PRACTICAL WIRELESS

OCTOBER 1970

3/6

TRANSISTOR & DIODE TESTER

ALSO..

TRANSISTOR VFO

SIMPLE MINI-ORGAN

ELECTRONIC DIGITAL COMBINATION LOCK

Laskys

TMK METER KITS

These two meter kits by TMK offer the unique opportunity of building a really first-class precision multimeter at a worthwhile saving in cost. The cabinets are supplied with the meter scale and movement mounted in position. The highest quality components and 1% tolerance resistors are used throughout. Supplied complete with full constructional, circuit and operating instructions.

MODEL 200

20,000 O.P.V. Multimeter. Features 24 measurement ranges with mirror scale. Large 3 × 2in meter. Full scale accuracy: DCV and current: ±2%. ACV: ±3%. resistance ±3%. Special 0·6V DC range for transistor circuit measurements.

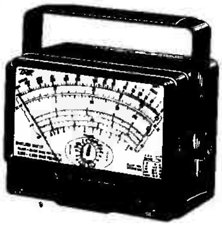
SPECIFICATION
● DCV: 0-0·6-6-30-120-600-1,200V at 20K/OPV. ● ACV: 0-6-30-120-600-1,200V at 10K/OPV. ● DC Current: 0-0·6-6-600mA. ● Resistance: 0-10-K 100K-1M-10M/ohms (58-580-5·8K-58K at mid-scale). ● Capacitance: 0·002-0·2μF (AC 6V range). ● Decibels −20 to +63dB. ● Output: 0·05μF blocking capacitor. Uses two 1·5V (U7 type) batteries. Black bakelite cabinet. Size 5¼ × 3⅞ × 1⅞in. Complete with test leads.

KIT PRICE **ONLY 92/-** Post 3/6

MODEL 5025

50,000 O.P.V. FEATURING 57 MEASUREMENT RANGES

Uses an entirely new range selection mechanism which permits the use of a really large meter in a more compact cabinet. The range selected is indicated on the meter face. High speed rotary range selection knob; polarity reversal switch shielded meter movement with overload protection circuit; Special μA and mA measurement ranges.

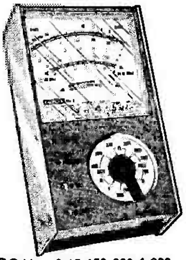


SPECIFICATION DCV: 0-0·25-2·5-10-50-250-1,000V at 25K/OPV. 0-0·125-1·25-5·0-25-125-500V at 50K/OPV. ACV: 0-3-10-50-250-1,000V at 2·5K/OPV. 0-1·5-5-25-125-500V at 5K/OPV DCμA: 0-25μA at 125mA: 0-50μA at 250mA DCmA: 0-2·5-25-250mA at 125mV: 0-5-50 500mA at 250mV. DC Amps: 0-5A at 125mV 0-10A at 250mV. Resistance: 0-10M/ohms Output: Capacitor (0·1μF, 400Vw) in series with ACV ranges. Decibels: −20 to +81·5dB Operates on two 1·5V batts. Black bakelite cabinet, size 5¼ × 6⅞ × 2⅞in. Complete with test leads.

KIT **£10.10** Post 5/-

MODEL 5025 *ALSO AVAILABLE READY BUILT AND TESTED £12.10.0* Post 5/-

EXCLUSIVE



TM-5

5 K ohms/V POCKET MULTIMETER

Another new look pocket multi-meter from Lasky's providing top quality and value. The "slimline" impact resistant case—size 4⅞in. × 2⅞in. × 1⅛in., fitted with extra large 2⅞in. square meter. Readability is superior on all low ranges: making this an excellent instrument for servicing transistorised equipment. Recessed click stop selection switch. Ohms zero adjustment. Buff finish with crystal clear meter cover.

- DC/V: 3-15-150-300-1,200 at 5K OPV.
- AC/V: 6-30-300-600 at 2·5K OPV.
- DC Current 0-300μA, 0-300mA.
- Resistance: 0-10K ohms, 0-1M ohms.
- Decibels: −10dB to +16dB.
- Complete with test leads, battery and instructions.

LASKY'S PRICE **49/6** P & P 2/6

TM-1 MINI-TESTER

1 K ohms/volt

The first of Lasky's new-look top value meters, the TM-1 is a really tiny pocket multimeter providing "big" meter accuracy and performance. Precision movement calibrated to ± 3 of full scale. Click stop range selection switch. Beautifully designed and made impact resistant black case—with white and metallic red/green figuring. Ohms zero adjustment.

Size Only 3⅛in × 2⅛in. × 1⅛in.

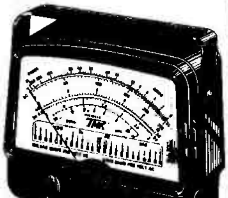
- DC/V: 0-10-50-250-1000 at 1K OPV
- AC/V: 0-10-50-250-1000 at 1K OPV
- DC CURRENT: 0-1mA. 100mA.
- Resistance: 0-150K ohms.
- Decibels: −10 to +22dB.
- Complete with test leads, battery and instructions.

LASKY'S PRICE **39/6** P & P 2/6

TMK 100,000 OPV

"LAB" MODEL

A highly accurate yet rugged Multitester using a 10μA meter hand calibrated to a D.C. accuracy of ±3% of full scale. Special features—ultra large meter scale 6¼ × 3⅛in incorporating an entirely new type of range selection panel which gives instant range identification without taking your eyes from the meter. An audible buzzer is provided for easy short testing. SPEC: D.C./V ranges: 0·5, 2·5, 10, 50, 250, 500, 1,000V at 100K/O.P.V. A.C./V ranges: 3, 10, 50, 250, 500, 1,000V at 5K/O.P.V. D.C. current: 0-10, 100μA, 0-10, 100mA, 0-2·5, 10A. Resistance: 0-1K, 10K, 100K, 10M, 100M/ohms. Decibels: −10 to 49.4dB. Continuity test: Audible buzzer. Operates on × 11·5V U2 and 1 × 15V B. 154 type batteries. Cabinet size 7¼ × 6⅞ × 3⅛in. Weight 4lb.

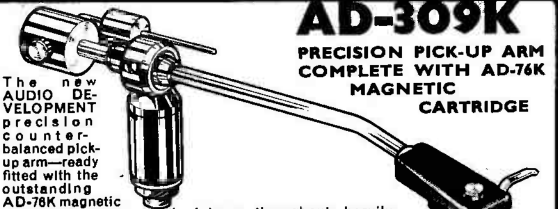


LASKY'S PRICE **£19.0.0** Post 5/-

Audio Development

AD-309K

PRECISION PICK-UP ARM COMPLETE WITH AD-76K MAGNETIC CARTRIDGE



The new AUDIO DEVELOPMENT precision counter-balanced pick-up arm—ready fitted with the outstanding AD-76K magnetic cartridge is constructed of brass throughout, heavily chromeplated; uses needle and miniature ballrace bearings; both coarse and fine balance adjustment is provided. The fixed head has standard ½in. mounting centres and is finished in black enamel with chrome lifting spur. Completely wired, with all fixing nuts and washers. Arm rest also supplied. Tech. details: Overall length 285mm; needle to pivot length 223mm; offset angle 24°; overhang 10mm. Requires single 7/16in dia. mounting hole.

LASKY'S PRICE **£9.19.6** POST 3/6

SONICS AS-57

ELEGANT BUDGET PRICED BOOKSHELF SPEAKER SYSTEMS

The AS-57 is a real space saver. This fine miniature high-fidelity speaker system will provide good quality sound anywhere in your home at remarkably low cost. Designed for use where space is at a premium, the AS-57 system is ideal for the small apartment or isolated listening area. The special high efficiency 5 × 7in. full range speaker has a frequency range of 70-18,000 Hz with a peak handling capacity of 10 watts. Imp. 8 ohms. Finish: oiled walnut. Size: 5⅞ × 15⅝ × 8¼in.

LASKY'S PRICE **£15 per PAIR** Post 10/-

AUDIO DEVELOPMENT AD-76K

Stereo Magnetic Cartridge. Frequency response: 20-20,000Hz. Output: 5mV. Stylus: Diamond LP. Tracking force: 2 gms ±0·5 gm. Replacement stylus type JS.P1 41/- post free.

90/- Post Free

AUDIO DEVELOPMENT AD-96K

Stereo Magnetic Cartridge. Frequency response: 20-20,000Hz. Output: 5mV. Stylus: Diamond LP. Tracking force: 2 gms. Replacement stylus type Y.960S 51/6, post free.

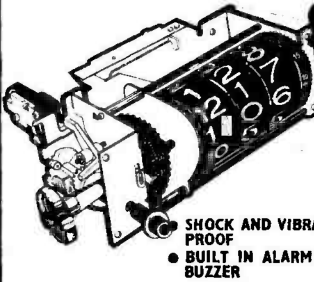
£5.18.6 Post Free

AudioTronics 70

The 1970 edition of Lasky's Audio-Tronics catalogue is available FREE on request. Packed with 1000's of items for the Radio and Hi-Fi enthusiast, lectronics Hobbyist, Servicemen and Communications Ham. Covers every aspect of Hi-Fi (including Laskys budget Stereo Systems and Package Deals) Tape recording and Audio accessories plus **Lasky's amazing money saving vouchers worth over £25. SEND TODAY.** *Send your name, address and 2/- for post and inclusion of your name on our regular mailing list*

This month's vouchers worth 50/-

EXCLUSIVE DIGITAL CLOCK SCOOP!



- SHOCK AND VIBRATION PROOF
- BUILT IN ALARM BUZZER
- MADE ESPECIALLY FOR LASKY'S BY FAMOUS MAKER
- MAINS OPERATION
- 12 HOUR ALARM
- AUTO "SLEEP" SWITCH
- HOURS, MINUTES AND SECONDS READ-OFF
- FORWARD AND BACKWARD TIME ADJUSTMENT
- SILENT OPERATION SYNCHRONOUS MOTOR

This unique DIGITAL CLOCK is now available **EXCLUSIVELY FROM LASKY'S** in chassis form for you to mount in any housing that you choose.
All settings are achieved by two dual-concentric controls at the front including: ON-OFF-AUTO and AUTO ALARM, "sleep" switch, 10 minute division "click" set alarm (up to 12 hour delay), time adjustment. Ultra simple mechanism and high quality manufacture guarantee reliable operation and long life.
The sleep switch will automatically turn off any appliance—radio, TV, light etc. at any pre-set time up to 60 min. and in conjunction with the AUTO setting will switch on the appliance again next morning.
The clock measures 4¾W x 1½H x 3¾D (overall from front of drum to back of switch)
SPEC: 210/240V AC, 50Hz operation; switch rating 250V. 3A. Complete with instructions. **HUNDREDS OF APPLICATIONS. COMPLETE WITH KNOBS. SPECIAL QUOTATIONS FOR QUANTITIES**

***LASKY'S PRICE* £6.19.6** Post 3/6

KNOBS AVAILABLE SEPARATELY—12/6 per set. Post 1/6

Garrard

SPECIAL OFFER

SL 55

One of the famous Garrard Synchro-Lab Series. Takes 8 Lps. 4-speed auto-changer; incorporating a tubular pickup arm and adjustable stylus force.
Wired for Mono and Stereo.
Size 14 in wide, 11¾in front to rear. 4¾in above and 3 in below lower edge of unit plate. **NOW AT LASKY'S SUPER SPECIAL OFFER PRICE. Complete with SONOTONE 9TA STEREO CARTRIDGE**

SPECIAL OFFER PRICE £10.19.6

OTHER GARRARD UNITS FROM STOCK

AUTOCHANGERS

SL72B £25 0 0	SL65B £15 10 0
2025TC with stereo cartridge £8 17 6	SL95B £35 0 0
3000 complete with 9TAHC stereo cartridge £9 19 6	SL75B £28 0 0

SINGLE PLAYERS
SP-25 MK II **£11.19.6**, AP 75, **£18.10.0**, AP75 with AD76K mag. cart., **£21.10.0**, 401 Transcription Unit **£28.0.0**.

BASES AND COVERS FOR GARRARD UNITS
Type WB1 and WB5 for models 2025TC, 3000, SL65B 1025, SP25 Mk II Price WB1 **£3.16.6**. WB5 **£5.12.6**. Type WB4 for models SL72B, SL75B, SL95B Price **£5.12.6**. Perspex covers SPC1 for WB1, **£3.14.1**. SPC4 for WB4 and WB5 allows unit to be played with the cover in place)—**£4.8.0**.

GARRARD PACKAGE DEALS

SP 25 Mk II complete with AD 76K magnetic cartridge teak plinth and perspex cover **£19.0.0** Post 7/6

THE AMAZING Astrad ORION

THE WORLD'S SMALLEST 6 TRANSISTOR TWO WAVEBAND RADIO

THOUSANDS SOLD

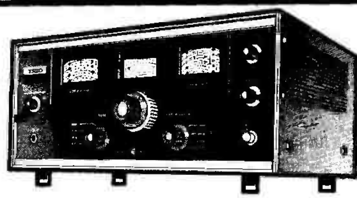
Made to the highest space-age standards—this remarkable micro-size set measures only 1 11/16 x 1 3/10 x 5/16in. yet it contains 6 transistors and other components combined in a photo etched circuit, only ¾ x ½ in. tuning capacitor, ferrite rod aerial, battery, wave band selection switch etc. Output to a high impedance crystal earpiece, giving ample volume (automatically adjusted) and clear tone. Brief tech. spec.: Waveband coverage—Medium wave 525 to 160kHz, Long wave 150kHz to 480kHz. Sensitivity: 35MV max. Selectivity —10dB (at 30kHz de-tuning). Power source: 1 x 1.4V Mercury battery.
The Orion is supplied fully built and tested complete with battery, left and right fitting earphone supports and attractive black and ivory plastic presentation/carrying case (matching the Orion). Never miss your favourite music, sport, news—the Orion is an ideal gift for all, providing a constant source of enjoyment without disturbing others.

AUTUMN PACKAGE PRICE

AVAILABLE SEP: RADIO 39/6, Post 2/6.
Spare batt. 3/6. Charger* 19/6, Post 2/6
(*enables Orion to be used non stop).

ONLY 57/- Post 2/6

TRIO 9R-59DE

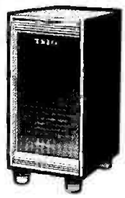


- 8 valve plus 7 diode circuit continuous coverage from 550kHz to 30MHz with Calibrated Bandspread on 10, 15, 20, 40 and 80 metre bands
- Clear SSB reception is achieved through the use of a product detector.
- Finished in light grey with dark grey case. Fully guaranteed, complete with instruction manual and service data.

SPECIFICATION: Frequency Ranges: 550-1600kHz; 1.6-4.8MHz; 4.8-14.5MHz; 10.5-30MHz. Bandspread: (Direct Reading on Ham Bands) 3.5MHz 80m; 7MHz 40m; 14MHz 20m; 21MHz 15m; 28MHz 10m. Sensitivity: A, B, C, Bands—Less than 6dB (for 10dB S/N ratio); D Band — 13MHz; Less than 18dB (for 10dB S/N ratio); 28MHz; Less than 10dB (for 10dB S/N ratio). Selectivity: ± 5kHz at —50dB. Audio Output: 1.5w. Power Requirements: AC 115/230V, 50/60Hz. Recommended Speaker Type: 4 or 8 ohm. Built-in Circuits: Bandspread; Automatic Noise Limiter (ANL); Automatic Volume Control (AVC); Headphone Jack. Dimensions: 7in. H 15in. W, 10in. D.

LASKY'S PRICE **£42.0.0** **Carriage free**

TRIO SP-5D



Communications speaker unit —matching all the TRIO receivers in both style and size. Contains 5 x 3 in. eliptical 8 ohms speaker specially designed to give extremely crisp reproduction of voice frequencies. Dark grey metal cabinet—size 7 x 3¾ x 5¼ in.

LASKY'S PRICE **87/6** post 5/-

TRIO HS-4 HEADPHONES

Rugged construction plus comfort make these a must for the Ham. Dynamic headset. Input impedance 8 ohms, matching 4-16 ohms. Max. power 3w. Frequency range 300-3000Hz.

LASKY'S PRICE **£5.19.6** post 3/6

JUST ARRIVED

New Laskys C60, C90, C120. Exclusively made for us in U.S.A. Great savings!

	EACH	FIVE FOR	TEN FOR
C 60—	7/6	33/-	62/-
C 90—	12/6	56/-	109/-
C 120—	17/6	75/-	135/-

U.S.A. Cassette head cleaner 10/6. Post 1/-
Post 1/- each, five for 2/-, ten for 3/-.

Lasky's Radio Limited

207 EDGWARE ROAD, LONDON, W.2. Tel: 01-723 3271
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Open all day, 9 a.m. 6 p.m. Monday to Saturday
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LASKY'S RADIO ESTABLISHED OVER 36 YEARS

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COMET

Hi-Fi DISCOUNT WAREHOUSES

- All items offered are brand new, latest models in manufacturers' sealed cartons. Fully guaranteed with after-sales service.
- Complete Free price list of over 800 items on request.

Customers Welcome
Open Daily to the public from 9 a.m. Closed Tuesday 1 p.m.
Mon. & Sat. 5-30 p.m. Open until 8 p.m. Wednesday, Thursday & Friday.

STEREO AMPLIFIERS

	Rec. Retail Price	Comet Price
ARMSTRONG 521	£52 0 0	£43 10 0
DULCI 207	£25 0 0	£17 0 0
DULCI 207M	£30 0 0	£20 19 0
GOODMANS Maxamp	£54 0 0	£39 19 6
LEAK Stereo 30 Plus	£53 0 0	£43 19 6
LEAK Stereo 30 Plus in teak case	£59 10 0	£47 19 6
LEAK Stereo 70	£65 0 0	£52 0 0
LEAK Stereo 70 in teak case	£71 10 0	£56 19 6
LINEAR LT.66	£18 18 0	£15 19 5
LL. Stereo Amp.	£23 10 0	£16 19 6
METRDSOUND ST 20	£32 0 0	£25 19 6
PHILIPS RH 591	£73 0 0	£55 19 6
PHILIPS RH 590	£49 0 0	£37 12 6
PHILIPS RH 580	£26 0 0	£19 19 6
PIONEER SA500	£62 1 11	£45 0 0
PIONEER SA700	£98 0 0	£74 19 6
PIONEER SA900	£134 2 0	£99 19 6
PIONEER Reverberation	£45 9 11	£35 19 6
QUAD 33 Pre-amplifier	£43 0 0	£38 19 6
QUAD 303 Main Amplifier	£55 0 0	£48 19 6
ROGERS Ravensbourne	£59 10 0	£46 19 6
ROGERS Ravensbourne (cased)	£64 0 0	£49 19 6
ROGERS Ravensbrook	£44 0 0	£36 19 6
ROGERS Ravensbrook (cased)	£49 0 0	£39 19 6
SINCLAIR 2000	£30 9 0	£24 19 6
TELETON 203E	£28 15 0	£19 19 6
TRUVOX TSA, 200	£54 12 0	£34 19 6
VOLTEX 100 watt stereo discotheque 8 electronically mixed inputs	£185 0 0	£139 0 0

TUNERS

	Rec. Retail Price	Comet Price
ARMSTRONG 523 AM/FM	£52 9 0	£44 19 6
ARMSTRONG 524 FM	£40 4 6	£34 19 6
ARMSTRONG M8 decoder	£9 10 0	£7 19 6
DULCI FMT.7FM	£22 1 0	£17 19 6
DULCI FMT.7S Stereo	£31 0 0	£25 5 0
GOODMANS Stereomax	£82 10 5	£71 19 6
LEAK Stereofetic Chassis	£59 18 0	£53 19 6
LEAK Stereofetic in teak case	£67 3 6	£59 19 6
PHILIPS RH 690	£39 0 0	£31 19 6
PIONEER TX500 AM/FM	£77 18 9	£63 19 6
PIONEER TX900 AM/FM	£153 13 10	£125 0 0
QUAD Stereo FM	£51 0 0	£39 19 6
ROGERS Ravensbourne	£61 17 9	£49 19 6
ROGERS Ravensbrook	£45 0 2	£39 19 6
ROGERS Ravensbrook (cased)	£51 5 3	£42 19 6
SINCLAIR 2000	£26 14 6	£19 4 6
TELETON 201X FM	£36 0 0	£29 19 6
TRUVOX FM 200/1C	£60 11 10	£39 19 6

All above tuners are complete with MPX stereo decoder

TUNER/AMPLIFIERS

	Rec. Retail Price	Comet Price
ARENA 2400	£90 6 0	£71 19 6
ARENA 2600 Stereo AM/FM	£111 6 0	£94 0 0
ARENA 2700 Stereo	£105 0 0	£85 0 0
ARENA T1500F	£72 9 0	£59 19 6
ARENA T9000	£303 9 0	£258 0 0
ARMSTRONG 525	£87 16 9	£74 10 0
ARMSTRONG 526	£98 15 6	£82 10 0
ARMSTRONG M8 decoder	£9 10 0	£7 19 6
GOODMANS 3000	£77 14 7	£55 19 6
PHILIPS RH781	£74 19 6	£54 19 6
PHILIPS RH790	£125 0 0	£101 19 6
PHILIPS RH691	£83 0 0	£70 10 6
PIONEER KX330 AM/FM/SW	£78 12 4	£62 19 6
PIONEER SX770 AM/FM	£160 8 6	£129 19 6
PIONEER SX990 AM/FM	£194 14 8	£155 0 0
TELETON F.2000	£51 0 0	£37 19 6
TELETON 7ATI	£103 19 0	£85 0 0
TELETON R4200	£51 15 0	£39 19 6
TELETON CR/10T	£39 15 0	£29 19 6
TELETON TFS50	£74 0 0	£59 19 6
WHARFEDALE 1001	£131 5 0	£105 0 0

All above Tuner Amplifiers are complete with MPX decoder

CARTRIDGES ALL MAKES STOCKED AT DISCOUNT PRICES

PICKUP ARMS

	Rec. Retail Price	Comet Price
GOLDRING Lenco L75	£12 6 6	£10 10 0
GOLDRING Lenco L69	£9 5 9	£7 0 0
SME 3009 with S2 shell	£31 6 3	£25 19 6
SME 3012 with S2 shell	£33 7 3	£28 19 6

All in-stock items value over £50 delivered by SECURICOR WITHIN 72 HOURS

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ALL GOODS FULLY INSURED AGAINST LOSS OR DAMAGE WHILST IN TRANSIT

TURNTABLES

	Rec. Retail Price	Comet Price
ARENA SP25 with base, cover	£22 1 0	£17 19 6
B.S.R. McDONALD MP60	£15 0 0	£10 19 6
B.R.S. McDONALD 610	£18 19 6	£13 19 6
GARRARD SP25, fully wired with Goldring G800 magnetic cartridge, complete with base, plinth and cover	Special price	£20 19 6
GARRARD SP.25 Mk II	£15 [illegible] 4	£10 10 0
GARRARD AP.75	£23 1[illegible] 0	£17 19 6
GARRARD SL.55	£13 1[illegible] 9	£11 12 6
GARRARD SL.65B	£19 [illegible] 5	£14 9 6
GARRARD SL.75B	£35 12 [illegible]	£28 19 6
GARRARD SL.95B	£45 9 [illegible]	£37 19 6
GARRARD 401	£3[illegible] 14 2	£26 10 0
GARRARD SL.72B	£30 2 0	£24 19 6
GARRARD 3500 with GKS Cartridge	£15 15 0	£11 19 6
GOLDRING GL69 Mk. II	£26 12 6	£21 10 0
GOLDRING GL69P Mk. II	£35 2 0	£27 19 6
GOLDRING GL.75	£36 8 2	£29 19 6
GOLDRING 75P	£46 18 8	£39 19 6
GOLDRING Covers for 69P and 75P	£4 4 3	£3 8 0
GOODMANS 3025 complete with G800 cartridge	£37 14 9	£25 19 6
PHILIPS 228	£19 19 6	£16 19 6
PHILIPS GA146	£29 19 6	£24 19 6
PHILIPS 217	£32 0 9	£27 4 0
PHILIPS 202 Electronic	£64 0 0	£54 0 0
THORENS TD.125	£75 17 8	£61 19 6
THORENS 125AB	£120 3 11	£99 19 6
THORENS 150A Mk II	£43 12 7	£32 19 6
THORENS 150AB Mk II	£47 8 7	£40 19 6
THORENS TD.124/11	£46 15 10	£39 19 6

Bases, plinths, and covers stocked.

SPEAKERS

	Rec. Retail Price	Comet Price
ARENA HT 27	£18 18 0	£13 19 6
ARENA HT 28	£17 17 0	£12 19 6
ARENA HT 21	£10 10 0	£9 5 0
ARENA HT 7	£19 19 0	£17 0 0
ARENA HT 10	£22 1 0	£18 19 6
ARENA HT 20	£32 11 0	£26 19 6
ARENA HT 26	£78 15 0	£65 19 6
B & W DM3	£63 0 0	£53 6 0
B & W P2H	£94 10 0	£79 0 0
B & W DM1	£32 0 0	£25 19 6
CELESTION Ditton 10	£21 3 2	£17 5 0
CELESTION Ditton 15	£29 0 0	£22 19 6
CELESTION Ditton 25	£59 17 0	£49 0 0
DULCI AS 3	£8 8 0	£6 19 6
GOODMANS Majesta	£57 0 0	£48 19 6
GOODMANS Maxim	£20 7 9	£16 19 6
GOODMANS Mezzo II	£30 18 0	£23 10 0
GOODMANS Magnum-K	£40 2 0	£29 19 6
GOODMANS Marimba	£24 0 1	£19 19 6
GOODMANS Mambo	£22 5 6	£17 19 9
GOODMANS 3005 (pair)	£25 0 0	£18 19 6
KEF Celeste	£29 0 0	£21 10 0
KEF Concord	£43 10 0	£32 19 6
KEF Concerto	£53 10 0	£41 19 6
KEF Cresta	£22 3 4	£18 5 6
LEAK Sandwich	£45 10 0	£34 19 6
LEAK Mini-Sandwich	£29 15 0	£22 19 6
LOWTHER Acousta (with PM6)	£45 10 0	£38 7 6
LOWTHER Ideal Baffle	£35 10 0	£29 17 6
LDWTHER Acousta (with PM7)	£53 0 0	£45 19 6
QUAD Electrostatic	£66 0 0	£52 19 6
PHILIPS RH 481	£11 0 0	£9 2 6
PHILIPS RH 482	£18 0 0	£14 19 6
WHARFEDALE Speakers		
Airedale	£69 10 0	£57 14 0
Denton	£19 0 0	£14 19 6
Super Linton	£22 10 0	£18 10 0
Melton	£29 10 0	£22 19 6
Dovedale 3	£39 10 0	£29 19 6
Rosedale	£59 10 0	£48 19 6
WHARFEDALE UNIT 3 Speaker Kit	£11 19 6	£9 19 6
WHARFEDALE UNIT 4 Speaker Kit	£16 0 0	£13 10 0
WHARFEDALE UNIT 5 Speaker Kit	£23 10 0	£19 19 6

CHASSIS SPEAKERS

	Rec. Retail Price	Comet Price
GOODMANS Axiette 8	£7 9 6	£5 19 6
GOODMANS Twinaxiette 8	£8 8 8	£6 19 6
GOODMANS Axiom 10	£8 16 8	£6 19 6
GOODMANS Axiom 80	£26 1 4	£21 12 6
GDODMANS Twinaxiom 10	£9 8 5	£7 15 0
GOODMANS Axiom 201	£13 9 0	£9 19 6
GOODMANS Axiom 301	£19 5 0	£14 10 0
GOODMANS Audiom 51	£12 3 0	£9 10 0
GOODMANS Audiom 61	£17 12 0	£12 19 6
GOODMANS Audiom 81	£29 13 0	£22 10 0
GOODMANS Audiom 91	£33 12 0	£25 19 6
GOODMANS Audiom 91/100	£34 17 0	£26 2 9
GOODMANS ARU 180	£3 17 8	£2 18 6
GOODMANS ARU 280	£3 17 8	£2 18 6
GOODMANS ARU 480	£5 8 5	£4 1 3
GOODMANS ARU 172	£3 17 8	£2 18 6
GOODMANS Trebax 100	£7 9 0	£5 11 6
GOODMANS Trebax 5K/20KL	£8 8 0	£6 6 0
GOODMANS Midax	£11 4 0	£8 8 0
GOODMANS Attenuator	£3 1 4	£2 6 0
GOODMANS Crossover Networks XO/950/5000	£8 8 7	£6 6 0
GOODMANS Crossover Networks XO/950	£6 7 9	£4 15 9
GOODMANS Crossover Networks XO/5000	£2 6 0	£1 14 6
WHARFEDALE 8 inch Bronze/RS/DD	£4 8 0	£3 13 6
WHARFEDALE Super 8/RS/DD	£7 12 0	£6 6 0
WHARFEDALE Super 10/RS/DD	£12 14 0	£10 10 0
WHARFEDALE WMT 1 Matching Transformer	16 9	13 6

HI-FI STEREO TAPE DECKS AND TAPE RECORDERS

	Rec. Retail Price	Comet Price
AKAI X-360	£339 0 0	£284 0 0
AKAI X-360D deck	£290 0 0	£243 0 0
AKAI 1710	£109 0 0	£85 19 6
AKAI 1710L	£89 17 0	£169 19 6
AKAI 1800	£158 0 0	£133 0 0
AKAI 1800SD	£199 0 0	£167 0 0
AKAI 4000	£124 18 0	£99 19 6
AKAI 4000 D deck	£89 19 1	£69 19 6
ALBA R22 Battery/Mains	£50 5 0	£29 19 6
BUSH TP 60 Cassette Tape Recorder	£27 15 8	£24 19 6
FERGUSON 3224 Twin Track	£33 14 0	£24 19 6
FERGUSON 3246	£41 14 0	£32 19 6
FERGUSON 3247 4-track	£47 1 0	£37 19 6
FERGUSON 3244 Stereo 4-track	£97 18 0	£79 19 6
GRUNDIG C200 Cassette	£37 19 10	£29 19 6
GRUNDIG TK 120 Continental	£39 5 0	£29 19 6
GRUNDIG TK 124	£44 18 0	£34 19 6
GRUNDIG TK 144	£49 19 6	£39 19 6
GRUNDIG 149	£57 12 8	£47 19 6
MARCONI 4218 Stereo tape Recorder	£89 11 2	£69 19 6
PHILIPS 3302 Cassette Tape Recorder	£28 7 0	£21 19 6
PHILIPS 4302 Twin Track Auto.	£35 17 6	£25 19 6
PHILIPS 4307 4-track	£49 10 0	£38 19 6
PHILIPS N4404 (4 track stereo)	£83 0 0	£69 19 6
PHILIPS N4407 Stereo	£105 0 0	£89 19 6
PHILIPS N4308	£60 10 0	£49 19 6
TELETON FXB 510D Stereo	£52 10 0	£43 19 6
TOSHIBA Battery/Mains	£45 3 0	£29 19 6
TRUVOX PD 102 Stereo Tape Recorder	£114 15 3	£79 0 0

COMET Hi-Fi DISCOUNT WAREHOUSES

Reservoir Road, Clough Road, Hull HU6 7QD. Tel 407906
also at 68a Armley Rd (Artist St) Leeds LS12 2EF Tel 32055

Customers are welcome to call personally.
Ample Car Parking facilities

Comprehensive Hi-Fi Catalogue available 5/-

Comet guarantee that all prices quoted are genuine. All items offered available at these prices at the time this issue closed for press.
Add 9/- for post and packing on all orders under £50 (cartridges 4/-). Orders over £50 add 12/- for Securicor delivery. Make cheques, Money Orders payable to "COMET"

'YORK' HIGH-FIDELITY 3 SPEAKER SYSTEM

★ Moderate size only 25 × 14 × 10in. COMPLETE KIT **20 Gns**
★ Response 30-20,000 c.p.s. I impedance 15 ohms
★ Performance comparable with units costing considerably more. Carr. 12/6

Consists of (1) 12in. 15 watt Bass unit with cast chassis, Roll rubber cone surround for ultra low resonance, and ceramic magnet. (2) 3-way quarter section series cross-over system. (3) 8 × 5in. high flux middle range speaker. (4) High efficiency tweeter. (5) Appropriate quantity acoustic damping material (6) Teak veneered cabinet. (7) Circuit and full instructions. Terms: Dep. 3 Gns. and 9 monthly payments 45/6 (Total 22½ Gns.). DEMONSTRATIONS AT ALL BRANCHES

AUDIOTRINE HIGH FIDELITY SPEAKER SYSTEMS

Consisting of matched 12in. 11,000 line 15 Watt 15 ohm high quality speaker, cross-over unit and tweeter. Smooth response and extended frequency range ensure suprisingly realistic reproduction. **£5.15.0** Carr. 5/9

OR SENIOR 15 WATT INC. HF126 15,000 LINE SPEAKER £6.15.0. CARR 6/6

AUDIOTRINE HIGH FIDELITY LOUDSPEAKERS

Heavy construction. Latest high efficiency ceramic magnets. Treated Cone surround "D" indicates Tweeter Cone providing extended frequency range up to 15,000 c.p.s. 'L' indicates Roll Rubber cone surround. Impedance 3 or 15 ohms. Please state choice Exceptional performance at low cost.

HF801D	8"	8W	54/3	HF120	12"	15W	79/9
HF102D	10"	10W	67/11	HF120D	12"	15W	89/9
HF100D	10"	15W	£4.19.0	HF126	12"	15W	£5.5.0
HF105DL	10"	10W	6gns.	HF126D	12"	15W	£5.15.0

HI-FI SPEAKER ENCLOSURES

Teak or Afrormosia veneer finish. Modern design. Acoustically lined. All sizes approx. Carr. 5/- per enclosure

JE8 Size 16 x 11 x 9in. Pressurised. Gives pleasing results with any 8in. Hi-Fi speaker. **£4.14.6**

SE8 For optimum performance with any 8in. Hi-Fi speaker. Size 22 x 15 x 9in. Ported **£5.15.0**

SE10 For outstanding results with 10in. Hi-Fi spkr Size 24x15x10in. P'td. **£5.19.9**

SE12 For exclnt prfmnce with 12in Hi-Fi speaker and Tweeter. Size 25 x 16 x 10½in. **£6.19.9**

RECORD PLAYING UNITS

Money saving units. Mounted on Plinth. Supplied with transparent plastic cover. Ready to plug into Amplifier or Tape recorder.

RP2C Garrard SP25 Mk II (with heavy turntable) fitted Goldring CS90 high compliance ceramic Stereo/Mono cartridge with diamond stylus. Carr. 9/6 **£24.12.6**

RP5C Garrard 2025 Auto Unit fitted Garrard GCS 23 Stereo Cartridge with diamond tip. Plinth & Cover as RP2C carr. 9/6. **15 Gns.**

Other types available with Magnetic cartridges and with alternative design plinths.

R.S.C. PLINTHS

Superior Solid Natural Wood Construction for Record Playing units, cut for Garrard 1025, 2025, 3000, AT60, SP25 etc. **3 gns.**

AVAILABLE WITH TRANSPARENT PLASTIC COVER **6 gns.** Carr. Free

LEADING MAKES HI-FI EQUIPMENT at CLEARANCE PRICES

Available at branches only

LINEAR L10 HIGH FIDELITY 10W AMPLIFIER **10 Gns.**

with separate Pre-amp Magnetic P.U. matching. To clear

SUPER 15 HIGH FIDELITY SOLID STATE AMPLIFIER

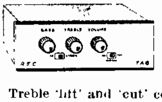
Approx. as Super 30 but single channel. Complete kit with full constructional details and point to point wiring diagrams. **12½ gns.** Carr. 12/6

OR FACTORY BUILT 15½ Gns. Carr. 12/6. Terms: Deposit 4 Gns. and 9 monthly payments 31/1 (Total £18.3.9) Available in Teak or Afrormosia veneered housing. 19gns.

R.S.C. BATTERY/MAINS CONVERSION UNITS

TYPE BM1 An all-dry battery eliminator. Size 5½ x 4½ x 2in. approx. Completely replaces batteries supplying 1·5v. and 90v. where A.C. mains 200/250v. 50c/s is available. Complete kit with diagram 59/9 or assembled 69/9.

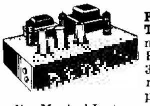
R.S.C. TA6 6 Watt HIGH FIDELITY SOLID STATE AMPLIFIER



200-250v. AC mains operated. Frequency Response 30-20,000 c.p.s. —2dB. Harmonic Distortion 0.3% at 1,000 c.p.s. Separate Bass and Treble 'lift' and 'cut' controls. 3 input sockets for Mike, Gram, Radio or Tape. Input selector switch. Output for 3-15 ohm spkrs. Max. sensitivity 5mV. Output rating I.H.F.M. Fully enclosed enamelled case, 9¼ × 2¾ × 5½in. Attractive brushed silver finish facia plate 10¼ × 3¼in. and matching knobs. Complete kit or parts with full wiring diagrams and instructions. **7 Gns** Carr. 7/6

OR FACTORY BUILT WITH 12 MONTHS' GUARANTEE £8.19.9

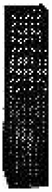
R.S.C. A11 HIGH FIDELITY 12-14 WATT AMPLIFIER



PUSH-PULL ULTRA LINEAR OUTPUT "BUILT-IN" TONE CONTROL PRE-AMP. Two input sockets with mixing facilities High sensitivity, 5 valves. Independent Bass and treble controls. Frequency response ± 3dB 30-20,000 c/s. Hum level —60dB. Sensitivity 40 millivolts. For Crystal or Ceramic PUs. High Impedance "mikes".

For Musical Instruments etc. Std. AC mains. For 3 & 15 ohm spkrs. SAE for leaflet. Complete kit. Full instructions and point-to-point wiring diagrams. Carr. 11/6. Twin handled metal cover 27/6. Price Factory built 13½ gns. or Deposit £3 and 9 monthly payments of 30/5 (Total £16.13.9. RSC A11T TRANSISTORISED VERSION of above complete kit 9 Gns. (Assembled 13 Gns.). **9½ Gns.**

R.S.C. COLUMN SPEAKERS



COVERED IN REXINE/VYNAIR. IDEAL FOR VOCALISTS AND PUBLIC ADDRESS. 15 ohm matching.

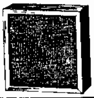
TYPE C48S 25/30 WATTS. Fitted four 8in. high flux 8 watt speakers. Overall size approx 48 × 10 × 5in. Or deposit £3 and 9 monthly payments 35/6 (Total £18.19.6). Carr. 10/- **16 Gns.**

TYPE C412S, 50 WATTS. Fitted four 12in. 11,000 line 15 watt speakers. Overall size 56 × 14 × 9in. approx. Carr. 15/-. Or Deposit £4 and 9 monthly payments of 58/8 (Total £30.8.0). **26 Gns.**

30 WATT HI-FI AMPLIFIER

FOR GUITAR, VOCAL OR INSTRUMENTAL GROUP.
A 2 or 4 input. 2 vol control Hi-Fi unit with Separate Bass and Treble controls. Current valves. Peak output rating. Strong Rexine covered cabinet with handles. Attractive black/gold P.V.A. facia. Neonind icato.. For 200-250v. A.C. mains. For 3 or 15 ohm speakers. Send S.A.E. for leaflet. Deposit £3.14.0 and 9 monthly payments of 42/- (Total £22.12.0) **19 Gns.** Carr. 12/6

HIGH QUALITY LOUDSPEAKERS

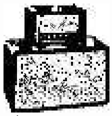


IN TEAK OR AFRORMOSIA VENEERED CABINETS

L13 13" × 8" 10 Watt 10,000 lines 3 or 15 ohms. Carr. 7/6 State impedance required **£4-19-9**

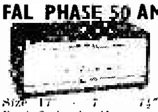
L12 12" 20 Watt 10,000 lines 15 ohms. Carr. 8/9 **£8-19-9**

R.S.C. BASS REGENT 50 WATT AMPLIFIER



A powerful high quality all-purpose unit for lead, rhythm, bass guitar, vocalists, gram radio, tape, Peak Output rating.
Loudspeaker unit horizontal or vertical mounting. **55 Gns.**
★ Two extra heavy duty 12in. Loudspeakers.
★ Four Jack inputs and two Volume Controls for simultaneous use of up to four pick-ups or "mikes". Bass and Treble controls. Carr. 30/-
Deposit £13.4.9 and 9 monthly payments of £5.11.9. (Total 60½ gns.). Send S.A.E. for leaflet

FAL PHASE 50 AMPLIFIER



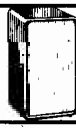
Solid state 3 Separately controlled inputs Ind. Bass and Treble Controls. Output for Speaker/s 3-30 ohms. Size 17 × 7 × 7¼" 200-250 A.C. mains. Peak Output rating. For fuller details of Phase 50 and Phase 100 see Manufacturers advert. page 424 or send S.A.E. for leaflets. **29 Gns.** Carr. Free

see Manufacturers advert. page 424

FAL PHASE 100 AMPLIFIER

100 Watt Solid State 4 Separately controlled inputs Plus master volume Control. Ind. Bass and Treble Controls. Output for speaker/s 3-30 ohms. Protective circuit to guard against damage from accidental shorts I.H.F.M. Output rating **59 Gns.**

RSC 50 Watt L/SPEAKER UNITS



Fitted pair of 12" 50 watt high flux speakers for conservative rating. Impedance 8-15 ohms. Two tone Rexine and vynair finish. **28 Gns.**

RSC G100 100 Watt

peak output. Complete with pair of speaker columns and a Bass Unit (Six 12" and Two 15" speakers) **99½ Gns.**

FANE ULTRA HIGH POWER LOUDSPEAKERS

All power ratings are R.M.S. continuous. 2 years' guarantee. High flux ceramic magnets. Heavy cast chassis.

'POP' 100 18" 100 Watt 14,500 gauss 8/15Ω **21 GNS.** Dep. £6 and 9 mthly pymnts £2 (Total £24).

'POP' 60 15" 60 Watt 14,000 gauss 8/15Ω **12 GNS.** Dep: 3 gns. and 9 mthly pymnts 25/6 (Total £14.12.6

'POP' 50 12" 50 Watt 14,000 gauss 15Ω **10 GNS.** Dep £2 and 9 monthly payments 22/6 (Total £12.2.6) Pair suitable all purposes

FOR BASS GUITAR OR ELECT. ORGAN ETC.

FANE LOUDSPEAKERS

'POP' 30C

12in. 25 WATT
Dual Cone 15Ω

(For uses other than Bass Guitar or Elect. Organ) **£5-19-9** Carr. free on deposit Deposit £1 and 9 monthly payments 13/- (Total £6.17.0).

R.S.C A10 30 WATT ULTRA LINEAR HI-FI AMPLIFIER

Highly sensitive. Push-Pull high output, with Pre-amp /Tone Control Stages. Hum level—70dB. Frequency response ±3dB 30-20,000 c/s. All high grade components. Valves EF86, EF86, ECC83, 807, 807, GZ34. Separate Bass and Treble Controls. Sensitivity 36 millivolts. Suitable for High Impedance microphones. Designed for Clubs, Schools, Theatres. Dance Halls or Outdoor Functions, etc. For use with Electronic Organ, Guitar, String Bass, etc. Gram, Radio or Tape. Reserve L.T. and H.T. for Radio Tuner. Two inputs with associated volume controls so that two separate inputs such as Gram and "Mike" can be mixed. 200-250 v., 50 c/s of parts with point to point wiring diagram and A.C mains. For 3 and 15 ohm speakers. Complete Kit instructions. Twin-handled perforated cover 35/-. Or factory built with EL34 output valves and 12 months' guarantee for 18 gns. **15 Gns.** Carr. 12/6
TERMS: Deposit £3.9.0 and 9 monthly payments of £2 (Total £21.9.0). Send S.A.E. for leaflet.

RSC TRANSFORMERS and L.F. CHOKES

FULLY GUARANTEED. Impregnated and Interleaved where necessary

Primaries 200-250v. 50c/s. Screened

MIDGET CLAMPED TYPE 2½ × 2⅜ × 2¼in.

250v., 60mA, 6.3v. 2a	17/11
250-0-250v., 60mA 6.3v 2a	18/11

FULLY SHROUDED UPRIGHT MOUNTING

250-0-250v. 60mA, 6.3v. 2a., 0-5-6.3v. 2a.	24/9
250-0-250v. 100mA. 6.3v. 4a., 0-5-6.3v. 3a.	39/9
300-0-300v. 100mA. 6.3v. 4a., 0-5-6.3v. 3a.	39/9
300-0-300v. 130mA, 6.3v. 4a., c.t., 6.3v. 1a. For Mullard 510 Amplifier	47/11
350-0-350v. 100mA. 6.3v. 4a., 0-5-6.3v. 3a.	39/9
350-0-350v. 150mA. 6.3v. 4a., 0-5-6.3v. 3a.	47/9
425-0-425v. 200mA, 6.3v. 4a., c.t., 5v. 3a.	89/9
425-0-425v. 200mA, 6.3v. 4a., 6.3v. 3a., 5v. 3a	93/9
450-0-450v. 250mA, 6.3v. 4a., c.t., 5v. 3a.	99/9

TOP SHROUDED DROP-THRO' TYPE

250-0-250v. 70mA, 6.3v. 2a., 0-5-6.3v. 2a.	23/9
250-0-250v. 100mA. 6.3v. 3.5a.	27/9
250-0-250v. 100mA. 6.3v. 2a., 6.3v. 1a.	28/9
350-0-350v. 80mA, 6.3v. 2a., 0-5-6.3v. 2a.	29/11
250-0-250v. 100mA. 6.3v. 4a., 0-5-6.3v. 3a.	39/9
300-0-300v. 100mA. 6.3v. 4a., 0-5-6.3v. 3a.	39/9
300-0-300v. 130mA. 6.3v. 4a., 0-5-6.3v. 1a. Suitable for Mullard 510 Amplifier	46/9
350-0-350v. 100mA. 6.3v. 4a., 0-5-6.3v. 3a.	39/9
350-0-350v. 150mA, 6.3v. 4a., 0-5-6.3v. 3a.	46/11

FILAMENT or TRANSISTOR POWER PACK Types 6.3v. 1.5a. 8/9; 6.3v. 2a. 9/9; 6.3v. 3a. 13/9; 6.3v. 6a. 22/9; 12v. 1a. 9/11; 12v. 3a. or 24v. 1.5a 23/9; 0.9-18v. 1½a. 19/11; 0-12-25-42v. 2a. 31/9

CHARGER TRANSFORMERS 0-9-15v. 1½a. 18/9; 2½a. 19/11; 3a. 21/11; 5a. 25/11; 6a. 29/9; 8a. 36/9.

AUTO (Step UP/step DOWN) TRANSFORMERS 0-110/120v. 200-230-250v., 50-80 watts 19/9; 150 watts, 33/6 250 watts 49/9; 500 watts 105/-.

OUTPUT TRANSFORMERS

Standard Pentode 5,000 Ω or 7,000 Ω to 3 Ω	8/9
Push-Pull 8 watts EL84 to 3 Ω or 15 Ω	14/9
Push-Pull 10 watts 6V6, ECL86 to 3, 5, 8 or 15 Ω	24/9
Push-Pull EL84 to 3 or 15 Ω 10-12 watts	23/9
Push-Pull Ultra Linear for Mullard 510, etc.	39/9
Push-Pull 15-18 watts, sectionally wound 6L6, KT66, etc., for 3 or 15 Ω	35/9
Push-Pull 20 watt high quality sectionally wound EL34, 6L6, KT66 etc. to 3 or 15 Ω	59/9

SMOOTHING CHOKES 150mA, 7-10H. 250 Ω 12/9; 100mA, 10H, 200 Ω 10/9; 80mA, 10H, 350 Ω 8/9; 60mA, 10H, 400 Ω 4/11.

SELENIUM RECTIFIERS F. W. (Bridged) All 6/12v. D.C. output. Max. A.C. input 18v. 1a. 4/3. 2a. 6/11 3a. 9/9. 4a. 12/9. 6a. 15/9.

R·S·C HIGH FIDELITY STEREO 'PACKAGE' OFFERS

Four fully wired units ready to 'plug in'.

★ Super 30 Amplifier (15 + 15 watt) in veneered housing
★ Garrard SP25 mk II Turntable on Plinth with cover
★ Goldring CS90 Ceramic P.U. Cartridge with diamond stylus
★ Pair of Stanway II 'Speaker Units'

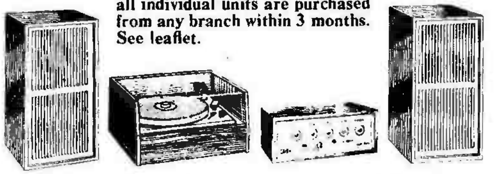
Special Total Price **76 Gns.** Carr. 30/-

★ Super 30 Amplifier (15 + 15 watt) in veneered housing
★ Goldring Transcription Turntable on Plinth as illustr.
★ Shure or Goldring Magnetic P.U. Cartridge.
★ Pair of Stanway II Loudspeaker units

Special Total Price **86 Gns.** Carr. 30/-

Matching as recommended for optimum performance. Send S.A.E for coloured brochure showing other money-saving offers.

Package prices apply providing all individual units are purchased from any branch within 3 months. See leaflet.



ATTRACTIVE TEAK or AFRORMOSIA VENEERED CABINETS and PLINTHS

TERMS AVAILABLE ALL PACKAGE OFFERS

★ TA12 Amplifier 6 + 5 watt in veneered housing
★ Garrard SP25 mk II Player unit on Plinth
★ Goldring CS90 Ceramic P.U. Cartridge with diamond stylus
★ Pair of Dorchester Loudspeaker Units

Special Total Price **53 Gns.** Carr. 25/-

Or Deposit £7 and 9 monthly payments £6.2.8 (Total 59 gns.). Transparent Plastic Cover 3 gns. extra.

AS ABOVE BUT WITH GARRARD 3000 AUTOCHANGER AND SONOTONE 9TA Ceramic Cartridge in lieu of SP25 and CS90 **47½ Gns.** Carr. 25/-

Or Deposit £6 and 9 monthly payments £5.11.5 (Total £56.2.9) Trans. Plastic cover 3 gns. extra.

AUDIOTRINE A55 HIGH QUALITY STEREO SYSTEM

5 + 5 WATT OUTPUT
GARRARD 5200 Changer

with low mass pick-up arm and GCS38 Cartridge. CONTROLS: TREBLE, BASS, VOLUME STEREO BALANCE. Operation on standard 200-250v. A. C. mains. Output rating I.H.F.M.

Luxurious Teak Veneer Finished Cabinets. Transparent plastic (tinted) cover included for main unit. Silver finished facia plate and matching control knobs.

PAIR OF LOUDSPEAKER UNITS

incorporating high flux 8" × 5" speaker. Size approx. 13 × 7½ × 8¾ ins.

Price complete ONLY **39Gns.** Carr 25/-

Deposit £5 and 9 monthly payments 4 gns (Total 44.18.0)

A REALLY SURPRISING STANDARD OF QUALITY IS OBTAINABLE FROM THIS COMPACT LOW PRICED SYSTEM

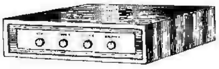
LOW DEPOSIT CREDIT TERMS

Available on purchases over £8
KITS of parts excepted

INTEREST CHARGES REFUNDED
On Credit Sales settled in 3 months

RSC G66 6+6 WATT high quality STEREO AMPLIFIER

Individual Ganged controls: Bass, Treble, Volume and Balance. Printed circuit construction employing Transistors plus Diodes. Output rating I.H.F.M. Suitable for Crystal Pick-ups etc., and for loudspeaker watt. output impedances of 3 to 15 ohms. For standard 200—250v A.C. mains operation. Attractive silver finished metal facia plate and matching control knobs.



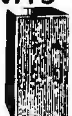
Complete KIT of PARTS INCLUDING FULL WIRED PRINTED CIRCUIT and comprehensive wiring diagram and instructions **£9.19.9**

Or FACTORY BUILT in Teak veneered cabinet as illustrated £12.10.0 carr 7/9 Or deposit 37/6 and 9 monthly payments 29/2 (Total £15).

PACKAGE OFFER SAVE £3 Above G66 assembled in cabinet. plus pair DORCHESTER LOUDSPEAKER UNITS **£27.9.6** Carr. £1
Or Deposit £5 and 9 monthly payments 57/6 (Total £30.17.6).

HIGH FIDELITY LOUDSPEAKER UNITS

Cabinets latest style Satin Teak or Aformosia veneer. Acoustically lined or filled acoustic damping. Ported where appropriate, credit terms available.



DORCHESTER Size 16 × 11 × 9in. appr. Range 45-15,000 c.p.s. Rating 8-10 watts. Fitted High flux 13 × 8in. Dual Cone speaker. Imp. 3 or 15 ohms. **£8.19.9** Carr. 7/6

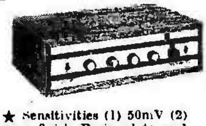
STANWAY II Size 20 × 10½ × 9½in. approx. Rating 10 watts. Inc. 13 × 8in speaker with highly flexible cone surround, long throw voice coil and 11,000 line magnet. High flux tweeter. Handsome Scandinavian design cabinet. Range 35-20 000 c.p.s. Imp. 15 ohms. Gives smooth realistic sound output. **16 Gns.**

R.S.C. TFM1 SOLID STATE VHF/FM RADIO TUNER

★ High-sensitivity. ★ 200-250v. A.C. Mains operation. ★ Sharp A.M. Rejection × ★ Drift-free reception. ★ Output ample for any amplifier (approx. 500 m.v.). ★ Output for feeding Stereo Multiplexer. ★ Tuner head using silicon Planar Transistors. ★ Designed for standard 80 ohm co-axial input. Visually matching our Super 15 and 30 amplifiers and of the same high standard of performance and reliability. Printed circuitry. A quality product at considerably less than the cost of comparable units. FACTORY BUILT 18 *gns*. Or in Teak finished cabinet as illustrated 21 *gns*. Terms: Deposit £6.1.0 and 9 monthly payments. 2*gns*. Total £24.19.0. Stereo version. 23½ *gns*. Carr. 10/6 extra

R.S.C. TA12 MKIII 6·5 + 6·5 WATT STEREO AMPLIFIER

FULLY TRANSISTORISED, SOLID STATE CONSTRUCTION
HIGH FIDELITY OUTPUT OF 6.5 WATTS PER CHANNEL



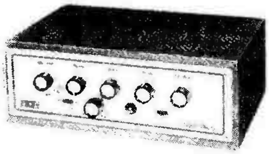
Designed for optimum performance with any crystal or ceramic Gram. P.U. cartridge, Radio tuner, Tape recorder, 'Mike' etc. ★ 3 separate switched input sockets on each channel ★ Separate Bass and Treble controls ★ Slide Switch for mono use ★ Speaker Output 3-15 ohms ★ For 200-250v. A.C. mains ★ Frequency Response 20-20,000 c.p.s. −2dB ★ Harmonic Distortion 0.3% at 1,000 c.p.s. Hum and Noise − 70dB ★ Sensitivities (1) 50mV (2) 400mV (3) 100mV. Output rating I.H.F.M. ★ Handsome finish Facia plate and Knobs. Complete kit of parts with full wiring diagrams & instructions. Factory built with 12 mth gntee 17 Gns or Deposit £3.0.0 and 9 mthly pymts 38/10 (Total 19½Gns.). Or in Teak or Afrormosia veneer housing 20½ Gns. Dep. 3 Gns. and 9 monthly payments 46/8 (Total 23 Gns.).

13½ Gns. Car. 7/9

R·S·C SUPER 30 Mk II HIGH FIDELITY STEREO AMPLIFIER

High Grade Components Specifications comparable with units costing considerably more.

TRANSISTORS 9 high quality types in each channel.
OUTPUT 10 Watts R.M.S. continuous into 15Ω (per channel). 15 Watts R.M.S. continuous into 3Ω.
INPUT SENSITIVITIES Mag. P.U. 4 mV. Ceramic P.U. 35 mV. Tape Amp. 400 mV. Aux. 100 mV. Mic. 5 mV. Tape Head 2.5mV.
FREQUENCY RESPONSE ± 2 dB. 10–20,000 c.p.s.
TREBLE CONTROL +17 dB to −14 dB at 10 Kc/s.
BASS CONTROL + 17 dB to −15 dB at 50 c/s.
HUM LEVEL −80 dB.
HARMONIC DISTORTION 0.1% at 10 watts 1,000 c.p.s. Employing Twin Printed Circuits. 200/250v. A.C. mains operation.
CROSS TALK 52 dB at 1,000 c.p.s.



CONTROLS 5 Position Input Selector. Bass, Treble, Vol., Bal., Stereo/Mono Switch, Tape Monitor Switch, Mains Switch.
INPUT SOCKETS (1) P.U. (2) Tape Amp. (3) Radio, (4) Mic. or Tape Head. (Operation of Input Selector assures appropriate equalisation).
CHASSIS Strong Steel construction. Approx. 12 × 3 × 8in.

FACIA PLATE Attractive design in rigid plastic silver background black lettering. Silver finish matching control knobs as available.
Eminently suitable for use with any make of pick-up or Mic. (Ceramic or Magnetic, Moving Coil, Ribbon or Crystal) currently available. Superb sound output quality can be obtained by use with first rate ancillary equipment.

COMPLETE KIT OF PARTS Point to point wiring diagrams and detailed instructions. **22 Gns.** Carr. 15/-

UNIT FACTORY BUILT 29 Gns.
With 12 months guarantee.
or Deposit £4 and 9 monthly payments 66/3 (Total £33.16.3 or in Teak or Afrormosia veneer housing Carr. 15/- Terms: Deposit £4 and 9 monthly payments of 74/2 (Total £37.7.6). Send S.A.E. for leaflet. **32 Gns.**

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DERBY 26 Osmaston Rd., The Spot (Half-day Wed.) Tel. 41361
DARLINGTON 18 Priestgate (Half-day Wed.) Tel. 68043
EDINBURGH 133 Leith St. (Half-day Wed.) Tel. Waverley 5766
GLASGOW 326 Argyle St. (Half-day Tues.) Tel. CIty 4158
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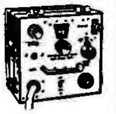
BELCO AF-5A SOLID STATE SINE SQUARE WAVE C.R. OSCILLATOR

Sine 18—200,000 Hz; Square 18—50,000 Hz Output max + 10 dB (10 K ohms)

Operation internal batteries Attractive 2-tone case 7¾" x 5" x 2". Price £17.10.0. Carr. 3/6.

CLASS D WAVEMETERS



A crystal controlled heterodyne frequency meter covering 1·7-8 Mc/s. Operation on 6 volts D.C. Ideal for amateur use. Available in good used condition. £5.19.6. Carr. 7/6. Or brand new with accessories. £7.19.6. Carr. 7/6.

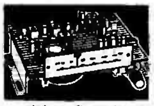
SPECIAL OFFERS!

Garrard SP25 MK II fitted Goldring G800 cartridge and wooden plinth and plastic cover. Total list price £35. OUR PRICE **£19.15.0** Carr. 10/-

Plastic cover 25/- extra.

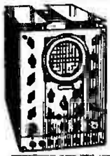
GOLDRING GL69/2 fitted Goldring G800 cartridge complete with deluxe base and cover. Total list price £50.16.0. OUR PRICE **£39** Carr. 10/-

★ TRANSISTORISED FM TUNER ★



6 TRANSISTOR HIGH QUALITY TUNER, SIZE ONLY 6×4×2½in. 3 I.F. stages. Double tuned discriminator. Ample output to feed most amplifiers. Operates on 9 V battery. Coverage 88–108Mc/s Ready built ready for use. Fantastic value for money. £6.7.6. P. & P. 2/6. Stereo multiplex adaptors 99/6.

TYPE 13A DOUBLE BEAM OSCILLOSCOPES



An excellent general purpose D/B oscilloscope. T.B. 2 cps–750 Kc/s. Bandwidth 5.5 Mc/s. Sensitivity 33mV/CM. Operating voltage 0/110/200/250V. A.C. Supplied in excellent working condition. £22.10.0. Carriage 30/-.

B.C. 221 FREQUENCY METERS

latest release 125 KHz—20 MHz. Excellent condition. Fully tested and checked and complete with calibrator charts. £27.10.0 each. Carr. 10/-

MARCONI T/44/TF956

AF Absorption Wattmeter

1 µ/watt to 6 watts.

£20. Carr. 10/-.

SOLARTRON CD 711S2

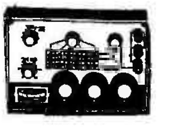
Double Beam Oscilloscopes

D.C. to 9 Mc/s. Perfect order £65. Carr. 50/–

TO-3 PORTABLE OSCILLOSCOPE

3in. tube. Y amp. Sensitivity 0·1y p-p/CM. Bandwidth 1·5 cps–1·5 MHz. Input imp. 2 meg Ω 25pF X amp. sensitivity 0·9v. p-p/CM. Bandwidth 1.5 cps–800KHz. Input imp. 2 meg Ω 20pF. Time base. 5 ranges 10 cps–300 KHz. Synchronization. Internal/external. Illuminated scale 140 x 215 x 330 mm. Weight 15½ lb. 220/240V. A.C. Supplied brand new with handbook. £37.10.0. Carr. 10/–.

TRANSISTORISED L.C.R. A.C. MEASURING BRIDGE



A new portable bridge offering excellent range and accuracy at low cost. Ranges: R. 1 Ω–11·1 meg Ω 6 Ranges ± 1% L.1 µ H - 111 HENRYS 6 Ranges – 2% C. 10pF ± 1110mFd. 6 Ranges ± 2%. TURNS RATIO 1:1/1000–1:11100. 6 Ranges ± 1%. Bridge voltage at 1,000 cps. Operated from 9 volts. 100µA. Meter indication. Attractive 2 tone metal case. Size 7½ × 5 × 2in. £20. P. & P. 5/-.

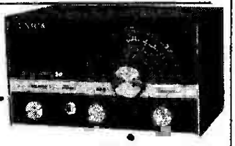
HALF PRICE OFFER! SINCLAIR STEREO 25

Original price £9.19.6. OUR PRICE **99/6** P. & P. 3/-.

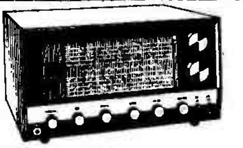
Hi-Fi solid state pre-amplifier and control unit incorporating treble, bass, volume and balance controls. Switched input for p.u. (magnetic and ceramic), mike and radio. Will also accept tape head. Operates from 9V–12V battery (20V max. 7·5mA). Frequency response 25Hz–30kHz ± 1dB. Noise level better than –50dB on all inputs. Principally designed for use with Z12 Amplifier but full instructions are supplied to enable it to be used with any amplifier. Size 6¼" × 2¼" × 2¼" overall plus knobs. Brushed and polished aluminium front panel with matching knobs. Supplied brand new and guaranteed, with full instructions.

UNR-30 4-BAND COMMUNICATION RECEIVER

Covering 550 Kcs—30 Mc/s. Incorporates BFO. Built in speaker and phone jack. Metal cabinet. Operation 220/240V. A.C. Supplied brand new, guaranteed with instructions. Carr. 7/6. **13 gns.**



TRIO JR.310 New Amateur Band 10–80 Metre Receiver in stock. **£77.10.0.**

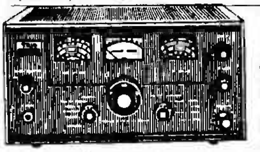


LAFAYETTE SOLID STATE HA600 RECEIVER

5 BAND AM/CW/SSB AMATEUR AND SHORT WAVE 150 Kc/s–400 Kc/s and 550 Kc/s–30 Mc/s F E T front end ● 2 mechanical filters ● Huge dial ● Product detector ● Variable BFO ● Noise limiter ● S meter ● 24in Bandspread ● 230V. A.C./12V. D.C. neg. earth operation ● RF gain control. Size 15in. × 9½in. × 8½in. Weight 18 lbs. EXCEPTIONAL VALUE. £45. Carr. 10/– S.A.E. for full details.

LAFAYETTE HA-800 SOLID STATE AMATEUR COMMUNICATION RECEIVER

Six bands 3·5-4, 7-7·3, 14-14·35, 21-21·45, 28-29·7, 50-54Mc/s. Dual conversion on all bands. 2 × 455 Kc/s mechanical filters. FET front end, product detector, variable BFO, 100Kc/s crystal calibrator. 'S' Meter. Huge slide rule dial. Operation 230V AC or 12V DC. Size 15 × 9¼ × 8½in. Complete with instruction manual. £57.10.0 Carr. Paid. 100Kc/s crystal 39/6 extra.

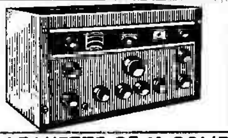


TRIO COMMUNICATION RECEIVER MODEL 9R-59DE

4 band receiver covering 550 Kc/s to 30 Mc/s continuous and electrical bandspread on 10, 15, 20, 40 and 80 metres. 8 valve plus 7 diode circuit, 4/8 ohm output and phone jack. SSB-CW ● ANL ● Variable BFO ● S meter ● Sep. bandspread dial ● IF 455 Kc/s ● Audio output 1.5 W. ● Variable RF and AF gain controls. 115/250V. A.C. Mains. Beautifully designed. Size: 7 × 15 × 10in. With instruction manual and service data. £42, carriage paid. **TRIO COMMUNICATION TYPE HEADPHONES.** Normally £5.19.6. OUR PRICE £3.15.0 if purchased with above reciever.

TRIO JR. 500SE 10-80 Metre Receiver £69.10.0

TRIO TS 510 AMATEUR TRANSCEIVER with speaker and mains P.S.U. £212. IN STOCK!

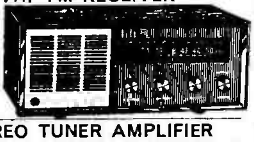


RCA COMMUNICATIONS RECEIVERS AR88D

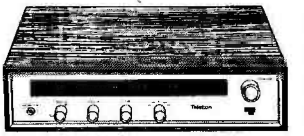
Latest release by ministry BRAND NEW in original cases. 110-250v. A.C. operation. Frequency in 6 Bands. 535 Kc/s—32 Mc/s continuous. Output impedance 2·5-600 ohms. Incorporating crystal filter, noise limiter, variable BFO, variable selectivity, etc. Price £65.0.0. Carr. £2.

LAFAYETTE PF-60 SOLID STATE VHF FM RECEIVER

A completely new transistorised receiver covering 152–174 Mc/s. Fully tunable or crystal controlled (not supplied) for fixed frequency operation. Incorporates 4 INTEGRATED CIRCUITS. Built in speaker and illuminated dial. Squelch and volume controls. Tape recorder output. 75 Ω aerial input. Headphone jack. Operation 230V. A.C./12V. D.C. Neg. earth. £37.10.0. Carr. 10/–.

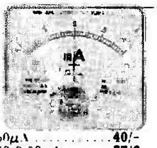


TELETON CR-10T AM/FM STEREO TUNER AMPLIFIER



A new model from Teleton. 31 solid state devices. 4 + 4 watt output. Inputs for ceramic/crystal cartridge. Frequency range AM 540–1600KHz FM 88–108MHz. Automatic FM Stereo reception. Stereo Indicator. Controls: Tuning, function selector, Tone and R & L volume controls. AFC switch. Stereo headphone socket. Size 13¾" × 3¾" × 9¼" approx. PRICE £29.19.6. Carr. 7/6.

CLEAR PLASTIC PANEL METERS



First grade quality Moving Coil panel meters. Type MR 38P. 1 21/32in. square fronts.

	.500-0-500µA 27/6	50mA 27/6	150V. D.C. 27/6
	1mA 27/6	100mA 27/6	300V. D.C. 27/6
	1-0-1mA 27/6	150mA 27/6	500V. D.C. 27/6
	2mA 27/6	200mA 27/6	750V. D.C. 27/6
	5mA 27/6	300mA 27/6	15V. A.C. 27/6
50µA 40/-	10mA 27/6	500mA 27/6	50V. A.C. 27/6
50-0-50µA 37/6	750mA 27/6	3V. D.C. 27/6	150V. A.C. 27/6
100µA 37/6	1 amp 27/6	10V. D.C. 27/6	300V. A.C. 27/6
100-0100µA 35/-	2 amp 27/6	15V. D.C. 27/6	500V. A.C. 27/6
200µA 35/-	5 amp 27/6	20V. D.C. 27/6	S meter 1mA 32/-
500µA 40/-	20mA 27/6	100V. D.C. 27/6	VU meter 42/-

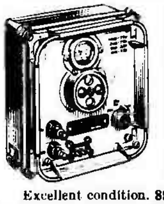
FULL RANGE OF OTHER SIZES IN STOCK. SEND S.A.E. FOR LEAFLET

POWER RHEOSTATS

High quality ceramic construction. Windings embedded in vitreous enamel. Heavy duty brush wiper. Continuous rating. Wide range available ex-stock. Single hole fixing, ¼in. dia. shafts. Bulk quantities available.

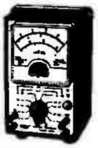
25 WATT. 10/25/50/100/250/500/1000/1500/2500 or 5000 ohms, 14/6. P. & P. 1/6.
50 WATT. 10/25/50/100/250/500/1000/2500 or 5000 ohms, 21/- P. & P. 1/6.
100 WATT. 1/5/10/25/50/100/250/500/1000 or 2500 ohms, 27/6 P. & P. 1/6.

CRYSTAL CALIBRATORS NO. 10



Small portable crystal controlled wavemeter. Size 7 × 7½ × 4in. Frequency range 500 Kc/s–10 Mc/s (up to 30 Mc/s on harmonics). Calibrated dial. Power requirements 300V. D.C. 15mA and 12V D.C. 0.3A. Excellent condition. 89/6. Carr. 7/6.

TE-40 HIGH SENSITIVITY A.C. VOLTMETER



10 meg. input 10 ranges: ·01/·003/·1/·3/1/3/10/30/100/300V. R.N.S. 4cps.-1-2 Mc/s. Decibels –40 to +50dB. Supplied brand new complete with leads and instructions. Operation 230V. A.C. £17.10.0 Carr. 5/–.

LELAND MODEL 27 BEAT FREQUENCY OSCILLATORS

Frequency 0–20 Kc/s. on 2 ranges. Output 500 Ω or 5k Ω. Operation 200/250V. A.C. Supplied in perfect order. £12.10.0 Carr. 10/–.

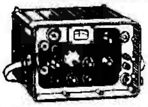
TE-65 VALVE VOLTMETER

High quality instrument with 28 ranges. D.C.volts 1·5–1,500v. A.C. volts 1·5–1,500v. Resistance up to 1,000 megohms. 200/240v. A.C. operation. Complete with probe and instructions. £17.10.0. P. & P. 6/–. Additional probes available: R.F. 42/6. H.V. 50/-

COSSOR 1049 DOUBLE BEAM OSCILLOSCOPES

D.C. coupled. Band width 1Kc/s. Perfect order. £25. Carr. 30/–.

AM/FM SIGNAL GENERATORS



Oscillator Test No. 2. A high quality precision instrument made for the ministry by Airmec. Frequency coverage 20-80 Mc/s. AM CW/FM. Incorporates precision dial, level meter, precision attenuator 1µV–100mV. Operation from 12 volt D.C. or 0/110/200/250 volt A.C. Size 12 × 8¼ × 9in. Supplied in brand new condition complete with all connectors fully tested. £45. Carr. 20/–.

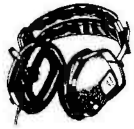
EDDYSTONE VHF RECEIVERS Model 770R. 19–165 Mc/s. Excellent condition. £150.

RUSSIAN C1-16 DOUBLE BEAM OSCILLOSCOPES

5 MHz Pass Band. Separate Y1, Y2 amplifiers. Calibrated triggered sweep from ·2 sec to 100 milli sec/cm. Supplied complete with all accessories and instructions £87. Carr. paid.

TE-16A Transistorised Signal Generator. 5 ranges 400kHz—30mHz. An inexpensive instrument for the handyman Operates on 9v battery. Wide easy to read scale. 800kHz modulation. 5¼ × 5¼ × 3½in. Complete with instructions and leads. £7.19.6. P. & P. 4/–.

HOSIDEN DH-08S DE-LUXE STEREO HEADPHONES



Features unique mechanical 2 way units and fitted adjustable level controls. 8 ohm impedance. 20–20,000cps. Complete with spring lead & stereo jack plug £7.19.6. P. & P. 2/6.

AUTO TRANSFORMERS

0/115/230V. Step up or step down. Fully shrouded.

150 W.	£2. 2.6.	P. & P. 3/6.
300 W.	£3. 5.0.	P. & P. 4/6.
500 W.	£4.10.0.	P. & P. 6/6.
1,000 W.	£6.10.0.	P. & P. 7/6.
1,500 W.	£8.19.6.	P. & P. 8/6.
7,500 W.	£15.10.0.	P. & P. 20/-

G. W. SMITH & CO (RADIO) LTD.
Also see oppos. page

BI-PRE-PAK LTD

DEPT. D, 222-224 WEST ROAD, WESTCLIFF-ON-SEA, ESSEX
TELEPHONE: SOUTHEND (0702) 46344

FULLY TESTED AND MARKED

AC107	3/-	OC170	3/-
AC126	2/6	OC171	4/-
AC127	3/6	OC200	3/6
AC128	2/6	OC201	7/-
AC176	5/-	2G301	2/6
ACY17	3/-	2G303	2/6
AF239	7/6	2N1302-3	4/-
AF186	10/-	2N1304-5	5/-
AF139	10/-	2N1306-7	6/-
BC154	5/-	2N1308-9	9/-
BC171 = BC107	2/6	2N3819 FET.	9/-
BC172 = BC108	2/6	2N3844A	5/-
BF194	3/-	Power	
BF274	3/-	Transistors	
BFY50	4/-	OC20	10/-
BSY25	7/6	OC23	10/-
BSY26	3/-	OC25	8/-
BSY27	3/-	OC26	5/-
BSY28	3/-	OC28	7/6
BSY29	3/-	OC35	5/-
BSY95A	3/-	OC36	7/6
OC41	2/6	AD149	10/-
OC44	2/6	AUY 10	30/-
OC45	2/6	2N3055	15/-
OC71	2/6	2S034	10/-
OC72	2/6	Diodes	
OC73	3/6	AAY42	2/-
OC81	2/6	OA91	2/-
OC81D	2/6	OA79	1/9
OC139	2/6	OA81	1/9
OC140	3/6	1N914	1/6

FREE! Packs of your own choice up to the value of 10/- with orders over £4.

NEW UNMARKED UNTESTED PAKS

H10	25	Mixed volts 1½ watt Zeners Top Hat type.	10/-
B80	8	Dual Trans. Matched O/P pairs NPN. Sil. in TO-5 can.	10/-
H11	30	Mat series "Alloy" PNP Transistors.	10/-
B83	200	Trans. Makers rejects. NPN/PNP. Sil. and Germ.	10/-
B84	100	Silicon Diodes DO-7 glass equiv. to OA200, OA202.	10/-
H15	30	Top Hat Silicon Rectifiers 750 mA. Mixed volts.	10/-
B86	50	Sil. Diodes sub. min. IN914 and IN916 types.	10/-
H16	8	Experimenters' Pak of Integrated circuits. Data supplied.	10/-
B88	50	Sil. Trans. NPN, PNP, equivalent to OC200/1, 2N706A, BSY95A, etc.	10/-
B60	10	7 Watt Zener Diodes. Mixed voltages.	10/-
H20	20	BY126/7 type Silicon Rectifiers 1 amp plastic. Up to 1,000 volts.	10/-
H6	40	250mW. Zener Diodse DO-7 min. Glass Type. AV.40% Good.	10/-

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H8	4	BY127 Silicon Recs. 1000 P.I.V. 1 amp. Plastic. Replaces the BY100	10/-
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B81	10	Reed Switches, mixed types, large and small.	10/-
B89	2	5SP5 Light Sensitive Cells. Light Res. 400 Ω Dark 1M Ω	10/-
B91	8	NKT163/164 PNP Germ. TO-5 equivalent to OC44, OC45.	10/-
B92	4	NPN. Sil. Trans. AO6 BSX20 2N2369 500 MHz, 360mW.	10/-
B93	5	GET113 Trans. equiv. to ACY17 to ACY21 PNP Germ.	10/-
B96	5	2N3136 PNP Sil Trans. TO-18, HFE 100-300 I.C. 600mA. 200MHz.	10/-
B98	10	XB112 and XB102 equiv. to AC126, AC156, OC81/2, OC71/2, NK271, etc.	10/-
H4	250	Mixed Resistors, Post and packing 2/-.	10/-
H7	40	Wirewound Resistors. Mixed Values. Postage 1/6.	10/-
H9	2	OCP71 Light Sensitive Photo Transistors.	10/-

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Full of short lead semiconductors and electronic components, approx. 170. We guarantee at least 30 really high quality factory marked Transistors PNP and NPN, and a host of diodes and rectifiers. Mounted on printed circuit panels. Identification chart supplied to give some information on the transistors.

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£7.5.0.

Solve your communication problems with this **4-Station Transistor Intercom** system (1 master and 3 Subs), in de-luxe plastic cabinets for desk or wall mounting. Call/talk/listen from **Master** to **Subs** and **Subs to Master**. Ideally suitable for Business, Surgery, Schools, Hospital, Office and Home. Operates on one 9V battery. On/off switch. Volume control. Complete with 3 connecting wires each 66ft. and other accessories. P. & P. 7/6.

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No batteries—no wires. Just plug in the mains for instant two-way, loud and clear communication. On/off switch and volume control. Price £11.19.6. P. & P. 8/6 extra.

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59/6

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- INDEPENDENT ADJUSTMENT OF THE TWO VICE HEADS TO ANY ANGLE WITH POSITIVE LOCKING.
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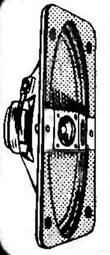
J1001	3″	L.P.	PVC	225ft.	5/6	P & P 1/2
J1002	3″	T.P.	Poly	600ft.	10/6	P & P 1/2
J1003	5″	L.P.	PVC	900ft.	10/-	P & P 1/8
J1004	5″	D.P.	Poly	1200ft.	15/-	P & P 1/8
J1005	5¾″	L.P.	PVC	1200ft.	12/6	P & P 2/-
J1006	5¾″	D.P.	Poly	1800ft.	22/6	P & P 2/-
J1007	7″	S.P.	PVC	1200ft.	12/6	P & P 2/6
J1008	7″	L.P.	PVC	1800ft.	17/6	P & P 2/6
J1009	7″	D.P.	Poly	2400ft.	25/-	P & P 2/6
J1010	7″	T.P.	Poly	3600ft.	50/-	P & P 2/6
C60 Cassette (Library cased)					8/6	P & P 1/-
C90 Cassette (Library cased)					13/-	P & P 1/-
C120 Cassette (Library cased)					18/-	P & P 1/-



E.M.I. LOUDSPEAKERS
MODEL 450 13½″ × 8″ elliptical with twin tweeters. 8 ohm impedance. 10 watts. Brand New; guaranteed. Lind-Air Price **89/6** P. & P. 4/6.
MODEL 150 13½″ × 8″ elliptical, 3 and 15 ohm impedance. 10 watts. Lind-Air Price **59/6** P. & P. 4/6.
TEAK FINISH SPEAKER CABINETS
Size 16″ × 10″ × 9″. Ideal for above units **£5.19.6**

DE-LUXE STEREO HEADPHONES

With soft rubber earpieces. Impedance 8-16 ohms. Frequency response 23-13,000 cps. With lead and stereo plug.
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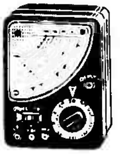
C.1001 MULTI-TESTER



Overload protection. 20,000 opv. AC volts 10, 50, 250, 1,000v. DC volts 5-25, 125, 500, 2500v. D.C. Current 0-50 uA, 0-250 mA. Resistance 0-60K, 0-6 Meg ohm. Decibels—20 to +22dB. Size of meter 4½ x 3¾ x 1in. Complete with leather case **85/-** P. & P. 3/6

NEW! STP.800 8-TRACK STEREO CARTRIDGE HOME PLAYER

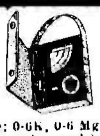
TELETON STP. 800 8-TRACK STEREO CARTRIDGE HOME PLAYER
A complete solid state unit ready to plug in and play. Hi Fi reproduction at 3¾ i.p.s. Player unit incorporates Volume, tone and balance controls and push button track selector. Size 14½″ × 10½″. Matched speakers size 11″ × 8″ × 5½″ each.

LIND-AIR PRICE
49 GNS. Carr. 30/-

SOLDERING GUN

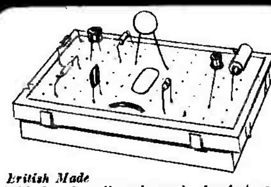
Comfortable grip with trigger control, "U" shaped 3½″. bit to minimise wear. Light beam is automatically directed on to end of bit when ON/OFF trigger is in use 230-250 volts. 85 watt element **49/6** P. & P. 3/6.

62D. MULTI-TESTER



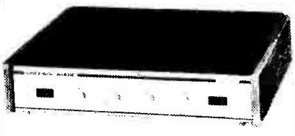
20,000 p.p.v. DC voltage 5 - 25 - 50 - 250 - 500 - 2.5 K (20,000 ohms per volt). AC voltage: 10-50-100-500-1000 volts (10,000 ohms per volt). DC Current: 0-50 uA, 0-2.5 mA, 0-250 mA. Resistance: 0-6K, 0-6 Mg (300 ohm and 30K at centre scale). Capacitance: 10f. to .001 mfd. .001 uf to .1 uf. Decibels: —20 to + 22dB. Size 4½ x 3½ x 1in. **71/-** P. & P. 3/6.

S-DEC BREADBOARD



British Made
Solderless breadboard panels, for fast reliable component connections.
Single DeCs. One S-DeC with Control Panel, Jig and Accessories for solderless connections to controls, etc., with booklet "Projects on S-DeC" giving construction details for a variety of circuits. **29/6.** P. & P. 2/6.
4-DeC KIT. Four S-DeCs with two Control Panels, Jigs and Accessories and the booklet "Projects on S-DeC" all contained in a strong attractive plastic case. Ideal for the professional user. **£5.17.6.** P. & P. 3/6.
T-DeC KIT **£5.17.6.** P. & P. 3/6.

LIND-AIR LA.20



A fantastic stereo amplifier made exclusively for Lind-Air and represents considerable advance in solid state stereo amplifiers. Inputs for gram and radio tuner and provision for direct tape recording. Attractive and modern panel with bass, treble balance and volume controls also on/off and stereo/mono switch. Output 5W per channel music power. Frequency response 40-20,000Hz 8-16 ohm speaker matching. Size 16½″ × 14″ × 4″.

LIND-AIR PRICE 22gns. P. & P. 10/-.

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UNILEX Audio Modules

Now you can build your own stereo units exactly as you want them, and entirely in your own home. A good quality stereo amplifier can be built with no electrical knowledge.
All solid state—Baxendall tone control circuit—no soldering—terminal block connections throughout.
Everything you need to know about UNILEX SYSTEMS is in the Mullard book "Do it yourself stereo". Superb designs, detailed plans, simple instructions in non-technical language covering 4 systems in 4 price ranges. Send for your copy now **5/-** Post Free.

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Amplifier Module EP9000	**£2.18.0** each
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Power Supply Module EP9002	**£4.12.0**
Control Panel Assembly and Escutcheon Plate	**£3.5.0**

BUILD A STEREO AMPLIFIER FOR ONLY £16.15.0 P. & P. 7/6

Garrard HI-FI TURNTABLES

2025 T/C with stereo cartridge	£8.19.6
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Base and cover for above	£5.19.6
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P. & P. Decks 12/6. Base & Cover 10/-. Deck/Base/Cover 17/6.
SPECIAL OFFERS!
SP25 MkII with base **£14.10.0.** P.&P. 15/-.
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SINCLAIR IC-10 INTEGRATED CIRCUIT

10 watt Amplifier. Size only 1 x 0.4 x 0.2in. A true hi-fi amplifier complete with manual giving details of a wide range of applications and instructions. Guaranteed 5 years.
ONLY **59/6** P. & P. 1/6.
SPECIAL TRANSFORMER FOR OPERATING SINCLAIR IC-10 from A.C. mains 230/250v. Output 13v. at 0.5 amp. **16/6** P. & P. 2/6.

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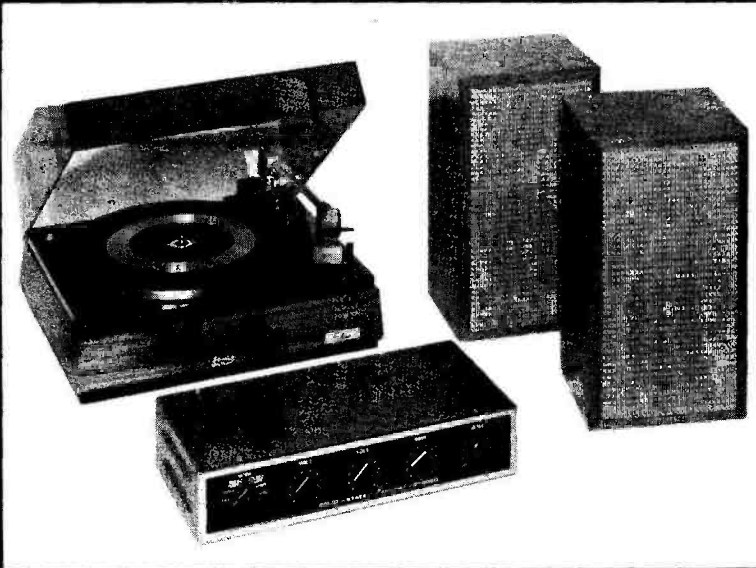
Complete Stereo System £41

WITH VISCOUNT F.E.T. FIELD EFFECT TRANSISTORS AMPLIFIER



This superb stereo system is a real price break through. It comprises the VISCOUNT F.E.T. Mk I amplifier on which full details are given below, the famous Garrard SP 25 Mk II (including teak veneer base and transparent cover) with diamond cartridge or 2025 TC and the very successful DUO type 2 speakers. Measuring 17½in x 10¼in x 6¾in, the Duo type 2 speakers are beautifully finished in teak veneer with matching vynair grills. They incorporate a 10½in x 6½in drive unit and high frequency speaker, both of which are of 3 ohms impedance. The Duo speaker system is also available separately at £6.6.0 each, plus 15/- p. & p.

Complete stereo system £41 plus £2.10. p. & p.

The Viscount F.E.T. Mk I **£14.5** plus 7/6 p. & p.

High fidelity transistor stereo amplifier employing field effect transistors. With this feature and accompanying guaranteed specifications below, the Viscount F.E.T. vastly surpasses amplifiers costing far more.

Specification—Output per channel 10 watts r.m.s. Frequency bandwidth 20 Hz to 20 kHz + 1db at 1 watt. Total distortion at 1 kHz at 9 watts 0.5% Input sensitivities CER. P.U. 100mV into 3 meg ohms. Tuner 100mV into 100K ohms. Tape 100mV into 100K ohms. Overload Factor Better than 26db. Signal to noise ratio—70db on all inputs (with vol. max). Controls—6 position selector switch (3 pos. stereo and 3 pos. mono). Separate volume controls for left and right channels. Bass ± 14db at 60 Hz. Treble (with D.P.S. on off) ± 12 db at 10 KHz. Tape recording output sockets on each channel. Size 12¼in . 6in . 2¾in. in teak-finished case. BUILT & TESTED.

MkII (MAG P.U.) **£15.15** plus 10/- p. & p.
Specification same as Mk. 1, but with the following inputs. Mag. P.U. CER. P.U. Tuner. Spec. on Mag. P.U. 3mV at 1 kHz input impedance 47K. Fully equalised to within ±1db RIAA. Signal to noise ratio—65db (vol. max).

The £29-10-0 Stereo system

The Duetto is a good quality stereo amplifier, attractively styled and finished. It gives superb reproduction previously associated with amplifiers costing far more.

SPECIFICATION—
R.M.S. power output 3 watts per channel into 10 ohms speakers.

INPUT SENSITIVITY. Suitable for medium or high output crystal cartridges and tuners. Cross-talk better than 30dB at 1Kc/s.

CONTROLS: 4-position selector switch (2 pos. mono and 2 pos stereo) dual ganged volume control.

TONE CONTROL Treble lift and cut Separate on off switch. A preset balance control.

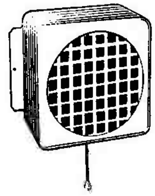
Duetto integrated transistor stereo Amp.	£9.10.0 + 7/6 p&p.
Garrard Changer from	£7.19.6 + 7/6 p&p.
Cover and teak finish plinth	£4.15.0 + 7/6 p&p.
Duo Type I speakers (see opp. page)	ea. £4. 4.0 + 7/6 p&p.
The above items purchased together	£29.10.0 + £1.10 p&p.

CAR TRANSISTOR IGNITION SYSTEM

by famous manufacturer

For 6 volt or 12 volt positive earth systems, Comprising: special high voltage working hermetically sealed silicon transistor mounted in finned heat-sink, high output ignition coil, ballast resistor and hardwear (screws, washers, etc.).

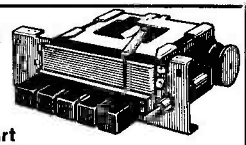
Price **£4.19.6** plus 5/- P. & P.



EXTRACTOR FAN

A.C. mains 230/250v. complete with pull switch. Size: 6 x 6 x 4in.

Price **27/6**
plus 7/6 P. & P.



PYE CAR RADIO

Push Button Tuning Heart

This PRESTOLOCK 5 station Push-Button Tuner Heart with Manual Over-ride is an ideal basis for a quality AM car radio. Size 6¼" x 4" x 2". As illustrated but without knobs.

25/- plus 3/- P. & P.

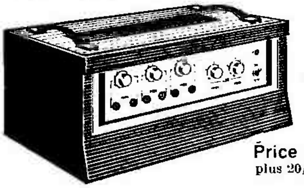
THE DUO SPEAKER SYSTEM

Similar in design to those on the previous page the 2-way speaker system is beautifully finished in polished teak veneer, with matching vynair grille. It is ideal for wall or shelf mounting either upright or horizontally.

Type 1 SPECIFICATION:—

Impedance 3, 8 or 10 ohms (please state requirement). It incorporates Goodmans high flux 6in x 4in speaker and 2½in speaker. Teak finish 12in x 6¾in x 5¾in. **4 guineas** each. 7/6 p. & p.

50 WATT AMPLIFIER



A.C. Mains 200-250V

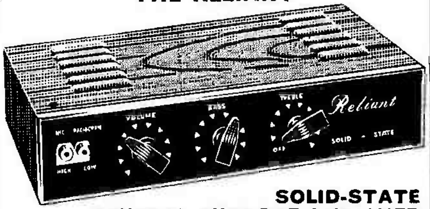
Price **£28.10**
plus 20/- p. & p.

An extremely reliable general purpose valve amplifier. Its rugged construction yet space age styling and design makes it by far the best value for money.

TECHNICAL SPECIFICATIONS

3 electronically mixed channels, with 2 inputs per channel. enables the use of 6 separate instruments at the same time. The volume controls for each channel are located directly above the corresponding input sockets. **SENSITIVITIES AND INPUT IMPEDANCES.** Channels 1 and 2 4mV at 470K. These 2 channels (4 inputs) are suitable for microphone or guitars. Channels 3 and 4 300mV at 1m. Suitable for most high output instruments (gram, tuner, organ, etc). Input sensitivity relative to 10w output. **TONE CONTROLS ARE COMMON TO ALL INPUTS. Bass Boost** +12dB at 60Hz. **Bass Cut**—13dB at 60Hz. **Treble Boost** +11dB at 15 KHz. **Treble Cut** —12dB at 15 KHz. With bass and treble controls central—3dB points are 30 Hz and 20 KHz. **POWER OUTPUT:** For speech and music 50 watts rms. 100 watts peak. For sustained music 45 watts rms. 90 watts peak. For sine wave 38.5 watts rms. Nearly 80 watts peak. Total distortion at rated output 3.2% at 1KHz. Total distortion at 20 watts 0.15% at 1KHz. Output to match into 8 or 15 ohms speaker system. **NEGATIVE FEEDBACK** 20dB at 1KHz. **SIGNAL TO NOISE RATIO** 60dB. **MAINS VOLTAGES** adjustable from 200-250V A.C. 50-60Hz. A protective fuse is located at the rear of the unit. Output-impedance 3, 8 and 15 ohms.

THE RELIANT



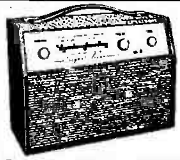
SOLID-STATE GENERAL PURPOSE AMPLIFIER

SPECIFICATIONS

Output—10 watts. Output impedance—3 to 4 ohms
Inputs—1. -xtal mic 10mV Tone Controls—Treble control range ±12dB at 10KHz.
2. -gram/radio 250mV. Bass control range ±13dB at 100Hz.
Frequency Response—(with tone controls central) Minus 3dB points at 20Hz and 40KHz. Signal to Noise Ratio—better than −60dB. Transistors—4 silicon Planar type and 3 Germanium type. Mains input—220/250V. A.C. Size of chassis— 10¼in x 4¾in x 2¾in. For use with Std. or L.P. records, musical instruments, all makes of pick-ups and mikes. Separate bass and treble lift control. Two inputs with control from gram. and mike. Built and tested.

RELIANT Mk. I
As above less teak case
£6.10 plus 7/6 P. & P.

RELIANT Mk. II
In teak finished case
£7.5 plus 7/6 P. & P.

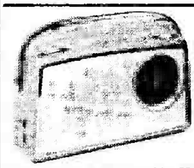


The ELEGANT SEVEN Mk. III

(350mW Output)

7 transistor fully-tunable M.W.—L.W. superhet portable Set of parts. Complete with all components, including ready etched and drilled printed circuit board—back printed for foolproof construction.
MAINS POWER PACK KIT: **9/6** extra.

Price **£5.5.0** plus 7/6 P. & P.
Circuit 2/6 FREE WITH PARTS



The DORSET

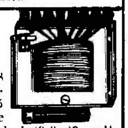
(600mW Output)

Price **£5.5.0**
plus 7/6 P. & P.

Circuit 2/6
FREE WITH PARTS

7-transistor fully tunable M.W.—L.W. superhet portable—with baby alarm facility. Set of parts. The latest modulised and pre-alignment techniques makes this simple to build. Sizes: 12 x 8 x 3in.
MAINS POWER PACK KIT: **9/6** extra

QUALITY MAINS TRANSFORMER



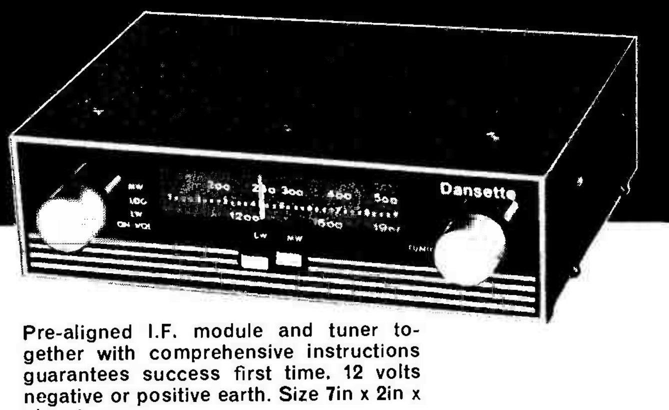
Input 250 volts. OUTPUT (All RMS values) 4 windings of 11.5 volts connected in series total 46 volts at 4.5 amps (conservatively rated). The following combinations may be used. 1.23-0-23 volts 2.46 volts.
Both of these above voltages are commonly used in medium to high powered transistor amplifiers, power supplies, etc.

Price **35/-** plus 7/6 P. & P.

LIQUIDATED STOCK

DANSETTE

TOURISTE MK3 CAR RADIO



ALL TRANSISTOR

Beautifully designed to blend with the interiors of all cars. Permeability tuning and long wave loading coils ensure excellent tracking, sensitivity and selectivity on both wave bands. R.F. sensitivity at 1 MHz is better than 8 micro volts. Power output into 3 ohm speaker is 3 watts.

Pre-aligned I.F. module and tuner together with comprehensive instructions guarantees success first time. 12 volts negative or positive earth. Size 7in x 2in x 4½in deep.

Originally sold complete for £15.4.6.

SET OF PARTS £6.6.0 plus 7/6 P. & P.

Circuit diagram 2/6. Free with parts

Speaker, baffle and fixing kit **25/-** extra plus 4/- P. & P.
Postage free when ordered with parts.

See top of previous page for address

RADIO & TV COMPONENTS
R+TV
(ACTON) LIMITED

PRACTICAL WIRELESS

VOL 46 NO 6
Issue 764

OCTOBER 1970

TOPIC OF THE MONTH

Women, arise!

WHAT with the establishment of the principles of equal pay and equal rights for women, the unisex concept and other such manifestations of emancipation, perhaps it is about time we did something about this parity of the genders in this hobby of ours.

For long years, women have been favoured by management to perform those delicate tasks in assembly and inspection etc., so admirably suited to their special temperament and this is increasingly evident in the radio and electronics industries. But after leaving the factory or laboratory they seem to lose interest. They want to wash their hair, go to the pictures or watch the telly, when what they *really* ought to be doing is getting to grips with F. G. Rayer's latest creation in Practical Wireless!

With their gentle touch and infinite patience, the wiring up of the modern generation of miniature components ought to trouble them not the slightest. And think of the fruitful field for gossip that can be extracted from the tales of constructional triumphs ..... "she said Radio Australia came booming out the first time she switched on. She hadn't even got the dial on straight. And the colour scheme of the cabinet!"

We admit that many ladies *are* involved in amateur radio but most of them take a fairly passive (or resigned!) part in the proceedings, eyeing with varying degrees of distaste the activities of their eccentric menfolk. Before the last war there were just *two* licensed lady radio amateurs among the ranks of several thousand in this country. The Services, however, took advantage of their usefulness as wireless operators and mechanics and this was the launching pad for many who decided to take up radio as a hobby—and as a hubby, for most of them seem to have been snapped up by male radio enthusiasts who realised they were on to a good thing!

Today the number of licensed ladies is well over 50 strong and still growing. But we could do with more support on the constructional side. We ought to persuade our betters to join us and let them share our pleasures (and agonies). Apart from brightening things up and allowing us more time with the hobby, we'd have another pair of hands to do some of the donkey work. But that is quite beside the point!

W. N. STEVENS—*Editor.*

NOVEMBER ISSUE WILL BE PUBLISHED ON OCTOBER 9

NEWS AND COMMENT

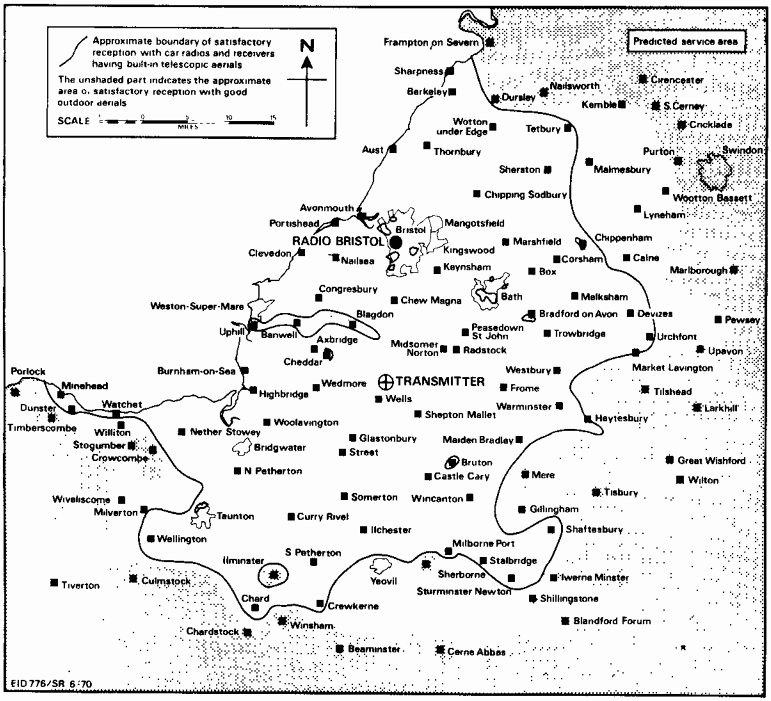
CONSTRUCTIONAL

OTHER FEATURES

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

Radio Bristol

Shown right is the v.h.f. service of Radio Bristol. Frequency is 95·4MHz with horizontal polarisation. Maximum e.r.p. is 5kW with a directional aerial. The inner and outer service area boundaries correspond to average field-strength contours of 60 and 48dB (relative to 1 microvolt per metre) respectively for a receiving aerial height of 30ft above ground level. The field strength at a particular site may differ by 10dB from that indicated.



R.A.E. Courses

A Radio Amateurs' Examination Course is to be run this winter by Glasgow Corporation Further Education Department at: The Glasgow College of Nautical Studies, 21 Thistle Street, Glasgow, C.5.

The course will meet at the College on Tuesdays and Thursdays from 7-9.30 p.m., commencing Tuesday, September 15th, 1970. Enrolment will take place at the College at 7 p.m. on the opening evening, and the fee for the course is £3, payable on enrolment. Students under the age of 18 on August 1st, 1970, will not be required to pay a fee.

The syllabus of the course embraces theory, licence conditions, and morse instruction, and no prior knowledge is assumed or required.

There will be a Radio Amateurs' Examination Course on Wednesdays, 6.30-9 p.m., starting September 23rd. Enrolments: Wednesday and Thursday September 9th and 10th, and Wednesday, September 16th, from 6.15-8.15 p.m., Room 8, Acton Technical College, opposite Acton Town Hall, Acton, London, W.3.

Fee: For three terms, £3. Lecturer: W. G. Dyer, M.I.E.E., G3GEH.

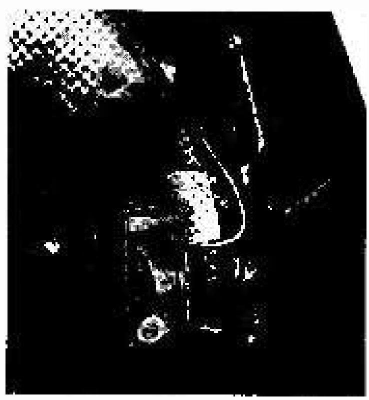
The Cove Further Education Centre (Hampshire) will be running a R.A.E. Course in mid-September. Further details may be obtained from P. D. Dimmick (Principal), Cove Secondary School, St. John's Road, Farnborough, Hants.

Mullard puts the brakes on

Mullard Ltd. recently announced details of a new car braking system using electronics. The system is designed to prevent a road wheel from locking when the vehicle driver applies too much force to the brake pedal. When a separate anti-lock control is used on each wheel, not only can full steering be available under maximum braking conditions, but shorter stopping distances result. The control circuit monitors wheel speed by means of a toothed wheel mounted on the hub. A magnetic pickup fixed near this wheel supplies a pulse train to the control circuit. Pulse frequency is proportional to wheel speed and so contains all information necessary to deduce deceleration, acceleration and speed. The circuit senses the condition in which a wheel is likely to lock and if this tendency continues, energises a hydraulic solenoid valve to relieve brake pressure.

Mullard Ltd. state that the whole system represents the result of a research project carried out at their Research Lab. and further development of parts of the system must be undertaken by car and brake manufacturers before the device can be applied to cars during their manufacture.

Pictures show the experimental circuit used for each anti-lock control and the anti-lock actuator inside the wheel.



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

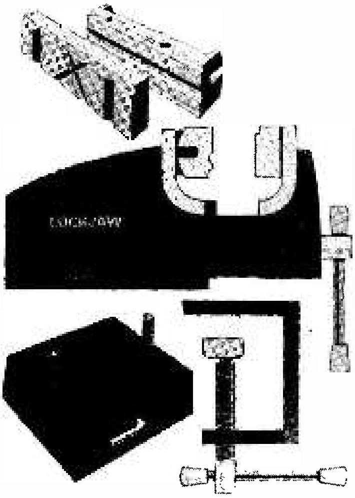
Bench vice for the radio shack

The Lockjaw is a bench vice announced by the Vice & Workholding Co. Ltd. The jaws give a remarkable capacity to grip difficult shapes and delicate objects. With its suction clamp and 'G' clamp, the Lockjaw is a very portable device. It can also be bolted down to a bench, and makes a very useful addition to the wireless 'shack'.

Grooves in the jaws enable a positive hold to be obtained when gripping washers, rods, printed circuits and components. Jawgrips are available with a rubber face for delicate work or silicon metal for harder usage. The silicon metal ones are supplied as standard. One jaw provides a rocking motion so that the face adjusts to work which tapers. If this jawgrip is turned round it is locked into a straight position.

The vice weighs under 4lb and the body is constructed of fine grain silicon alloy metal. It is claimed to hold as strongly as a typical cast-iron type eight times heavier. Jaw width is 4in and overall length closed 8in.

Price of the Lockjaw including silicon metal jaws is 86s. The 'G' clamp base is 30s and the rubber-faced jaws for delicate work 14s a pair. Manufacturers are: *Vice and Workholding Co. Ltd., 149a Crayford Road, Crayford, Kent.*



Gravesend. . .

The above Club has now moved from King's Farm Community Centre, Gravesend, to new premises at the Northfleet Recreation Centre, Springhead Road, Northfleet, Kent, and meetings are held on Thursdays from 7.30 p.m. to 10.30 p.m.

They have taken larger premises as they are anxious to extend their membership and any person interested in Radio will be most welcome; there is no age limit.

Anyone interested in joining, should contact Allen J. Moules, after 7 p.m. weekdays at home—tel. no. Gravesend 2965.

I.S.W.C.

The International Short Wave Club will be pleased to send readers a copy of their bulletin International Short Wave Radio, if they would care to make application to them enclosing return postage. The address is: *Mr. Arthur E. Bear, 100 Adams Gardens Estate, London, S.E.16.*

Audio 70

The date of the New Northern International High Fidelity Festival, at the Cairn Hotel, Harrogate, is September 18th-20th. Many well-known companies will be exhibiting.

Mobile Conference

One of the first large scale conferences on the subject of mobile radio was held at Brunel University from June 30 to July 2. Organised by the Society of Electronic and Radio Technicians, it comprised eleven contributions from both industry and users. In his concluding address, Mr. J. W. Grandey (Gresham Lion) Chairman of the Conference Organising Committee, said that during his discussions with delegates he had been struck by the interest aroused by the contributions. He felt safe in saying that this Conference had been highly successful from every point of view; not least in bringing together over 120 representatives of all branches of this increasingly important field of electronics. The manufacturing industry was well represented as were the Home Office, Electricity and Gas Boards, Police and British Rail.

Most of the material presented at this Conference was new and had not previously received a public hearing. Many of the delegates were unaware of the work being carried out by various organisations, such as the Home Office, in looking to the future of mobile radio. Mr. E. W. Crompton proposed the adoption of a new system of modulation, double side band suppressed carrier, which appeared to provide two advantages, higher range and narrower bandwidth. Some of the recent work carried out by industry in providing new or better applications of mobile radio were also described. Mr. Welsh and Mr. Carey of Cossor proposed a system of vehicle location using phase measurement which had not previously been publicly described and Mr. N. C. Croft of Storno presented a paper on Automatic Extension Ringing from Vehicles.

One of the pressing problems in this rapidly expanding field is frequency availability. This kept cropping up in discussion and was dealt with at length by Mr. D. B. Balchin of the Ministry of Posts and Telecommunications.

TRANSISTOR & DIODE TESTER

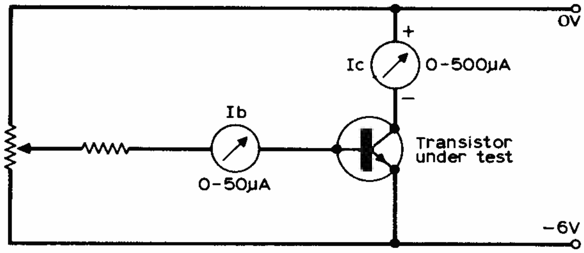
J THORNTON LAWRENCE

THIS TRANSISTOR AND DIODE TESTER IS THE FIRST OF A SERIES OF ARTICLES DESCRIBING A NEW LINE OF TEST EQUIPMENT. THE VARIOUS INSTRUMENTS, ALL IN MATCHING CASES, WILL PROVE WORTHY ADDITIONS TO ANY WORKSHOP.

THE Transistor and Diode Tester to be described will rapidly check transistor leakage current and measure current gain (beta), over a range of collector currents, up to 5mA, for both n.p.n. and p.n.p. transistors. It is also suitable for checking semiconductor diode forward conduction and reverse leakage current. The tester is simple to build and contains only passive components.

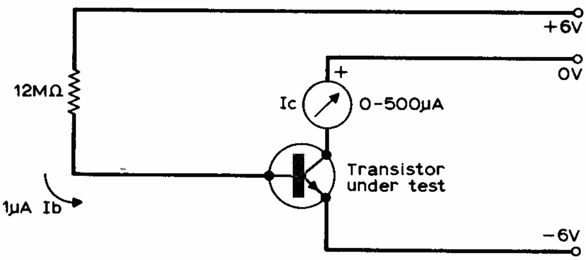
Circuit

The d.c. beta, or h_{FE}, of a transistor is the ratio of the collector current to the base current, beta $= \frac{I_c}{I_b}$ A simple set-up for measuring beta is shown in Fig. 1 The base bias is adjusted to give a convenient value of Ic and the base current Ib, is read off and the calculation made.

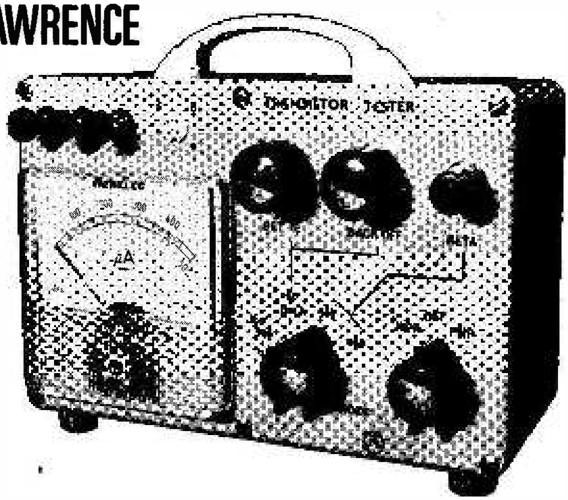


▲ *Fig. 1.*

Fig. 2. ▼

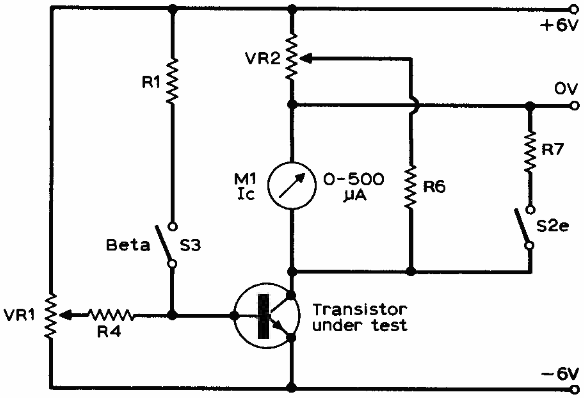


To avoid the necessity of reading Ib from a meter, the base could be fed with a known value of current, say 1μA, from a known fixed supply voltage through a known value resistor, as shown in Fig. 2. The Ic, in μA, would then be a measure of the beta, e.g. 60μA Ic would indicate a beta of 60.



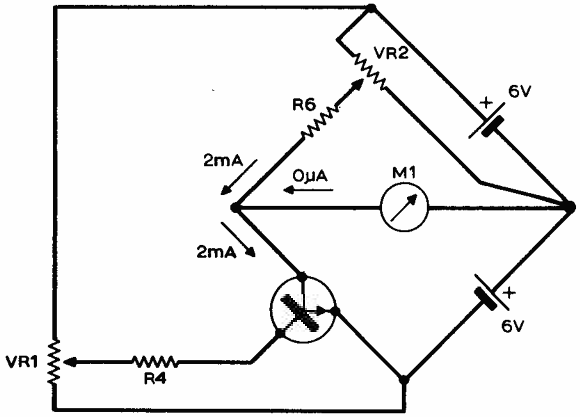
It is often useful to measure beta at different values of Ic, and a basic circuit for doing this is shown in Fig. 3.

In this circuit, R7 is a 5mA shunt for the 500μA meter and with S2e closed, the meter reads 5mA full scale deflection. If, for example, it is desired



▲ *Fig. 3.*

Fig. 4. ▼



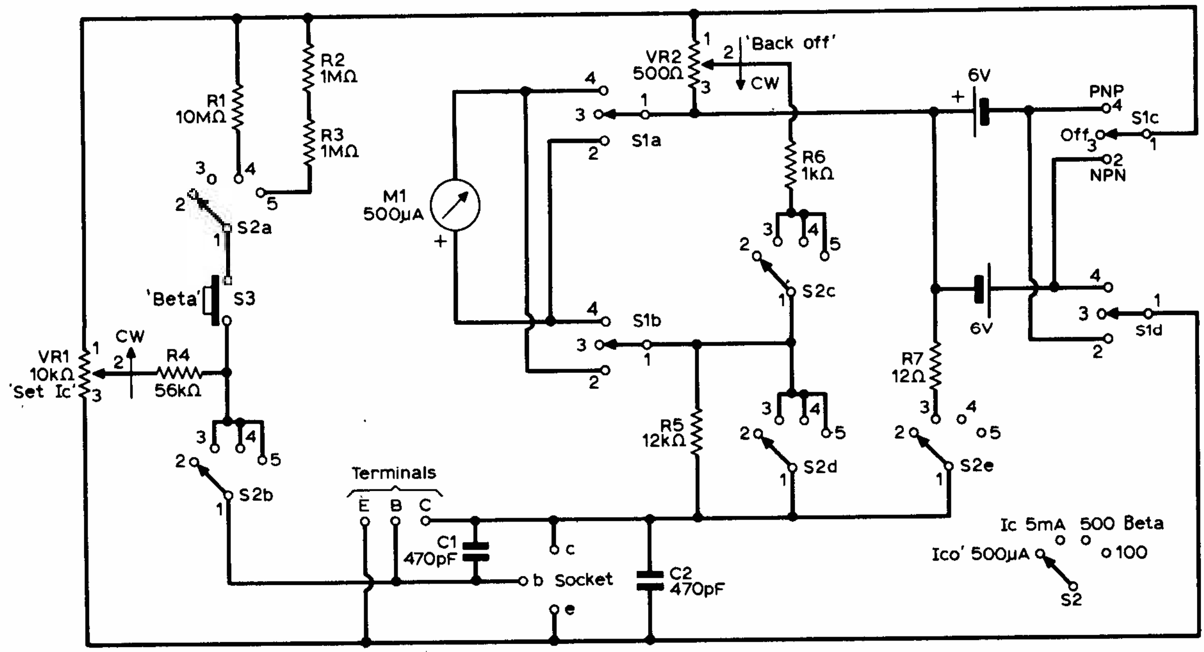


Fig. 5 : Complete circuit of the transistor and diode tester.

to test the transistor at 2mA Ic, VR1 is adjusted to provide sufficient Ib to give an Ic of 2mA, as indicated by M1 (accepting that VR2 and R6 have negligible effect on the accuracy of M1).

The current through M1 is then 'backed-off' by an equal and opposite current, provided by VR2 and R6, until M1 indicates zero. This action may be more easily seen if the circuit is redrawn in the form of a Wheatstone bridge as shown in Fig. 4.

With zero reading on M1, S2e is now opened, thus disconnecting the 5mA shunt and returning M1 to 500μA f.s.d.

To read beta, S3 is closed and the known current, Ib, provided by R1, causes an increase in Ic which is indicated by M1. As previously mentioned, the value of Ib is chosen so that M1 gives a direct reading of beta.

The backing-off current feed resistor R6, has a slight shunting effect on M1, making the meter read about 550μA f.s.d. The value of R1 is therefore chosen accordingly and the facility of reading beta directly is retained.

The method of testing applies equally to p.n.p. and n.p.n transistors, although provision must be made to reverse the polarity of the supplies, and of course the connections to M1.

The complete circuit of the transistor tester is shown in Fig. 5, and here S1 is the 'PNP-NPN' switch which also has a centre 'off' position.

The function switch, S2, switches the meter shunt, R7, the backing-off feed R6, and allows for two ranges of beta 0-500 and 0-100 to be provided by switching two values of Ib through R1 and R2+R3 to the base of the transistor.

Diodes may be checked by connecting between the emitter and collector terminals, when forward and reverse current is indicated. The forward current is limited to 500μA by R5.

★ components list

Resistors:

R1	10MΩ	R5	12kΩ
R2	1MΩ	R6	1kΩ
R3	1MΩ	R7	12Ω
R4	56kΩ		

All ½W 5% carbon

VR1 10kΩ potentiometer, wire-wound
VR2 500Ω potentiometer, wire-wound

Capacitors:

C1/2 470pF disc ceramic

Switches:

S1 2 wafers, each 3 pole 4 way, on Maka-Switch shafting unit (Henry's Radio)
S2 1 wafer, 4 pole 3 way, on Maka-Switch shafting unit (Henry's Radio)
S3 Push button (Micro Omron VAQ-40-45 (Henry's Radio)

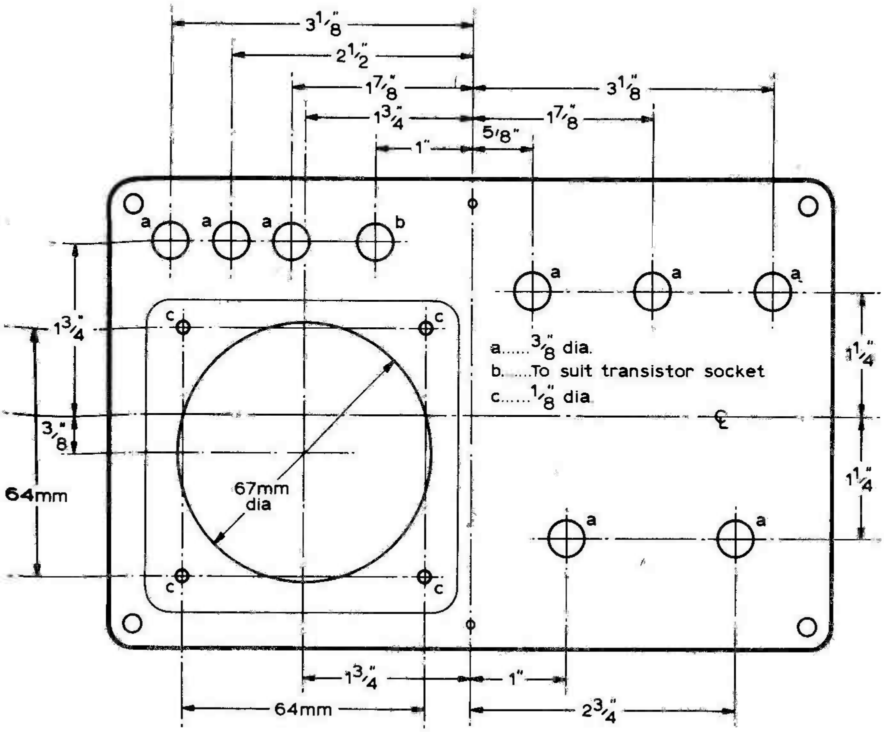
Miscellaneous:

M1, Meter, 500μA f.s.d. (Henelec MRA-65B Henry's Radio)
Die-cast box (Eddystone 6357P, Home Radio)
Knobs (2-PK, 2-WK, Radiospares)
Terminals (3-Paignton PK 12K Home Radio)
Transistor socket. Handle. Plastic feet. Battery connectors

Construction

The transistor tester is built in a 7¼×4½×3in. deep Eddystone die-cast box, type 6357P. The lid of the box forms the front panel and the drillings for this are shown in Fig. 6.

The meter M1, is a Henrys 'Henelec' MRA-65A 500μA moving coil instrument. It should be noted that this meter is a later type to the 65 series illustrated in Henry's catalogue and has slightly different drilling requirements.



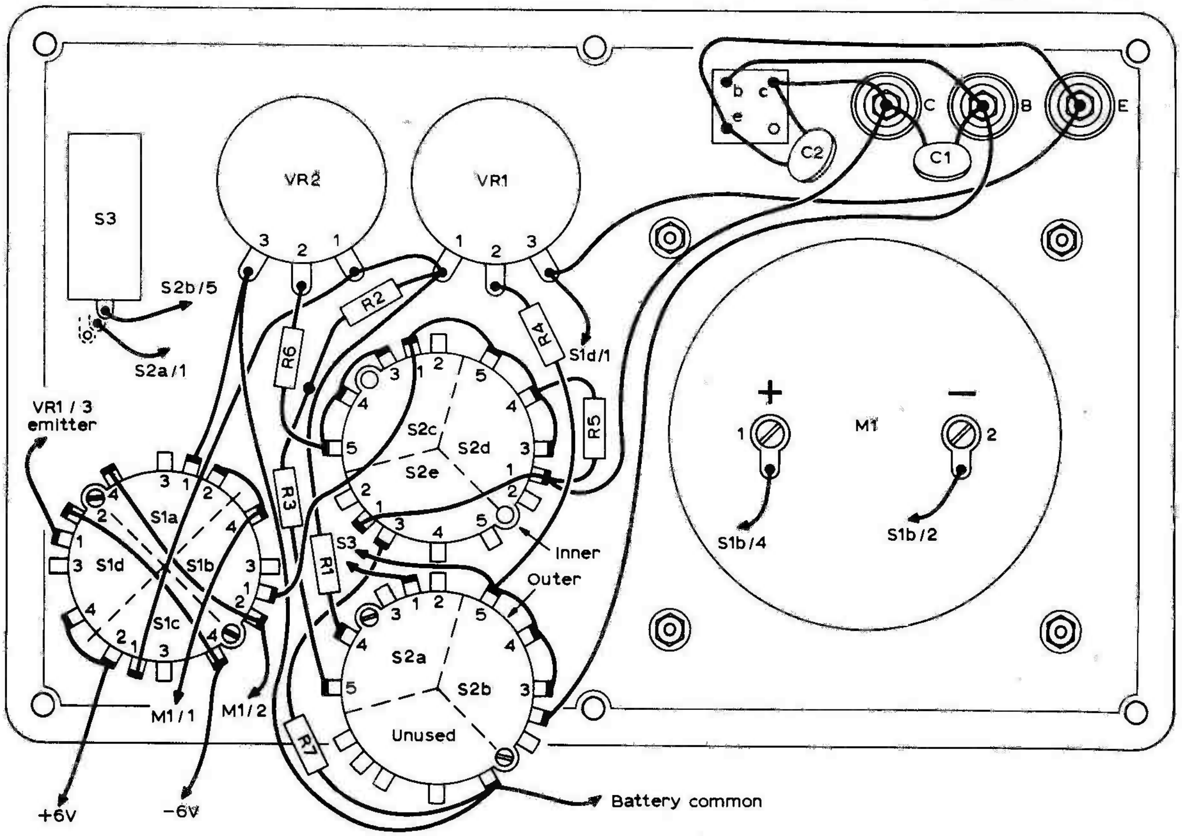
▲ *Fig. 6: Drilling details of front panel.*

The switches are Radiospares Maka-Switch types and it is important for these to be assembled with the markings on the switch wafer facing the switch mechanism. No spacers are used between the wafers but a 6BA washer is fitted between the front wafer and the switch mechanism. The connections to the switch wafers are shown in Fig. 7.

The tester is powered by two PP1 batteries and these fit into the die-cast box as shown in Fig. 8. A strip of polythene or similar material is required between the batteries to prevent an accidental short circuit between the battery connectors. Two 470pF disc ceramic capacitors, C1 and C2, are connected across the transistor socket and terminals to prevent parasitic oscillation of the transistor under test.

To give a good external appearance, the box is sprayed with one of the popular car enamel aerosols and lettered with Letraset lettering, sheet 209.

▼ *Fig. 7: Wiring diagram of tester. The wafers of switch S2 have been separated for clarity.*



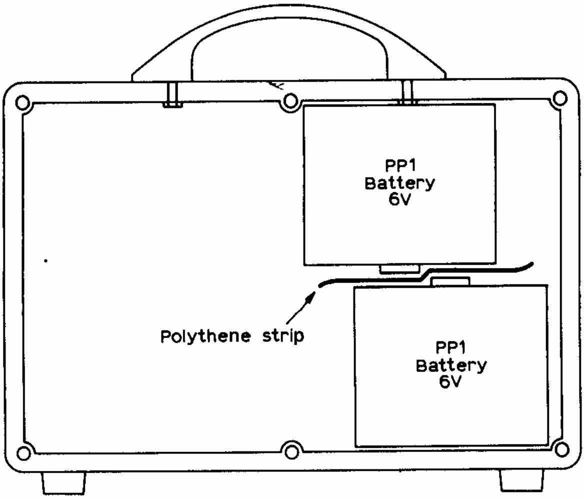


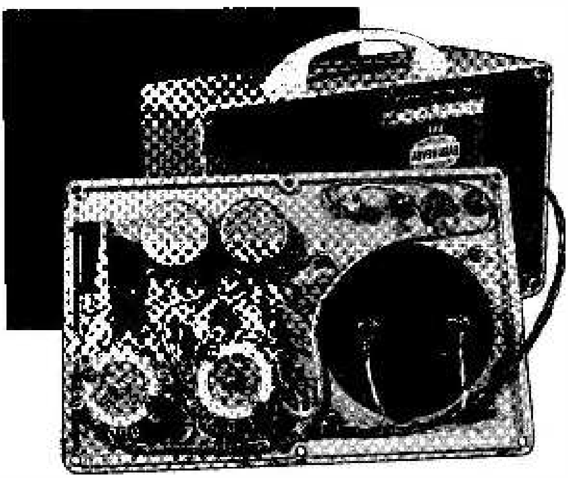
Fig. 8 : Positioning of the two batteries inside the case.

Operation

1. Before connecting the transistor or diode, check the settings of the controls,

Set Ic	fully anti-clockwise
Back off	fully clockwise
Function Switch	to 'Ico"
Polarity Switch	to 'OFF'

2. Connect the transistor to the terminals or socket and switch to 'PNP' or 'NPN' as appropriate. The meter now reads 0-500μA of collector leakage current with the base open circuit (Ico'), at a collector voltage of 6 volts. If the meter reads full scale, the transistor is probably faulty and no further tests should be made. (Some very large germanium power transistors may have leakage currents of this order and may not necessarily be faulty. These are outside the capabilities of this tester.)
3. Set the function switch to 'Ic.'

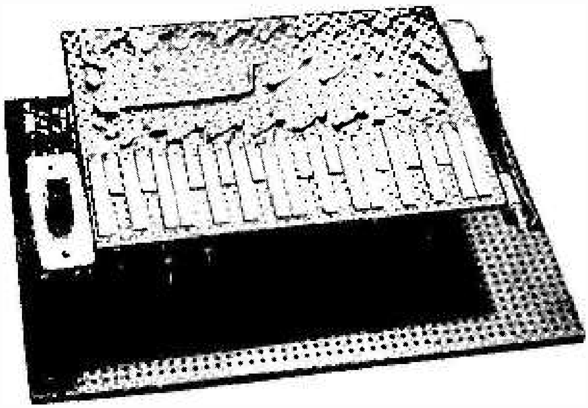


Completed tester. Compare with the wiring diagram, Fig. 7.

4. Set the 'Set Ic' control for a suitable value of Ic. The meter reads 5mA f.s.d. For small a.f. and r.f. types 1-2mA is suitable, higher currents may be used for higher power types.
5. Adjust the back-off control for zero reading of Ic.
6. Set the function switch to 'Beta 500' or '100' and if necessary re-zero the meter with the back-off control.
7. Press the Beta button for a direct reading of beta.
8. Photo-transistors may be checked as normal transistors providing that they are not exposed to light. The sensitivity to light may be checked by setting the tester to Step 3 and alternately exposing and shielding the photo-transistor to and from light. The 'Set Ic' control should be set to minimum (anti-clockwise).
9. In the testing of semiconductor diodes, the cathode should be connected to terminal C and the anode to terminal E.
10. Set the function switch to Diode.
11. Set the polarity switch to 'FOR' for the forward conduction test. The forward current is limited to 500μA.
12. Set the polarity switch to 'REV' for the reverse leakage test. The reverse current, 0-500μA, is measured at 6 volts.
13. Switch OFF before returning the controls to the positions given in Step 1.

Identification

A simple method of identifying p.n.p. or n.p.n. transistors is to insert the unknown type in the socket and temporarily short circuit the E and B terminals with a piece of wire. With the function switch at 'Ico',' turn the polarity switch to 'PNP' and then 'NPN,' the position which produces little or no current reading indicates the transistor type. The short circuit may then be removed and testing carried out in the usual way. ■



mini organ

P. M. DELANEY

THE small organ to be described in this article can be built in an evening. If it is built as described, then it will give two octaves, one above and one below 'Middle C'. Full constructional details are given, so that even a relative newcomer to electronics should find no difficulty in building this organ.

Circuit

The organ consists of three sections, the circuit diagram being given in Fig. 1. Tr2 and Tr3 together form an astable multivibrator, tuned by VR1-VR25, R9, C5 and C6. It is sometimes difficult to make a transistorised multivibrator begin to oscillate. However, by the omission of the emitter bias resistor to Tr2, the necessary imbalance is produced.

The output transistor, Tr4, uses a transformer T1 for its load to match the speaker. A tremolo is provided by the low frequency oscillator Tr1, and this signal is switched in by S1. The variable resistors VR1-VR25 are used to obtain the different notes.

If a simpler organ is required (without a tremolo), then R1-R7, C1-C4, Tr1 and S1 can be omitted. Similarly a one octave instrument can be built requiring only 13 variable resistors.

Construction

The organ is built on two pieces of Veroboard—one with copper strips and one without. Before assembling any parts, the holes 'Y' should be drilled to clear 8BA. Beginning with the plain board, a keyboard can be made. Using $\frac{1}{8}$th inch 'Cir-kit' strip, a series of copper strips are laid out as shown in Fig. 2. Note that the corners of strips 2 and 24 are cut off slightly.

Next the variable resistors are fitted around the edge of the board, and VR23-25 are placed in the centre. To ease the task of tuning, these are angled back, so that the tags come through the holes indicated. Wires are now connected along the top as shown, and underneath from the wipers to the copper strips.

The wiper of VR1 goes by the wire numbered 1 to the note 1, etc. The notes 18 and 19 are connected on the top of the board. All the wires should be kept short and as close to the board as possible. A length of wire (about $1\frac{1}{2}$ inches) is attached to the point Z.

The main part of the circuit can then be assembled. Firstly, the copper strips should be broken as indicated in Fig. 4. On the plain side of this board (Fig. 3), the connecting wires to the speaker, switch

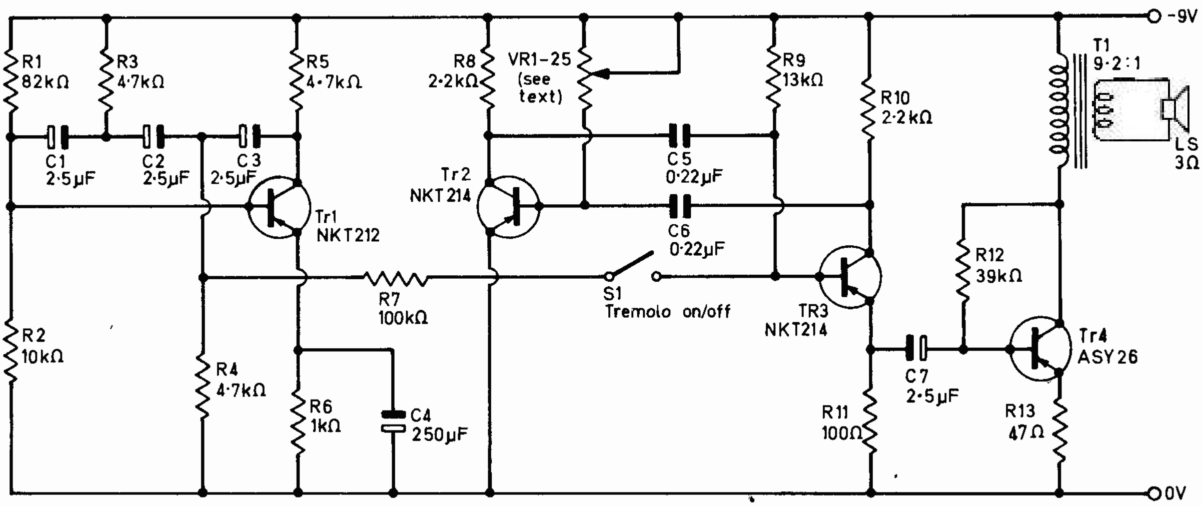


Fig. 1: Circuit of the mini organ. Tr1 provides the tremulo effect, Tr2-3 form the multi-vibrator oscillator and Tr4 the audio amplifier.

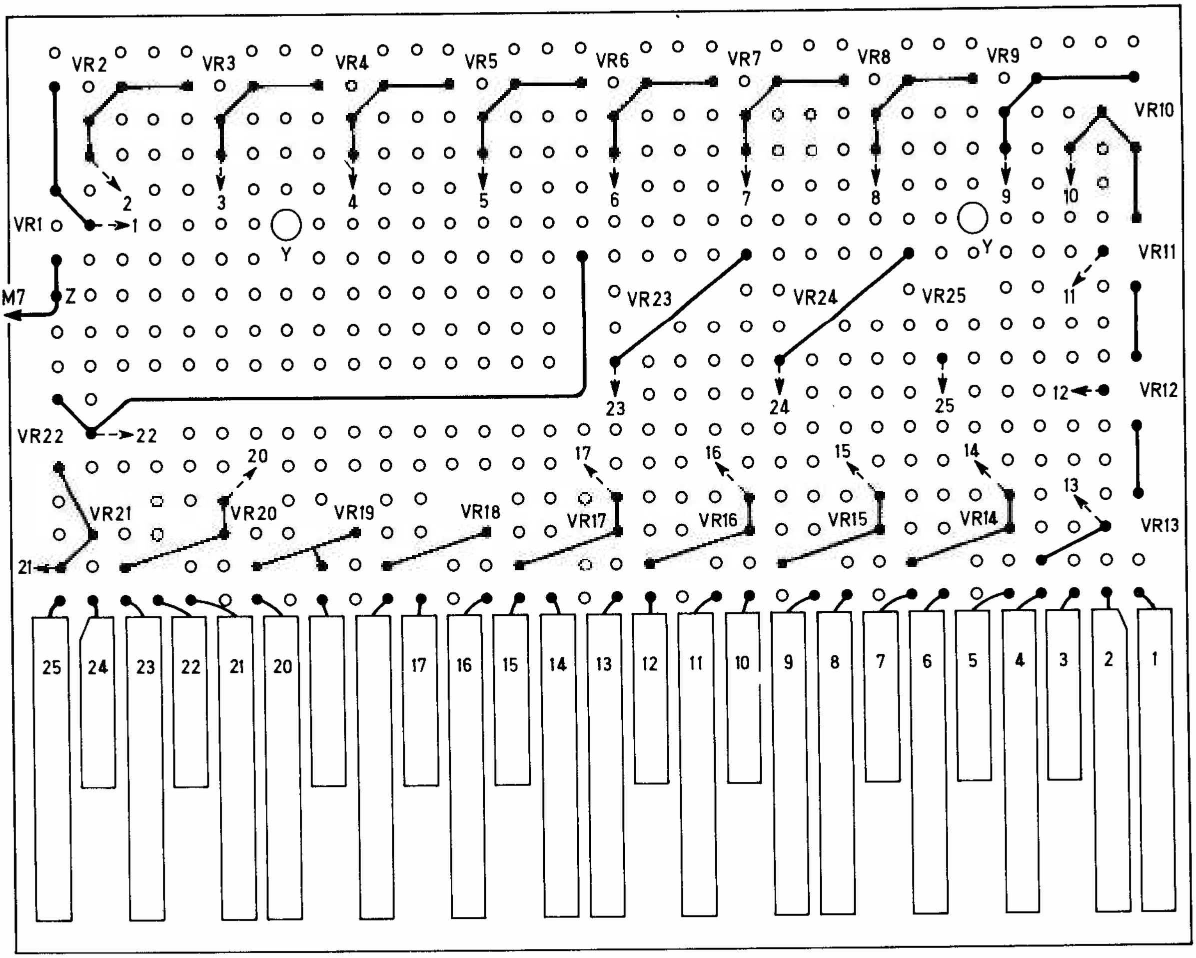


Fig. 2: Layout of the 'keyboard'. Compare with heading photograph.

and battery should be connected, and the wire from the point Z added.

The resistors should be added next, followed by the capacitors (except C4). The switch and the output transformer can then be fixed in place, along with the shorting links. If the transformer specified is used, then the fixing tags should be removed, and the transformer glued to the board, using Araldite (or a similar adhesive).

The four pins to the windings will fit directly onto Veroboard of 0·1 inch matrix—the secondary winding being nearest the edge of the board. Next the transistors can be soldered in. The base diagrams are given in Fig. 5. It is important to get the wires the right way round, and to use a heat shunt between the soldering iron and the transistor can. A pair of pliers held firmly on the wire being soldered will make an excellent heat shunt.

If C4 is not provided with an insulating sleeve around it, then one must be put on the emitter lead of Tr2, which passes underneath. C4 can then be fixed in place. The capacitors C5, C6, and Tr1, Tr2 and Tr3 should be laid against the board.

The stylus can be easily made from an old ball-point pen. The ball tip is removed, and the end soldered over—this removes the possibility of any ink coming onto the keys (see Fig. 6). The cut down body (about 4 inches) has a slot cut in one side at the end, and a wire passed through here, and soldered to the back of the metal part of the pen. This is then glued back in the plastic body, the wire pulled out through the slot, and the end cap replaced.

About a foot of wire is then left from the end cap to the point A49 on the Veroboard, to which the free end is fixed. The speaker is connected to the wires provided for it, and the battery leads connected to a suitable battery connector.

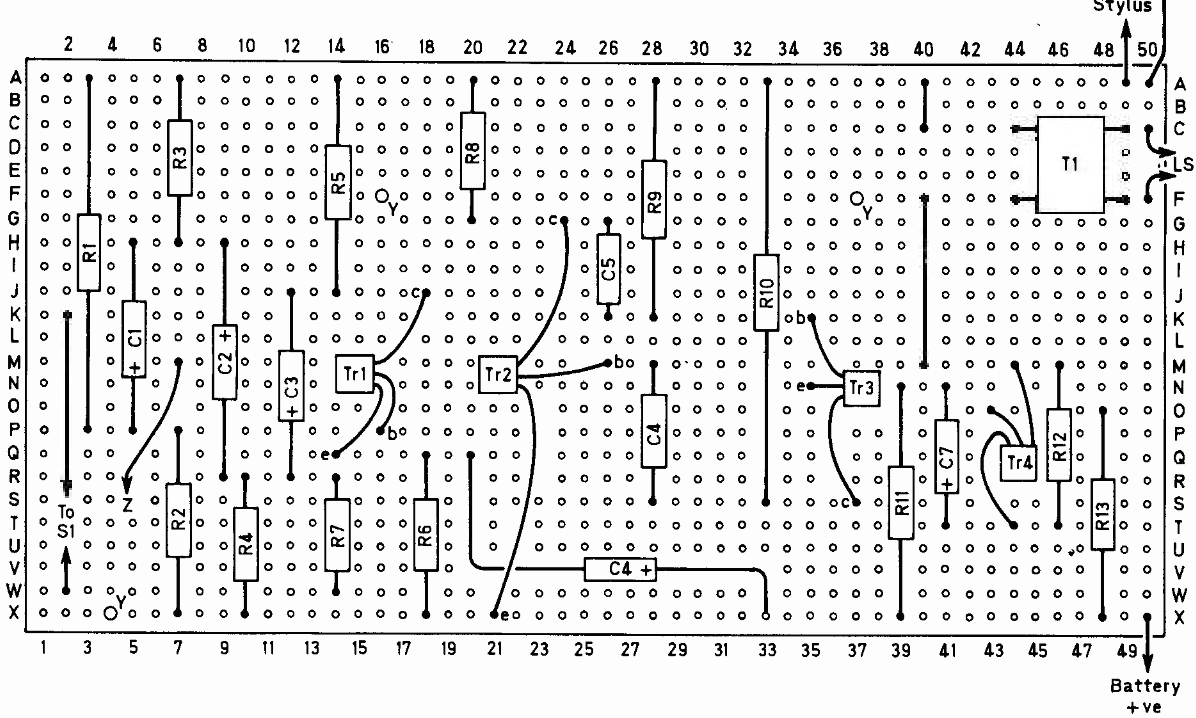
Close-up of some of the pre-set potentiometers which enable the organ to be tuned

Tuning

Each note is sounded by touching the stylus tip against the corresponding copper strip. The prototype was tuned using the services of a musician and a tuning fork. From the A of the fork, the top C was tuned (using VR1), then the notes 2, 3 and 4 tuned to be of equal intervals in pitch, until note 4 ('A') corresponds exactly to the tuning fork.

The rest of the tuning is completed in a similar

Fig. 3: Lower circuit board which forms the base of the organ. This board may be deeper, as shown in the photographs.



manner—getting equal intervals between successive notes. When completed, notes 1, 13 and 25 should be at octave intervals apart. If an alternative method is required, then the notes can be tuned to be of the same pitch as the corresponding note on a piano. The long strips of copper on the keyboard are equivalent to the white notes on a piano—the short strips to the black notes.

Whichever method is used, once a note has been set it should be left—the tuning is incremental, so altering one note will affect all the notes below it in the chain. The values of the variable resistors used in the prototype should be used for the range suggested (VR1 and VR14-VR25 are 5kΩ, VR2-VR13 are 1kΩ). Higher values would work of course, but tuning would become difficult. Once tuning is complete, the keyboard and switch should be bolted to the circuit board using 1-inch 8BA bolts.

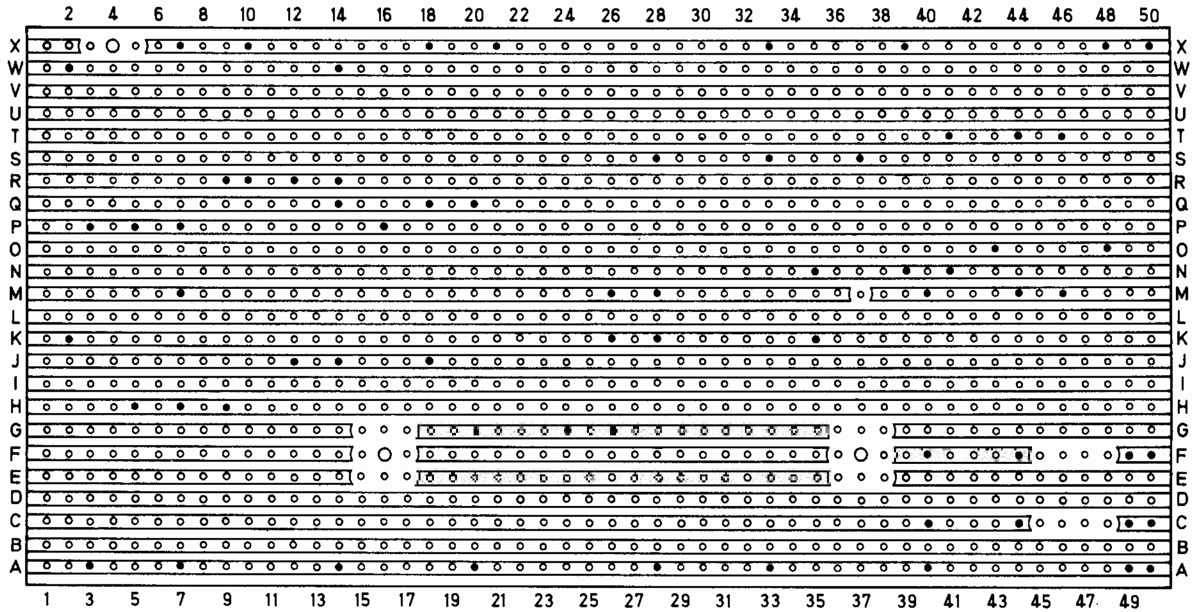


Fig. 4: The copper strips should be cut away as shown above before components are mounted on the lower circuit board.

★ components list

Resistors:

R1	82kΩ	R8	2·2kΩ
R2	10kΩ	R9	13kΩ
R3	4·7kΩ	R10	2·2kΩ
R4	4·7kΩ	R11	100Ω
R5	4·7kΩ	R12	39kΩ
R6	1kΩ	R13	47Ω $\frac{1}{2}$W 5%
R7	100kΩ		

All resistors $\frac{1}{8}$W 5% unless otherwise noted.

VR1, VR14 to VR25 (13 off) 5kΩ
VR2 to VR13 (12 off) 1kΩ
All subminiature vertical skeleton preset potentiometers

Capacitors:

C1	2·5μF 6V elec.	C5	0·22μF polyester
C2	2·5μF 6V elec.	C6	0·22μF polyester
C3	2·5μF 6V elec.	C7	2·5μF 6V elec.
C4	250μF 6V elec.		

Semi-conductors:

Tr1	NKT212	Tr3	NKT214
Tr2	NKT214	Tr4	ASY26

Miscellaneous:
Veroboard, 5 x 2½in, 0.1in matrix, copper clad.
Veroboard, 3¾ x 2½in, 0.1in matrix, plain board.
Cir-kit strip, $\frac{1}{8}$in, 5ft. card. Small slide switch.
Output transformer, ratio 9·2:1 (Radio spares T/T4)
Speaker, 3 ohm. Ball point pen. 8 BA nuts and bolts.

Components

Although it is possible to use fixed value resistors in place of VR1-VR25, the tolerances of other parts (C5 and C6 in particular) make variables more satisfactory. The required values of resistance do not equal the standard preferred values anyway, and the extra cost is minimal. Suitable variable resistors are the series PN sold by Messrs Electrovalue.

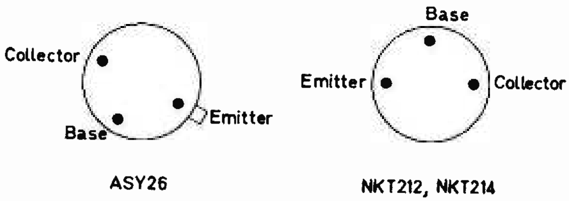


Fig. 5: Base diagrams of transistor connections.

The capacitors may, of course, be substituted by components of higher voltage rating. C1, C2, C3 and C7 could well be from the Mullard C426 series for instance. The speaker is specified only in its impedance (3 ohm), the size being unimportant. Because of this no details for a case are given. 0·1 inch Veroboard is specified for ease of assembly, as VR1-VR25 and T1 have tags at multiples of this dimension.

It will be noted from the photographs that the piece of Veroboard used for the circuit board is larger than that specified—however the size specified is sufficient to accommodate all the parts. The total cost for a complete instrument should be under £5, a single octave instrument without tremolo would come to about £3.10.0.

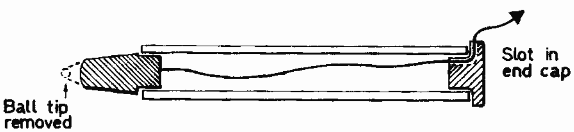
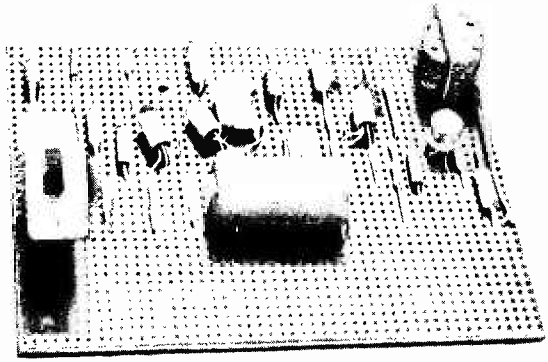


Fig. 6: Stylus made from a ball-pen.



Photograph of lower circuit board. Compare with Fig. 3.

Alternative Circuits

As stated earlier, the tremolo can be omitted without affecting the rest of the circuit. The pitch of the instrument can be raised by decreasing R9 or C5 and C6. If C5 and C6 are made 0·1μF, the instrument will play an octave higher than that described. The setting of VR1-VR25 will however be different, so a composite device is not really practicable. It is possible to use a higher impedance speaker (about 80 ohm) without a matching transformer. It will then be necessary to reduce, or possibly even omit R13. If required, a switch can be inserted in the negative battery lead. In use the organ will remain in tune even when the battery voltage falls from 9 volts to 6 volts, and having two octaves will play many simple tunes. ■

"*Project Autumn*"

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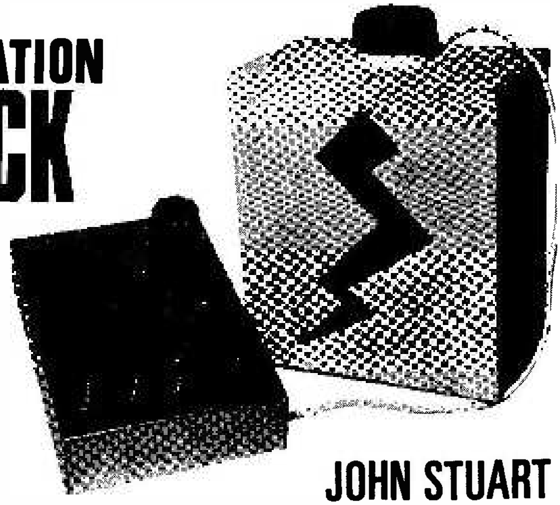
Rules on page 451 PA-PW-10

ELECTRONIC DIGITAL COMBINATION LOCK



JOHN STUART

THE need for a money-making game, for a Scout Coffee Morning, which was a little more sophisticated than the well tried 'Screw-eye along the bent wire', resulted in this digitally switched combination lock.

PRINCIPLE

The principle of operation is that a code number. 0 to 7, is set up on a 3 pole 8 way rotary switch. The switch is connected in 1-2-4 binary form to a set of three toggle switches, each toggle switch corresponding to one pole of the rotary switch.

For the combination lock to be 'opened', it is necessary to set the three toggle switches (binary 1-2-4) to equal the code number set up on the rotary switch. A correct setting completes the circuit through the switches thus opening the lock. A table of binary—decimal equivalents is shown in Table 1.

If the code number is unknown, the chances of setting the toggle switches to the correct number, in one try, are 8:1 against. To improve these odds, for the player, it was decided to allow three attempts at any particular combination. The chances of winning are now 8:3 against, but having three attempts psychologically encourages the would-be safe-cracker to feel that the odds could possibly be in his favour.

Two indicator lights, red and green, are connected so as to indicate the failure or success of the attempt. However, this display on its own seemed a little tame for the effort involved and it was decided that a more dramatic 'failure' indication and an attractive reward for a successful attempt was required.

To satisfy these requirements, a mock 'safe' was built which had an electrically opening door and a suitably loud bell mounted on top. The general arrangement of the combination lock and safe can be seen in the photograph.

For the commercially minded, small chocolate bars were used as bait and we charged 3d. for three goes. About 35s. profit was made during one Coffee Morning.

S2	S3 (1)	S4 (2)	S5 (4)
0	0	0	0
1	1	0	0
2	0	1	0
3	1	1	0
4	0	0	1
5	1	0	1
6	0	1	1
7	1	1	1

TABLE 1

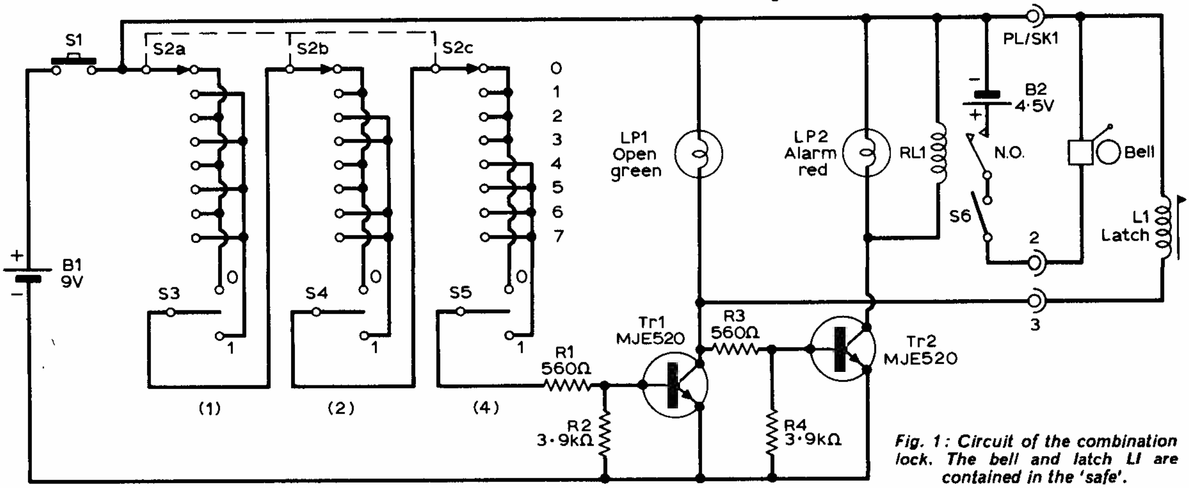


Fig. 1: Circuit of the combination lock. The bell and latch LI are contained in the 'safe'.

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6BW6 14/3
6BW7 13/-
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6BZ6 6/-
6C4 5/-
6C5GT 6/-
6C6 3/9
6C9 14/6
6C12 5/9
6C17 12/6
6CD6G 23/-
6CH6 7/-
6CL6 8/6
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AC157 5/-
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OC83 4/-
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OC123 4/6
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★ components list

Resistors:
R1 560Ω R3 560Ω
R2 3·9kΩ R4 3·9Ω
All ½W 5%

Semi-conductors:
Tr1/2 MJE520 Motorola (L.S.T. Components)

Switches:
- S1 Single pole, push-to-make push switch
- S2 3 wafers, each 1 pole 8 way, rotary
- S3 Single pole, change over, toggle
- S4 Single pole, change over, toggle
- S5 Single pole, change over, toggle
- S6 Single pole, on-off toggle

Miscellaneous:
LP1/2, Lamps 8V 0·2A m.e.s. RL1, Reed operating coil Type 1 with dry reed switch Type 10RSR (Radiospares). L1, Modified P.O. Type 3000 relay, 200 ohm coil. Bell, AC/DC 4·5V. Batteries, 9V PP9, 4·5V 1289 (Ever Ready).

CIRCUIT OPERATION

The complete circuit is shown in Fig. 1. When the settings of S3, S4 and S5 are such as to equal the setting of S2, (correct combination), continuity exists between the rotor of S2a and the common connection of S5.

In this condition, the closing of S1 (push button) will cause +9 volts to be applied to the collector circuits of Tr1 and Tr2 and to R1.

This results in Tr1 conducting, causing the 'OPEN' lamp, LP1, to light and the latch solenoid, L1, to be energised, thus opening the safe door.

In the event of the setting of S3, S4 and S5 not equalling the setting of S2, (incorrect combination), there will be no continuity through the switch system.

In this condition, the closing of S1 will cause +9 volts to be applied to the collector circuits of Tr1 and Tr2, as before, but Tr1 will now be non-conducting.

This results in Tr1 collector being at approximately +9 volts, LP1 remaining unlit and L1 de-energised.

The positive voltage at Tr1 end of R3 causes Tr2 to conduct, lighting the 'ALARM' lamp, LP2, energising the reed relay RL1 and thus ringing the alarm bell.

A separate 4·5V battery, is used to drive the alarm bell, as 9V is rather excessive for the type of bell used. Switch S6 is included in the bell circuit so that the bell may be muted if the lamp indication only is required.

The layout of the components is not at all critical. The two transistors are bolted to the chassis to the right of the reed solenoid.

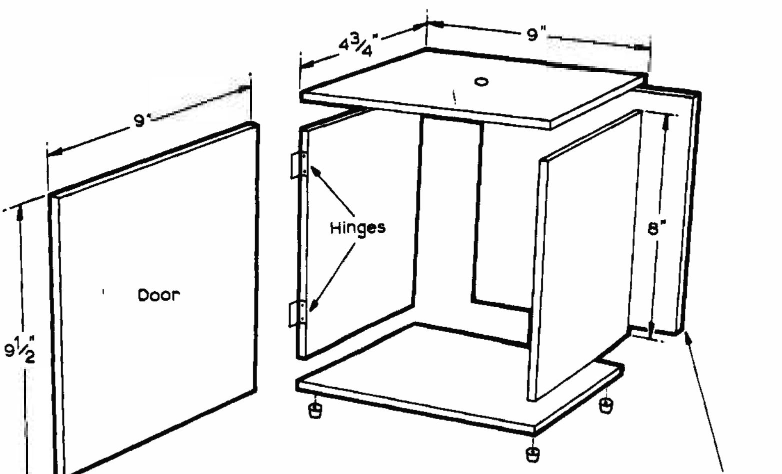
CONSTRUCTION

The switch system, lamp batteries and other components are housed in a conventional aluminium chassis, size 10×6½×2in. The layout of components is not critical and the general arrangement can be seen in the photographs.

The rotary switch, S2, does not have any positional markings on the knob, so as not to indicate the combination setting to the contestant and thus increase his chances of opening the safe.

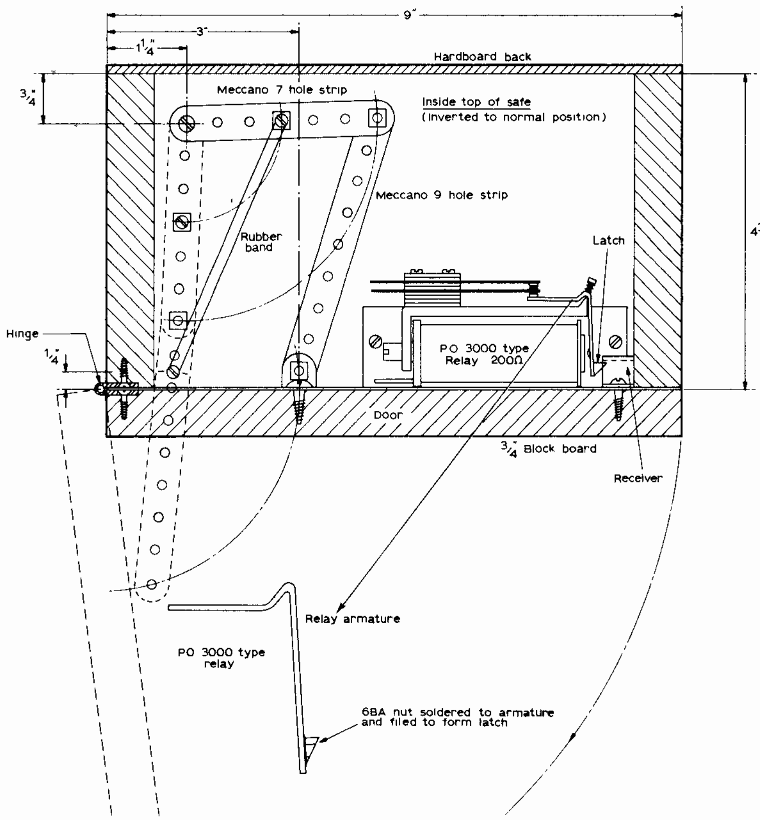
The safe is built from ¾in. blockboard and could be scaled up or down to suit individual requirements.

The method of construction is shown in Fig. 2.



Material ¾" block board except for back (hardboard) 9" x 9½"

Fig. 2: Constructional details of the 'safe'.



The electrical latch is made from a Post Office type 3000 relay. The relay is modified by soldering a brass latch to the toe of the relay armature as shown in Fig. 3.

The relay is mounted on its side by either soldering the metal bobbin cheek to a brass backing plate or by using a suitable curved clip fitting over the relay bobbin.

The moving part of the latch is formed by a small angle bracket fixed on the side of the door.

The automatic opening mechanism is a crude but effective arrangement using two Meccano strips and a rubber band. The arrangement is shown in Fig. 3. It should be noted that the mechanism is on the underside of the top of the safe and that the drawing and photograph show how it appears when the safe is inverted.

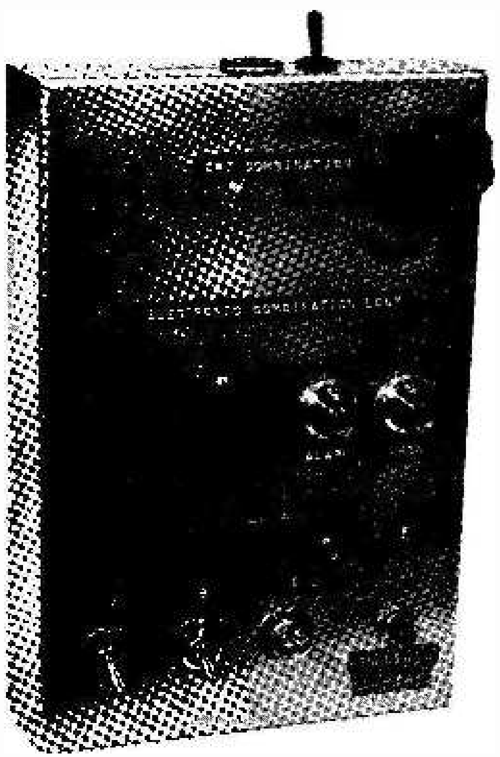
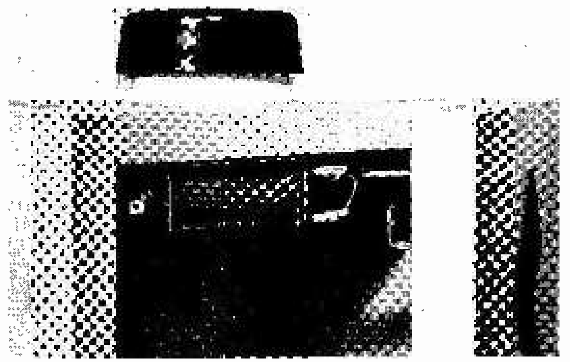


Fig. 3: (top) Details of the latch mechanism and relay modification. (below) photograph of completed control unit.



Close-up view of latch mechanism and door catch.

OPERATION

1. Set Combination Switch S2 to any position.
2. Set bell switch S6 to 'ON' if bell is required.
3. Contestant sets S3, S4 and S5 to his choice.
4. Contestant presses S1, (OPEN or ALARM operates).

Note: *S2 must be changed to a new combination after each attempt or set of attempts, to obtain the desired odds.*

COMMENTS

Although the Electronic Digital Combination Lock is used as a game, an extension of the number of digits could form the basis of a commercial combination lock having an easy and rapid change of combination. ■

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(*Total value £10/8/0d.*) *Our Price* **£5.18.** *+ 4/6 p. & p.*

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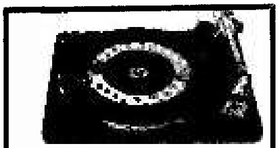

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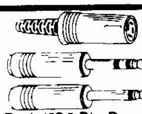

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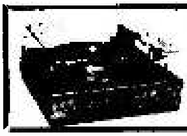

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Replacement Stereo DIAMOND STYLI

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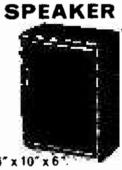
Countdown SPEAKER

Teak Cabinet



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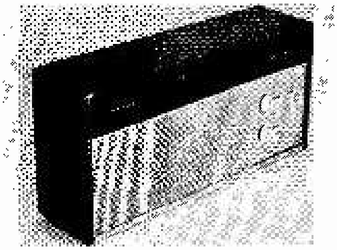

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ON THE SHORT WAVES

MONTHLY NEWS FOR DX LISTENERS

THE BROADCAST BANDS

Malcolm Connah

Frequencies in kHz • Times in GMT

In the past it has always been thought that the summer months were a time when most enthusiasts had very little time for listening on the bands. The amount of mail that I have received in the last few months has convinced me that this is not so. I sincerely hope that this trend will continue and reports will continue to pour in.

Because of the large number of reports that I now receive every month I have been forced to be more selective in choosing the material that I use. In the future I would be obliged if all reports gave accurate details of the station heard, such as frequency, time and programme details. Reports which conform to this requirement will stand a much better chance of being published.

When I started writing this column a year ago I said that it would be my policy to try and include as much material as possible from the more exotic stations. This is still my policy and with the large number of reports coming in I can select these more interesting stations. I will, however, continue to mention the more common stations, as I have found that among the beginners to the hobby who read this page there is a real demand for these easier stations.

Members Logging and News

Des Walsh of Little Baddow feels that all civilised countries should operate a short-wave service. He is particularly interested in the fact that the Republic of Ireland has no such service. He has tried to get them to start such a service but with no success. He would like all readers who are interested in this problem to write to *Radio Telefis Eireann* to ask them to start a short-wave service.

Malcolm Cheeseman of Llanberis in Caernarvonshire is using a 20-year-old Pye domestic receiver and a 24 foot vertical aerial and he logged the following stations:

7065 *Radio Tirana*, Albania at 1840
9625 *Radio Israel* at 2045 GMT.
11672 *Radio Pakistan* at 2005
11815 *Trans World Radio*, Bonaire at 0035
15160 *Radio Ankara*, Turkey at 2205
15345 *Radio Kuwait* at 1645
17890 *HCJB*, Ecuador at 2330

J. Trewick of London Colney has heard some very interesting stations in the last month:

11955 *BBC Far Eastern Relay station* with ident. at 1658 and at close down at 1815
15165 *Radio Damascus*, Syria at 1930 in English
15240 *ABC Australia* with news in Eng. at 2145
15320 *ABC Australia* at 2155.

R. F. Bruce of Angus in Scotland has an Eddystone 940 receiver and an indoor Joystick which enabled him to hear:

5050 *Radio Tanzania* until sign-off at 2000
11735 *Radio Morocco*, English news at 1715
11955 *BBC Far East Relay*, ident. at 1815
15020 *The Voice of Vietnam* in English at 2000
15165 *Radio Damascus*, Syria, English news at 1930
21690 *WIBS*, Grenada heard at 2100.

Stephen Wainwright of St. Helens has again used his Skyrover Mark II receiver and 100 foot longwire to good effect:

9625 *Radio Trans Europe* with test transmissions for the U.K. from 1345 to 1415.
15345 *Radio Kuwait* in English with news at 1830

Stephen also reports that HCJB are issuing QSL cards without requiring the information stated in this column in the June issue.

Roy Patrick of Derby sent in the following interesting information:

South Africa: Radio RSA broadcasts to the U.K. at 1800-1850 on 21480 and 15250, the former frequency gives the better reception.
Kenya The Voice of Kenya on 4915 is audible with a fairly good signal with a programme in Swahili at 1900.

Terry Gibbs of Swindon heard the following stations:

11800 Italian Broadcasting at 1930 to 2000
17860 *ABC Australia* at 2130 to 2230
21495 *Radio Portugal* at 2030 to 2100.

Regular reporter **Geoffrey Gilham** of London S.E.12 has been on holiday but still managed to send in the following log:

4865 *Azores* with talk in Portuguese at 2157
4870 *Dahomey*, vernaculars and music at 2137
4915 *Ghana*, talk in English at 2156
4940 *Kiev*, classical music at 1935
5058 *Tirana*, classical music at 2145.

Mervyn Winters of Co. Antrim used his AR88 and 12 foot whip aerial to hear:

9009 *Israel* heard at 2115
9560 *Amman, Jordan*, heard at 1600
11960 *All India Radio*, Delhi at 2015
15265 *Radio Afghanistan* at 1800
17855 *NHK, Japan* heard at 0700.

With apologies to all those reporters whose contributions I have not used I will end with a log from **Glen Morgan** of Tredegar:

3204 *Ibadan* in English at 2205
3380 *Malawi*, dance band music at 2025
4774 *Libreville*, African music at 2205
6540 *Pyongyang* in English at 1935.

Please note that by the time this article is published I will have changed my address and all reports should be sent to me at *5 Ranelagh Gardens*, Cranbrook, Ilford, Essex, by the 17th of the month.

ON THE SHORT WAVES

THE AMATEUR BANDS

David Gibson, G3JDG

Frequencies in kHz ● Times in GMT

IT just isn't fair. Every month the contest types come last, so, just to show there's no hidden meaning in it, let's start off by seeing what's happening contest-wise. September 12-13th, WAE DX phone contest; 13th, 3·5MHz field day (go on, have a listen all you h.f. types); October 3-4th, u.h.f./s.h.f. contest. The 10 metre phone contest on October 10-11th, should prove an interesting one, while for those not too far from London there is a lecture at the Institution of Electrical Engineers on the Trans-Arctic Expedition. You get a cup of tea, too!

P. Newman (Bucks.) reckons we ought to have a page of logs from home-brew equipment only. Start dusting the cobwebs off that old t.r.f. you built and get listening! I agree that there is a greater sense of achievement in bagging some good DX on a homebrew. (You wait until my 600 transistor receiver is finished—Cor, think of the gain.)

M. Bernstein (Lancs.) finds that the mornings are the best time for a listen on 14MHz. **S. Ireland,** down in Kent, is giving serious thought to building a 144MHz converter "to give Glyn Richards some competition." Steve also claims that the 5B4NZ heard on topband (Amateur Bands, August issue) was flying the Jolly Roger because the only recent licence in that area was 5B4ES. (Well shiver me dipoles.)

In spite of a patchy period, **Steve Ireland** (Kent), HRO MX, 67ft. end fed, bagged these on 3·5MHz: CR6IV, CT1MC, CT2AK, OJØDX (Market Reef), PY3BAD, PY5XQ, PY7AF, UW9AF, VEØNEF/G5, VP8FL, VP8KF, ZB2BY, ZS5XA, 6W8DY, 9V1PP. Tuning h.f., a listen on 21MHz brought sigs from: AX9AC, AX9SS, AX9XI (Christmas Island), CR6CA, CT2AK, CX5BV, EA8BQ, EP2SW, FHØVP, HM5PF, HS1ACW, IS1DFO, KG6AAY, KL7FBK, KP4CH, KR6HB, KR8BY, KV4FZ, KX6HW (Marshall Island), KZ5AM, LU2DAW, LX1SD, MP4BFO, MP4MBB, OA8V, OD5BA, OX3LP, OJØDX, PJ9JR, PZ5RK, TA1TR, TU2CW, VP2VI, VP5HZ, VS6DO, ZB2BY, ZC4CB, ZE5JU, ZS6DH, 3V8AL, 5A5TH, 5B4ES, 5H3JL, 5N2AAE, 5V4JS, 5Z4MO, 6W8AL, 7Q7BC, 8P6BQ, 9F3USA, 9G1GD. Perhaps I didn't connect that antenna after all.

N. Sanderson (Edinburgh), CR45, 200ft. long wire went s.s.b. spotting on 14MHz. Stations observed: AP5HQ, AX2ARZ, AX3XJ, AX4HA, AX7GK, AXØLD, CE3BE, CR6MT, CR7GJ, CT3SC, DU1FH, EA8FS, ET3DS, GB3GWC, GC3VJX/OH5, HC2SO, HK3BCA, HR2HHP, JA1OWT, K5ARJ, K6ZDP, K7TGF, KA1KSO, KH6OR, KL7EBK, KP4DHV, LU2HC, LX1RC, OJØDX, OX5BL, PJ9HH, PY7ACQ, PZ1BW, SU1MA, TA2AE, VE2BEO, VO1CA, VP7NA, VR6TC, W6TSQ, W7IM, XE1YM, YA1EXZ, YB2AO, YK1AA, ZD8DB, ZE1DG, ZF1GC, ZL4CX, ZS2OF, ZS6IK, 4U1ITU, 4X4QA, 5Z4UK, 7Q7JO, 7X2SMA, 9M2PR, 9Q5MP, 9U5DP, 9Y4US.

R. Dinning (Ayrshire), HA350, PR3OX, RQ1O, 380ft. wire at 50ft., has spent a ten-week spell in hospital. It doesn't seem to have affected his skill with a receiver as his 21MHz log shows: CR7GJ, EL1CA, EL2DU, EP2SW, HR1SR/P/HR2, HS1ACW, IRØIJ, KR6KB, KS6DH, OHØNJ, OJØDX, TU2CS, VU2IXP, W5YSL/P/DU1, XW8DM, XW8DS, YBØBD, ZD9BM, 3V8AL, 4U1ITU, 5A5TH, 5H3JR, 5N2ABG, 5Z4GK, 6W8GE, 6Y5GB, 7P8AB, 9F3USA, 9L1GQ, 9M2VI, 9Q5WF, 9V1PP, 9X5AA.

A. Crooks (Leicester), RA1, PR30, 45ft. end fed, heard CR6IE, on 14MHz, CR6MX and 9G1GT on 28MHz while 21MHz s.s.b. brought: EL2L, HBØLL, PY2HY, PY7GAH, VU2KV, ZD8JK, ZS6AD, 4Z4BG, 5N2AAE, 5U4JS, 9J2PV, 9U5DP.

J. Moore (Leicester) claims that topband, eighty and forty were a dead loss this month and bemoans time-base QRM on 160 from local tele's. I reckon that's the transmission of spurious signals, report them to the GPO!

John's bets on 14MHz s.s.b. were: CR6EV, OX5AP, PY2ELT, UL7JG, VR6TC, ZP5CF. Fifteen metres produced: CE3OE, CR6LG, JA1TRL, VE3GJU, 4Z4DX, 8P6BQ. The gear is a CR100/2, a.t.u. and 130ft. end fed. Putting a home-brew f.e.t. converter in front and tuning 24·9—26·9MHz gave a.m.-type squeaks on 144MHz from: G2JF, G2BKC, G3DAH, G3TDR, G3TXB, G3VCV, G3WRD, G8VZ, G8CKT/P (Surrey), G8AXZ, G8BJK, G8BPO, G8BYB, G8CIW, G8CQX, G8CRN, G8CUW, G8DAS, GC2FZC. The same band but s.s.b. raised: G2CIW, G3LQR, G3SOA, G6UW, PAØCML (near The Hague).

A Garex converter feeding a PR30 and CR7OA from an 8-element Yagi is located at Wendover and the controls titivated by **N. Richardson.** A peep at 144MHz revealed the following stations: G3AOS/P, G3LHO, G3LXP/P, G3PNA, G3PRM/P, G3TQF/P, G3UES/P, G3VPE/P, G6GN, G8BCQA, G8BDJ/P, G8CGX/P, GW3ITZ, GW3UCB, GW8ACG/P, GW8BEB/P, GW8BHY/P.

V. Koopman (Lancs. but on holiday at Windsor), RA1, Joystick at 15ft., had some success on 7MHz (more success than I did I might warble). Dragged from the dreaded forty (still screaming) were: AX9XI, CR9AK, FP8CS, HS1ABO, JW8MI, KJ6CF, SVØWO, UK3ABA, VQ8CZ, VR6TC (Pitcairn Island), VS6DO, W2HCW, YA1SG, 7P8AB, 9N1MM—all on c.w. (splendid, splendid) except W, 7P8 and 9N1.

The same gear on 21MHz raised: CE6DP, FO8BW, GM3MNM/MM near Capetown, IRØXPS, JX8IL (Jan Meyen Island), KM6DQ, LU3AQ, TR8DG, VR2EK (Fiji), VR4EE, VU2BEO, ZD9BN, 9G1GD—all s.s.b.

Please note that the deadline for the month's logs is the 15th of each month, that is, they should reach me by the 15th. If they arrive later, they are too late for the current issue and "out of date" for the following one. So please slaves, letters to 5 Edward Close, St. Albans, Herts., before the 15th—Ta!

THE MW COLUMN

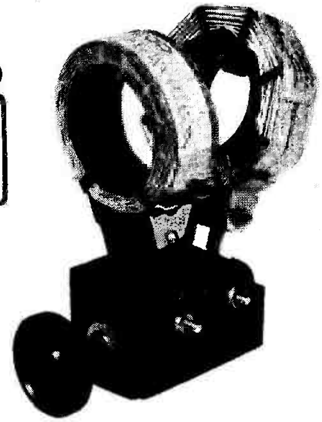
AS the evenings start to draw in, medium wave stations in North America can be logged as early as midnight. Among the first to be heard are an interesting group in Newfoundland right at the low frequency end of the band. There are three networks. The Canadian Broadcasting Corporation (CBC) operates CBT 540kHz in Grand Falls and CBN 640 St John's with satellites CBNA 600 St Anthony and CBNM 740 Marystown. There are two commercial networks. The Colonial Broadcasting System has key station VOCM 590 in St John's plus CHCM 560 Marystown and CKCM 620 Grand Falls. The Newfoundland Broadcasting Company can be heard on CJCN 680 Grand Falls, CJOX 710 Grand Bank and CJON 930 St John's. All these stations are logged regularly in the UK. Others from the same area include CFCY 630 Charlottetown Prince Edward Island; CFDR 790 Dartmouth Nova Scotia; CJCH 920 Halifax N.S; CHER 950 Sydney N.S; CHNS 960 Halifax; CKBW 1000 Bridgewater N.S; CBA 1070 Moncton New Brunswick; CBD 1110 Saint John N.B; CKCW 1220 Moncton; CKEC 1320 New Glasgow N.S; CKBC 1360 Bathurst N.B. Newfoundland Standard Time is 3½ hours behind G.M.T., the odd half hour being a help to station identification. The remaining Maritime Provinces are on Atlantic Standard Time which is 4 hours back. An unusual catch from this area which counts as a separate DX country, is Radio St Pierre 1375kHz in the French islands of St Pierre et Miquelon which lie to the south of Newfoundland. This station can often be heard when Lille 1376kHz signs off for the night at 2300 hrs G.M.T. The programmes from Radio St Pierre are in French and local time is 3 hours behind G.M.T.

Chris Stacey of Tunbridge Wells asks what sort of aerial is suitable for DXing on the Long Waves. At this QTH there is a 90ft long-wire at about 20ft above ground level and it performs very well when used with a CR100. Although a long outdoor aerial is an advantage on this band it is not essential. Dick Clark, a lw DXer in Florida USA has converted a standard m.w. loop for long wave use by increasing the number of turns from 7 to 20 and he regularly logs Europeans with it. Buzz from TV receivers may be troublesome with indoor aerials in some QTHs though this will disappear around midnight when the TV closes down. The long waves extend from 151kHz to 433kHz though only the section below 272kHz is in general use in Europe. There are some 50 Asiatics on this band situated in China, Mongolia, Turkey and asiatic USSR, and many can be logged in this country. Look for Ulan Bator 209kHz Mongolia; Tselinograd 227 Khazakistan; Dushanbe 254 Tadjakistan; Harbin 272 China; Ashkhabad 375 Turmenistan. Among semi-DX there is Tiflis 191 Georgia; Azilal 209 Morocco; Orenburg 300 USSR; Oulu 433 Finland.

Charles Molloy

GOING BACK...

1970 60 50 40 30 20



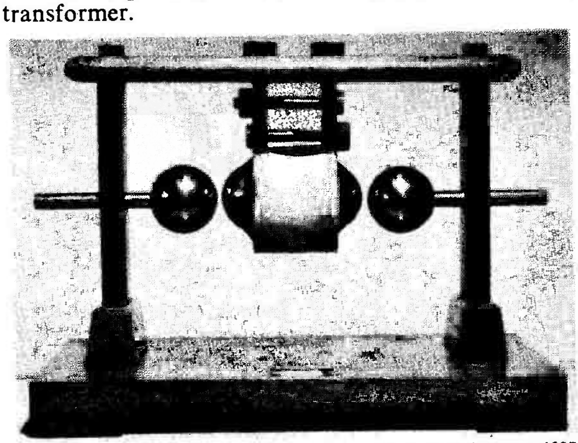
COLIN RICHES
ARTHUR DOW

THE first type of spark transmitting equipment used a simple aerial circuit which included the spark gap. The best type of radiator was found to be an elevated aerial but the spark gap in series with it provided a high resistance and naturally a damping action. Therefore, the discharge began at a high initial voltage which soon died away to zero. After some time, another spark discharge would take place but in the meantime, there was no radiation from the aerial.

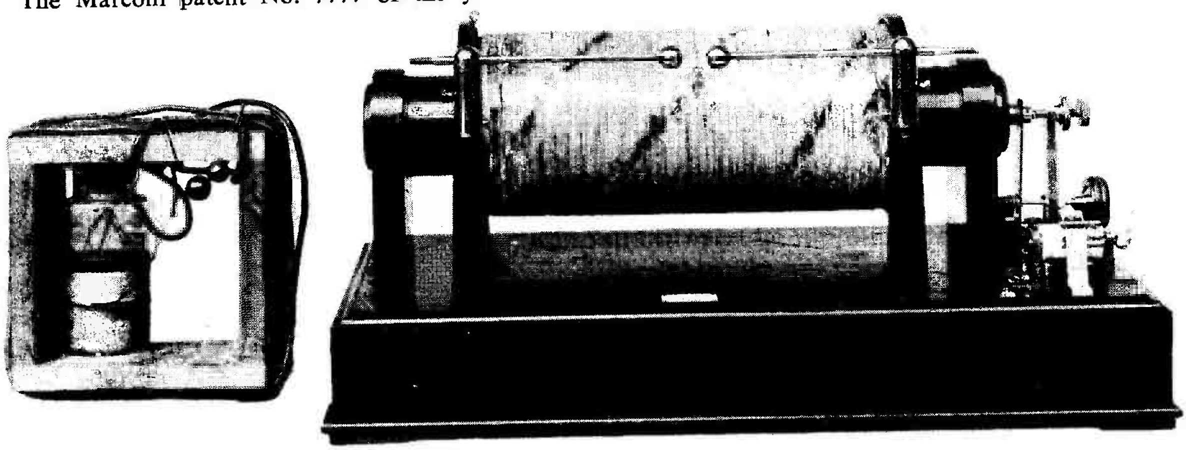
In the circuitry employing aerial coupling, the spark gap was included in a primary circuit; a separate tuned aerial circuit forming the secondary circuit. This latter was low resistance so that any oscillations induced could persist for a relatively long time before they finally died out. Thus for equivalent radiation compared with the plain aerial, the initial voltage would be lower, causing less strain on insulation but the increased radiation performance demanded less initial power. An added advantage was that the radiation covered a narrower waveband.

Marconi's first tuned transmitter (see photograph) was built in the year 1899. It comprised an oscillation transformer in the primary of which was a spark gap and capacitor. The secondary was connected to an adjustable inductor in the aerial circuit.

The Marconi patent No. 7777 of the year 1900 was based on this design. It covered the later forms of tuned apparatus without which the famous "Atlantic transmission" of 1901 would have been impossible. This patent clearly specifies the tuning of four circuits, i.e. spark gap circuit, transmitter aerial and primary and secondary of the receiving transformer.



Spark gap used by Marconi in his early experiments in the year 1895. Lent to the Science Museum, London, by Marconi Wireless Telegraph Co. Ltd.



Lent to the Science Museum, London, by Marconi Wireless Telepraph Co. Ltd.

Induction coil and tuning inductance of Marconi's first tuned transmitter (1899)

Radiograms 1922

"A wireless penny-in-the-slot machine has been invented in America. The invention consists of an automatic apparatus surmounted by a revolving loop aerial, and takes its power from the lighting circuit supply. When the coin is inserted in the slot two valves are switched on, and the music is heard through a large horn at the bottom of the instrument." . . .

"A racehorse in America has been equipped with a receiver and trained to race by commands from the trainer." . . .

"Suggestions are made in the non-technical Press that by means of piezo-electric crystals London could be lighted by means of its noise. Piezo-electricity is the property possessed by certain crystals whereby they generate electricity when subjected to vibration." . . .

"Experiments in the flying of a pilotless wireless-controlled aeroplane will shortly take place in France." . . .

"There are now 350 broadcasting stations in the United States." . . .

"Experiments to determine the feasibility of reception of wireless signals by the sense of taste have recently been carried out. Silver electrodes were used, one of which made contact with the inner part of the upper lip of the operator and the other with the tip of his tongue. Using four-stage amplification, it was found possible to detect signals and to tune in a station by noting when the intensity of the taste sensation was maximum. For messages to be read, the speed must not be greater than ten words a minute." . . .

"A wireless receiving set has been installed in Buckingham Palace." . . .

"Among the many thousands of people who listened-in to the Prince of Wales's broadcast speech to the Boy Scouts of the nation were the blind soldiers of St. Dunstans. Captain Ian Fraser, the blind chairman of St. Dunstans, has been an ardent wireless experimenter for two years past, and in the course of a short address following the transmission, he stated that wireless telephony was opening a new world for the blind. A blind man's hobbies were limited, but wireless was one of those which he could pursue just as well as anyone else. In listening-in, he was at no disadvantage to those who could see." . . .

"Direct wireless communication between France and New York was established the week before last from the great wireless station at Saint-Assise." . . . August 19, 1922.

"It is rumoured that some enterprising firm has brought out a clothes line which has a stranded copper centre for use in cases where landlords object to aerials." . . .

"Is the doom of the gramophone in sight? A firm is now advertising: 'Why not have your gramophone converted into a high-grade wireless receiving set?' . . ."

A Reader Comments

During my early youth I had access to current numbers of the old "Model Engineer" and was fired by the rather brief articles on radio then in its infancy; I was born in 1893. V. W. Delves Broughton had described his own installation which featured all the primitive means available at the time, and when I began work on the railway in 1909 most of my spare time was occupied with my own version of the bits and pieces, improvised from materials to hand; I had not then seen any "real" radio apparatus.

In 1910 I joined the Cadet Unit of the K.R.R's, and was soon learning Army Signalling; by extraordinary good fortune I was picked in 1913 to attend a Radio Course at Marconi House (evenings) and so became acquainted with the real thing. I saw the Fleming valve, its De Forest improvement, and listened on the Marconi Multiple Tuner and Magnetic Detector, which I soon duplicated in my own way at home. The big rotary generators and 10in. spark coils were rather out of my sphere, and the noise and space required were all too obvious. I do wonder if *P.W.* can come across any others who attended these Cadet Courses?

1914 found me in uniform seriously, putting my earlier signal training to practical use. As Signal Sergeant of my unit we dabbled on the fringe of radio but few infantry units had the opportunity to use it in action. I heard my first Radio speech when visiting Div. H.Q. just after the Armistice.

I obtained my first Radio Receiving licence in November 1919 in the form of a letter from the G.P.O., and have been a listener ever since.

In North London we formed the North Middlesex Radio Club, which had as the "motto" on the badge: "Listen before sending and so avoid jamming" and our Secretary, Mr. Savage of Winchmore Hill, was a fine enthusiastic character who did great work for us. I moved away to Stevenage in 1922 and found only one radio aerial in the locality, at the hamlet of Todds Green. My own soon went up—I had sold my 30 foot London mast to Arthur Burrows who later became a notable figure in Radio on the organising side; he was the Secretary of the International Organisation.

I had bought No. 1 of *The Wireless World*, and in due course followed with No. 1 of *Practical Wireless* and every other radio paper which appeared and disappeared; I am still faithful to *PW* which has given me much food for thought and had set a fine pattern, if not always "snooty" enough for some.

I am now approaching my 77th birthday, and still dabble, listening over most of the bands, broadcast and otherwise. I was able to do a bit in the Home Guard, and shared the consternation when on official orders we were not able to try out the C.52 sets issued and withdrawn almost at once. Of course I still read Morse, am a sort of unofficial honorary member of the Stevenage Radio Society, who keep the flag flying in this part of the country. But you can imagine I look back and think how very fortunate I was to get that Course of Instruction during 1913/14 at Marconi House when things were still in their infancy.

B. G. ASHMAN,
(Stevenage, Herts.).

I.C. OF THE MONTH

L.A.J. IRELAND

Number 12 Motorola MFC 4010P/Mullard TAA263 Utility Amplifier

WHEN two separate manufacturers in two continents introduce very similar products within a short time, clearly a definite demand has been identified; and even a cursory examination of the circuit diagrams will establish the basic identity of the Motorola MFC4010P (and the Mullard TAA263) mentioned last month.

Application

The application is also clear, as a small signal utility amplifier or "gain block" for industrial or consumer electronic systems. This function is frequently required, so that an integrated unit which eliminates the chore of designing and assembling discrete transistor units will be very welcome.

Performance

The performance of the units extends from d.c. to greater than 1 MHz, a limit which is established by the stray capacitances in the circuit, which degrade gain and introduce phase shifts. However, this still permits the circuit to be described as a wide band unit, i.e., not limited to industrial applications in servomechanisms handling switching or d.c. levels, or to consumer applications in the audio field. It can function, for example, as a fairly effective video amplifier, and indeed, with suitable tuned circuits as an a.m. i.f. amplifier or even as a t.r.f. radio receiver.

One objection may be raised to the circuits as illustrated, Fig. 1. It may be claimed that the base-emitter junction of Tr2 effectively short-circuits the collector of Tr1, and similarly with Tr3 shunting the output of Tr2. However, it should be remembered that the integrated circuit manufacturing process pre-supposes the use of silicon, and whereas in germanium transistors the 0·2 volts, typical of a base-emitter junction, would indeed bottom the proceeding stage, in silicon this junction establishes a potential of approximately 0·7 volts while the bottoming collector voltage is lower. The designers are quick to exploit this feature of the physics of silicon.

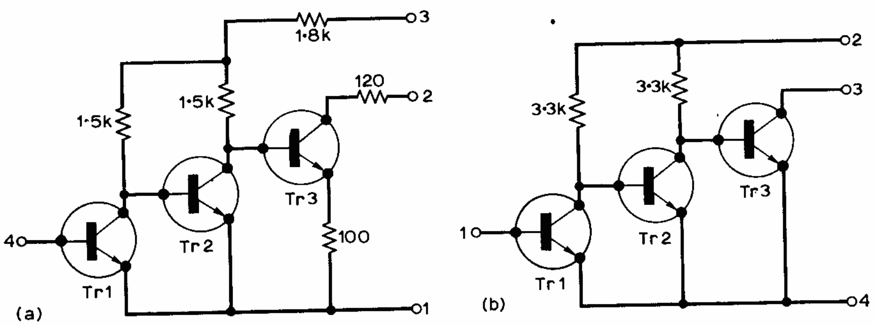


Fig 1 : (a) Circuit of MFC4010P and (b) of the TAA263.

On this point of ubiquity, in the July 1970 *Practical Wireless,* page 195, C. F. Fletcher describes a hybrid transmitter modulator incorporating a "ring of three" direct coupled audio gain stage identical to the integrated units we deal with this month; the same issue features a reverberation unit with an acoustic delay system requiring small amplifiers in conjunction with the input and output transducers; finally there is an account of a light-operated switch indicating the application of a d.c. amplifier, a function for which this month's circuits are ideal. No doubt other issues of this magazine would contain a similar series of projects in which a small signal gain function is required.

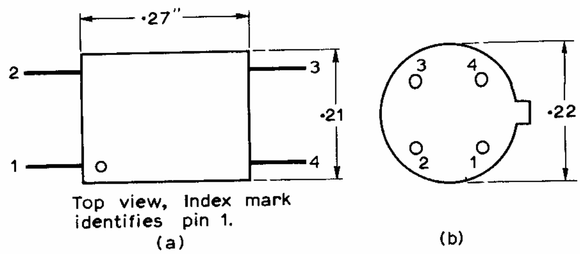
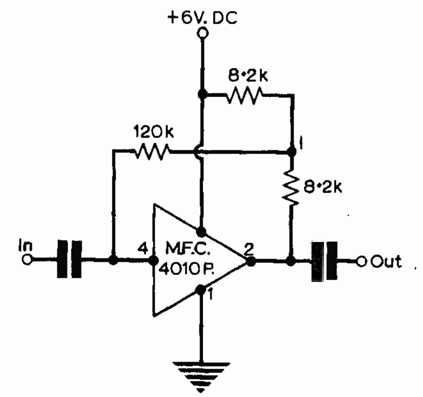


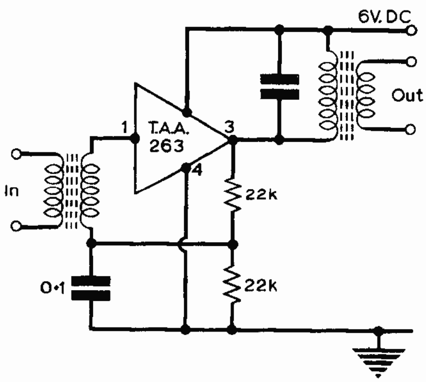
Fig. 2 : (a) Connections of MFC4010P and (b) of TAA263.

In a practical application of a "ring of three" direct-coupled transistor amplifier subsystem, the operating conditions are set and stabilised by d.c. feedback, i.e. the base bias of Tr1 is drawn through a suitable resistor network from the output of the block.

Open loop voltage gain for both units is some 70 dB; it is usual to incorporate in the d.c. feedback loop some reactive elements (inductors or capacitors) to determine the amplifier passband and the actual gain realised.



(a) A.F. Low level amp.



(b) Tuned amplifier (R.F. or I.F.)

Fig. 3 : (a) Circuit as A.F. amplifier.
(b) Circuit as R.F. or I.F. amplifier.

The cost of fabrication of a simple i.c. chip is only slightly greater than that of a good discrete transistor, and the yield, or fraction of satisfactory devices, is not much lower. Packaging is a different matter, though, since the typical i.c. requires more manual attention at this stage. Hence the advantage of this month's i.c.'s, in that both are supplied in simplified four terminal packages, requiring only signal input and output, and power leads.

Connection identification is possible by reference to Fig. 2, and the test circuits, Fig. 3, indicate the approach to the incorporation of one of these units in an actual project.

Constructors may obtain the Mullard units from advertisers in this magazine, while the Motorola i.c. is in stock at the U.K. distributors: Celdis Ltd., 43-45 Milford Road, Reading, Berks.; or Semicomps Ltd., 5 Industrial Estate, Beresford Avenue, Wembley, Middx. ■

Readers of Practical Wireless are invited to submit articles for publication and to compete for the Practical Wireless "Designer's Trophy"

RULES.

1. Articles submitted for the competition should conform to the general style of material published in Practical Wireless and must describe the operation and construction of a piece of radio, audio or test equipment that has been designed and built by the author.
2. Articles should, preferably, be typed using double spacing, leaving wide margins, and on one side only of each sheet. Circuit diagrams and any other drawings should be on separate sheets and numbered to agree with the text. Author's roughs must be clear enough to permit re-drawing. Component lists must also be separate and laid out to the standard PW format.
3. Photographs of the equipment are desirable and should be in black and white, sharp and clear. Each photograph should be identified by sticking a piece of paper on the back rather than by writing on the photograph itself.
4. Components used in the design must be readily available from retail sources.
5. An entry form, properly completed, must accompany each article submitted. There is no limit to the number of articles submitted by any one author.
6. Articles must reach the Editor, Practical Wireless, Old Fleetway House, Farringdon Street, London, E.C.4. by the first post on Monday, November 2nd 1970 with the envelope and title sheet clearly marked "Project Autumn". A stamped, self-addressed envelope must accompany each entry.
7. All entries submitted will be considered by a panel of judges and the Editor's decision on all matters arising will be final. The Editor will require authors of winning entries to submit the equipment to him immediately on request for final assessment by the panel.
8. Employees and staff of Practical Wireless are not eligible for entry to this competition.
9. The winner of the competition will receive and retain outright the Practical Wireless "Designer's Trophy 1970". Other prizes will be awarded to the best runners-up. Any article published will be paid for at normal rates.

ENTRY FORM
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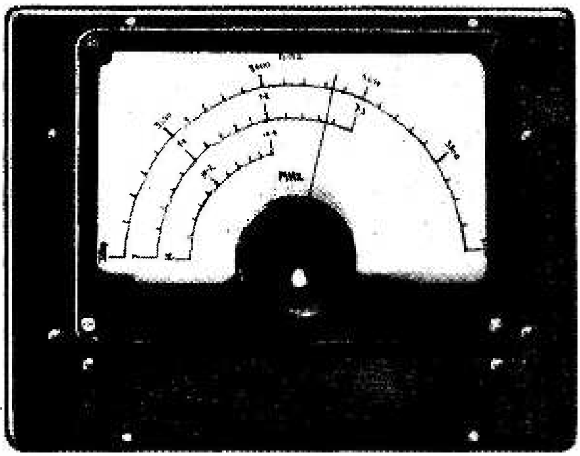
TRANSISTOR V



P. CAIRNS G3ISP

THIS article describes a relatively simple transistor v.f.o. unit, suitable for use with most amateur transmitters. Its basic merits are an extremely stable, low drift characteristic for large changes in temperature, supply volts, and over long periods of time and almost constant amplitude output over the frequency range together with a cheap and simple construction.

Specification

The v.f.o., whose complete specification is given in Table 1, was given most stringent tests, particularly with regard to frequency drift and stability, all frequency measurements being made on a digital frequency meter with a discrimination of ±1Hz. The results of these tests are shown graphically in Table 2. From these curves it can be seen that even under extreme changes in parameters, the frequency drift was always well under 100Hz or better than 0·003%. As the tuning capacitor represents only a small part of the total capacitance, the oscillator only covers the required frequency range, that is 3·5 to 3·8MHz. This means a large open scale and almost linear divisions in calibration. With a scale radius of 2¼in. (scale length of about 7in.) each 10kHz occupies approximately ¼in. Amplitude stability is maintained by an effective control circuit which does not employ a thermister with its attendant time lag. Supply is 24V d.c., though this is not at all critical, while the current drain is less than 50mA.

The complete unit is housed in an 8in × 6in × 6in case, co-axial output being taken from the rear. The output impedance is extremely low, thus allowing the unit to drive transmitters having a wide range of input impedance.

The Circuit

The complete circuit diagram, together with component list is given in Fig. 1. Basically the circuit comprises a modified Butler oscillator with emitter follower output. Tr1 and Tr2 form the oscillator circuit with Tr3 as an emitter follower output. L1, VC1, VC2 and C1 determine the frequency of oscillation, the output from Tr2 being d.c. coupled to Tr3. This stage provides isolation between the oscil-

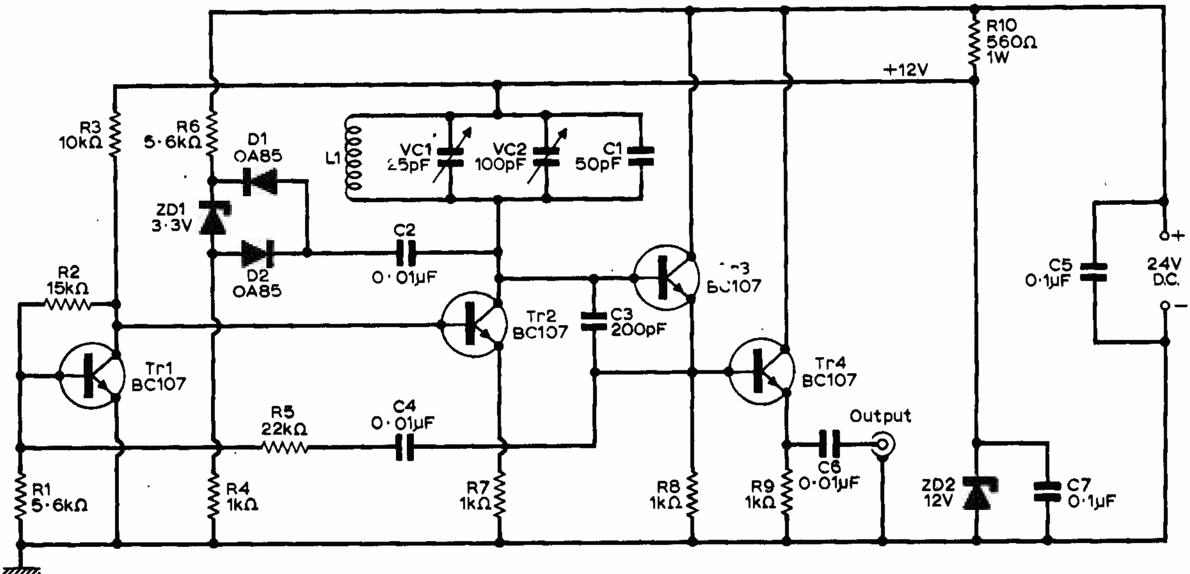
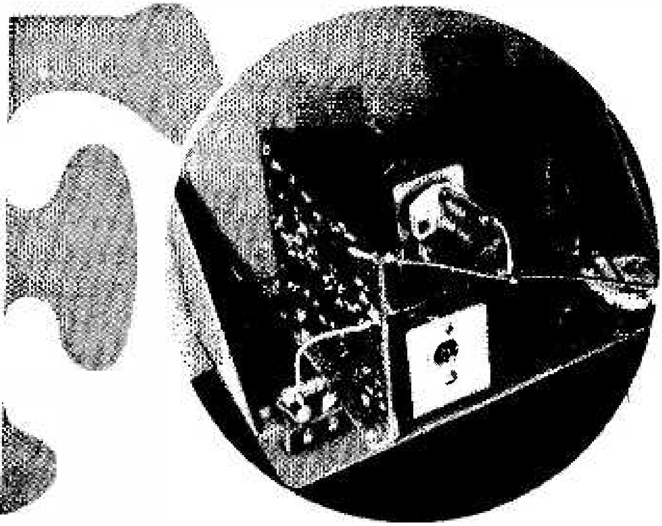


Fig. 1: The complete circuit of the transistor v.f.o. See components list for details of L1.



lator and feedback amplifier Tr1. The output developed across emitter load R8 is applied via the feedback components C4 and R5 to the base of Tr1. The output from this transistor is d.c. coupled back to the base of Tr2. Negative feedback is applied to Tr1 via R2 which, in conjunction with R1, determines the effective level of oscillator feedback.

The output stage, Tr4, is also an emitter follower, d.c. coupled from the emitter of Tr3. This stage ensures isolation between the output and oscillator circuit and also provides a low output impedance, C6 providing d.c. blocking to the output terminal. Two levels of supply line are used, 24V and 12V, the 12V being obtained via R10 and ZD2. The output emitter followers are supplied from the higher voltage line, thus ensuring adequate signal swing without clipping and allowing d.c. coupling to be easily achieved.

The amplitude stabilization circuit is formed by components ZD1, D1 and D2. The oscillator output is coupled via blocking capacitor C2 to the diodes D1 and D2. The voltage across the zener diode ZD1 is maintained via the resistor dividers R4 and R6, these being connected across the main d.c. supply. The rectified signal output from diodes D1 and D2 is therefore constantly compared against the fixed zener voltage. Changes in oscillator level are converted to d.c. and simply registering as variations in zener current, the voltage across which is always constant and therefore provides a constant reference for the signal source. Decoupling of the supply lines is provided by C5 and C7.

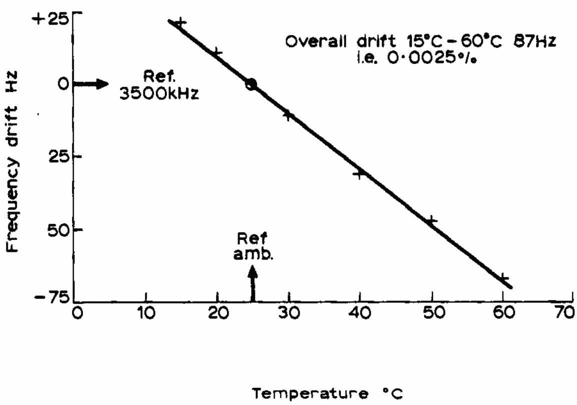
Construction

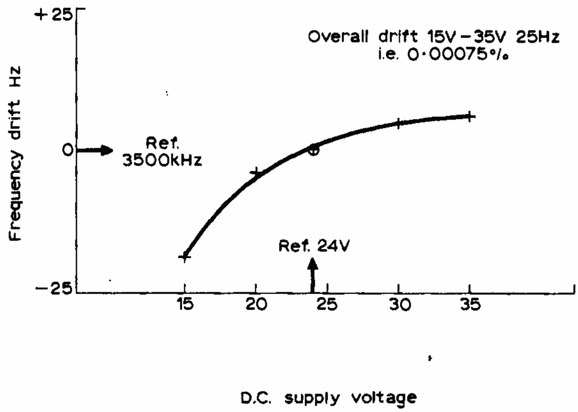
The construction of the v.f.o. is quite straightforward and can best be followed from the photographs shown. All components except the tuning and trimming capacitors, coil and C5, are mounted on a piece of Veroboard 4in.×3in. The complete Veroboard layout is shown in Fig. 2. This is completed first and then fixed vertically on the chassis by means of a small aluminium bracket.

The chassis is simply an aluminium plate with a small right-angle lip bent along the front edge for fixing to the front panel. Side brackets, with lips bent in for fixing the front panel to chassis are

SPECIFICATION

Frequency Range	3·5MHz to 3·8MHz fundamental (approx.)
Frequency Stability	After 10 mins warmup: Temperature 15°C to 60°C: less than 100Hz or 0·003% Supply volts 15V to 30V: less than 30Hz or 0·0009% Over a six hour period: less than 10Hz or 0·0003%
Output	Minimum 5V peak to peak. Amplitude stability over frequency range better than 1dB. Output impedance less than 200Ω
Supply	Nominal 24V d.c. Current drain less than 50mA
Dimensions	8in. x 6in. x 6in.





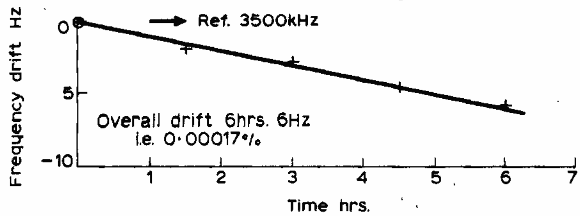
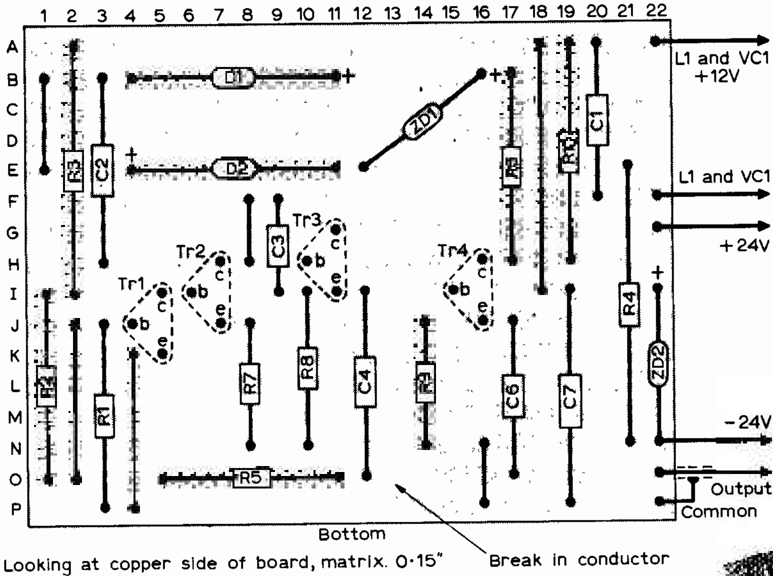


Table 1 (top): gives the specification of the v.f.o. while the graphs in Table 2 demonstrate the stability of the unit with regard to temperature supply voltage and time.



also used as mechanical rigidity is of major importance for optimum frequency stability. Layout is clearly indicated in the photographs.

Also mounted on the chassis are the tuning capacitor, trimming capacitor and coil. The wiring between these components and the Veroboard is all of 18s.w.g. tinned copper and should be as short and direct as possible, mechanical rigidity again being of first importance. The output co-axial socket is mounted on a small bracket on the rear of the chassis and close to the Veroboard, thus ensuring

★ components list

Resistors:

R1	5·6k Ω	R6	5·6k Ω
R2	15k Ω	R7	1k Ω
R3	10k Ω	R8	1k Ω
R4	1k Ω	R9	1k Ω
R5	22k Ω	R10	560 Ω 1 watt 10%

All resistors ½ watt, 5% except R10

Capacitors:

VC1 25pF air-spaced variable, ceramic mounting (Jackson Code JB/804/3·3/25)
VC2 100pF ceramic trimmer
C1 50pF silver mica
C2 0·01μF polyester
C3 200pF silver mica
C4 0·01μF polyester
C5 0·1μF polyester
C6 0·01μF polyester
C7 0·1μF polyester

Semiconductors:

Tr1	BC107	ZD1	3·3V zener, BZY88-C3V3 Mullard
Tr2	BC107	ZD2	12V zener, BZX61-C12 Mullard
Tr3	BC107	D1	OA85 Mullard
Tr4	BC107	D2	OA85 Mullard

Coil:

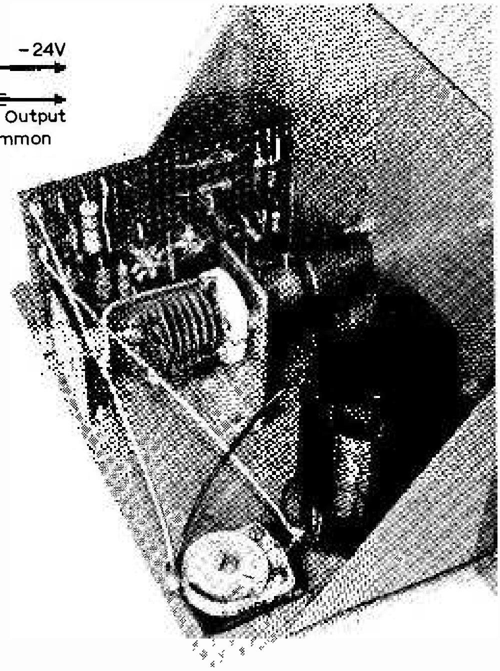
25 turns, close wound on 1½in. diameter former, 18 s.w.g. enamelled copper wire

Miscellaneous:

Veroboard, 0·15in. matrix, 22 x 16 holes; Transistor heat sinks; Co-ax. socket; Two-way tag strip; Slow motion drive assembly; Chassis 8in. x 6in. x 6in. from H. L. Smith & Co, type W.

Fig. 2: (left) The component layout on Veroboard.

(Below) The layout of the v.f.o. can be clearly seen from this photograph and the heading illustration.



short output leads. On the outer side of the Veroboard is the two-way tag strip for the incoming d.c. supply, C5 is connected across these tags, thus decoupling the main supply at its entry point. The negative side of the supply is taken to chassis via the common fixing contact on the tag strip.

The front panel should be drilled to take the particular type of slow motion drive and dial assembly before being fixed to the chassis and side brackets. The tuning capacitor VC1 is mounted on a bracket of suitable height so as to engage with the slow motion drive shaft. This capacitor should be of the ceramic mounting type as with this circuit both sets of vanes must be isolated from chassis.

Holes should be drilled in the rear of the cabinet to allow for the entry of the co-axial plug and supply leads, these being taken through a grommet. While the size of the cabinet used by the writer is specified, being readily available, any similar type of case or cabinet which is already to hand may be used.

Calibration

The ideal instrument for calibrating the v.f.o. is of course a digital frequency meter. As such instruments are seldom available to the average amateur,

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organ pedal bass unit

PART 2

A. LESTER-RANDS

THE main note generator is a simple multi-vibrator, Tr1 and Tr2, Fig. 11, with the base of Tr2 taken to the negative rail via the tuning pre-set potentiometers PR1 to PR13 and VR1/R17 and R18. The pre-sets, PR1 to PR13, are used to tune the multi-vibrator to cover one complete octave in tempered scale from C (65Hz approx) to C (130Hz approx).

The potentiometer VR1 will shift the overall pitch up or down by a full interval (one whole note) so that the unit can be tuned instantly to instruments not tuned exactly to concert pitch. The output from the multi-vibrator provides the fundamental notes for the 8ft. pitch and is taken directly to the tone forming network C23, L1 and C24 which provides the 'flute' voicing. The capacitors C25 and C26, together with the resistors R40 and R43 provide the 'clarinet' voicing.

The output from the multi-vibrator simultaneously drives the divider circuit Tr3 and Tr4 which provides the fundamental notes for the 16 ft. pitch. The output from the divider is taken via the flute voicing network R14, C10, R15 and C11 and then via S1 and R16 to the buffer amplifier Tr9. The voiced outputs from the 8ft. pitch voicing network are switched via S3 and R45 to Tr9 base. The switches S1 and S3 allow a choice of 8ft. flute (or clarinet with S4 closed) or 16ft. flute (or clarinet with S4) or both i.e., the 8 and 16ft. pitches combined.

The signal output from the buffer amplifier is approximately 1V r.m.s. with the output gain control VR2 at maximum.

Drum Brush Circuit

The drum brush sound is generated when any pedal is depressed either momentarily or continuously. The brush sound begins with a medium degree of attack and decays away in approximately 1 second depending on the setting of the pre-set potentiometer PR14. A four notes per bar pedal bass will therefore produce a four beats per bar brush rhythm. The brush rhythm can be switched on or off as desired.

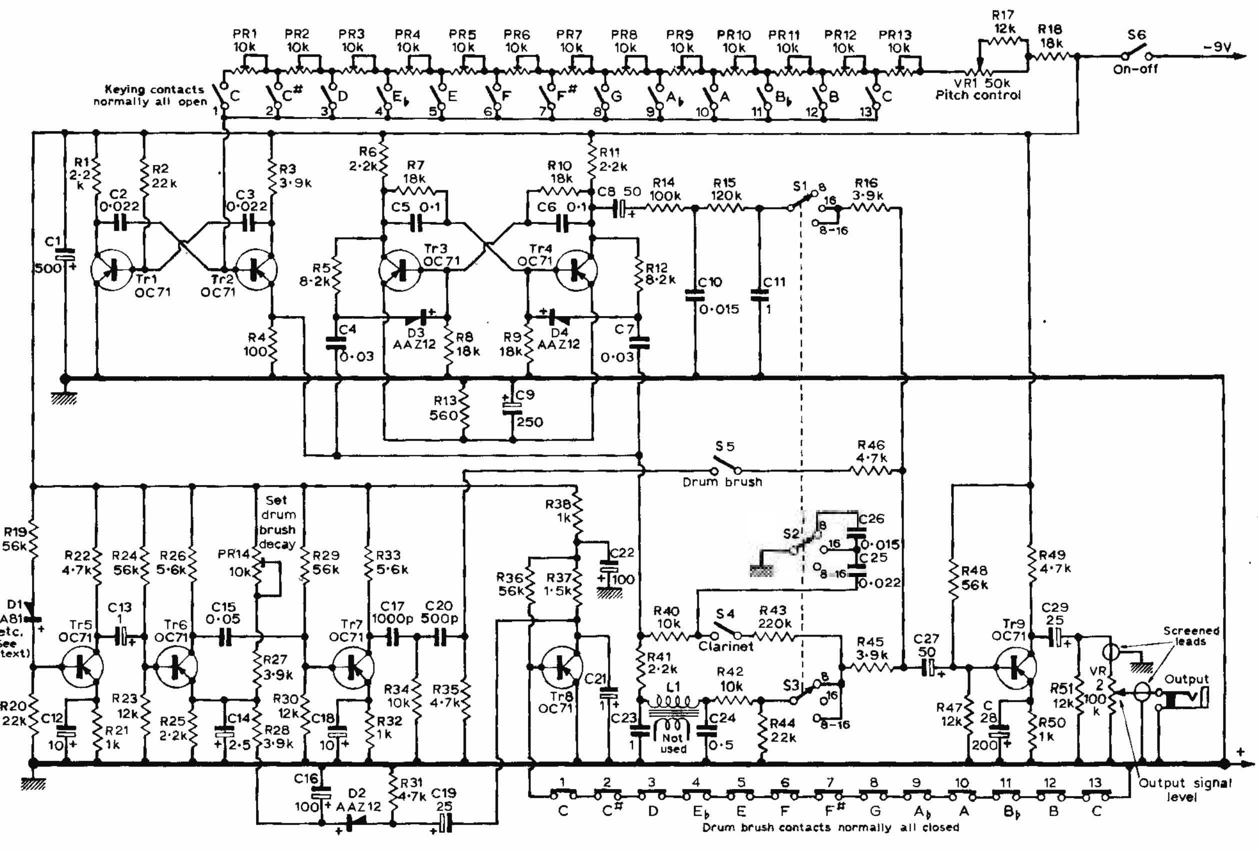


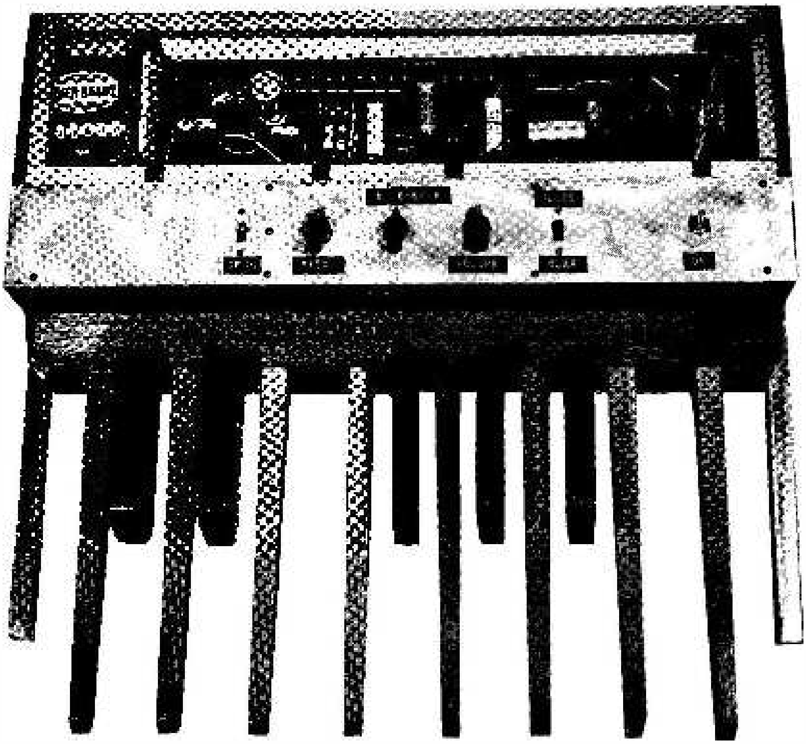
Fig. 11: Complete circuit of the Organ Pedal Bass Unit.

The circuit for the drum brush sound consists of a noise generator (D1, Tr5, Tr6, Tr7) and the attack/decay control circuit (Tr8). The choice of a diode for D1 may require some trial and error as a 'noisy' diode is required i.e., one that generates most noise when current is passed through it.

There should be at least 500mV of white noise from the collector of Tr7 (junction C17 and C20) with Tr6 conducting i.e., with PR14 at maximum resistance. An oscilloscope should display a typical spiky noise signal of about 1V peak to peak.

The function of the attack/delay control is as follows:— With PR14 set to maximum resistance constant noise should appear at the output of the unit. Adjust PR14 until Tr6 is just cut off in which case the continuous noise signal will cease. The function of Tr8 is to provide a positive pulse to the emitter of Tr6 when any of the contacts 1 to 13 (drum brush contacts in Fig. 10 Part 1) are opened.

The control transistor Tr8 is normally cut off but conducts rapidly when any of the contacts 1 to 13 are opened. The result is a fairly large pulse at the collector of Tr8 which is rectified by the diode D2 and charges C16. The charge on C16 allows Tr6 to conduct instantly, thus initiating the 'attack' but the charge then dies away slowly via R28 and R25 thus providing the 'decay' of the brush noise. The decay time will be about 1 second with PR14 adjusted so that Tr6 is only just cut off. Decreasing PR14 resistance so that Tr6 is beyond cut off will produce a much shorter decay time to the brush sound.



Top view of the completed unit.

The total current consumption of the whole unit with any pedal depressed and the drum brush circuit switched on should not exceed 25mA. It is therefore quite economical to run the unit from a 9V (PP9) battery. There is no reason why a small mains unit should not be used but the smoothing capacitor should be at least 5000μF. to keep hum level to an absolute minimum.

Circuit Boards and Panel Controls

The tone generator, divider and voicing networks are assembled on Board A as in Fig. 12. The preset tuning potentiometers PR1 to PR13 should be

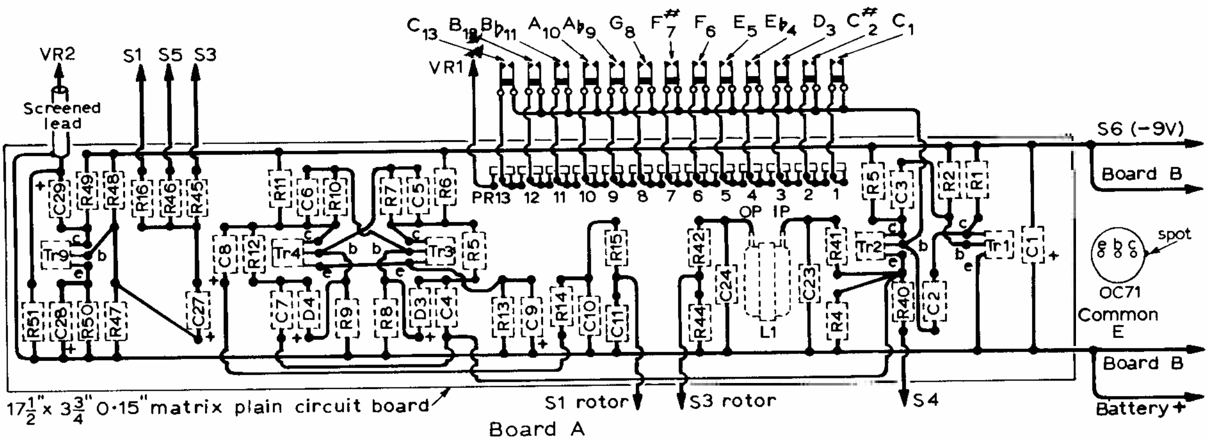


Fig. 12: Layout of circuit Board A for the tone generator, divider and voicing networks.

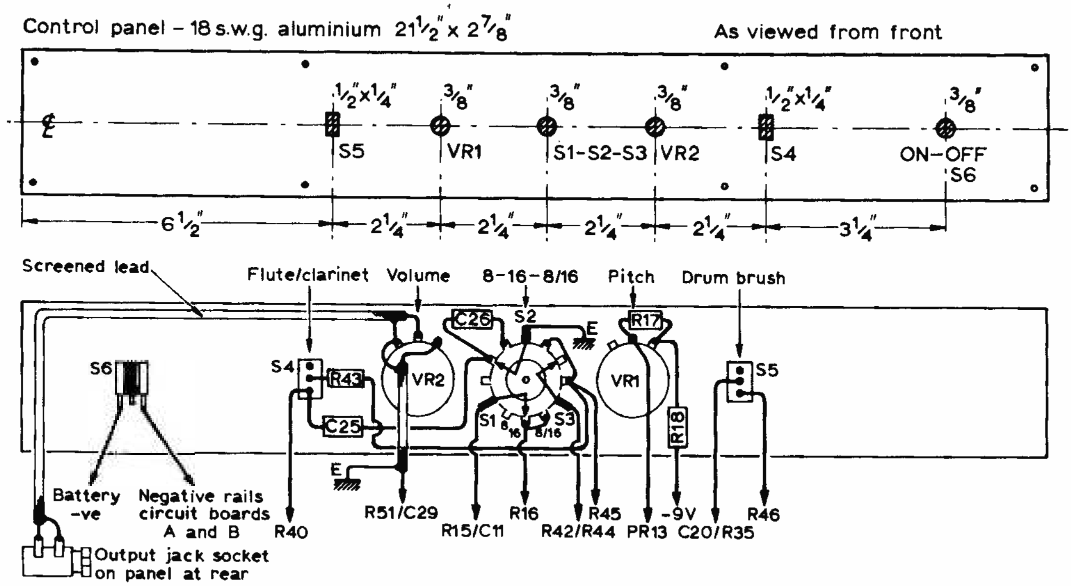


Fig. 13: Details of the layout and wiring of the control panel.

★ components list

Resistors :

R1	2·2k Ω	R14	100k Ω	R27	3·9k Ω	R40	10k Ω
R2	22k Ω	R15	120k Ω	R28	3·9k Ω	R41	2·2k Ω
R3	3·9k Ω	R16	3·9k Ω	R29	56k Ω	R42	10k Ω
R4	100 Ω	R17	12k Ω	R30	12k Ω	R43	220k Ω
R5	8·2k Ω	R18	18k Ω	R31	4·7k Ω	R44	22k Ω
R6	2·2k Ω	R19	56k Ω	R32	1k Ω	R45	3·9k Ω
R7	18k Ω	R20	22k Ω	R33	5·6k Ω	R46	4·7k Ω
R8	18k Ω	R21	1k Ω	R34	10k Ω	R47	12k Ω
R9	18k Ω	R22	4·7k Ω	R35	4·7k Ω	R48	56k Ω
R10	18k Ω	R23	12k Ω	R36	56k Ω	R49	4·7k Ω
R11	2·2k Ω	R24	56k Ω	R37	1·5k Ω	R50	1k Ω
R12	8·2k Ω	R25	2·2k Ω	R38	1k Ω	R51	12k Ω
R13	560 Ω	R26	5·6k Ω	R39	Not required		

All resistors ¼W 10%
PR1-14 10k Ω pre-set potentiometer. (Sub-miniature carbon skeleton type.)
VR1 50k Ω carbon potentiometer, linear.
VR2 100k Ω carbon potentiometer, log.

Capacitors :

C1	500μF (elec)	C11	1μF (paper)	C21	1μF (elec)
C2	0·022μF	C12	10μF (elec)	C22	100μF (elec)
C3	0·022μF	C13	1μF (elec)	C23	1μF (paper)
C4	0·03μF	C14	2·5μF (elec)	C24	0·5μF
C5	0·1μF	C15	0·05μF	C25	0·022μF
C6	0·1μF	C16	100μF (elec)	C26	0·015μF
C7	0·03μF	C17	1000pF (cer)	C27	50μF (elec)
C8	50μF (elec)	C18	10μF (elec)	C28	200μF (elec)
C9	250μF (elec)	C19	25μF (elec)	C29	25μF (elec)
C10	0·015μF	C20	500pF (mica)		

All capacitors at least 12VW

Semi-conductors :

Diodes D1 (see text). D2, 3, 4 AAZ12 (Mullard)
Tr1—Tr9 OC71 (Mullard)

Switches :

S1, 2, 3 — 3 pole, 3 way, ganged wafer type.
S4, 5 — Single pole, on-off, slide type.
S6 — Single pole, on-off, toggle or slide type.

Miscellaneous :

Aluminium panel 21½ x 2⅞ in. 18 s.w.g. Inductor L1 (Type CP6713/2, Henrys Radio Ltd). Output Socket. Control knobs (3). Veroboard (2) 17½ x 3¾ in. and 7½ x 3 in. both plain, 0·15 in. matrix.

mounted at an angle or side by side so that the adjustment slots can be reached with a small screwdriver from the back of the case.

Connection from the tuning pre-sets PR1 to PR14 to their respective contacts are also shown in Fig. 12 together with connections to the panel controls VR1, VR2, S1, S3, S4, S5 etc.

The control panel assembly and wiring is shown in Fig. 13. Note that some components such as R43, C25, C26, R17 and R18 are wired between controls.

Mention has already been made regarding the drum brush circuit and adjustment for long or short decay. The choice is for the user but should the sound level appear too high, then the resistor R46 (4·7K) should be increased until the required balance between drum brush and bass notes is achieved.

Before tuning set the wipers on the pre-sets PR1 to PR13 to midway, set the 'pitch' control VR1 also to midway position and then begin tuning with PR13 which will tune the highest C note. If possible the

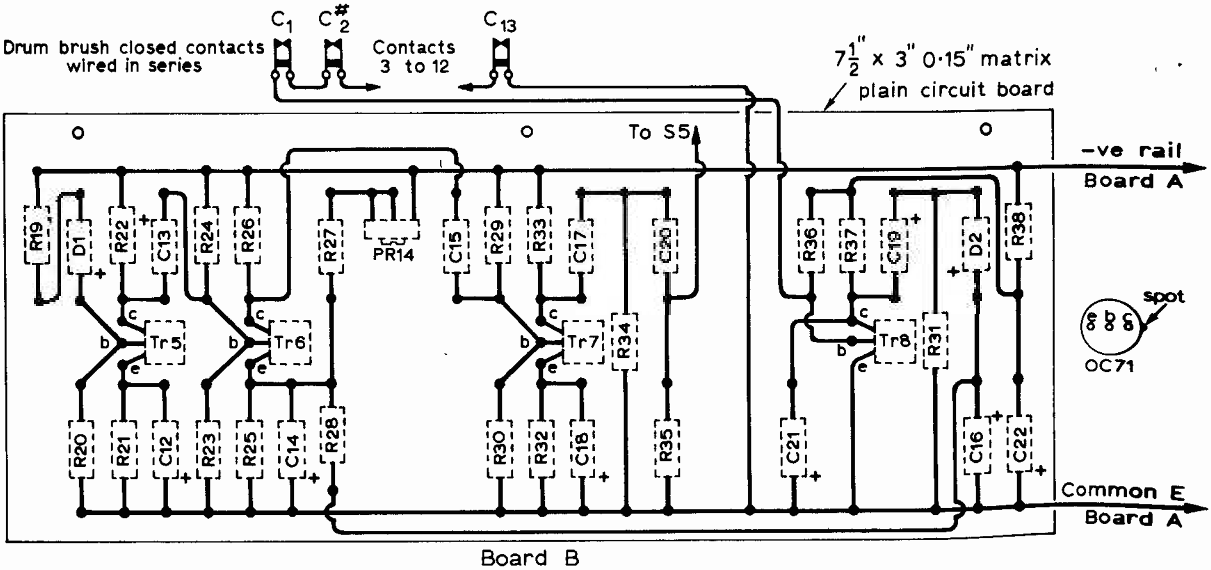


Fig. 14: Circuit Board B containing the noise generator and control amplifier.

The control panel is mounted on the top of the case framework at the front (see Fig. 8 and Fig. 9 Part 1).

The drum brush noise generator and control amplifier is assembled on Board B as shown in Fig. 14. Connections to S5 and the drum brush contacts are also shown.

Board B is mounted toward the rear of the unit on the lower cross members of the case in the position shown in Fig. 8 Part 1. Board A is mounted toward the front of the case as in Fig. 8 Part 1. Board B should be situated to the left of the case (looking from the rear) so as to leave enough space for the battery. The output jack can be mounted on a small aluminium panel as shown in the photograph in Part 1.

Checking and Tuning

If an oscilloscope is available the waveform from the multi-vibrator Tr1-Tr2 can be checked at the junction of R4 and the collector of Tr2 and from the divider at C8-R14. The function of the drum brush circuit can be checked at C20-R35. The voiced waveforms can of course be checked at the output socket and those for flute should appear nearly sinusoidal. Wth the 'clarinet' switched on a small pulse will be superimposed on the flute waveform and the audible tone will be slightly 'reedy'.

With 8 + 16 pitch the respective waveforms will combine and the 8ft. waveform will appear to sit on top of the 16ft. waveform. Audibly, the 8ft. and/or 16ft. pitch with flute voicing should have a round deep tone.

tuning should be done with the aid of an electronic organ with bass by tuning each note on the pedal unit to zero beat. Failing this, tune with a piano and use the zero beat method for each note. Start with the highest C (PR13) and tune each note going down using 8ft. pitch and flute voicing. The tuning will maintain itself for a long time but should be checked occasionally to ensure perfect pitch.

Final Assembly

The covers for the top, back and base can be made from hardboard cut to fit over the framework. Make a cut-out where the battery goes in and a small separate panel to secure the battery in place, Fig. 15. The covers should be screwed on so as to allow quick access to the pedal contacts and circuit

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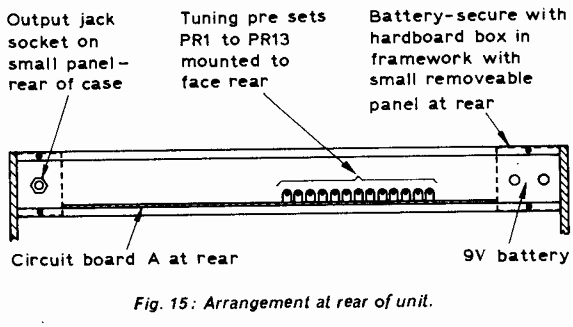

Fig. 15: Arrangement at rear of unit.

PW **VIBRASONIC 25-50** F.C.JUDD

GUITAR AMPLIFIER

Part 2

The previous article (Part 1) dealt with the cabinet and main chassis assembly and with the function of the pre-amplifier and tremulant circuitry. The full circuit for the pre-amplifier was included (Fig. 5 Part 1) which should be used in conjunction with the various assembly details given in this article.

The pre-amplifier and tremulant control circuit is divided into three sections each having its own circuit board as in Figs. 6, 7 and 8. Before dealing with these however, it is advisable to construct the small separate assemblies such as the panel tremulant indicator lamp, the l.d.r. mounting, its control lamp and cover, and the mains input socket panel which is fitted at the rear of the cabinet.

The l.d.r. is mounted on a small piece of s.r.b.p. attached to a chassis fixing bracket as in Fig. 10. Its control lamp B2 is mounted in a dial light holder (m.e.s.) as shown in the same diagram. The two assemblies are secured to the chassis with self tapping screws so that the lamp is level with the l.d.r. and approximately $\frac{1}{8}$in. in front.

The l.d.r. cover is shown in Fig. 11 and this is simply fitted over the l.d.r. and its lamp and secured to the chassis with self tapping screws. This cover keeps any external light off the l.d.r. and is useful when the amplifier is being tested out of the cabinet,

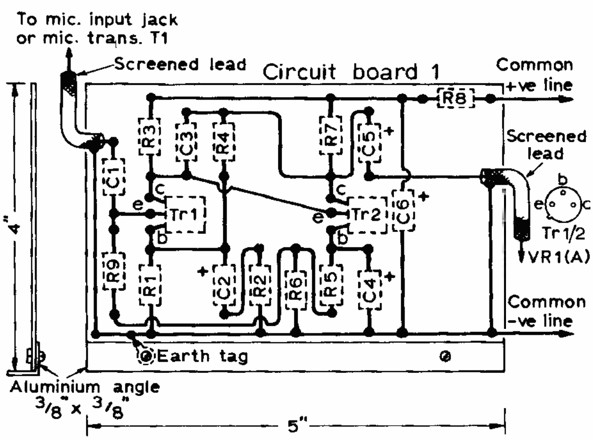

Fig. 6: Microphone pre-amplifier on Circuit Board 1.

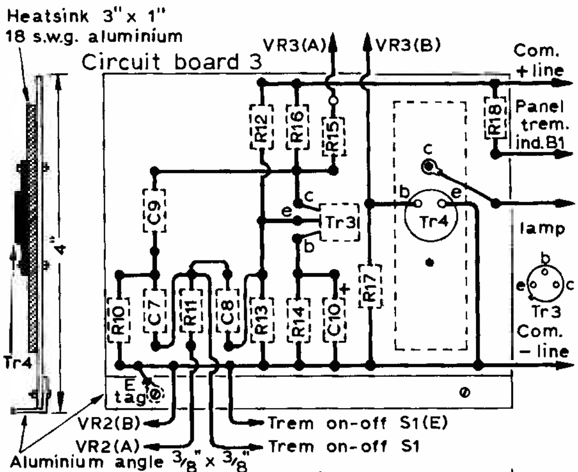

Fig. 8: Phase shift oscillator and LDR control amplifier, Circuit Board 3.

With these done and the front panel drilled ready for the controls etc. the circuit boards can be made and wired and the whole amplifier finished off ready for testing.

The panel tremulant lamp unit is simple to make and requires only an m.e.s. batten lampholder mounted on a bracket as in Fig. 9. This is fitted to the chassis with self tapping screws in the position shown Fig. 13, so that the lamp 'looks' through the hole provided as in the front panel layout diagram. A piece of coloured celluloid is glued over the hole, inside the panel, to enhance the appearance.

When the tremulant circuit is operating, this lamp flickers at the tremulant speed and its brilliance varies according to the setting of the tremulant depth control.

where light could reach the l.d.r. and alter its operating range.

The remaining small assembly is the 3-pin mains input socket which requires only a panel as in Fig. 12. This assembly is fitted at the back of the cabinet as can be seen in the photographs.

Pre-amplifier Circuit Boards

These are numbered 1, 2 and 3 and are located on the main chassis as in Fig. 13. Boards 1 and 3 are 5 x 4in. plain s.r.b.p. with 0·1in. matrix and Board 2 is 5 x 7in. of the same material. Each board is mounted on $\frac{3}{8}$ x $\frac{3}{8}$in. aluminium angle which secures the board to the chassis (self tapping screws).

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AAZ13	3/2	ASY27	6/-	BCY72	3/2	BSY95A	2/11	NKT153	6/-	NKT281	5/-	OC41	5/-	40309	6/6	2N929	5/3	2N3415	6/-	2N5028	11/6
AC107	7/7	ASY28	4/5	BCY87	86/9	BYZ14	33/3	NKT154	6/-	NKT301	18/-	OC42	4/6	40310	9/-	2N930	6/-	2N3416	7/6	2N5029	9/6
AC126	5/-	ASY29	6/-	BCZ11	7/6	BYZ15	33/3	NKT161	6/-	NKT302	12/5	OC43	4/6	40311	6/9	2N1131	6/-	2N3436	15/-	2N5030	8/6
AC127	4/-	ASZ21	7/6	BD119	15/-	C111	18/-	NKT162	6/-	NKT303	17/6	OC44	3/-	40312	9/6	2N1132	6/-	2N3525	21/9	2N5172	3/-
AC127Z	9/6	AUY10	30/-	BD121	13/-	C111E	12/-	NKT163	6/-	NKT304	9/10	OC45	3/-	40314	7/3	2N1302	3/7	2N3528	19/-	2N5174	10/6
AC128	4/-	B1181	10/-	BD123	16/6	C426	8/3	NKT164	6/8	NKT351	10/-	OC70	2/6	40315	7/3	2N1303	4/6	2N3606	5/6	2N5175	10/6
AC176	5/-	B2M	12/6	BD124	12/6	CR1-051C	8/-	NKT165	6/-	NKT352	17/6	OC71	3/-	40316	9/3	2N1304	4/11	2N3607	4/6	2N5176	9/-
AC187	6/-	B3M	15/-	BDY20	20/8	CR1-401C	10/-	NKT201	6/-	NKT361	20/-	OC72	4/6	40317	7/3	2N1305	4/11	2N3702	2/6	2N5232	5/6
AC188	6/-	BA102	9/-	BF115	5/-	D13T1	10/-	NKT202	6/-	NKT362	20/-	OC74	8/-	40319	10/9	2N1306	6/-	2N3703	2/5	2N5249	13/6
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ACY39	11/-	BC137	8/6	BF200	10/6	MPF105	8/-	NKT221	7/-	NKT676	5/-	OC170	5/-	40462	11/3	2N2369	3/4	2N3855	5/6	2S018	17/6
ACY40	3/-	BC138	12/-	BFX13	5/-	NKT11	7/6	NKT222	6/-	NKT677F	3/10	OC171	6/-	40467	16/6	2N2369A	3/11	2N3855A	6/-	2S019	19/6
ACY41	3/-	BC140	13/3	BFX29	6/2	NKT12	5/5	NKT223	5/-	NKT703	8/-	OC200	7/6	40468A	7/-	2N2613	7/6	2N3856	6/-	2S020	20/-
ACY44	8/-	BC142	15/-	BFX44	8/-	NKT32	6/-	NKT224	3/7	NKT713	3/10	OC201	9/6	40602	8/-	2N2614	4/-	2N3856A	6/-	2S104	12/6
AD140	11/-	BC143	15/-	BFX84	5/2	NKT42	6/-	NKT225	3/6	NKT717	5/10	OC202	12/6	1N3713	30/-	2N2646	10/-	2N3858	5/-	2S301	8/6
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AF102	12/6	BC168	3/9	BFY51	3/9	NKT104	6/-	NKT237	5/9	NKT10519	4/5	ORP12	10/-	2G339A	5/-	2N2923	4/-	2N3877A	9/6	2S322	8/-
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AF126	3/6	BCY31	5/6	BCX20	3/3	NKT125	4/6	NKT262	4/3	NKT3521915/9		S4M	33/6	2N698	6/-	2N3136	6/-	2N4060	5/-	3N128	13/9
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AF129	15/-	BCY33	4/-	BSX60	12/7	NKT127	10/6	NKT264	4/3	OC20	19/6	TD716	2/-	2N706A	2/6	2N3234	27/6	2N4062	4/6	3N141	14/6
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AF180	12/6	BCY39	9/6	BSX77	6/-	NKT135	6/1	NKT271	2/10	0C24	10/-	TIS34	17/6	2N711	7/6	2N3392	5/-	2N4288	3/-	3N152	17/3
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AF186G	8/-	BCY42	4/-	BSY27	4/-	NKT141	10/6	NKT273	3/8	OC26	6/6	TIP31A	12/4	2N743	4/6	2N3394	4/9	2N4290	3/-	AA119	2/-
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AFY19	22/6	BCY54	7/6	BSY32	5/-	NKT143	9/6	MKT275	3/4	OC29	15/-	V205	20/-	2N911	10/-	2N3403	5/6	2N4292	3/-	AAZ12	6/-
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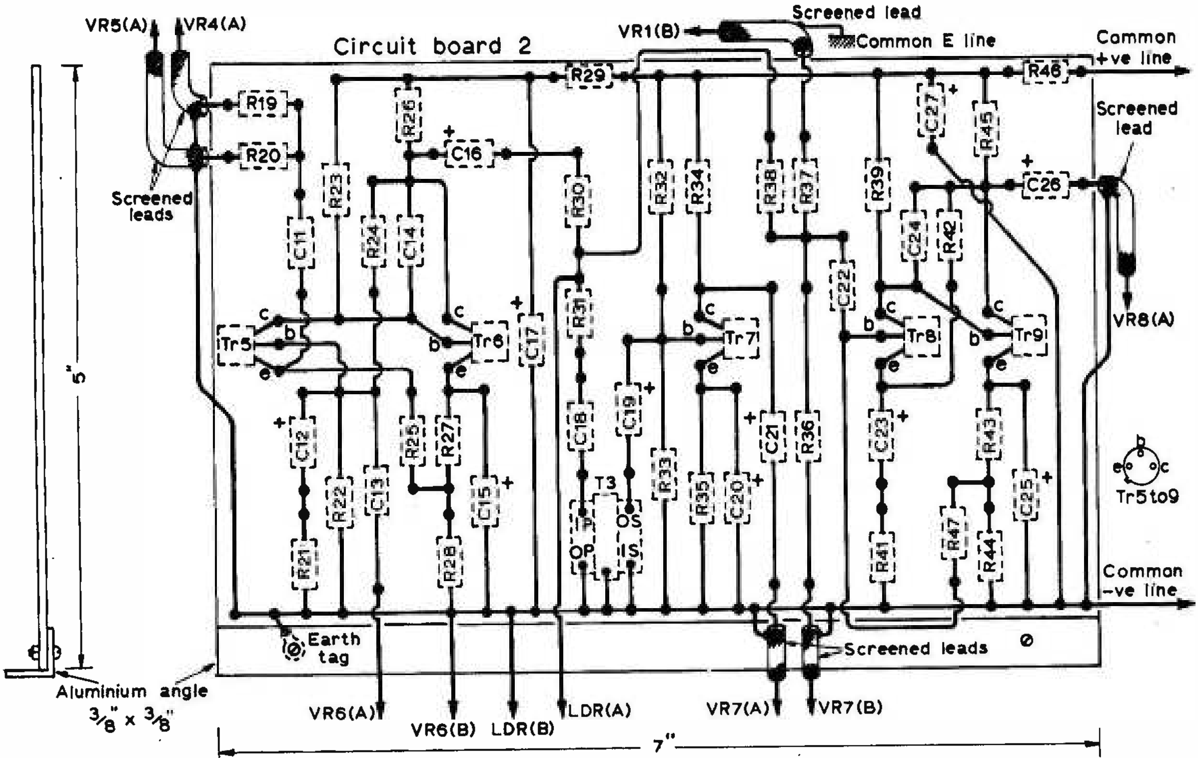
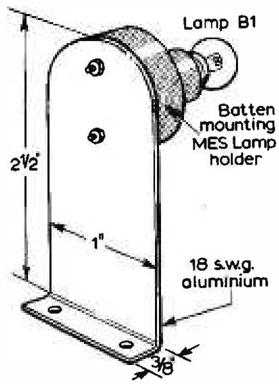


Fig. 7: Guitar and tremulant amplifier on Circuit Board 2.



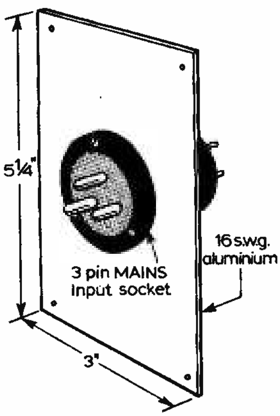
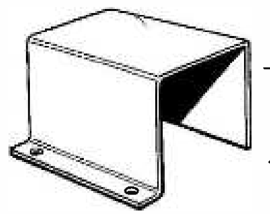
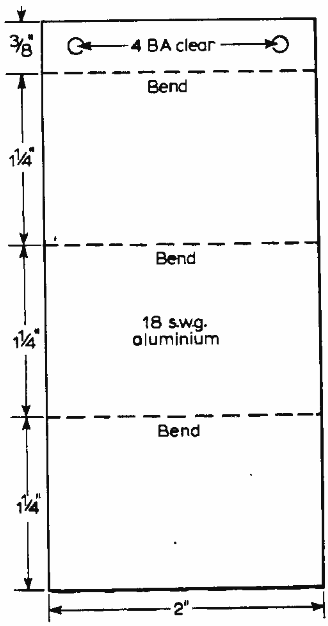


Fig. 9: (far left) Mounting bracket for tremulant indicator lamp.

Fig. 12: (left) Mains input socket mounting.





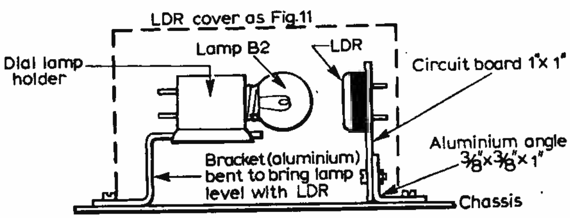


Fig. 10: (left) Mounting details of LDR and lamp.

Fig. 11: (right) construction of LDR cover.

Board 1 contains the microphone pre-amplifier Tr1 and Tr2 and it is most important that the screened leads are earthed to the common earth line as shown.

Board 3 contains the tremulant phase shift oscillator Tr3 and the l.d.r. control amplifier Tr4. Note that the earth returns from VR2 and the tremulant on-off switch must be made as shown, to the common earth line on the circuit board, and to nowhere else. The l.d.r. control amplifier Tr4 must be fitted with a small heatsink as shown in Fig. 8.

The guitar and tremulant amplifier board (Board 2) has several screened lead connections and again it is important that these are earthed, as shown, to the common earth line on the board, as must the earth return from the l.d.r. (l.d.r-B).

CHASSIS LAYOUT

FRONT PANEL LAYOUT

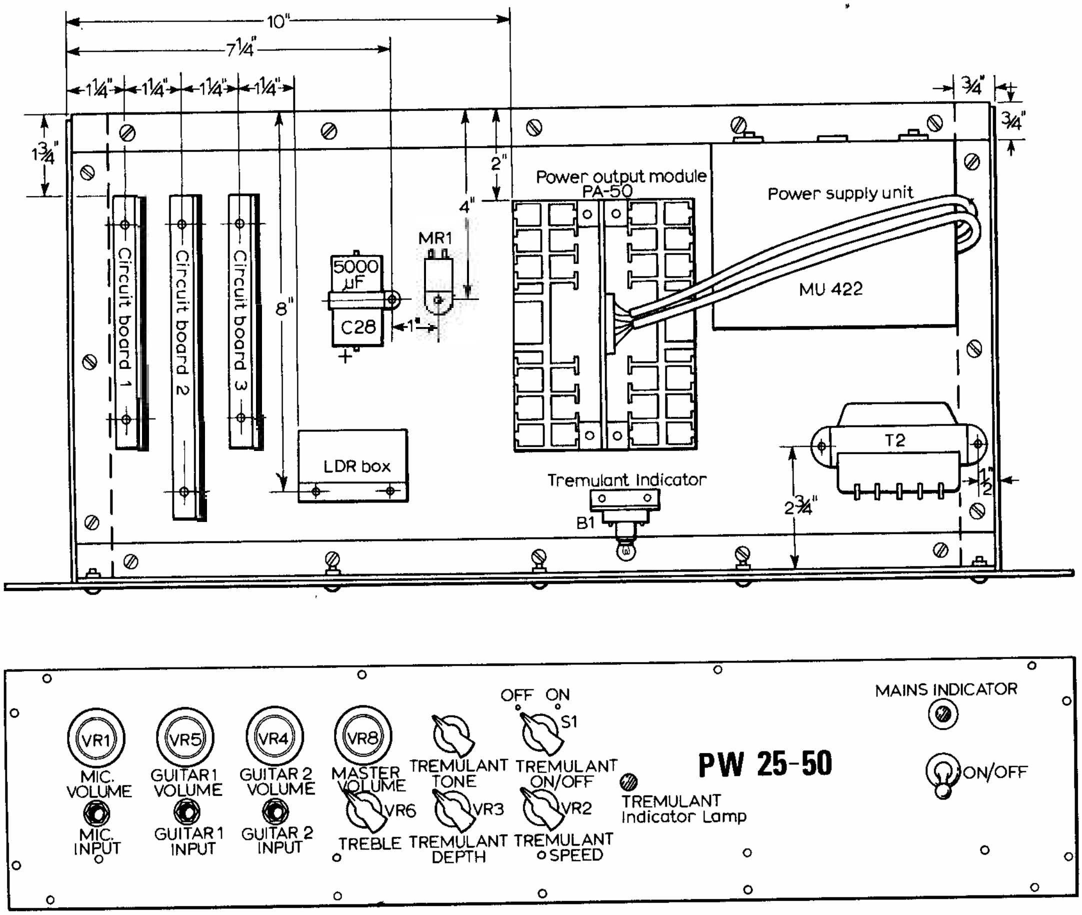


Fig. 13: Layout of panel controls and main components on top of chassis.

The coupling transformer T3 is bolted directly to the circuit board and is a type CP6713/2. It has the IP-OP and IS-OS connections clearly marked on it and these must be connected as in the diagram.

Pre-amplifier Power Supply

It is not convenient to take the supply voltage for the pre-amplifiers from the output module power supply as this is a sealed unit. Transformer T2, the rectifier MR1 and smoothing capacitor C28 form the pre-amplifier power supply and are wired as shown in Fig. 14.

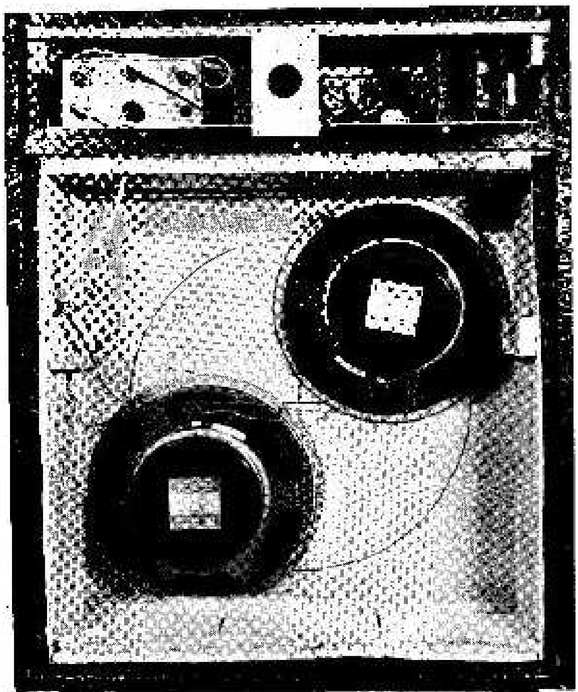
The reason for locating T2 at the far end of the chassis is to prevent the tremulant amplifier transformer T3 from picking up mains hum by mutual coupling. The mains transformer T2 has three secondary tappings but only the 17V tap is used.

Chassis and Panel Layout

The positions of the circuit boards, the pre-amplifier power supply components, the power module and the module power supply are given in Fig. 13. It is most important to adhere to this layout to prevent hum loops around the chassis.

Points for the fixing holes of the power output module and its power supply have not been included as prototype units were used by the writer for the original amplifier. Fixing holes are however, provided

Rear view of completed amplifier and speakers.



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3rd I.F. P50/3CC	6/7	J.B. Tuning Gang	10/6
P51/1 or P51/2	6/7	Weyrad Booklet	2/-
P51/3	6/7	OPTI	11/-

Ferrite Rod 8 × ⅜in. 4/-, 6 × ¼in. 5/-.

VOLUME CONTROLS

Long spindles. Midget Size 5 K. ohms to 2 Meg. LOG or LIN. L/S 3/-. D.P. 5/-. STEREO L/S 11/-. D.P. 15/-. Edge 5K. S.P. Transistor, 5/-.

80ohm Coax 9d. yd. BRITISH AERIALITE AERAXIAL-AIR SPACED 40 yd. 28/-; 60 yd. 40/-. FRINGE LOW LOSS Ideal 625 lines. **2/- yd.**

WIRE-WOUND 3-WATT POTS. Small type with small knob. Values 10 Ω to 30 K., Carbon 30 K to 2 meg. **5/-**

WIRE-WOUND 3-WATT STANDARD SIZE POTS. LONG SPINDLE 10 OHMS to 100 K. **8/-**

VEROBOARD 0.15 MATRIX

2½ × 5in. 3/8. 2½ × 3¾in. 3/2. 3¾ × 3¾in. 3/8. 3¾ × 5in. 5/2. EDGE CONNECTORS 16 way 5/-; 24 way 7/6. PINS 36 per packet 3/4. FACE CUTTERS 7/6.

S.R.B.P. Board 0.15 MATRIX 2½in. wide 6d. per 1in., 3¾in. wide 9d. per 1 in.; 5in. side 1/- per 1in. (up to 17in.). S.R.B.P. undrilled 1/16 in. Board 10 × 8in. 3/-.

BLANK ALUMINIUM CHASSIS. 18 s.w.g. 2½in. sides, 7 × 4in., 6/-; 11 × 3in., 7/6; 11 × 7in. 9/6; 13 × 9in., 10/6; 15 × 14in., 15/-; 9 × 7 × 2in., 8/6; 14 × 11 × 2in., 14/6. ALUMINIUM PANELS 18 s.w.g. 12 × 12in. 6/6; 14 × 9in. 5/6; 12 × 8in. 4/6; 10 × 7in. 3/6; 8 × 6in. 2/6; 6 × 4in. 1/6.

1-inch DIAMETER WAVE-CHANGE SWITCHES. 2 p. 2-way, or 2 p. 6-way, or 3 p. 4-way 4/6 each. 1 p. 12-way, or 4 p. 2-way, or 4 p. 3-way 4/6 each. 1 inch DIAMETER Wavechange "MAKITS" 1 p. 12-way, 2 p. 6-way, 3 p. 4-way, 4 p. 3-way, 6 p. 2-way, 1 wafer 12/-, 2 wafer 18/-, 3 wafer 24/-, 4 wafer 30/-, 5 wafer 36/-, 6 wafer 42/-. TOGGLE SWITCHES, sp. 2/6; sp. dt. 3/6; dp. 3/6; dp. dt. 4/6.

ALL PURPOSE HEADPHONES

H.R. HEADPHONES 2000 ohms Super Sensitive	35/-
LOW RESISTANCE HEADPHONES 3-5 ohms	39/6
DE LUXE STEREO HEADPHONES 8 ohms	65/-

"THE INSTANT" BULK TAPE ERASER AND RECORDING HEAD DEMAGNETISER

200/250 v. A.C. Leaflet S.A.E. **47/6** Post 2/6

★ GENERAL PURPOSE TRANSISTOR PRE AMPLIFIER BRITISH MADE ★

for Mike, Tape, P.U., Guitar

Battery 9-12v or H.T. line 200-300v D.C. operation. Size 1½" x 1½" x ½". Response 25 c.p.s. to 25 Kc/s. 26db gain. For use with valve or transistor equipment. Full instructions supplied. Brand new. Guaranteed. Details S.A.E. **17/6** Post 2/6

NEW TUBULAR ELECTROLYTICS				CAN TYPES	
2/350V	2/6	100/25V	2/-	16+16/500V	11/-
4/350V	2/6	250/25V	2/6	50+50/350V	7/-
8/450V	2/6	500/25V	4/-	60+100/350V	11/6
16/450V	3/-	8+8/450V	3/6	32+32/250V	3/6
32/450V	4/-	8+16/450V	4/-	32+32/450V	6/6
25/25V	2/-	16+16/450V	5/-	32+32+32/350V	6/9
50/50V	2/-	32+32/350V	5/-	100+50+50/350V	9/6

SUB-MIN. ELECTROLYTICS. 1, 2, 4, 5, 8, 16, 25, 30, 50, 100, 200mF 15V 2/-; 500, 1000mF 12V 3/6; 2000mF 25V 7/-. CERAMIC 1pF to 0.01 mF, 9d. Silver Mica 2 to 5000pF, 9d. PAPER 350V-0.1 9d, 0.5 2/6; 1mF 3/-; 2mF 150V 3/-. 500V-0.001 to 0.05 9d; 0.1 1/-; 0.25 1/6; 0.47 5/-. 1,000V-0.001, 0.0022, 0.0047, 0.01, 0.02, 1/6; 0.047, 0.1, 2/6. SILVER MICA. Close tolerance 1% 2.2-500pF 1/6; 560-2,200 pF 2/-; 2,700-5,600pF 4/-; 6,800pF-0.01, mfd 6/-; each. TWIN GANG. "0-0" 208pF+176pF, 11/-; Slow motion drive 365+365 with 25+25pF, 11/-; 500pF slow motion, standard 9/-; small 3-gang 500pF 22/-. SHORT WAVE. Single 25pF 11/-. CHROME TELESCOPIC AERIAL 23in. 5/-. TUNING. Solid dielectric. 100pF, 300pF, 500pF, 7/- each. TRIMMERS. Compression 30, 50, 70pF, 1/-; 100pF, 150pF, 1/6; 250pF, 1/6; 600pF, 750pF, 2/-; 1000 pF, 2/6. RECTIFIERS CONTACT COOLED ½ wave 60mA 7/6; 85mA 9/6. SILICON BYZ13 6/-; BY100 10/-. Full wave Bridge Rectifiers 75mA 10/-; 150mA 19/6. EX-GOVERNMENT RECTIFIERS 250v. 200mA. 6/-. NEON PANEL INDICATORS 250V AC/DC Red, Amber 4/-. RESISTORS. Preferred values, 10 ohms to 10 meg. ⅛ w., ¼ w., 1 w., 20% 3d.; 1½ w. 8d.; 2 w. 1/-; ½ w. 10% 6d. HIGH STABILITY. ½ w. 2% 10 ohms to 10 meg., 2/-. Ditto 5% Preferred values 10 ohms to 22 meg., 9d. WIRE-WOUND RESISTORS 5 watt, 10 watt, 15 watt, 10 ohms to 100K. 2/- each; 2½ watt. 1 ohm to 8.2 ohms 2/-.

Q MAX CHASSIS CUTTER

Complete: a die, a punch, an Allen screw and key

⅜in.	16/6	⅝in.	17/6	1⅛in.	19/6	1⅜in.	24/-	2 3/32			44/3
½in.	16/6	1in.	19/6	1¼in.	20/6	1¾in.	29/-	2½in.			57/3
¾in.	16/9	1 1/16in.	19/6	1½in.	21/6	2in.	39/9	1in. sq.			36/6

TRANSISTOR MAINS POWER PACKS. FULL WAVE 9 volt 500mA. Size 4¼ × 2½ × 2in. Metal case. Crackle finish. Output terminals. On/off switch. **78/-**

Half Wave 9 volt 50mA. Size 2½ × 1½in. Snap terminals 36/-

MAINS TRANSFORMERS

Post 5/- each

250-0-250 50 mA. 6.3 v. 2 amps, centre tapped	22/-
250-0-250 80 mA. 6.3 v. 4 amp.	28/-
250-0-250 80 mA. 6.3 v. 3.5 a. 6.3 v. 1 a, or 5 v. 2 a.	38/-
350-0-350 80 mA. 6.3 v. 3.5 a. 6.3 v. 1 a, or 5 v. 2 a.	38/-
300-0-300 v. 120 mA., 6.3 v. 4 a. C.T.; 6.3 v. 2 a.	50/-
MINIATURE 200 v. 20 mA., 6.3 v. 1 a. 2½ × 2 × 1⅝in.	15/-
MIDGET 220 v. 45 mA., 6.3 v. 2 a. 2⅝ × 2⅛ × 2in.	18/-
HEATER TRANS. 6.3v. 1½ a.,	10/6
Ditto tapped sec. 1.4 v., 2. 3, 4, 5, 6.3 v. 1½ amp.	15/6
GENERAL PURPOSE LOW VOLTAGE. Outputs 3, 4, 5, 6, 8, 9, 10, 12, 15, 18, 24 and 30 v. at 2 amp.	38/-
1 amp., 6, 8, 10, 12, 16, 18, 20, 24, 30, 36, 40, 48, 60,	38/-

AUTO TRANSFORMERS 0-115-230 v. Input/Output, 60 w. 18/6; 150w. 36/-; 500w. £5; 1000w. £12.

CHARGER TRANSFORMERS. Input 200/250v. for 6 or 12v., 1½ amp., 24/-; 4 amp., 38/-

FULL WAVE BRIDGE CHARGER RECTIFIERS: 6 or 12 v. outputs, 1½ amp. 8/-; 2 amp. 11/-; 4 amp. 17/-.

COAXIAL PLUG 1/3, PANEL SOCKETS 1/3. LINE 3/6. OUTLET BOXES. SURFACE OR FLUSH 5/-. BALANCED TWIN FEEDERS 1/- yd. 80 ohms or 300 ohms. JACK SOCKET Std. open-circuit 2/6, closed circuit 4/6; Chrome Lead Socket 7/6. Phono Plugs 1/-. Phono Socket 1/-. JACK PLUGS Std. Chrome 3/-; 3.5mm Chrome 2/6. DIN SOCKETS Chassis 3-pin 1/6; 5-pin 2/-. DIN SOCKETS Lead 3-pin 3/6; 5-pin 5/-. DIN PLUGS 3-pin 3/6; 5-pin 5/-. VALVE HOLDERS, 9d.; CERAMIC 1/-; CANS 1/-.

E.M.I. 13½ × 8in. LOUDSPEAKERS

With flared tweeter cone and ceramic magnet. 10 watts. Bass res. 45-60 cps. Flux 10,000 gauss. Speech coil, 3 or 15 ohm. **45/-** Post 3/6

Also with twin tweeters. Complete with crossover. 3 or 8 or 15 ohms. 10 watt. Post 2/6 **£4**

Recommended Teak Cabinet Size 16 × 10 × 9in. Post 2/6 **£5**

MINI-MODULE LOUDSPEAKER KIT

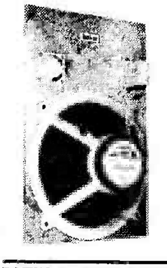
10 WATT **65/-** CARRIAGE 5/-

Triple speaker system combining on ready cut baffle. ½ in. chipboard 15 in. × 8½ in. Separate Bass, Middle and Treble loudspeakers and crossover condenser. The heavy duty 5 in. Bass Woofer unit has a low resonance cone. The mid-Range unit is specially designed to add drive to the middle register and the tweeter recreates the top end of the musical spectrum. Total response 20-15,000 cps. Full instructions for 3 or 8 ohm.

TEAK VENEERED BOOKSHELF ENCLOSURE. 16 × 10 × 9 in. Modern Scandinavian fluted front design for Mini-Module. **£5** Post 2/6

ALL MODELS "BAKER SPEAKERS" IN STOCK

BAKER 12in. MAJOR £9



30-14,500 c.p.s., 12in. double cone, woofer and tweeter cone together with a BAKER ceramic magnet assembly having a flux density of 14,000 gauss and a total flux of 145,000 Maxwells. Bass resonance 40 c.p.s. Rated 20 watts. Voice coils 3 or 8 or 15 ohms. Post Free

Module kit, 30-17,000 c.p.s. with tweeter, crossover, baffle and instructions. **£11.10.0**

BAKER "GROUP SOUND" SPEAKERS— 8 or 15 ohm

'Group 25'	'Group 35'	'Group 50'
12in. 25 watt **£7**	12in. 25 watt **£9**	15in. 50 watt **£19**

TEAK HI-FI SPEAKER CABINETS. Fluted wood front.

For 10 or 12in. round Loudspeaker	£9.0.0.
For 13 × 8in. or 8in. round Loudspeaker	£5.0.0.
For 10 × 6in. or 6½in. round Loudspeaker	£4.0.0.

LOUDSPEAKER CABINET WADDING 18in. wide, 3/- ft

TWO-WAY XOVER NETWORK 300 c/s.

With variable tweeter attenuator giving accurate high/low frequency balance. Mounted on panel 5½in. × 4in. with control knob, tweeter and woofer leads and input terminals. Suitable for 3 to 8 ohm impedance **38/-** Post 2/-

Horn Tweeters 2-16kc/s, 10W 8 ohm or 15 ohm 39/6.
De Luxe Horn Tweeters 2-18 Kc/s, 15W, 16 ohm 59/6.
ELAC MOVING COIL Deluxe cone tweeter 5 ohm 35/-.
3000cps CROSSOVERS 3 or 8 or 15 ohm 19/-.
SPECIAL OFFER! 80 ohm, 2¾in., 2½in. dia.; 35 ohm, 3in. 25 ohm, 3in. dia.; 6 × 4in.; 8 × 3in.; 8 × 5in. 15 ohm 3½in. dia; 7 × 4in.; 8 × 5in. 8 ohm, 6 × 4in., 3 ohm, 2¾in, 3in, 5in. 5 × 3in. 7 × 4in. **17/6** EACH TYPE
LOUDSPEAKERS P.M. 3 OHMS. 6½in. 22/6; 8 × 5in, 25/-; 8 × 2½in. 18/-; 8in. 35/-; 10 × 6in. 38/-.
5in. WOOFER 8 watts max. 20-10,000 cps. 8 or 15 ohm. 36/-.
ELAC 8 in. De Luxe Ceramic 3 ohm or 15 ohm 50/-.
SPECIAL OFFER—FAMOUS RICHARD ALLAN LOUDSPEAKERS 8 or 10 or 12in. Twin cone 3 or 15 ohm 39/6.
OUTPUT TRANS. EL84 etc. 5/-; MIKE TRANS. 50:1 5/-.
SPEAKER COVERING MATERIALS. Samples Large S.A.E.

SOUND ACTIVATED PSYCHEDELIC LIGHT BOX

Fascinating light patterns of Green, Blue, Red and Amber. Works with any mono or stereo amplifier or radio output. Input required 0.2 watts. A.C. mains operated. Size 13 × 13 × 4in.

£12.10.0 Post Free

ALL EAGLE PRODUCTS

SUPPLIED AT LOWEST PRICES

ILLUSTRATED EAGLE CATALOGUE 5/-. Post Free

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

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

BARGAIN FM TUNER 88-108 Mc/s Six Transistor. 9 volt Printed Circuit. Calibrated slide dial tuning. Walnut Cabinet. Size 7 × 5 × 4in. **£10**

BARGAIN FM TUNER as above less cabinet **£7.10.0**

FM STEREO MULTIPLEX ADAPTOR. For above or general use. Ready made with 4 transistors, 6 diodes. **99/6**

BARGAIN 3 WATT AMPLIFEIR. 4 Transistor Push-Pull Ready built, with volume control. 9v. **69/6**

★RADIO BOOKS ★ (Postage 9d.)

Practical Radio Inside Out	4/6
Practical Stereo Handbook	3/6
Supersensitive Transistor Pocket Radio	3/6
Radio Valve Guide, Books 1,2,3 or 4 ea. 5/- No. 5 ea.	6/-
T.V. Fault Finding 405/625 lines	8/6
Transistor Communication Sets	6/-
Wireless World Radio Valve Data	10/-
Transistor Circuits for Radio Controlled Models	7/6
Valves, Transistors and Diodes equivalents Manual	10/6
Coil design & construction	5/-
Hartley on Hi-Fi Radio Tuners	5/-
22 Circuits for Micro Alloy transistors	5/-
Practical Car Radio installation	6/-

BALFOUR MAIN ELECTRIC MOTORS

120v. or 240v. AC. Size 2¼ × 2¼ × 1½in. Clockwise 1,200 r.p.m. 4-pole 50mA. Spindle ⅛ × 3/20 **17/6** Post 2/6

E.M.I. TAPE MOTOR

120V or 240V A.C. Heavy Duty 1,200 r.p.m. 4 pole 135mA (as illustrated) **25/-** Post 2/6

Minimum Post and Packing 2/6 RETURN OF POST DESPATCH. HI-FI STOCKISTS. CUSTOMERS FREE CAR PARK. CALLERS WELCOME.

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List 1/-. **Written guarantee with every purchase.** *(Export: Remit cash and extra postage.) Buses 133, 68 pass door. S.R. Stn. Selhurst.* **Tel. 01-684-1665**

Rear view of amplifier chassis.

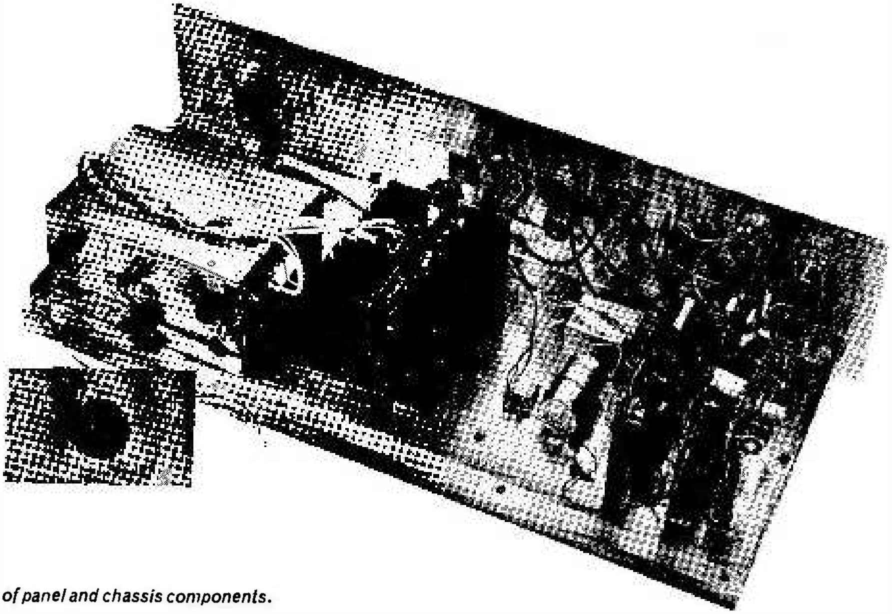
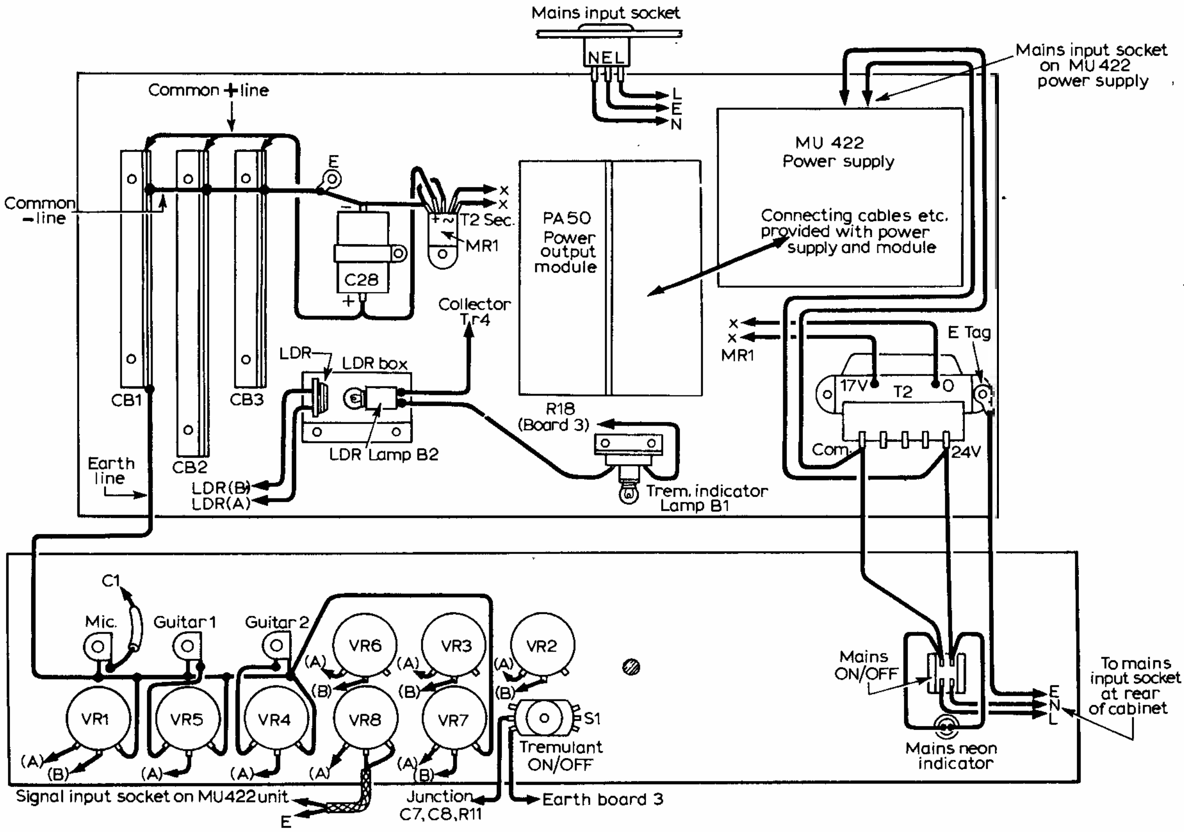


Fig. 14: (below) Wiring of panel and chassis components.



on both and the two units have only to be mounted in the position shown.

Make sure they are firmly bolted to the chassis using all the fixing holes provided.

These units complete with interconnecting cables and plugs and the only external connections necessary are those of the mains input, the loudspeaker(s) and signal lead from the master volume control VR8.

It is most important that the earthed side of VR8 is taken to earth *only* via the screening braid to the earth pin of the power unit input signal DIN socket as shown in Fig. 15B. It should be explained that although the signal input socket for the power module is located on the MU422 power supply unit it is carried through to the power module by the screened interconnecting cables.

Point to point wiring of the various controls, the pre-amplifier power supply and the mains input connections are given in Fig. 14. Note the earth connections for the signal input jacks and controls VR1, VR4, VR5 and VR7 which finally go to the common earth line on circuit Board 1. The mains supply circuits are shown separately in Fig. 16.

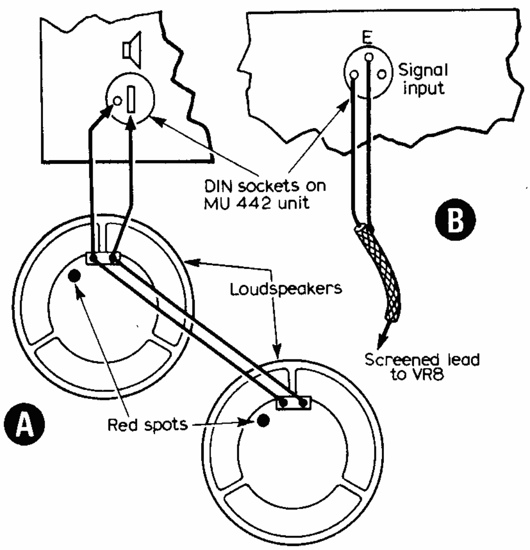


Fig. 15: Connections for speakers and signal input lead.

Loudspeakers

The terminals of the Goodmans type 12P loudspeakers specified for the PW25-50 amplifier are marked with regard to phasing. Connect them in parallel as shown with the 'red spot' terminals on the same line. *Do not under any circumstances* earth either of the loudspeaker connections or the loudspeaker frames. Connect only to the DIN loudspeaker socket on the left hand side of the MU422 unit as shown in Fig. 15A.

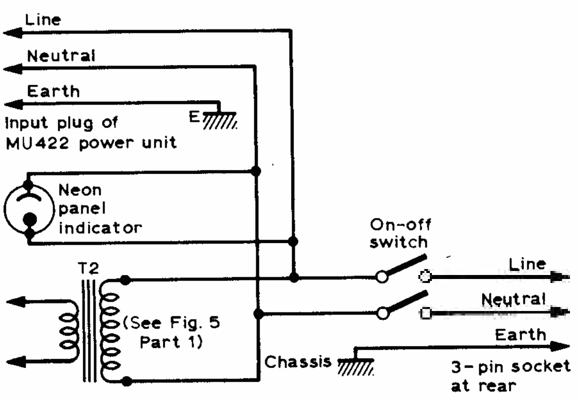


Fig. 16: Mains input wiring details.

The third and final article will deal with optional extras—the foot control tremulant, the wah-wah control and with testing the amplifier for correct performance.

TO BE CONTINUED

CODAR CR.70A

Communications Receiver 540-10 metres

£22-10-0

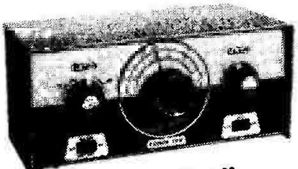
Carriage 13/- extra

***Ideal for SWLs *5 valves (inc. two twin triodes) giving 7 valve line-up *Excellent on amateur and shipping frequencies *Calibrated signal strength meter (illuminated) *Automatic volume control *Separate B.F. oscillator for morse and S.S.B. signals *Two speed vernier tuning *Separate output for recording etc.**

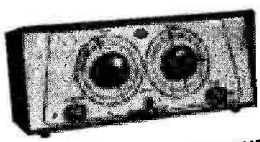
The Codar CR.70A is an excellent general coverage communications receiver for the keen short wave listener. Very reasonably priced at just £22.10.0 the CR.70A is outstanding value for money. In four stable ranges, the receiver covers from 540 metres medium wave, right through the shipping and coastguard frequencies all the short wave and international amateur bands up to and including 10 metres.

The CR.70A has a high 'Q' aerial input stage using exclusive CODAR COIL air space inductor. Double tuned, iron cored I.F. transformers produce high selectivity. Ready to plug into 200-250 volt AC mains, the CR.70A needs only your aerial and a 2-3 ohm loudspeaker. The cabinet measures only 13" x 5¾" x 7¾" and the control panel is finished in black and white with chrome trim knobs. Fully guaranteed for 12 months!

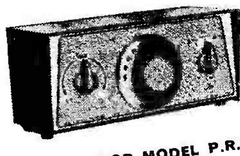
New model has separate direct output socket for feeding tape recorder, Hi-Fi equipment, etc.



T28 RECEIVER FOR 160 & 80 METRES AMATEUR BANDS
9 transistors, bandspread 1.8-2Mc/s and 3.5-4Mc/s 12 volts, only 8" x 4" x 3½", ideal portable, mobile or home receiver. Efficient BFO, printed circuits. ONLY **£16.10.0**, Carr. 5/-.



CR45 MAINS T.R.F. SHORT-WAVE RECEIVER
World wide reception. *Separate electrical band-spread. *3 slow motion drives. *Output 3 watts for 2/3 ohm speaker. *Valves ECC81, FL84, EZ80. Size 12" x 5¼" x 7". CODAR-KIT CR.45K with 3 coils (10-28, 25-75, 60-176 metres). **£10.10.0**, Carr. 10/-. Extra coils 6/3 each.



R.F. PRE-SELECTOR MODEL P.R.30 1.5-30Mc/s
Provides up to 20dB gain plus substantial image rejection, improved signal/noise ratio and selectivity. Power requirements 180-250 volts 12mA H.T. 6.3 volts. .3 amp L.T. Size 8½" x 5" x 4". Ready built complete with cables, plugs and instructions. **£6.10.0**, Carr. 5/-. Self-powered P.R.30x **£8.10.0**, Carr. 5/-.

MINI-CLIPPER—OUR FAMOUS SHORT-WAVE RECEIVER
* Can be built in one evening. * Complete with valve, one coil 25-75 metres and 4 page instruction manual. Price 55/-, Carr. 3/-, Extra coils 6/3.

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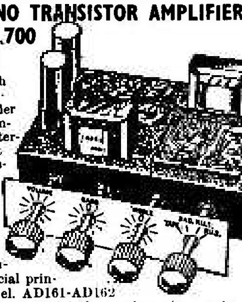
MONO TRANSISTOR AMPLIFIER HSL.700



A really high fidelity monaural amplifier with performance characteristics to suit the most discriminating listener. 6 transistor circuit with integrated pre-amplifier assembled on special printed sub panel. AD161-AD162 operating in symmetrical complementary pair. Output transformer coupled to 3 ohm and 15 ohm speaker sockets. Standard phono input sockets. Full wave bridge rectifier power supply for AC mains 200-240v. Controls: Bass, Treble, Volume/on/off. Function selector for PU1, PU2, Tape, Radio. The HSL.700 is strongly constructed on rigid steel chassis bronze hammer enamel finish, size 9¼ × 5 × 4½in. high.

Sensitivity: PU1-50m/v. 56K input impedance.
PU2-110m/v. 1 meg input impedance.
Tape—110m/v. 1 meg input impedance.
Radio—110m/v. 1 meg input impedance.

Output power measured at 1Kc—6.2 watts RMS into 3 ohms. 5.8 watts RMS into 15 ohm. Overall frequency response 30 c/s-18 Kc/s: Continuously variable tone controls: Bass, +8db to—12db at 100c/s. Treble, +10db to—10db at 10Kc/s. The HSL.700 has been designed for true high fidelity reproduction from Radio Tuner, Gramophone deck and Tape Recorder preamp. Supplied ready built and tested, complete with knobs, attractive anodised aluminium front escutcheon panel, long spindles (can be cut to suit your housing requirements) full circuit diagram and operating instructions.

Our Special Price **£7.19.6** P. & P. 7/6

LOUDSPEAKER BARGAINS

3" 4 ohm 10/- P. & P. 1/6. 5in. 3 ohm 16/-. P. & P. 3/-. 7 × 4in. 3 ohm 21/-, P. & P. 4/-, 10 × 6in. 3 or 15 ohm 35/-, P. & P. 6/-, E.M.I. 8 × 5in. 3 ohm with high flux magnet 26/-. P. & P. 4/- E.M.I. 13½ × 8in. 3 ohm with high flux ceramic magnet 42/- (15 ohm 45/-), P. & P. 6/-. E.M.I. 13 × 8in. 3 or 15 ohm with two inbuilt tweeters and crossover network 4 gns.P. & P. 6/-.

BRAND NEW. 12in. 15w. H/D Speakers, 3 or 15 ohms. Current production by well-known British maker. Now with Hiflux ceramic ferrobar magnet assembly **£5.10.0.** P. & P. 7/6 Guitar models: 25w. **£6.10.0**, 35w. **£8.10.0.**

E.M.I. 3½in. HEAVY DUTY TWEETERS. Powerful ceramic magnet. Available in 3 or 8 or 15 ohms **18/6** each. P. & P. 2/6.

12in. "RA" TWIN CONE LOUDSPEAKER. 10 watts peak handling, 3 or 15 ohm **37/6**, P. & P. 6/-.

35 OHM SPEAKERS 3½in. **14/-**, P. & P. 2/6.

VYNAIR AND REXINE SPEAKER AND CABINET FABRICS. Approx. 54in. wide. Usually 35/- yard. OUR PRICE **15/-** per yard length. P. & P. 2/6 (min. one yd.). S.A.E. for samples.

MAGNAVOX DESK TYPE MOVING COIL MICROPHONE. Medium imp. Brand New. Special Price **42/-** p. & p. 2/-.

BALANCED ARMATURE EARPHONE Approx 70 ohm impedance. Can be used as ultra sensitive mike or speaker. ONLY **3/6**. P. & P. 1/6.

CRYSTAL MIKES. High imp. for desk or hand use. High sensitivity, **18/6**, P. & P. 1/6

HIGH IMPEDANCE CRYSTAL STICK MIKES. OUR PRICE **21/-**, P. & P. 1/6.

HIGH IMPEDANCE DYNAMIC STICK MIKES. High sensitivity, **39/6**, P. & P. 2/6.

HONEYWELL MICROSWITCHES. S/P. C/O. Push button action. Rating 250v. AC at 15 amps. Size approx. 1¼ × ¾ × ⅜in. **5/-** each. P. & P. 1/- (6 or more post free).

SPECIAL OFFER! PLESSEY TYPE 29 TWIN TUNING GANG. 400pF + 146pF. Fitted with trimmers and 5:1 integral slow motion. Suitable for nominal 470 k/sc I.F. Size appox. 2×1×1½. Only **8/6**. P. & P. 2/6.

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BRAND NEW MULTI-RATIO MAINS TRANSFORMERS. Giving 13 alternatives. Primary: 0-210-240v. Secondary combinations 0-5-10-15-20-25-30-35-40-60v. half wave at 1 amp. or 10-0-10, 20-0-20, 30-0-30v. at 2 amps full wave. Size 3in. long × 3½in. wide × 3in. deep. Price **35/-**, P. & P. 6/-.

MAINS TRANSFORMER. For transistor power supplies Pri 200/240v. Sec. 9-0-9 at 500mA. **14/-**. P. & P. 2/6. Pri. 200/240v. Sec. 12 0-12 at 1 amp. **17/6**. P. & P. 2/6. Pri. 200/240v. Sec. 10-0-10 at 2 amp. **27/6**. P. & P. 3/6. Tapped Primary 200-220-240v. Sec. 21.5v. at 500mA. **12/6**. P. & P. 2/6.

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Beautifully made teak finish enclosure with most attractive Tygan-Uynair front. Size 16½" high × 10¼ wide × 6" deep. Fitted with E.M.I. Ceramic Magnet 13" × 8" bass unit, two H.F. tweeter units and crossover. Power handling 10 watts. Available 3 or 15 ohm impedance. **8 Gns.** Carr 10/-

TRANSISTOR STEREO 8 + 8 MK II

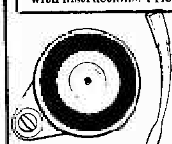
Now using Silicon Transistors in first five stages on each channel resulting in even lower noise level with improved sensitivity. A really first-class Hi-Fi Stereo Amplifier Kit. Uses 14 transistors giving 8 watts push pull output per channel (16W. mono). Integrated pre-amp with Bass, Treble and Volume controls. Suitable for use with Ceramic or Crystal cartridges. Output stage for any speakers from 3 to 15 ohms. Compact design, all parts supplied including drilled metal work. Cir-Kit board, attractive front panel, knobs, wire, solder, nuts, bolts—no extras to buy. Simple step by step instructions enable any constructor to build an amplifier to be proud of. Brief specification: Freq. response ±3dB. 20–20,000 c/s. Bass boost approx. to +12dB. Treble cut approx. to −16bB. Negative feedback 18dB over main amp. Power requirements 25V at .6 amp.

PRICES: AMPLIFIER KIT **£10.10.0**; POWER PACK KIT **£3.0.0**; CABINET **£3.0.0**. All Post Free.

Also available STEREO 10 + 10. As above but 10 watts per channel. **PRICES:** AMPLIFIER KIT **£12**; POWER PACK KIT **£3.10.0** Circuit diagram, construction details and parts list (free with kit) 1/6 (S.A.E.).

GENERAL PURPOSE HIGH STABILITY TRANSISTOR PRE-AMPLIFIER

For P.U. Tape, Mike, Guitar, etc. and suitable for use with valve or transistor equipment. 9-18v. battery or from H.T. line 200/300v. Frequency response 15Hz—25KHz. Gain 26dB. Solid encapsulation size 1½" x 1½" x ½". Brand new complete with instructions. Price **17/6** P. & P. 2/6.



SPECIAL PURCHASE! E.M.I. 4-SPEED PLAYER

Heavy 8½in. metal turntable. Low flutter performance 200/250v. shaded motor (90v. tap). Complete with latest type lightweight pick-up arm and mono cartridge with t/o stylii for LP/78. ONLY **63/-**. P. & P. 6/6.

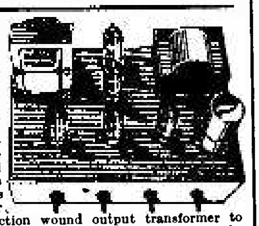
QUALITY RECORD PLAYER AMPLIFIER MK II

A top quality record player amplifier employing heavy duty double wound mains transformer, ECC83, EL84, EZ80 valves. Separate Bass, Treble and Volume controls. Complete with output transformer matched for 3 ohm speaker. Size 7in. wide × 3in. deep × 6in. high. Ready built and tested. PRICE **75/-**. P. & P. 6/-.

ALSO AVAILABLE mounted on board with output transformer and speaker ready to fit into cabinet below. PRICE **97/6**, P. & P. 7/6.

DELUXE QUALITY PORTABLE R/P CABINET MK II. Uncut motor board size 14½ × 12in. clearance 2in. below, 5½in. above. Will take above amplifier and any B.S.R. or GARRARD changer or Single Player (except AT60 and SP25). Size 18 × 15 × 8in. PRICE **79/6**, P. & P. 9/6.

10/14 WATT HI-FI AMPLIFIER KIT



A stylishly finished monaural amplifier with an output of 14 watts from 2 EL84s in push-pull. Super reproduction of both music and speech, with negligible hum. Separate inputs for mike and gram allow records and announcements to follow each other. Fully shrouded section wound output transformer to match 3-15 Ω speaker and 2 independent volume controls, and separate base and treble controls are provided giving good lift and cut. Valve line-up 2 EL84s, ECC83, EF86 and EZ80 rectifier. Simple instruction booklet **2/6** (Free with parts). **All parts sold separately.** ONLY **£7.19.6**. P. & P. 8/6. Also available ready built and tested complete with std. input sockets, **£9.19.6**. P. & P. 8/6.

BRAND NEW TRANSISTOR BARGAINS. GET 15 (Matched pair) **15/-**; V15/10p **10/-**; OC71 **5/-**; OC76 **6/-**; AF117 **3/6**; 2G339 (NPN) **3/-**. Set of Mullard 6 transistors OC44, 2—OC45, AC128D matched pair AC128 **25/-**; ORP12 Cadmium Sulphide Cells **10/6**. All post free.

VERY POWERFUL COMPACT MOTOR

For 12v. D.C. operation. Off load consumption approx. 100mA. Totally enclosed. Quiet in operation with high starting torque. Overall size approx. 1⅞"L × 1¼" dia. Free shaft $\frac{1}{16}$" dia. × ¼"L. Ideal for Model Makers, etc. ONLY **7/6** each P. & P. 1/-
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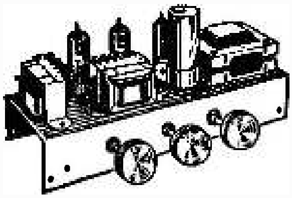
DE LUXE STEREO AMPLIFIER



A.C. mains 200-240 v. Using heavy duty fully isolated mains transformer with full wave rectification giving adequate smoothing with negligible hum. Valve line up:—2 × ECL86 Triode Pentodes. 1 × EZ80 as full wave rectifier. Two dual potentiometers are provided for bass and treble control, giving bass and treble boost and cut. A dual volume control is used. Balance of the left and right hand channels can be adjusted by means of a separate 'Balance' control fitted at the rear of the chassis. Input sensitivity is approximately 300m/v for full peak output of 4 watts per channel (8 watts mono), into 3 ohm speakers. Full negative feedback in a carefully calculated circuit, allows high volume levels to be used with negligible distortion. Supplied complete with knobs, chassis size 11"w × 4"d. Overall height including valves 5". Ready built and tested to a high standard. **PRICE £8.18.6 P. & P. 8/-.**

4-SPEED RECORD PLAYER BARGAINS

Mains models. All brand new in maker's packing.

SPECIAL OFFER! Famous GARRARD 3500 fitted Sonotone 9TAHCD Diamond Stereo Cartridge. List price over £16. Limited Number at **£10**. Carr. 8/6.

LATEST B.S.R. C109/A21 4-SPEED AUTOCHANGER. With latest mono compatible cartridge **£6.19.6**. Carr. 6/6. With stereo cartridge **£7.19.6**. Carr. 6/6.

LATEST GARRARD MODELS. All types available 1025, 2025, SP25, 3000. AT60 etc. Send S.A.E. for latest Prices!

PLINTH UNITS cut out for Garrard Models, 1025, 2025, 2000, 3000, 3500 etc. With rigid transparent plastic cover. Special design enables above models to be used with cover in position. Also suitable for housing AT60 and SP25. OUR PRICE **£5.15.0** complete. P. & P. 8/6.

LATEST ACOS GP91/18C mono compatible cartridge with t/o stylus for LP/EP/78. Universal mounting bracket. **30/-**. P. & P. 1/6.

SONOTONE 9TAHC compatible Stereo Cartridge with diamond stylus **50/-**. P. & P. 2/-.

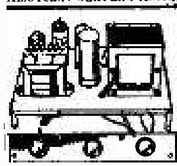
LATEST RONETTE T/O STEREO/COMPATIBLE CARTRIDGE for EP/LP/Stereo/78. **32/6**. P. & P. 2/-.

LATEST RONETTE T/O MONO COMPATIBLE CARTRIDGE for playing EP/LP/78 mono or stereo records on mono equipment. Only **30/-**. P. & P. 2/-.

HIGH GAIN 4 TRANSISTOR PRINTED CIRCUIT AMPLIFIER KIT Type TA1

Peak output in excess of 1½ watts. All standard British components. Built on printed circuit panel size 6 x 3in. Generous size Driver and Output Transformers. Output transformer tapped for 3 ohm and 15 ohm speakers. Transistors (GET114 or 81 Mullard AC128D and matched pair of AC128 o/p). 9 volt operation. Everything supplied, wire, battery clips, solder, etc. Comprehensive easy to follow instructions and circuit diagram **2/6** (Free with Kit). All parts sold separately. **SPECIAL PRICE 49/6**. P. & P. 3/-.
Also ready built and tested, **55/-**. P. & P. 3/-.

3-VALVE AUDIO AMPLIFIER HA34 MK II.



Designed for Hi-Fi reproduction of records. A.C. Mains operation. Ready built on plated heavy gauge metal chassis, size 7½" w. × 4" d. × 4½" h. Incorporates ECC83, EL84, EZ80 valves. Heavy duty, double wound mains transformer and output transformer matched for 3 ohm speaker. Separate volume control and now with improved wide range tone controls giving bass and treble lift and cut. Negative feedback line. Output 4½ watts. Front panel can be detached and leads extended for remote mounting of controls. Complete with knobs, valves, etc., wired and tested for only **£4.15.0**. P. & P. 6/-.

HSL "FOUR" AMPLIFIER KIT. Similar in appearance to HA34 above but employs entirely different and advanced circuitry. Complete set of parts, etc. **79/6**. P. & P. 6/-.

HARVERSON'S SUPER MONO AMPLIFIER

A super quality gram amplifier using a double wound mains transformer, EZ80 rectifier and ECL82 triode pentode valve as audio amplifier and power output stage. Impedance 3 ohms. Output approx. 3.5 watts. Volume and tone controls. Chassis size only 7in. wide × 3in. deep × 6in. high overall. AC mains 200/250v. Supplied absolutely Brand New completely wired and tested with valves and good quality output transformer. FEW ONLY. BARGAIN PRICE **55/-** P. & P. 6/-

Open 9–5.30 Monday to Saturday
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practically wireless commentary by HENRY

No. 72

The "Ah-Ha" Syndrome

ONCE I could rattle away quite happily at these monthly pieces, secure in the knowledge that the boys at the P.W. Office would do no more than rip the sense from context with their surgical blue pencils. At least, I consoled myself, they hadn't to correct the spelling.

Now, I am not so sure. What you see here, Joe, may be the polished version of what my palsied typewriter has stuttered onto the page. All because those indefatigable watchdogs of the public weal, the Consumers' Association, once told me it was not "Good Value for Money."

According to *Which*—and not even a current one, but an oldie Mrs. Henry recovered from a wardrobe drawer—this honest old machine, now stuttering out its resentment after years of faithful service, is far from being a Best Buy.

Lately, shame on them, the watchdogs of *Which* have cast their blight on things hi-fi. Their prime choice of loudspeakers, for example, completely shunned my precious DM1s and my gramophone deck, the result of many hours overtime (not only earning but choosing), gained nary the breath of a mention.

One in forty explodes

Knowing the fierce independence cherished by some reviewers, and guessing at a similar trait in others, Henry is inclined to regard the Consumers' Association as well-meaning but misguided. Unfortunately, the sort of public who write letters of sympathy to Annie Walker or believe that Waggoner's Walk exists, are inclined to take the *Which* verdict as the word of the Law.

The C.A. may say that drafts of reports are subject to verification and revision, and that it is often these drafts that receive instant publicity, but how often, we may ask, is refutation made? Recently, for example, *Which* came out quite strongly about the high breakdown rate of colour television receivers. According to their survey, one in 17 sets gives off smoke and one in 40 explodes!

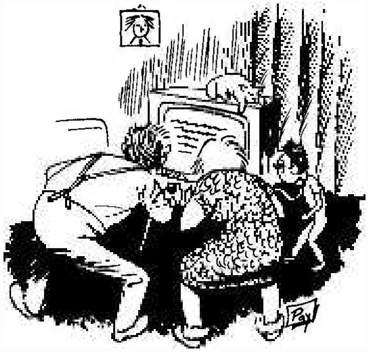
Explodes, mind you, not merely dissolves into an indeterminate mix of dun and indigo, or curses visual blue streaks at its user, but '. . . expands violently with loud report under influence of suddenly developed internal energy.'*

Along with the technical secretary of the British Radio Equipment Manufacturers' Association, this cynical onlooker is inclined to think that the *Which* findings were unrepresentative and 'out of line with makers' reports on breakdowns'.

This gent, the appropriately named Mr. Donald Doo, claimed that when the first draft of the *Which* report was submitted to him the paragraph on smoking and exploding colour television sets was conspicuous by its absence.

'We would have challenged it straight away,' he claimed. 'We have had no reports from any of our members of problems like this.'

I'll bet they haven't. Not since the early days of colour television at least. Those of us who have slogged at a bench are well aware that teething troubles were experienced; are even ready to admit that, despite the brochures and advertisements, modern television receivers can and do break down.



The permutations from knob-twiddling. . .

Stop and think—the average colour television receiver has four times as much in it as the monochrome equivalent. There are between twice and three times as many controls for the installer to set up. The permutations of error from quite simple knob-twiddling are disproportionately large. Signal variations at the site—ghosting, changes in level, interference, etc.—which would be tolerated in black and white become very pronounced when a chromatic scene is being viewed.

Yet how many of the 400,000 colour TV installations are totally unsatisfactory? A higher proportion than black and white—of course. But do we really believe, as *Which* implies, that 10,000 sets have 'exploded' since installation?

After all, if you read this article and feel the same way about the pontifical pronouncements of *Which* as I do, you don't say: 'Ah-Ha, I agree with the writer.'

Oh no, you say: 'Ah-Ha, Henry agrees with me.'

I hope.

*My dictionary definition.

NOTES ON THE PW UNIT-BUILT GENERAL COVERAGE RECEIVER

DETAILS of this 12-transistor 4-waveband receiver were published in the March and April 1970 issues of "Practical Wireless." These brief notes should be of assistance to anyone considering constructing the receiver.

The completed circuit shows 4 diodes and 12 transistors, with 4-band coverage, and it is apparent that quite a number of constructors feel that the wiring of the whole receiver is rather complicated. The whole circuit is not unusually complex for this type of equipment. However, it should not be overlooked that the receiver can be constructed in simpler form, and added to from time to time, and is, in fact, the manner in which the original receiver was made.

This is an important point, because it does mean that a relatively simple, straightforward superhet is initially built and wired which can be tested and used in this way. When this is found to perform correctly, other features can be added the receiver being tested each time an addition is made. Should a wiring error or other fault be present, this greatly reduces the number of circuits to be investigated.

A few further details on this stage by stage method of building the receiver should prove useful.

STAGE BY STAGE ASSEMBLY

The initial circuit is wired for one waveband only which will avoid errors in wiring the many switch contacts, and sets of coils. The SW1 range coils, for 30-11MHz, are very near the switch wafers, and tend to hinder the wiring of coils, so it is probably best to wire the SW2 range coils first, for 14-5MHz.

By omitting the r.f. stage, there are only two coils, those for the mixer and oscillator circuits. The bandswitch is set to its second position, and these two coils are wired in. Should the receiver fail to operate because of a switch or coil wiring error, only these few connections need be checked.

When the receiver is working correctly on the SW2 range, add the pair of coils for the SW3 range, and test to see that proper results are obtained. Then add the m.w. range, and test again. Finally, the SW1 range coils are wired in.

When the r.f. stage has been added, wire in the SW2 aerial coil, and test the receiver. Should a fault be present, only the few new items introduced need be checked. Then add the other aerial coils, one at a time, testing the receiver after each addition.

This is much better than wiring in the twelve coils, for four bands with r.f. stage, then finding some obscure fault exists in coil or bandswitch connections.

As described, the receiver is easily wired as a 6-transistor superhet, for one band. It will then have Tr2 (mixer), Tr3 and Tr4 (i.f. amplifiers), Tr10 (driver) and the output stage Tr11/Tr12. Only the a.m. diode and a.g.c. rectifier D2 need be connected. This means that Tr1 (r.f. amplifier), Tr5 (meter amplifier), Tr6 and Tr7 (product detector) with b.f.o. Tr8, and a.f. amplifier Tr9, are not needed, neither is the multi-way function switch, nor diodes D1, D3 and D4. The circuit, in this simplified form, is capable of excellent reception and volume.

The additional features can be added in any order preferred. Probably the r.f. amplifier, Tr1, will be found most useful. After this, Tr9, for additional audio gain, may be included.

Adding Tr6, Tr7 and Tr8, will then allow c.w. and s.s.b. to be resolved, as the use of the diode D2 allows reception only of a.m. signals.

Remember to test the receiver after each addition. Then if a fault or error has been introduced, it must be in the part of the circuit last added. By proceeding in this way there will be no need to check the whole receiver, but only some relatively small part of it.

AUDIO TRANSFORMERS

The driver and output transformers listed are no longer made. Fortunately many transformers suitable exist for OC81D driver and 2xOC81 and similar output transistors. The Weyrad LFDT4 driver and OPT1 output transformers will be found suitable. Connecting data for the LFDT4 appear in Fig. 1, connections for the OPT1 remaining unchanged.

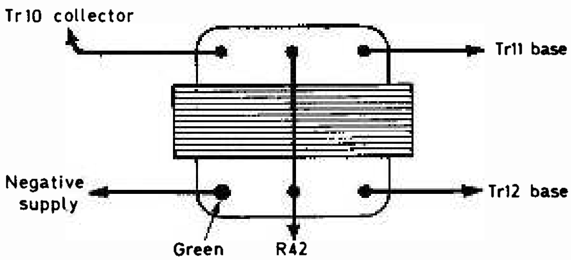


Fig. 1: Connections to alternative audio driver transformer

As is usual with this type of circuit, operation of the output pair is critically dependent upon the relative values of R42 and R40/R41. If there is distortion, R42 should be increased slightly to about 100 ohms.

Any ordinary 2 or 3ohm speaker is suitable, preferably a reasonably large unit, in a cabinet.

AERIALS

Long-range reception is possible with the telescopic aerial, especially on the h.f. ranges. However, for the best possible results with weak signals, some form of external aerial should be added. This can be of any type normally employed with a communications receiver such as a random length external wire, or an end-connected wire with tuner, or a dipole or tuned doublet, etc. Any of these aerials can be expected to give an improvement in the signal strength of several S-points. ■

MICRO SWITCH

5 amp. changover contacts, 1/9 each, 18/- doz. 15 amp Model 2/- each or 21/- doz.

TOGGLE SWITCH

3 amp 250v. with fixing ring. 1/6 each, 15/- doz.

CONSTRUCTORS PARCEL

1. Plessey miniature 2 gang tuning condenser with built in trimmers and wave gang switch. 2. Ferrite slab aerial with coils to suit the above tuning condenser. 3. Circuit diagram giving all component values for 6 transistor circuit covering full medium wave and the long wave band around Radio 2. The three items for only 7/6d which is half of the price of the tuning condenser alone.

SLOW MOTION DRIVES

For coupling to tuning condensers etc. One end ¼in. shaft, the other end fits to a ¼in. shaft with grub screws. Price 4/6 each 48/- dozen.

LARGE PANEL MOUNTING MOVING COIL METERS

Size 5in. x 4in. Centre zero 200-0-200 micro amp made by Sangamo Weston. Regular price probably £8. Our price 59/6. ditto but 100-0-100 79/6.

A.C. AMMETER

0·5 amps. flush mounting—moving iron. Ex equipment but guaranteed perfect 29/6.

CIRCUIT BOARDS

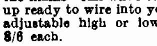
Heavy copper on 3/32 paxolin sheet ideal for making power packs etc. as sheet is very strong and thick enough to allow copper to be cut away with hacksaw blade. 5in. x 5in. 1/6 each. 15in. x 5in. 4/6d. each.

6KVA AUTO-TRANSFORMER

in ventilated sheet steel case—tapped 110v-140v-170v-200v-230v. Ex equipment but guaranteed perfect £19.10.0. carriage at cost.

PP3 BATTERY ELIMINATOR

Run your small transistor radio from the mains—full wave circuit—made up ready to wire into your set and adjustable high or low current. 8/6 each.



REED SWITCHES

Glass encased, switches operated by external magnet—gold welded contacts. We can now offer 3 types:

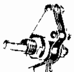
Miniature. 1in. long × approximately ⅛in. diameter. Will make and break up to ½A up to 300 volts. Price 2/6 each. 24/- dozen.

Standard. 2in long × 3/16in. diameter. This will break currents of up to 1A, voltages up to 250 volts. Price 2/- each. 18/- per dozen.

Flat. Flat type, 2in. long, just over 1/16in. thick, approximately ¼in. wide. The Standard Type flattened out, so that it can be fitted into a smaller space or a larger quantity may be packed into a square solenoid. Rating 1 amp 200 volts. Price 6/- each. £3 per dozen.

Small ceramic magnets to operate these reed switches 1/9 each. 18/- dozen.

0.005mFd TUNING CONDENSER



Proved design, ideal for straight or reflex circuits 2/6 each, 24/- doz.

SUB-MINIATURE MOVING COIL MICROPHONE

as used in behind the ear deaf aids

Acts also as earphone size only ⅜in. × ⅜in. × ⅜in. Regular price probably £3 or more. Our price 19/6. Note these are ex-equipment but if not in perfect working order they will be exchanged.

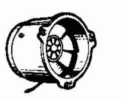
CHART RECORDER MOTOR

Small 2″ diameter (approx) instrument motor with fixing flange and spindle (¼″ long, ⅛″ diameter) integral gear box gives 1 rev per 24 hours. 19/6

IGNITION (E.H.T.) TRANSFORMER

made by Parmeko Ltd., Primary 240V 50 cps. Secondary 5KV at 23 mA. Size approx. 4½″ + 3¼″ + 2½″ thick. 29/6 plus 4/6 p. & p.

12V EXTRACTOR FAN BY DELCO



Ideal for ventilation in Caravan, Car or Boat. 6 Bladed 5″ diameter fan inside heavy duty cylinder with 3 point fixing flange. 5½″ diameter fixing hole. Length approx. 8½″. Exceptional bargain 27/6 plus 5/6 post and insurance.

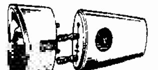
NEED A SPECIAL SWITCH

Double Leaf Contact. Very slight pressure closes both contacts, 1/3 each, 12/- doz. Plastic push-rod suitable for operating, 1/- each, 9/- doz.

COMPUTER MULTI-CORE CABLES

12, 14/0076 copper cores, each one insulated by coloured P.V.C. then separately screened, the 12 metal braided cores laid together and P.V.C. covered overall making a cable just under ½ in. dia. but quite pliable. Price 7/6 per ft. Any length cut. Other sizes available 7 core 5/- ft., 6 core 4/- ft. 4 core 3/6 ft.

RECHARGEABLE TORCH

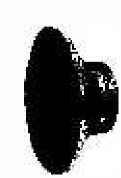


Neat flat torch, fits unobtrusively in your pocket, contains 2 Nicad cells and built-in charger. Plugs into shaver adaptor and charges from our standard 200/240 volt mains. American made, sold originally at over 4 dollars. Our price only 19/6 each.

INTEGRATED CIRCUIT BARGAIN

A parcel of integrated circuits made by the famous Plessey Company. A once-in-a-lifetime offer of Micro-electronic devices well below cost of manufacture. The parcel contains 5 ICs all new and perfect, first-grade device, definitely not sub-standard or seconds. The ICs are all single silicon chip General Purpose Amplifiers. Regular price of which is well over £1 each. Full circuit details of the ICs are included and in addition you will receive a list of 50 different ICs available at bargain prices 5/- upwards with circuits and technical data of each. Complete parcel only £1 post paid; or List and all data 10/- post free. Credited when you order IC's value of 30/- and upwards.

HI-FI SPEAKERS (15, 30, 40 & 100W)



FULL FI 12 INCH LOUDSPEAKER. This is undoubtedly one of the finest loudspeakers that we have ever offered, produced by one of the country's most famous makers. It has a die-cast metal frame and is strongly recommended for Hi-Fi load and Rhythm Guitar and public address. Flux Density 11,000 gauss—Total Flux 44,000 Maxwells—Power Handling 15 watts R.M.S. Cone Moulded fibre—Freq. response 30-10,000 c.p.s.—Specify 3 or 15 ohms—Mains resonance 60 c.p.s.—Chassis Diam. 12in.—12⅜in. over mounting lugs—Baffle hole 11in. Diam.—Mounting holes 4, holes—¼in. diam. on pitch circle 11⅝in. diam.—Overall height 5¼in. A £6 speaker offered for only £3.19.6 plus 7/6 p. & p. 12in. 40watt £8.19.6. carr. 8/6. 15in. 25 watt £7.19.6 carr. 10/6. 18in. 100 watt £19.10.0. carr. 30/-.

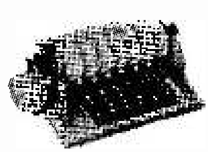
THIS MONTH'S SNIP

25 Amp Electrical Programmer

Learn in your sleep! Have Radio playing and kettle boiling as you awake—switch-on-lights to ward off intruders—have warm house to come home to. All these and many other things you can do if you invest in an Electrical Programmer. Made by the famous Smiths Instrument Company. This is essentially a 230/240 volt mains operated Clock and a 20 amp Switch, the switch-off time of which can be delayed up to 12 hours (continuously variable not Stepped). Similarly the switch-on time can be delayed. This is a beautiful unit, size 5¾″ × 3¾″ × 2½″ deep. Metal encased, glass fronted with chrome surround. Offered at 47/6 plus 3/6 postage and insurance.

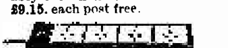
MOTORISED SWITCH

For Animated signs etc.



This is motorised programmer switch, mains operated, with six 15 amp changeover contacts operated by triggers on a rotating drum. Six triggers will put switches up and another six triggers will put switches down. Also simple on/off operation or changeovers are possible. The triggers are exactly set to any position around the drum which is rotated by a one rev. per hour motor. (Motors with other speeds available). A beautifully made precision switch which probably cost in excess of £20. Limited quantity only £9.15. each post free.

DISTRIBUTION PANELS



Just what you need for work bench or lab. 4 × 13 amp sockets and on/off switch with neon warning light (in metal box). Takes standard 13 amp fused plugs. Supplied complete with 7 feet of heavy cable. 39/6 wired up, ready to work plus 4/6 post & insurance. 5 amp 3 pin model 35/-, 15 amp 3 pin model 45/-

BARGAIN OF THE YEAR

MICROSONIC KEYCHAIN RADIO

7 transistor Keychain Radio in very pretty case, size 2⅝ x 2⅛ x 1⅛in.—complete with soft leather zipped bag. Specification:—Circuit: 7 transistor superheterodyne. Frequency range: 530 to 1600 Kc/s. Sensitivity: 5 mv/m. Intermediate frequency: 465 Kc/s or 455 Kc/s. Power output: 40mW. Antenna: ferrite rod. Loudspeaker: Permanent magnet type. In transit from the East these sets suffered slight corrosion as the batteries were left in them but when this corrosion is cleared away they should work perfectly—offered without guarantee except that they are new. Price only 24/6 less batteries plus 2/6 post 6 for £7 post free.

THE 5-5 WATT STEREO AMPLIFIER

Made by one of our most famous makers for a de-luxe player. This amplifier has a quality of reproduction much better than average. Using a total 16 transistors and a generously sized mains power pack. Controls include bass, treble, balance and volume. Suitable for 8-16 ohms impedance speakers with crossovers for tweeter mid-range and bass thus giving option of 1, 2 or 3 speakers per channel. Offered at about one third of its original price only £9.19.6d. plus 6/6d post and insurance.

OUT OF SEASON BARGAIN

3kW TANGENTIAL HEATER UNIT

This heater unit is the very latest type, most efficient, and quiet running. Is as fitted in Hoover and blower heaters costing £15 and more. We have a few only. Comprises motor, impeller, 2kW. element and 1kW. element allowing switching 1, 2 and 3kW. and with thermal safety cut-out. Can be fitted into any metal line case or cabinet. Only need control switch. 59/6, 2kW. Model as above except 2 kilowatts 39/6. Postage and insurance 6/6. Don't miss this.

Where postage is not stated then orders over £5 are post free. Below £5 add 2/9 Semiconductors add 1/- post. Over £1 post free. S.A.E. with enquiries please.

MAINS TRANSFORMERS

Note all these are first grade Transformers and all have normal 200/240 volt 50 cycle primary.

Mains Transformer Type No. 56786
Upright mounting, size 3 × 2½ × 2in. approximately. 2 secondaries one 28 volt 1 amp and the other 5.5 volt 1.5 amp. Earth screen between primary and secondaries—this transformer will power a 5.5 watt stereo amplifier (circuit diagram available, price 2/6). Suitable output transformer is type 56787 described below. Our price 17/6. Plus 4/6 post.

Mains Transformer Type No. 56733
Chassis mounting type, size approximately 3 × 2½ × 3in., 2 secondaries one 230 volt at 60 mA and other 6.3 volts 1.5 amp. Earth screen between primary and secondaries. This will power a 5 watt amplifier (circuit available 2/6). Matching OPT. s 56734 described below. Price 16/6 plus 4/6 post.

Mains Transformer Type No. 56695
Upright mounting, size approximately 4 × 3 × 2½in. 2 secondaries 275-0-275 at 90 mA and 6.4 volts at 3.1 mA. There is a screen between primary and secondaries. This is a partner to output transformer 56694 described below. Price 19/6 plus 4/6 post.

OUTPUT TRANSFORMERS

OPT. ref. 56694
Chassis mounting—size 2 × 2 × 2in. approximately 7 watts. A push pull transformer for matching 2/EL84 or similar valves to 15 ohm Loud Speaker. 14/6 no extra for post if ordered with Transformer 56695. Circuit diagram of amplifier available, price 2/6.

OPT. r. f. 56787
Upright mounting, size approximately 3½ × 2 × 2in. Matching impedance 60 ohms to 15 ohms. 5 watts output using transistor type AD140 (Circuit diagram available price 2/6). Price 8/6 each, no extra for postage if ordered with mains transformer type 56786.

OPT. ref. 525004
Upright mounting, size approximately 2 × 2½ × 2in. Primary impedance 60 ohm, secondary impedance 3 ohm, otherwise this is as 56787. Price 8/6.

OPT. ref. 56734
Chassis mounting, size approximately 2½ × 2 × 1⅛in. Primary 500 ohm centre tapped. Ratio 27/1.5 watts output using twin ELL80 or similar. Price 12/6. No extra for postage if ordered with 56733.

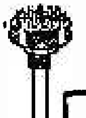
HEAVY DUTY MAINS TRANSFORMER

30V. 37A. Primary tapped 200/240 in 10v. steps. A really beautiful "C" core transformer. Made by Parmeko, impregnated and varnished. Weight approx. 50 lb., size approx. 8in. wide 6½in. deep and 8½in. high. Metal framed for free standing and fitted with E.S. screen. Probably priced £40-£50 from Parmeko. Ex equipment, but perfect, £17.10 each, plus carriage at cost.

50 CYCLE TO 60 CYCLE INVERTERS

For operating American instruments and other equipment made for 60 cycles 115 v. from 230/240 50 cycle mains. These units have an output of 115 volts A.C. and will handle a load of up to 100 watts. These are precision made and have a reed type frequency meter which vibrates when the frequency is exactly 60 c.p.s. Adjustment of the frequency is by a knob on control panel. Input by 3 core output from 3 pin socket. Original cost of this in excess of £60. A limited quantity available £17/10 each.

MINIATURE WAFER SWITCHES



2 pole, 2 way—4 pole, 2 way—3 pole, 3 way—4 pole, 3 way—2 pole, 4 way—3 pole, 4 way—2 pole 6 way—1 pole, 12 way. All at 3/6 each. 36/- dozen, your assortment.

WATERPROOF HEATING ELEMENT

26 yards length 70W. Self-regulating temperature control. 10/- post free.

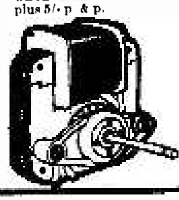
MAINS OPERATED CONTACTOR

220/240v. 50 cycle solenoid with laminated core so very silent in operation. Closes 4 circuits each rated at 10 amps. Extremely well made by a German Electrical Company. Overall size 2½ × 2 × 2in. 19/6 each.

AUTO ELECTRIC CAR AERIAL

With dash board control switch—fully extendable to 40″ or fully retracted Suitable for 12V positive or Neg. earth supplied complete with fitting instructions and ready wired dash board switch £5.18.6 plus 5/- p. & p.

MAINS MOTOR



Precision made — as used in record decks and tape recorders—ideal also for extractor fan, blower, heaters etc. New and perfect. Snip at 9/6. Postage 3/- for first one then 1/- for each one ordered, 12 and over post free.

ELECTRONICS (CROYDON) LTD

Dept. PW, 266 London Rd., Croydon CRO 2TH

Also 102/3 Tamworth Road, Croydon

TRANSISTOR V.F.O.—*continued from page 454*

a good communications receiver with either internal or external 100kHz marker of known accuracy are the basic alternatives. If an existing v.f.o. of known accuracy is obtainable, this can make things much easier.

Having connected the necessary d.c. supply to the v.f.o., set the trimmer capacitor to about mid-point and the tuning capacitor to maximum value (vanes fully meshed). Loosely couple the output to the receiver aerial input and allow to warm up for 10 to 15 minutes. Next search around 3·5MHz on the receiver dial, the b.f.o. being switched in first. When the beat note is heard, note the frequency on the receiver dial. If no beat note can be found, check that the v.f.o. output is present using an oscilloscope or valve-voltmeter.

With the beat frequency noted, set the receiver dial accurately to 3·5MHz using the 100kHz marker to ensure accuracy. Now adjust the trimming capacitor in the v.f.o. until the beat note is obtained on exactly 3·5MHz. If the original beat frequency was high, VC2 should be increased and if it was low, decreased. The setting of VC2 should be carried out with care, the trimming tool being removed after each adjustment as a small hand capacity effect is almost unavoidable. With this frequency correctly set on zero beat, the v.f.o. dial can be marked at this point. No further trimming should now be required.

The receiver dial is next set to 3·6MHz, again using the crystal marker, and the v.f.o. tuning capacitor slowly adjusted until the beat note is again heard. Having set VC1 for exactly zero beat, mark the appropriate point on the scale. This procedure is repeated for 3·7 and 3·8MHz. The upper limit of 3·8MHz will vary slightly between different units due to differences in stray capacitance.

The mid-points of 50kHz steps and 10kHz subdivisions can only be accurately marked if the receiver dial has suitable calibration points or if an existing v.f.o. is available. As the scale divisions are almost linear, however, reasonably accurate subdivisions can be obtained geometrically. When the main scale is fully calibrated, the harmonic calibrations for the other bands (7MHz, 14MHz, etc.) can be completed on the lower scales of the v.f.o. dial. ■

CORRIGENDA

FREQUENCY METER—MAY 1970
Under the heading "Construction" the sentence "Note the breaks in the copper strip at holes D9, D15 and E4" should read "at holes C14, D3 and D9."

SUMS AND CIRCUITS—JUNE 1970
The voltage and current waveforms shown in Fig. 3.3 and 3.4b should be interchanged
In the July issue of the same article the equation on page 192 reading $-1+0\cdot3010=\bar{0}\cdot6990$ should read $-1+0\cdot3010=-0\cdot6990$.

TEN OR FIFTEEN METRE CONVERTER—JUNE 1970
Figure 1 and the components list should show R3, R8 and R10 as 1kΩ and not 10kΩ.

LIGHT OPERATED SWITCH—JULY 1970
The value of R7 both in the circuit and the components list should read 4·7Ω and not 4·7kΩ.

AUDIO EXPANDER/COMPRESSOR—AUGUST 1970
In the components list C11 should have read 100pF and not 100μF. The circuit is however correct.
In Fig. 11, the screening of the wire connected to the slider of S1 section C should be connected to the other screen wires and not to the slider of S1 section B.

ORGAN PEDAL BASS UNIT—*continued from page 460*

boards in the event of a faulty contact or circuit failure.

The last stage is to fit aluminium or wooden rails, one on each side of the case, to prevent the unit tipping forward when the pedals are pressed. Full downward pressure on a pedal should bring it to within half inch or so of floor level. Further pressure would tip the unit forward, hence the need for the rails as shown in Fig. 16.

Amplifier Requirements

Because of the very low frequency of the pedal bass notes a sizeable loudspeaker in a suitable enclosure is necessary if the true bass fundamentals are to be audible. Small organs like the Philicorda have only small loudspeakers which are not suitable for bass reproduction. For organs of this calibre it is best to build a suitable amplifier with an output of 5 to 10 watts which can be incorporated within the speaker enclosure. The speaker should be 10 to 12in. in diameter.

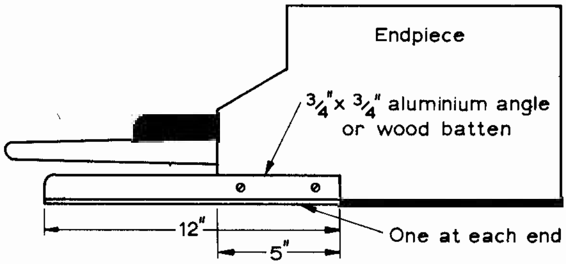


Fig. 16: Fitting of rails to case.

There is no reason why the pedal bass unit described in this article should not be integrated with an amplifier and speaker so designed as to fit beneath small organs like the Philicorda. For portables fed into large power amplifiers with sizeable speakers it should only be necessary to connect the pedal bass unit to a suitable input on the amplifier.

There is of course the question of volume control or 'expression' whilst playing. For small organs where the overall sound output is relatively low it will be sufficient to set the pedal bass sound to an arbitrary level. A pedal type volume control could be used or an extra volume control mechanically coupled to an existing pedal. ■

TAKE 20

JULIAN ANDERSON

A series of simple transistor projects, each using less than twenty components and costing less than twenty shillings to build.

No. 18
ADD-ON TONE CONTROL

ALTHOUGH we have described two general-purpose amplifiers in this series, tone control facilities have not been incorporated, mainly due to our limitation on cost. The tone control stage described here is a general-purpose one which can be added to most transistor amplifiers in the early stages. The gain, with the controls in their middle settings, is very small as the amplification of the stage is nearly all used as negative feedback to alter the tone. The circuit shown is not very original, in fact it is widely used in commercial amplifiers.

Performance of this type of circuit is excellent; with reference to 1kHz, frequencies of 100Hz can be boosted or cut by up to 15dB and the same degree of control is available at 15kHz. A low noise transistor, a BC169C, is used so noise introduced by this additional stage is negligible.

THE CIRCUIT

For those unfamiliar with this type of circuit, a quick glance will probably lead to rapid bafflement, but basically the design is simplicity itself.

The input is coupled to the d.c. blocking capacitor C1 and is then applied by one path to the base of the transistor through C3 and a part of VR1, a 100kΩ potentiometer. The actual part of VR1 that it passes through depends on the setting of the control. By another path the signal reaches the transistor via R2 and C5. It will be seen that C5 is paralleled by a part of VR2, again depending on the setting of the control.

These combined signals are applied to Tr1 which has R3, a 10kΩ resistor acting as the collector load and R4 as the base bias. The output is taken from the collector via C7 to the existing volume control.

Also connected to the collector of Tr1 is C6. Now in a common emitter amplifier (which is what we are using here) there is phase inversion, that is the signal at the collector is out of phase with the signal applied to the base. This anti-phase signal is applied to the other side of VR1 and VR2 via an identical network to the one that fed the original signal to these controls.

It will be seen then that both controls are able to select either very little or a considerable amount of the out-of-phase signal and since these networks are frequency selective we are able to achieve a considerable amount of control over the tone.

Careful scrutiny of the circuit will show that a certain degree of negative feedback is applied to the transistor through R4, the base bias resistor, but this is quite small and anyhow is not frequency selective. Many designs decouple this a.c. feedback by using two resistors in series, their common junction being connected to earth via a high value capacitor, such as 100μF; in practice the author has found this to be unnecessary.

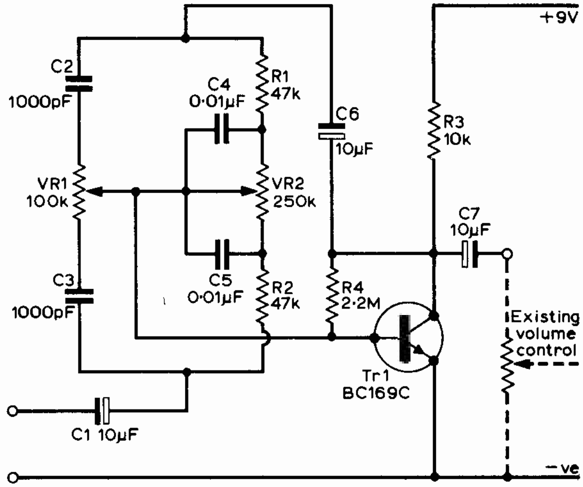


Fig. 1: The circuit of the add-on tone control. VRI is the treble control, VR2 the bass control.

★ components list

Resistors:

R1	47kΩ	R3	10kΩ
R2	47kΩ	R4	2·2MΩ

All ⅛ or ¼ watt, 5% types
VR1 100kΩ linear pot. Treble control
VR2 250kΩ linear pot. Bass control

Capacitors:

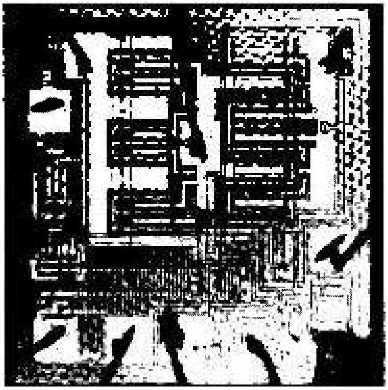
C1	10μF 12V	C5	0·01μF
C2	1,000pF	C6	10μF 12V
C3	1,000pF	C7	10μF 12V
C4	0·01μF		

Transistor:
Tr1 BC169C or BC109

FREQUENCY SELECTIVE NETWORKS

There are probably many readers who are unsure what we mean by "frequency selective networks." In practice these are very simple and can be calculated and designed by even the raw beginner. A.C. theory can be very complicated and describing, from first principles, the operation of capacitors would be hard and is anyway unnecessary; just take it as a fact that the impedance of a capacitor is directly proportional to the frequency and the impedance, in ohms, is equal to $1/(2\pi fC)$ where f is the frequency and C the capacitance in Farads; so that C2 and C3 at 100Hz have a "resistance" of about 1·6MΩ and at 10kHz, 16kΩ. Similarly C4 and C5 have a "resistance" at the same two frequencies of 160kΩ and 1·6kΩ respectively. Substituting these "resistance" values instead of the capacitors we are left with a potential divider (but only of course at a particular frequency) and it will be seen that the gain can be changed by the setting of the controls VR1 and VR2. ■

MONOLITHIC INTEGRATED CIRCUIT HIGH FIDELITY AMPLIFIER AND PRE-AMP



the world's most advanced high fidelity amplifier

The Sinclair IC-10 is the world's first monolithic integrated circuit high fidelity power amplifier and pre-amplifier. The circuit itself, a chip of silicon only a twentieth of an inch square by a hundredth of an inch thick, has an output of 5 watts R.M.S. (10 watts peak). It contains 13 transistors (including two power types), 2 diodes, 1 Zener diode and 18 resistors, formed simultaneously in the silicon by a series of diffusions. The chip is encapsulated in a solid plastic package which holds the metal heat sink and connecting pins. This exciting device is not only more rugged and reliable than any previous amplifier, it also has considerable performance advantages. The most important are complete freedom from thermal runaway due to the close thermal coupling between the output transistors and the bias diodes and very low level of distortion.

The IC-10 is primarily intended as a full performance high fidelity power and pre-amplifier, for which application it only requires the addition of such components as tone and volume controls and a battery or mains power supply. However, it is so designed that it may be used simply in many other applications including car radios, electronic organs, servo amplifiers (it is d.c. coupled throughout) etc. The photographic masks required as part of the process of producing monolithic I.Cs are expensive but once made, the circuits can be produced with complete uniformity and at very low cost. This enables us to cover every IC-10 with the Sinclair guarantee of reliability.

■ SPECIFICATIONS

Output	10 Watts peak, 5 Watts R.M.S. continuous.
Frequency response	5 Hz to 100 KHz±1dB.
Total harmonic distortion	Less than 1% at full output.
Load impedance	3 to 15 ohms.
Power gain	110dB (100,000,000,000 times) total.
Supply voltage	8 to 18 volts.
Size	1 · 0.4 · 0.2 inches. 25.6 · 10 · 5 mm.
Sensitivity	5mV.
Input impedance	Adjustable externally up to 2.5 M ohms.

■ CIRCUIT DESCRIPTION

The first three transistors are used in the pre-amp and the remaining 10 in the power amplifier. Class AB output is used with closely controlled quiescent current which is independent of temperature. Generous negative feedback is used round both sections and the amplifier is completely free from crossover distortion at all supply voltages, making battery operation eminently satisfactory.

■ APPLICATIONS

Each IC-10 is sold with a very comprehensive manual giving circuit and wiring diagrams for a large number of applications in addition to high fidelity. These include stabilised power supplies, oscillators, etc. The pre-amp section can be used as an R.F. or I.F. amplifier without any additional transistors.

SINCLAIR

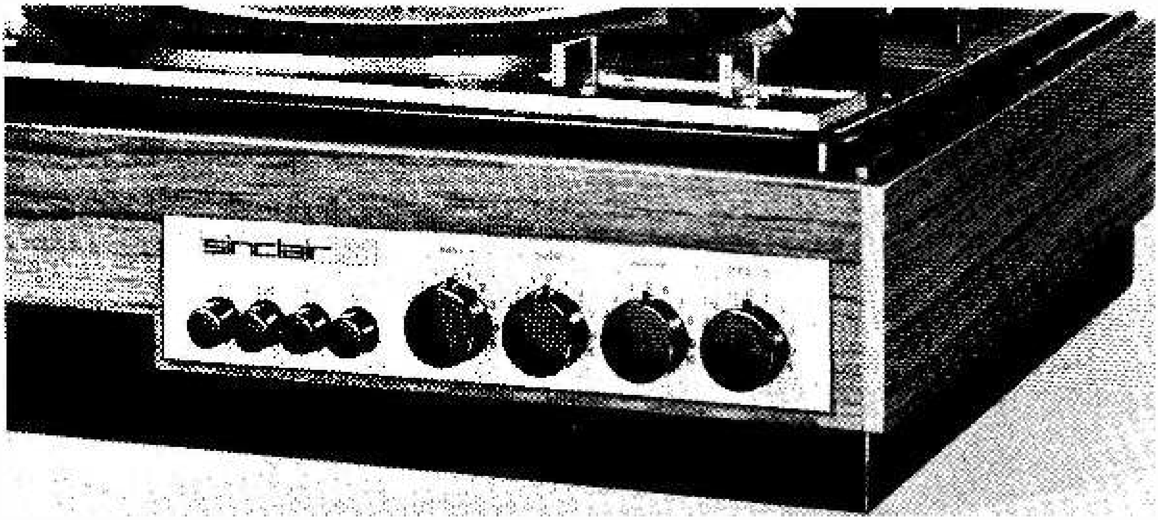
IC.10 *with IC.10 manual* **59/6**

POST FREE

sinclair

SINCLAIR RADIONICS LIMITED
22 NEWMARKET ROAD · CAMBRIDGE
Telephone 0223 52731

Project 60



Laboratory standard modular high fidelity

Sinclair Project 60 comprises a range of modules which connect together simply to form a compact stereo amplifier with really excellent performance. So good, in fact, that only 2 or 3 amplifiers in the world can compare in overall performance and now the constructor has choice of assemblies with either 20 or 40 watts output per channel, with or without filter facilities. The modules are: **1.** The Z.30 and Z.50 high gain power amplifiers. **2.** The Stereo 60 preamplifier and control unit. **3.** The Active Filter Unit. **4.** 4 supply units—PZ.5; PZ.6; PZ.7 and PZ.8. In a normal domestic application, there will be no significant difference between PZ.5 or PZ.6 unless loudspeakers of very low efficiency are being used, in which case the PZ.6 will be required. For assemblies using two Z.50's there is the PZ.8 supply unit to ensure maximum performance from these amplifiers. No skill or experience are needed to build your system and the Project 60 manual gives all the instructions you can possibly want, clearly and concisely.

Perhaps the greatest beauty of the system is that it is not only flexible now but will remain so in the future as new additions are made to the range. A stereo F.M. tuner is next to come. These and all other modules introduced will be compatible with those already available and may be added to your system at any time. And because Sinclair are the largest producers of constructor modules in Europe, Project 60 prices are remarkably low.

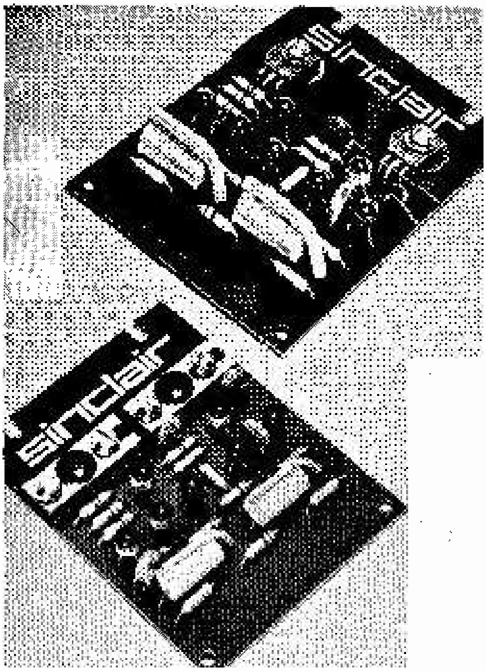
	System	The Units to use	In conjunction with	Your Project 60 Units will cost
A	Car Radio	Z.30	Existing car radio, Sinclair Micromatic	89/6
B	Simple battery powered record player	Z.30	Crystal pick-up, 12 V or more battery supply and volume control	89/6
C	Mains powered record player	Z.30 and PZ.5	Crystal or ceramic P.U. Vol. control etc.	£9.9.0
D	20+20 watts RMS stereo amplifier for most needs	Two Z.30s, Stereo 60 and PZ.5	Crystal, ceramic or magnetic P.U., most dynamic speakers, FM tuner, etc.	£23.18.0
E	20+20 watts RMS stereo amplifier for use with low efficiency (high performance) speakers	Two Z.30s, Stereo 60 and PZ.6	High quality ceramic or mag. P.U., F.M. Tuner, Tape Deck, etc. All dynamic spkrs.	£26.18.0
F	40+40 watts RMS de-luxe stereo amplifier	Two Z.50s, Stereo 60 PZ.8 and mains transformer	As for E	£32.17.6
G	Outdoor public address system	Z.50	Microphone, up to 4 P.A. speakers, 12V car battery with or without converter, controls	£5.9.6
H	Indoor P.A	One Z.50, PZ.8 and mains transformer	Mic., guitar, heavy duty speakers etc., controls	£17.8.6
J	High pass and low pass filters	AFU	D, E or F as above	£5.19.6
K	Stereo F.M. tuner	To be released shortly		

How to assemble and use Project 60 modules to best advantage in the above and other applications will be found in the fully descriptive Project 60 manual included with Project 60 systems. This 48 page manual is available separately, price 2/6d including postage.

sinclair

SINCLAIR RADIONICS LTD., 22 NEWMARKET RD., CAMBRIDGE

Telephone 0223 52731



Z.30 & Z.50 POWER AMPLIFIERS

The Z.30 together with the Z.50 are both of advanced design using silicon epitaxial planar transistors to achieve unsurpassed standards of performance. Total harmonic distortion is an incredibly low 0.02% at full output and all lower outputs. Whether you use the Z.30 or Z.50 power amplifiers in your Project 60 system will depend on personal preference, but they are the same physical size and may be used with other units in the Project 60 range equally well. For operating from mains, for the Z.30 use PZ.5 for most domestic requirements, or PZ.6 if you have very low efficiency loudspeakers. For Z.50, use the PZ.8 described below.

SPECIFICATIONS (Z.50 units are interchangeable with Z.30s in all applications.)

Power Outputs

Z.30 15 watts R.M.S. into 8 ohms, using 35V: 20 watts R.M.S. into 3 ohms using 30 volts.

Z.50 40 watts R.M.S. into 3 ohms from 40 volts: 30 watts R.M.S. into 8 ohms, using 50 volts.

Frequency response 30 to 300,000 Hz ± 1dB

Distortion 0.02% into 8 ohms

Signal to noise ratio better than 70 dB unweighted

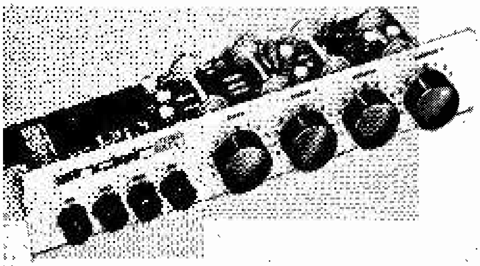
Input sensitivity 250mV into 100 Kohms.

For speakers from 3 to 15 ohms impedance

Size 3½ x 2¼ x ½ ins. (90 x 58 x 13 mm)

Z.30 *Built, tested and guaranteed* **89/6**

Z.50 *Built, tested and guaranteed* **109/6**

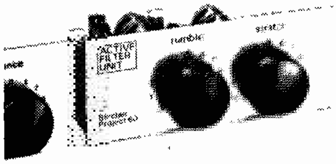


STEREO 60 Pre-amp/Control unit

Designed for the Project 60 range but suitable for use with any high quality power amplifier. Silicon epitaxial planar transistors are used throughout, achieving a really high signal-to-noise ratio and excellent tracking between channels. Input selection is by means of push buttons and accurate equalisation is provided for all the usual inputs.

- Input sensitivities — Mag. p.u. — 3mV correct to R.I.A.A. curve ± 1dB: 20 to 25,000Hz. Ceramic p.u., Radio and Aux, each up to 3mV.
- Output — 250mV.
- Signal-to-noise ratio — better than 70dB.
- Channel matching — within 1dB.
- Tone controls — TREBLE +15 to —15dB at 10kHz: BASS +15 to —15dB at 100Hz.
- Front panel — brushed aluminium with black knobs and controls.
- Size 8¼ x 1½ x 4 ins. (210 x 138 x 102 mm)

Built, tested and guaranteed **£9.19.6**

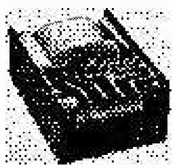


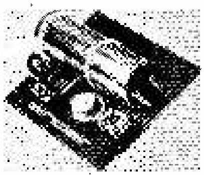
ACTIVE FILTER UNIT

For use between Stereo 60 unit and two Z.30s or Z.50s, the Active Filter Unit matches the Stereo 60 in styling and is as easily mounted. It is unique in that the cut-off frequencies are continuously variable, and as attenuation in the rejected band is rapid (12dB/octave), there is less loss of the wanted signal than has previously been possible. Amplitude and phase distortion are negligible. The Sinclair A.F.U. is suitable also for use with any other amplifier system.

Two stages of filtering are incorporated—rumble (high pass) and scratch (low pass). H.F cut-off (—3dB) variable from 28kHz to 5kHz. L.F cut-off (—3dB) variable from 25Hz to 100Hz. Filter slope, both sections 12dB per octave. Distortion at 1kHz (35V supply) 0.02% at rated output.

Built, tested and guaranteed **£5.19.6**





POWER SUPPLY UNITS

Designed specially for use with the Project 60 system of your choice. Illustration shows PZ.5 power supply unit to left and PZ.8 (for use with Z.50s) to the right. Use PZ.5 for normal Z.30 assemblies and PZ.6 where stabilised supply is essential.

PZ-5 *30 volts unstablisied* **£4.19.6**

PZ6-*35 volts stabilised* **£7.19.6**

PZ-8 *45 volts stabilised (less mains transformers* **£5.19.6**

PZ-8 *mains transformer* **£5.19.6**

GUARANTEE

If within 3 months of purchasing Project 60 modules directly from us, you are dissatisfied with them, we will refund your money at once. Each module is guaranteed to work perfectly and should any defect arise in normal use we will service it at once and without any cost to you whatsoever provided that it is returned to us within 2 years of the purchase date. There will be a small charge to service thereafter. No charge for postage by surface mail. Air-mail charged at cost.

sinclair

To: SINCLAIR RADIONICS LTD., 22 NEWMARKET RD., CAMBRIDGE

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NAME ....

ADDRESS ....

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PW 10

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(Saturday callers only 5% Discount)

GUARANTEED

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Type	Price
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2G302	4/-
2G303	4/-
2G306	8/6
2G308	6/-
2G309	6/-
2G371	3/-
2G374	4/-
2G381	4/6
2N404	4/6
2N696	4/-
2N697	4/-
2N698	5/-
2N706	2/6
2N706A	2/6
2N708	3/-
2N709	12/6
2N2718	5/-
2N726	6/-
2N727	6/-
2N914	3/6
2N916	3/6
2N918	6/-
2N929	4/6
2N930	5/6
2N987	10/6
2N1090	6/6
2N1091	6/6
2N1131	5/6
2N1132	6/6
2N1302	3/6
2N1303	3/6
2N1304	4/6
2N1305	4/6
2N1306	5/-
2N1307	5/-
2N1308	6/-
2N1309	6/-
2N1507	5/6
2N1613	5/-
2N1631	8/6
2N1632	8/6
2N1637	8/6
2N1638	7/6
2N1639	7/6
2N1711	5/-
2N1889	6/6
2N1893	8/6
2N2147	14/6
2N2148	12/6
2N2160	11/6
2N2193	9/6
2N2193A	10/-
2N2194A	4/6
2N2217	5/6
2N2218	6/-
2N2219	6/-
2N2220	5/-
2N2221	5/-
2N2222	5/-
2N2287	21/6
2N2297	6/-
2N2303	5/-
2N2368	5/-
2N2369	3/-
2N2369A	5/6
2N2410	8/6
2N2483	5/6
2N2484	6/6
2N2539	4/6
2N2540	4/6
2N2613	7/-
2N2614	5/-
2N2646	11/6
2N2696	6/6
2N2711	6/-
2N2712	6/-
2N2713	5/6
2N2714	6/-
2N2865	12/6
2N2904	7/-
2N2904A	8/-
2N2905	8/-
2N2905A	9/-
2N2906	6/-
2N2906A	6/6
2N2907	6/6
2N2923	3/6
2N2924	3/6
2N2925	3/6
2N2926	
,, Green	2/9
,, Yellow	2/6
,, Orange	2/6
2N3011	6/-
2N3014	6/6
2N3053	5/6
2N3054	11/-
2N3055	15/-
2N3133	8/-
2N3134	6/-
2N3135	5/-
2N3136	5/-
2N3390	7/6
2N3391	4/-
2N3391A	6/-
2N3392	4/-
2N3393	4/-
2N3394	4/-
2N3402	4/6
2N3403	4/6
2N3404	7/6
2N3405	9/-
2N3414	5/6
2N3415	6/6
2N3416	7/6
2N3417	7/6
2N3570	25/-
2N3572	17/6
2N3605	5/6
2N3606	5/6
2N3607	4/6
2N3662	7/6
2N3663	7/6
2N3702	2/6
2N3703	2/6
2N3704	3/6
2N3705	3/-
2N3706	2/6
2N3707	3/-
2N3708	2/-
2N3709	2/-
2N3710	2/6
2N3711	2/6
2N3819	7/-
2N3823	22/6
2N3854	5/6
2N3854A	5/6
2N3855	5/6
2N3855A	6/-
2N3856	6/-
2N3856A	7/-
2N3858	5/-
2N3858A	6/-
2N3859	5/6
2N3859A	6/6
2N3860	6/-
2N3866	30/-
2N3877	8/-
2N3877A	8/-
2N388A	12/6
2N3900	7/6
2N3900A	8/-
2N3901	19/6
2N3903	7/-
2N3004	7/-
2N3905	7/6
2N3906	7/6
2N4058	3/6
2N4059	5/-
2N4060	5/-
2N4061	4/6
2N4062	4/6
2N4244	9/6
2N4255	8/6
2N4285	3/6
2N4286	3/6
2N4287	3/6
2N4288	3/6
2N4289	3/6
2N4290	3/6
2N4291	3/6
2N4292	3/6
2N5027	10/6
2N5028	11/6
2N5029	9/6
2N5030	8/6
2N5172	3/-
2N5174	10/6
2N5175	10/6
2N5176	9/-
2N5232	5/6
2N5232A	6/-
2N5245	12/6
2N5246	12/6
2N5249	12/6
2N5249A	13/6
2N5265	62/6
2N5266	55/-
2N5267	52/6
2N5305	7/6
2N5306	8/-
2N5307	7/6
2N5308	7/6
2N5309	12/6
2N5310	8/6
2N5354	5/6
2N5355	5/6
2N5356	6/6
2N5365	9/6
2N5366	6/6
2N5367	11/6
2N5457	7/6
2N718A	6/-
2S005	15/-
2S020	37/6
2S102	6/6
2S103	6/6
2S104	6/6
2S501	5/6
2S502	5/6
2S503	5/6
3N83	37/6
3N128	18/6
3N140	19/6
3N141	19/6
3N142	19/6
3N143	19/6
3N152	22/6
R.C.A. :—	
40050	10/3
40251	17/6
40309	6/6
40310	9/-
40311	7/-
40312	9/6
40314	7/6
40320	7/6
40323	6/6
40324	9/6
40326	7/6
40329	6/-
40344	5/6
40347	7/6
40348	10/6
40360	8/6
40361	9/6
40362	11/6
40370	6/6
40406	11/6
40407	8/-
40408	10/6
40410	12/6
40467A	11/6
40468A	7/-
40600	14/6
AC107	6/-
AC126	4/-
AC127	5/-
AC128	4/-
AC154	4/6
AC176	5/-
AC187	12/-
AC188	7/6
ACY17	5/-
ACY18	5/-
ACY19	5/-
ACY20	5/-
ACY21	5/-
ACY22	4/-
ACY28	4/-
ACY40	4/-
ACY41	5/-
ACY44	8/-
AD140	8/-
AD149	11/6
AD150	12/6
AD161	7/6
AD162	7/6
AF106	8/6
AF114	5/-
AF115	6/6
AF116	5/-
AF117	5/-
AF118	12/6
AF119	4/-
AF124	4/6
AF125	4/-
AF126	4/-
AF127	3/6
AF139	7/6
AF178	11/-
AF179	14/6
AF180	10/6
AF181	8/6
AF239	8/6
AF279	9/6
AF280	12/6
AFZ11	6/6
ASY26	5/6
ASY27	7/6
ASY28	5/6
ASY29	5/6
ASY36	5/-
ASY50	5/-
ASY54	5/-
ASY86	6/6
ASZ20	7/6
ASZ21	7/6
AUY10	30/-
BC107	2/6
BC108	2/6
BC109	3/-
BC113	5/6
BC115	6/6
BC116A	7/6
BC118	6/6
BC121	6/-
BC122	4/-
BC125	11/-
BC126	11/-
BC134	6/6
BC135	8/6
BC136	7/6
BC140	7/6
BC147	3/6
BC148	3/6
BC149	3/6
BC152	3/6
BC154	12/6
BC157	4/-
BC158	4/6
BC159	4/6
BC160	12/6
BC167	3/-
BC168	3/6
BC168B	2/9
BC168C	3/-
BC169	3/6
BC169B	2/9
BC169C	3/-
BC170	3/6
BC171	3/6
BC172	3/6
BC175	5/6
BC182	4/6
BC182L	2/3
BC183	4/6
BC184	4/6
BC212L	3/6
BCY30	5/6
BCY31	5/6
BCY32	7/6
BCY33	4/6
BCY34	4/6
BCY38	4/6
BCY39	8/6
BCY40	7/6
BCY42	3/6
BCY43	3/6
BCY54	6/6
BCY58	4/6
BCY59	4/6
BCY60	19/6
BCY70	4/-
BCY71	8/6
BCY72	3/6
BCZ10	5/6
BCZ11	7/6
BD116	22/6
BD121	13/-
BD123	16/6
BD124	12/-
BD131	19/6
BD132	19/6
BDY10	27/6
BDY11	37/6
BDY17	37/6
BDY18	49/6
BDY19	62/6
BDY20	22/6
BDY38	19/6
BDY60	36/-
BDY61	36/-
BDY62	27/6
BF115	5/-
BF117	9/6
BF163	7/6
BF167	5/-
BF173	6/6
BF177	6/6
BF178	12/6
BF179	14/6
BF180	7/-
BF181	6/6
BF184	6/6
BF185	8/6
BF194	3/6
BF195	5/6
BF196	8/6
BF197	8/6
BF198	8/6
BF200	10/6
BF224	6/-
BF225	6/6
BF237	6/6
BF238	6/6
BF244	9/6
BFW61	13/6
BFX12	4/6
BFX12X	4/6
BFX13	4/6
BFX29	7/-
BFX30	9/-
BFX43	7/6
BFX44	7/6
BFX68	13/6
BFX68A	13/6
BFX84	6/-
BFX85	7/-
BFX86	6/-
BFX87	10/-
BFX88	5/-
BFX89	12/6
BFX92A	12/6
BFY10	6/6
BFY11	6/-
BFY12	4/6
BFY13	4/6
BFY17	4/6
BFY18	6/6
BFY19	6/6
BFY20	12/6
BFY21	8/6
BFY24	9/-
BFY29	10/-
BFY30	10/-
BFY41	10/-
BFY43	12/6
BFY50	4/6
BFY51	4/6
BFY52	4/6
BFY53	4/6
BFY56A	11/6
BFY75	6/-
BFY76	8/-
BFY77	11/6
BFY85	9/-
BFY90	13/6
BFW58	5/6
BFW59	5/-
BFW60	5/-
BPX25	37/-
BPX29	36/-
BPY10	29/-
BRY39	9/6
BSX19	3/6
BSX20	3/6
BSX21	7/6
BSX26	9/-
BSX27	9/6
BSX28	6/6
BSX60	16/6
BSX61	12/6
BSX76	4/6
BSX77	5/6
BSX78	5/6
BSY24	3/-
BSY25	3/-
BSY26	3/6
BSY27	3/6
BSY28	3/6
BSY29	3/6
BSY32	5/-
BSY36	5/-
BSY37	5/-
BSY38	4/6
BSY39	4/6
BSY40	6/6
BSY51	6/6
BSY52	6/6
BSY53	7/6
BSY54	8/-
BSY56	18/-
BSY79	9/-
BSY82	10/6
BSY90	11/6
BSY95A	3/6
BSW41	8/6
BSW70	5/6
D16P1	7/6
D16P2	7/6
D16P3	7/6
D16P4	20/-
GET102	6/-
GET113	4/-
GET114	4/-
GET118	4/-
EET119	4/6
GET120	6/6
GET873	3/-
GET880	6/-
GET887	4/6
GET889	4/6
GET890	4/6
GET896	4/6
GET897	4/6
GET898	4/6
MAT100	6/-
MAT101	6/-
MAT120	6/-
MAT121	6/-
MC140	6/6
MJ400	21/6
MJ420	22/6
MJ421	22/6
MJ430	20/6
MJ440	19/6
MJ480	19/6
MJ481	25/-
MJ490	20/-
MJ491	27/6
MJ1800	43/6
MJE340	12/6
MJE520	17/6
MJE521	17/6
MPF102	8/6
MPF103	7/6
MPF104	7/6
MPF105	7/6
MPS3638	6/6
NKT0013	7/-
NKT124	6/6
NKT125	4/6
NKT126	4/6
NKT128	4/6
NKT135	4/6
NKT137	6/6
NKT210	4/6
NKT211	4/-
NKT212	4/-
NKT213	5/-
NKT214	4/-
NKT215	4/-
NKT216	7/6
NKT217	9/-
NKT219	5/-
NKT223	5/-
NKT224	4/-
NKT225	4/-
NKT229	4/-
NKT237	6/-
NKT238	5/-
NKT240	5/6
NKT241	5/6
NKT 281	5/-
NKT 713	4/-
NKT 781	5/-
NKT10419	4/6
NKT10439	6/-
NKT10519	5/-
NKT20329	7/-
NKT20339	6/6
NKY80111	14/6
NKT80112	17/6
NKT80113	21/-
NKT80211	17/-
NKT80212	17/6
NKT80213	17/6
NKT80214	17/6
NKT80215	17/6
NKT80216	17/6
OC20	15/-
OC22	10/-
OC23	10/-
OC24	11/6
OC25	10/-
OC26	6/6
OC28	12/6
OC29	15/-
OC30	8/-
OC35	8/-
OC36	12/6
OC38	10/6
OC41	4/6
OC42	5/-
OC44	4/-
OC45	2/6
OC46	3/-
OC70	3/-
OC71	2/6
OC72	2/6
OC74	6/6
OC75	4/6
OC76	4/6
OC77	6/-
OC81	4/-
OC81D	4/6
OC83	5/-
OC84	5/-
OC139	6/6
OC140	6/6
OC170	6/-
OC171	6/-
OC200	6/6
OC201	9/6
OC202	12/6
OC203	8/6
OC204	8/6
OC205	8/6
OC207	7/6
OCP71	8/6
ORP12	12/6
ORP60	10/-
ORP61	10/-
P346A	4/6
TIP31A	16/6
TIP32A	19/6
TIS34	12/6
TIS43	8/-
TIS44	2/6
TIS45	3/6
TIS46	3/6
TIS47	3/6
TIS48	3/6
TIS49	3/6
TIS50	4/6
TIS51	3/6
TIS52	3/6
TIS53	6/-
TIS60	6/-
TIS61	6/-
ZTX107	3/6
ZTX108	3/6
ZTX109	3/6
ZTX300	3/6
ZTX301	3/6
ZTX302	4/6
ZTX303	4/6
ZTX304	6/6
ZTX500	4/6
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ZTX502	5/-
ZTX503	5/-
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38 Series—FACE SIZE 42 × 42mm. All prices for 1-9 pieces. 50μA, **37/6**; 100μA, **35/-**; 200μA, **32/6**; 500μA, **27/6**; 50-0-50μA, **35/-**; 100-0-100μA, **32/6**; 500-0-500μA, **25/-**; 1MA, **25/-**; 5MA, **25/-**; 10MA, **25/-**; 50MA, **25/-**; 100MA, **25/-**; 500MA, **25/-**; IA, **25/-**; 5A, **25/-**; 10V **25/-**; 20V, **25/-**; 50V, **25/**; 300V, **25/**; 500V, **25/-**.

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6A	—	—	5/-	6/-	6/6	7/-	10/-*	—
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17A	11/6	12/6	15/6	18/-	19/6	24/-	31/6	37/6

*5A only 1A Types are plastic

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IN914	1/6	IS940	1/6	BAX13	1/6	BYX10	4/6	OA79	1/6
IN916	1/6	AA119	2/6	BAX16	1/9	BYZ10	7/-	OA81	1/6
IN4007	4/6	AA213	4/6	BAY18	3/3	BYZ11	6/6	OA85	1/6
IS010	3/-	AAZ13	3/-	BAY31	1/6	BYZ12	6/-	OA90	1/6
IS021	4/-	AAZ15	2/6	BAY38	3/9	BYZ13	5/-	OA91	1/6
IS44	2/-	AAZ17	2/-	BY100	4/6	FST3/8	4/-	OA95	1/6
IS113	3/-	BA100	3/-	BY103	4/6	OA5	3/6	OA200	2/-
IS120	3/-	BA102	4/6	BY122	7/6	OA9	2/-	OA202	2/-
IS121	3/6	BA110	7/-	BY124	3/-	OA10	2/6		
IS130	2/6	BA115	1/6	BY126	3/6	OA47	1/6		
IS131	2/6	BA144	2/6	BY127	4/6	OA70	1/6		

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CA3012	17/9	CA3026	20/-	CA2043	27/6	CA3054	22/-
CA3013	21/-	CA3028A	14/9	CA3044	24/	CA3055	48/-
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CA3018	16/9	CA3029	17/6	CA3046	15/-	CA3064	25/-
CA3018A	22/-	CA2029A	38/6	CA3047	27/6		
CA3019	16/9	CA3030	27/6	CA3048	42/6		
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Data and application sheets **2/-** per type

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MC788P	19/6	MC1303P	57/9
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Quantity Prices on Application

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Mullard

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TAA263	15/6	FJH141	17/6
TAA300	35/-	FJH161	17/6
TAA310	25/-	FJH171	18/3
TAA320	14/6	FJH221	17/6
TAA350	35/-	FJJ101	27/6
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Plessey

SL402A	42/6	SL403A	42/6

TRIACS

SC41D, 6A 400V **25/-**

SC41B, 6A 200V **22/-**

40512 6A 400V **33/-**

SC50D **60/-**

Data and App. Sheets **2/6**

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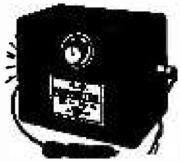

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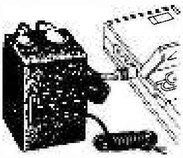

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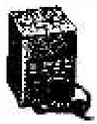

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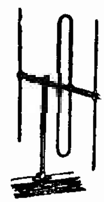

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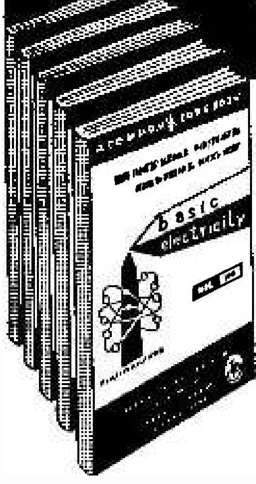

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400	2/6	5/6	7/6	25/–
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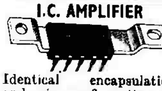

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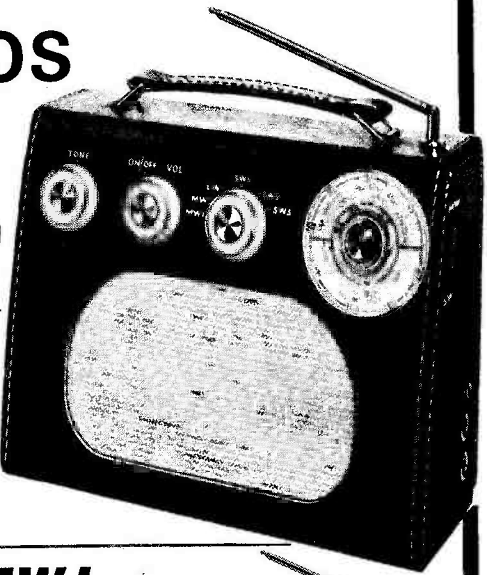

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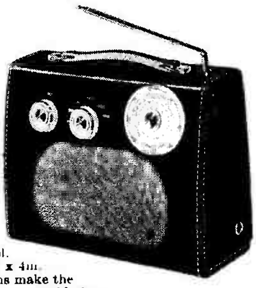
7 Tunable Wavebands: Medium Wave 1, Medium Wave 2, Long Wave, SW1, SW2, SW3 and Trawler Band. Built in Ferrite Rod Aerial for Medium and Long Waves. Five section 22in. chrome plated Telescopic aerial for Short Waves can be angled and rotated for maximum performance. Push pull output using 600 mW transistors. Socket for car aerial. Tape record socket. Selectivity switch. Switched earpiece socket complete with earpiece for private listening. Eight transistors plus 3 diodes. Famous make 7in. x 4in. Speaker. Air spaced ganged tuning condenser. On/Off switch volume control. Wave change switch and tuning control. Attractive case in rich chestnut shade with gold blocking. Size 9 x 7 x 4in. approx. Easy to follow instructions and diagrams make the Roamer Eight a pleasure to build. Total Building Costs **£6.19.6**
Parts Price List and Easy Build Plans 5/- (FREE with parts).
P. & P. 7/6

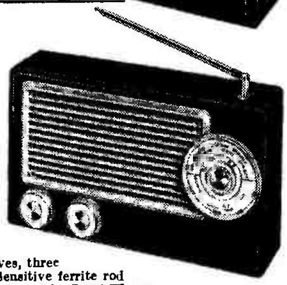
roamer seven mk IV



SEVEN FULLY TUNABLE WAVEBANDS—MW1, MW2, LW, SW1, SW2, SW3 and Trawler Band. Extra Medium waveband provides easier tuning of Radio Luxembourg, etc. Built in ferrite rod aerial for Medium and Long Waves. Retractable 4 section 24in. chrome plated telescopic aerial for peak Short Wave listening. Socket for Car Aerial. Powerful push-pull output. Seven transistors and two diodes including Micro-Alloy R.F. Transistors. Famous make 7 x 4in. P.M. speaker. Air spaced ganged tuning condenser. Volume/on/off control, wave change switches and tuning control. Attractive case with carrying handle, Size 9 x 7 x 4in approx. Easy to follow instructions and diagrams make the Roamer 7 a pleasure to build. Parts price list and easy build plans 3/- (FREE with parts). Personal Earpiece with switched socket for private listening, 5/- extra.

Total building costs
£5.19.6 P. & P. 7/6

NEW! trans eight



SIX WAVEBAND PORTABLE WITH 3in. SPEAKER

Attractive case in black with red grille and cream knobs and dial with polished brass inserts. Size 9 x 5½ x 2¾in. approx. Tunable on Medium and Long Waves, three Short Waves and Trawler Band. Sensitive ferrite rod aerial for M.W. and L.W. Telescopic aerial for Short Waves. Eight improved type transistors plus 3 diodes. Push pull output. Battery economiser switch for extended battery life. Ample power to drive a larger speaker. Parts price list and easy build plans 5/- (FREE with parts). Earpiece with switched socket for private listening 5/- extra.

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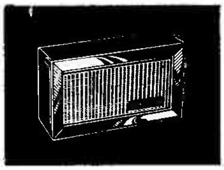
P. & P. 5/6

pocket five

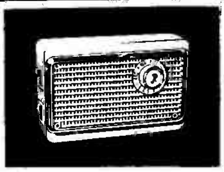


MEDIUM WAVE, LONG WAVE AND TRAWLER BAND PORTABLE WITH SPEAKER

Attractive black and gold case. Size 5½ x 1¼ x 3½in. Tunable over both Medium and Long Waves with extended M.W. band for easier tuning of Luxembourg, etc. 7 stages—5 transistors and 2 diodes, supersensitive ferrite rod aerial, fine tone moving coil speaker. Easy build plans and parts price list 1/6 (FREE with parts).

Total building costs
44/6 P. & P 3/6

transona five

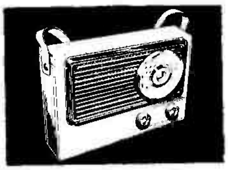


MEDIUM WAVE, LONG WAVE AND TRAWLER BAND PORTABLE WITH SPEAKER

Attractive case with red speaker grille. Size 6½ x 4½ x 1½in. 7 stage—5 transistors and 2 diodes, ferrite rod aerial, tuning condenser, volume control, fine tone moving coil speaker. Easy build plans and parts price list 1/6 (FREE with parts).

Total building costs
47/6 P. & P. 3/9

roamer six



SIX WAVEBAND PORTABLE WITH 3in. SPEAKER

Attractive case with gilt fittings. Size 7½ x 5½ x 1½in. Tunable on Medium and Long waves, two short waves, Trawler Band Plus an extra M.W. band for easier tuning of Luxembourg, etc. Sensitive ferrite rod aerial and telescopic aerial for Short waves. 8 stages—6 transistors and 2 diodes including Micro-Alloy R.F. Transistors etc. (Carrying strap 1/6 extra). Easy build plans and parts price list 2/-. (FREE with parts). (Note: When present stocks of these cases are exhausted a new case similar to "Transeight" will be supplied).

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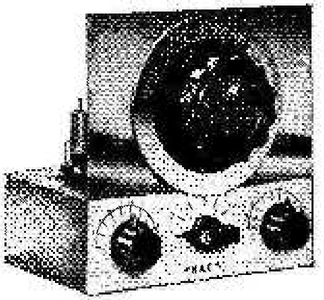

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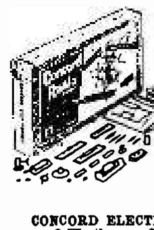

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ECC82	3/–	EF183	4/–	U281	5/–	20P1	5/–
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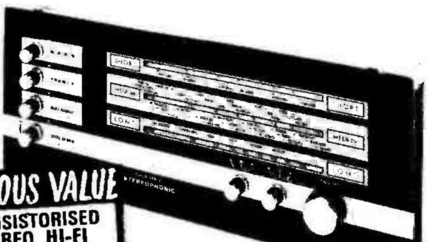

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12¼"	8⅞"	2	3	0	2	11	6	2	15	6
14¼"	3⅞"	1	10	0	1	17	6	2	2	0
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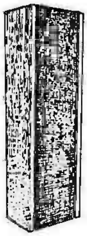

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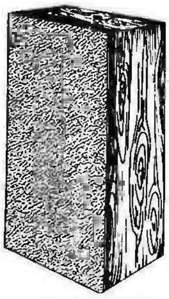

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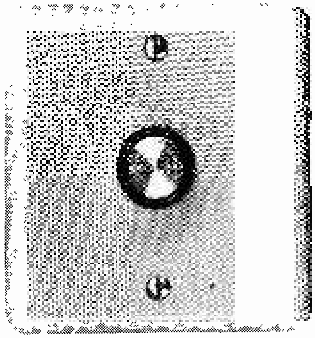

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3B28	2.15	6BR8	0.65	6K7	0.35	12AT7	0.33
3BP1	2.75	6BS7	1.30	6K8G	0.35	12AU6	0.30
3Q4	0.40	6BW6	0.85	6K23	0.55	12AU7	0.30
3S4	0.35	6BW7	0.70	6K25	0.75	12AV6	0.33
3V4	0.45	6BX6	0.25	6L6GT	0.45	12AV7	0.50
5R4GY	0.60	6BZ6	0.35	6L7	0.40	12AX7	0.30
5U4G	0.33	6C4	0.33	6L18	0.45	12AY7	0.70
5U4GB	0.42	6C5GT	0.40	6LD20	0.40	12BT4A	0.55
5V4G	0.42	6CA4	0.28	6N7GT	0.40	12BA6	0.85
5Y3GT	0.32	6CA7	0.50	6P1	0.60	12BA7	0.35
5Z3	0.50	6CB6	0.30	6P28	0.65	12BE6	0.35
5Z4G	0.40	6CD6GA	1.15	6Q7	0.40	12BH7	0.40
6/30L2	0.75	6CG7	0.50	6SA7	0.40	12BY7	0.55
6AB4	0.35	6CH6	0.55	6SG7	0.35	12K5	0.55
6AF4A	0.50	6CL6	0.50	6SK7	0.35	12K7GT	0.35
6AG7	0.40	6CW4	0.68	6SL7GT	0.35	12Q7G	0.30
6AH6	0.50	6CY7	0.65	6SN7GT	0.35	12SR7	0.85
6AJ8	0.30	6D3	0.45	6SQ7	0.40	14S7	0.80
6AK5	0.30	6DC6	0.75	6SR7	0.40	20D1	0.45
6AK6	0.57	6DK6	0.48	6T8	0.35	20L1	1.10
6AL3	0.43	6DQ6B	0.63	6U4GT	0.60	20P1	0.50
6AL5	0.20	6DS4	0.75	6U8A	0.40	20P4	1.10
6AM5	0.32	6EA8	0.58	6V6GT	0.38	20P5	1.20
6AM6	0.33	6EH7	0.30	6X4	0.30	25C5	0.50
6AQ5	0.35			6X5GT	0.35	25L6GT	0.45
6AQ6	0.55			6X8	0.55	25Z4G	0.30

25Z6GT	0.65	50B5	0.45	CY31	0.35	ECC81	0.33
30A5	0.45	50C5	0.40	DAF96	0.42	ECC82	0.30
30AE3	0.40	50CD6G	1.65	DF96	0.42	ECC83	0.30
30C1	0.30	50L6GT	0.50	DK40	0.55	ECC84	0.30
30C15	0.80	83A1	1.50	DK92	0.50	ECC85	0.60
30C17	0.85	85A2	0.40	DK96	0.42	ECC88	0.40
30C18	0.75	90AV	2.50	DL96	0.42	ECC89	0.50
30F5	0.85	90C1	0.60	DY86	0.33	ECC91	0.20
30FL1	0.70	90CV	1.25	DY87	0.35	ECC189	0.60
30FL12	0.93	807	0.50	DY802	0.50	ECF80	0.35
30FL14	0.75	811A	1.60	E55L	2.75	ECF82	0.35
30L1	0.40	812A	3.50	E88CC	0.65	ECF83	0.75
30L15	0.85	813	3.75	E130L	5.00	ECF86	0.65
30L17	0.80	866A	0.75	E180F	0.95	ECF804	1.50
30P12	0.80	5642	0.65	EABC80	0.35	ECH42	0.70
30P19	0.80	6080	1.50	EAF42	0.55	ECH81	0.30
30PL1	0.70	6146	1.50	EBC33	0.50	ECH83	0.40
30PL13	0.93	6146B	2.50	EBC41	0.55	ECH84	0.45
30PL14	0.90	6360	1.25	EBC81	0.30	ECL80	0.40
35A3	0.55	6939	2.15	EBF80	0.40	ECL81	0.45
35A5	0.75	7199	0.75	EBF83	0.40	ECL82	0.35
35B5	0.65	7360	1.80	EBF89	0.30	ECL83	0.65
35C5	0.40	7586	1.25	EC53	0.50	ECL84	0.55
35D5	0.70	7895	1.25	EC86	0.60	ECL85	0.55
35L6GT	0.50	9002	0.35	EC88	0.60	ECL86	0.40
35W4	0.30	9003	0.50	EC90	0.33	ECLL800	1.50
35Z3	0.60	AZ1	0.48	EC92	0.35	EF37A	0.60
35Z4G	0.30	AZ31	0.55	EC93	0.50	EF39	0.40
35Z5GT	0.40	CBL1	0.80	EC8010	2.25	EF40	0.50
50A5	0.70	CBL31	0.90	ECC40	0.60		

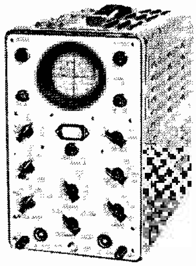
EF41	0.65	EZ40	0.45	PCL88	0.90	U78	0.30
EF42	0.70	EZ41	0.45	PCL800	0.93	U191	0.75
EF80	0.25	EZ80	0.25	PCL801	0.70	U201	0.35
EF83	0.55	EZ81	0.28	PD500	1.50	U281	0.40
EF85	0.35	GY501	0.80	PF86	0.60	U282	0.40
EF86	0.30	GZ30	0.40	PF818	0.85	U301	0.40
EF89	0.28	GZ31	0.33	PFL200	0.70	U403	0.50
EF91	0.33	GZ32	0.48	PL33	0.35	U404	0.40
EF92	0.40	GZ33	0.70	PL36	0.55	U801	1.00
EF95	0.30	HABC80	0.45	PL81	0.50	UABC80	0.35
EF97	0.65	HK90	0.35	PL82	0.45	UAF41	0.50
EF183	0.30	KT66	1.70	PL83	0.45	UAF42	0.55
EF184	0.35	KT88	1.75	PL84	0.40	UBC41	0.50
EF800	1.00	N78	1.15	PL302	0.80	UBC81	0.40
EK90	0.30	PABC80	0.40	PL504	0.80	UBF80	0.40
EL34	0.50	PC86	0.60	PL508	0.90	UBF89	0.35
EL36	0.50	PC88	0.60	PL801	0.80	UBL1	0.50
EL41	0.55	PC97	0.50	PL802	0.75	UBL21	0.60
EL42	0.58	PC900	0.48	PM84	0.50	UC92	0.35
EL81	0.55	PCC84	0.40	PY31	0.30	UCC85	0.40
EL83	0.42	PCC85	0.40	PY33	0.63	UCF80	0.55
EL84	0.25	PCC88	0.55	PY80	0.35	UCH21	0.60
EL85	0.43	PCC89	0.50	PY81	0.30	UCH42	0.70
EL86	0.40	PCC189	0.55	PY82	0.30	UCH43	0.75
EL90	0.35	PCC805	0.85	PY83	0.38	UCH81	0.35
EL95	0.35	PCC806	0.80	PY88	0.40	UCL81	0.60
EL360	1.15	PCF80	0.30	PY500	1.00	UCL82	0.35
EL803	1.00	PCF82	0.35	PY800	0.50	UCL83	0.60
EL821	0.55	PCF84	0.50	PY801	0.50	UF41	0.60
EL822	0.90	PCF86	0.60	PZ30	0.35	UF42	0.60
ELL80	0.75	PCF87	0.85	QQV2-6	2.15	UF43	0.60
EM34	0.90	PCF801	0.50	QQV03-10	1.25	UF80	0.35
EM71	0.75	PCF802	0.50	QQV03-20A	5.25	UF85	0.40
EM80	0.40	PCF805	0.75	TT21	2.65	UF89	0.35
EM81	0.60	PCF806	0.70	TT22	2.80	UL41	0.65
EM84	0.35	PCF808	0.75	U18/20	0.75	UL84	0.30
EM87	0.55	PCH200	0.70	U25	0.75	UM84	0.20
EN91	0.35	PCL81	0.50	U26	0.75	UY1N	0.50
EY51	0.40	PCL82	0.35	U31	0.45	UY11	0.65
EY80	0.45	PCL83	0.65	U37	1.50	UY41	0.45
EY81	0.40	PCL84	0.65	U52	0.33	UY82	0.50
EY83	0.55	PCL85	0.40	U76	0.30	UY85	0.30
EY86	0.40	PCL86	0.45			Z803U	0.90
EY87	0.43						
EY88	0.43						

TRANSISTORS

Quantity prices quoted on request

2N404	0.17	2S003	1.00	BCY34	0.30
2N444A	0.25	2S034	1.00	BCY72	0.20
2N696	0.20	2S102	0.40	BCZ11	0.40
2N697	0.23	2S104	0.50	BD121	0.80
2N698	0.40	2S701	0.50	BD123	0.95
2N705	0.70	2S702	0.50	BF115	0.20
2N706	0.15	2S746	0.30	BF167	0.25
2N708	0.20	AC113	0.15	BF173	0.30
2N753	0.25	AC125	0.30	BF181	0.25
2N929	0.30	AC126	0.25	BF184	0.25
2N930	0.35	AC127	0.20	BF185	0.20
2N987	0.35	AC128	0.20	BF194	0.20
2N1131	0.40	AC153	0.25	BF195	0.15
2N1132	0.45	AC154	0.15	BF196	0.20
2N1184	1.25	AC157	0.20	BF197	0.20
2N1301	0.40	AC169	0.10	BFX88	0.25
2N1302	0.25	AC176	0.25	BFY17	0.40
2N1304	0.25	AC187	0.30	BFY19	0.60
2N1305	0.25	AC188	0.30	BFY50	0.25
2N1306	0.25	ACY17	0.30	BFY51	0.20
2N1307	0.30	ACY18	0.20	BFY52	0.25
2N1308	0.40	ACY19	0.25	BSY26	0.25
2N1309	0.35	ACY20	0.20	BSY27	0.30
2N1613	0.25	ACY21	0.20	BSY28	0.30
2N1711	0.30	ACY22	0.15	BSY65	0.20
2N1756	0.75	AD140	0.80	BSY95A	0.20
2N2147	0.75	AD149	0.50	OC16	0.75
2N2160	1.25	AD161	0.35	OC22	0.65
2N2217	0.30	AD162	0.35	OC23	0.60
2N2218	0.40	AF114	0.25	OC24	0.60
2N2219	0.45	AF115	0.30	OC25	0.40
2N2369A	0.25	AF116	0.25	OC26	0.30
2N2477	0.65	AF117	0.20	OC28	0.60
2N2646	0.60	AF118	0.45	OC29	0.65
2N2905	0.50	AF125	0.25	OC30	0.75
2N2923	0.15	AF126	0.25	OC35	0.50
2N2924	0.15	AF127	0.25	OC36	0.60
2N2926	0.15	AF178	0.40	OC42	0.30
2N3053	0.30	AF186	0.50	OC44	0.20
2N3055	0.75	AF239	0.40	OC45	0.20
2N3133	0.35	AFZ11	0.45	OC70	0.20
2N3134	0.50	ASY26	0.25	OC71	0.15
2N3391	0.20	ASY27	0.30	OC72	0.25
2N3392	0.15	ASY28	0.30	OC73	0.40
2N3393	0.15	ASY29	0.30	OC75	0.25
2N3394	0.15	ASY54	0.25	OC76	0.25
2N3395	0.20	ASY74	0.50	OC78	0.25
2N3402	0.15	ASY77	0.35	OC78D	0.20
2N3403	0.15	ASY82	0.20	OC81	0.25
2N3404	0.35	ASY86	0.20	OC81D	0.15
2N3414	0.20	BC107	0.15	OC83	0.20
2N3415	0.15	BC108	0.15	OC139	0.35
2N3416	0.25	BC109	0.20	OC140	0.40
2N3417	0.25	BC113	0.40	OC141	0.60
2N3702	0.15	BC118	0.30	OC170	0.25
2N3703	0.15	BC134	0.30	OC171	0.25
2N3704	0.20	BC147	0.20	OC200	0.30
2N3707	0.20	BC148	0.15	OC201	0.60
2N3709	0.15	BC149	0.15	OC202	0.65
2N3710	0.15	BC152	0.15	OC203	0.40
2N3819	0.35	BC175	0.25	OC204	0.40
2N3906	0.80	BCY30	0.35	OC205	0.70
2S002	1.00	BCY33	0.25	OC206	0.70

SYNCHROSCOPE TYPE C1-5



3-in tube fitted with telescopic viewing hood, giving bright display in full daylight.
Bandwidth 10 c/s—10 mc/s. Triggered sweep pre-set at 1-2-5-10-30-100-300-1000-3000 μsec per stroke. Free-running time base 20 c/s to 2000kc/s with built-in crystal calibrator providing timing marks at .05-.2-1-5-20-100 μ sec + 5%
Amptihide calibrator directly calibrated in volts.
Input attenuator 1-10-100.
Power supplies 127/230v AC.

PRICE **£39.00.** Packing and carriage 1.50

MINIATURE 1-IN CATHODE RAY TUBE TYPE DH3-91—1CP1—1CP31

63v heater. Anode voltage 500v. Sensitivity Y plates 45v/cm; X plates 52v/cm (typical) Y plates suitable for assymmetrical deflection. Green face, medium persistence.

PRICE **£6.0.0** p.p. 0.25

CARTRIDGE TYPE HS32 EHT RECTIFIER

10,000p.i.v. Rectified current 350mA mat. Surge current 30 Amps. PRICE **£7.00**

OUR NEW 1970/1971 CATALOGUE IS NOW READY AND AVAILABLE FREE OF CHARGE. PLEASE SEND QUARTO STAMPED AND ADDRESSED ENVELOPE FOR THIS VALUABLE SOURCE OF REFERENCE LISTING MANY THOUSAND TYPES OF VALVES, SEMICONDUCTORS, TUBES ETC.

SILICON MAINS POWER RECTIFIERS

DD000	50p.i.v.	500mA	Wire ended	0.15
KD202B	50p.i.v.	1A	Stud mounted	0.15
KD202A	50p.i.v	3A	Stud mounted	0.25
RS21AF	100p.i.v.	500mA	Wire ended	0.50
RS210AF	100p.i.v.	750mA	Wire ended	0.20
SX631	100p.i.v.	750mA	Stud mounted	0.20
KD202G	100p.i.v.	1A	Stud mounted	0.15
KD202V	100p.i.v.	3A	Stud mounted	0.25
D242	100p.i.v.	10A	Stud mounted	0.30
IS121	150p.i.v.	200mA	Wire ended	0.20
IN3193	200p.i.v.	750mA	Wire ended	0.15
KD202E	200p.i.v.	1A	Stud mounted	0.20
KD202D	200p.i.v.	3A	Stud mounted	0.30
BYZ13	200p.i.v.	6A	Stud mounted	0.40
IN645	225p.i.v.	400mA	Wire ended	0.25
D226V	300p.i.v.	300mA	Wire ended	0.15
KD202I	300p.i.v.	1A	Stud mounted	0.20
IS113	400p.i.v.	400mA	Wire ended	0.25
DD006	400p.i.v.	500mA	Wire ended	0.25
DD226	400p.i.v.	1A	Wire ended	0.30
BYZ12	400p.i.v.	6A	Stud mounted	0.25
DD716	400p.i.v.	35A	Stud mounted	1.50
RS27AF	600p.i.v.	100mA	Wire ended	0.20
1N649	600p.i.v.	400mA	Wire ended	0.35
IS115	600p.i.v.	400mA	Wire ended	0.40
1N2071	600p.i.v.	750mA	Wire ended	0.20
BY127	600p.i.v.	1A	Wire ended	0.15
BY100	700p.i.v.	450mA	Wire ended	0.20
DD058	800p.i.v.	500mA	Wire ended	0.35
BYZ10	800p.i.v.	6A	Stud mounted	0.40
1N5399	1000p.i.v.	1.5A	Wire ended	0.25
1N5408	1000p.i.v.	3A	Wire ended	0.50

INTEGRATED CIRCUIT AMPLIFIERS

CA3005 RF amplifier, 100mc/s bandwidth	£1.35
CA3012 Wide Band Amplifier for IF applications	1.10
CA3020 550mW Audio Amplifier	1.50
CA3036 Two super-alpha pairs for stereo pick-up systems	0.95
CA3052 Latest addition to RCA range. Four-in-one amplifier	2.10
PA222 1.2 watt Audio Amplifier	3.25
PA234 1 watt Audio Amplifier	1.30
PA237 2 watts Audio Amplifier	2.00
MC1709G—G.P. operational Amplifier	1.15
TAA263 3-stage direct coupled Amplifier	0.75
TAA293 3-stage direct coupled Amplifier	1.00
TAA320 MOST input + bi-polar stage	0.65
TAD100 All active components required to construct an AM receiver	2.25
SL403A 3 watts Audio Amplifier	2.40

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