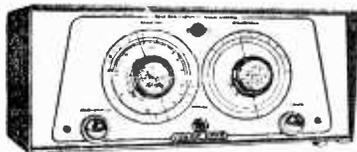
G3RIA writes . . . The results in conjunction with my Eddystone 888 are amazing. Signals are twice as strong with much higher signal/noise ratio. A first-class product well worth the money. The P.R.30 uses EF183 Frame Grid R.F. Amplifier and provides up to 20 dB gain. Features include vernier tuning, 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 BUILT, 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** Carr. 3/6.

P.R.30X self powered with internal power supply for 200-250 volt A.C. Will provide 200 volts up to 25 mA and 6.3 volts 1 amp. for other accessories. **£7.2.0** Carr. 3/6.

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★ Both models are ready built with all cables, instructions.
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- ★ Peak Performance short wave battery receiver. **88/6**
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- ★ 2 Mullard transistor amplifiers, pre-assembled and tested.
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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 7½in. 6/9 extra if required. Extra Coils 4/9 each.

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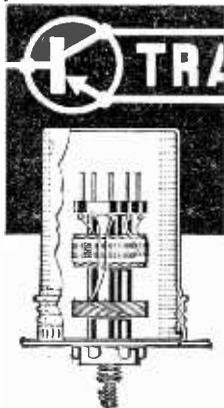
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TRANSISTOR TUNING COILS

- Coils for transistor superhets or converters, with or without an R.F. stage and using 465 Kc/s or 1.6 Mc/s I.F.
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Full technical details now included in Technical Bulletin DTB.4—1/6d.

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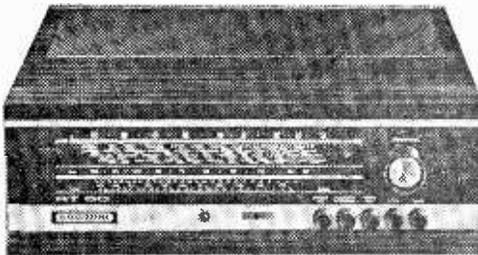
rade ews

Hi-Fi Tuner

THE new a.m./f.m. tuner, just released by

Grundig Limited, employs twelve valves and fifteen semi-conductors in its circuit, providing a.m. coverage from 510kc/s to 1,620kc/s and f.m. coverage from 87Mc/s to 104Mc/s. The circuit features switchable automatic frequency control and a stereo decoder stage on f.m., and switchable bandwidth selection on a.m. Several other worthwhile facilities are provided.

Finished in a smart teak case, the tuner (model RT50) comes from Grundig (Great Britain) Limited, 40 Newlands Park, Sydenham, London, S.E.26.



The Grundig a.m./f.m. tuner model RT50.

Automatic Record Changer

THE model 3000LM is a new automatic record changer produced by Garrard Engineering Limited. This deck will take up to eight records of various sizes at four speeds, but it can also be used as a single play deck, when the record spindle is replaced by a special short spindle, supplied with each deck.

Another feature of Garrard's new changer, is the low mass pick-up arm incorporated into the design. This design technique eliminates the mass and resonance of the pick-up arm, thus ensuring

that the best possible performance is obtained from the pick-up cartridge. Reduced record wear is also achieved through this arrangement.

The manufacturers of the 3000LM record changer are Garrard Engineering Limited, Newcastle Street, Swindon.

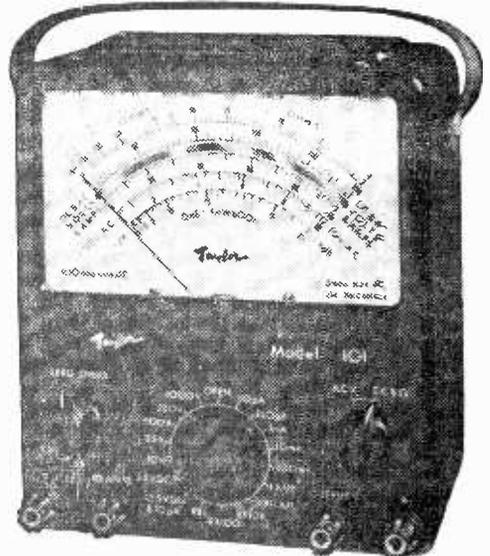


This is the 3000LM record changer made by Garrard.

100,000 Ω /V Multimeter

A NEW multimeter from Taylor's has a sensitivity of 100,000 Ω /V. This instrument—the model 101—should find many applications in radio and television servicing and in transistor radio and television measurements. In many applications, the model 101 can be used in place of a valve voltmeter, but without the inconvenience of zero drift, valve replacement, and a.c. supply connections inherent in valve voltmeters. The instrument incorporates a rugged 7 μ A centre pole movement which features a mirror arc on the scale to assist readings.

Ranges of the 101 include a 10 μ A range and resistance measurements to 200M Ω . The manufacturers of this instrument are Taylor Electrical Instruments Limited, Montrose Avenue, Slough, Buckinghamshire.



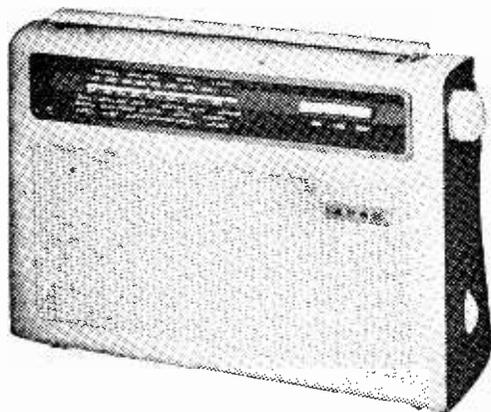
The model 101 multimeter from Taylor Limited.

7-Transistor Portable

RECENTLY introduced into the range of Bush radios is the TR112 transistor portable. This receiver covers the long and medium wave bands and provides a power output of 300mW through a 6in. x 4in. elliptical loudspeaker.

The 7-transistor circuit has an average power consumption of 20mA which is supplied by the usual 9V battery. Tone control is provided and wave band selection is accomplished by push-button switches.

The wooden cabinet is covered mainly in calf vynide material with walnut veneer end panels. **Bush Radio, Power Road, Chiswick, London, W.4, make the TR112, which costs 21 guineas.**



This new 7-transistor portable joins the range of Bush radios.

A Simple 2-stage Amplifier

—continued from page 67

of the chassis, as revealed by the broken-line in Fig. 2, and the connecting leads are directed through grommets to the various circuits underneath the chassis.

The smoothing and filter electrolytics on the h.t. line comprise two dual units C9/10 and C4/6. These are of the metal case variety and are mounted by clips on the top of the chassis, with chassis cut-outs to allow connection to the tags. The bridge rectifier is clamped on to the chassis to balance with C9/10.

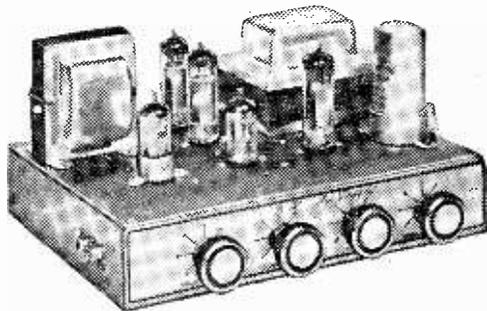
The speaker circuit is terminated at a two-point socket, but if preferred the speaker leads may be soldered directly into the circuit. Note that negative feedback will occur only when the "earth" and feedback connections on the secondary of the output transformer are correctly phased. If the connections are the wrong way round positive feedback will take place. This is exhibited by very bad instability which is completely uncontrollable. Should this happen, the black inner conductor of

14W Amplifier

TECHNICAL SUPPLIERS LIMITED have announced a new 14W high fidelity amplifier available either ready assembled or in kit form. The amplifier which is known as the B.H. High Fidelity 14, offers separate mixing facilities and full range bass and treble cut and lift controls. As a kit, the amplifier sells for nine guineas; manufactured and fully tested it costs eleven guineas.

Three or 15Ω outputs are provided and with an input sensitivity of 5 and 40mV respectively, 14W output is obtained. Frequency response is 30c/s to 16kc/s ± 2dB at 10W output.

Technical Suppliers Limited, Hudson House, 63 Goldhawk Road, London, W.12 are the makers of this amplifier.



T.S.L.'s new 14W amplifier.

Trade Note Correction

We wish to bring to the attention of readers the fact that the Irongate (M.O.) Company Limited are the *sole U.K. stockists* of the transistor tester featured in the Trade News page of the March issue, and *not* as stated in that item, the manufacturers of this equipment.

the screened negative feedback cable and the chassis connection to the speaker socket should be reversed.

Provided the layout is adhered to there should be no problems in getting the amplifier to work correctly. For full output the amplifier requires in the order of 400mV of input signal, and this is readily available from a crystal or ceramic type of pickup. ■

ECLL800 Audio Valve

THIS new valve used in the "7-20" Stereo Amplifier which was described in the March issue of PRACTICAL WIRELESS, consists of a triode and two power pentodes within one envelope and has a novel (B9A) base.

Developed and manufactured by Standard Electric Lorenz A.G., West Germany, the ECLL800 is now available in the U.K. from *Messrs Lugton and Co., 209-212 Tottenham Court Road, London W.1.*

NOW! ANOTHER PURCHASE of the year's keenest TAPE RECORDER BARGAIN!



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 - B.S.R. Monardeck Type T.D.2 **\$7.7.0** + 4/6 Carr.
 - Accessories—Mike, Tape, Screened Lead Plugs, etc. **\$1.0.0** + 2/- Carr.
 - COMPLETE KIT comprising Items above **15 gns.** + 10/- Carr.
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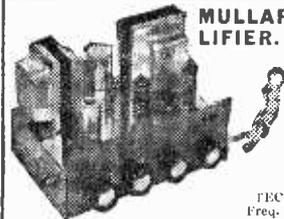
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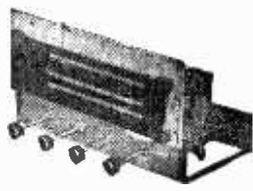
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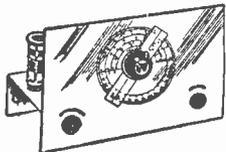
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The text is written for the young beginner and naturally more advanced readers will find some of the information superfluous. The author is sure that any beginner will be able to make this radio as a result of this article.

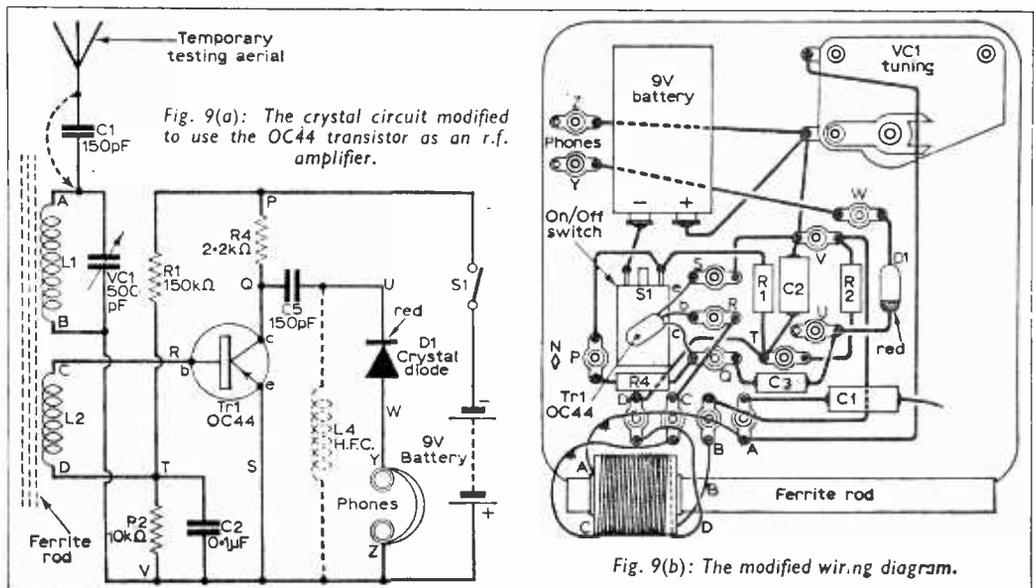
CONTINUED FROM PAGE 1181 OF THE APRIL ISSUE

BY E. V. KING

IT may seem odd that having described in last month's issue, how to make the OC44 transistor Tr1 operate as an a.f. amplifier, we should now convert it to an r.f. amplifier! Actually in the final version of this receiver it acts as both! This is known as reflexing and since the circuit for this arrangement is rather difficult for the beginner to understand we are building it bit by bit and testing at each stage.

Fig. 9 shows the next modification with all wiring. The following wires (see Fig. 8) are removed or altered:

1. Disconnect from the phones the lead which goes to R4. Connect this lead to the switch S1.
2. Remove entirely the other phone lead.
3. Remove both ends of the coil L2 (plastic-covered leads), then connect the knotted end to tag "C" and the other end to tag "D".
4. Disconnect from the base of Tr the lead which goes to D1. Connect this lead to one phone terminal.
5. Connect the other phone terminal to the rotor of VC1.



- Connect C3 (150pF) between the collector of the transistor and the red end of the diode.
- Join coil tag "C" to the base of the transistor.
- Join coil tag "D" to the junction of R1, R2 and C2 (at tag T).

Testing the R.F. Amplifier

The circuit is now as in Fig. 9 (without L4) and the wiring should all be carefully checked. The aerial is placed on tag "A", the lead earth on tag "B" and the ferrite rod moved almost completely out of the coil. The Light Programme should now be heard, heavily damped over most of the scale. If the aerial is removed from C1 the station will be very weak but should be tunable with the ferrite rod positioned midway in the coil.

The r.f. choke L4 is next made and temporarily connected.

Making the R.F. Choke

An ordinary $\frac{1}{4}$ in. coil former with dust-iron slugs is required. Four pieces of $\frac{1}{4}$ in. rubber tube are then cut as shown in Fig. 10 and they are slid over the former to make slots. Some fine wire, the gauge of which is not critical, is then wound on, all in one direction, so that every slot has exactly 200 turns in it. If there is room in the slots it is advantageous to put on 300 turns but the number of turns in each slot must be the same. The ends of the wires are scraped clean and taken to tags which are conveniently fitted to screws used for fixing the choke.

Fitting and Testing the Choke

The receiver is working as explained with the circuit of Fig. 9. The r.f. choke is now wired temporarily between the red end of the diode and the rotor of the tuning capacitor. The volume of the receiver will now be as loud as it was when the OC44 transistor was employed as an a.f. amplifier. Tuning will be sharp and adequate. Only in very strong signal areas, however, will the receiver work without an aerial.

The choke is now fitted carefully, using tags U and V. This will automatically put it in circuit if the coil ends go also to these tags.

Combined A.F. and R.F. Amplifier

The next stage in the development of this receiver is the conversion to "reflex operation".

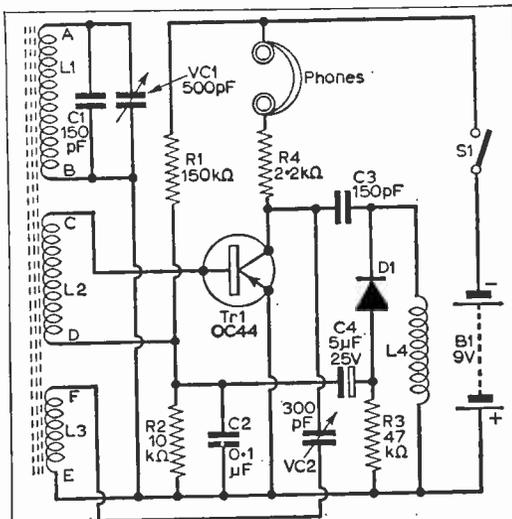


Fig. 11a (above): The reflex circuit (long waves only) with reaction.

Fig. 11b (below): The wiring of the regenerative receiver.

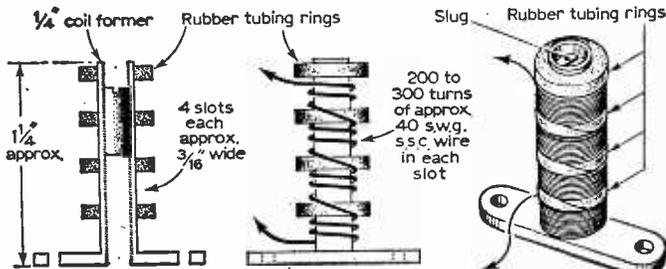
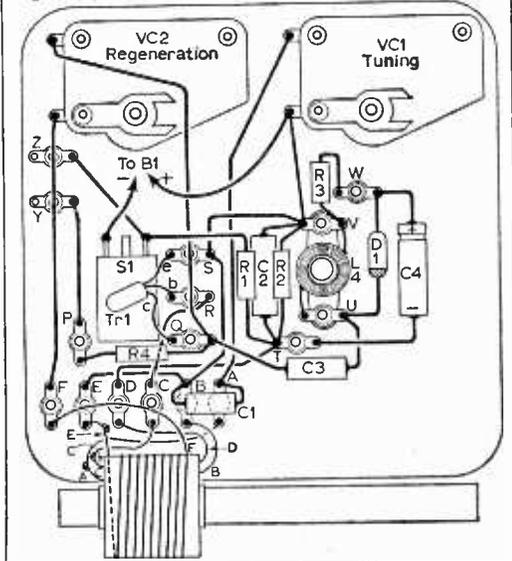


Fig. 10: Winding details of the r.f. choke, L4.

This means that the transistor Tr1 will function as an r.f. amplifier as well as an a.f. amplifier.

The operative circuit will be as in Fig. 11 (except that VC2 and L3 will not initially be connected. L1 tunes to the desired station; it is transformer-coupled to L2 which feeds r.f. into the OC44 transistor. The amplified r.f. is "choked" off by R4 and the phone windings (these act as a r.f. choke) and is thus forced

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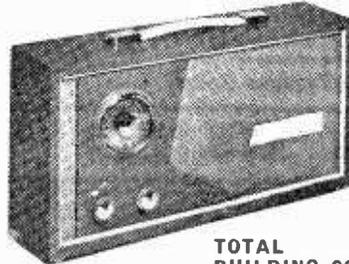


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through C3, where it sets up oscillations across L4, which may be assumed to be a very broadly tuned circuit.

The r.f. signal across L4 is rectified by the diode D1 and generates a voltage across R3, the diode load resistor. L.F. audio frequency variations (i.e. vibrations caused by speech or music) can pass C4, which is of high capacity, and this a.f. or audio signal is fed back to the transistor base via the coil L2.

The OC44 transistor amplifies these audio vibrations but they cannot pass the small capacitor C3 and thus are fed along R4 into the phones. This process is known as "reflexing" and it gives the gain of two transistors with only one being actually used.

Resistors R1 and R2 form a bias network splitting the battery voltage in the ratio 15:1, giving the coil L2 a potential of approximately 0.5V negative relative to the positive line. This will give a collector current of about 2mA in the transistor.

Later a feedback coil (L3) will be fitted and also a feedback capacitor VC2. These two components together will give reaction and the receiver will then work anywhere in the British Isles without an external aerial.

Reflex Wiring (Fig. 11)

The wiring modifications are as follows.

1. Test the receiver as working at stage of Fig. 9 with the choke L4 fitted.
2. Remove both phone wires.
3. Remove the wire from R4 to switch S1 and connect one from R4 to phones.
4. Connect the other phone tag to switch S1.
5. Connect C4 with positive end to diode black.
6. Connect negative end of C4 to tag "T".
7. Connect black of diode to R3 and other end of R3 to rotor of tuning capacitor VC1 or tag V.
8. The choke L4 is now fitted. This is easy but great care is required to keep the wiring correct. The tags labelled U and V are made the choke terminals (or tags) and may usually be conveniently made the fixing screws as well. Check the wiring carefully with Fig. 11.
9. Make sure the small capacitor C3 is between the diode side of the choke and the collector of the OC44 transistor.

Testing the Reflexing

The receiver is fixed as before and this time the volume will be so great that in most places the Light Programme will come in at an uncomfortable volume which is easily audible two yards or more away from good phones (reed type). The current taken is still only about 2mA. The tuning will be somewhat flat and unselective.

The choke has an appreciable effect in this circuit: if wound as in the instructions all is well, if a purchased one is used the ordinary TV-type h.f. choke is *not* suitable and readers must specify that the choke is for medium and long waves only.

Adding Regeneration

When regeneration (or "reaction") is added the set will work without an external aerial, the ferrite rod being sufficient. The tuning will be more selective but somewhat more difficult, since the variable regeneration control VC2 has some effect on the settings of the tuning capacitor VC1.

For regeneration an additional coil, L3, is wound on the two coils already wound. This is done as shown in Fig. 4, stage 4. (See March issue.) The directions of winding are most important.

The following wiring is then carried out:

1. Solder aerial reaction coil L3 ends E and F to their respective tags.
2. Join tag F to reaction capacitor VC2 rotor and tag E to tag B (battery+ line).
3. Wire stator of VC2 to the collector of the OC44.
4. Wire spare end of C1 to tag B.
5. Inspect carefully for any shorts, especially between tags for anchoring the aerial coil connections.

These connections are already shown in Fig. 11.

Testing with Regeneration

No aerial is required. Place the ferrite rod in the coil and switch on. Adjust VC1 so that the vanes are fully opened and then close VC2 until oscillation at audio frequency is heard. If it is not then something is wrong. The trouble in this event may be due to a poor, insensitive transistor or the r.f. choke L4 may be at fault. The direction of the coil windings is all-important. Remember, the aerial is directional.

Assuming oscillations are heard, reduce the capacity of VC2 until they just cease. This point is the most sensitive and when tuning VC1 the reaction control VC2 must be constantly adjusted so that the oscillations are *just* on the point of commencing. This will take some getting used to as VC2 is not a volume control but a sensitivity control.

The Light Programme will come in at good strength (say three times as loud as a crystal set with a long aerial), although no external aerial is required.

With this station tuned in VC1 will be about halfway out and VC2 may be anywhere, but we want now to get the reaction adjusted for optimum ease of adjustment. This is performed as follows: Fully close VC1 and adjust VC2 until oscillation just occurs. If this occurs with VC2 nearly fully in all is well. On the other hand, if this control is opened to any great degree then one turn at a time must be taken off L3 (the last coil wound) until oscillation occurs only when VC2 is almost fully in. In this way the reaction adjustment will be found to be much finer, steadier and easier.

The long wave section is now complete. The receiver should now be thoroughly tested as working and then every wire and component should be laid out carefully and methodically so that further modifications may be carried out without any mishaps to the part already done.

Some younger readers may feel that they have done enough for now and the unit may now, if desired, be housed in a plastic sandwich box and it will give good service in this way.

How the Reaction Works

The r.f. oscillations are choked off after leaving the collector of the OC44 by R4 and the phone windings, some pass C3 to the diode and are rectified but some pass through VC2 to the feedback coil L3. Here, provided the coil is wound the correct way, magnetic coupling will feed additional r.f. into L2. additional, that is, to the r.f. being fed into L2 by L1 (and the ferrite rod). If L3 winding direction is correct the r.f. will be in phase (will increase amplification), but the reverse is also true. The number of turns suggested for L3 will suit the worst OC44 but a good one will probably only need five or six turns. The less the better as long as feedback is sufficient, since the less turns on L3 the less the tuning of L1 will be affected.

Adding Another Transistor

The receiver is now as shown in Fig. 11. It is proposed now to fit a second transistor, a

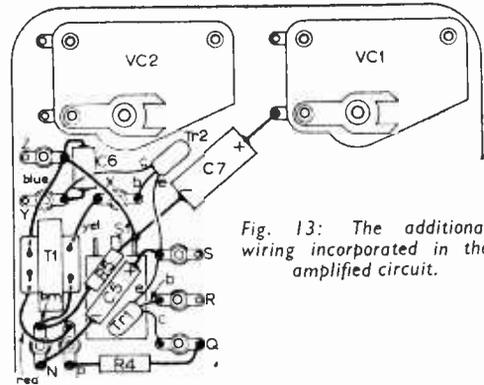


Fig. 13: The additional wiring incorporated in the amplified circuit.

this resistor. The other phone tag is left wired to the switch and the blue transformer wire is also soldered to it. The yellow lead is soldered to the tag marked "X" and it must be checked that this tag is not fouled by the capacitor vanes when they open.

The brown lead is soldered to a small tag labelled "N" and is coupled to the switch via R5. From the "N" side of R5 connect C5 with the positive end to the emitter of the OC44. Connect C6 across the phone terminals. Carefully sleeve the leads of the OC81 and solder the emitter to the emitter of the OC44, the base to tag "X" (yellow transformer lead) and the collector to the open-circuit phone tag. Check that the circuit complies with Figs. 12 and 13.

Testing the Amplifier Circuit

The phones and battery are re-connected and on test the receiver will now be much more powerful and Droitwich should be heard easily with the phones laid on the table. Remember to set the reaction control almost on the point of oscillation. If a milliammeter is available the current should be about 8mA, but this is not very critical as long as it is not creeping up. Good volume can be obtained with a current of only 3mA and adjustment of this current is possible by carefully altering the value of R5. If it is made of lower resistance the current will increase, not necessarily with any increase in volume. Good results with low consumption of battery current may be obtained with R5 at 200kΩ.

Check now that the vanes of VC2 cannot foul the OC81 leads.

In the concluding part of this series next month, the receiver circuit will be modified, once again, to include medium as well as long waves in its coverage.

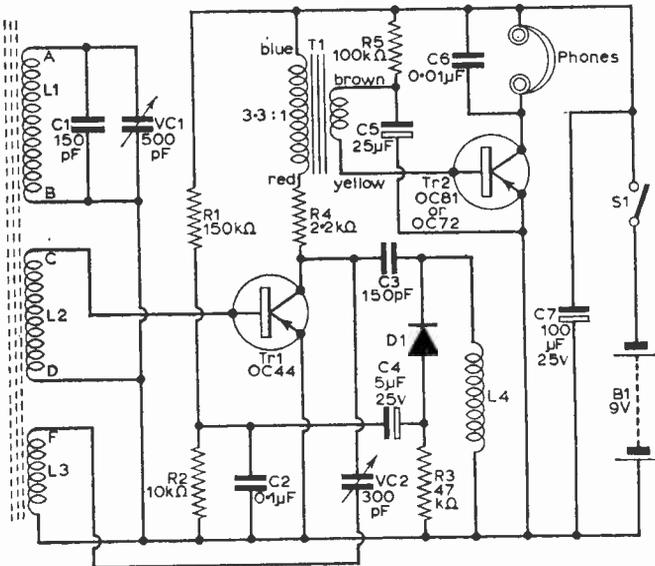


Fig. 12: An amplified version of the reaction circuit.

type OC81, as shown in Figs. 12 and 13.

The audio frequency transformer T1 is fairly critical and the correct one should be obtained and fitted through the two holes indicated in Fig. 1. (Radiospares type T/T3, ratio 3:3:1.) The tags are soldered to a thick wire as shown in Fig. 2(b)—see March issue.

Wiring the OC81

The circuit of Fig. 12 is now to be completed, the new wiring being shown in Fig. 13.

The lead from R4 to the phones is removed entirely and the red transformer lead attached to

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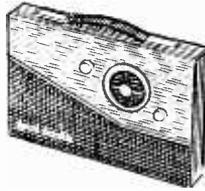
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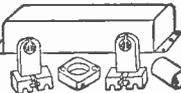
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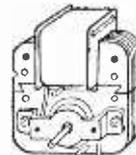
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3.	3/11	4/6	5/2	5/9	6/5	7/-	7/6	8/3	8/6	9/6	10/1	10/1
4.	4/6	5/4	6/2	7/-	7/10	8/8	9/5	10/4	10/10	12/-	12/6	12/6
5.	5/2	6/2	7/3	8/3	8/9	10/1	11/3	12/5	13/1	14/6	15/6	15/6
6.	5/9	7/-	8/3	9/6	10/9	12/-	13/2	14/6	15/8	17/-	18/3	18/3
7.	6/5	7/10	9/4	10/9	12/3	13/8	15/1	16/1	17/6	19/6	20/11	20/11
8.	7/-	8/8	10/4	12/-	13/8	15/4	17/-	18/8	19/8	22/-	23/5	23/5
9.	7/8	9/6	11/5	13/3	15/4	17/-	18/10	20/9	21/11	24/6	26/4	26/4
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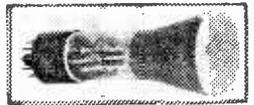
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LETTERS TO THE EDITOR

A MEETING GROUND FOR THE RADIO ENTHUSIAST

SIR.—Every month your magazine devotes a page to the activities of the amateur radio societies. As readers will have noticed, much of the activity is concerned with what we pithily refer to as “ham” radio and the impression is that club members are a bunch of technically informed gentlemen with a good deal of expensive and complicated equipment. There is, however, a huge army of radio enthusiasts throughout the country who regularly subscribe to P.W. but who are deterred from joining the local radio society because of the fear that their lack of technical knowledge would deprive them of the enjoyment of full participation.

For them, the more novice yet nonetheless enthusiastic readers of this journal, there are in most districts, particularly in London and the bigger towns, the local Evening Institute which provides classes in radio and television. There are, of course, special courses organised by Technical Colleges for those with the serious intention of taking up radio as a career, but the general Institutes hold classes for the radio enthusiast who regards his interest as his hobby.

The accent of these classes is on the practical side and those who attend are encouraged to build equipment or even to take along their own faulty receivers so that they can be shown how to repair them.

The feature of these radio classes which should be especially attractive to young P.W. readers, is that they provide an organised meeting ground for all who are interested in practical radio and who wish to enlarge their knowledge of their favourite hobby in a social atmosphere.—H. NAYLOR CALEY (London).

POCKET SIGNAL INJECTOR CASE

SIR.—Last year I began construction of the Pocket Signal Injector by Mr. R. W. Kneeshaw, described in the July issue of P.W. All the parts were easy to obtain, but for one item—the penlight torch case. I searched every Woolworth store in Cardiff only to be told that it was out of stock and would not be renewed.

Now again, I am unable to obtain the same case for the Pocket Signal Tracer which appeared in the March '64 edition. I would therefore be glad of your advice in this matter.—G. L. DAVIS (Gabalra, Cardiff).

SIR.—With reference to the availability of the penlight torch cases specified in my articles on the Pocket Signal Injector and Signal Tracer, it

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

does appear that Woolworths no longer sell these but I suggest that an alternative “penlight” casing that could easily be adapted, is readily obtainable from Boots Chemists.

In my opinion this case would produce an even more professional looking unit than the original. No circuit alterations are required but, because of its slightly greater length, the inner chassis of either unit would have to be slightly longer with the width remaining the same. This, of course, will present no special problems. A slightly modified method of attaching the probe tip may also have to be evolved, but again this should not prove difficult for the constructor.

The Boots case also has the advantage of a push-button on/off switch incorporated at its end, this being a great improvement on the original.

I trust that this information will prove useful to any of your readers contemplating the construction of either of these units. — R. W. KNEESHAW (Bristol 6).

MODE OF OPERATION

SIR.—Being interested in transistor gadgets, I recently constructed Mr. P. Rowe's Thermostat described in your December 1963 issue. I find this device very sensitive, but the mode of operation is the reverse of that given in the text, i.e. a rise in temperature causes the relay to operate. I therefore suggest that a relay with normally closed contacts be used instead of the type specified.—D. H. COX (Leeds, 17).

[In reference to this letter, the author has verified Mr Cox's remarks and observes that the sentence on page 761 beginning “When the temperature of the sensing transistor Tr1 rises . . .” should read “When the temperature of the sensing transistor Tr1 falls, . . .” A relay with normally closed contacts should, of course, be used.—Ed.]

NOT SUCH A GOOD THING

SIR.—At the risk of offending your Scots readers I feel I must, as a music-loving Englishman, protest the suggestion of your correspondent, Mr. J. F. Jameson (April P.W.) that you should publish a bagpipe amplifier design. However, his comments, apart from this, I agree with. Perhaps too much space is being devoted to musical applications of electronics in your pages. I feel there must be other outlets for your contributors who find insufficient inspiration in superhets and radio-grans.

Now that your guitar-playing readers have been catered for, how about getting back to conventional designs?—S. D. STEBBINGS (Bournemouth, Hampshire).

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SIR—I have just acquired a tape recorder and I would like to "tapespond" with readers of P.W. I am interested in learning Esperanto and so would especially welcome tape correspondence from readers with similar interests.—**M. L. VAN DE LINDE**, 2 Cowie Street, Sidwell, Port Elizabeth, South Africa.

SIR—I would like to hear from readers in any country, who have an interest in electronics and are of my own age—16. I will answer all letters received.—**MICHAEL ALKALAY**, 37 Prince Street Gardens, Cape Town, South Africa.

SIR—As a regular reader of P.W. and an enthusiast of transistor circuits, I would like a correspondent of my own age (14) in Great Britain. I will answer all correspondence.—**D. PURTON**, "Mount Pleasant", Pakenham, Victoria, Australia.

SIR—I am an enthusiast of amateur radio and I would like a correspondent in England having similar interests.—**M. MAHADEVA RAJU**, B.Sc., 4 Cubbon Pet, 12th Cross, Bangalore 2, South India.

SIR—I am interested in radio and electrical service technology and I would like to correspond with radio servicemen from any country. I will answer promptly all letters received.—**N. O. AZUBUINE**, P.O. Box 359, Port Harcourt, Nigeria.

Sir—I would be grateful if any reader could sell or loan me . . .

. . . the circuit and servicing manual of the Marconi receiver CR 150. If required I will return any data by registered mail.—**V. SAMMUT**, 158 Old Theatre Street, Valletta, Malta.

. . . the instruction manual for the Eddystone receiver model S.750.—**E. RAWSTRON**, 146 Partington Street, Castleton, Rochdale, Lancashire.

. . . the October and November 1960 issues of P.W.—**J. G. WOODLEY**, 6 Perry Avenue, Cullercoats, Northumberland.

. . . the February and April 1962 issues of P.W.—**J. F. MOYNIHAN**, 4 Leeson Park, Dublin, 6, Irish Republic.

. . . E. M. Squire's "Radio Questions and Answers", volume 2, Radio Receivers.—**Rev. E. A. MCCARTHY**, The Vicarage, East Ruston, Stalham, Norwich, Norfolk. **NOR 18Z**.

. . . the issues of P.W. dealing with the No. 19 Set.—**J. F. ROWLES**, 5 Tower Road, Southsea, Hampshire.

. . . the February 1961 issue of P.W.—**A. SLADI**, 12 Greywethers Avenue, Swindon, Wiltshire.

. . . information on the indicating unit type 221.—**S. FOWLER**, 66 Chiltern View Road, Uxbridge, Middlesex.

. . . the circuit of the Bendix aircraft receiver type RA 1B.—**D. W. HANNANT**, 6 Recreation Road, Gorleston, Great Yarmouth, Norfolk.

. . . the June 1961 and March 1963 issues of P.W.—**C. HARGIS**, "Loddington Grange," 13 Knole Road, Boscombe Bournemouth, Hampshire.

. . . the handbook or any information for the Halli-crafter BC669 transmitter/receiver, and the Bendix BC 433 radio compass.—**P. L. MOGFORD**, 27 Ynysmaerdy Road, Briton Ferry Neath, Glamorganshire.

. . . the July, August and September 1963 issues of P.W.—**M. J. CHELL**, 13 Hampden Road, Leicester.

. . . conversion data for the R1155 receiver.—**P. HUGHES**, 4 Ingram Road, Beechwood Gardens, Coventry, Warwickshire.

CORRIGENDA

The Malvern Tape Recorder

When this article was published in the July 1963 issue of PRACTICAL WIRELESS, a number of readers found difficulty in obtaining Mullard or G.E.C. ferrite cores LA1 and LA2 as specified. At that time it was not possible to recommend a supplier for these components. Now, however, we can inform readers that Henry's Radio keep a complete range in stock.

The Euphon

This article was published in the October 1963 issue of PRACTICAL WIRELESS and we bring to the attention of readers the following point which was omitted from the text and which, although perhaps obvious to experienced readers, might not have been apparent to any beginners attempting the construction.

Any other loudspeakers in operation should be cut out to obtain the required effect with the Euphon, the two it feeds *only* being alive.

Another observation which would best be pointed out is that if a high volume is required, the h.f. speaker must not be *too* small or it will not handle the volume. The l.f. speaker must always be considerably larger than the h.f. unit; but it must also be remembered that too large a base loud-speaker will emphasise bass more than is required.

Six-band T.R.F. Receiver

—continued from page 55

distance results. Local transmissions may overload V2, so the gain of V1 must then be reduced by means of VR1.

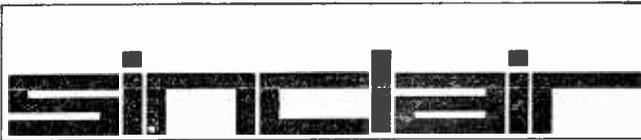
Quite a good degree of selectivity is obtainable when VR2 is adjusted to bring the detector near the oscillation point. If VR1 and VR3 are both at maximum volume, and VR2 is turned back, to reduce volume, tuning will be flat, and sensitivity poor. It is thus frequently necessary to keep VR2 carefully adjusted so that the detector is nearly oscillating, and reduce gain by VR1. In these circumstances, selectivity is surprisingly good, even for congested s.w. bands, and distant stations can be received.

Loose wiring, or a microphonic valve, can result in a ringing or continuous noise commencing whenever the regeneration control is critically adjusted. A screening can over V2 will help prevent this trouble.

If mains interference is bad, a r.f. choke may be wired from the telescopic aerial to chassis. By-pass capacitors (about 0.01 μ F) can also be wired in parallel with the mains transformer primary, or from mains leads to earth.

If desired, an external aerial tuner can be constructed. This consists of a suitable coil, with parallel capacitor, tunable to the band required. This tuner unit which is simply wired from aerial to chassis, will be found to increase the volume of weak transmissions, and help eliminate possible breakthrough of strong, local stations.

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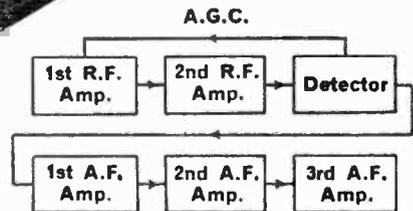
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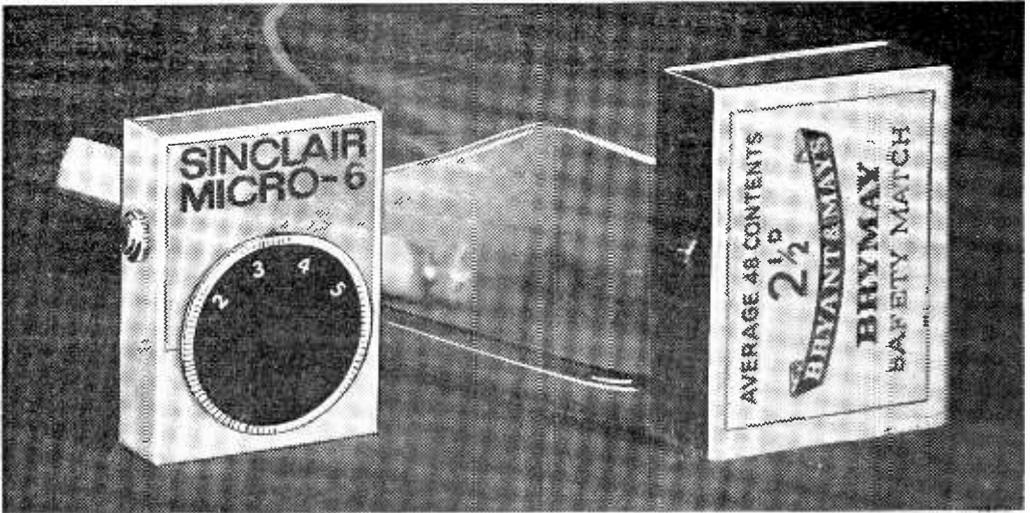
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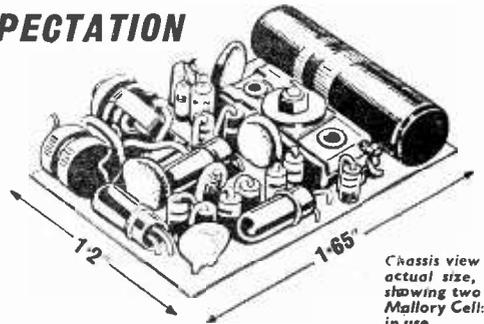


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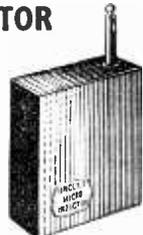
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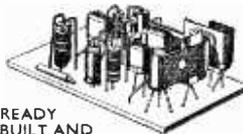
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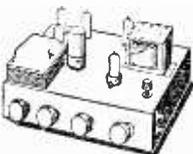
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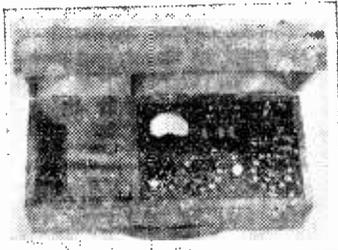
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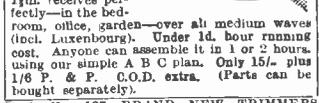
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DL91 7/6	EF91 4/-	K736 17/6	PL82 7/6	U404 10/-	Z77 7/-	6F6 6/9	7D6 15/-	30L1 8/6
DL92 5/6	EF92 4/-	K766 15/-	PL87 7/6	U801 19/6	Z152 5/-	6F12 4/-	7D8 15/-	30L15 11/-
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EAC91 4/6	EL3 21/6	LN309 9/-	PX25 25/-	UBL21 20/-	1R5 5/6	6F26 13/6	10C1 12/6	30PL13 12/6
EAF42 9/6	EL32 4/6	LZ319 12/6	PY31 15/-	UCC84 11/6	1R4 3/6	6F33 5/6	10C2 17/6	30PL14 12/6
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EB91 4/-	EL35 10/-	MVS'PEN 17/6	PY81 6/6	UCH21 20/-	1U5 5/9	6J5GT 4/6	10I5 23/6	35Z4 6/6
EBC3 21/6	EL37 17/6	MVS/PENB 15/-	PY82 5/6	UCH22 8/6	2P 22/6	6J7 7/6	12A6 6/6	35Z5 8/6
EBC33 4/6	EL38 17/6	MU14 9/6	PY83 8/-	UCH81 7/-	3A4 5/-	6J7GT 5/-	12A8H 11/-	41STH 22/6
EBC41 8/6	EL41 9/6	MU14 9/6	PY88 10/-	UCL82 9/-	3A5 10/6	6J7GT 7/6	12AT6 7/6	50C5 10/-
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RM3 10/-	14A100	28/-	18RA 1-1-8-1	5/- (FC118)
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Features 2½in. DG7/5 Tube. Level 2dB, 50 c/s to 2 Mc/s. 3½ Sec. to 80µ Sec. Sweep. High sensitivity. Fully portable scopes. Ideal for all transistor and valve design or servicing. 22 to 30 volt D.C. operated. Mains transformer for 220/250 volts A.C. conversion 22/6.

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3.9 volt 450mA/H, 12/6.
All types easily split into any multiple of 1.2 volt. Brand new.



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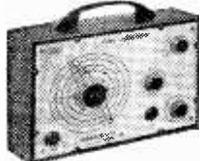
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Each box fully calibrated with insulated leads. Invaluable for service and design.

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5in. 600ft., 12/6; 5in. 900ft., 15/-; 7in. 1,200ft., 18/6; 7in. 1,800ft., 25/-; 7in. 2,400ft., 27/6. Excellent quality.

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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.

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Each blueprint in this series contains details of two separate instruments or items of equipment.

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The PW Signal Generator			
The Savoy VHF Tuner	}	*	5/-
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The Berkeley Loudspeaker Enclosure	}	*	5/-
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The PW Britannic Two	}	*	6/-
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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 May, 1964, and must accompany all queries in accordance with the notice on our "Letters to the Editor" page.

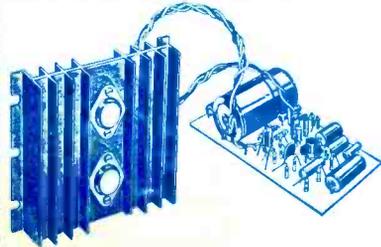
PRACTICAL WIRELESS, MAY, 1964.

NEW! 84 PAGE FULLY DETAILED AND ILLUSTRATED CATALOGUE. HUNDREDS OF NEW ITEMS AND PRICE REDUCTIONS. PRICE 2/-.

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RESULTS WILL AMAZE YOU!



● **POWER AMPLIFIERS.** Two versions. ± 1 dB 40 c/s to 20 kc/s. 60dB Feedback. 100mV input and less than 0.25% distortion for 10 watts output. 3 and 15 ohm versions. Very low current. 6-Transistors and Rectifier.

★ 3 ohm 10 Watt. BUILT **£5.10.0** P.P. 2/6.
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★ **MAINS UNIT**—will run 2-amplifiers for 3 ohm and 15 ohm. 6/6, P.P. 2/6. Each type.

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★ **Preamplifier Built.**
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PERFORMANCE EQUAL TO VALVE UNITS OF FOUR TIMES THE PRICE AND VERY MUCH LARGER.

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Dark Brown and Gold Panel Plate. 8/6.

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Complete in every detail.
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ALL AUDIOKITS IN STOCK

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(As described in December 1963 Edition of "Radio Constructor").

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- ★ 4 Diodes.
- ★ Full coverage 87 to 105 Mc/s.

★ **AFC and AVC.** Printed circuit design of high sensitivity and quality. Output for valve or transistor amplifiers. Size 3½ x 2½ x 4in. Simplified building instructions. All parts sold separately.



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★ 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 600mW push-pull output.

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★ 6 Mullard Transistors and 2 Diodes.

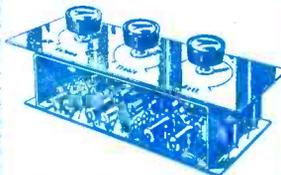
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UNBEATABLE FOR QUALITY AND VALUE

7-TRANSISTOR RECORD/PLAYER/RADIOGRAM AMPLIFIER

- 4 watt peak output.
- Full Treble and Bass boost and cut.
- 40 c/s to 20 kc/s ± 3 dB.
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