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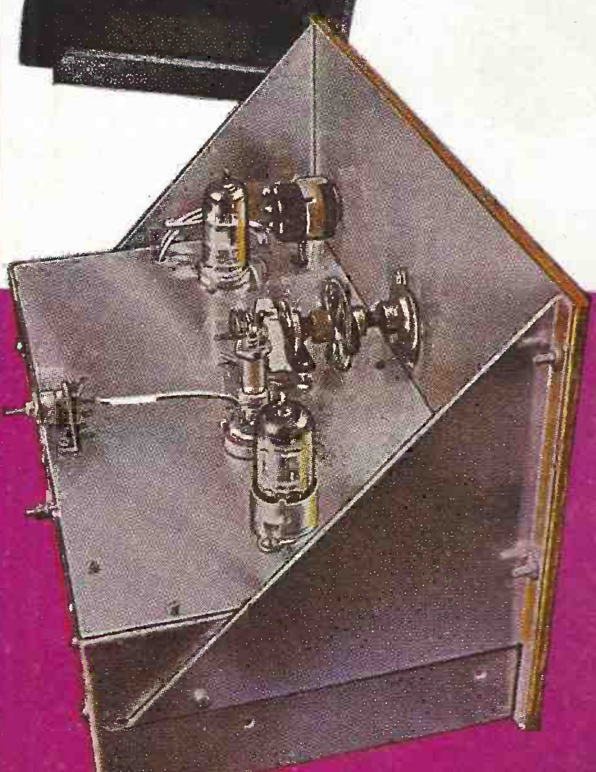

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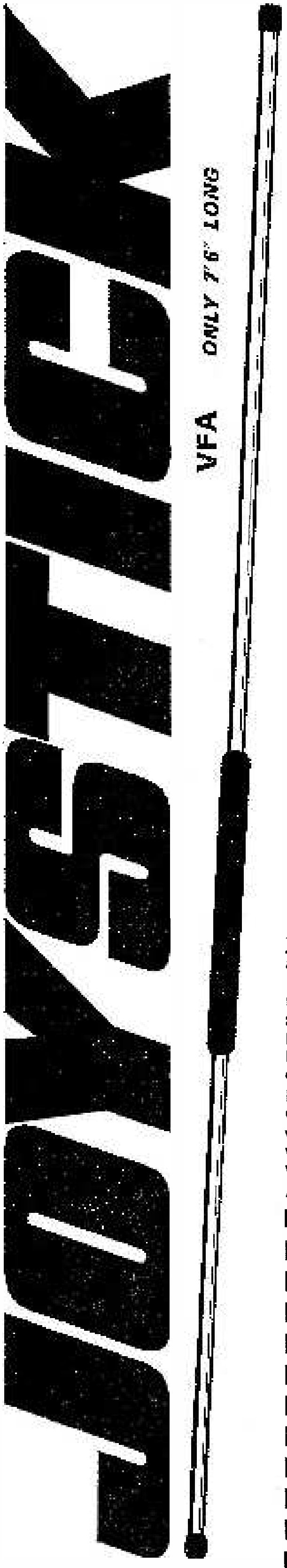
AND

BEGINNERS' 5-BAND RECEIVER



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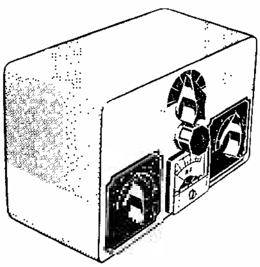

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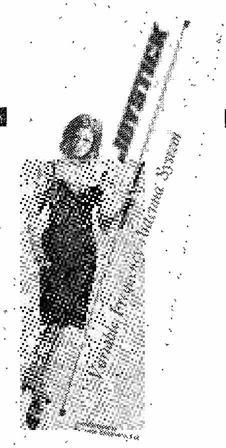

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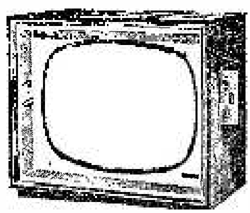

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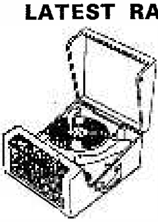

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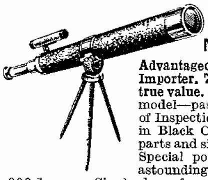

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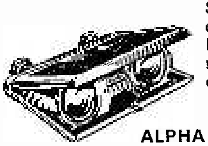

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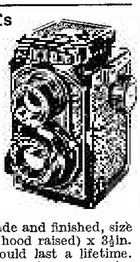

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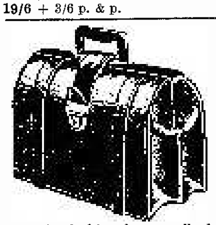

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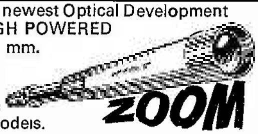

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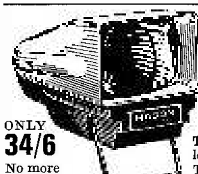

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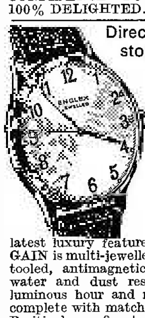

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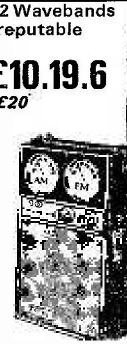
10 Transistors, 3 Diodes, 2 Wavebands

AM/FM PORTABLE. By reputable Manufacturer at fraction of original price. 500 only at £10.19.6

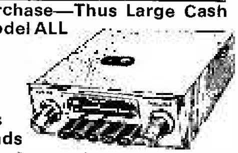
Try matching this for £20



You've never seen such quality as this superb 1967 luxury model—large size, 7" x 4" x 2", in permanent hand stitched real cowhide case magnificent silver and black finish, retractable 6 section telescopic rod aerial. It also covers F.M. waveband 88 108 megacycles *—overhear many interesting and important broadcasts.* Interference-free tone, high sensitivity, fantastic range brings in dozens of stations incl. B.B.C., Continentals, etc. Slashed price for cash—only **£10.19.6** + 5/6 registered p. & p. (personal phone, 4 batteries, etc., 7/6 ex.)

Large Bulk Purchase—Thus Large Cash Saving 1967 Model ALL

TRANSISTOR CAR RADIO



7 Semi-Conductors
5 Push Buttons
2 Full Wavebands

including Extras **£11.19.6** INCREDIBLY SLASHED PRICE

NORMALLY COSTS DOUBLE THIS PRICE

Leading manufacturers high specification—Full 2 watts output, superb tone from dynamic 6" x 4" elliptical speaker, uncannily sensitive, latest drift transistor, full med. & long waves, all-metal construction—*not plastic,* exquisite black and silver finish, precision slide rule tuning brings in all B.B.C. and dozens of Continentals WITHOUT FADING. Utterly simple to install to any 12 volt system. Complete with all accessories, WRITTEN GUARANTEE. Simple instructions, size 6½" x 6" x 2". Amazing price, cash £11.9.6 + 6/6 registered post/safe packing. Order confidently, your money back immediately if not 100% satisfied.

New to Great Britain—Just arrived at the Docks

THE LATEST AUTOMATIC SELF SHARPENING PORTABLE ELECTRIC RAZOR

Complete shipment purchased at amazingly low price.

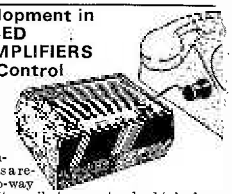
ONLY 39/6

PORTABLE ELECTRIC RAZOR—Shave anywhere at any time. Long life blades sharpen themselves automatically. Circular shaving surface is designed to give the closest possible shave. Power unit and shaver fits neatly into the zip-up case which is beautifully lined to give that luxury finish. LIMITED QUANTITY so rush your orders whilst stocks last. FULLY GUARANTEED. Send only **39/6** plus 4/6 p. & p. for 7 days' home trial. *Money back if not the bargain of a lifetime.*

The latest development in

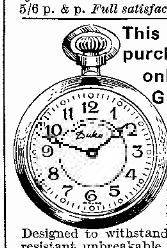
TRANSISTORISED TELEPHONE AMPLIFIERS with Fingertip Control

New Low Price



ONLY 69/6

The superb new streamlined desk consol houses a remarkably powerful two-way telephone amplifier. Fits easily to any standard telephone in seconds and enables anyone in the room or office to hear the telephone conversation if required. Leaves both hands free for taking notes—always hear every word. LIMITED QUANTITY AVAILABLE. Only 750 left at **69/6** plus 5/6 p. & p. *Full satisfaction or your money refunded in full.*



This is truly a wonder purchase. Limited quantity only of FABULOUS EVERGOLD POCKETWATCHES

Now at the lowest ever price. ONLY **25/-** No More To Pay

Now offered at well below clearance price these remarkably reliable EVERGOLD pocket watches. Designed to withstand years of constant use with high resistant unbreakable glass. Luminous face markings—so easy to see the correct time at a glance. Fully guaranteed DON'T MISS THIS ONCE IN A LIFETIME BARGAIN. Send only **25/-** plus 3/6 p. & p. for 7 days' free home trial. *Money back if not your best ever bargain.*

CONCORD ELECTRONICS LIMITED (P.W.34) 87-89 TABERNACLE ST., LONDON, E.C.2. (Callers Welcome)

FOR MONEY SAVING CHRISTMAS GIFTS ! ! ! !

SOLID STATE "7" TRANSISTOR

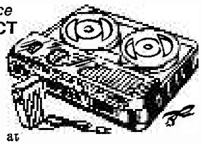
Direct Import Scoop. 2 complete crates only with 1750 of these amazing 7 TRANSISTOR full variable waveband radios.

You could pay 6 gns. for this performance.

OUR CRAZY PRICE 49/6

Your chance to own this remarkable FULL SIZE 7 TRANSISTOR PORTABLE at the lowest ever price. The improved internal ferrite aerial—works in car, boat or plane—pulls in loud and clear all the programmes—B.B.C., Luxembourg, Pirates etc. the full sized speaker gives high sensitivity and room filling volume. Brand New and Boxed in Maker's carton—1750 only at 49/6 plus 4/6 p. & p. (Carrying case, Battery and Earpiece 7/6 extra). Demonstrations Daily.

New Sensational Price Breakthrough **DIRECT IMPORT 1000 only High powered PORTABLE TAPE RECORDERS**



You've seen recorders at more than twice our price

NOW ONLY £5.19.6

At last a highly sensitive full-sized tape recorder at a price you can afford. "NOT A TOY" — but a beautifully designed instrument which is solidly assembled on a rigid steel chassis. You'll be amazed at the fine reproduction of sound for all purposes including dictating, notes, party fun, etc. Fingertip control for volume and selector switch. Hand Microphone has unique REMOTE CONTROL on/off switch for accurate recording and playback. 1000 only at £5.19.6, plus 5/6 p. & p. (Tape, Spare Spool, Microphone, Batteries and Earphone 15/- extra.)

Miraculous Scoop from Swiss Mnfr.

Limited Shipment NEW

21 JEWELLED DIVER'S WATCH

with Rotating Timing Bezel. Staggering price reduction—compare prices locally. 950 only at **97/6**

Make a genuine LARGE CASH SAVING on this high-quality watch, 200 vacuum tested for depth. 21 Jewelled movement. Shock-proof, electronically timed, lum. dial and hands. Ideal for skin-divers, sailing, motoring, research work for accuracy. FULLY GUARANTEED. Send only 97/6 plus 4/6 p. & p. TEST AT HOME. Money back guarantee. STAINLESS STEEL expanding bracelet 12/6 extra.

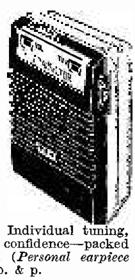
SAVE YOUR LEGS! INTERCOM OUTFIT & BABY ALARM

Ready Built

Only 49/6

Robustly made, brand new current models. You get 2 separate fully transistorised intercommunicating sets—each can speak or listen to the other—complete with 60ft. connecting wire. **Fixed in a flash.** Ends baby-crying worries. Ideal for Workshop to House, Sickroom, hundreds of uses! Hangs on wall or stands up. **Our absurd price 49/6,** battery 2/6 extra. **Post, etc. 4/6. Money back guarantee.**

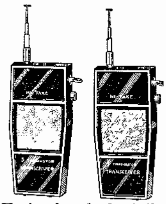
NEW FULLY TRANSISTORISED PORTABLE RADIOS



with Full Variable waveband. NOW A FRACTION OF THE NORMAL PRICE

ONLY 39/6

WHY PAY MORE? All the latest refinements are packed into this new MULTI-STATION ALL Transistor radio—the internal aerial picks up even the remote stations and the powerful built-in speaker gives room filling volume. Individual tuning, first-class reception. Purchase with confidence—packed in original manufacturer's cartons. (*Personal earpiece and battery* 4/6). Send 39/6 plus 4/6 p. & p.



Frustrated Import Shipment OFFERED BELOW HALF PRICE TO CLEAR 500 only 5 TRANSISTOR PERSONAL TRANSCEIVER SETS

OUR PRICE £5.19.6

You've heard about them—You've read about them. NOW YOUR CHANCE TO OWN THEM. Highly sensitive two-way transistor transceiver sets have individual volume control and talk-listen switch. Telescopic aerial pulls in the voice from the other set over tremendous distances—no wires—a genuine transceiver as used by official bodies and forces. 500 sets only at £5.19.6 plus 5/6 p. & p. (Batteries, leather cases, etc. 10/6 extra). Money back if not delighted with the performance. These cannot be operated in the U.K.

Fantastic stock clearance from Importer

New Famous Make

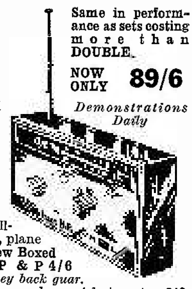
Long Distance Portables 8 TRANSISTORS + 2 FULL WAVEBANDS

Act Now 900 Only

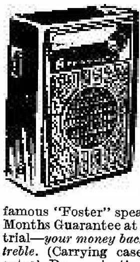
Same in performance as sets costing more than DOUBLE.

NOW ONLY 89/6

Demonstrations Daily



The highly sensitive internal Ferrite Aerial Plus Multi section telescopic aerial of this powerful full size radio pulls in 100's of Inter-Continental Stations including B.B.C., Luxembourg, Pirates — the lot. Superb Hi-Fi tone from famous big Speaker at hall-filling volume. Works in car, plane or boat. **900 Only. Brand New Boxed with Guarantee at 89/6 + P & P 4/6 for 7 days home trial**—*money back guar.* (leather case, shoulder sling, earphone, 4 bats., etc., 9/6 ex.).



Complete unopened crate of 1,000 only superb 1966 full variable waveband 6-transistor full-size portables worth £6.

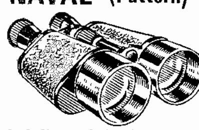
Half Price Offer 1,000 Only 44/6

Your chance to own one of these famous RADIOS—as make recommended on TV April 7th. Amazing new-type internal ferrite aerial—works in car, boat or plane—pulls in all your favourite programmes, B.B.C., Pirates and Luxembourg. Gives room-filling volume and amazing tone from famous "Foster" speaker. 1,000 only. Brand New with 6 Months Guarantee at 44/6 plus 4/6 p. & p. for 7 days' free trial—*your money back if it doesn't out-perform sets costing treble.* (Carrying case etc. Battery, Earpiece, etc. 7/6 extra). Demonstrations Daily.

Don't be put off by low price—we bought bankrupt stock.

NAVAL (Pattern) BINOCULARS

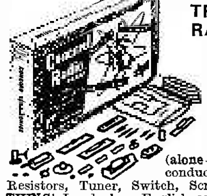
40mm. O.G. lens



45/-

NO MORE TO PAY

including real pigskin case. Superb area magnifications of **15 times.** Brand new. Grade A.2 de luxe model by leading optical manufacturer. **Full size, metal construction, lightweight,** precision ground and polished optical lenses for wide angle, needle sharp definition. *Telescopic draw tubes with smooth action centre focusing and inter-pupilary pivot.* Takes you into space or just across the road. Save £ £ £'s—**ONLY 45/-, incl. real pigskin case and shoulder strap, plus 4/6 p. & p.** Order quickly while limited stocks last. *Money back guarantee.*



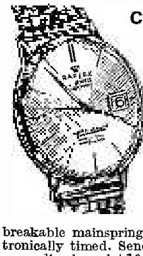
Make 5 different TRANSISTOR RADIOS for 39/6 No Experience Necessary

No soldering. Only 8 connections for first radio to work. Just look, you get Easy ABC Plans Cabinet, Loudspeaker (alone 17/6). Earphone, 4 Semi-conductors, Coils, Condensers, Resistors, Tuner, Switch, Screws, etc. **YES—EVERY THING!** Loud clear English and Foreign reception. As supplied to Educational Authorities, H.M. Forces, etc. TESTIMONIALS GALORE. **Mr. R. O'D of Londonerry, writes:** "*. . . I received your components and I must say that I am very satisfied with them, I have it already set up! . . .*" **COMPLETE HOME/RADIO COURSE.** Originally £6 **SEND ONLY 39/6, plus 4/6 post etc.**

NO SOLDERING AMAZING CIGARETTE RADIO

ONLY 25/-

Yes a perfectly ordinary packet of cigarettes! But watch your friends astonishment on hearing it fetch in station after station, loud and clear! Still holds 10 cigarettes—yet cleverly conceals highly sensitive, fully transistorised circuit **(including tiny battery).** Even a young boy can assemble it under 2 hours. **No soldering. No experience necessary. Only 16 connections to make. Ideal for taking** to work with you. From our bulging testimonial file **Mr. D. B. of Huddersfield, writes:** "*. . . I have fitted the parts in it and it is working wonderfully . . .*" ALL PARTS including Semi-Conductors, ABC Plans, etc. **ONLY 25/-. plus 2/6 post, etc.** *Parts Available Separately.*



Scoop at the Docks—a Complete Unopened Crate FULLY AUTOMATIC SELF-WINDING 21 JEWELLED DATE WATCHES

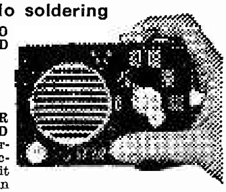
Fraction of real worth

NOW ONLY £5.7.6 *compare prices locally*

1,500 only to be cleared at below half price. Gent's calendar watch by reputable Swiss maker. Luxurious gold finish, stainless steel screw back—shock resistant, anti-magnetic, water resistant. Unbreakable mainspring—21 Fully Working jewels. Electronically timed. Send £5.7.6, plus 4/6 p. & p. Matching expanding bracelet 10/6 extra. **Brand New with guarantee.**

NEW RADIO No soldering

VOLKSRADIO ANYONE CAN BUILD IN 2-3 HOURS

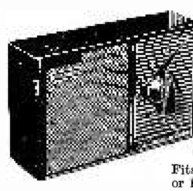


ONLY 25/-

EVEN THE OLDER CHILDREN BUILD THEM! . . . no soldering—only 16 connections! then hear it reach out bringing in station after station, loud and clear. Palm-of-hand size $4\frac{3}{4}$ x $2\frac{3}{4}$ x $1\frac{1}{4}$in. Many Testimonials: **M. H. of Bradford writes:** "*. . . I have just completed one of your sets successfully, it is the first time I have ever tackled anything like radio, and I must state here and now, I am amazed how easy it is to a layman like me. Your instructions and plan have obviously been very carefully thought out so that even the most dim can follow them . . .*" **Direct from Manufacturers to You. Send 25/- plus 2/6 post, etc.**

PARTS AVAILABLE SEPARATELY.

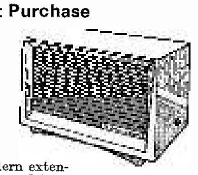
TRANSISTOR POCKET RADIOS with Loudspeaker. Bulk Purchase Enables us to Make this Fantastic Offer



Only 32/6 *No more to pay*

The "SAN REMO" so tuned that it brings the voices of star vocalists dramatically to life — in your home, office, etc. Only $4\frac{3}{4}$ x $2\frac{3}{4}$ x $1\frac{1}{4}$in. Fits easily into your pocket or handbag. Works for months off 1/2 battery. Should last a lifetime, **anyone can assemble it in an hour or two** with our easy plan. Miniature speaker—everything, only **32/6.** 3/6 p. & p. (Parts can be bought separately). Limited supply—so rush your order before it's too late.

Miraculous Import Purchase 200 Only NOW HAVE MUSIC IN EVERY ROOM Extension speaker



More than doubles the value of your radio.

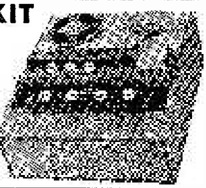
For Only 27/6 Complete

Just place this ultra modern extension speaker in any room and tune in to your favourite programmes—Now you can relay even from HI-FI radiograms down to transistor portables. Simply place in position or fix on wall and plug in the long lead supplied. What could be easier? DON'T MISS THIS AMAZING BARGAIN, remember 200 only at this price 27/6, **plus 3/6 p. & p.** Money instantly refunded if not worth more than double.

CONCORD ELECTRONICS LIMITED (P.W.34) 87-89 TABERNACLE ST., LONDON, E.C.2.

CALLERS WELCOME—DEMONSTRATIONS DAILY

AUDIOTRINE HI-FI TAPE RECORDER KIT



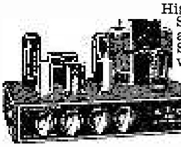
REALISM AT INCREDIBLY LOW COST. S.A.E. for leaflets.
CAN BE ASSEMBLED IN AN HOUR.
ONLY 4 PAIRS OF SOLDERED JOINTS PLUS MAINS.
Incorporating the latest Magnavox Tapedeck. The Audiotrine High Quality Tape Amplifier with switched equalisation for each of 3 speeds. High Flux P.M. Speaker, empty Tape Spool, a Reel of Best Quality Tape and a handsome Portable Cabinet of latest styling finished dark grey leathercloth. Size 14½ x 17 x 8½in. and circuit. Purchased separately would total approx. **£34.** Performance equal to units in the £50-£60 class. **Deposit 4 gns.** and 9 mthly paymts **59/6** (Total 29½ gns.) **26½ Gns.**
4 Track Model 3 gns. extra. Carr. 19/6

LINEAR TAPE PRE-AMPLIFIER. Type LP/1 Switched Equalisation. Positions for Recording at 1⅞in., 3¾in., 7½in. per sec., and Playback. EM84 Recording Level Indicator. Designed primarily as the link between a Magnavox Tape Deck and Hi-Fi amplifier suitable most Tape Decks. Terms available. **10½ Gns.**

R.S.C. 4/5 watt A5 HIGH GAIN AMPLIFIER

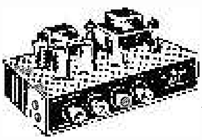
A highly-sensitive 4-valve quality amplifier for the home, small club, etc. Suitable for all crystal or ceramic P.U. heads and practically all "mikes". Separate Bass and Treble controls giving "lift" and "cut". Hum level 71dB down. Negative Feedback 15dB. Reserve power supply 300v 25 m.a., 6.3v 1.5 a. for Radio Tuner or Tape Pre-amp. For A.C. mains 200-250v. Speaker output 3 ohms. Complete in every detail with fully punched enamelled chassis, point-to-point wiring diagrams and instructions. Or assembled ready for use 6 gns. plus 5/6 carr. **£4.17.9**

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



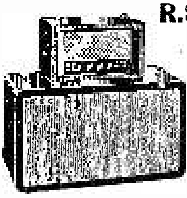
Highly sensitive. Push-Pull high output, with Pre-amp./Tone Control Stages. Performance figures equal to most expensive amplifiers available. Hum level—70dB. Frequency response ±3dB 30-20,000 c/s. Specially designed sectionally wound ultra linear output transformer with 807 output valves. All first grade components. Valves EF86, EF86, ECC83, 807, 807, GZ34. Separate Bass and Treble Controls. Sensitivity 12 millivolts so that **any kind of Microphone or Pick-up is suitable.** 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. 200-250v. 50 c/s A.C. mains. For 3 and 15 ohm speakers. Complete kit of parts fully punched chassis, point to point wiring diagrams and instructions. **12 Gns.** Carr. 12/6
Supplied factory built with EL34 output valves, 12 months guarantee for **15 gns.** If required perforated cover with carrying handles can be supplied for **21/-**. Send s.a.e. for leaflet.
TERMS: Deposit 48/- and 9 monthly payments of 33/7 (Total £17.10.3).

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



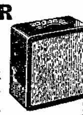
PUSH-PULL ULTRA LINEAR OUTPUT "BUILT-IN" TONE CONTROL PRE-AMP Two input sockets with associated controls allow mixing of "mike" and gram. etc., etc. High sensitivity. Valves ECC83, ECC83, EL84, EL84, EZ81. High quality sectionally wound output transformer specially designed for Ultra Linear operation and reliable small condensers of current manufacture. INDIVIDUAL CONTROLS FOR BASS AND TREBLE. Frequency response ±3dB 30-20,000 c/s. Six negative feedback loops. Hum level —60dB. SENSITIVITY 23 millivolts. Suitable for Crystal or Ceramic P.Us, all types "mikes". Comparable with the very best designs. For **Musical Instruments** such as **String Bass, Electronic Guitars,** etc. **Reserve Power** provides 300v. 30mA, and 6.3v. 1.5a. for **Radio Tuner** or **Tape Pre-amp.** Size approx. 12 x 9 x 7in. For A.C. mains 200-250v. 50 c.p.s. Output for 3 and 15 ohm speakers. Kit complete to last nut. Chassis fully punched. Full instructions and point-to-point wiring diagrams (or factory built **£11.15.0**). Metal covers with 2 carrying handles can be supplied for **21/-. TERMS ON ASSEMBLED UNITS: Deposit 36/6** and 9 monthly payments of **25/9** (Total **£13.8.3**). Send S.A.E. for leaflet of Cabinets, Speakers, Mikes, etc. **£8.15.0** Carr. 11/6

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



AN EXCEPTIONALLY POWERFUL HIGH QUALITY ALL-PURPOSE UNIT For lead, rhythm, bass guitar and all other musical instruments. For vocalists, gram, radio, tape and general public address
★ UNUSUALLY POWERFUL LOUDSPEAKER COMBINATION consisting of a FANE HIGH FLUX 15in. 30 watt unit PLUS a FANE 12in. 20 watt unit with extended frequency response. ★ 4 Jack Inputs and two Volume Controls for simultaneous use of up to 4 pick-ups or "mikes".
★ Cabinets covered in two-tone Rexine/Vynair with gold trimming. Fitted carrying handles. ★ Separate Bass and Treble Controls giving "lift" and "cut".
49½ Gns. Carr. 30/- Send S.A.E. for leaflet. Or call at one of our many branches and compare the Bass-Regent with units at three times the cost. Or deposit **£7.17.6** and 9 monthly payments of **£5.10.10.** (Total 55 gns.)

B20 MULTI-PURPOSE AMPLIFIER especially suitable for Bass Guitar



Incorporating massive 15in. high flux loudspeaker. Rating 25 watts. Individual bass and treble controls. Two jack inputs separately controlled. Substantial cabinet attractively finished in Rexine and Vynair. Size approx. 24 x 21 x 11in. Send S.A.E. for leaflet. Or Deposit **£4.14.6** and 9 monthly payments of **66/-** (Total **£34.8.6**). Carr. 17/6. **29½ Gns.**

G15 15 WATT AMPLIFIER for Lead or Rhythm Guitar, Mike, Gram or Radio

High-fidelity output. Separate bass and treble controls. Twin separately controlled inputs so that two instruments or "mike" and pick-ups can be used at the same time. Heavy Duty 12in. 20 watt Speaker. Cabinet covered in attractive Rexine/Vynair. Size 18 x 18 x 8in. Deposit **3 gns.** **19½ Gns.** Carr. 15/-. and 9 monthly payments of **43/7** (Total **£22.15.3**). S.A.E. for leaflet.

LINEAR TREMOLO PRE-AMP UNIT

Suitable for use with any of our Amplifiers. Controls are Speed (frequency of interruptions). Depth (for heavy or light effect). Volume and Switch. **4½ Gns.**

POWER PACK KIT

Consisting of Mains Transformer, Metal Rectifier, Electrolytics, smoothing choke, chassis and circuit. 200/250v. A.C. mains. Output 250v. 60mA, 6.3v. 2a supplied with case in lieu of chassis for **26/11.** **22/11**

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. 50 c/s is available. Complete kit with diagram **44/9** or ready for use **59/11.**

SELENIUM RECTIFIERS F.W. (Bridged)

All 6/12 v. D.C. output. Max A.C. input 18 v.
1 a. **3/11.** 2 a. **6/11.** 3 a. **9/9.** 4 a. **12/9.** 6 a. **15/9.**

G20 SUPER TWIN AMPLIFIER

Rating 20 watts (max.) for vocalists, Lead or Rhythm Guitar etc. Twin separately controlled inputs. Two 12in. High Flux Speakers (Total rating 30 watts). Attractive Rexine/Vynair covered cabinet. Terms: Deposit £4.6.8 and 9 monthly payments 50/- (Total £26.16.8). **23 Gns.** Carr. 17/6

SPECIAL PURCHASE! 12in. 30 WATT HEAVY DUTY 15 ohm LOUDSPEAKERS

Flux Density 17,000 lines. Fully Guaranteed. **7 GNS.** Carr. 12/6
Outstanding value at normal price of approx. £12. Or deposit 23/10 and 9 monthly payments of 15/6 (Total £8.3.4).

HEAVY DUTY SELENIUM RECTIFIERS

12v. 15 amps. F.W. (Bridged). Only **19/9**

HEAVY DUTY BATTERY CHARGER KITS 6/12 v.

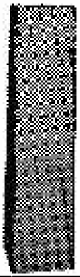
Consisting of Mains Trans. 200-250 v., Rectifier, Ammeter, Variable Charge Rate Selector, Panels, Plugs, Fuses and Holders. Fully punched stove enamelled case and circuit. 4 a. **49/11** 6 a. **69/11**

FANE HEAVY DUTY HI-FI SPEAKERS

12in. 20 watt. Type 122/10. **5 GNS.** Post 5/6.

R·S·C HI-FI CENTRES LTD.

R.S.C. COLUMN SPEAKERS



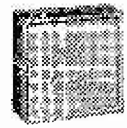
Covered in two-tone Rexine/Vynair. Ideal for vocalists and Public Address. 15 ohm matching.
Type C58, 15-20 watts. Fitted five 8in. high flux speakers. Overall size approx. 42 x 10 x 5in. Or Deposit £2 and 9 mthly pymts 28/- (Total £14.12.0) **12½ Gns.** Carr. 10/-
Type C412, 40 watts. Fitted four 12in. 12,000 line 10 watt speakers. Overall size 56 x 14 x 9in. approx. Carr. 15/- **19½ Gns.** Or Deposit **3 gns.** and 9 monthly payments of **43/7** (Total **£22.15.3**).

30 WATT HI-FI AMPLIFIER

for Guitar, Vocal or Instrumental Group

A Four Input, two volume control Hi-Fi unit with separate Bass and Treble "cut" and "boost" controls. Latest type valves. Housed in strong Rexine covered cabinet with twin carrying handles. Attractive black and gold perspex facia plate. For 200-250v. A.C. mains. Output for 3 or 15 ohm speakers. Send S.A.E. for leaflet. Deposit **£3** and 9 monthly payments of **37/5** (Total **£19.16.9**). **17 Gns.** Carr. 12/6

12in. HIGH QUALITY LOUDSPEAKERS



In walnut veneered cabinet. **10 Watt Model.** Gauss 12,000 lines. Speech coil 3 or 15 ohms. **£4.19.11** **Terms:** Deposit **15/-** and 9 monthly payments of **11/2** (Total **£5.15.6**) Carr. 7/6
20 Watt Model. 15 ohm. Size 18x18x10in. **Terms:** Deposit **24/6** and 9 monthly payments of **17/3** (Total **£8.19.9**). **£7.19.11** Carr. 10/6
30 Watt Model. 15 ohms. Or Deposit **32/-** and 9 monthly payments of **22/4** (Total **£11.13.0**). **10 Gns.** Carr. 12/6 **Any of above in extra heavy Rexine covered Cabinets, £1 extra.**

R.S.C. GRAM AMPLIFIER KIT. 3 watts output. Negative feedback. Controls: Vol., Tone and Switch. Mains operation 200-250v. A.C. Fully isolated chassis. Circuit, etc. supplied. Only **44/9.** Carr. 3/9.

HIGH QUALITY 12in. 10 WATT SPEAKERS 59/11

Flux Density 12,000 lines. 3 or 15 ohms.

TRANSISTOR SALE

Mullard OC71 **2/11,** OC45 **3/11,** OC44 **3/11,** OC72 **2/11,** OC75 **7/9,** OC81 **2/11,** OC171 **8/9.** AF117 **6/9.** Ediswan XA101 **3/9,** XA112 **3/9,** XC101A **3/9.** Postage 6d. for up to 3 transistors.

INTEREST CHARGES REFUNDED on H.P. and Credit Sale Accounts settled in 3 months.

R.S.C. MAINS TRANSFORMERS

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

MIDGET CLAMPED TYPE 2½ × 2½ × 2¼in.

250v., 60mA, 6.3v. 2a	14/11
250-0-250v., 60mA, 6.3v. 2a	15/11

FULLY SHROUDED UPRIGHT MOUNTING

250-0-250v. 60mA, 6.3v. 2a, 0-5-6.3v. 2a, 2½ × 3 × 3in.	19/9
250-0-250v. 100mA, 6.3v. 4a, 0-5-6.3v. 3a.	33/9
300-0-300v. 100mA, 6.3v. 4a, 0-5-6.3v. 3a.	33/9
300-0-300v. 130mA, 6.3v. 4a c.t., 6.3v. 1a. For Mullard 510 Amplifier	41/9
350-0-350v. 100mA, 6.3v. 4a, 0-5-6.3v. 3a.	33/9
350-0-350v. 150mA, 6.3v. 4a, 0-5-6.3v. 3a.	42/9
425-0-425v. 200mA, 6.3v. 4a, c.t., 5v. 3a.	67/9
425-0-425v. 200mA, 6.3v. 4a, 6.3v. 4a, 5v. 3a	69/9
450-0-450v. 250mA, 6.3v. 4a, c.t., 5v. 3a	79/9

TOP SHROUDED DROP-THROUGH TYPE

250-0-250v. 70mA, 6.3v. 2a., 0-5-6.3v. 2a	19/9
250-0-250v. 100mA, 6.3v. 3.5a	21/9
250-0-250v. 100mA, 6.3v. 2a, 6.3v. 1a	22/9
350-0-350v. 80mA, 6.3v. 2a, 0-5-6.3v. 2a	23/9
250-0-250v. 100mA, 6.3v. 4a, 0-5-6.3v. 3a	32/9
300-0-300v. 100mA, 6.3v. 4a, 0-5-6.3v. 3a	32/9
300-0-300v. 130mA, 6.3v. 4a, 0-5-6.3v. 1a. Suitable for Mullard 510 Amplifier	39/9
350-0-350v. 100mA, 6.3v. 4a, 0-5-6.3v. 3a	32/9
350-0-350v. 150mA, 6.3v. 4a, 0-5-6.3v. 3a	39/11

FILAMENT or TRANSISTOR POWER PACK Types 6.3v. 1.5a 6/9, 6.3v. 2a 7/9, 6.3v. 3a 9/9, 6.3v. 6a 19/9, 12v. 1a 8/9, 12v. 3a or 24v. 1.5a 19/9, 0-25-35-42v. 2a 27/9.

CHARGER TRANSFORMERS 0-9-15v. 1½a, 13/9, 0-9-15v. 2½a, 16/9, 0-9-15v. 3a, 18/9, 0-9-15v. 5a, 21/9, 0-9-15v. 6a, 25/11, 0-9-15v. 8a, 31/9.

AUTO (Step UP/Step DOWN) TRANSFORMERS 0-110/120v.-200-230-250v.

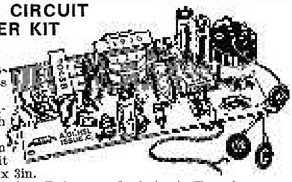
50-80 watts	14/9	250 watts	49/9
150 watts	29/11	500 watts	99/9

OUTPUT TRANSFORMERS

Standard Pentode 5,000Ω to 3Ω or 7,000Ω to 3Ω	7/9
Push-Pull 8 watts EL84 to 3Ω or 15Ω	11/9
Push-pull 10-12 watts 6V6 to 3Ω or 15Ω	19/9
Push-pull 10-12 watts to match 6V6 to 3, 5, 8 or 15Ω	21/9
Push-pull EL84 to 3 or 15Ω 10-12 watts	19/9
Push-pull Ultra Linear for Mullard 510, etc.	35/9
Push-pull 15-18 watts, sectionally wound 6L6, KT66, etc., for 3 or 15Ω	22/9
Push-pull 20 watt high quality sectionally wound, EL34, 6L6, KT66, etc., to 3 or 15Ω fully shrouded	55/9

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

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 (GET 114 or 81 Mullard OC81D and matched pair of OC81 o/p). ● 9 volt operation. ● Everything supplied, wire, battery clips, solder, etc. ● Comprehensive easy to follow instructions and circuit diagram 1/6 (Free with Kit). All parts sold separately.

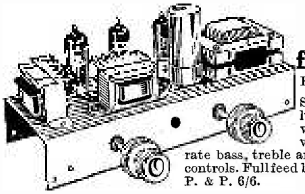
SPECIAL PRICE 45/-. P. & P. 3/-.

Also ready built and tested, **52/6.** P. & P. 3/-.

A pair of TA1s are ideal for stereo.

STEREO AMPLIFIER

Incorporating 2 ECL86s and 1 EZ80, heavy duty, double wound mains transformer. Output 4 watts per channel. Full tone and volume controls. Absolutely complete.



ONLY **£4.19.6** P. & P. 6/6

Super De-luxe version with ECL86 valves separate bass, treble and balance controls. Full feed back. **8 gns.** P. & P. 6/6.

6 TRANSISTOR AND DIODE SUPERHET

A first-class 2 waveband transistor superhet. ● Printed circuit panel (size 8½ x 2⅝in.). ● 3 pre-aligned IF transformers. ● High-gain Ferrite Rod Aerial. ● All First-grade transistors. ● Car aerial winding. ● Push-pull output. ● All parts supplied with simple instructions. **All parts sold separately.** Set of parts if purchased at one time ONLY **£4.5.0.** P. & P. 2/6 (Circuit diagram 2/-. Free with set of parts.)

35 OHM SPEAKERS

Suitable for use with above. 2in. Goodmans. Ideal replacement for most pocket portables, **8/6;** 3½in. **12/6;** 7 x 4in., **21/-;** P. & P. 2/- per speaker.

Portable CABINET

Size approx. 9½ x 6⅝ x 3½in. Suitable for above using 3½in. speaker, **25/-.** P. & P. 2/6.

COIL AND TRANSFORMER SET FOR TRANSISTOR SUPERHET

3 IF transformers one oscillator coil one driver transformer and wound Ferrite aerial (med. long and car aerial coupling), **32/6** complete post 2/-. 6 transistor printed circuit board to match **8/6.** Post 1/-. Circuit diagram 1/6 extra.

MINIATURE PRECISION AIR-SPACED TWO GANG TUNING CONDENSER. 176+176 p.F. size 1½"w x ⅞d x 1⅜"h with vanes open. Built in trimmers **5/-.** P. & P. 1/-.

BRAND NEW TRANSISTOR BARGAINS

GET 15 (Matched Pair) **15/-;** V15/10p, **10/-;** OC71 **5/-;** OC76 **6/-;** AF117 **7/6.**

Set of Mullard 6 transistors OC44, 2—OC45 OC81D matched pair OC81 **25/-,** ORP12 Cadmium Sulphide Cell **10/6.**

EDISWAN MAZDA

PXA101 **6/6;** XA103 **6/6.**

R.F.I. Pack: 1—PXA102 Mixer; 2—PXA101 I.F. Amp. (Equiv. OC44 and OC45) **10/6**

R.F. 2 Pack: 2—PXA101 I.F. 1—PXA102 Osc.1—PXA102 Mixer **12/6**

L.F.6 Pack: Consisting of PXB113 Driver Matched pair. PX171 mounted complete with heat sinks (Equiv. OC81D and OC81) **12/6**

ALL TRANSISTORS POST FREE.

TAPE DECKS

B.S.R. MONARDECK (Single speed) 3¾in. per sec., simple control, uses 5¾in. spools, **£6.15.0** plus 7/6 carr. and ins. (Tapes extra).

LATEST COLLARO MAGNAVOX 363 TAPE DECK DE LUXE. Three speeds, 2 track, takes up to 7in. spools. **10 gns.** Plus 7/6 Carr. & ins. on each (Tapes extra).

PORTABLE TAPE RECORDER CASE

Beautifully made and expensively finished in dark grey heavy grade rexine. Satin Chrome metal grille front and chrome fittings. Speaker aperture 9" x 4". Overall size 15½" w. x 15" d. x 7½" h. Will take any standard tape deck or single record player. Limited number only. Worth at least **£5.** OUR PRICE **49/6.** P. & P. 5/-. Brand new and unused.

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

TSL CRYSTAL STICK MIKE. Listed at 45/-. Our price **18/6.** P. & P. 1/6.

QUALITY RECORD PLAYER AMPLIFIER

A top-quality record player amplifier. This amplifier (was used in a 29 gn. record player) employs 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. w. x 2½in. d. x 5½in. h. Ready built and tested. **PRICE 69/6.** P. & P. 4/9.

ALSO AVAILABLE mounted on board with output transformer and 6in. speaker ready to fit into cabinet below. **PRICE 89/6.** P. & P. 5/9.

QUALITY PORTABLE R/P CABINET

Uncut motor board. Will take above amplifier and B.S.R. or GARRARD Autochanger or Single Record Player Unit. Size 18 x 14 x 8½in.

Price £3.9.6. Carr. 7/6.

4-SPEED PLAYER UNIT BARGAINS

All brand new in maker's original packing.

SINGLE PLAYERS

B.S.R. TU/12	**£3.9.6**	Carr. 5/6.
GARRARD SP25 De Luxe ..	**£12.10.6.**	Carr. 5/6.
B.S.R. GU7 with unit mounted pickup arm.	**£4.18.8.**	Carr. 5/6.

AUTO CHANGERS

Latest B.S.R. UA25 Super slim **£6. 2.6**

GARRARD 1000 with special Hi-Fi cartridge.. **£6.19.6**

GARRARD AT6....**£9.10.0.** Carr. 6/6 on each.

All the above units are complete with t/o mono head and sapphire styli or can be supplied with compatible stereo head for 12/6 extra.

BRAND NEW CARTRIDGE BARGAINS!

ACOS GP67-1. Mono complete. List price **21/-.** Our price **13/6.** P. & P. 1/-.

BRAND NEW 3 OHM LOUDSPEAKERS

5in., **12/6;** 6½in., **15/-;** 8in., **21/-;** 10in., **25/-;** 7in. x 4in., **15/-;** 10in. x 6in., **26/-.**

E.M.I. 8" x 5" with high flux ceramic magnet, **23/6.**

E.M.I. 13½ x 8in with high flux ceramic magnet, **42/-** (15 ohm, **45/-**). P. & P. 5" 2/-, 6½" & 8" 2/6, 10" & 12" 3/6 per speaker.

SPECIAL OFFER!

Limited number of 12in. 10 watt "R.A." Speakers: 3 ohm **25/-;** 15 ohm, **27/6.** P. & P. 3/6.

E.M.I. PLASTIC CONED TWEETERS. 2½" 3 ohm. Limited number **12/6** each. P. & P. 1/6.

BRAND NEW HEAVY DUTY 12in. SPEAKERS Response 45 c/s-13 Kc/s. 1½in. voice coil. Available in 3 or 15 ohms. Guaranteed full 15 watts British rating. Heavy cast aluminium frame. There are current production by world famous maker and as they are offered well below list price we are not permitted to disclose the name. LIMITED NUMBER ONLY. UNREPEATABLE at **89/6.** P. & P. 5/-. Also 25 watt Guitar Model available at **£5.5.0.** And 35 watt Guitar Model **£8.8.0.**

VYNAIR AND REXINE SPEAKER AND CABINET FABRICS. Approx. 54in. wide. Usually **35/-** yard. OUR PRICE **13/6** per yard length. P. & P. 2/6 (min. one yd.) S.A.E. for samples.

SPECIAL OFFER!

GENUINE HIGH QUALITY TYGAN FABRIC. 48in. wide. Our price **10/-** per foot run. P. & P. 1/6. **30/-** per yard run. P. & P. 2/6.

SEMI SHROUDED DROP THRO' MAINS TRANSFORMER. Tapped pri 200/250 v. Sec. 300-0-300 v. at 110mA. and 6.3 v. at 3 amp. (E/S screen). Stack size 3⅝ x 3⅛ x 1½in. **30/-.** P. & P. 3/6.

MAINS TRANSFORMER. For Transistor power supplies. Pri. 200/240v. Sec. 9-0-9v. at 500mA. **11/-.** P. & P. 2/6.

MAINS TRANSFORMER For transistor power supplies. Tapped pri 200-250v. Sec. 40-0-40 at 1 amp (with electrostatic screen) and 6.3v at .5 amp for dial lamps etc. Drop thro mounting. Stack size 1⅞" x 3⅝" x 3½" **27/6.** P. & P. 4/6.

SMOOTHING CONDENSER. 2800 mfd. 25v. 1¼" dia x 3" high **3/-.** P. & P. 1/-.

MATCHED PAIR OF 2½ WATT TRANSISTOR DRIVER AND OUTPUT TRANSFORMERS. Stack size 1⅛ x 1½ x ⅞in. Output trans. tapped for 3 ohm and 15 ohm output. **10/-** pair plus 2/- P. & P.

7-10 watt OUTPUT TRANSFORMERS to match pair of ECL 86's in push-pull to 3 ohm output. ONLY **11/-.** P. & P. **2/6.**

7-10 watt ULTRA LINEAR OUTPUT TRANSFORMERS to match pair of ECL 82's in push-pull to 3 ohm output. ONLY **15/-.** P. & P. 2/6.

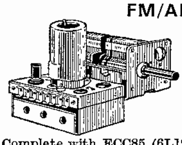
WELL-KNOWN MAKERS SURPLUS!

ONE TRANSISTOR PRE-AMP

Suitable for use with Medium or High Impedance mikes, guitars, gram pickups, tape decks etc; For operation from 200/300 volt H.T. rail or 9 volt battery. Gain approx 14:1. Fully isolated input by Mu-Metal screened transformer. Size 4½" x 1" x 1". Ready built complete with full circuit diagram and instructions. ONLY **15/-.** Post free.

Dual Purpose Bulk Tape Eraser and Tape Head Demagnetiser. 35/-. P. & P. 3/-.

SPECIAL HARVERSON OFFER! FM/AM TUNER HEAD



Beautifully designed and precision engineered by Dormer and Wadsworth Ltd. Supplied ready fitted with twin .0005 tuning condenser for AM connection. Prealigned FM section covers 86-102 Mc/s. I.F. output 10.7 Mc/s. Complete with ECC85 (6L12) valve and full circuit diagram of tuner head. Another special bulk purchase enables us to offer these at **27/6** each. P. & P. 3/-. Order quickly! Limited number also available with precision geared 3:1 reduction drive, **30/-.** P. & P. 3/-.

MATCHED PAIR AM/FM I.F.'s

Comprising 1st I.F. and 2nd I.F. discriminator (465kc/s /10.7Mc/s). Size 1 x 1½ x 2½in. high. Will match above tuner head. **11/-** pair. P. & P. 2/-.

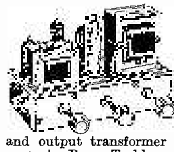
SPECIAL PURCHASE! TURRET TUNERS

By famous maker. Brand new and unused. Complete with PCC84 and PCF80 valves 34-38 Mc/s IF. Biscuits for Channel 1 to 5 and 8 and 9. Circuit diagram supplied. **ONLY 25/-** each. P. & P. 3/9.

GORLER F.M. TUNER HEAD

88-100, Mc/s 10.7 Mc/s I.F., **15/-,** plus 2/- P. & P. (ECC85 valve **8/6** extra).

3-VALVE AUDIO AMPLIFIER MODEL HA34

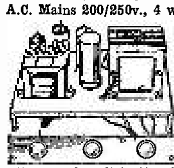


Designed for Hi-Fi reproduction of records. A.C. Mains operation. Ready built on plated heavy gauge metal chassis, size 7½in. w. x 4in. d. x 4¾in. h. Incor. rates ECC83, EL84, EZ80 valves. Heavy duty, double wound mains transformer and output transformer matched for 3 ohm speaker, separate Bass, Treble and volume controls. Negative feedback line. Output 4½ watts. Front panel can be detached and leads extended for remote mounting of controls.

The HA34 has been specially designed for us and our quantity order enables us to offer them complete with knobs, valves, etc., wired and tested for only **£4.5.0** P. & P. 6/-.

HSL 'FOUR' AMPLIFIER KIT

A.C. Mains 200/250v., 4 watt, using ECC83, EL84, EZ80 valves.



● Heavy duty double-wound mains transformer with electrostatic screen. ● Separate Bass, Treble and Volume controls, giving fully variable boost and cut with minimum insertion loss. ● Heavy negative feedback loop over 2 stages ensures high output at excellent quality with very low distortion factor. ● Suitable for use with guitar, microphone or record player. ● Provision for remote mounting of controls or direct on chassis. ● Chassis size only 7½in. wide x 4in. deep. Overall height 4⅞in. ● All components and valves are brand new. ● Very clear and concise instructions enable even the inexperienced amateur to construct with 100% success. ● Supplied complete with valves, output transformer (3 ohms only), screened lead, wire, nuts, bolts, solder, etc. (No extras to buy.) **PRICE 79/6.** P. & P. 6/-.

Comprehensive circuit diagram, practical layout and parts list 2/6 (free with kit).

This kit although similar in appearance to HA34 employs entirely different and advanced circuitry.

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 3-15Ω speaker and 2 independent volume controls, and separate bass and treble controls are provided giving good lift and cut. Valve line-up 2 EL84s, ECC83, EF86, and EZ80 rectifier. Simple instruction booklet 1/6. (Free with parts.) **All parts sold separately.** ONLY **£7.9.6.** P. & P. 8/6. Also available ready built and tested complete with std. input sockets, **£9.5.0.** P. & P. 8/6.

Carrying case for above **28/6.** P. & P. 7/6.

NEON A.C. MAINS INDICATOR. For panel mounting, cut out size 1⅛ x ⅝ x ⅞in. deep in . terminal. White case with lens giving brighter light. For mains 200/250v. **2/6** each. P.P. 6d. (6 or more post free).

Open all day Saturday

Early closing Wed. 1 p.m.

A few minutes from South Wimbledon Tube Station.

HARVERSON SURPLUS CO. LTD.

170 HIGH ST., MERTON, S.W.19 CHErrywood 3985

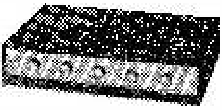
SEND STAMPED ADDRESSED ENVELOPE WITH ALL ENQUIRIES

(Please write clearly)

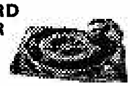
PLEASE NOTE: P. & P. CHARGES QUOTED APPLY TO U.K. ONLY. P. & P. ON OVERSEAS ORDERS CHARGED EXTRA.

HI-FI AMPLIFIERS — TUNERS — RECORD PLAYERS

20+20 STEREO AMP. AA-22U



GARRARD PLAYER AT-60



TRANSISTOR MIXER. MODEL TM-1. A must for the tape enthusiast. Four channels. Battery operated. Similar styling to Model AA-22U Amplifier. Kit **£11.16.6.** Assembled **£16.17.6**

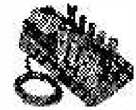
20+20W TRANSISTOR STEREO AMPLIFIER. Model AA-22U. Outstanding performance and appearance. 5 stereo inputs each channel, 20 transistor, 10 diode circuit. Kit **£39.10.0** Assembled **£57.10.0** (Cabinet **£2.5.0** extra).

GARRARD AUTO/RECORD PLAYER. Model AT-60, less cartridge **£13.1.7.** With Decca Deram pick-up **£17.16.1** incl. P.T.

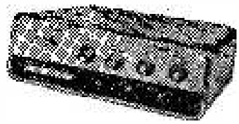
Many other Garrard models available, ask for Lists.

HI-FI MONO AMPLIFIER. Model MA-5. A general purpose 5W Amplifier, with inputs for Gram., Radio. Modern functional appearance. Kit **£11.9.6** Assembled **£15.15.0**

10W POWER AMP. MA-12



9+9W STEREO AMP. S-99



HI-FI MONO AMPLIFIER. Model MA-12. 10W output, wide freq. range, low distortion. Use with control units. Models UMC-1 (Mono) or USC-1 (Stereo). Kit **£12.18.0** Assembled **£16.18.0**

3+3W STEREO AMPLIFIER. Model S-33. An easy-to-build, low cost unit. 2 inputs per channel. Kit **£13.7.6** Assembled **£18.18.0**

DE LUXE STEREO AMPLIFIER. Model S-33H. De luxe version of the S-33 with two-tone grey perspex panel, and high sensitivity necessary to accept the Decca Deram pick-up. Kit **£15.17.6** Assembled **£21.7.6**

HI-FI STEREO AMPLIFIER. Model S-99. 9+9W output. Ganged controls. Stereo/Mono gram, radio and tape inputs. Push-button selection. Printed circuit construction. Kit **£28.9.6** Assembled **£38.9.6**

POWER SUPPLY UNIT. Model MGP-1. Input 100/120V, 200/250V, 40-60 c/s. Output 6·3V, 2·5A A.C. 200, 250, 270V, 120mA max. D.C. Kit **£5.12.6** Assembled **£7.2.6**

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Make the most of your leisure time..

Hear the BBC Stereo FM Programmes

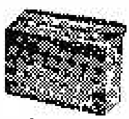
on the TRANSISTOR STEREO FM TUNER

Elegantly designed to match the Stereo Amplifier, AA-22U

Many special features including:—
- ★ Pre-assembled and aligned RF tuning unit.
- ★ 4 stage IF amplifier, Automatic freq. control.
- ★ Printed circuit board, 14 transistor circuit.

Available in two units, sold separately, can be built for a **TOTAL PRICE KIT** (STEREO) **£24.18.0** incl. P.T. Kit (MONO) **£20.19.0** incl. P.T. can be converted to stereo with adaptor, optional extra. Cabinet, optional extra **£2.5.0.** Send for details.

TRANSISTOR RADIOS



Oxford

"OXFORD" LUXURY PORTABLE Model UXR-2. Specially designed for use as a domestic or personal portable receiver. Many features, including solid leather case. Kit **£14.18.0** incl. P.T.

UXR-1

TRANSISTOR PORTABLE. Model UXR-1. Pre-aligned I.F. transformers, printed circuit. Covers L.W. and M.W. Has 7" x 4" loudspeaker. Real hide case. Kit **£12.11.0** incl. P.T.

JUNIOR EXPERIMENTAL WORKSHOP Model EW-1. More than a toy! Will make over 20 exciting electronic devices, incl.: Radios, Burglar Alarms, etc. 72 page Manual. The ideal present! Kit **£7.13.6** incl. P.T.

HIGH PERFORMANCE CAR RADIO, CR-1. Superb LW/MW entertainment, wherever you drive. For 12v pos. or neg. earth systems. Tastefully styled to match any car colour scheme. Many special features. Send for details. Kit (less speaker) **£12.17.0., L/S £1.4.5** extra. Prices incl. P.T.

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TEST INSTRUMENTS

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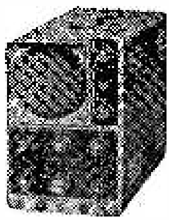
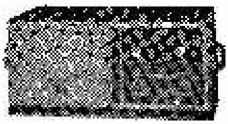
3" LOW-PRICED SERVICE OSCILLOSCOPE. Model OS-2. Compact size 5" x 7⅜" x 12" deep. Wt. only 9¾lb. "Y" bandwidth 2 c/s-3 Mc/s, ±3dB Sensitivity 100mV/cm. T/B 20 c/s-200 kc/s in four ranges, fitted mu-metal CRT Shield. Modern functional styling. Kit **£23.18.0** Assembled **£31.18.0**



OS-2

5" GEN.-PURPOSE OSCILLOSCOPE. Model 10-12U. An outstanding model with professional specification and styling. "Y" bandwidth 3 c/s-4·5 Mc/s ±3dB. T/B 10 c/s-500 kc/s. Kit **£35.17.6** Assembled **£45.15.0**

DE LUXE LARGE-SCALE VALVE VOLTMETER. Model IM-13U. Circuit and specification based on the well-known model V-7A but with many worth-while refinements. 6" Ernest Turner meter. Unique gimbal bracket allows operation of instrument in many positions. Modern styling. Kit **£18.18.0** Assembled **£26.18.0**



VVM, IM-13U

AUDIO SIGNAL GENERATOR. Model AG-9U. 10 c/s to 100 kc/s, switch selected. Distortion less than 0·1%, 10V sine wave output metered in volts and dB's. Kit **£23.15.0** Assembled **£31.15.0**

VALVE VOLTMETER. Model V-7A. 7 voltage ranges d.c. volts to 1,500. A.C. to 1,500 r.m.s. and 4,000 peak to peak. Resistance 0·1 Ω to 1,000MΩ with internal battery. D.C. input resistance 11MΩ. dB measurement, has centre-zero scale. Complete with test prods, leads and standardising battery. Kit **£13.18.6** Assembled **£19.18.6**

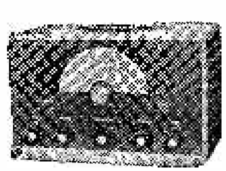
V-7A

MULTIMETER. Model MM-1U. Ranges 0–1·5V to 1,500V a.c. and d.c.; 150μA to 15A d.c.; 0·2Ω to 20MΩ 4½" 50μA meter. Kit **£12.18.0** Assembled **£18.11.6**

RF-1U

R.F. SIGNAL GENERATOR. Model RF-1U. Up to 100 Mc/s fundamental and 200 Mc/s on harmonics. Up to 100mV putput. Kit **£13.18.0** Assembled **£20.8.0**

SINE/SQUARE GENERATOR. Model 1G-82U. Freq. range 20 c/s–1 Mc/s in 5 bands less than 0·5% sine wave dist. less than 0·15μ sec. sq. wave rise time. Kit **£25.15.0** Assembled **£37.15.0**



IG-82U

TRANSISTOR POWER SUPPLY. Model IP-20U. Up to 50V, 1·5A output. Ideal for Laboratory use. Compact size. Kit **£35.8.0** Assembled **£47.8.0**

Prices and specifications subject to change without notice

TAPE AMPLIFIERS — TAPE DECKS — CONTROL UNITS

FM TUNER FM-4U

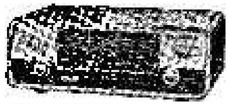
STUDIO-MATIC DECK

HI-FI FM TUNER. Model FM-4U. Available in two units. R.F. tuning unit (£2.15.0 incl. P.T.) with I.F. output of 10·7 Mc/s and I.F. amplifier unit, with power supply and valves (£13.13.0). For free standing or cabinet mounting. Total Kit **£16.8.0**
(Multiplex adaptor available, as extra).

STUDIOMATIC "363" TAPE DECK. The finest buy in its price range. Operating speed: $1\frac{7}{8}$", $3\frac{3}{4}$" and $7\frac{1}{2}$" p.s. Two tracks, "wow" and "flutter" not greater than 0·15% at $7\frac{1}{2}$" p.s. **£13.10.0**
With TA-1M Tape Pre-amplifier kit **£31.5.6**

HI-FI AM/FM TUNER. Model AFM-1. Available in two units which, for your convenience, are sold separately. Tuning heart (AFM-T1—£4.13.6 incl. P.T.) and I.F. amplifier (AFM-A1—£22.11.6). Printed circuit board, 8 valves. Covers L.W., M.W., S.W., and F.M. Built-in power supply. Total Kit **£27.5.0**
(Multiplex adaptor available, as extra).

TRUVOX DECK



AM/FM TUNER

TRUVOX D-93 TAPE DECKS. High quality stereo/mono tape decks.
D93/2, $\frac{1}{4}$ track, **£36.15.0** **D93/4,** $\frac{1}{2}$ track, **£36.15.0**

TAPE RECORDING/PLAYBACK AMPLIFIER.
Mono Model TA-1M Kit **£19.18.0** Assembled **£28.18.0**
Stereo Model TA-1S Kit **£25.10.0** Assembled **£35.18.0**
MULTIPLEX ADAPTOR KIT, SD–1. Fully transistorised. Self powered. Ideal for use with models FM-4U and AFM-1
Kit **£8.10.0** Assembled **£12.5.0**

MONO CONTROL UNIT. Model UMC-1. Designed to work with the MA-12 or similar amplifier requiring 0·25V or less for full output. 5 inputs. Baxandall type controls. Kit **£9.2.6** Assembled **£14.2.6**

STEREO CONTROL UNIT. Model USC-1. Push-button selection accurately matched ganged controls to ±1dB. Rumble and variable low pass filters. Printed circuit boards. Kit **£19.19.0** Assembled **£27.5.0**

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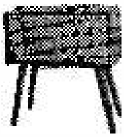
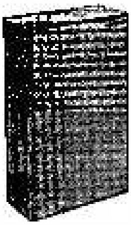
Heathkit DAYSTROM

SPEAKER SYSTEMS



SSU-1



Berkeley

HI-FI SPEAKER SYSTEM. Model SSU-1. Ducted-port bass reflex cabinet "in the white". Two speakers. Vertical horizontal models with legs, Kit **£12.12.0,** without legs, Kit **£11.17.6** incl. P.T.

The **BERKELEY SLIM-LINE SPEAKER SYSTEM,** fully finished walnut veneered cabinet for faster construction. Special 12" bass unit and 4" mid/high frequency nnit. Range 30-17,000 c/s. Size 26" x 17" only $7\frac{3}{8}$" deep. Modern attractive styling. Excellent value.
Kit **£19.10.0** Assembled **£24.0.0**

COTSWOLD SPEAKER SYSTEMS. Outstanding performance for price.
MFS: Size 36" x $16\frac{1}{2}$" x 14" deep.
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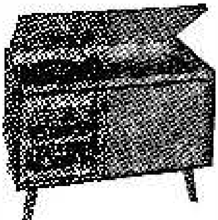
STANDARD: Size 26" x 23" x $14\frac{1}{2}$" deep.
Kit **£25.12.0** Assembled **£33.17.0**

HI-FI CABINETS

A wide range available including kits, ready assembled cabinets or assembled and fully finished cabinets, for example:

GLOUCESTER. Kit **£18.10.0** incl. P.T.
MALVERN. Kit **£18.1.0** incl. P.T.
CHEPSTOW. Kit **£11.18.6** incl. P.T.



Malvern

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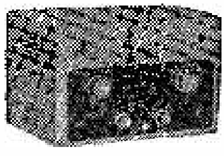
DAYSTROM LTD **Dept. P.W.—12 GLOUCESTER**

"AMATEUR" EQUIPMENT

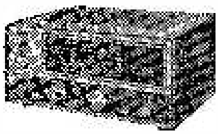
80-10m TRANSMITTER, DX-40U. Power inputs 75W. C.W., 60W peak CC phone. Output 40W tp aerial. Provision for VFO.
Kit **£29.19.0** Assembled **£41.8.0**



DX-40U

SSB ADAPTOR, SB-10U
Kit **£39.5.0** Assembled **£54.18.0**

AMATEUR BANDS RECEIVER Model RA-1. To cover all the Amateur Bands from 160-10 metres. Many special features, including: half-lattice crystal filter; 8 valves; signal strength "S" meter; tuned R.F. Amp. stage.
Kit **£39.6.6** Assembled **£52.10.0**

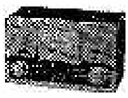


RA-1

160-10M TRANSMITTER. Model DX-100U. Careful design has achieved high performance and stability. Completely self-contained.
Kit **£81.10.0** Assembled **£106.15.0**

COMMUNICATIONS TYPE RECEIVER. Model RG-1. A high performance, low cost receiver for the discriminating listener. Frequency coverage: 600 kc/s–1·5 Mc/s and 1·7 Mc/s–32 Mc/s.
Kit **£39.16.0** Assembled **£53.0.0**

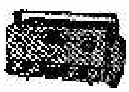
REFLECTED POWER METER and SWR BRIDGE. Model HM-11U. Indicates reliably but inexpensively, whether the RF power output of your TX is being transferred efficiently to radiating antenna. Kit **£8.10.0** Assembled **£10.15.0**



HM-11U

OUTSTANDING "AMATEUR" EQUIPMENT
A wide range of American Amateur SSB equipments is now available in the U.K. Why not send for full details of range, for example:

FILTER TYPE SSB TRANSCEIVERS
Models for 80, 40 or 20 metre bands.
Model HW-12 (80M) **£67.10.0** Kit.
Model HW-22 (40M) } **£66.0.0 each kit.**
Model HW-32 (20M) } price inc. duty, etc.



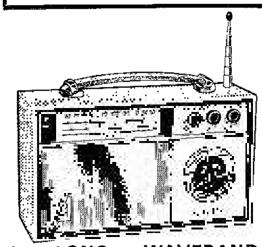
80M Transceiver HW-12

Without obligation please send me (Tick here)
FREE BRITISH HEATHKIT CATALOGUE........................ ☐
FULL DETAILS OF MODEL(S).. ☐
(*Please write in BLOCK CAPITALS*)
NAME ....
ADDRESS...
.... **DEPT. P.W.12**

LASKY'S RADIO — FOR THE FINEST VALUE AND TO HOME CONSTRUCTORS

TRANSISTOR PORTABLES

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



THE SKYROVER De Luxe

7 transistor plus 2 diode superhet, 6 waveband portable receiver covering the full Medium Waveband and Short Waveband 31-94M and also 4 separate switched bandspread ranges, 13M., 16M., 19M., and 25M., with Band Spread Tuning for accurate Station Selection. The coil pack and tuning heart is completely factory assembled, wired and tested. The remaining assembly can be completed in under three hours from our easy to follow, stage by stage instructions. Superhet, 470 Kc/s. All Mullard Transistors and Diode. Uses 4 U2 batteries. 5in. Ceramic Magnet P.M. Speaker. Easy to read Dial Scale, 500 MW Output. Telescopic Aerial and Ferrite Road Aerial. Tone Circuit is incorporated, with separate Tone Control in addition to Volume Control. Tuning Control and Waveband Selector. In a wood cabinet, size 11½ x 6½ x 3in. covered with a washable material, with plastic trim and carrying handle. Car aerial socket fitted.

Can now be built for **£8 . 19 . 6** Post 5/- extra

H.P. Terms: **45/-** deposit and 11 monthly payments of **14/2.** Total **H.P.P. £10.0.10**

★ LONG WAVEBAND COVERAGE IS NOW AVAILABLE FOR THE SKYROVER

A simple additional circuit provides coverage of the 1100/1950M. band (including 1500M. Light programme). This is in addition to all existing Medium and Short wavebands. All necessary components with construction data.

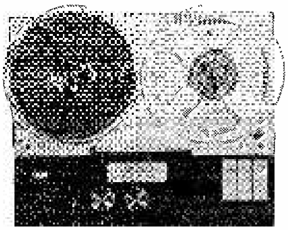
Only **10/-** extra Post Free.

This conversion is suitable for receivers that have already been constructed.

Data 2/6 extra: Refunded if you purchase the parcel. **Four U2 batteries 3/4 extra.**
All components available separately.

TAPE RECORDERS

MAGNAVOX-COLLARO 363 TAPE DECKS



The very latest 3 speed model—1⅞, 3¾, 7½ ips, available with either ½ track or ¼ track head. Features include: pause control; digital counter; fast forward and rewind; new 4 pole fully screened induction motor, interlocking keys. Size of top plate 13½ x 11in. x 5¼in. deep below unit plate. For 200/250v. A.C. mains, 50 cps operation. New, unused and fully guaranteed.

Lasky's Price ½ track model **£10.10.0**
Lasky's Price ¼ track model **£13.9.6**

Carriage and Packing 7/6 extra.

NEW MARTIN TAPE RECORD/REPLAY AMPS.

Now available from stock—for use with the Magnavox 363 Tape Deck.

½ track model............. LASKY'S PRICE **£14.19.6** Carriage and
¼ track model............. LASKY'S PRICE **£15.19.6** Packing 4/6 extra.

Optional extra: Control panel escutcheon to take deck and amplifier controls.
LASKY'S PRICE **12/6** Post & Packing 2/6.

INTERNATIONAL TAPE — Famous American Brand—Fully Guaranteed

3in.	Message tape, 150ft.	2 6	5¾in.	Long play, 1200 ft. Acetate	12 6
3in.	Message tape, 225ft.	3 9	5¾in.	Standard play, 850ft. PVC	11 6
3in.	Message tape, 300ft.	7 6	5¾in.	Long play, 1200ft. Mylar	15 0
3¼in.	Triple play, 600ft. Mylar	10 0	5¾in.	Triple play, 2400ft. Mylar	45 0
4in.	Triple play, 900ft. Mylar	17 6	7in.	Standard play, 1200ft. Acet.	12 6
5in.	Double play, 1200ft. Mylar	15 0	7in.	Standard play, 1200ft. Mylar	12 6
5in.	Long play, 900ft. Acetate	10 0	7in.	Long play, 1800ft. Mylar	19 6
5in.	Standard play, 600ft. PVC	8 6	7in.	Double play, 2400ft. Mylar	25 0
5in.	Triple play, 1800ft. Mylar	35 0	7in.	Long play, 1800ft. Acetate	15 0
5¾in.	Double play, 1800ft. Mylar	22 6	7in.	Triple play, 3600ft. Mylar	50 0

P. & P. 1/- extra per reel. 4 reels and over Post Free
Full range of Philips prerecorded cassettes—send S.A.E. for list.

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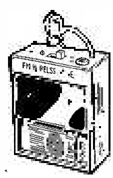
THE VERY LATEST MARVELS OF ELECTRONIC MINIATURISATION

THE TTC MODEL B4002 FM WIRELESS MICROPHONE



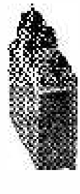
Highly sensitive—suitable for either static or mobile use. Signals can be picked up by any FM radio or tuner which receives frequencies between 96—104 Mc/s over several hundred yards. Size only 3 x 2½ x 1in. (in leather case). Operates in one PP3 type battery. Complete with neck cord, clip on dynamic extension mike (½ x ¾ x 5/16in.!) and battery. **LASKY'S PRICE 14 Gns.** Post Free anywhere in world.

THE TTC MODEL 13/500. More powerful version of above—size 4 x 1 x 1in. Operates on one PP3 type battery. **LASKY'S PRICE 16 Gns.** Post Free anywhere in world.

CONSTRUCTORS BARGAINS

SPECIAL PURCHASE—UHF/VHF TV TUNERS

Well known British makers surplus stocks. Now available for the first time to the Home Constructor. **Add 2/6 Post and Packing on each.**



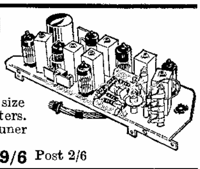
TRANSISTORISED UHF MINIATURE MODEL
Shielded metal case only 3¾ x 1¾ x 3in. Fully tunable—complete with two AF139 transistors. LASKY'S PRICE **39/6**

VALVE UHF MODEL (illustrated)
In metal case size 4 x 6 x 1¾in. Fully tunable—complete with PC86 and PC88 valves. LASKY'S PRICE **29/6** Without valves **12/6**

TRANSISTORISED VHF MODEL 1
Miniature turret type fitted with 12 sets of coils and 3 Mullard AF102 transistors. In metal case size 4 x 2 x 3¾in. LASKY'S PRICE **29/6**

TRANSISTORISED VHF MODEL 2
Sub-Miniature turret type fitted with 12 sets of coils and 3 Mullard AF102 transistors. In metal case size 3 x 1½ x 2¼in LASKY'S PRICE **37/6**

MAKER'S SURPLUS TELEVISION IF AMPERES

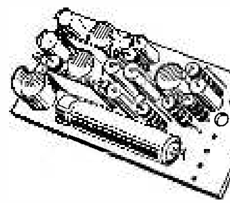


38 Mc/s. Contains a large number of components, IF transformers, resistors, capacitors etc., and the following valves: 2 x PCF80, 1 x EB91, EF80, EF183 and EF184. Overall size 11½ x 3½ x 4in. deep. Ideal for servicemen and experimenters. This IF amp. when used with the valve model UHF tuner (above) provides a suitable conversion for BBC2.
No circuit available. LASKY'S PRICE **39/6** Post 2/6

SPECIAL PACKAGE BARGAIN OFFER!

Free standing table cabinet, size 19½ x 9 x 5¼in., finished in medium Mahogany. Scale marked 21 to 68 (UHF band). Designed to accept the above IF Amplifier with space for a Valve UHF Tuner.
Special Package Offer: IF Amplifier, UHF Tuner with valves and Table Cabinet
LASKY'S PACKAGE PRICE **89/6**
Post & Packing 6/-

NEW—LASKY'S MINIATURE TRANSISTOR AMPLIFIER MODULES



Incorporating the very latest circuitry to provide high sensitivity and good quality in conjunction with extreme small size and compactness. High quality Newmarket transistors used throughout. All designed to operate on 9v. miniature battery.
Add 1/- on each for Post and Packing.

TYPE LRPC 1. 3 transistor. Input sens. 50mV, output 150mW, output imp. 40 Ω, 2 x 1 x ⅝in. .... PRICE **27/6**

TYPE LRPC 2. 5 transistor. Input sens. 1mV, output 330mW, output imp. 15 Ω, size 2½ x 1½ x ⅝in. .... PRICE **22/6**

TYPE LRPC 3. 5 transistor. Input sens. 5mV, output 400mV, output imp. 15 Ω, size 2¼ x 1½ x ⅝in. .... PRICE **25/-**

TYPE LRPC 4. 5 transistor, Input sens. 150mV, output 330mW, output imp. 15 Ω, size 2½ x 1½ x ⅝in. .... PRICE **22/6**

TYPE LRPC 5. 6 transistor. Input sens. 8mV, output 3W, output imp. 3 Ω, size 5¼ x 1¾ x 1in. .... PRICE **59/6**

FULLY ENCAPSULATED MODULES
Special function modules—all one size 1¾ x 1 x 1¼in. Complete with detailed function and installation instructions. Send S.A.E. for specification sheets.

TYPE PA-1. Public address amp. for use with carbon, crystal or Dynamic microphones. 3 Ω output imp. .... PRICE **30/-**

TYPE GR-1. Gramophone amp.—provides sufficient power to fill average room. 3 Ω output imp. .... PRICE **30/-**

TYPE CO-1. Morse code practice oscillator—for use with morse key and 3 Ω speaker. PRICE **20/-**

TYPE MT-1. Metronome module—provides audible and visual beat from 30 to 240 beats per minute (for use with 3 Ω speaker or indicator lamp). .... PRICE **22/6**

GORLER UT 340 FM/VHF TUNING HEART

Permeability tuned—covering 87 to 108 Mc/s. For use with one ECC85 valve. In metal case, size 3 x 2½ x 1½ in. Circuit supplied.
LASKY'S PRICE **15/11** Post 2/-. ECC85 valve **9/-** extra.

TRANSISTORS — ALL BRAND NEW AND GUARANTEED

GET 81, GET 85, GET 86 **2/6**; 873A, 874P **3/6**; OC45, OC71, OC81D **4/6**; OC44, OC70, OC76, OC81 **5/6**; (match pair **10/6**); AF117, OC200 **6/6**; OC42, OC43, OC73, OC82D **7/6**; OC201, OC204 **15/-**; OC205, OC206 **19/6**; OC28 **24/6**; OC75 **8/-**.

TRANSFILTERS by BRUSH CRYSTAL CO., Available from stock.

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TO—01D 470 kc/s. ± 2 kc/s.
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TO—02D 470 kc/s. ± 1 kc/s.
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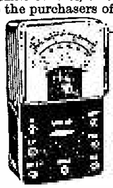
Complete Amplifier Kit comprising E.C.L. 82 Mains transformer, metal rectifier, volume control, smoothing condenser, metal chassis, speaker, etc. To the purchasers of the above changer only **19/6** plus 3/- P. & P.



POCKET MULTI-METER

Size $3\frac{7}{8}$ x $2\frac{1}{8}$ x $1\frac{3}{8}$in. Meter size $2\frac{1}{8}$ x $1\frac{3}{8}$in. Sensitivity 1,000 O.P.V. on both A.C. and D.C. volts. 0115, 0·150 0·1,000. D.C. current 0·150mA. Resistance 0·100kΩ. Complete with test prods, battery and full instructions, **42/6**. P. & P 3/6. **FREE GIFT** for limited period only. 30 watt Electric Soldering Iron value **15/-** to every purchaser of the Pocket Multi-Meter.

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£11.11.0 plus 9/-. P. & P.

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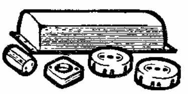

Incorporating **GEC** Choke size $8\frac{1}{4}$in. x $1\frac{3}{4}$in. x $1\frac{3}{4}$in., 2 bi--pin holders. starter and starter-holder. P. & P. 5/6. **11/6**

Similar to above: 80W. Fluorescent Light Kit incorporating **GEC** choke size $11\frac{3}{4}$in. x $1\frac{3}{4}$in. x $1\frac{3}{4}$in. 2 bi-pin holders, P. & P. 6/6 starter and starter holder. **17/6**

Twin 40W Choke instant start for 2 x 2ft. tubes **17/6**. P. & P. 5/6.

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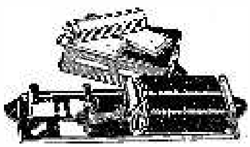
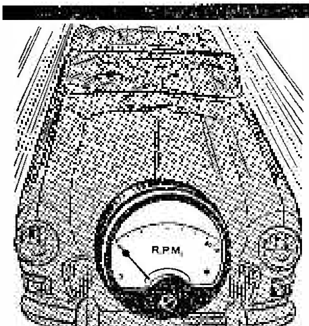
Incorporating "C" core type mains transformer, full wave metal rectification and smoothing condenser. Smooth output 250 v. 250 ma and 6·3 v. 4 amp. for Heaters.

25/- P. & P. 9/6



MOTORISTS!



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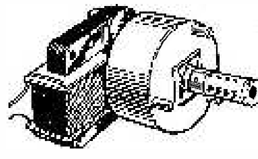
PRICE £4.4.0

P. & P. 3/-



Type E MOTOR

Small A.C. mains motor 230/250 volts complete with gearbox. **6** r.p.m. Price **15/-** plus 4/-. P. & P.

Similar to above motor but without gearbox. Price **9/6** plus 3/-. P. & P.

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$5\frac{3}{4}$in.	Std.	850ft.	..	9/-	5in.	L.P.	850ft.	..	10/6
7in.	Std.	1200ft.	..	11/6	3in.	T.P.	600ft.	..	10/6
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7in.	L.P.	1800ft.	..	18/6	7in.	T.P.	3600ft.	..	42/6
$5\frac{3}{4}$in.	D.P.	1800ft.	..	18/6	4in.	T.P.	900ft.	..	15/-

P. & P. on each 1/6, 4 or more post free.

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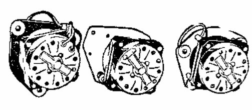

Set of three Tape Deck Motors 240V. A.C. Three motors **49/6**. P. & P. 6/-.

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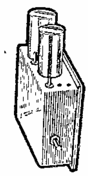

Complete with PC.88 and PC86 Valves. Full variable tuning. New and unused. Size $4\frac{1}{2}$ x $5\frac{1}{2}$ x $1\frac{1}{2}$in. Complete with circuit diagram. **35/-** plus 3/6 P. & P.

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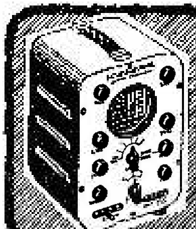

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Push-pull X amplifier: Flyback suppression: Internal Time-base Scan Wave form available for external use: pulse output available for checking TV line O/P Transformers, etc. Provision for external—I/P and C.R.T. Brightness Modulation. A.C. mains 200/250 v. **£18/18/-**. P. & P. 10/-.

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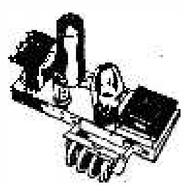

Comprising chassis $8\frac{3}{4}$in. x $2\frac{1}{2}$in. x 1in. Double wound mains transformer output transformer. Volume and tone controls, resistors, condensers, etc. 6V6, ECC81 and metal rectifier. Circuit 1/6 free with kit, **29/6** plus 5/6 P. & P. The above Amplifier built and tested, **10/6** extra.

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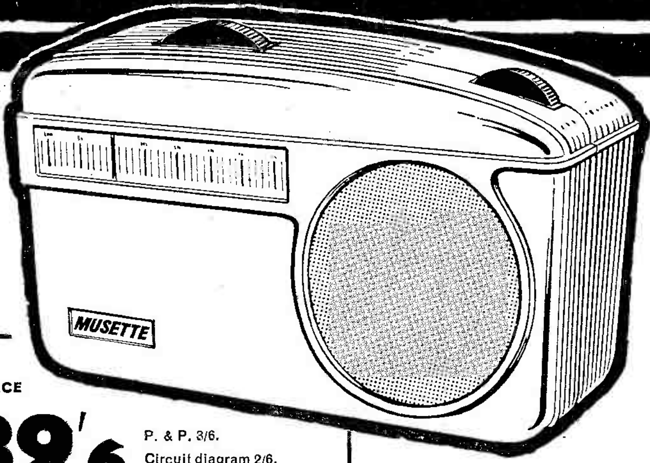

- $2\frac{1}{4}''$ Speaker.
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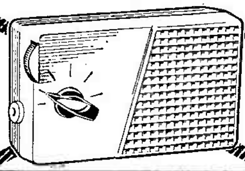

Size $5\frac{1}{2}'' \times 3\frac{1}{4}'' \times 1\frac{1}{2}''$. For IF and RF alignment and AF output 700 c/s frequency coverage 460 Kc/s to 2 Mc/s in switched frequencies. Ideal for alignment to our Elegant Seven and Musette. Built and tested. **39/6** P. & P. 3/6

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★ De luxe grey wooden cabinet size $12\frac{1}{2}'' \times 8\frac{1}{2}'' \times 3\frac{1}{2}''$.
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★ Parts list and circuit diagram 2s. 6d., free with parts. Price **£4.4.0** + 7s. 6d. postage and packing.

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Plus 7/6 P. & P. Parts List and circuit diagram 2/6 FREE with parts.

POWER SUPPLY KIT
To purchasers of 'Elegant Seven' parts, incorporating mains transformer, rectifier and smoothing condenser, A.C. mains 200/250 volts. Output 9v 100mA. 7s. 6d. extra.

SPECIAL OFFER For one month only, R. & A. 7″ x 4″ 9000 lines P.M. Speaker at no extra charge.

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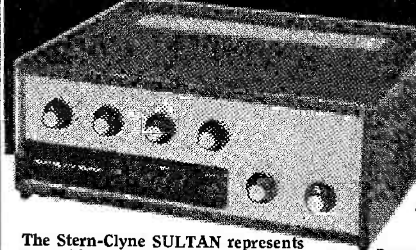
MEMBER OF THE PANTIYA GROUP OF COMPANIES

Announcing the stern-clyne SULTAN Solid State Integrated Stereo Amplifier



The Stern-Clyne SULTAN represents a considerable advance in solid-state, high fidelity stereo amplifiers. Outstanding performance is allied to meticulous construction, comprehensive facilities, installation simplicity, and attractive functional styling.
SULTAN performance is a natural result of superb design incorporating the most advanced fully proved semi-conductors, and modular substage construction that permits searching quality control and precise matching at every stage of assembly. Particular attention has been given to the provision of all the additional input, output, and power take-off facilities ever likely to be required. The compact sized, craftsman finished teak cabinet and restrained styling ensures unobtrusive, harmonious matching with almost any decor.

38 Gns. Complete. Carriage & Insurance **8/6**

SPECIFICATION & PERFORMANCE

Power Supply	A.C. only. 200-250V, 50—60 c/s. (Alternative ratings to special order)
Power Consumption	48 watts maximum.
Power Output	13 watts per channel RMS into 15 ohm load. Combined channels 20 w.
Speaker Matching	8-16 ohms (for 3-5 ohms use 2/3 ohm wire wound resistors in series with each L/S.
Distortion	Total harmonic distortion less than ·25% at full output.
Frequency Response	at 1 watt ± 2 dB, 30-25,000 c/s. at 10 watts ± 3 dB, 40-15,000 c/s.
Cross Talk	Better than 50 dB at 18 Kc/s.
Hum and Noise	Better than 52 dB below full output.
Inputs;	P.U.1. 3·5 mV. 47K ohms impedance } RI.A.A. compensated
	P.U.2. 20 mV, 47K ohms impedance } RI.A.A. compensated
	Radio 100mV, 220K ohms impedance—Flat
	Tape 100mV, 220K ohms impedance „
	Aux. 250mV, 430K ohms impedance „
	Aux. 250mV, 430K ohms impedance „
Dimensions	13" x 11" x 5½" Panel 12" x 4"
Bass Control	Boost 14 dB at 40 Kc/s. Cut 15 dB at 40 Kc/s.
Treble Control	Boost 12 dB at 14 Kc/s. Cut 18 dB at 14 Kc/s.

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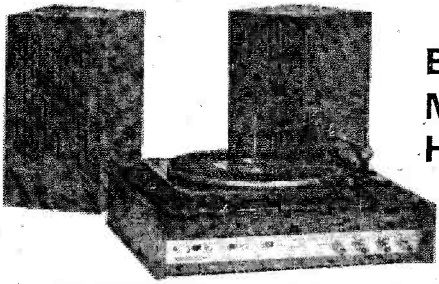
- TENSILIZED—prestretched, extra strong.
- Full frequency spectrum response.
- Guaranteed playing times.

STERN-CLYNE make huge bulk purchases of recording tapes from the world's biggest manufacturers—and hand on the enormous price advantage to their customers. The quality is unequalled: Tensilized to ensure the most permanent type of base. Highly resistant to breakage, moisture, heat, cold or humidity. Highly polished, splice-free finish. Smooth output throughout entire audio range. Ideal for your most treasured recordings.

TENSILIZED P.V.C.				
3in.	250ft. Long Play	.. ..	5	6
5in.	600ft. Standard	.. ..	8	6
5in.	900ft. Long Play	.. ..	10	0
5¾in.	1,200ft. Long Play	.. ..	12	6
7in.	1,200ft. Standard	.. ..	12	6
7in.	1,800ft. Long Play	.. ..	15	0
TENSILIZED POLYESTER				
3¼in.	600ft. Double Play	.. ..	11	6
5in.	1,200ft. Double Play	.. ..	15	0
5¾in.	1,800ft. Double Play	.. ..	22	6
5¾in.	2,400ft. Triple Play	.. ..	37	6
7in.	2,400ft. Double Play	.. ..	25	0
7in.	3,600ft. Triple Play	.. ..	50	0

MERCURY

BRILLIANT NEW MODULAR HI-FI STEREO



With Garrard Autochanger, Solid State Amplifier, Free-Cone Speaker Systems

The Stern-Clyne Mercury is an important new approach to Hi-Fi sound reproduction in the home. One compact, modular system embodies the latest advances in solid-state amplifier design, loudspeaker system miniaturization, and pick-up cartridge development to provide superb stereo performance with exceptional installation facility. Combined Player Unit/Amplifier Console and identical speaker systems are superbly housed in matching teak veneer cabinets, specially designed to fit existing furniture or shelf space, and match any decor.

MERCURY SYSTEM

AUTOCHANGER AND PICK-UP Garrard High-grade, Model 3000, specially equipped with high-compliance, ceramic cartridge fitted with Diamond stylus to ensure superb, wide range reproduction, and extremely low tracking weight.
AMPLIFIERS Identical, 5-watt, 7-transistor amplifiers designed round the latest, fully-proved semi-conductors. Each is independently constructed on a modular circuit board and subjected to searching inspection and precise matching at each stage of assembly.
LOUDSPEAKER SYSTEMS Bookshelf size, acoustically designed speaker system enclosures contain bass speakers and matching high frequency units with crossover network. Specially developed bass speaker employs enormously powerful magnet and free suspension cone to provide the full blooded bass response usually associated with much larger units.

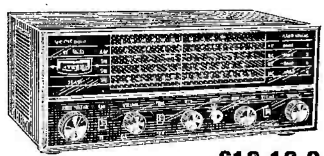
49 GNS. COMPLETE Carr. and Ins. **15/-**

SPECIFICATION

Power Supply 200/250 volts. 50 cycles AC (other standards to special order)
Output (Amplifiers) 5 watts per channel
Output Impedance 15 ohms (other speakers of 8 to 16 ohms may be used)
Frequency Response (Amplifiers) 30 c/s to 35 kc/s flat (2 dB) at 1 watt, tone controls level
Harmonic Distortion Less than 1%
Hum and Noise —55 db below full output, tone controls level
Cross talk between channels 48 dB at 1 kc/s.
Bass Compensation ± 15 dB at 40 c/s.
Treble Compensation ± 15 dB at 14 kc/s.
Balance Control Ganged potentiometer; either channel can be faded to zero without affecting the other.
Tape Record Outlets 200 mV average, each channel
Dimensions—Player Unit 16½ x 14 x 8½ in. overall
Loudspeakers 13 x 7 x 8 in. (each).

ONLY FROM STERN-CLYNE

CR150 COMMUNICATIONS RECEIVER



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Carriage and Insurance 15/-

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PRACTICAL WIRELESS

VOL 42 No 8

issue 718

DECEMBER 1966

TOPIC OF THE MONTH

Who's for Hertz?

GAD, Sir! Let's send a gunboat down the Rhine and subdue those followers of Heinrich Rudolph Hertz! How dare they threaten our homely c/s!

The term Hertz (Hz), used in Europe as the unit of frequency, has lately been promoted for more widespread acceptance. The situation at the moment, if you'll pardon the expression, is flux. The British technical press is divided, as is that of America, but the amateur radio movement and press appear to favour the older terminology.

There is little guidance from officialdom. The British Standards Institute have made no proclamation, nor have the ITU Radio Regulations been amended. No doubt future committees will sit and—as seems likely—declare for conversion to Hz.

Reasons for the change are (a) to tie in with Continental nomenclature and (b) to honour the name of Hertz. Standardisation is usually desirable in technical fields but with the prospect of decimal coinage, *mm* for inches, *gm* for those fine old English lbs, CCIR standards for u.h.f. TV, etc., some patriots feel that things have gone far enough. They wonder if, one day, the M1 will be renamed Autobahn 1, Scotland Yard becomes the Surette, "Practical Wireless" will cost 1½ Swiss francs and London is known as Londres, in the interests of unification.

As for perpetuating the name of Hertz, why stop there? Casting around in radio's past will land a healthy catch of other worthy but unsung heroes. Why not start again and concoct an entirely new set of technical units to satisfy all national honours? There are also many untapped areas for *new* units. Instead of expressing Wow, Flutter and Distortion as percentages we could devise a scale of units, to be called respectively, say, Dollys, Littlewoods and Beatles. The possibilities are boundless.

As for changing c/s to Hz, this seems to be utterly unnecessary. "Cycles per second" is an exact specification, whereas Hertz is meaningless without qualification. One might as well abolish the gramophone disc r.p.m. for "Berliners", i/s of tape speed for "Pfleumers" and m.p.h. for "Fords".

So for the moment we are sticking to old-fashioned c/s—at least until a change seems universally acceptable or until the Electricity Boards begin supplying 50Hz mains! W. N. STEVENS, Editor

NEWS AND COMMENT

CONSTRUCTIONAL

GENERAL ARTICLES

JANUARY ISSUE WILL BE PUBLISHED ON DECEMBER 8th

Lafayette Receivers

I THINK your readers should be made aware how difficult it is to obtain spares for some of the American built receivers that are extensively advertised and sold in this country.

I purchased an H.E.30 communications receiver some time ago and recently wanted one or two parts which are special to the receiver. I have written twice to the Lafayette Radio Corporation, in New York, asking for the name of a spares supplier in this country, without success.

It is thus assumed that no spares facilities exist in this country (having not received a reply to either of my letters) and that one has to obtain them direct from the States. From my experience in trying to obtain a manual for this receiver (costing approximately 10s. plus 14s. for postage and insurance), it is obvious to me that the purchase of any foreign set is an uneconomical proposition.

My receiver remains silent.

H. C. Pryse. Weybridge, Surrey.

Short Wave Receiver

BEING interested in S.W.L. for some time, I decided to build the "valve-base coil" short wave receiver (P.W. July 65) and found it necessary to have a twin gang 300 + 300 p.F. tuning capacitor using one gang as described in the text and the other gang with a coil of the same number of turns used in L1 across it with the aerial side of it going to pin 2 of V1.

I would like to hear from other readers who have built this set, and whether they had to do the same.

P. Blanchard. 8 Bircham View, Goosewell Hill, Eggbuckland, Plymouth.

Converting the R1392

WITH reference to my article in the November issue page 502, I notice three errors.

Line 7 first paragraph should read $\text{f xtal} = \dfrac{\text{f signal—I.F. Mc/s.}}{18}$ In Fig. 2 the power supply lead marked "H.T.+ve to pin 9 . . ." etc., should read "H.T.−ve to pin . . ." etc., although anyone looking at the circuit will realise that the lower H.T.+ve should read H.T.—ve. Also in Fig. 2, R5 should be in series with V2 (OA2).

C. G. Elliott, G8ADP. Devon.

NEWS AND..

NEW CORRESPONDENCE CENTRE

The Aldermaston Court Centre for Adult Education was officially opened recently by Sir Arnold Lindley, Chairman of the Engineering Training Board. This historic place now houses the modern and efficient machinery for providing correspondence courses varying from the ever popular G.C.E. "O" and "A" levels up to and including degree level. In fact 1,000 different courses are currently available.

The intake of the centre now tops twenty thousand a year, and over 2,000 letters and enquiries are answered every week. This is by no means restricted to Britain, and overseas lessons are shipped out at a rate of five tons per month.

This correspondence college embraces many of the well-known names: The British Institute of Engineering Technology; School of Careers; Press Art School, to name just a few.

There is no doubt that all these colleges, which come within the Cleaver-Hume Group, are extremely capable and well-organised. One room at the centre contains some three million lessons ready printed and our guide explained that these were "kept warm" to avoid any suspicion of paper deterioration.

The preparation of a course is a specialised business. First a panel of consultants is formed to prepare the syllabus. Once this is agreed, experts are approached to select text books, prepare lessons complete with test questions and model answers. The proposed course is then vetted and edited by experts in correspondence tuition. When the consultant panel is satisfied completely, the lessons and model answers are prepared for printing.

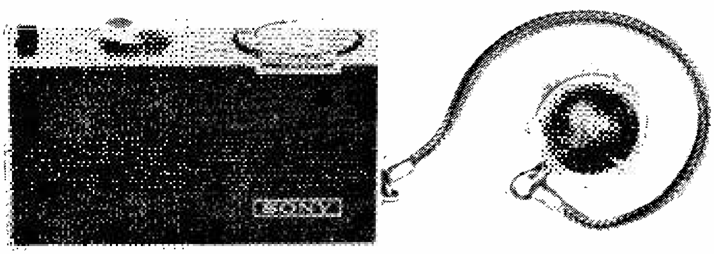
One of the courses examined at random was "Technical Mathematics", the subject—logarithms. The style and presentation was clear and lucid, but perhaps the most pleasing thing was the number of examples given; fifteen in fact. In the majority of text books only a couple of worked examples are included followed by numerous test questions.

£1·1M AUTOMATIC WEATHER SYSTEM ORDER

The Marconi Company is to supply the Royal Swedish Air Force with an automatic meteorological system to process weather information received from ground stations, weather ships and weather satellites. The system is scheduled to be in operation by 1969.

POCKET RADIO WITH INTEGRATED CIRCUIT

This small Sony radio is of integrated design. In fact all the components (9 transistors 4 diodes 14 resistors and several inductors) are incorporated in a small silicon chip measuring 1·5mm. × 2·25mm. The overall dimensions of the receiver are: 1·25 × 2·3 × 0·7in.; weight is 105gm. Maximum audio output is quoted as 70mW. The address of Sony U.K. Sales is 70–72 Welbeck Street, London, W.1. (Tel. WELbeck 3546).



The integrated Circuit used in this receiver, has 9 transistors, 4 diodes, 14 resistors, and the size is 1·5 mm. × 2·25 mm.

...COMMENT

B.S.R. WINS GOLD MEDAL AT LEIPZIG FAIR

B.S.R. Ltd. of Old Hill, Staffordshire, won a Gold Medal for the UA50 Mini-Changer which is claimed to be the smallest portable record changer in the world.

Altogether, 53 Gold Medals and Diplomas were awarded at this Fair. Nearly 300 firms from 25 countries submitted products for examination by scientific and technical experts.

NEW MODELS FROM HEATHKIT

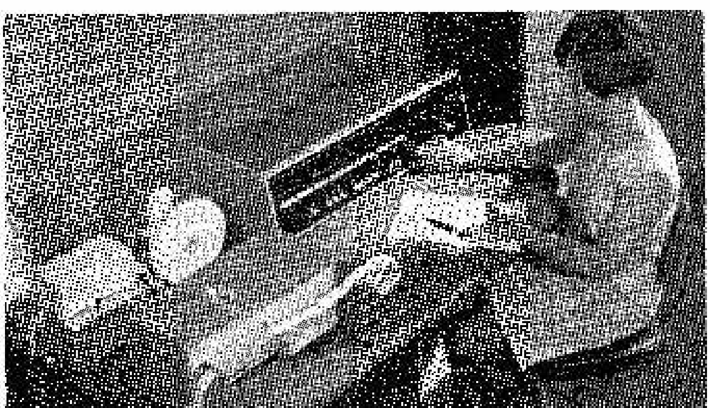
Two new kits are announced by Daystrom Ltd. in their Heathkit *range. Model CR-1 is a high performance car radio covering m.w. and l.w. available as a kit for £12.17.0 (loudspeaker extra).*

Model SD-1 is a welcome addition to the range. It is a transistor f.m. stereo decoder which although designed for use with the existing Heathkit *tuners can also be used with most other f.m. tuners with facilities for multiplex output. The kit, complete with built-in power pack costs £8.10.0.*

SPIRALUX TOOLS

The new 48-page catalogue of Spiralux hand tools contains details of many items used by radio constructors. Copies may be obtained on application to Hollands & Blair Ltd., Bensham Grove, Thornton Heath, Surrey.

MICROELECTRONIC COMPUTER



The photograph shows the new Marconi *Myriad II*, claimed to be one of the world's most powerful microminiature machines. It is a simpler version of the original *Myriad*, the first commercially available integrated circuit computer. Over 20 million orders per minute can be handled in this parallel computer which uses a 24-bit word and single address form order code.

BBC ENTER DISC MARKET

The BBC is to market its own disc records under the label of BBC Radio Enterprises. The records will utilise the BBC archives for material and will probably be along the same lines as the records of BBC programmes issued by Pye, Decca and E.M.I., an arrangement which will continue. This is another venture designed to raise revenue for the BBC; its sister division, BBC Television Enterprises, has been bringing in between £1M–£2M annually.

Regenerative Rejuvenation

FROM time to time letters are published in these columns criticising the super-regenerative receiver. This is a great pity, since properly built and operated super-regen's take a lot of beating.

I am also pleased to see that interest has been aroused in the v.h.f. and u.h.f. bands. Now perhaps we shall see more of these interesting receivers. It is true that they have rather a wide bandwidth, but this is obviously an advantage at v.h.f. and u.h.f.

As far as I can see, the f.m. detection of a super-regen is as good as found in commercial receivers, which require a sweep-generator for alignment if distortion is to be avoided. With the super-regenerative receiver, the operator is able to realign as he pleases with his single tuning control.

If really high quality is wanted with economy, then the quenching of the oscillator should be sinusoidal. This does mean that another valve or transistor is needed, plus a few resistors, capacitors, an r.f. choke and a quenching transformer. Even then, the total cost is well below a conventional f.m. receiver.

Recently, I had occasion to replace a complicated v.h.f. receiver I had built for satellite listening. I knocked-up a super-regen and was pleasantly surprised with the results. It was not so noisy as the superhet, yet was just as sensitive and a lot smaller.

I venture to predict, Sir, that we shall be seeing in the not too far distant future, a line-up something like this: grounded-grid (or base) r.f. amplifier-mixer, local oscillator, super-regenerative self-quenching detector (operating on the difference frequency), followed by the usual audio stages. For amateur use, the added complexity of automatic gain stabilization can be dispensed with.

Hugh A. L. Wagner. Kuala Lumpur.

Surplus not Junk

I WAS rather surprised to read your Club Spot feature on the Luton & District Amateur Radio Club that the seller of the i.f. strips was termed a *junk dealer*.

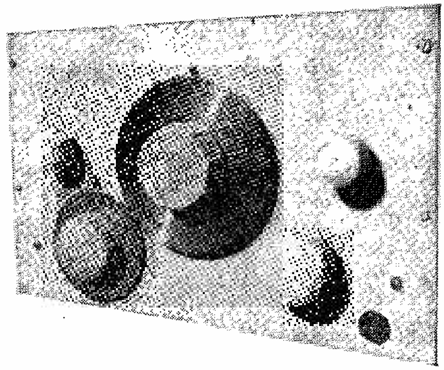
I would like to state that my Surplus Radio Components Business in Luton has a large selection of components, and that in the space of two years we have built up a reputation that we are very proud of.

George Hannington. Luton, Beds.

More News and Comment on Page 588

5 band TRF

F.G. RAYER
G3OGR



FOR a t.r.f. receiver to be successful it must be possible to control reaction smoothly and efficiently. Tuning should also be easy, and the whole construction rigid. These points are satisfactory in the receiver described here, and very good results may be obtained.

Figure 1 on the blueprint shows the circuit. Ready-made Denco green type plug-in coils are used and the following ranges are available:

1	150—500kc/s	2000—750m.
2	515—1,545kc/s	580—194m.
3	1·67—5·3Mc/s	180—57m.
4	5·0—15Mc/s	60—20m.
5	10·5—31·5Mc/s	28—9·5m.

Ranges 2, 3 and 4 are the most suitable, giving coverage from 580—20 metres. VC2 is for medium wave tuning, or short wave bandsetting, while VC3, operated by a ball drive, is for s.w. tuning, or band-spreading. This arrangement is very helpful in the congested s.w. bands.

VR1 allows the screen grid voltage of V1 to be adjusted for best regeneration, which is controlled by the 15pF capacitor VC1. When long range reception is not achieved with a t.r.f. receiver, this is usually because regeneration is not properly controlled. A little care is necessary in this direction, but the presence of VR1 and the small size of VC1 does allow excellent reaction. The 6BR7 is a high gain, low microphony valve very suitable for detector.

The two sections of a 12AT7 are used as audio amplifier and output stages. Reception is often satisfactory with a loudspeaker, but 'phones are obviously more suitable for DX work. VR2 is the audio gain control. A small transformer T2 and

BLUEPRINT SIDE ONE

a pair contact cooled rectifiers provide h.t., which is smoothed by C10/Ch/C9.

An attempt was made to measure sensitivity with a laboratory type signal generator, a difficult exercise with a t.r.f. receiver. Tests were made on 10Mc/s. With VC1 fully open and VR1 adjusted for maximum gain, an input of 200μV at the aerial terminal produced an output just audible in the loudspeaker. With VC1 rotated for maximum sensitivity, an input of 1μV produced an output just audible.

Chassis and Panel

Dimensions of the chassis and positions of major components can be taken from Fig. 2 on the blueprint. A ¾in. diameter punch is most satisfactory for the valveholders and coil holder. These are fixed with 6BA bolts, with tags under the nuts. Trimmer T1 has its lugs through a strip of paxolin, supported by a bracket.

The panel used in the prototype was made of hardboard, painted, and backed by sheet aluminium, but aluminium alone would do. This and the side brackets can be purchased ready cut if preferred. The panel is bolted to the brackets and chassis.

A large hole is needed for the ball drive, and its lug is bolted to the panel. If the drive and VC3 are fitted carefully, the flexible coupling could be omitted. This coupling takes up any slight mis-alignment, but for smooth tuning VC3 should be as near in line with the drive as possible.

Leads from VR1 pass through an adjacent hole, and may be coloured for easy identification. This is also so with VR2; take separate well-insulated leads from the switch (VR2) through the chassis to the primary of T2, and mains.

A non-skirted holder is most suitable for the coils. The use of screening cans on V1 and V2 is optional.

Under the Chassis

Figure 3 on the blueprint shows wiring and components under the chassis. Leads to VC1, VC2, VC3, V1 and the coil holder should be as short and direct as possible. All connections can be in 20 s.w.g. tinned copper wire, with insulated sleeving.

A tag strip near T2 anchors switch, mains and T2 primary leads. Tag 1 is a junction for switch and primary wires. Tag 2 holds the mains red (L) lead and the second switch connection. Tag 3 is a junction point for the mains black (N) lead and transformer primary.

When wiring is completed as in Fig. 3, the output transformer T1 can be bolted to the side runner. Its primary is connected to h.t. positive at R6 and tag 6 of V2. Leads from the secondary run to the panel jack socket.

The wires from C5, VR2 and R8 are close against the chassis. So are the 6·3V heater connections. C6 is directly from tag 1 to tag 7. If audio oscillation begins with VR2 near maximum gain, this should be checked. Wiring should otherwise be perfectly straightforward, from Figs. 2 and 3.

Notes on Components

Changes are possible with no loss of efficiency, and this may allow items on hand to be used. Any trimmer, small variable capacitor, or pre-set capacitor should do for TC1, though it must, of course, be insulated from the chassis.

Though VC1 and VC3 are 15pF, values from 10pF to 25pF will be found satisfactory. VC3 should not be too large or tuning will be less easy, but some plates can be taken off larger capacitors. VC2 can be 250pF, 300pF or similar. The smaller values will reduce the band coverage, especially for medium waves. Should some other type of drive be available, it can be fitted to VC3.

Resistor values are not very critical. R1 could be 68kΩ to 150kΩ. R3 and R6 may be about 200kΩ to 270kΩ. VR2 could be 500kΩ. The coupling and by-pass capacitors can also be changed somewhat in value without spoiling results.

The anode current of the output stage is small, and the type of speaker matching transformer originally intended for small battery operated pentodes will do well. The power output of this stage is similar to that of the output pentodes once used in battery portables (about 250mW).

If to hand, a larger transformer could be used for T2, but a bigger chassis, with the transformer on top, might be necessary. If the transformer is intended for use with a valve rectifier, and the valve is also to hand, it can replace R1 and R2. Provided an h.t. supply of around 250V is available, the actual components employed will not be important.

Speaker/'Phones

The output jack is for a speaker, or headphones. There is some mismatch when using 'phones, but this is quite usual, and not too important. 'Phones of quite low impedance are most suitable.

If a high-impedance headset is to hand, a jack for this purpose can be connected to the receiver chassis. Take the second jack contact to a 0·01μF mica capacitor, wired to tag 6 of V2.

Receiver Tuning

The results obtained depend very much on correct adjustment of VC1 and VR1. These are *not* volume controls and cannot be simply turned to maximum and left.

With an average aerial, T1 can probably be about half closed. Set VC1 about two-thirds closed, and rotate VR1 to increase V1 screen grid voltage from zero, until oscillation is heard when tuning through a transmission. If VR1 is not turned far enough, no reaction may be obtained. Turning VR1 too far will make reaction violent and difficult to adjust by means of VC1. With VR1 in a suitable position, a smooth build-up of sensitivity should be possible with VC1.

Adjust VC1 critically while tuning with VC3.

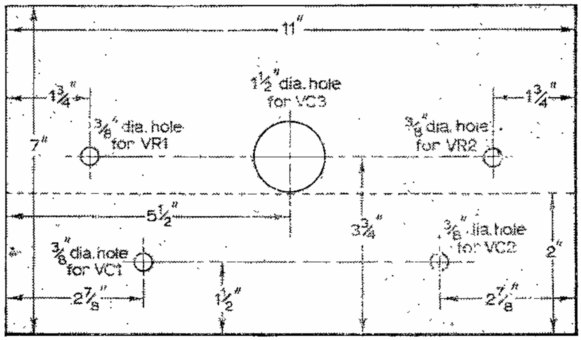


Fig. 4: Dimensional data for the front panel. If one does not have a cutter large enough to tackle the hole for VC3, drill a lot of smaller holes just inside its circumference, then break away the unwanted metal and finish the job off with a file.

After changing coils, or moving VC2, VR1 may have to be re-set. This is actually quite easy, but note that if VR1 is turned past a certain point, sensitivity begins to fall off, even if reaction can still be obtained.

VC2 is used to locate the required band, and this is tuned with VC3. Should T1 be set at too high a capacitance for the aerial used, reaction may be lost on some frequencies, especially with the smaller coils. VR2 is a conventional audio gain control.

If possible, provide an earth on the receiver. However, this depends on the location, and other factors. Mains current can be drawn from a plug fitted with the smallest available fuse, such as 1A.

If instability arises, especially at maximum audio gain, keep the aerial lead away from the receiver, and especially phone or speaker connections. Small capacitors (about 100pF) may be wired from tags 2 and 7 of V2 to chassis. Alternatively, stopper resistors of about 100kΩ each may be placed in the connections to tags 2 and 7, immediately at the holder. The possibility of such instability depends to some extent on actual wiring.

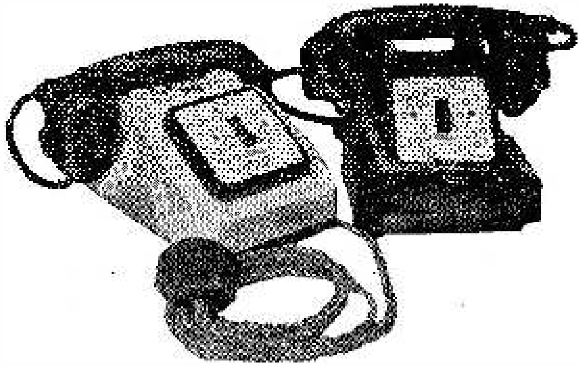
Band coverage with each coil depends somewhat on the position of the core, movement of which also has some influence on regeneration. Initially, the cores may be set with about ¼in. of brass thread clear, and this can be adjusted later if necessary. The cores are locked with 6BA nuts, to retain tuning calibration.

Try 80 Metre Band

Many transmissions should be heard at any hour, but the most suitable bands depend on the time of day and other factors. If a start is being made in amateur band reception, then 80m will furnish many stations, especially at week-ends. The 20m band will usually be most suitable for long distance amateur signals. Very many broadcast stations will be heard around 19, 25, 31, 41 and 49 metres.

When maximum selectivity is required (as on the medium wave band) volume should be reduced as necessary by TC1 and VR2, so that regeneration can be increased. Good performance is then possible. ■

SEE BLUEPRINT FOR OTHER DRAWINGS AND COMPONENTS LIST



HOME INTERCOM UNIT

By D. WILSON & J. W. ROBSON

THIS unit uses sound-powered handsets, and embodies a small transistor amplifier at each station. Each amplifier may be built for less than five shillings, and the resulting power is at least as good as that available on the GPO system, without the tonal quality deteriorating.

Figure 1 (see Blueprint) shows the circuit diagram. The transmitter of the handset feeds via the blocking capacitor into the base of the transistor, which operates in the "common emitter" mode. The receiver of the handset acts as a collector load, and the audio output is fed via the line S" (which includes a 0·5μF capacitor to prevent the paralleling of the collectors of the two amplifiers), to the receiver of the other station, and thence via its battery to return along the "C" line. The power for the amplifier is taken from a 4·5V battery, which is used for calling.

Amplifier

This is built around a cheap "red spot" transistor as advertised in "PW" at 1s. each which together with the base resistor and blocking capacitor is mounted on a piece of 1/16in. thick paxolin 1½ × 2⅜in. in such a way that an imitation printed-circuit results. Four flexible "tails" serve to connect the amplifier to the remainder of the equipment. Constructional details are shown in Fig. 2.

Calling System

Calling is via a third line "R," the current returning via the line "C". Any small bell or buzzer of 3 volt rating will be satisfactory over lines of moderate loop-resistance (say not more than 15Ω) though in the author's case special arrangements had to be made, using relays to accommodate a loop resistance of 50Ω.

BLUEPRINT SIDE TWO

The pulsating nature of the current taken by a bell or buzzer will give rise to voltage pulses in the impedance of the "C" line, and as this impedance is common to the speech circuit, the pulses will produce a rasping sound in the caller's receiver to indicate that the bell at the other station is ringing. Since in the author's case the "C" line did not carry the bell current, it is not possible to state the loudness of this sound, but if it proves to be excessive it may be attenuated by shunting a large low-voltage electrolytic capacitor across each bell.

The "call" switch is of the single-pole change-over type, spring-biassed to one position. A neat switch may be cheaply made from a "VETO" flush two-way switch available from Woolworths, if the mechanism is modified so that the locating spring does not pass over dead centre. Access to the mechanism is obtained by first removing the two tapered square-headed screws securing the ceramic to the rear of the moulded front-plate. If the pinching screw is then removed from the centre terminal a small screw will be found inside, which if removed, will allow the mechanism to be withdrawn. By careful use of a miniature hacksaw the lug to which the locating spring is attached may be lengthened sufficiently to ensure that the line of the spring always remains to the front of the rocker fulcrum. No matter how the rocker is then moved it will always return to the one position upon release. Reassembly should be such that the lower portion of the rocker protrudes in the "free" condition. See Fig. 3.

Case

This may be made from wood, plastic or metal in any shape or form to suit the individual constructor, provided that it will house the battery, amplifier and requisite terminal blocks. Externally there must be mounted the "call" switch, and a locating cradle for the handset, beneath which must be fitted a push-to-break switch (preferably a lever-operated micro-switch) to cause the amplifier to be switched off when the handset is on the cradle.

Handset

As purchased, this will be fitted with a twin-core cabtyre-sheathed cable, which must be removed and replaced by a four-core cord. In some handsets a capacitor is connected in parallel with the transmitter, and it optional whether this is left in position or discarded. A neat four-core cord may be made by plaiting together two twin twisted flexibles (an idea of how to do this may be had from examining a handset cord on a pre-STD GPO instrument in some public call-boxes).

Flexibles, with transparent insulation are available with both tinned and untinned conductors, and it will assist in the final connecting up, as well as producing a pleasing appearance if different finishes of conductors are used respectively for transmitter and receiver. The action of plaiting will cause a loss of about 30% of the length of the individual twin-cores, so that due allowance must be made for this when purchasing. Care must also be taken to see that the cords are clamped and anchored at each end to remove all stress from the terminals.

Commissioning

Before the batteries are inserted it must be ascertained that the polarities are correct, and that the lines interconnecting the instruments are led to the correct terminals. A diagram, copied from Fig. 1, neatly drawn and pasted inside the battery-access panel of each instrument case will complete the project and afford it a professional appearance. On test, one of the author's instruments emitted a feedback whistle continuously whilst energised. A glance at Fig. 1 will show a similarity to the diagram of a blocking oscillator if a coupling could be arranged between receiver and transmitter. It was felt that the four-core cord could produce such a coupling, and the reversing of the cores to the receiver (or transmitter did in fact effect a cure.

Authors' Prototype

The authors' prototype instruments, which have worked perfectly at Knaresborough for six months in spite of gardening damage to the lines were rather special in that certain local difficulties had to be overcome, although they embody the same principal components as the units described above.

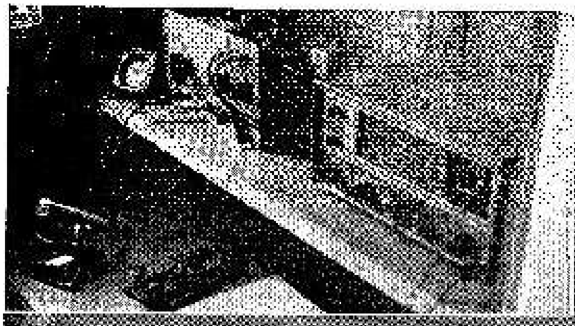
Firstly, the line-wire which happened to be available was ex-army steel-conductor type with a resistance of about 0·44Ω/yard. Since the distance between the stations was 60 yards, the resulting loop-resistance of 50Ω prevented the use of direct-ringing bells or buzzers for calling. A relay was therefore fitted at each end to detect the calling signal and ring the called station's bell from its local battery. The relay used had a coil resistance of 60Ω and with careful adjustment was made capable of working with a coil current of only 30mA which makes adequate allowance for the falling voltage of an ageing battery.

Note the 'S' line d.c. blocking capacitor on the right, and also how the cords were lashed so as to relieve the terminals of all stress.

This shows the cradle-switch and the call-detection relay. The modified dial mechanism can be seen in the background.

Secondly, we were fortunate in being able to obtain a couple of scrap dial-type instruments, similar to GPO type, of which we were able to use the case, internal chassis, terminal block and handset cradle-switch. The dial, after modification (replacing the toothed pulsing cam by a toothless one so as to give one long "impulse" per operation) was retained as a call-switch. Removal of the "ringer," gongs, induction coil and capacitors gave sufficient room for the battery, amplifier, and call-detecting relay to be accommodated inside the instrument. The calling bell, of the cheap circular type, with its mechanism beneath the gong was simply affixed by screws to the rear of the instrument case. A disc, carefully lettered with calling instructions and fitted inside the dial gave the final professional touch to the instruments, which could stand unashamedly beside GPO counterparts.

Since the handle of the ex-Government sound-powered handset is wider than that of the GPO type carbon handset care must be taken to see that on being replaced after a conversation it depresses the cradle-switch plungers sufficiently to switch off the amplifier. If there is any uncertainty about this, it may be eliminated either by a bit of judicious filing, or by cementing a piece of ⅛in. thick ½in. wide plastic to the underside of the handset handle. ■



HAM FEATURE

ALAN FORD G3UIV

GETTING YOUR TICKET

THIS magazine frequently receives letters from readers who ask, *"How can I get a licence, and how much is it?"*, a question which can never be fully answered in a letter. Many of these inquiries are in connection with transistor walkie-talkie transceivers imported from Japan. Others refer to car radio-telephones. And the rest come from budding short-wave listeners, who have heard their first amateur contact on the short-wave band of the domestic set.

First, it should be made quite clear that **licences are not issued in this country for the use of transceivers on the Citizens' Band of 27Mc/s.** The Citizens' Band exists in America, and licences to operate such sets are relatively easy to obtain there. But the 27Mc/s band is allocated in the United Kingdom to model control, medical apparatus and industrial control systems.

There is in fact no Citizens' Band here, and the GPO will not under any circumstances, or for any fee, issue a licence. Although it is illegal to use such apparatus, and an offender may be fined and have the sets confiscated, it is not illegal to sell them. This is a fortunate paradox since, *provided an amateur licence is held,* these excellent little sets may be converted for the amateur 28Mc/s band and used very effectively.*

Many of these sets have been bought by people who imagine that a licence is not required as they operate "under the three-mile limit." This is a complete misconception of the law. The three-mile limit refers only to the stretch of seawater round the coast of the United Kingdom, within which its laws and regulations may be enforced. Outside this limit, at present, some of these regulations may be broken with impunity, which is how the pirate broadcasting stations are able to exist. But the term has nothing at all to do with the actual range of transmitting apparatus, and it is therefore illegal to operate in this country even over a range of a few yards.

The wavebands allocated by the GPO for control of models only are 26·96—27·28Mc/s and 464—468Mc/s. The transmitter input must not exceed 5 watts. A licence for this purpose is quite straightforward to obtain, the fee being £1 for five years.

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* *Providing they are not of the super-regenerative type and do not create television and other interference!—Editor.*

The address to apply to is: *Radio Branch, Radio and Accommodations Dept., G.P.O. Headquarters, London E.C.1.*

Car radio-telephone systems may be considered in three classes. Firstly, official services like Fire, Police and Ambulance, which have their own spot frequencies specially allocated. Secondly, the GPO radio-telephone system, where subscribers in certain areas may rent instruments which are linked to the ordinary telephone system. The rental for this Post Office service is sufficiently high for its use to be mainly confined to business.

Thirdly, private systems, where a firm equips its own vehicles and sets up a base station. The apparatus is usually rented from a manufacturer and special wavebands have been set aside for this purpose.

We now come to amateur transmitting. Holders of these licences are able to operate morse, speech, teleprinter and even television transmitters. Many of them instal apparatus in their cars for which they need an additional permit.

Most beginners imagine that obtaining an amateur licence is largely a question of finance but this is not so. A fee of two pounds is required, but by the time the applicant arrives at this stage, the money seems very minor in comparison with the other requirements. The conditions to be met in order to be issued with an amateur transmitting licence are as follows:

1. Applicants must be over fourteen and be British subjects.
2. A pass must be obtained in the Radio Amateurs' Examination. This is a written examination paper somewhat of a cross between 'O' and 'A' level G.C.E. Physics, but with a more limited syllabus.
3. A pass must be obtained in the Post Office morse test, which is a test of receiving and sending in morse code at twelve words per minute, plain language and figures.
4. The fee of two pounds annually must be paid.

THE EXAMINATION

The Radio Amateurs' Examination is held twice a year, usually in May and December, and is organised by the City and Guilds of London Institute. The work covered for this examination is considered as a subject of study in its own right, and is listed as subject No. 55.

By writing to the Institute at 76 Portland Place, London W.1, a booklet setting out the syllabus and copies of previous papers may be obtained. The papers will give the student a good guide to the type of question usually set.

Centres where the examination may be taken are widespread and it is not always necessary to travel to London. In most cases the local technical college can make arrangements for the examination to be sat, but in this case the applicant must ensure that the college concerned knows that he wishes to sit the examination there. This should be done at least two months before the examination day. The college will probably require a fee of about five shillings.

The examination syllabus and the questions are compiled by a committee which comprises representatives of the Post Office, Ministry of Education and the official amateur radio organisation—the Radio Society of Great Britain, among others. This means that the questions asked are fair and applicable to normal amateur practice.

The whole purpose of the examination is to make sure that a person is not allowed to operate transmitting apparatus if he does not have sufficient knowledge to do so safely and without inconvenience to amateur and other stations.

The two most important questions in the examination always relate to this aim. In the first question the applicant is merely required to write out more-or-less word for word parts of the conditions set out in the actual licence.

A specimen licence can be obtained from the GPO, and should be learnt by heart. This part of the examination should present no problem. The second question always deals with methods of avoiding or curing interference to other radio or television services.

The rest of the syllabus is as follows: elementary electricity and magnetism, elementary radio principles, thermionic valves and semiconductors, radio receivers, low-power transmitters, propagation of radio waves, aerials and measurements—particularly frequency measurements. This may seem a formidable amount of work, but as already stated the pattern of questions set remains within fairly narrow limits.

The authorities consider (whether rightly or wrongly is outside the scope of this article) that any person sufficiently keen and sufficiently intelligent not to be a nuisance or danger on the air, will be able, with reasonable application, to achieve a pass mark.

Quite obviously, though, it is no use the applicant sitting back until the examination comes along and then expecting to sit down and sail through. He must study, unless, of course, he already possesses a qualification which has taken him through a similar course of work.

There are three ways in which such a course of study may be tackled. Firstly, the books listed in the City of Guilds pamphlet may be bought or borrowed from a Public Library, and studied at home. Secondly, a correspondence course may be taken. Thirdly, the student may attend a course at evening school.

Many technical colleges run evening classes in this work. All that is needed is an inquiry. If there are enough applicants, a college not already offering such a course will specially arrange one. The fee is very small—usually a guinea or two for the whole session.

SHORT WAVE LISTENING

In addition to his studies, the intending applicant should spend a great deal of time *listening* on the amateur bands. These are as follows:

1·8— 2·0 Mc/s (160 metres, or "Top Band")
3·5— 3·8 Mc/s (80 metre band)
7·0— 7·1 Mc/s (40 metre band)
14·0—14·35Mc/s (20 metre band)
21·0—21·45Mc/s (15 metre band)
28·0—29·7 Mc/s (10 metre band)

plus the v.h.f. bands, which the beginner probably won't be able to receive at first.

By listening regularly, he will become familiar with amateur procedure and learn a great deal from listening to contacts. He may also hear pirates. Pirates are not welcome on the amateur bands, and they are usually caught in the end. An applicant for a licence is unlikely to secure it easily if he has been previously convicted for piracy, so it pays to be patient and wait for the "ticket."

In the course of his listening, the Short Wave Listener, as he can now be termed, will come across a great deal of morse code. Learning to read this early on will add greatly to his enjoyment as well as pave the way for the Morse Test later.

THE CODE

There has been much written on learning the code, but each generation of beginners seems to need the same advice just as urgently. Learning the code and learning to use it are two entirely different things, though obviously one will have to come before the other.

When first learning the alphabet, do not memorize dots and dashes, but learn each letter as a combination of "di" and "dah." For instance, V is not dot-dot-dot-dash but didididah. Learning the alphabet in this way will ensure easy transition to the morse key. A morse operator does not think about dots and dashes. *He recognises the sound or rhythm.*

Here again, some technical colleges run a course in conjunction with the R.A.E. classes. Also most radio clubs run practice sessions, and there are scheduled slow morse transmissions run by the RSGB usually on 1·8—2·0Mc/s. Finally, practices with a friend as frequently as possible are invaluable. All that is needed is a simple oscillator and morse key.

Mention of the RSGB slow morse and the Radio Club sessions prompts two further pieces of advice. Join your local radio club, where you will meet many to help you on your way to the ticket; and join the RSGB, which publishes a monthly bulletin entirely devoted to amateur radio. In the pages of their Bulletin details of slow morse transmissions appear regularly.

A course of study which includes the theory for the R.A.E. and practice for the morse test will normally take several months. Do not be tempted to let the work slip until a week before the examination and then try to cram. It just won't work, for most students anyway.

Most would-be amateurs wait to hear their results in the examination before taking the morse test. The

—continued on page 575

This Martin Recordakit

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3 SPEEDS: 7″ REELS
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SOLDERING NOT NECESSARY

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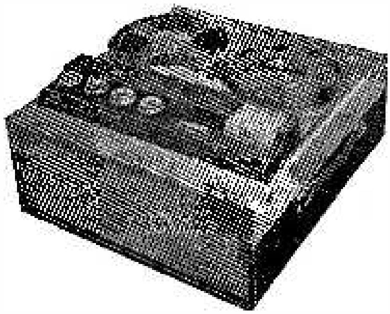

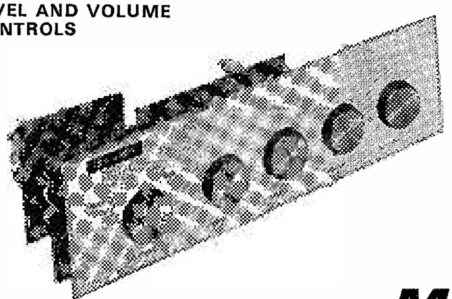

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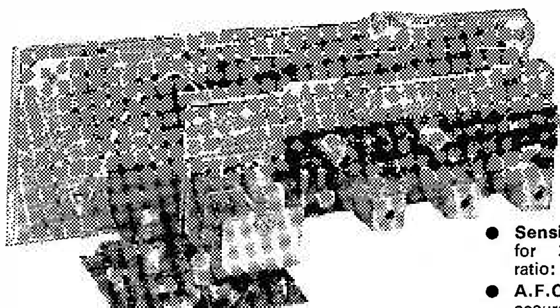

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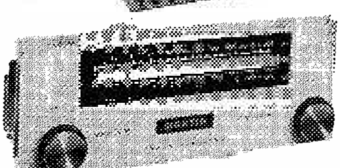

View above shows Units 15, 16 and 17 assembled. Below, the attractive escutcheon.

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P.W.12

GETTING YOUR TICKET

—continued from page 572

reason for this is that the morse may be taken any time after the examination, but if the morse is taken first, and twelve months elapse before the examination is passed, then the morse has to be taken again. Thus if the student failed the examination he might find the morse test fee wasted!

The morse test may be taken at Head Post Offices in London, Birmingham, Cambridge, Derby and Manchester, and at certain coastal radio stations. Application should be made to: *Radio Services Department, Wireless Telegraphy Section, Union House, St. Martins-le-Grande, London, E.C.1.*

The applicant will be sent a form to fill in, and will have to pay the fee of ten shillings, in the form of a postage stamp. He will then be given ample warning of the date and time of his test, usually to suit him.

The official conducting the test is usually only too pleased to give a pass slip if he possibly can. The applicant will often be given a choice of keys and will have plenty of time to get the feel of the key. The examiner will probably send a practice run first. So there is no reason for the student to fail through "nerves" provided he has practised beyond the required speed.

If the applicant is successful in the R.A.E. and in the Morse Test, he will have now two "pass slips." These are sent, together with the form supplied by the GPO and a birth certificate or other proof of nationality and age, to GPO Headquarters. The fee should *not* be sent until asked for. Eventually the fee will be requested, and quite soon the "ticket" will arrive.

In fact it is not a ticket, but a rather disappointing looking collection of typewritten duplicated sheets—but on it will be written a callsign, which will be the password to many happy years and to many good friends. Good luck! 73!

Further information on obtaining a license may be found in: "A Guide to Amateur Radio" (5s. 7d. post paid) and "Radio Amateurs' Examination Manual" (5s. 9d. post paid) from *Radio Society of Great Britain, 28 Little Russell Street, London, W.C.1;* also "How To Become a Radio Amateur," available free from *Radio Services Branch, G.P.O. Headquarters Building, St. Martins-le-Grande, London, E.C.1.* ■

OBITUARY—Captain Henry Joseph Round

Captain Henry Joseph Round, M.C., A.R.C.Sc., one of the pioneers of broadcasting and a prolific inventor with 117 patent applications to his credit, died recently in Bognor Regis.

Captain Round, born on June 2nd, 1881, graduated from the Royal College of Science, London, with a first-class honours. In 1902 he joined The Marconi Company and was sent to the United States where he worked at the Company's training school for wireless operators, at Babylon, Long Island. Here, in his spare time, he investigated wireless propagation problems, experimented with dust-core tuning inductances and devised the elements of direction finding.

About this period, and again in his spare time, Round constructed one of the first arc radio telephones, which on his recall to England he demonstrated to Guglielmo Marconi. He became a personal assistant to Marconi and was conspicuous for his ability to rectify obscure faults in the apparatus of the period. In 1910-11 he greatly improved the performance of the Clifden (Ireland) high power trans-Atlantic transmitter and followed this in 1912 with a brilliant feat of engineering at two stations on the upper reaches of the River Amazon which were not achieving the contract guarantee by reason of heavy signal attenuation across the jungle. Round virtually redesigned the stations *in situ* to operate on 4000 metres by day and 2000 metres by night, a masterpiece of ingenuity since no parts were to hand. The occasion was historic in that it was the first time that deliberate use had been made of different wavelengths for day and night working.

At the outbreak of the Great War, Round was seconded to Military Intelligence with the task of building a network of "valved" direction-finding stations to cover the entire Western Front. These stations, which he had developed just prior to the onset of war, were so successful in pinpointing the location of enemy transmitters that he was recalled to England to supervise the construction of a second network there.

Other war work included the co-design with Major Prince of the first telephony transmitters and receivers for airborne use, including the design of the valves. For his services to the country, Captain Round was awarded the Military Cross.

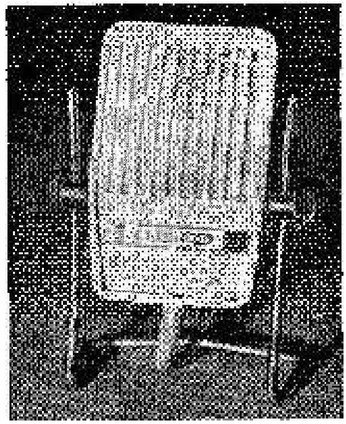
In 1919 he developed new types of transmitting valves and in March of that year directed the installation of a telephony transmitter at Ballybunion, Ireland, which became the first European station to span the Atlantic with telephony. Further experimental telephony work at Chelmsford followed which led, via the early broadcasts from the Marconi 2MT station at Writtle, to the establishment of the original London broadcasting station 2LO at Marconi House, for which Round designed the transmitting equipment. In parallel with all this work he also carried out another huge project, the redesigning of the Caernarvon high-power station from spark to valve transmission.

He was appointed chief of the newly formed Marconi Research Group in 1921. In addition to his work on short-wave telephony he was responsible for several other developments including the "Straight Eight" receiver.

In 1931 he resigned from The Marconi Company to set up in private practice as a research consultant, returning to Marconi's in an advisory capacity in 1937 for work on echo sounding. During World War II he worked on ASDIC for the Admiralty, continuing with this until 1950. In 1952 he was presented with the prized Armstrong Medal by the Radio Club of America.

Captain Round has been working in close association with the Marconi organization almost to the time of his death. He was a truly great engineer, whose contributions to technology have helped in no small measure to shape the course of history.

MICROPHONE STAND
FOR THE GRUNDIG GDM



By A. D. Cardwell

SEVERAL of the microphones supplied with the popular range of Grundig tape recorders have no stands. In this article details are given for a simple stand which can be constructed in about an hour if you have the use of a sturdy vice.

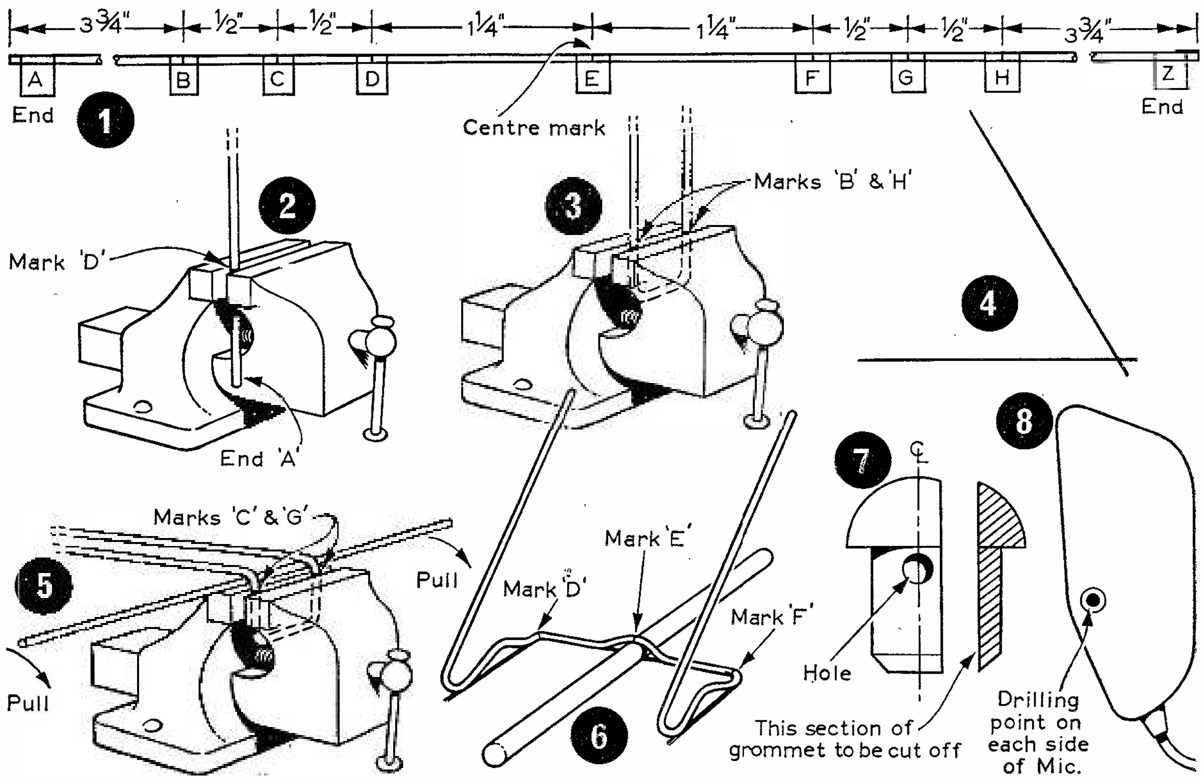
The necessary materials should be easy to come by since all you need is a foot of $\frac{3}{16}$ in. diameter brass rod (brazing wire from a garage will do), a small roll of "sticking plaster" and a couple of rubber grommets. Total cost to the author was 3s. 6d., getting the "sticking plaster" from a local chemist and the rubber grommets from the spares department of a Standard Triumph garage (type 605851).

No difficulty should be experienced in constructing this stand if you first mark the brass rod (using the "sticking plaster") as shown in Fig. 1. Once this has been done, the bending process can be tackled. The first bend should be of 90° at position D. Then make a 90° bend at F to make the brass rod "U" shaped.

Now the base can be formed by bending the metalwork at B and H as shown in Fig. 3 beyond the 90° point to match the angle in illustration 4. The next step is to round off this bend with a screwdriver or similar instrument as shown in Fig. 5 to get the side pieces looking like those illustrated in Fig. 6. The final step is to bend the rear section of the base for the microphone cable.

With this completed, one should cut part of each grommet away and drill as shown in Fig. 7. Be careful not to have an accident when cutting the grommet—a wet blade will reduce the risk of the knife slipping.

The best position for drilling the microphone case is shown in Fig. 8. One should, however, be careful not to allow the head of the drill to penetrate too far when drilling the microphone case as damage can be done to the microphone insert. Also be careful not to make the holes too large, otherwise it will be difficult to secure the grommets. ■



MAKING SUB-MINIATURE RELAYS

I. J. KAMPEL

MANY constructors take a pride in making all the units they build as small as possible. Naturally, a circuit containing a relay is somewhat of a headache since the standard Post Office type of relay is rather a bulky device. Smaller relays are available (sometimes from the surplus market), but these can be rather expensive, hence the article on constructing sub-miniature relays. The one described here can be built at little cost in an evening. It is possible to deviate from the specification and from the materials used to suit individual requirements.

Background

In simple terms, the relay is an electrically operated switch. Current passes through a solenoid which magnetically attracts the moving portion of a contact assembly to either make or break a circuit or circuits. There can be as many circuits as one likes, but additional circuits add to the weight of the contact assembly and thus require more power.

The relay described is a single changeover device with a common contact and a "make" and a "break" contact.

CONSTRUCTION

Figure 1 shows the fully assembled relay, Table 1 its specification and Table 2 the materials used. Construction is not too difficult, and all dimensions are given in millimetres.

Solenoid

The core of the solenoid must be capable of being magnetised, but not a material which can become a permanent magnet. Soft-iron is ideal, and it has been found that some bolts make perfect cores. If you are not sure of the suitability of a selected bolt, first check if it is attracted to an ordinary magnet, and secondly check if it can become a permanent magnet. To do this, stroke the selected bolt with a permanent magnet, twenty to thirty times as shown in Fig. 2. If the selected bolt has permanent magnet properties, you will now be able to pick up small metal items with it. If you can, throw it away and find another with which to make the core.

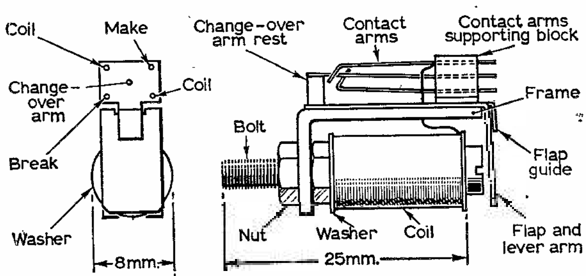


Fig. 1: Front and side elevation of the completed relay.

If one was to use a material with permanent magnet properties, the contacts would permanently remain in the energised position.

Once a core has been chosen, the next step is to make up a yoke to hold the windings. This is best done with nuts and washers, as shown in Fig. 3. Size is not critical; the author used 8 mm washers spaced 13 mm. apart on a 3 mm. bolt, which had an overall length of 25 mm.

The next step is to wind the coil. There are several methods one can use, from doing the job by hand, or by machine employing an old gram motor or an electric drill. The only thing one must remember is that the turns should be wound fairly tightly and layer upon layer. Probably the best way is to start from the left, wind to the right and then back again until you come up level with the washers. The author used 44 s.w.g. enamelled-copper wire, brought the two ends of the coil out at the "head end" of the bolt and wrapped the turns with tape to hold them in position.

If the coil has been wound tightly, the resistance should be around 200Ω. Before proceeding any further, it is worthwhile checking if the solenoid has the sufficient pulling power. This can be done by attaching the coil to a 1·5 volt battery and seeing if the solenoid will lift small pieces of metal. If it will, in all probability, there will be sufficient power to move the completed contact assembly: remember, with a 1·5 V potential the current through the coil is less than 10mA.

TABLE 1

SPECIFICATION
Size: 23mm. x 16mm. x 9mm. Working voltage: 9 to 24V d.c. Min. operating current: 45mA. Contacts: single changeover, common with make and break.

Frame

Constructional details for the frame are included in Fig. 4. A non-ferrous metal should be used (one that is not attracted by magnetic fields) such as aluminium, copper or brass. When completed, it should be bolted to the solenoid; see Fig. 1 for

TABLE 2

MATERIALS
One 3mm. bolt (25mm. long) with nuts and 8mm. washers.
44 s.w.g. enamelled-copper wire.
Small piece of tin.
Small piece of thin metal.
Small piece of 5mm. thick perspex.
Short lengths of piano wire (38 s.w.g. or larger).
Insulating tape.

positioning. No difficulty should be encountered in this operation, but one must be careful to ensure that the end of the frame is level with the bolt head. It should be filed to fit if necessary.

Flap and Lever Arm

The flap and lever arm assembly is the chief moving part of the relay, the flap moving towards the solenoid, when energised, to change the position of the contacts. Thin metal, less than 1mm., which has the same properties as the core of the solenoid (being attracted to a magnet, but not having permanent magnet properties) should be used. A strip from an old tobacco tin is ideal. Fig. 5 shows the dimensions. The fold should be almost a right-angle, but not quite so that maximum contact is made with the bolt head when the solenoid is operated.

The rest arm for the lever assembly can be made from perspex and glued in position. Whilst this sets, the flap arm, which locates and positions the flap and lever arm, may be cut; see Fig. 6. Again this is bent just short of a right angle.

Lay the completed lever assembly on to the frame of the relay and position it so that a light depression on the flap will cause the end carrying the arm rest to lift a millimetre or so in the air. In this position the flap should lie flat on the head of the bolt. Fig. 7 shows the required overhang of the flap guide.

Supporting Block for Contact Arms

A block of perspex is used to support the contact arms. This is cut to the dimensions specified in Fig. 8. The block itself is "T" shaped, the lower portion of the "T" resting on the flap guide and upper section projecting out above the arms of the flap and lever arm assembly; Fig. 10 shows this. The five holes in the block are to take the contacts and the terminating pins for the coil. If a very small drill is not to hand, it is possible to burn the holes through with the actual contact bars (38 gauge or thicker piano wire) and the terminals.

Contacts

The contacts are made from piano wire and heated into the supporting block (see Fig. 9). The centre contact, the changeover arm, should be fitted before the other two contacts which, if possible, should be of thicker wire. The ends of these should be bent at right-angles and positioned so that they are 1 to 2mm. away from the changeover arm rest. Also be careful to leave enough projecting through the other side of the supporting block for the solder connections.

The contact bar nearest the frame should just touch the centre contact bar and the upper one should be close but not actually touching the centre bar. A little adjustment will be needed here to get the lower arm to break away from the centre rod when the relay is operated.

The pins for the coil terminations may be made from almost anything, since they too can be heated into the perspex.

Positioning Supporting Block

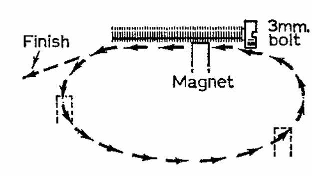
When fitting the supporting block to the frame of the relay it is important to make sure that the lever arm can move freely before glueing the block in position. Once set, the relay is ready for testing.

Final Adjustment

In all probability it will be necessary to make some adjustment to the contacts before putting the relay into service. To do this, it is best to heat the contact bars and rotate them to the wanted position. As soon as heat is removed from the bars, the perspex hardens and will hold the contact bars in position.

Now is the time to put 12 volts across the relay. If it fails to operate, possibly the centre contact is under too much pressure. Check this by gently

—*continued on page 583*



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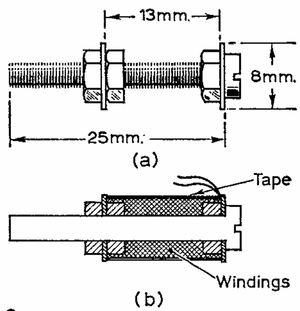
2. Elliptical path to be taken with the magnet when stroking the bolt.



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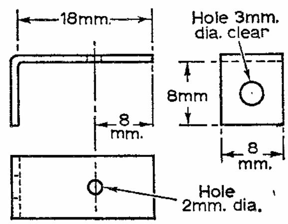
3. (a) 3mm. bolt; showing positioning of nuts and washers. (b) cross-sectional view of bolt after coil winding.



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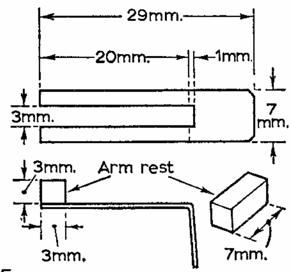
4. Frame assembly (about 1mm. thick).



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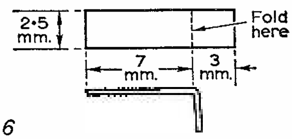
5. Flap and lever arm assembly.



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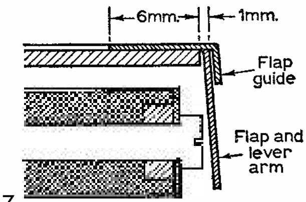
6. Flap guide.



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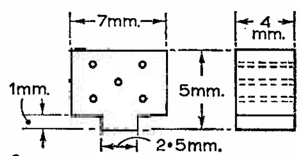
7. Cross-sectional view showing overhang of flap guide.



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8. Contact arms supporting block.

Q MULTIPLIER FOR THE R1155

C. MOLLOY

THE R1155 is a 10-valve communications and direction finding receiver which, together with its associated T1154 transmitter, loop aerial and visual direction finding indicator, was used extensively in aircraft during the last war.

Although sensitivity is good, selectivity is not up to communication receiver standards owing to the absence of a crystal filter in the i.f. stages. The response curve of the i.f. amplifier indicates a bandwidth of 4·3kc/s at the 6dB points and several methods of improving this were considered. Fortunately, the direction finding part of the receiver is largely independent of the remainder and the three DF valves and the bulk of the DF components can be removed, leaving space for modifications and additions.

Mechanical filters of Japanese origin are now obtainable at moderate cost, but these, unfortunately, are only available for an i.f. of 455kc/s while the R1155 has an i.f. of 560kc/s. Construction of a crystal filter was thought to be impracticable and a regenerative i.f. stage was also rejected, since these can lead to a noisy background and instability. Finally, interest was aroused in the Q Multiplier. An experimental model was constructed using an outboard chassis, and was eventually incorporated within the R1155 itself, using the space occupied by the Jones plugs and sockets for the panel controls.

The Q Multiplier is essentially a parallel tuned circuit resonating at the i.f. frequency and connected between the frequency changer anode and chassis. A parallel tuned circuit offers a high impedance at its resonant frequency and can be regarded as a band stop filter or a rejector type wavetrap. When regeneration is applied to the parallel circuit the Q is boosted to a high value, resulting in a sharp, narrow rejection notch.

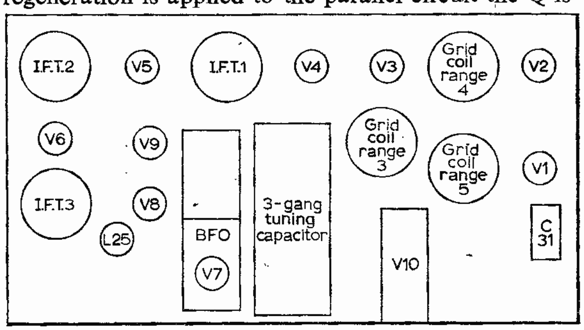


Fig. 1: Layout of the complete chassis. The valve positions are as follows: V1, V2 D.F. Switching (VR99 or X66); V3 R.F. Amplifier (VR100 or KTW62); V4 Frequency Changer (VR99 or X66); V5 1st I.F. Amplifier (VR100 or KTW62); V6 2nd I.F. Amplifier (VR100 or MHLD6); V7 Beat Frequency Oscillator (VR101 or MHLD6); V8 L.F. Amplifier (VR101 or MHLD6); V9 D.F. Meter Switching (VR102 or BL63); V10 Tuning Indicator (VI103 or Y61).

When this circuit is connected to a frequency changer, frequencies outside the rejection notch are shunted through the low impedance of the parallel circuit and as a result they do not enter the i.f. amplifier. Frequencies within the rejection notch cannot pass through the tuned circuit and are applied to the i.f. input and amplified. The combined effect of the Q Multiplier and i.f. amplifier is to produce a sharp peak to the i.f. response, the width of the peak being controlled by the regeneration control. The position of the peak within the i.f. passband can be adjusted by the variable tuning capacitor.

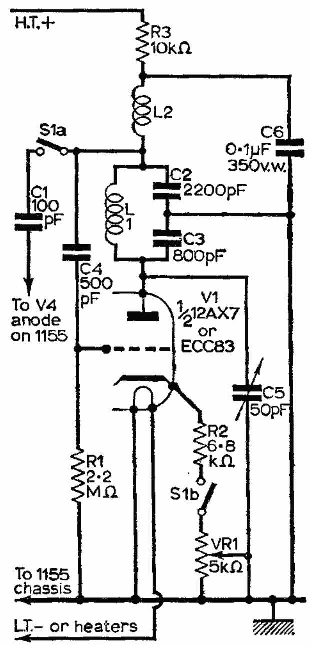


Fig. 2: Circuit diagram of the "Q" Multiplier.

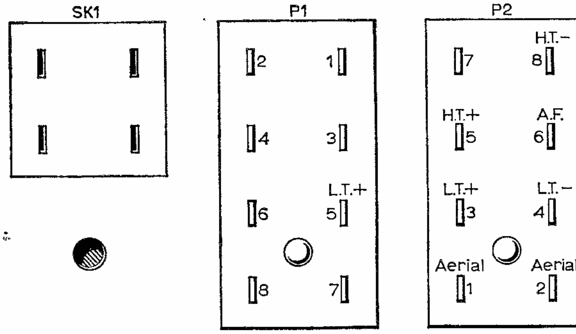
The circuit derived after some trial and error is shown in Fig. 2. The inductor L1 together with C2 and C3 form a Colpitts oscillator, the frequency being adjustable over a small range by C5. The amount of feedback is controlled by VR1. Decoupling is provided by R3 and C6, the r.f. choke preventing leakage at the i.f. frequency. Coupling to the receiver is via C1, which also isolates the h.t. on the frequency changer from the Q Multiplier.

A small chassis 5 x 2½ x 2in. which was available was found to be adequate. It was thought advisable to mount L1 on the underside in order to avoid touching it while operating the controls. This inductor is pot cored, a hexagonal trimming tool being required to adjust the core. A suitable tool was obtained from the supplier of the coil. A screened r.f. choke is preferred and several are available among the redundant DF components in the R1155. The one chosen was taken from the screened compartment behind the b.f.o. valve (L2).

Care should be taken not to interfere with L25 which is situated near V8 and the third i.f. transformer (Fig. 1). This component is of a similar shape to the one specified but is of a different type (10C/2186). It is required in the communication part of the receiver and should not be removed. It is not essential to use the r.f. choke specified, several types were tried and the circuit would even work with a 47kΩ resistor in place of the choke.

Good quality co-axial cable is used between V4 anode and the Q Multiplier. The length of this cable is kept as short as possible as its capacitance will detune the first i.f. transformer. Re-alignment of the first i.f. stage will be necessary and the cores of the transformer will not be able to peak if the cable is longer than about 3 feet. The value of resistor R2 may have to be changed on account of differences in layout and supply voltages, details of how to do this are given in the setting up instructions.

Published circuits of Q Multipliers show the tuning capacitor C5 connected across L1, which means that both sides of C5 are at h.t. potential. Satisfactory operation was obtained with one side connected to chassis as shown, thus allowing a standard component to be used. In the interests of frequency stability close tolerance silver mica capacitors should be used for C2 and C3, though the actual values are not critical. The power drain of the Q Multiplier is small, the h.t. consumption is only 1mA. Both the h.t. and heater currents should be easily obtained from the R1155 without overloading its power supply.



▲ *Fig. 3: Front view of the Jones plugs and sockets.*

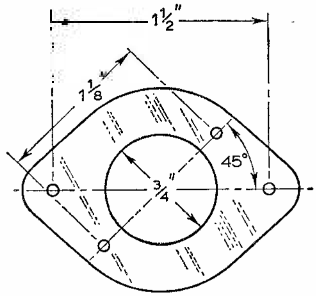


Fig. 4: Dimensions for the adaptor plate to convert Octal to B9A. ▶

Setting up

With the Q Multiplier switch in the *off* position connect it to the receiver and re-align the i.f. stages, making sure that the a.v.c. is off. Tune the receiver to a steady signal such as a local medium wave transmitter and use the magic eye as a peaking indicator while the cores are being adjusted. After alignment is complete, switch on the Q Multiplier with C5 and VR1 set to mid position. Adjust the core of L1 until a signal is heard, using C5 as a fine tuner. If VR1 is advanced, oscillation will occur and the control should be set just short of the oscillation point to obtain maximum selectivity. It will probably be too sharp for other than c.w. reception and the control should be backed further until sufficient bandwidth is obtained. If oscillation does not occur when VR1 is advanced then R2 is of too high a value and must be reduced to 5·6kΩ. If oscillation occurs, irrespective of the position of the regeneration control, then R2 should be increased to 8·2kΩ. After a little practice with the controls it should be possible to obtain selectivity comparable to that given by a crystal filter. With VR1 set for maximum selectivity, speech becomes unintelligible and each sideband can be selected at will.

At this point the reader may think that an outboard Q Multiplier would be adequate for his needs. Commercial add-on units are available which use their own power supply or the receiver supply. Constructional details are not given here as the unit described was experimental and was subsequently dismantled and rebuilt as an integral part of the R1155. There is no reason why it could not be fitted into a small metal case and used permanently in this way. Operation on 465kc/s can be obtained by changing C3 to 1000pF, C2 to 3000pF and C5 to 100pF.

The remainder of the article describes how the Q Multiplier was fitted into the R1155. This should not be attempted by anyone who has not had previous experience of wiring or receiver construction. A novice could very easily put his R1155 out of action permanently.

Removal of Components

The following components should be removed from the receiver. In each case the associated wiring must be traced back to source and cut. Meter Balance Control; Meter Deflection Switch; Aural Sense switch and associated tagboard and resistors; Valveholders V1 and V2; Tagboard and components mounted beside V1 and V2 on the end of the coil compartment. The two large inductors and mounting plate situated behind the Jones plugs and sockets. The metal panel labels screwed to the top of the front plate.

New Components

Fit a jack type socket in place of the Meter Balance control, the second terminal or body of the socket going to the chassis. This is the new high impedance phones socket.

A banana socket fitted in place of the Meter Deflection switch provides the new aerial input.

A 4-pin Painton socket (type 500467) or similar, replaces the Aural Sense switch. This will only be required if an external power supply for the receiver is in use. A square hole should be cut in the front panel to accommodate this.

A small metal adaptor plate mounting a B9A valveholder is now mounted in place of V1 to hold the Q Multiplier valve. A neat job can be made using an adaptor plate and details are shown in figure 4.

Before removal of the Jones sockets and plugs the aerial, phones and power wiring must be moved to their new location.

Aerial Inputs

When the receiver was originally in use in an aircraft a fixed aerial was utilised for ranges 1 and 2

(18·5Mc/s to 3Mc/s) and a trailing aerial for ranges 3, 4 and 5 (1·5Mc/s to 75kc/s). P1 pin 1 is the fixed aerial input and P1 pin 2 the trailing aerial (Fig. 3). Unsolder from pins 1 and 2 the two wires coming from above the chassis, pull them back and connect each of them to the new aerial socket. This will provide a single aerial socket for all ranges. The two 2·2MΩ resistors connected from P1 pins 1 and 2 to earth are not required and should be removed.

Phones Output

The connection from the output transformer comes via a grey wire from a tagboard mounted below the chassis at the front left-hand side of the receiver. This wire passes along a metal channel and terminates on P1 pin 6. Unsolder this wire from pin 6, pull it back through the channel and extend it to the new phone socket immediately above, at the top left hand corner of the front panel.

Internal Power Wiring

Bolt a 4-way tagstrip to the underside of the chassis behind the Jones plugs and socket and transfer the internal power leads to it. The remaining wires connected to P1, P2 and SK1 are not required and should be unsoldered, traced back to their source and cut. The Jones plug and sockets can now be removed. *Note, HT is NOT connected direct to the chassis but passes through a bias resistor.*

If an internal power pack is in use, as in the writer's receiver, connection can be made to it from the tagblock. When an external power pack is used, run wires from the tagblock to the Painton socket. The wires from the power pack will have to be connected to the corresponding pins of a Painton 4-way plug (cat. 500207).

Installation

A metal panel $4\frac{1}{2}$ x $2\frac{1}{4}$in. mounting VR1, C4, C5 and the 2-pole switch is now fixed to the front panel in the space vacated by the Jones plugs and sockets. A length of co-axial cable runs from the panel to the anode of V4, the screen being connected to chassis. C4 is mounted on a spare contact of the switch. Two screened leads run to the remaining components which are located around the B9A valveholder. The space vacated by V2 is used above the chassis for the r.f. choke and L1 is mounted underneath. C31 is a 4μF paper capacitor connected between HT+ and chassis. This component, if still required, can be replaced by a small 350V working electrolytic and space then becomes available which can be used as and alternative location for the Q Multiplier coil, choke and associated components. This would shorten the leads required to the front panel controls. The writer was unable to do this as a mains transformer and smoothing choke had already been fitted here.

No difficulty was experienced operating the Q Multiplier in its new location. Setting up, as described earlier, including the adjustment of the 1st i.f. transformer cores was necessary on account of the new layout. ■

★ components list

Resistors:		**Capacitors:**	
R1	2·2MΩ	C1	100pF
R2	6·8kΩ	C2	2,200pF
R3	10kΩ	C3	800pF
VR1	5kΩ potentiometer (Radiospares midget)	C4	500pF
		C5	50pF variable
		C6	0·1μF 350V

Miscellaneous: L1 Q Multiplier pot-cored coil type Q46 Electroniques. Bridge Road, Felixstowe, Suffolk. L2 r.f. choke type 10C/2019 see text, S1a/S1b 4-pole 2-way midget rotary wavechange switch—only two poles used, V1, 12AX7 or ECC83—only one section used.

MAKING SUB-MINIATURE RELAYS

—continued from page 580

lifting it up with a pair of tweezers and seeing if the arm pulls in when 12V is applied. If this is the case, the wire must be bent upwards to release the pressure; adjusting the other contacts accordingly.

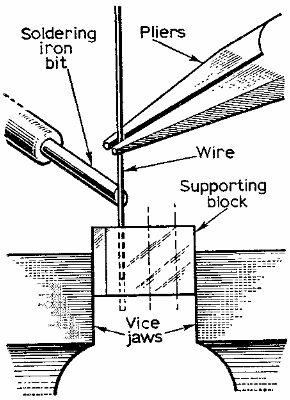
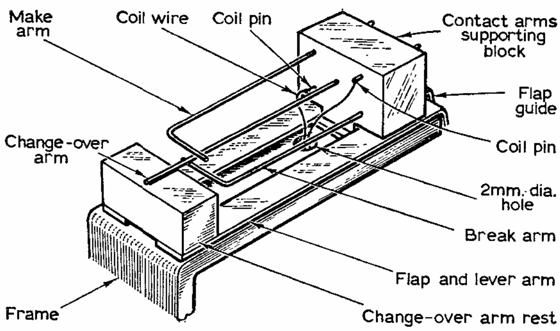


Fig. 9: (left) Method of locking wire contact arms in supporting block.

Fig. 10: (right) Contact arms and lever arm assembly.



If still unsuccessful, it is possible that the piano wire used is too heavy a gauge.

Extra Poles

It is possible to add another changeover to the relay if required. It is best to place the extra one to the side of the existing one in preference to placing above it. ■

receiving the ·· ·· ·· ·· ·· ··

BBC STEREO PROGR

NOW that the BBC is at last transmitting regular two-channel stereo programmes, many readers are asking how it works and what extras are needed to receive the programmes and so forth. This article sets out to answer such questions, starting first at the transmitting end of the chain.

Stereo programmes are transmitted at v.h.f. in Band II, using frequency-modulation. The Wrotham and Dover stations are the first to carry the new signals, but within a year or so stereo will be extended to the Sutton Coldfield and Holme Moss transmitters. Public reaction to the system and prevailing economic factors will determine the subsequent rate of development and the nature of the stereo programmes transmitted. The first stereo broadcasts are in the Third Network Music Programmes (see *Radio Times*).

How Stereo is Transmitted

Stereo reproduction demands two (or more) isolated audio channels from the sound source to the listeners' ears (Fig. 1). The requirements, therefore, are for two microphones, two isolated audio channels and two loudspeakers. On stereo tape the two channels are recorded separately side by side, while the channel isolation on disc records is achieved by the effective cutting of two modulation tracks at right-angles to each other.

It would be possible, of course, to maintain this two-channel isolation on radio by sending the information of the right-hand channel through one transmitter and that in the left-hand channel through a second transmitter. This system, which calls for two receivers, works quite well and readers may recall experiments along these lines being made by the BBC some time ago, with the v.h.f. set carrying one channel and the television sound section the second channel.

This is a very costly way of handling the problem since, apart from the need for two receivers, it holds the services of two transmitters. Far better methods have since been evolved, requiring only one transmitter for the two channels of audio information and no more radio space than required for a single channel mono transmission.

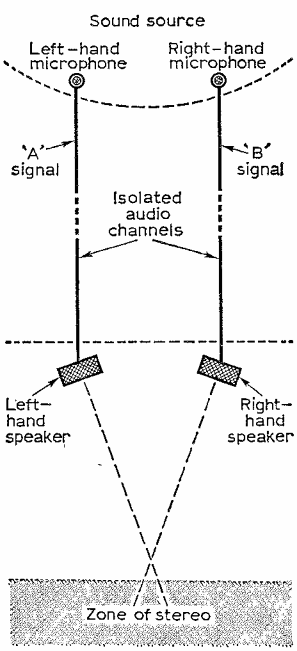


Fig. 1. Stereo reproduction requires the use of at least two isolated audio channels. The signal in the left-hand channel is called the A signal and that in the right-hand channel the B signal.

After examining the various methods put forward, Working Party S of the European Broadcasting Union proposed the Zenith-GE system for Europe. This is an American system, created jointly by the American General Electric Company and the Zenith Radio Corporation, and is, in fact, the system now in use by the BBC with the pre-emphasis changed from the American 75μS to the British 50μS.

Compatibility

A stereo broadcasting system must be compatible. This means that a stereo transmission must produce correctly balanced mono when tuned in by any ordinary f.m. set or tuner. Incorrect balance would be obtained if the mono set responded only to one of the stereo channels or if the right and left-hand information failed to be correctly integrated.

The Zenith-GE system is, of course, compatible, and by tuning in a stereo transmission on any ordinary mono receiver a perfect mono reproduction is obtained. However, when that same transmission is tuned in by a stereo radio or tuner or one with a stereo decoder attached, then the signals in the right- and left-hand channels are adequately isolated and fed to their corresponding audio channels.

Now, from the original source of sound, the signal given by the left-hand microphone (see Fig. 1) is called the *A signal* and that from the right-hand microphone is called the *B signal*. Clearly, then, A+B signal is equal to correctly balanced mono signal. By the same token, therefore, A—B signal must equal the stereo information. The A+B signal is called the *M signal* (M for mono) and the A—B signal is called the

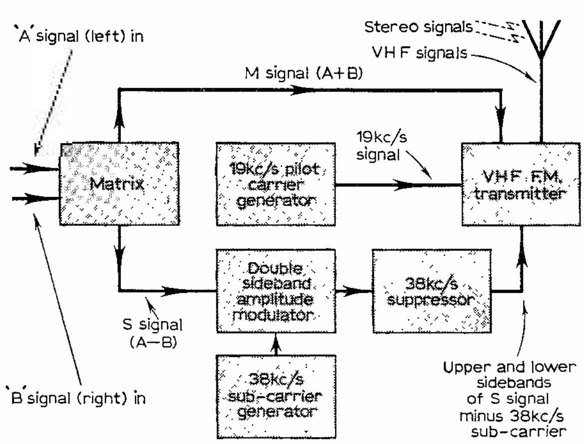
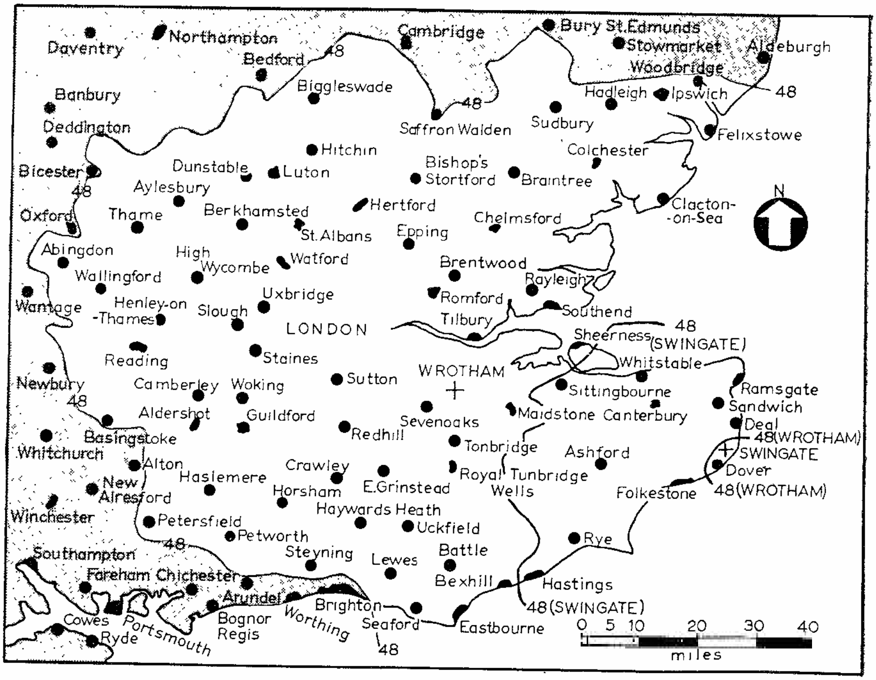


Fig. 2. Block diagram of the essential features of the transmitting end of the Zenith-GE stereo system. The M or mono signal is A+B and the S or stereo signal is A—B.

k.royal

AMMES

S signal (S for stereo). The M signal is obtained at the transmitter by adding the A and B signals, while the S signal is derived from subtraction, these processes being handled by a so-called *matrix*. We shall see later that a matrix is also used in the decoder of a stereo receiver to produce the ultimate A and B signals.



Wrotham and Swingate are the only two BBC sound stations to radiate stereo. The contours on the map indicate field-strength in dB relative to 1μV/m for a receiving aerial height of 30 ft.

At this juncture it would be best for us to take up the story by referring to the basic block diagram of a stereo transmitter (Fig. 2). So far we we have seen that the M and S signals are obtained from the matrix due to A and B input signals. Now, the M signal is fed to the v.h.f. transmitter and thus modulates the v.h.f. carrier in the ordinary manner. The transmitter also receives a 19kc/s pilot carrier signal and upper and lower sidebands of the S signal. The v.h.f. carrier wave is, therefore, frequency-modulated by three separate signals, which are (i) the ordinary M signals, (ii) the 19kc/s pilot signal and (iii) the sidebands only of the S signal.

The first modulation signal provides ordinary mono receivers responding to the transmission with a mono signal (giving the system compatibility), while the second and third signals are concerned only with the stereo information. These signals are rejected by mono receivers and accepted only by stereo receivers, as we shall see later.

Sidebands

The upper and lower sidebands of the S signal can only be obtained by first modulating the S signal onto a carrier wave. To keep the S sidebands within the channel spectrum, a frequency of 38kc/s is chosen for the sub-carrier, and this carrier signal along with the S signal (which is effective audio, of course) is applied to a double-sideband amplitude modulator.

Suppressed Sub-Carrier

Between the output of this modulator and the modulation input of the v.h.f. f.m. transmitter is interposed a 38kc/s sub-carrier suppressing network, leaving only the upper and lowe S signal sidebands for modulation. These sidebands fail to overlap the other modulation signals because they are spaced either side of 38kc/s on the modulation spectrum, as shown in Fig. 3.

It should be remembered that all these signals together frequency-modulate the v.h.f. carrier.

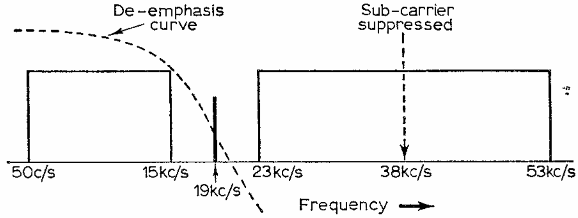


Fig. 3. Showing the frequency disposition of the various modulation signals.

Ratio Detector

Fig. 4 shows a typical balanced ratio detector circuit that may be found in a good quality f.m. tuner or receiver. Some sets may effectively employ a slightly different version of this circuit or a Foster-Seeley discriminator. A well designed balanced ratio detector is capable of good quality demodulation and has certain advantages with regard to stereo. But whatever type of detector is used, its response must be sufficiently wide to

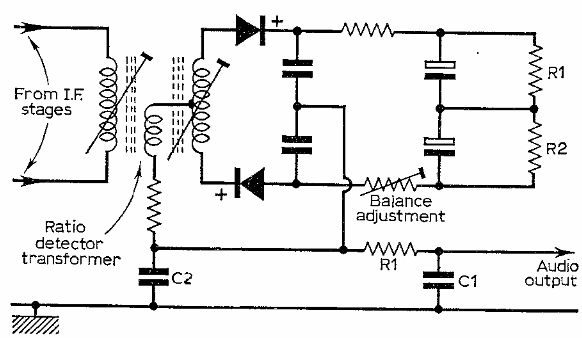


Fig. 4. The output circuit of a ratio detector used in many receivers and tuners. When feeding the signal into a stereo decoder either the de-emphasis components R1 and C1 should be removed or the output should be taken from the top of R1.

avoid cutting the higher order modulation components of the v.h.f. signal, and the same must apply to the i.f. channel which feeds the detector.

When the circuit in Fig. 4 receives a mono f.m. signal it develops across C2 the audio modulation of that signal. The audio is normally fed out through network C1, R1 for de-emphasis. This is necessary because pre-emphasis is given to the modulation signal at the transmitter to improve the system's signal/noise ratio.

Pre-emphasis means treble lift and de-emphasis treble cut. If the de-emphasis at the set end equals the pre-emphasis at the transmitting end, the result is a flat overall audio response. Improved signal/noise ratio occurs because the treble cut (de-emphasis) at the receiver reduces the worst of the high audio-frequency noise at the same time as correcting for the treble lift (pre-emphasis) at the transmitter.

It is important to bear this in mind because when a stereo decoder is fitted to a mono set or tuner the original de-emphasis circuit has to be disconnected. The reason for this is that the de-emphasis circuit effectively attenuates at the rate of 6dB/octave all the stereo information that is present on the transmission. Thus, with the de-emphasis circuit *connected,* the pilot carrier and upper and lower sidebands of the S signal are all suppressed and the receiver then behaves exactly the same on stereo transmissions as on mono ones.

Now let us suppose that we disconnect R1 and C1 in Fig. 4 and take the modulation output direct from across C2. We get the M signal as before, but in addition we get the pilot carrier and S signal sidebands. These are of no use to mono sets and tuners, but when a mono receiver is linked to a *decoder* it then becomes possible to reclaim the S signal, thereby making it possible to obtain the left and right-hand A and B signals.

Basic Decoder

It is best to consider how this works from the block diagram given in Fig. 5. Here the modulation signal from the output of the receiver's detector (minus the de-emphasis) is applied to a signal amplifier in the decoder. The M signal from the output of this amplifier is taken direct to the matrix (which has the reciprocal action of that at the transmitter). For this matrix to deliver A and B signals it must receive the S signal as well as the M signal.

The S signal, however, cannot be obtained by detection without the 38kc/s sub-carrier (suppressed at the transmitter) first being re-inserted. This is where the 19kc/s pilot carrier signal comes in. This signal is passed through a filter, sometimes with extra amplification, and then into a frequency doubling stage, stepping up the frequency to 38kc/s.

The signal amplifier also passes the upper and lower sidebands to a synchronous detector, at which stage the

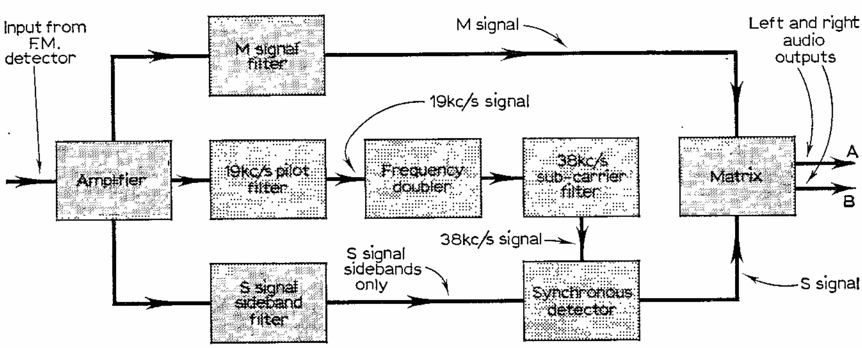


Fig. 5. Block diagram showing the stages of a stereo decoder.

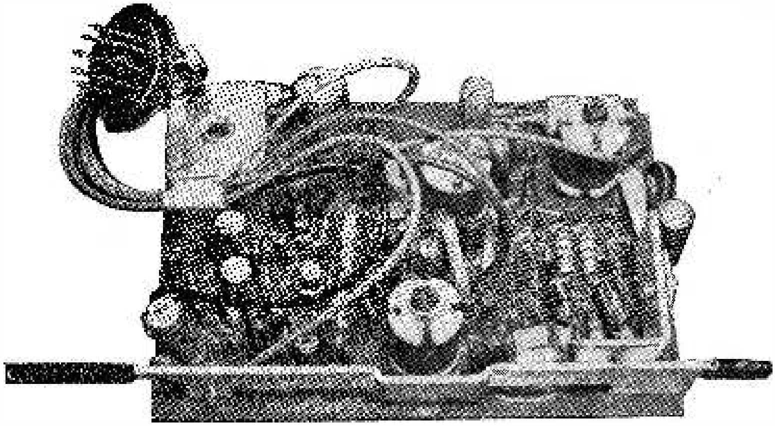


Fig. 6. Commercial stereo decoder unit designed for plugging into the Bang and Olufsen *Beomaster 1000, integrated stereo tuner and hi-fi amplifier.*

38kc/s sub-carrier is added, and amplitude demodulation produces the S signal, fed to the matrix.

The matrix processes the M and S signals so that they yield the original A and B signals in the left and right-hand channels respectively. The matrix can be considered as a balanced bridge detector, arranged so that the combination of the 38kc/s sub-carrier and the S and M signals produces a modulation pattern, on one side of which is the left-hand channel and on the other side the right-hand channel envelope. Looking at it that way, each channel is then detected by the bridge; actuated synchronously by the 38kc/s signal.

The original A and B information is obtained because (A+B) + (A—B) = 2A and (A+B) — (A—B) = 2B, the matrix, in effect, giving rise to simple addition and subtraction, as intimated at the start of this article.

The A and B signals from the matrix are then fed to separate left and right-hand audio channels, via 50μS de-emphasis circuits, and thence to corresponding speakers.

Deviation

The reason for suppressing the 38kc/s sub-carrier and then re-inserting it again in the decoder may not be apparent. It is concerned with modulation percentage or deviation. If the 38kc/s sub-carrier were retained, its depth of modulation on the main v.h.f. carrier would be such that the deviation of the audio signals (M and S signals) would have to be reduced to avoid over-modulation. Less modulation depth is produced by the 19kc/s pilot carrier owing to its reduced level in terms of v.h.f. modulation. In practice, the pilot carrier accounts for about 10 per cent of the total

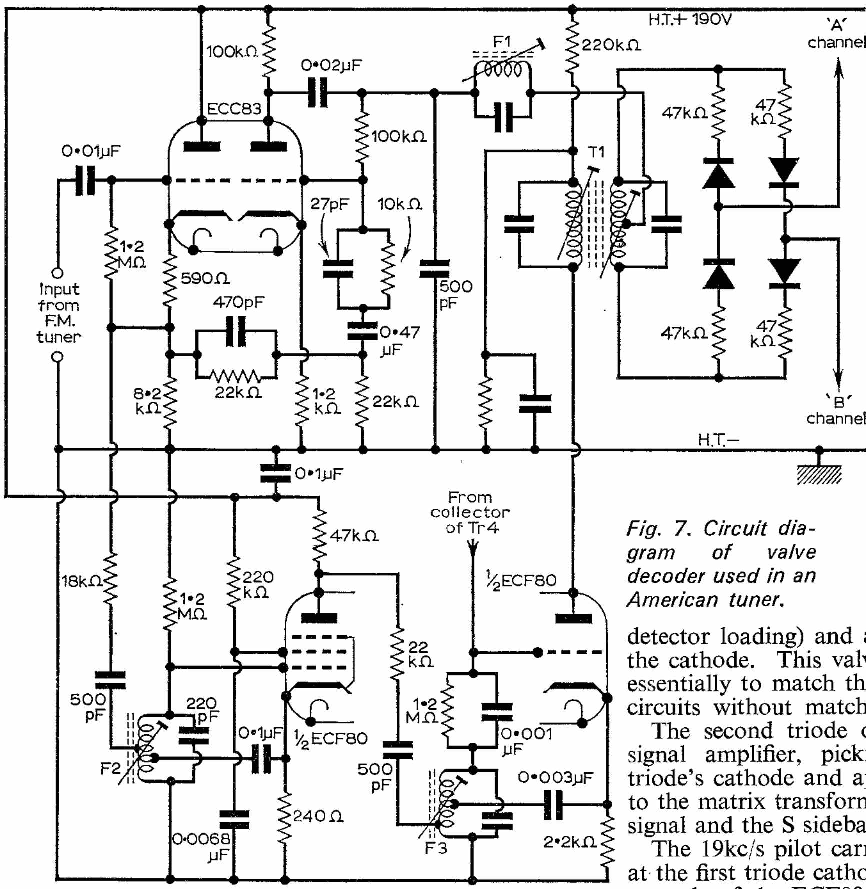


Fig. 7. Circuit diagram of valve decoder used in an American tuner.

modulation, leaving 90 per cent for the M and S signals.

Both these signals can separately modulate the v.h.f. carrier to a maximum of 90 per cent because they never rise together. When the modulation of, say, the M channel is rising it is falling on the S channel.

In stereo tuners and receivers the decoder circuit is integrated and often takes the form of a small printed circuit board sub-assembly. Separate decoders are also being made, self-powered or for powering from the parent set. Some of the latest f.m. tuners have plug-in provision for decoder sub-assemblies, such an assembly being depicted in Fig. 6 for the *Bang and Olufsen* Beomaster 1000, integrated f.m. tuner and stereo amplifier.

Valve Decoder

Fig. 7 shows a valve decoder designed by the American *Dyna Company*. This uses two valves, a double-triode ECC83 and a triode-pentode ECF80. The first triode of the ECC83 is arranged in a cathode-follower stage, having a high input impedance (to avoid f.m. detector loading) and a medium output impedance at the cathode. This valve does not amplify, but serves essentially to match the f.m. detector to the decoding circuits without matching loss.

The second triode of the ECC83 is an M and S signal amplifier, picking up signal from the first triode's cathode and applying its output at the anode to the matrix transformer T1. Filter F1 passes the M signal and the S sidebands but rejects the pilot carrier.

The 19kc/s pilot carrier signal which is also present at the first triode cathode is fed to the first grid of the pentode of the ECF80, this section being arranged as pilot carrier amplifier. This signal is tuned by filter F2 at the input and filter F3 at the output. Frequency doubling is performed by the triode of the ECF80 and the 38kc/s sub-carrier is developed across the primary of T1.

The four diodes and associated resistors in the combined synchronous detector and matrix circuit receive

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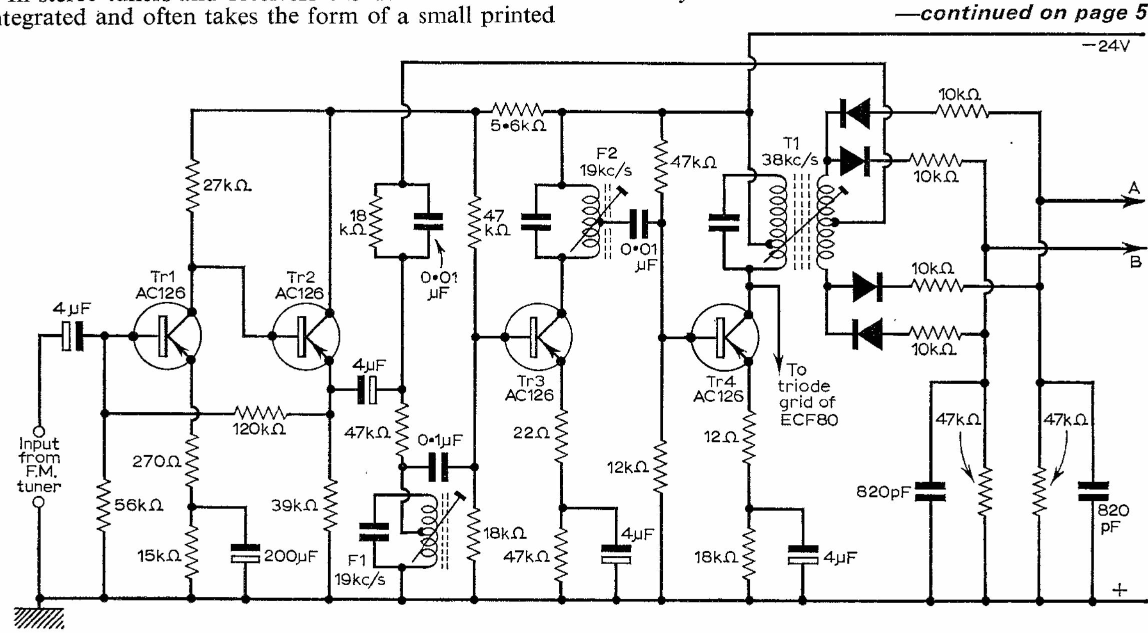


Fig. 8. Transistor decoder circuit, based on the B & O 1000.

S.W. Broadcast Stations

I REFER to the letter on page 201, July issue, by Mr. N. D. Mugford.

Mr. Mugford has the advantage over a great majority of the people on this earth, that he lives in a free (relatively so) and democratic society. I do too. Therefore, Mr. Mugford immediately has no right to demand of you that you cease printing details of communist broadcasters, just because he doesn't like what they're doing!

However, away from the political side of it all, and assuming that Mr. Mugford simply objects to Radio Peking, Radio Sofia, RBI, Radio Moscow, etc., because they contravene the ITU and clutter up the bands, using non-broadcast-assigned frequencies, etc., then we find a strange omission in his listings . . . he forgot the BBC, poor chap! Here we have a prime example of how to sign the rules, then forget 'em . . . Ol' Granny BBC's got some strange frequencies hitched to her girdle, like 9410kc/s, 18150kc/s, 12095kc/s, and a few more!

So now, Mr. Editor, I must beseech you Sir, don't ever print any mention of the BBC until they drop all their naughty ways! And of course, they will take ever-so-much notice of the tremendous loss of listeners through your silence of their name!

Of course, Sir, you would then have to omit reference to any others so misusing the bands, which means nearly every international broadcaster worth his salt, and many who aren't.

Robert Ronai, New South Wales,
Australian Radio DX Club. Australia.

Valve Information: VX3188

MAY I correct the information given by your correspondent, W. Ritchie, on page 33 of the October issue?

The VX3188 is equivalent to the CV2277 and is a low-impedance pentode for use as an a.f. power amplifier and as a series valve in voltage stabilisers. The manufacturer's data sheet gives the following information: V_H 26.5V, I_A 90mA, I_H 0.23A, Vg1 —13V, V_A 100V, gm 9.5 mA/V, Vg2 100V, µA 8500Ω, Base: B9A.

Figures are also given for operation with V_A & Vg2=26.5V.

J. R. W. Murland. Co. Down, N. Ireland.

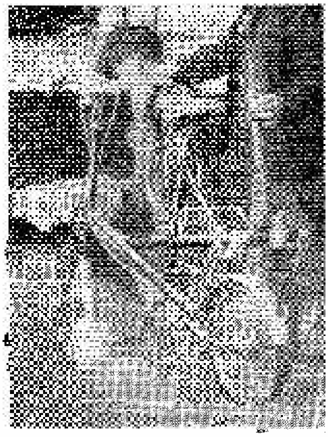
Low Voltage Neon Indicator

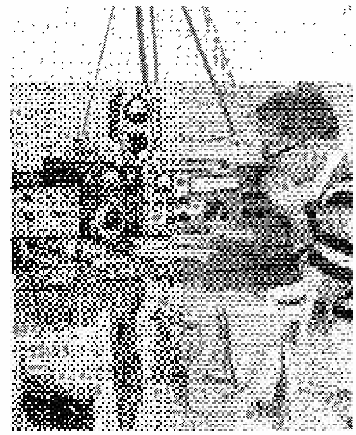
I NOTE that several readers have been unable to obtain transistor types 2SO18 and XB121 as specified in my article "Low Voltage Neon Indicator" in the June 1966 issue. I have succeeded in obtaining a small stock of 2SO18's at 10s. each. Transistors type XB121 are available from Henry's Radio Ltd. at 10s. each.

A. J. Bassett. 28 Park Road, Chorley, Lancashire.

NEWS AND..

HARLOW MOBILE RALLY





On Sunday September 25th, a stream of traffic came in all shapes and sizes to Magdalen Laver. A family saloon with a base loaded whip on the front and a mini-halo on the back. A motor bike with a side car so full of gear it looked like a mobile Jodrell Bank. There was even a mobile on a bicycle, wobbling along the road with a huge whip towering upwards from the back of the saddle.

Without a doubt this is the friendliest rally your reporter has been to. The beaming face of Fred G3TLF on the front doorway and the eager handshakes from various people who five minutes past had been complete strangers all sum up the Harlow Rally.

The organisers covered everything; tea-and-cakes stall for the hungry; lucky dips and raffles for the gamblers; a make-up demonstration by a leading cosmetics house for the ladies; and a grand sale of the most glorious junk.

Then there were the kids; the dogs; the yarns of the DX that got away; and the groups of technical bods expounding pet theories.

Commercial gear was much in evidence but the antennae were ingenious. G3CZA/M had a very lofty whip with what appeared to be a midget basket-wound coil half way up. But perhaps the quaintest was a two foot length of 16 gauge which fed directly into an "S" meter clutched in the hand of an enthusiastic s.w.l. who promptly informed all when the talk-in station was on the air. G3RVV reminisced on receivers he built back in the old days, one of which was built bread-board style on a 9-foot plank of wood!

REMOTE CONTROLLED TRANSMITTING STATION

Two 30kW, high frequency Marconi Self-Tuning radio transmitters are to be installed at Belgium's communications centre at Ruiselede. They are fully automatic, and will be remotely controlled over land lines from a centre three kilometres away.

In this installation, any one of 235,000 different frequencies at 100c/s steps in the range 4 to 27·5Mc/s can be selected from the control station without manual intervention at the transmitters.

This export order was awarded by the Belgian Posts and Telegraphs Department through SAIT Electronics, Marconi's Belgian Associates.

...COMMENT

TAYLOR ASSEMBLY SHOP

In order to meet increasing demands for their products, Taylor Electrical Instruments Ltd. put into operation a 3-point plan. A training school was set up on the factory premises, new jigs were designed and installed, and new assembly techniques devised. The result has been highly successful in that delivery times have been improved and production output increased by three times, without occupying additional floor space.

ANTEX SOLDERING KIT

New from Antex Ltd., of Grosvenor House, Croydon, is a complete Soldering Kit consisting of a durable and rigid plastic "tool-box" with a lift-off "see-thro" cover, designed not only to keep everything to hand but also to serve as an iron stand whilst the iron is in use. Contained in this "tool-box" is an Antex Model CN 240 15W soldering iron, fitted with a $\frac{3}{16}$in. nickel plated bit. Two spare interchangeable bits ($\frac{5}{32}$in. and $\frac{3}{32}$in.) are also provided, with a reel of resin-cored solder, a cleaning pad, and a handy heat sink for soldering up transistors etc. A useful addition to the kit is a handy 36-page illustrated booklet on "How-to-solder". Price is 49s. 6d. complete.

"THE ENGINEERS' DAY"

To encourage more young people to become engineers, the Government has sponsored "The Engineers' Day" exhibition at the Science Museum, South Kensington. Opening at 2 p.m. on November 18th, the exhibition will run to January 14th and will be open from 10 a.m. to 6 p.m. Mondays to Fridays and from 2.30 p.m. to 6 p.m. on Sundays. Graphic displays, with films and lectures, have been designed to promote an awareness of the importance and achievements of engineers and technologists.

Over 7,000 sq.ft. on the ground floor of the Science Museum have been given up to this exhibition. The installation at Goonhilly Down (Britain's ground satellite receiving station) will be featured.

Ground Communications

I HAVE recently been conducting some research on ground communication which, I believe, will be of interest to many readers.

Although the transmitter and receiver earths should normally be orientated so that they face each other, I have discovered that, for good local communication, they should be beamed in order to obtain a good signal/noise ratio . . . the noise here being mains hum. The useful transmitting range for speech in my area, with transmitter earths 25 yd. apart and an output of 4W; is about 300 yd., although the soil conducts unusually well. Doubling the transmitter power increases the range by about 25%.

M. J. Walsh. Portsmouth, Hampshire.

Coil Formers for the Beginners' S.W.2

IN relation to the Short Wave Receiver for the Beginner (PRACTICAL WIRELESS, July 1966 issue, page 182) Eddystone inform me that coil former type 538 specified for two of the three coils, is no longer available.

I have found that type B37 may be used for all three coils if a little patience is exercised.

A. White. Oxton, Birkenhead.

The R1155

WITH reference to the letter from John Tye inferring that enough has been written about the R1155 receiver, I would like to point out, we have not all been able to get back numbers of the magazines he mentions, which had articles on this receiver, i.e. noise limiter circuit. I endorse Mr. R. E. Robinson's cry for further articles on the R1155 or a reprint of "10 metre Converter" or "Noise Limiter" for this well tried set.

Perhaps Mr. Tye would be willing to loan his back numbers to people interested in this receiver?

I would be willing to get the pages copied.

A. R. Preston. 16 Millard House, Grove Street, Deptford, London, S.E.8.

The "Ten-Five" Receiver

IN the list of components for the modified "Ten-Five" Receiver appearing in the September issue of PRACTICAL WIRELESS the specification for T4 was omitted. *T4 should be a miniature transistor-type transformer, Denco, Range 2 (Red).*

the M and S signals after the carrier has been added and the signal demodulated. The matrix then delivers the audio signals in channels A and B, as already explained. It should be noted here that the matrix diodes have a d.c. return path through the resistors shunting the A and B amplifier inputs.

It is usual practice for the A and B outputs at the matrix to be fed to voltage amplifiers (another double-triode valve —one triode per channel—is commonly employed) before being applied to the input of the main stereo amplifier system, and it is in this early audio section that de-emphasis is often applied.

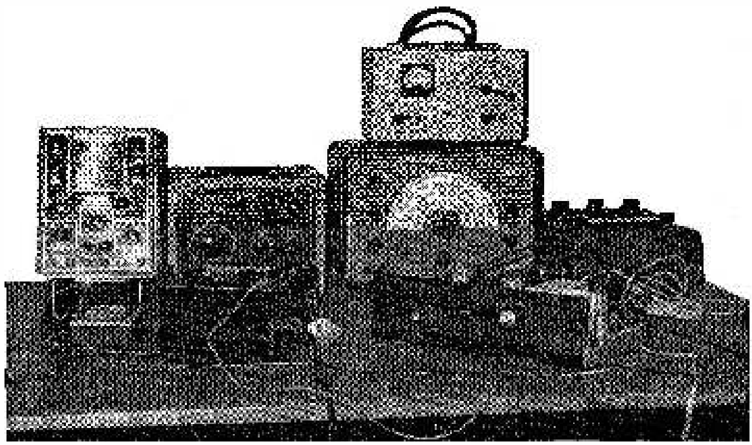


Fig. 9. Stereo tuner undergoing oscilloscope/wobbulator alignment.

Transistor Decoder

A transistor decoder circuit, based on the *Bang and Olufsen* Beomaster 1000, is given in Fig. 8. This has much in common with the valve circuit in terms of operation. Tr1 and Tr2, are signal amplifiers, the first in common-emitter mode and the second in common-collector mode, the equivalent of the valve cathode-follower. Stabilising feedback is applied between Tr2 emitter and Tr1 base, via the 120kΩ resistor.

The M signal and the sidebands of the S signal are passed to the tap on the secondary of the matrix transformer T1, via the RC filter (18kΩ in parallel with 0·01μF). The 19kc/s pilot carrier signal is tuned by filter F1 in the bass circuit of Tr3 and by F2 in the collector circuit. Tr4 acts as a frequency doubler, the 38kc/s sub-carrier signal being tuned by T1 primary in Tr4 collector circuit. The operation of the synchronous detector/matrix is the same as explained in the valve circuit.

Critical Demands

To recapitulate; we have seen that any reasonable quality f.m. tuner can be coupled to a stereo decoder to provide A and B (left- and right-hand) stereo signals provided first the de-emphasis filter across the output of the f.m. detector is removed and that de-emphasis is inserted in each stereo channel subsequent to the decoding process.

It should be noted, though, that while some features of design or performance of the tuner may be acceptable for mono, there are certain critical demands for good quality stereo reception. For example, the tuner should be capable of maintaining a linear frequency response up to at least 240kc/s. In some cases it may be necessary to modify the f.m. detector a little to secure the best results. The total d.c. load of a ratio detector (i.e., R1 + R2 in Fig. 4) should not be much greater than 20kΩ, while the effective capacitance in parallel with the i.f. signal at the detector should not rise much above 250pF.

Poor overall frequency response or bad phase characteristics of the parent tuner can cause the output of the A channel to appear in the B channel, and vice versa (this is called crosstalk). The alignment of the discriminator transformer is also important from this aspect and to ensure that correct detector synchronisation occurs. If possible, alignment is best checked with an oscilloscope and wobbulator.

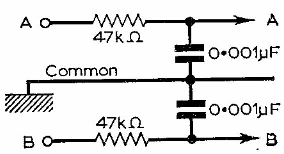


Fig. 10. A and B channel de-emphasis.

Setting Up

Finally, a word about the setting up of a decoder. The output A and B channels usually need to feed through a triode or transistor amplifier to raise the signal levels sufficiently to work into, say, the *radio* inputs of a hi-fi stereo amplifier or into the audio section of a high quality radio or radiogram. The de-emphasis should also be remembered, and Fig. 10 shows a suitable twin-channel de-emphasis circuit for connection to the outputs of a decoder.

Incidentally, the 19kc/s or 38kc/s signal developed in the decoder when a stereo transmission is tuned in is often fed to some form of *stereo* indicating device. With a decoder having reverse compatibility, this then enables the user quickly to tune over Band II in search of a stereo transmission. The indicating device can be a moving-coil meter movement, a magic-eye tuning indicator or even a bulb.

The magic-eye tuning indicator is probably the easiest device to use, since the signal level at points marked 'A' in Figs. 7 and 8 is adequate to give full deflection of the shadow. To operate a meter the signal would have to be rectified and amplified in a valve or transistor to provide sufficient pointer deflection.

Coil Winding

For readers wishing to experiment with decoders and construct their own models, the following information for the winding of 19kc/s and 38kc/s coils and transformers will be of assistance.

To secure sufficient inductance and Q, the coils should be wound on pot-type cores, such as the Mullard Vinkor LA2505 or equivalent. About 1,500 turns of 45 s.w.g. enamelled-covered wire will tune over 19kc/s with about 220pF in parallel. Tapping in to get the correct impedance coupling necessitates making a connection about 25 per cent from the 'cold' or earthy end of the winding.

To tune 38kc/s the primary of the matrix transformer should contain about 700 turns of 45 s.w.g. enamelled-covered wire tuned by 150pF, while the secondary to feed the diodes should contain about 100 turns. The exact tapping points will depend on the nature of the circuit, of course. ■

ON THE SHORT WAVES

MONTHLY NEWS FOR DX LISTENERS

Times in GMT
Frequencies in kc/s

THE BROADCAST BANDS by JOHN GUTTRIDGE

CONSIDERABLE increase in sunspot activity has been noted at times with complete blackout of h.f. channel on occasions. This means that better things are just around the corner as the higher frequency bands become more and more used. The move of the high-powered transmitters to these bands will considerably relieve overcrowding on the lower frequency bands and give the lower-powered stations a chance.

SOUTH AMERICA

Argentina: *Radio National* (Ayacucho 1556, Buenos Aires) is reported to be using LRA33, 15,345 until after 2300 in Spanish.

Brazil: *Radio Clube de Pernambuco* (Avenida Cruz Cabuga 394, Recife) often heard on 11,865 is now audible also at 2220 on 6,015). *Radio Jornal do Comercio* (Rua Marquez do Recife) now puts in a very strong signal on 15,145 after 0030.

Radiodifusora Sao Paulo (Casilla Postale 252, 4142, Sao Paulo) seems to be carrying the programme of *Radio Tupi* over 17,817. Strong heterodyne with Radio Canado on 17,820.

Radio Clube Ribeirao Preto (Casilla Postale 18, Ribeirao Preto) now putting in good signal after 2230 on 15,415. *Radio Sociedad de Babia* (Rua Carlos Gomes, 57, Salvador) is back on 11,875. At 2300 there is interference from Radio Moscow.

Chile: *Radio President Balmaceda* (Casilla 13650, Santiago) is audible with frequent identification 2245-2301 when blotted out by Vladivostock relaying Radio Moscow.

Colombia: *Radio Nacional* (Apartado Nacional, 1824, Borgota) heard on the new frequency of 15,345 around 0100. Programmes in the main were transcription features of other stations.

Ecuador: *La Voz de los Andes* (Casilla 691 Quito) uses 15,325/17,880 to Europe 1830-2200 and 15,115/17,890 from 2330-2400.

Venezuela: *Radio Barquisimeto* (Apartmentado 576, Barquisimeto) gives a good signal from 0000 onwards on YVMQ 4,990. *Radio Tropical* (San Jacinto 9, Caracas) heard after 0025 over YVKP 4,870. Music, advertisements and news make up programme.

EUROPE

Albania: *Radiodiffusion et Television Attanaise* (Rue Ismail Quemal, Tirana) now has a QSL card. Some reports say the 0630-0700 English transmission is aired over 7,090/7,265 whilst others give the frequencies as 7,265/9,390.

Denmark: *Radio Denmark* (Radiohouse, Rosenornsalle 22, Copenhagen V) has a special musical transmission 1800-1845 over long wave 245 (kc). There is English 1825-1830 and reports are wanted.

France: O.R.T.F. (Maison de l'O.R.T.F., 116 Avenue du President Kennedy, Paris 16) now has English at 1300-1330 over 15,245/17,740/21,580 and 1915-1930 over 15,130/17,740. The French inter programme is relayed on the following frequencies 6,175 1100-2200, 11,845/11,920, 1545-2000, 15,245 1100-1200, 17,765 1100-1230, 21,580 1100-1230, 1400-1700.

German Federal Republic: *Deutsche Welle* (Bruedertsrasse 1, Postfach 344, Skoln) has made changes in the following English transmissions 0300-0340 11,945/9,530; 0845-0940 11,925/15,275/17,845; 0600-0630 11,775/15,295; 1045-1055 9,765/11,905; 0130-0250 6,075/9,640; 0500-0540 15,140/9,735; 2050-2100 9,700/11,925/15,405.

Deutsche Bundepost (Funkampt Hamburg, Funkdienstburo, Hamburg 13, Schlüterstrasse 3) has a SSB point-to-point transmission over DGT46 19,460 at 1420. QSL verification is given.

Great Britain: BBC (C.E.X.B., Bush House, London, W.C.2) has been heard carrying its 2000-2100 Russian transmission in SSB over 12,185.

Greece: *National Hellenic Broadcasting Institute* (Mourouzi Street 16, Athens) can be heard (with patience) at 2200-2230 and 2300-2330 over 15,345/11,720.

Holland: *Radio Nederland Wereldomroep* (P.O. Box 22, Hilversum). The 2100-2150 English transmission is now aired over 11,730 and on frequency in the 31 m.b.—probably 9,590.

Norway: *Radio Norway* (Oslo) now transmits as follows: 0300-0430 9,550/9,610/11,850/1,578; 0745-0815 21,670/11,850/15,175/17,825/25,900; 1100-1230 7,240/21,670/15,175/17,825/25,900; 1300-1430, 1500-1630, 1700-1830 21,670/15,175/17,825/25,900; 1900-2030 11,850/15,175/17,825/21,670/21,730; 2100-2230 11,850/15,175/17,825; 2300-0030 11,850/9,550/9,610. The use of the 11 m.b. should be noted here.

Portugal: *Radio Portugal* (Rua du Quelhas 21, Lisboa) reported to be using 7,225/21,495 for its 2015-2100 English transmission to Europe although schedule says 41 and 49 m.b. are used.

★ ★ ★

Contributors this month were P. Charlton, A. B. Thompson, S. Shaw, M. C. Donnelly, D. Rye, D. Priestley, Swiss Broadcasting Corporation and Radio Nederland.

A VERITABLE deluge of logs, letters and reports have arrived from just about everywhere. The majority—7Mc/s. Some of the reports on forty are extremely good and as can be seen by the logs shown later—the DX is most definitely there for those who can be bothered to listen.

Very few tried 3·5Mc/s, and only two listened on 160 in spite of the fact that W's are active down the l.f. end.

From the h.f. end comes news of great activity. Both 14 and 21 Mc/s have been quite fantastic at times but reports are now growing on 28Mc/s. One particularly good opening on ten metres showed just a quick preview of things to come, things like Argentine, Canal Zone, South Africa, Israel, all on phone.

Seven Meg. Souffle

No, you don't need a beam! **N. Henbrey** (Rye), 20-metre dipole and an EA12 logged CN8AW, UC2BF, VK2AVA, VP6KL, VS9ARV, VS9OC, WA4YOJ/P/4 (0557), 5A2TZ. **R. Adair** (Co. Down), R107, dipole, UW9AS, VK2AVA, VP3JR, VP6KL, VS9ARV, ZB2AJ, 4X4VL, 9M2OV.

J. Fitzgerald (Great Missenden) uses a Hitachi WH837 portable with another BC set as a b.f.o. This set up harvested the following: CN8AW, EL2A, JA1AEA, JA2BAY, LX1BB, MP4MAW, OD5BZ, PY's 1CAD, 1CLI, 1CNK, 2DL, 2EAD, 6WA, 7AOT, 7LAK (all between 2052 and 2395); UA1WW, UB5UW, UW9AF, VK2AVA, VP3JR, VP6KL, ZB2AJ, ZS1JA (2312),5A2TR, 6O6BW, 9HIR, 9M2OV (2316). All s.s.b. Times for above three logs all between 1928—2143 except where stated otherwise.

D. Allisett (Gurnsey, C.I.), TCS receiver, 120ft. l.w., heard CT1LX, JA2BOI, OX3LP, PY4ND, VK2AVA, VK3VJ, ZB2AJ. **G. Morgan** (Tredegar), HA230 tuned to 7050kc/s, 45ft. end fed, all s.s.b. —CN8AW, HB9AHL, LA1K, OH5MW, PY's 1CLI, 2EAB, 6WA, 7APS, 8QQ; SL6BH, UW9AF, VK's 2EQ, 2AVA, 3MO, 7SM (Tasmania); VP3JR, VP3YG, VP6KL, VS9OC, 9H1R, 9R4VT, all on a loudspeaker, too!

Twenty and Fifteen

If it's alive and it radiates, then you'll find it on one of these two bands. **R. Wells** (St. Albans) reports hordes of JA's romping in, and other s.w. l' s quote similar instances of intense activity from distant climes.

R. Dowdell (Ewell), "52 rx. soon to be replaced with 130ft. end fed wire, running NW/SE." Coo! they must be coming in strong! 14Mc/s s.s.b.: CR6CN, EA8AH, EP2GF, ET3WH, HS1AK, KH6EN, KR6UA, LU5AES, PY2DSQ, VK3ZL, VS9OC, YA1DAN, YK1AA, YV5CIV, ZD9BE, ZS6AR, 5A2TS, 5A5TV, 5N2AAW, 5Z4IR, 9G1FF, 9J2MM, 9M2BO, 9M2DW, 9Q5HF, 9U5BB, 9X5MH.

David Griffiths (Cardiff), 640 plus 4 r.f. stages (why bother with the 640 OM?), 100ft. l.w., 14Mc/s s.s.b.: CR—6HF, 6IV, CR7—AP, FM, GW, EL2R, EP2PL, FH8KD, HS4AK, JA—1BN, 2BQE, 3RQ, 3UE, 5RG, 6AD, KG6CF, KG6ALW, KH6BX, KH6BJ, KL7—BTP, FCH, FEF, FIL, KM6CE, KR6HW, KR6QW, KS6BT, KZ5EX, K1VSD/AM, UH8DE, VE—2DZ, 8AA. VE1AED/SU, VE2BUJ/SU, VK3EUU, VK9VK, VP2VV, VP3HAG, VP5RB, VS9OC, VS9ARV, WØOTP, WØGTA/8F4, W6KXZ, YA1DAN, YV5BNW, ZC4JU, ZD9BE, ZL1CR, ZL4CH, ZP5OG, 4U1ITU, 4X4BL, 5A4TR, 9H1AB, 9M2LO, 9V1MY. An extremely good log, set out in alphabetical order with the date, time, RST, mode, band, etc. Interesting from this log to see that even the ZL's were 5 and 5.

Philip Cooper (Uttoxeter), CR45 t.r.f., 70ft. l.w., managed CN8CS, EP2AX, F9RY, HP9FC/MM, I1AUM/M1, K1HRV/MM, K1VKD/P/KG6, K6JXS/MM, KR6KS, KR6UL, KV4CF, M1B, OD5BZ, PY2DFS, SVØWX, VE1AAH, VE2BUJ/P/SU, VE8AG, VK3—MO, TL, ZL, W7ALE/Fix. P/KG6, XW8AY, YV5CHO, ZL3MM, ZS6XL, 5A3TW, 5A5TB, 6O1AW, 7Q7LC.

D. Harvey (Salop), PCR3, ground-plane hunted 21Mc/s for—CN8FB, CR7FG, CT2AC, CX5AAM, CXØLE, EA8ES, HR1JKM, K1, 2, 3, 4, LU4LG, OD5EC, PY2GKD, PY9AI, SL7ZZS, SV1AC, VE2BUJ/MM/SU, VE3BIF, W1, 2, 3, 7, 8, 9, Ø.

Paul Baker (Pontypool), HE30, 45ft. l.w. 21Mc/s—CE5MEO, dozens of CN's, CO8RA, CR7's, CT5JAS (ex G3SJ), CX5AAN, EA8CR, EAØAY, EL2AA, EP2RJ, HK4TA, many JA's, K6BNL, LU1DJO, MP4BEU, OA4DJ, OD5BZ, PX1MA, PY's, PZ1BE, SM3DJU/MM, VE2BUJ/SU, SU1IM, TL8JF, TN8BK, UA9TT, VE8BZ, VP7NA, VS9ASP, W6YAW, WA6LDG, WB6DLA, W7LUN, ZC4MO, ZE6JL, ZS1JQ, 4X4QA, 5A1TK, 5H3JL, 5N2AAW, 6W8DD, 6Y5RS, 7XØBB, 9G1FV, 9H1R, 9L1TL, 9M2FI (Penang Is.), 9Q5FV, 9V1MT.

Sunspot Special

Were you disappointed with 28Mc/s this month or did you hear mumblings from distant mikes?

Pat Longbone and **John Singleton** use a modified S640, 20m. dipole—GM5ABN/KP4PRY, LA8WI, OE6UX, ZS6AJH. **John Farrer** (Bishop's Stortford), Mini-clipper, ground-plane—CT1PQ, DL8MM, DJ8OD, EA8EV (Canary Is.), EL8B, many G's, ZC4GB, ZE1AA, ZE8JJ, ZS4OI, ZS6—DK, DLW, IW, JK, IB, 5N2AAM, 9J2DT, 9J2MM.

G. Owen (Bristol), Mohican, Joystick, 28Mc/s a.m. CT1—OW, PT, QL, CR6EF, CX2CN, EA7DG, I1FAE, KV5VF, LU1AAB, OZ4FF, PY—1BAV, 3BSB, 4AB, 7EC, ZE2JA, ZE3JO, 5X5JK. On s.s.b. he claims CE3PR, CX—2AAJ, 2BD, 9CO, DJ1OJ, DJ7LY, DJ8LD, EL2R, HI1JMN, KP4AXC, KZ5KW, PY1CK, PY2PA, PY3BKT, PY4CT,

—continued on page 610

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PORTABLE CABINET As illustrated, to fit standard player or autochanger. **69/6**

3 WATT AMPLIFIER. Ready made and tested. With UCL82 triode pentode valve and loudspeaker. **59/6**

SUPERIOR AMPLIFIER Ready made and tested. Guaranteed better sound. Fully isolated AC Mains Transformer 4 watt output. ECL86 triode pentode valve. Volume and tone controls with knobs. Quality Loudspeaker **89/6**

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BSR Junior	£3. 9.6	BSR Superslim	£4.19.6
BSR GU7	£4.19.6	Garrard 1000	£5. 9.6
Garrard SRP12	£4.19.6	Garrard 2000	£6.19.6
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Garrard A70	£19.19.6	Garrard AT60 with diecast turntable	£10.19.6
Garrard LAB80	£24.19.6		
Garrard 401	£29.19.6		

Garrard Teak Wood Base WB 1 Takes 1,000, 2,000, 3,000, SP25, AT60. **72/6**

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½in.	14/6	1$\frac{1}{16}$in.	18/-	1⅝in.	22/6
⅝in.	14/9	1⅛in.	18/-	2in.	34/3
¾in.	15/6	1¼in.	18/6	2$\frac{3}{32}$in.	37/9
⅞in.	15/9	1⅜in.	20/-	2½in.	44/3
1in.	18/-	1½in.	20/6	1in. sq.	31/6

BARGAIN XTAL PICK-UP ARM Complete with ACOS LP-78 Turnover Head and Styli 20/-; Stereo 30/-.
SPEAKER FRET Tygan various colours, 52in. wide from 10/- ft.; 26in. wide from 5/- ft. Samples S.A.E.
EXPANDED METAL Gold or Silver 12 x 12in. 6/-.
NEW GARRARD GRAM MOTORS 100-130v. A.C. 15/- pair for 200/250v. (in series), or 10/- each (Post Free).

FULL WAVE BRIDGE SELENIUM RECTIFIERS: 2, 6 or 12 v. outputs, 1½ amp., 8/9; 2 a. 11/3; 4 a., 17/6.
CHARGER TRANSFORMERS. Tapped input 200/250 v. for charging at 2, 6 or 12 v., 1½ amps., 15/6; 2 amps., 17/6; 4 amps., 25/-. Circuit included. Amp meter 5 amp., 10/6.

MOVING COIL MULTIMETER TK 25. 0-1,000 v. A.C./D.C., ohms 0 to 100k. etc. **47/6**
MOVING COIL MULTIMETER EP10K. 0-1,000 v. A.C./D.C., ohms 0 to 3 meg. etc., **79/6**
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OC71 6/-; OC72 7/6; OC81D 7/6; OC81 7/6; AF115 10/6; AF114 11/-; OC44 8/-; OC45 8/-; OC171 9/-; OC170 8/6; AF117 9/6. OC26 12/6; Transistor Holders 1/3.

VALVE HOLDERS. EA50 6d. MOULDED Int. Oct. 6d. Mazda Oct. 6d.; B7G, B8A, B8G, B9A, 9d.; B7G with can 1/6. B9A with can 1/9. Ceramic OCTAL, EF50, B7G, B9A, 1/-. Valve base plugs B7G, B9A, Int. Oct., 2/3.

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Famous "Power-Mite" 9 volt. Same size as PP9 battery. Fully smoothed, full-wave circuit. **45/-**

WEYRAD P50 — Transistor Coils

RA2W 6 in. Ferrite Aerial with car aerial coil	12/6	Spare Cores	6d.
Osc. P50/1AC	5/4	Driver Trans. LFDT4	9/6
470 k/cs I.F.P50/2CC	5/7	Printed Circuit, PCA1	9/6
3rd I.F. P50/3CC	6/-	J.B. Tuning Gang	10/6
		Weyrad Booklet	2/-

Volume Controls

Long spindles. Midget Size 5 K. ohms to 2 Meg. LOG or LIN. L/S 3/-. D.P. 5/-. Stereo L/S 10/6. D.P. 14/6.

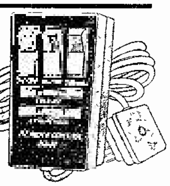
80 Ohm Coax 6d yd.

Semi-air spaced Cable 40 yd. 17/6. 60 yd. 25/-.

FRINGE LOW LOSS. Ideal 625 lines. **1/6** yd.

COAXIAL PLUG 1/-. PANEL SOCKETS 1/-. LINE SOCKETS 2/-. OUTLET BOXES, SURFACE OR FLUSH 4/6. BALANCED TWIN FEEDERS 6d. yd., 80 or 300 ohms. TELESCOPIC CHROME AERIAL. 12in. extends to 33in. 6/6.

TV REMOTE CONTROL



For Philips 19TG111A, 121A, 125A, 142A, 23TG111A, 113A, 121A, 131A. Stella ST1033A, 39A, 43A, 53A. Cossor CT1910A, 21A, CT2310A, 21A, 31A. Philips Price 3 gns.
Our Price **12/6** Post Free
Brand New. Includes 11ft. 7-way cable, Mullard OA81 2 pots., 3 switches, 5 resistors.

NEW ELECTROLYTICS FAMOUS MAKES

TUBULAR		TUBULAR		CAN TYPES	
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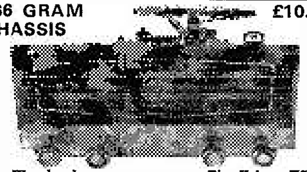

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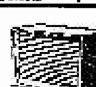

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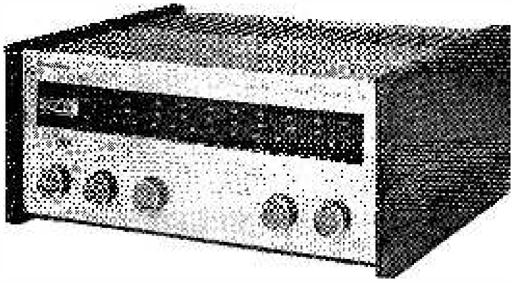
STEREO RADIO



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All three have similar facilities; pickup and tape inputs, tape recording output, bass and treble tone controls.

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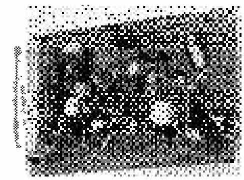
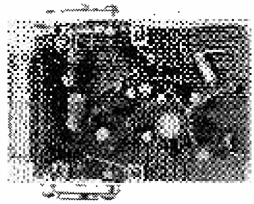


12/12



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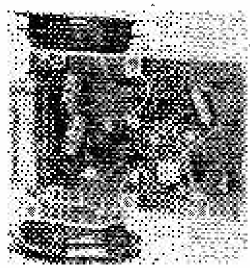

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new books

CIRCUITS FOR AUDIO AND TAPE RECORDING
By F. C. Judd, A.Inst.E., Haymarket Press Limited, London.
80 pages. Size 10¼ x 8in. Price 7s. 6d.

MANY of the circuits contained in this book have been published in earlier issues of the *Amateur Tape Recording* magazine. However this volume does contain a large number of very useful circuits covering most audio requirements. Component values are given for almost all the circuits and in some cases a layout diagram is also included.

Over forty circuits are shown including stereo amplifiers; microphone mixer units; hi-fi amplifiers; echo units; even circuitry for an electronic metronome and a simple transistorised electronic organ.

After looking through the pages several times your reviewer was lead to the inescapable conclusion that 7s. 6d. for this is excellent value for money.—*DLG.*

AMATEUR RADIO ANTENNA HANDBOOK
By Harry D. Hooton, W6TYH. Published by Foulsham-Sams & Co. Ltd., Slough, Bucks. 160 pages. Size 8½in. x 5½in. Price 24s.

THIS book appears to offer both theoretical and practical aspects of aerials suitable for the radio amateur. To do this in 160 pages is a very tall order and to me this attempt has been a failure.

The eight chapters include Transmission Lines; Antenna Fundamentals; Practical H.F. Antennas; Impedance Matching Systems; Antenna Coupling Systems; and Practical Antenna Construction.

Some of the pages seem to be a waste of time to read. On page 151, for instance, there is a table of data for guying towers and information on the wind load. The smallest tower mentioned here is 120 ft. high, and one wonders how many amateurs in this country could either erect or afford this sort of thing.

Perhaps the biggest gripe about this book is the price, when one considers the ARRL Antenna Handbook with some 300 pages for 19s. 6d. post free.—*DLG.*

FUNDAMENTALS OF RELIABLE CIRCUIT DESIGN
Vols. 1 and 2. By Mel Xlander. Published by Iliffe Books Ltd., London. Vol. 1. 197 pages. Size 8½in. x 5⅜in. Price 30s. Vol. 2. 138 pages. Size 8½in. x 5⅜in. Price 27s. 6d.

THE preface begins "The purpose of this book which is published in two volumes, is to introduce the principles of basic circuit design and to provide practice in solving the type of problems that occur in industry."

How refreshing to find an accurate preface which sums up two volumes in a single sentence. For those who are interested in circuit design, these books should prove ideal; a very thorough treatment of the exact why and how of circuit design.

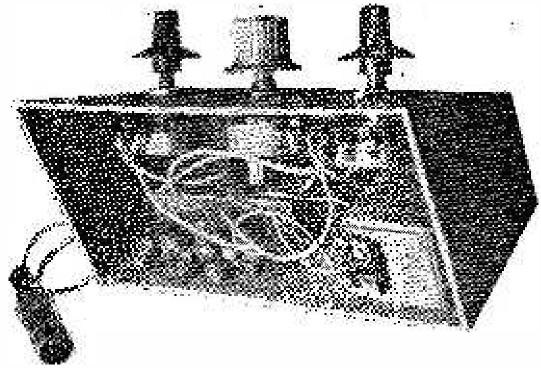
The style of the author is excellent and even the more obscure points are explained with the greatest clarity. Volume 1 covers Fundamentals of Linear Circuits; Inductance; Capacitance; General Equations; Voltage Extremes; Current Extremes; Voltage Divider Design; Threshold Circuits; and Power Dissipation.

Volume 2 continues with Diodes; Transistors, Analysis of Transistor Circuit Functions; Transistor Specifications; Transistor Circuit Design; and Circuit Specifications.

For students or indeed anyone wanting a clear explanation of these subjects then your reviewer has absolutely no hesitation in recommending both these volumes. Indeed these books would prove, in time, to be an investment rather than an expense.—*LSA.*

P.A. PREAMPLIFIER

By L. McNamara



SIMPLE audio mixers are a great utility with such diverse equipment as domestic tape recorders and electric guitars. The writer was therefore surprised when he found difficulty in obtaining one to suit his purposes in adapting a public address system for use in a small hall. An extensive collection of past issues of electronics magazines similarly failed to provide the answer so the unit to be described was developed. It had to provide a limited gain with at least three inputs, each individually controlled and matching either high or low impedance sources. It was decided to employ a transistor amplifier for each input, and mix the outputs. This procedure has the important advantage, as compared with a passive mixing network followed by a transistor pre-amplifier, that interaction between the various inputs is eliminated. Therefore increasing the volume of input 1 has no effect on the signal level of other inputs.

Figure 1 shows the circuit finally adopted. The signal is applied via a volume control and capacitor chosen to match the impedance of the source to a single transistor amplifier operating in the common-emitter mode. This system sets the desired signal level prior to mixing. The signals are mixed in a collector load common to all the transistors. The output develops a voltage across this resistor independent of any other signals present. This output signal feeds the input of the main amplifier whose volume and tone controls have their usual effect. Power for the mixer can be obtained (as in the prototype) from a battery, which due to the very small current drain has an extremely long life; of at least several months. It is also possible to use the heater line of the main amplifier, rectified by an OA 202 diode and smoothed by a 1,000μF, 12V capacitor, as the power supply to the mixer. It will be noticed that the base bias supply for each transistor is obtained by a potential divider from the collector, rather than as is usual, from the h.t. line. This introduces a measure of feedback to correct the matching of the amplified signals from each transistor to the impedance represented by the common load and the other transistors. Otherwise considerable attenuation would occur.

The actual construction of the device is evident from the illustrations. As can be seen the prototype is a three-input mixer, battery-powered through a switch on one of the volume controls and built into a small plywood cabinet. As mentioned above there are alternatives to this arrangement and due to the small size of the unit the ambitious constructor may even build it into his main amplifier. The heart of the unit is the printed circuit board shown in Fig. 2. It will be noted that it is of unitary construction, in that each mixer is a repetition of a standard layout. Therefore should a mixer with a larger number of inputs be desired the constructor need only use a longer piece of circuit board and repeat the pattern. If this process is carried beyond six stages, the common load may have to be reduced and with it the mixer gain. The circuit board is made up in the usual way by masking the copper of a laminate board with cellulose paint in accordance with Fig. 2, and etching off the unwanted remainder with $FeCl_3$. Adaption of the circuit to assembly on veroboard or a blank paxolin panel with wired connections on the reverse side is a possibility should the reader wish to avoid chemicals.

Having assembled the circuit board, connections from the volume controls to their respective elements on the board may be made, and also connections to the input sockets. To avoid hum problems, special care should be taken with earth connections to sockets and controls; where leads of more than a few inches are involved, use of screened wire is advisable, and the output lead to the main amplifier is, of course, screened. In the proto-

—*continued on page 601*

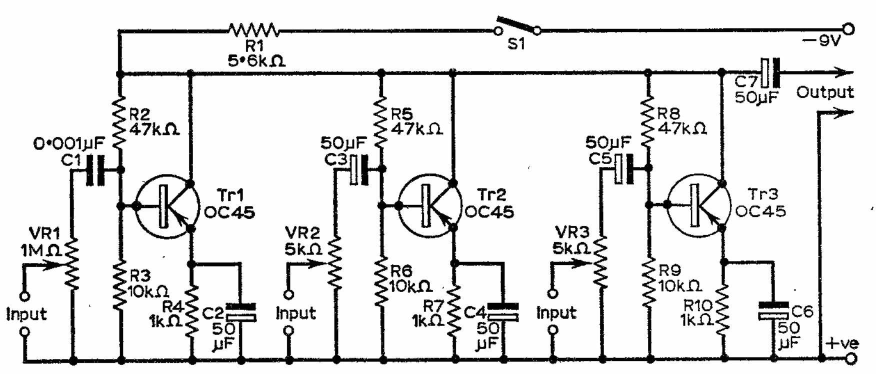


Fig. 1: Circuit diagram of the P.A. Preamplifier: Input 1 is suitable for high-impedance sources, while other inputs are suitable low impedance sources such as dynamic, moving-coil and magnetic microphones.

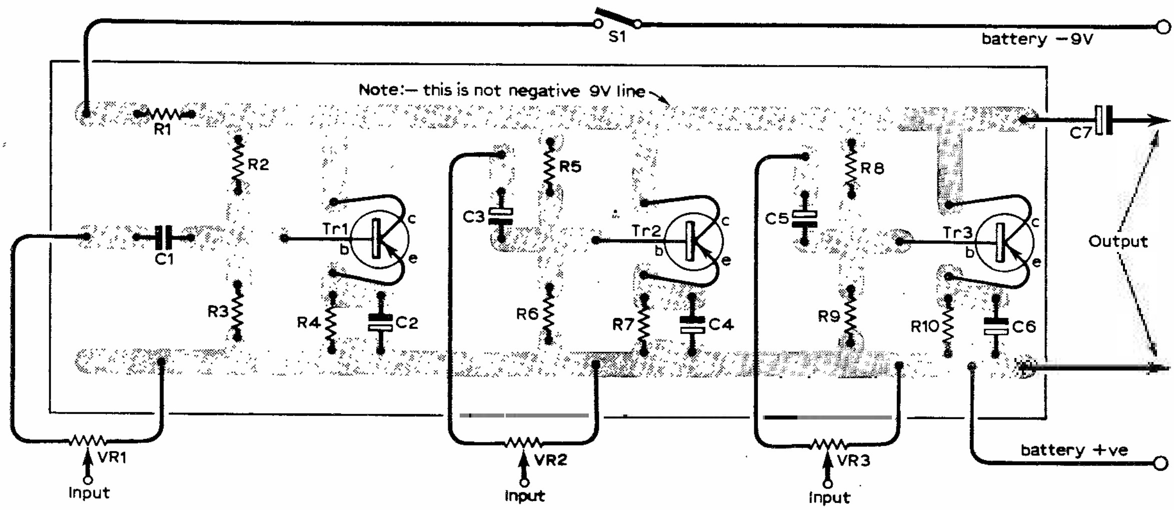


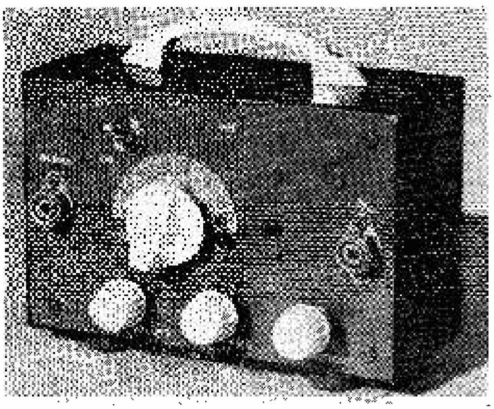
Fig. 2: Layout of the printed circuit board.

type, input 1 was designed for use with high-impedance sources, such as record decks or crystal microphones. The other inputs are low impedance, for use with dynamic, moving-coil or magnetic mikes.

Frequency response and distortion figures for the prototype have not been measured, but it is in regular use and proving satisfactory, giving accurate speech reproduction and crisp performance on records. ■

PRACTICAL WIRELESS

NEXT MONTH'S FEATURES



"Explorer" VHF Receiver

A four-transistor portable receiver/tuner for a.m. and f.m. reception on the v.h.f. bands. It covers 65–120Mc/s and 110–170Mc/s, which take in the 2m and 4m amateur bands, BBC Band II and many other transmissions.

Power Supplies

This article examines mains power supplies in detail and draws attention to several fundamental requirements not always appreciated when designing a power supply to fulfil a particular role. The author discusses valve, metal rectifier and transistor circuitry.

"Ten-Five" Transmitter

An attractive "pocket-size" 'phone transmitter covering 160 and 80m bands for use under fixed station, portable or mobile conditions. By the designer of the popular Ten-Five transistor communications receiver.

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A unit to provide simultaneous record/monitor facilities, without the use of monitor headphones, where these are not incorporated in the tape recorder.

JANUARY ISSUE ON SALE DECEMBER 8th

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MW DX '66-67 SEASON

The MW DX season is now in full swing. We are now riding high (or low?) on the sunspot minima and results should be excellent. Consequently, it will be possible to log the West Coast of America and Canada at times and to get interesting loggings from the Far East and South Africa.

Although DX is DX wherever you chase it, and certain basic principles for success apply on any band, searching for really long distant stations on the medium wave band requires a good deal more skill and patience than that necessary on the higher frequency short wave bands. Newcomers are referred to the two lead-in articles to the '66–67 Season published in the October and November issues. Readers with copies of the November 1965 issue will also find a good deal of information in a special article in that issue.

Opportunities should abound in the next few months for much interesting listening and we would like to hear from readers who have logged any unusual DX (with times and other relative information) or any new stations. We are particularly interested to hear of West Coast American and Canadian loggings—and the time to try for these is around dawn, or earlier.

The following personal DX log for late-October 1965 to late-April 1966 will show the range of DX possible. Although this may be used as a guide to newcomers, note that some of the stations may not be heard this season and some may have changed frequency. Some stations were heard frequently (almost nightly); others rarely only. Other listeners heard many more DX stations than those listed.

The receiver used was a GEC communications type with crystal filter. The aerial was a short "long-wire" into the TV antenna.—*Editor.*

kc/s	Callsign	Location
540	CBT	Grand Falls, Newfoundland
550	CFNB	Fredericton, N. Brunswick
560	CKCN	Seven Sisters, P. Quebec
	LV1	R. Colon, San Juan
	YVLX	R. Rumbos, Caracas
	CHCM	Margstown, Newfoundland
570	——	Godthab, Greenland
	WMCA	New York
580	CFRA	Ottawa, P. Quebec
	——	All India Radio, Tiruchi
	CJFX	Antigonish, Nova Scotia
590	VOCM	St. John's, Newfoundland
600	HJHJ	R. Libertad, Bucaramanga
	CFCF	Montreal, P. Quebec
	HLSA	Suwan, South Korea
	——	All India Radio, Ajmer
	——	R. Paramaribo, Surinam
602	——	Abafon, Nigeria
604	——	Jeddah, Saudi Arabia
620	CKCM	Grand Falls, Newfoundland
	PRH7	R. Panamericana, Sao Paulo
	——	RNE, Santa Cruz, Canary Is.
625	TIRICA	San Jose, Costa Rica
630	CFCY	Charlottetown, P.E.I.
	LV14	Buenos Aires
	——	Radio Pakistan, Lahore
640	CBN	St. John's, Newfoundland
	CMQ	Havana, Cuba
645	HOS22	R. Mia, Panama
650	YVQO	Ondas Portenas, Puerto la Cruz
	WSM	Nashville, Tenn.
	ELBC	Monrovia, Liberia
	——	Godhavn, Greenland
	——	All India Radio, Indore
	——	Peking, China
654	EAJ103	R. Sahara, El Aaiun
655	YSS	R. Nacional, Salvador
	——	Pyongyang, N. Korea
656	——	Ibadan, Nigeria
	4XB47	Tel-Aviv
660	WNBC	New York
	CB66	R. Chilena, Santiago
665	——	Damascas, Syria
675	YND	Union Radio, Managua
677	——	Jerusalem, Jordan
680	WNAC	Boston, Mass.
	CJCN	Grand Banks, Newfoundland
690	CBF	Montreal, P. Quebec
	CMBC	Havana, Cuba
	——	Radio Pakistan, Dacca
700	YVMH	R. Popular, Maracaibo
	WLW	Cincinnatti, Ohio
701	——	BBC Relay, Perim Is.
705	——	?Thailand?
710	WOR	New York
	CJOX	Grand Banks, Newfoundland
720	WGN	Chicago, Ill.
	——	China (Peking?)
730	CKAC	Montreal, P. Quebec
737	——	Chelyabinsk, USSR
740	CBL	Toronto, Ontario
	CMKJ	Holguin, La Voz de Cuba
746	——	Aleppo, Syria
750	WSB	Atlanta, Georgia
	HJDX	Antioquia, Columbia Rep.
	BED2	BBC, Taipeh, Taiwan
	——	Radio Pakistan, Quetta
760	WJR	Detroit, Michigan
	HJAJ	La Voz de Barranquilla, Col. Rep.
	ZFY	Georgetown, Guyana
	CQA	Sao Thome e Principe
	——	VOA, Hue, Vietnam
	——	All India Radio, Lucknow
	——	Radio Baghdad, Iraq
764	——	Dakar, Senegal
770	WABC	New York
785	——	Pyongyang, N. Korea.
786	——	Damascus, Syria
790	WEAN	Providence, Rhode Island
	WFUN	South Miami, Florida
	CFDR	Dartmouth, Nova Scotia
	——	?Peshawar, Pakistan?
795	——	?Black Rock, Barbados?
800	PJB	Bonaire, Neth, Antilles
	——	Amman, Jordan
810	WGY	Schenectady, N.Y.
	WKVM	San Juan, Puerto Rico
820	WBAP	Fort Worth, Texas

—*continued on page 605*

MW DX LIST

—continued from page 602

kc/s	Callsign	Location
	WFAA	Dallas, Texas
	HJED	La Voz de Rio Cauca, Cali.
	LU2	R. Nacional, Bahia Blanca
830	WCCO	Minneapolis, Minn.
	CMCA	Havana, Cuba
	CR6R	Luanda, Angola
	JOBB	Osaka, Japan
834	——	Belize, British Honduras
	——	Kiangsi, China
836	——	Beirut, Lebanon
840	WHAS	Louisville, Kentucky
	——	R. Ethiopia, Harrar
	——	R. Caribbean, St. Lucia
	——	All India Radio, Vijayawada
850	WHDH	Boston, Mass.
	WEAT	West Palm Beach, Florida
	CKVL	Verdum, P. Quebec
	YVLD	R. Valencia, Venezuela
	HJKC	Emisora Nuevo Mundo, Bogota
	CX16	R. Carve, Montevideo
	VUA	All India Radio, Ahmehedad/ Baroda
	——	Pyongyang, N. Korea
854	OAX4A	R. Nacional, Lima
860	CBH	Halifax, Nova Scotia
	CJBC	Toronto, Ontario
	PRA3	R. Mundial, Rio de Janeiro
	——	Kansu, China
	——	All India Radio, Sambalpur
870	WWL	New Orleans, La.
	WHOA	San Juan, Puerto Rico
	LRA	R. Nacional, Buenos Aires
	JOLB	Fukuoko, Japan
880	WCBS	New York
890	WLS	Chicago, Ill.
	YVLW	R. Valencia, Venezuela
	PRA6	R. Gazeta, Sao Paulo
900	CKDH	Amherst, Nova Scotia
	CJBR	Rimouski, P. Quebec
	PJA6	R. Victoria, Aruba, Neth. Ant.
	YVMD	R. Mara, Maracaibo
	XEW	Nexico City
	——	?Shensi, China ?
910	WABI	Bangor, Maine
	CMBF	R. Musical Nacional, Havana
	LR4	R. Splendid, Buenos Aires
	VUR	All India Radio, Rajkot
	YVRQ	R. Aeropuerto, Maiguetia
917	——	Lourenco Marques, Mozambique
920	CJCH	Halifax, Nova Scotia
	——	Shantung, China
930	CJON	St. John's, Newfoundland
940	WINZ	Miami, Florida
	CBM	Montreal, P. Quebec
	YVQT	R. Carapuno, Venezuela
	PRF4	R. Jornal do Brazil, Rio de Janeiro
	——	Kaduna, Nigeria
	——	All India Radio, Tiruchirapalli
	——	Anwhei, China
950	WLOF	Orlando, Florida
	CKNB	Cambletown, N.B.
	CHER	Sydney, Nova Scotia
	LR3	R. Belgrano, Buenos Aires
953	——	Aleppo, Syria
960	CHNS	Halifax, Nova Scotia
	YVRB	R. Monogas, Maturin
	——	Omdurman, Sudan
	——	China (Peking ?)
970	HCLA	Suwan, S. Korea
	CBZ	Fredricktown, N.B.
980	PRE8	R. Nacional, Rio de Janiero
985	——	Kermamshah, Iran
990	CBY	Corner Brook, Newfoundland
1000	WCFL	Chicago, Ill.
	CKBW	Bridgewater, Nova Scotia
	YVNM	R. Moron, Venezuela
	XEOY	R. Mil, Mexico
	KOMO	Seattle, Washington
1005	HRVP	R. Norte, Honduras
1010	WINS	New York
	CFRB	Toronto, Ontario
	JONR	Osaka, Japan
1015	HOU	La Voz de Baru, David, Panama
1020	KDKA	Pittsburg, Penn.
	YVNZ	R. Calendario, Maracaibo
1025	TICA	R. Fides, San Jose, Costa Rica
1030	WBZ	Boston, Mass.
	——	Peking, China
1035	4VEF	Cap Haitien, Haiti
1040	WHO	Des Moines, Iowa
	PRG2	R. Cultura, Sao Paulo
	——	VOA, Sugarloaf, Florida
	VUB	All India Radio, Bombay
1050	WHN	New York
	CHUM	Toronto, Ontario
1060	CJLR	Quebec City
	CB106	Soc. Nac. de Mineria, Santiago
	HLKX	Inchon, S. Korea
1070	CBA	Sackville, N.B.
	LR1	Radio el Mundo, Buenos Aires
	VUD	All India Radio, Delhi
	WMIA	Arecibo, Puerto Rico
1075	TIFC	Voz de la Victor, San Jose
1080	WTIC	Hartford, Conn.
	YVQJ	R. Barcelona, Venezuela
1090	WBAL	Baltimore, Md.
	HJBC	La Voz de Cucuta, Colombia Rep.
	CX28	R. Impartial, Montevideo
	KING	Seattle, Washington
1100	WKYC	Cincinnatti, Ohio
	PRG9	R. Nacional, Sao Paulo
1110	WBT	Charlotte, N.C.
	CBD	St. John's, N.B.
1115	YNC	Leon, Nicaragua
1120	KMOX	St. Louis, Mo.
	TGRB	R. Reloj, Guatemala City
	YVMF	Ondas del Lago, Maracaibo
	——	Unid. Far Eastern Station
1125	TISRHB	R. Popular, San Jose
1129	——	Kuwait
1130	WNEW	New York
	HJAC	Emisora Riomar, Barranquilla
	LU5	R. Splendid, Neyquen
	——	Unid. Far Eastern (JOQR ?)
1140	CBI	Sydney, N.S.
	CB114	R. Corporacion, Santiago, Chile
	——	VOA, Poro, Phillipines
1150	CHSJ	St. John's, N.B.
	CKTR	Three Rivers, P.Q.
	LU6	R. Atlantica, Mardel Plata
	——	Radio Pakistan, Rawalpindi
	XEJP	Mexico City
1157	——	R. Americas, Swan Island
1160	WJJD	Chicago, Ill.
	——	Thailand
1170	WWVA	Wheeling, W.Va.
1178	——	VOA, Okinawa

—continued on page 606

MW DX LIST

—continued from page 605

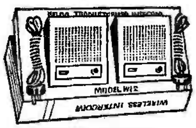
kc/s	Callsign	Location
1180	WHAM	Rochester, N.Y.
	—	VOA Marathon Key, Florida
	PRE3	R. Globo, Rio de Janeiro
1190	WOWO	Fort Wayne, Indiana
	JOQB	Nilgata, Japan
	—	China
1200	WOAI	San Antonio, Texas
	YVOZ	La Voz de Avila, Caracas
	BED88	Taipeh, Taiwan.
	PRE9	Fortaleza
	—	Freetown, Sierra Leone
1210	WCAU	Philadelphia, Pa.
	LV3	R. Cordoba, Argentine
	—	Unid. Far Eastern Station (JOOR?)
1220	WGAR	Cleveland, Ohio
1230	—	Peking, China
1235	ZBM1	Hamilton, Bermuda
1240	LU10	R. de Sur, Bahia Blanca
1250	CKBL	Matane, P.Q.
	WRYT	Pittsburg, Penn.
	WTMA	Charleston, S.C.
	—	All India Radio, Sangli
	—	Vladivostok, Siberia
1260	WEZE	Boston, Mass.
	WAME	Miami, Florida
1268	—	Thailand
1270	CJCB	Halifax, N.S.
	WTNT	Tallahassee, Florida
	LS11	R. Provincia, La Plata
	—	VUNC, Khangwa Is.
1280	CJMS	Montreal, P. Quebec
	CKCV	Quebec City
	WCMN	R. Centro, Arecibo, P. Rico
	WADO	New York
	PRG3	R. Tupi, Rio de Janeiro
	—	Hopei, China
1290	WKNE	Keene, N.H.
	—	China (Peking?)
	KOIL	Omaha, Nebraska
1295	PJD2	St. Maartan, Neth. Antilles.
1300	CBAF	Moncton, N.B.
	WERE	Cleveland, Ohio
	WFBR	Baltimore, Md.

kc/s	Callsign	Location
1305	HJAK	La Voz la Patria, Barranquilla
	ZP10	Emisora Paraguay, Asuncion
1310	CHGB	St. Annes, P.Q.
	CKOY	Ottawa, Ontario
	—	REF, Martinique
	—	Unid. China
1315	HOL55	Chitre, Panama
1320	CKEC	New Glasgow, N.S.
	CJSO	Sorel, P.Q.
	WZOK	Jacksonville, Florida
	WKAP	Allentown, Pa.
	—	Enugu, Nigeria
1325	PJA10	Aruba, Neth. Antilles
	—	Teheran, Iran
1330	WPOW	New York
	WCRB	Waltham, Mass.
	4VW	R. Haiti, Port-au-Prince
	LT14	R. General Urquiza, Parana
	—	All India Radio, Bikaner
1340	ZBM2	Hamilton, Bermuda
1345	—	Kuwait
1350	WAVY	Portsmouth, Va.
	WORK	York, Pa.
	CKEN	Kentville, N.S.
	PRH6	Belo Horizonte
1360	CKBC	Bathurst, N.B.
	WDRC	Hartford, Conn.
	WSAI	Cincinnati, Ohio
	ZYH25	R. Uirapuru, Fortaleza
	KSBU	Okinawa, Ryuku Is.
1370	WSAY	Rochester, N.Y.
	CFLV	Valleyfield, P.Q.
	WIVV	Vieques, Puerto Rico
	ZYK31	R. Continental, Recife
	—	Unid. Eastern station
1375	—	REF, St. Pierre et Miquelon
1380	CKLC	Kingston, Ontario
	CFDA	Victoriaville, P.Q.
	WLCY	St. Petersburg, Florida
	CB138	R. Cruz del Sur, Santiago
	JOUF	Osaka, Japan
1390	WCSC	Charleston, S.C.
	WEGP	Presque Is., Maine
	—	All India Radio, Imphal
	—	Ahwaz, Iran
	LR11	R. Universidad, La Plata
1394	CSB80	Santa Maria, Azores
1395	HCVE4	La Voz de Esmereldas, Chimbo

kc/s	Callsign	Location
1400	WOND	Pleasantville, N.J.
	WIRA	Port Pierce, Florida
1403	—	Conakry, Guinea Rep.
1410	WPOP	Hartford, Conn.
	—	Phnon Penh, Cambodia?
1416	—	Bamako, Mali.
1420	WOC	Davenport, Iowa
1430	WENE	Endicott, N.Y.
	WNJR	Newark, N.J.
1435	PJA5	R. Kelkboom, Neth. Antilles
1440	CKPM	Ottawa, Ontario
	WAAB	Worcester, Mass.
1450	CBG	Gander, Newfoundland
1460	WOKO	Albany, N.Y.
	WHEC	Rochester, N.Y.
	CKRB	Ville de St. Georges, P.Q.
1470	WLAM	Lewiston, Maine
	WMMW	Meriden, Conn.
	CFOX	Pointe Claire, P.Q.
	XESM	Mexico City
1475	CSB90	Funchal, Madeira
1480	WHBC	Canton, Ohio
	WSAR	Fall River, Mass.
	WMDD	Fajardo, Puerto Rico
1490	WPOR	Portland, Maine
1500	WTOP	Washington, D.C.
	—	All India Radio, Vijayawada
1510	WMEX	Boston, Mass.
	WLAC	Nashville, Tennessee.
1520	WKBW	Buffalo, N Y
1523	—	West China, Peking relay
1530	WCKY	Cincinnati, Ohio
1540	WPTR	Albany, N.Y.
	ZNS	Nassau, Bahamas
1550	WBSC	Bennettsville, S.C.
	CBE	Windsor, Ontario
	WOKJ	Jackson, Missouri
	HJZI	R. Fantasia, Bogota
1560	WQXR	New York
	—	All India Radio, Siliguri
1570	CKLM	Montreal, P.Q.
	XERF	Villa Acuna, Mexico
1580	CBJ	Chicotimi, P.Q.
1590	WAKR	Akron, Ohio
	WSMN	Nashua, N.H.
1600	CJRN	Niagra Falls, Ontario

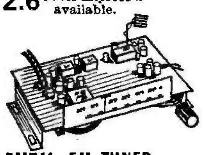
RADIO • HI-FI • COMPONENTS • TEST EQUIPMENT

ALL ITEMS SENT POST FREE



WI-2. TRANSISTORISED WIRELESS INTERCOM
No wires, no installation needed, simply plug them into AC power point and talk. Units have press-to-talk lock switch and on-off volume control. Ideal Intercom or Baby Alarm for home, office, factory. **£14.12.0** Complete.

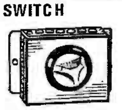
DP303. DOOR PHONE INTERCOM
Ultra sensitive transistorized intercom designed so that you may answer the door from within for greater convenience and safety.
£4.12.6 Other intercoms available.



EAGLE FMT41. FM TUNER
Sub-miniature 6 transistor 3 diode F.M. Tuner. Covers 88-108 Mc. Operates from 9-volt battery, micro miniature circuit giving brilliant FM reception. Ready to use, simply connect to your Hi Fi amplifier. Instructions supplied.
£8.10.0

EG304
Sub-miniature 3 watt transistorised push-pull radio amplifier on printed circuit. Ideal unit for Interooms, Baby Alarms, Radio Tuners, etc. Complete with circuit and instructions. **£3.12.6**
Also available EG104. One Watt **£3.2.6**
and EG2004 250 mW **£2.5.0**

SS.70.S. STEREO SELECTOR SWITCH



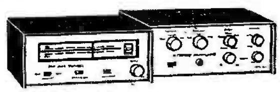
Seven position stereo switch for selecting all or seven different combinations for HI-FI Speaker systems. Will handle up to 60 watts of Audio power. Complete with instrctns. **£1.10.0**

TE190. SINE SQUARE WAVE AUDIO GENERATOR
SINE WAVE: 20–200,000 cps in four bands.
SQUARE WAVE: 60–30,000 cps. Input impedance 0–5,000 ohms. Especially designed for HI-FI Radio and TV Service men who require a dependable instrument. **£21.19.6**

K142. VACUUM TUBE VOLTMETER
This high quality V.T.V.M. is an indispensable test instrument for the technician-engineer. It is a highly accurate D.C. Voltmeter, A.C. Voltmeter and Ohmmeter incorporating a 6in. full view meter. **£21.15.0**
Also a full range of other meters available.

LATEST EAGLE PRODUCT TSA90 4×4 WATT ALL TRANSISTOR STEREO AMPLIFIER
Gram and radio inputs—output impedance 3-16 ohms. Silver anodized aluminium front panel complete with matching metal knobs. Only **10 gns.**

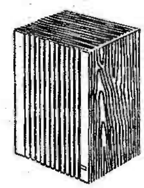
EAGLE SA100. 10W INTEGRATED STEREO AMPLIFIER



A compact, versatile integrated unit for monaural or stereophonic reproduction from record player, tape recorder and tuner. Power output 5 watts per channel. Frequency response 40–20,000 c.p.s.
£18.0.0

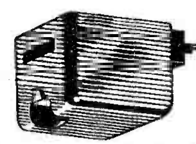
EAGLE AFM100. AM-FM TUNER
Combines a host of advanced features that easily make it the finest AM-FM tuner in its class. A tuned RF stage on FM, AFC circuit and a heavy flywheel giving smooth but effortless tuning, built in AM Ferrite aerial. FM.88–108Mc. AM 535–1605 K/s. **£29.0.0**

MS80. 20W ROSEWOOD SPEAKER SYSTEM



The perfect answer for the music lover who wants full range fidelity in a compact system. Features an 8in. full range high compliance speaker with an output capacity of 20 watts RMS. Frequency response: 30–20,000 c.p.s. Resonant frequency: 30–40 c.p.s. Sensitivity: 97 db/w. Flux density: Over 12,000. Impedance: 16 ohm. Size 14½in. high x 10⁵/₁₆in. wide x 8in. deep. **£14.14.0**
As well as this beautifully designed speaker there are two other models MS65. 10 watts RMS at £12.12.0 and MS40 5 watts RMS £8.10.0.
All three speakers are finished in magnificent rosewood and the entire cabinet filled with acoustic damping material.

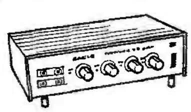
EAGLE PRODUCTS
MAGNETIC STEREO CARTRIDGES



M1007G GOLD	M1007F. SILVER
Response: 20-20,000 cps	Response: 20-18,000 cps
Output: 5MV at 1Kc/5cm/Sec.	Output: 10MV at 1Kc/5cm/Sec.
Stylus: 0.5 Mil diamond	Stylus: 0.7 Mil diamond
Tracking Pressure 1–2.5 grams.	Tracking Pressure 2–4 grams.
£6.12.6	**£5.14.6**

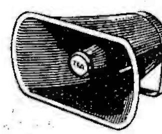
Both feature singularly smooth reproduction and incisive separation of stereo channels

ALL TRANSISTOR PUBLIC ADDRESS AMPLIFIERS

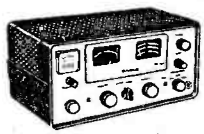


Two new models offering the last word in P.A. amplification. All transistorised circuit, negative feedback circuit reduces distortion to a minimum. Two mike inputs high and low with individual controls. Plus inputs for TAPE, TUNER and RECORD PLAYER.
PA540 35 Watts **£36.0.0**
PA541 50 Watts **£56.0.0**
Other P.A. models available.

SC10F. RECTANGULAR REFLEX HORN SPEAKER

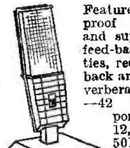


An outstanding combination of reflex horn and driver unit for car mounting, to deliver wide angle high quality reproduction. Weatherproof, waterproof and shockproof. Output 10 watts. **£7.15.0**
Also available SC5F: 5 watts, £4.2.6 and SC15F: 15 watts £14.12.6.



SR165. ALL BAND COMMUNICATION RECEIVER
This entirely new professional type communication receiver features frequency coverage of 535 Kc/s–30 Mc/s for complete general coverage. In particular ham bands are arranged in the same calibration scale, so that the band switching can be accomplished rapidly. **£48.0.0**

UD40H CARDOID DYNAMIC MICROPHONE

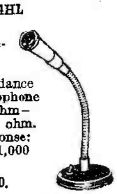


Features a pop-proof diaphragm and superior anti feed-back properties, reduces feed-back and room reverberation. O/p: —42 db. Response: 60–12,000 cps; 50K ohm impedance £6.6.

DM31C. CARDOID DYNAMIC MICROPHONE

Superb quality with ball head for distributed cardoid front-al pick-up. Output: —52db. Response: 40–13,000 cps. Impedance 50k ohm. £7.7.0.

DM24HL



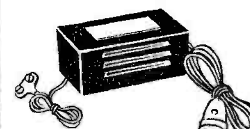
A goose-neck dual impedance microphone 600 ohm – 50K ohm. Response: 50–11,000 cps. £6.6.0.

27 other microphones available.

FOR FULL DETAILS OF THESE AND MANY OTHER ITEMS SEND FOR FREE COMPREHENSIVE CATALOGUE, EAGLE NEWS AND ORDER FORM. ALL ITEMS AVAILABLE POST FREE AND COVERED BY 12 MONTHS' GUARANTEE.

Callers Welcome at our HI-FI SHOWROOM — 87 TOTTENHAM COURT ROAD, LONDON, W.1.

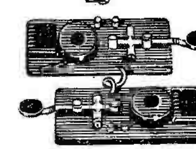
TE-188. RF SIGNAL GENERATOR
A stable wide range signal generator with a range of 120 Kc/s–260Mc/s on 6 bands. Features a large 4½in. vernier tuned, etched circular dial for easy accurate frequency adjustments. Complete with instructions. **£20.15.0**



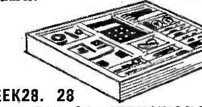
LA9P. AC ELIMINATOR
with a double wound step down transformer to operate 9v Radios, etc., from AC Mains. **£1.8.6**

FSW1. FOOT SWITCH
Snap action foot switch with skid proof rubber base pad. Plugs into your Tape Recorder remote control system but special adaptor supplied enables this to be used with all other Tape Recorders. **24/-**

CSK.10
Self-powered crystal set kit with private earphone. Supplied complete with instructions. **18/6**



MCK.2. MORSE CODE KIT
Two station morse code kit supplied with instructions, 50ft. of connection wire and morse code charts. **£2.2.0**



EEK28. 28 PROJECT CONSTRUCTIONAL KIT
This advanced educational kit is excellent for beginners as well as the more advanced experimenter. Not even a soldering iron is needed. Complete with 60 page booklet giving full details of suggested circuits. **£6.10.0**

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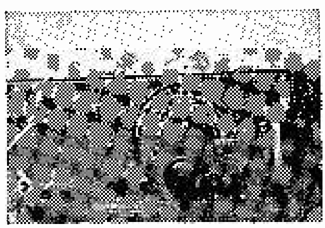

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MODIFYING THE ELECTRONIC GATE

Described in the April Issue

ONE of our readers who has built two of the electronic gates, described in the April issue by H. T. Kitchen, for converting single-beam oscilloscopes into dual-trace machines, has modified the original circuit to make it more versatile. Briefly, he has made the gating oscillator free running—continually variable from 50c/s to 5kc/s—and improved the wave shape of the high frequency gating pulses.

Variable Gating Speed

Two one-watt, wire-wound resistors (one fixed and one variable) are the only components necessary to carry out the fixed to free-running conversion. There are, however, a few circuit alterations; Fig. 1 shows the circuitry around V1 which has to be changed.

To effect the modification, proceed as follows: Disconnect the earthy end of R1 and R2. Connect one end of a fixed 120kΩ resistor to the 250+ h.t. rail; the other to one end of a 100kΩ potentiometer. The "free" end of the potentiometer has to be connected to the earth rail and the wiper to the "free" ends of R1 and R2.

With the wiper of the potentiometer at the earthy end, the fixed speeds will be as before, but they will increase as the wiper is moved towards the h.t. rail to give continuous coverage.

"Squaring-up the Square Waves"

A prominent rounding of the leading edge of the square wave output of the gating oscillator takes place on the higher frequencies; 2kc/s and above, the higher the frequency the worse it gets. Although careful layout will improve matters, the stray capacity of the valve will cause some distortion. The result of this distortion is a spike on the signal across V2; the width being proportional to the percentage of the curve to the square on the waveform. If a careful study of the anode or output waveform is made it will be seen that the curve usually starts about three-quarters of the way up the leading edge.

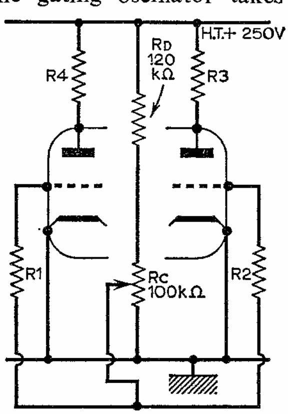


Fig. 1: Modifications to the gating oscillator VI to give continuous coverage from 50c/s to 5kc/s.

To overcome this problem the top portion of the square wave has been chopped. Instead of using a Zener diode (which would be expensive, since it would have to operate at about 160 volts), a pair of reversed diodes and a potential divider have been used. A circuit showing the alterations is given in Fig. 2. From this it can be seen that a potential divider, comprising a 50kΩ variable and a 12kΩ wire-wound, half-watt resistor, is inserted across the supply lines. The diodes, which must be capable of withstanding 300 p.i.v. and a forward current of 10mA, are connected to the centre point from the anodes of V1a and V1b. The diodes are thus reversed biased when the valve is conducting. When the anode voltage rises to the predetermined level, in this case 160V, the diode conducts and prevents any further increase in amplitude. This has the effect of clipping the waveform at the wanted voltage level and thus eliminates the distorted portion of the square wave. R_A can, of course, be replaced with a fixed resistor once the optimum value has been selected. A small improvement may be found if a 0·05 μF capacitor is put across R_B.

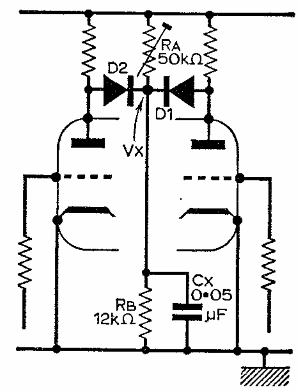


Fig. 2: Clipper modifications to improve the square wave output of the gating oscillator.

When carrying out this modification, it is advisable to look at the signal on the anodes of V2. It should appear as a square wave, reducing to zero as VR1 (in the original circuit) is advanced to the mid position. Any distortion from the oscillator will appear as spikes, which VR1 will have no control over.

Correction

The lead connections from Pin 2 and Pin 7 of V1 in the original circuit diagram of the trace doubler (page 1077) are incorrect. They should be transposed to give cross coupling. ■

CLUB SPOT

No. 12 THE BRITISH AMATEUR ELECTRONICS CLUB

IN November 1965 steps were taken to show the full series of Mullard technical films to all interested in electronics and who lived in the Cardiff area. Arrangements were made to show the films at the Penarth Secondary School, St. Cyres Road (where we still meet) and the organisation was called The St. Cyres Electronics Group. We had to borrow a projector, and these and other technical films were shown until March to very appreciative members. On May 16th we adopted a Constitution, elected a Committee, changed our name to The British Amateur Electronics Club, and we were off!

The first thing we did was to arrange for the public to play with an electronic shooting gallery during Penarth Holiday Week and we were allocated the shelter on the promenade. Having got the go-ahead from the Council we then had to design and make it! To cut a long and unbelievable story short we did, in fact, have a modified game ready just in time (well, two hours late!) and we raised £38 for the British Empire Cancer Campaign during the week.

In June we published our first Newsletter which contained details of the aims and policy of the B.A.E.C. and all prospective members were sent a copy. Much to the surprise of our members a second Newsletter was published in September, and apart from details of the electronic games played during the Holiday Week it gives details of our future programme of meetings.

The electronic games we make are designed to incorporate different types of electronic circuits (counters, and gates, S.C.R.'s, etc.) and during our meetings we will be investigating the principles and operation of all types of electronic devices and circuits with the aid of electronic test equipment, and then incorporate them in the games. During Penarth Holiday Week next August we hope to have a few new games ready and do better than this year, particularly as we have more time in which to prepare.

Our membership fee is 10s. per year and out of this we pay for all electronic components used in the electronic games we make. The British Amateur Electronics Club is for all who are interested in electronics as a hobby, and it is hoped that more who live too far from Penarth to attend our meetings will join and exchange ideas through the Newsletter. To encourage this the B.A.E.C. has a scheme whereby electronic groups in other parts of the country can join as a whole, and if more than half their members are individual members of the B.A.E.C. then they can receive free electronic components up to 40% of their individual membership fee for any electronic project they plan which is approved by the committee of the B.A.E.C. This 40% would be the cost price plus postage, and as the B.A.E.C. can buy in bulk very cheaply indeed this idea could mean the difference between doing and not doing.

As has been shown in this summary we are a young club but very ambitious and full of ideas. To carry out our policy of catering for all who are interested in electronics as a hobby (and that includes radio) we need more members, so if you would like more details please write to the Hon. Secretary, Mr. R. E. Cullen, 4 Roseberry Road, Penarth, Glam., and he will, without hesitation, send you our first Newsletter!

THE AMATEUR BANDS

—continued from page 594

SM5JW, SP5AKG, TI2LA, ZE1AN, ZE8SKI, ZP5KT, ZS4RI, 4X4GY, 5A2TI, 5N2AAF, 5Z4GS, 9J2—DT, DX, MM, VX, 9Q5BD, 9X5MH.

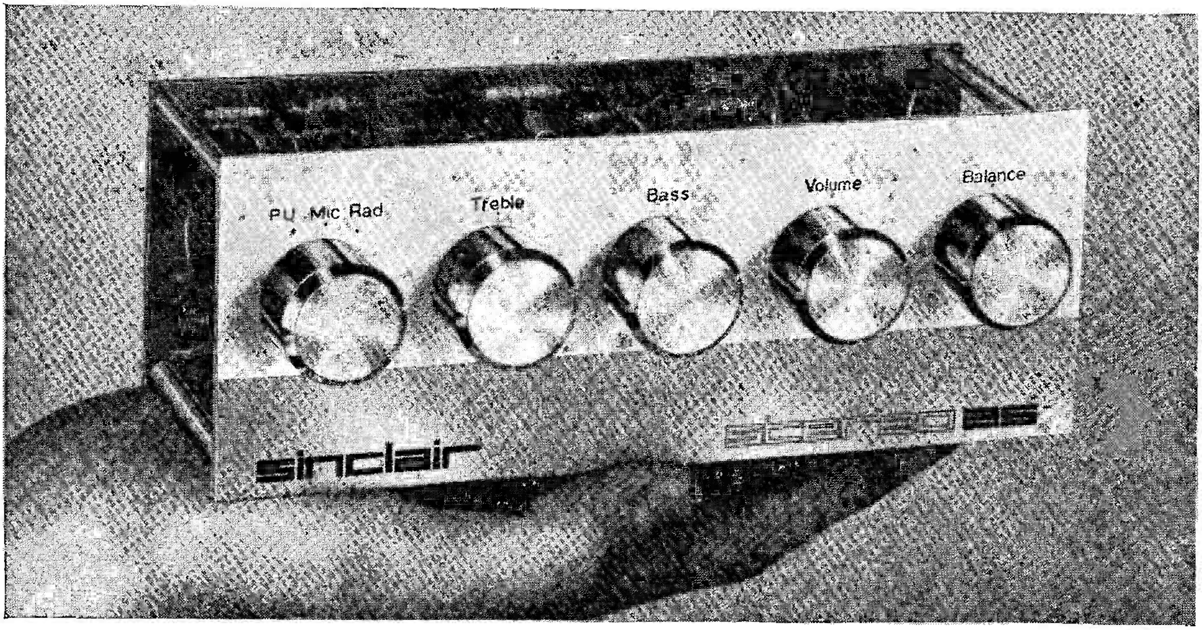
News and Views

Contests for November include: 12th—13th, 7Mc/s DX contest (c.w. section); 19th—20th, Topband contest (second); December 4th, Fourth 70Mc/s contest (c.w.).

What to look for and where? Well, try the l.f. end of 1·8Mc/s for W's on c.w. Almost any time on 14 and 21Mc/s for DX. Don't forget 7Mc/s still provides a challenge if you find DX too easy on 14 and 21.

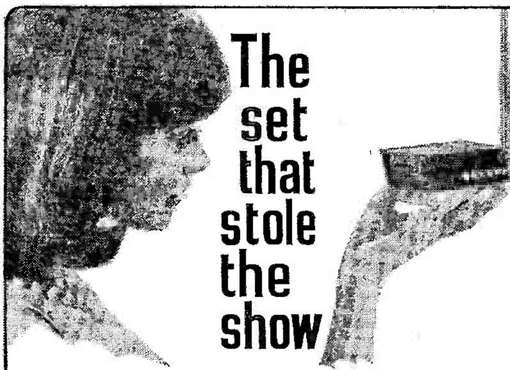
How about 80, very few reports these days for this band. Finally, every time you switch on the gear—a quick listen on 28Mc/s. You never know what you might hear these days.

PS—G3JDG is loose on topband with 10 watts into 140ft. end fed. You have been warned! Deadline for this month is 27th.



SINCLAIR STEREO 25

DE-LUXE PRE-AMPLIFIER AND CONTROL UNIT



THE WORLD'S FIRST POCKET TV

THE SINCLAIR MICROVISION POCKET TV RECEIVER provided a world wide sensation when shown for the first time at the 1966 Radio and TV Exhibition. This fantastic British set tunes over 13 channels on bands 1 and 3, operates from six self-contained "Penlite" batteries and measures only 4in. x 2½in. x 2in. Despite the minute proportions of this 30 transistor receiver, quality from the exclusively designed tube and loudspeaker is superb. This amazing Sinclair triumph will be available early in 1967 at a cost of 49 gns.

SINCLAIR MICROVISION

Available early 1967

A revelation in quality and economy

THE SINCLAIR STEREO 25 has been designed specially to ensure the highest possible standards of reproduction when used with two Z.12s or any other first class stereo power amplifier. Best possible components are used in the construction of this superb unit, whilst its appearance reflects the professional elegance characteristic of all Sinclair designs in hi-fi, radio and TV. The front panel of the Stereo 25 is in solid brushed and polished aluminium with beautifully styled solid aluminium control knobs. Mounting the unit is simple, and power is conveniently obtainable from the Sinclair PZ.3 which can also be used to supply two Z.12s to make a complete stereo assembly. Hi-fi enthusiasts seeking the ultimate in domestic listening will find all they want from this combination of Sinclair units. With a Micro FM for tuner, they will have an installation to compare favourably with anything costing from four to five times as much.

IDEAL FOR USE WITH TWO Z.12s AMPLIFIER

TECHNICAL SPECIFICATIONS

Performance figures obtained with the Stereo 25 fed to two Z.12s and a PZ.3 mains power supply unit.

- **SENSITIVITY** for 10 watts into 1.5 ohms load per channel.
  Mic.—2 mV into 50K ohms.
  Pick-up—3 mV into 50K ohms.
  Radio—20 mV into 4.7K ohms.
- **FREQUENCY RESPONSE** (Mic. and Radio)—25 c/s. to 30 kc/s. ± 1dB extending to 100 kc/s ±3dB.
- **EQUALISATION**—Correct to within ±1dB on RIAA curve from 50 c/s to 20 kc/s
- **TONE CONTROLS**
  Treble +12dB to —10dB at 10 kc/s.
  Bass +15dB to —12dB at 100 c/s.
- **SIZE**—6½in. x 2½in. x 2½in. overall, plus knobs.
- **FINISH**—Front panel sectioned in brushed and polished solid aluminium with solid aluminium knobs. Black figuring on front panel.

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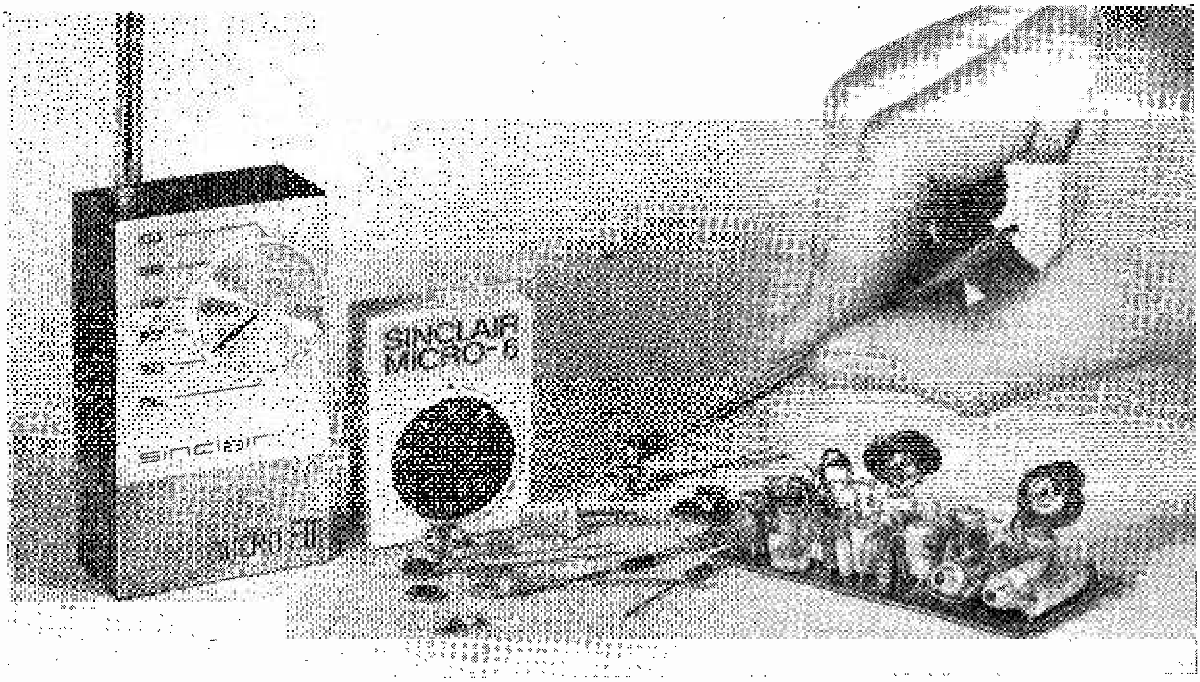


2 SETS THAT HAVE CHANGED THE FACE OF RADIO

Nothing has ever equalled Sinclair designs for compactness and efficiency and the Micro-6 and Micro FM are now world famous examples of what can be achieved by specialisation in transistor electronics. Countless thousands of these sets have been built to the delight of constructors all over the world. Each in its class fulfills a very real need in terms of present day listening requirements, and anyone can easily build both sets by following the well prepared instructions supplied with each kit. Proof of their success is found in the never ending stream of enthusiastic letters constructors send us. Here are yet more typical examples.

MICRO FM

"We have now completed installation of the Micro FM after being lost in admiration for the superb construction. Results are beyond praise. The quality is perfect. In fact I haven't done a stroke of work since we finished it. Please thank all for a first class job. We are thrilled with it."

C.E., Lowick, Berwick-on-Tweed.

"I should like to express my very considerable satisfaction with the performance of the Micro FM. You have clearly designed a very efficient circuit with first rate overall performance. I am more than pleased."

L.E.H., Harrogate.

MICRO-6

"A truly excellent kit. The finish and general quality is very good. It is fantastic that a radio can be so compact."

N.R.C., Bishop's Stortford.

"Reception and sound is superb. I found the instructions very easy to understand."

R.R., Spanish Town, Jamaica.

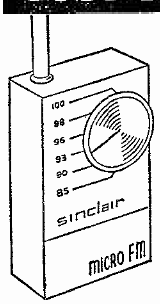
Z.12

"The results are outstanding when used with a good quality speaker."

P.O.S., London, E.13.

MICRO FM

7 TRANSISTOR SUPERHET F.M. TUNER/RECEIVER



Complete kit inc. telescopic aerial, case, earpiece and instructions.

£5.19.6

This unique, superbly engineered superhet FM set is completely professional in styling inside and out. Its performance is fantastic. It is the only set in the world which can be used both as an FM tuner and as an independent FM pocket receiver just whenever you wish. Problems of alignment which previously made it almost impossible for a constructor to complete an FM set for himself have been completely eliminated. This set is ready to use the moment you have built it. The pulse counting discriminator ensures best possible audio quality; sensitivity is such that the telescopic aerial included with the kit assures good reception in all but the very poorest reception areas. The Sinclair Micro FM give will you all you want in FM reception and the satisfaction of building a unique design that will save you pounds.

TECHNICAL DESCRIPTION

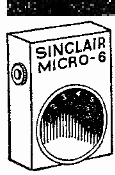
Self-contained double-purpose FM superhet using 7 transistors and 2 diodes. The R.F. amplifier is followed by a self-oscillating mixer and three stages of I.F. amplification which dispense with I.F. transformers and all problems of alignment. The final I.F. amplifier produces a square wave which is converted to produce the original modulation exactly. A pulse-counting discriminator ensures better audio quality. One output is for feeding to amplifier or recorder and the other enables the Micro FM to be used as an independent self-contained pocket portable. A.F.C. "locks" the programme tuned in. The telescopic aerial included is sufficient in all but the worst signal areas.

- ★ **Size: $2\frac{13}{16}$ x $1\frac{11}{16}$ x $\frac{3}{4}$in.**
- ★ **Powerful A.F.C.**
- ★ **Pulse counting discriminator**
- ★ **Low I.F. completely eliminates alignment problems**
- ★ **Tunes from 88 to 108 Mc/s**
- ★ **Audio response: 10 to 20,000 c/s $\pm$ 1dB**
- ★ **Signal to Noise Ratio: 30dB at 30 microvolts**
- ★ **Operates from standard 9V battery,**
- ★ **self-contained**
- ★ **Plastic case with brushed and polished aluminium front and spun aluminium tuning dial**

MICRO-6

SIX-STAGE MEDIUM WAVE A.M. RECEIVER

The smallest radio set in the world!



This is the set against which a matchbox looks enormous. Yet it is completely self-contained, including aerial and batteries and virtually plays anywhere. Its clever six-stage circuit (2 R.F., double diode detector, 3 A.F.) ensures all you want in a radio today—power, range, quality and selectivity. A.G.C. counteracts fading, bandspread brings in Luxembourg like a local station. There is great pleasure to be had in building the Micro-6, and it makes a highly acceptable gift with its white, gold and black case and amazing performance.

- **Size: $1\frac{4}{5}'' \times 1\frac{3}{10}'' \times \frac{1}{2}''$**
- **Weight: One Ounce**
- **Easily built in an evening**

Complete kit with earpiece, case and instructions.

59/6

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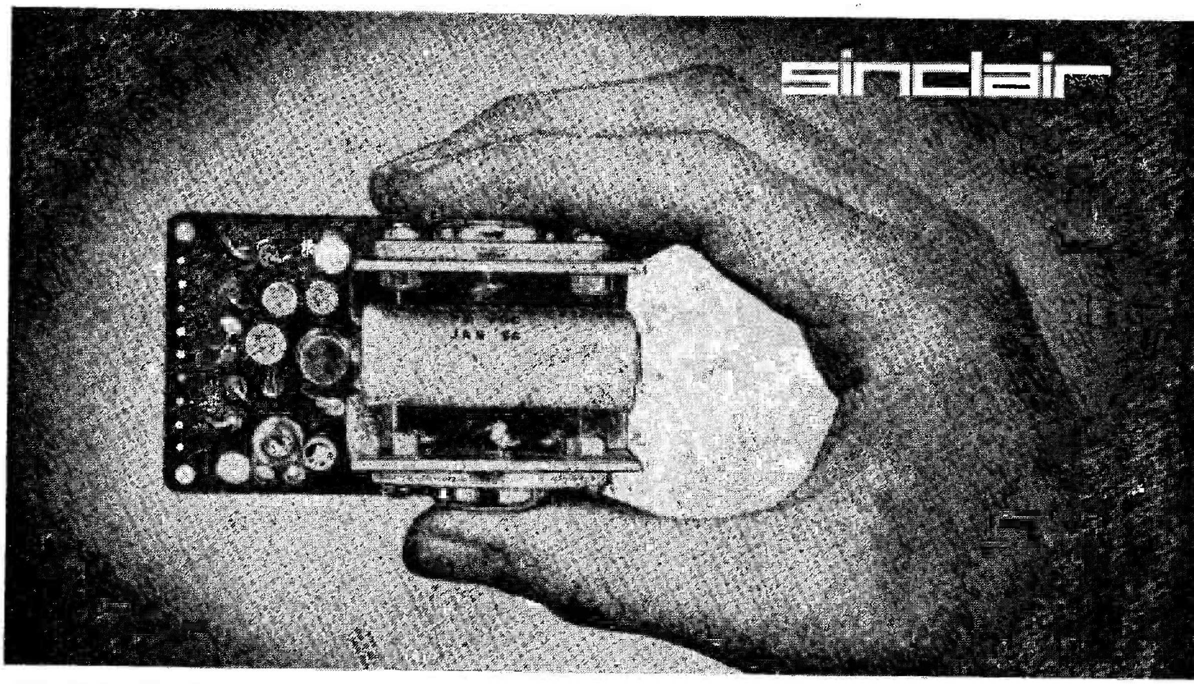


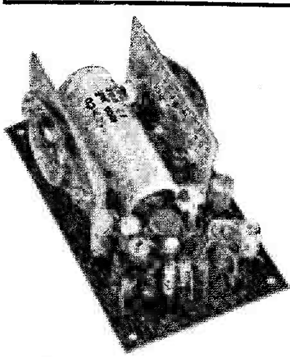
SINCLAIR Z.12

COMBINED 12 WATT HIGH-FIDELITY AMPLIFIER AND PRE-AMP

12 WATTS R.M.S. OUTPUT
CONTINUOUS SINE WAVE (30W. PEAK)

8 TRANSISTOR CIRCUIT WITH CLASS B ULTRALINEAR OUTPUT

IDEAL FOR HI-FI (STEREO OR MONO) CAR RADIO, ELECTRIC GUITAR, P.A., INTERCOM, ETC.



The amazing adaptability and rugged construction of this very powerful and exceptionally compact amplifier make it possible to use just one type of unit with outstanding success in an unusually wide variety of applications. Eight special H.F. transistors are used in a highly original circuit to achieve the characteristics demanded of any quality amplifier irrespective of price, yet this Sinclair unit costs well under £5, including its own integrated pre-amplifier. The Z.12 accepts radio, microphone and pick-up inputs. Detailed instructions for connecting these in mono and stereo are given in the manual supplied with every unit. A number of different control networks are also shown. The Z.12 will operate efficiently from any supply between 6 and 20 v.d.c., making it very convenient to run the amplifier from a car battery. Where it is required to run the Z.12 from mains supply, the PZ.3 is recommended. Those wishing to have a ready made pre-amp control unit can feed inputs via the Stereo 25, which, with two Z.12s will provide the finest stereophonic hi-fi possible—and the saving in cost is fantastic.

TECHNICAL SPECIFICATIONS

- Size 3 in. x 1¾in. x 1¼in.
- Class "B" ultralinear output
- RESPONSE 15–50,000 c/s ± 1 dB.
- Suitable for 3, 7·5 or 15Ω speakers. Two 3Ω speakers may be used in parallel
- INPUT—2mV into 2kΩ.
- OUTPUT—12 watts R.M.S. continuous sine wave (24 w. peak); 15 watts music power (30 w. peak)
- Signal to noise ratio better than 60dB.
- Quiescent current consumption—15mA.

Built, tested and guaranteed. Ready for immediate use. With Z.12 manual.

89/6

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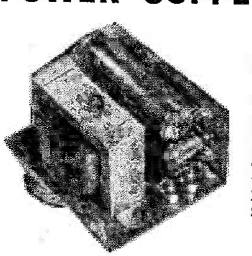
SINCLAIR PZ.3
POWER SUPPLY UNIT



This special power supply unit uses advanced transistorised circuitry to achieve exceptionally good smoothing. Ripple is a barely measurable 0.05 v. The PZ.3 will power two Z.12s and a Stereo 25 with ease.

79/6

Sinclair Stereo 25
DE-LUXE PRE-AMP. AND CONTROL UNIT
PLEASE TURN TO PAGE 611

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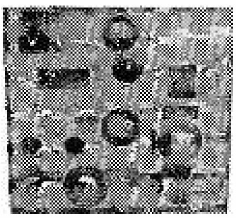

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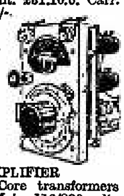

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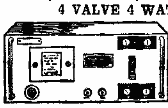

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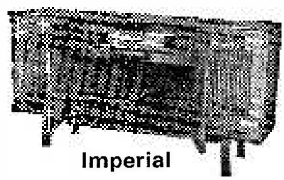

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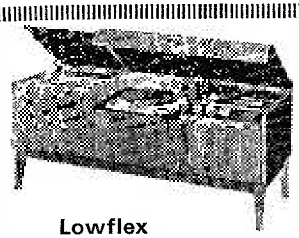

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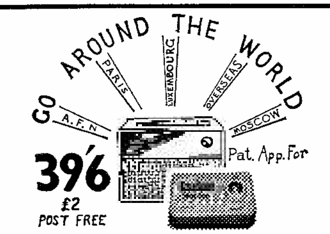

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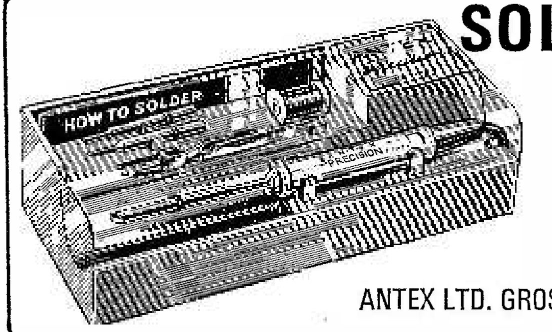

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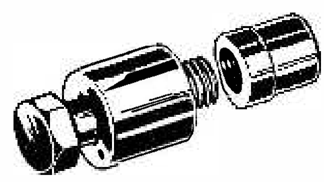

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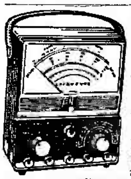

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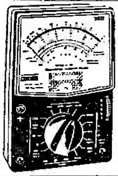

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These cannot be operated in U.K.

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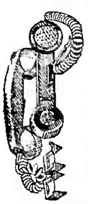

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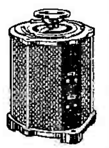

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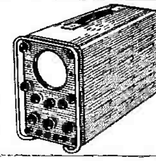
PORTABLE OSCILLOSCOPE CT-52



A compact (9in. x 8in. x 16½in.) general purpose 'scope T/B 10c/s-40 kc/s. Band width 1 M/cs. Mullard DG 7/5 2½in. CRT. For operation on 200/250v. A.C. Supplied complete with metal transit case, strap, test leads, and visor hood. Brand new, £22.10.0. Carr. 10/-. Supplied complete with instructions.

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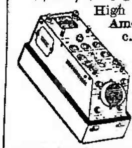

High quality Portable American Oscilloscope, 3in. c.r.t. T/B 3c/s-50kc/s X Amp: 0-500 kc/s Y Amp: 0.2 Mc/s. Power requirements 105-125v. A.C. Supplied in brand new condition. Fully tested. £25. Carr. 10/-. Suitable 230-115 v. Transformer, 15/6.

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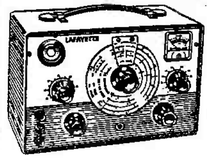

LAFAYETTE TE-46 RESISTANCE CAPACITY ANALYSER

2 PF—2,000 MFD, 2 ohms—200 Megohms. Also checks impedance, turns ratio insulation 200-250 v. A.C Brand New £15. Carr. 7/6.

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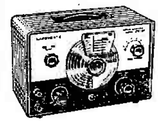
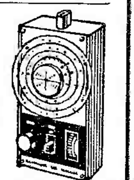


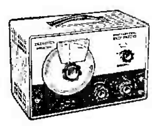
Accurate wide range signal generator covering 120 kc/s-260Mc/s on 6 bands. Directly calibrated. Variable R.F. attenuator. Operation 200/240v. A.C. Brand new with instructions. £12.10.0. P. & P. 7/6.
S.A.E. for details.

LAFAYETTE NUVISTOR GRID DIP METER



Compact, true one hand operation. Frequency range 1.7 - 180 Mc/s. 230v. A.C. operation. Supplied complete with all coils and instructions. £12.10.0. Carr. 5/-.

TE22 SINE SQUARE WAVE AUDIO GENERATORS



Sine: 20 cps to 200 kc/s. on 4 bands. Square: 20 cps to 30 kc/s. Output impedance 5,000 ohms. 200/250v A.C. operation. Supplied Brand New and Guaranteed with instruction manual and leads. £15 Carr. 7/6.

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All above post paid with battery.

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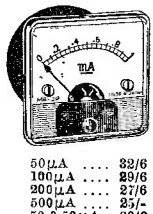

First grade quality, Moving Coil panel meters, available ex-stock. S.A.E. for illustrated leaflet. Discounts for quantity. Available as follows: Type MR, 38P, 1 21/32in. square fronts.

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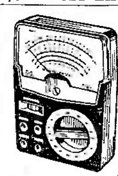
200μA	27/6	1-0-1mA	22/6	500mA	22/6	300V D.C.	22/6
500μA	25/-	1mA	22/6	750mA	22/6	500V D.C.	22/6
50-0-50μA	29/6	2mA	22/6	1A D.C.	22/6	750V D.C.	22/6
		5mA	22/6	2A D.C.	22/6	15V A.C.	22/6
		10mA	22/6	5A D.C.	22/6	50V A.C.	22/6
		20mA	22/6	3V D.C.	22/6	150V A.C.	22/6
		50mA	22/6	10V D.C.	22/6	300V A.C.	22/6
		100mA	22/6	20V D.C.	22/6	500V A.C.	22/6
		150mA	22/6	50V D.C.	22/6	'S' Meter 1mA	29/6

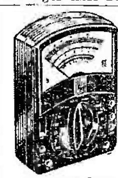
POST EXTRA. Larger sizes available—send for lists.

TE-51 NEW 20,000Ω/VOLT MULTIMETER



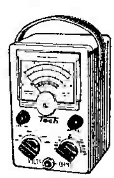
0 / 6 / 60 / 120 / 1,200V. A.C.
0 / 3 / 30 / 60 / 300 / 600/3,000V. D.C.
0 / 60μA / 12 / 300 MA. D.C.
0 / 60K / 6 Meg.Ω
85/-. P. & P. 2/6.

MODEL TE-12

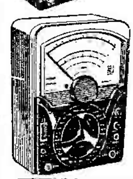


20,000 O.P.V. 0/.06/6/30/120/600/1,200/3,000/6,000v. D.C. 0/6/30/120/600/1,200 v. A.C. 0/60μA/6/60/600 mA. 0/6K/600K/6 Meg./60 Meg.Ω. P.F. —.2 MFD. £5.19.6. P. & P. 3/6.

MODEL PV-58 VALUE VOLTMETER



11 meg. input. 7 D.C. volt ranges. 1.5-1,500 v. 7 A.C. volt ranges. 1.5-1,500 v. 4,000 Peak to Peak. Resistance .2 ohm to 1,000 megohm. Decibels — 10db to +65db. Supplied brand new with instructions, leads and probe. £12.10.0. P. & P. 3/6.



MODEL 500. 30,000 opv, 0/.5/1/2.5/10/25/100/250/500/1,000 v. D.C.
0 / 2.5 / 10 / 25 / 100 / 250 / 500 / 1,000v. A.C.
0 / 50μA / 5 / 50 / 500mA. 12 amp D.C.
0 / 60K / 6 Meg. / 60 MegΩ. £8.17.6. Post paid.

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OC3	6/-
OD3	6/-
OZ4A	5/-
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1A5GT	5/-
1A7GT	8/-
1B3GT	8/-
1C5GT	5/-
1D6	8/-
1D8GT	6/-
1G4GT	8/-
1G6GT	7/-
1H5GT	7/-
1L4	2/6
1N5GT	8/-
1R4	6/-
1R5	6/-
1S4	5/-
1S5	4/6
1T4	3/-
1T5GT	6/-
1U4	5/-
1U5	6/-
1V2	10/-
1X2B	7/-
1Z2	35/-
2C26A	7/-
2C34	7/6
2C51	12/-
2CW4	12/-
2D21	6/-
2E24	40/-
2E26	22/6
3A4	4/-
3A5	7/-
3A8GT	8/-
3AV6	6/6
3B7	5/-
3B28	40/-
3D6	4/-
3E29	60/-
3Q4	7/-
3Q5GT	6/6
3S4	5/-
3V4	6/-
4-65A	80/-
4E27	60/-
4THA	8/-
4TSP	8/-
4X150A	100/-
4X250B	120/-
5B/255M	35/-
5R4GY	9/-
5U4GB	6/6
5U8	8/-
5V4G	8/6
5Y3GT	5/-
5Z3	7/6
5Z4G	7/-
6/30L2	10/-
6A3	12/-
6A7	10/-
6A8	8/-

6AB4	6/6
6AB7	4/-
6AC5GT	10/-
6AC7	4/-
6AF4	10/-
6AF6G	11/-
6AG5	2/6
6AG7	6/-
6AH6	10/-
6AK5	5/-
6AL5	3/-
6AM5	2/6
6AM6	4/-
6AN8	10/-
6AQ4	5/-
6AQ5	5/6
6AR5	6/-
6AR6	6/-
6AR8	17/6
6AS5	5/-
6AS6	6/-
6AS7G	15/-
6AT6	4/6
6AU6A	6/6
6AU8	9/-
6AV5GTA	11/-
6AV6	5/-
6AW8A	12/6
6B4G	17/-
6B8	7/-
6B8G	2/6
6BA6	4/6
6BA7	15/-
6BE6	4/6
6BF6	6/-
6BF7	15/-
6BG6G	15/-
6BH6	7/6
6BJ6	7/6
6BK4	22/6
6BK7A	9/-
6BL7GTA	10/-
6BN6	7/6
6BQ7A	7/-
6BR7	11/-
6BR8	5/-
6BS7	17/-
6BW6	7/-
6BW7	10/-
6BZ6	6/-
6BZ7	11/-
6C4	2/6
6C5	8/-
6C5GT	6/-
6C6	4/-
6C9	11/-
6C31	12/-
6CB6	5/-
6CD6GA	17/-
6CG7	10/-
6CH6	6/-
6CL6	9/-
6CU6	11/-
6CW4	12/-
6CY5	10/-
6CY7	11/-
6D[illegible]	[illegible]

6D6	3/-
6DC6	12/6
6DK6	8/-
6DQ6G	11/-
6DS4	15/-
6E5GT	8/-
6F1	14/-
6F4	30/-
6F5G	8/-
6F6G	5/-
6F7	5/-
6F8G	5/-
6F11	6/-
6F12	4/-
6F13	6/6
6F14	15/-
6F15	11/-
6F17	6/-
6F18	7/6
6F23	10/-
6F24	12/-
6F25	12/-
6F28	10/6
6H6	2/-
6J4	9/-
6J5G	4/-
6J6	3/6
6J7G	5/-
6K6G	6/-
6K7GT	5/-
6K8	8/-
6K8G	4/-
6L6GC	7/6
6L17	9/-
6L18	6/-
6LD20	5/-
6N7GT	7/-
6P25	12/-
6P28	12/6
6Q5G	15/-
6Q7	7/-
6SA7	7/-
6SC7	9/-
6SF5	8/-
6SF7	7/-
6SG7	6/-
6SH7	4/-
6SJ7	7/-
6SK7	6/-
6SL7GT	6/-
6SN7GT	4/6
6SQ7	7/-
6SR7	7/-
6T8	6/6
6U4GT	10/6
6U8	7/6
6U8A	9/6
6V6GT	6/6
6X4	4/-
6X5GT	5/6
6Y6G	9/-
7B6	11/-
7B7	7/-
7B8	8/-
7C5	11/-
7C6	6/6
7C7	5/-
7H7	8/-
7Y4	8/-

7Z4	6/-
9BW6	7/-
10C1	9/6
10C2	13/-
10D1	7/-
10F1	9/-
10F3	8/-
10F9	10/-
10F18	9/-
10L1	7/6
10P13	12/-
10P14	13/-
11D3	7/-
11D5	7/-
11E3	42/-
12AC6	8/-
12AD6	9/-
12AE6	7/6
12AL5	7/-
12AQ5	7/-
12AT6	5/-
12AT7	4/-
12AU6	6/-
12AU7	5/6
12AV6	5/6
12AV7	8/-
12AW6	20/-
12AX7	6/-
12AY7	10/-
12B4A	9/-
12BA6	6/-
12BE6	5/6
12BH7	6/-
12BY7	10/-
12C8	4/6
12E1	20/-
12K7GT	7/-
12K8	8/-
12Q7G	4/-
12SA7	7/-
12SC7	4/-
12SG7	5/-
12SH7	4/-
12SJ7	4/-
12SK7	5/-
12SL7GT	7/6
12SN7GT	7/6
12SR7	5/-
14S7	18/-
20D1	9/-
20F2	13/-
20L1	13/-
20P1	12/-
20P3	12/-
20P4	13/-
20P5	11/-
25L6GT	6/6
25Z4G	8/-
25Z5	8/-
25Z6GT	11/-
28D7	7/-
30A5	7/-
30C1	6/3
30C15	10/-
30C17	11/6
30C18	11/-
30F5	10/-
30FL1	10/6
30FL12	11/-

30FL13	6/-
30FL14	11/-
30L1	5/6
30L15	11/-
30L17	11/-
30P12	9/-
30P16	7/-
30P18	6/6
30P19	13/-
30PL1	10/6
30PL13	12/-
30PL14	10/6
35A3	10/-
35A5	10/-
35B5	12/-
35C5	6/6
35D5	12/-
35L6GT	6/-
35W4	4/6
35Z3	10/-
35Z4G	4/-
35Z4GT	8/6
35Z5GT	5/6
42	6/-
43IU	8/-
50A5	12/-
50B5	6/3
50C5	6/-
50CD6G	27/6
50L6GT	6/-
52KU	7/-
55CG	30/-
58CG	45/-
75C1	13/-
80	6/-
83A1	12/-
85A1	25/-
85A2	7/6
85A3	5/6
90AG	46/-
90AV	46/-
90C1	12/-
90CG	25/-
90CV	25/-
150B2	10/-
150B3	8/-
185BTA	15/-
807	9/-
811	40/-
812A	57/6
832	20/-
866A	14/-
872A	40/-
884	15/-

955	3/-
956	2/-
957	5/-
958A	4/-
959	8/-
991	7/-
1267	20/-
2050	12/-
4313C	20/-
5651	7/6
5654	8/-
5670	10/-
5718	10/-
5749	10/-
5751	12/-
5965	5/-
6080	25/-
6146	25/-
6159	32/-
6293	60/-
6360	30/-
6939	45/-
7551	30/-
8136	15/-
9002	5/6
9003	9/-
A1820	20/-
AC/HL/DD	8/-
AC/HL/DDD	10/-
AC/SG	13/-
AC5/PEN	10/-
AC6/PEN	6/-
AR8	6/-
ARP12	3/6
ATS25	9/-
AW6	5/-
AZ11	6/-
AZ12	9/-
AZ31	9/-
AZ41	7/-
C1C	12/-
CBL31	15/-
DA90	4/-
DAC32	7/6
DAF40	10/-
DAF91	4/6
DAF92	6/-
DAF96	6/6
DC90	7/-
DCC90	7/-
DF33	8/-

DF64	5/-
DF91	3/-
DF92	2/6
DF96	7/-
DH63	6/-
DK32	8/-
DK40	11/-
DK91	6/-
DK92	8/-
DK96	7/-
DL33	6/6
DL35	5/-
DL68	10/-
DL69	12/6
DL91	5/-
DL92	5/-
DL93	4/-
DL94	6/-
DL95	7/-
DL96	7/-
DM70	5/6
DY30	8/-
DY86	6/6
E88CC	12/6
E90CC	10/-
E92CC	7/-
E180CC	8/-
E180F	17/6
E182CC	23/-
EA50	2/-
EABC80	6/6
EAC91	4/-
EAF42	8/6
EBC33	7/-
EBC41	8/6
EBC81	6/3
EBC90	4/6
EBC91	5/-
EBF80	7/6
EBF83	8/-
EBF89	7/-
EBL31	20/-
EC86	12/-
EC88	11/-
EC90	2/6
EC91	5/-
EC92	6/6
ECC35	17/-
ECC40	9/6
ECC70	15/-
ECC81	4/-
ECC82	5/-
ECC83	6/-
ECC84	6/6

ECC85	5/-
ECC86	7/-
ECC88	8/-
ECC91	3/6
ECC189	11/-
ECC804	10/-
ECF80	7/-
ECF82	7/6
ECF83	12/-
ECF86	9/6
ECH35	11/-
ECH42	9/6
ECH81	5/3
ECH83	7/6
ECH84	9/-
ECL80	7/-
ECL81	7/6
ECL82	6/3
ECL83	9/6
ECL84	12/-
ECL85	11/6
ECL86	9/-
EF36	5/-
EF37A	8/-
EF39	6/-
EF40	9/-
EF41	8/6
EF42	11/-
EF54	6/-
EF55	8/-
EF80	5/-
EF83	10/-
EF85	6/6
EF86	6/3
EF89	5/6
EF91	4/-
EF92	2/6
EF93	4/6
EF94	5/6
EF95	5/-
EF96	2/6
EF97	10/-
EF98	10/-
EF183	6/6
EF184	6/6
EF800	8/-
EF804	21/-
EF811	12/-
EF812	10/-
EF814	12/-
EH90	7/6
EK90	4/6
EL22	15/-
EL33	12/6

EL34	9/6
EL35	5/-
EL36	8/6
EL38	17/6
EL41	8/6
EL42	7/6
EL81	9/-
EL82	8/-
EL83	7/-
EL84	4/3
EL85	7/6
EL86	8/-
EL90	5/6
EL91	2/6
EL95	5/-
EL360	22/-
EL821	6/-
EL822	16/-
EM34	13/-
EM35	8/-
EM80	7/-
EM81	7/-
EM84	7/-
EM85	11/-
EM87	7/-
EN91	6/-
EN92	6/-
EY51	7/-
EY81	7/-
EY83	9/-
EY84	7/6
EY86	6/6
EY87	8/-
EZ22	6/-
EZ35	5/6
EZ40	7/6
EZ41	8/-
EZ80	5/-
EZ81	5/-
EZ90	4/-
GS10H	40/-
GTE175M	12/-
GU50	25/-
GZ30	7/6
GZ32	10/-
GZ34	10/-
GZ37	12/-
HABC80	8/-
HBC90	5/-
HBC91	5/6
HF93	6/-
HF94	6/-
HL2	4/-
HL2K	4/-
HL23	6/-
HL23DD	6/-
HL41	4/-
HL92	6/6
HL94	7/-
HL132D	4/-
HL133DD	10/-
HN309	15/-
HY90	4/6
KT2	7/-
KT32	6/6

KT36	17/6
KT41	7/6
KT44	5/-
KT45	15/-
KT66	16/-
KT67	45/-
KT88	23/-
LP2	7/-
MH4	5/-
MH41	9/-
MHL4	5/-
MS/PEN	8/-
MS/PENT	10/-
NT8	16/6
PABC80	7/6
PC86	11/-
PC88	11/-
PC97	7/6
PC900	9/-
PCC84	5/6
PCC85	7/-
PCC89	11/-
PCC189	11/-
PCC805	11/-
PCC806	11/-
PCE800	10/6
PCF80	6/3
PCF82	6/6
PCF87	11/6
PCF800	10/-
PCF801	9/6
PCF802	9/6
PCF805	11/-
PCF806	12/-
PCF808	11/-
PCL80	10/6
PCL81	9/-
PCL82	7/-
PCL83	8/6
PCL84	7/6
PCL85	9/-
PCL86	8/6
PCL88	10/6
PCL800	12/-
PCL801	10/6
PEN25	5/-
PEN36C	8/-
PEN45	7/-
PEN45DD	12/-
PEN46	6/-
PEN220A	7/-
PEN383	10/-
PEN384	7/-
PEN453DD	10/-
PENA4	7/6
PF86	7/6
PF818	10/-
PFL200	14/-
PL36	9/-
PL38	16/-
PL81	6/-
PL82	7/-
PL83	6/6
PL84	6/6

PL302	13/-
PL500	13/6
PT15	15/-
PX25	15/-
PY32	8/6
PY33	8/6
PY80	5/6
PY81	6/-
PY82	5/6
PY83	6/-
PY88	8/-
PY301	11/-
PY800	7/-
PY801	7/-
PZ30	8/6
QP21	5/-
QP25	5/-
QP230	5/-
QQVO2-6	45/-
QQVO3-10	30/-
QQVO6-40	90/-
QS83/3	7/6
QS92/10	4/-
QS95/10	5/6
QS150/15	8/-
QS1200	10/-
QS1202	8/6
QS1203	8/6
QS1215	12/-
QVO3-12	10/-
QVO5-25	9/-
R1	8/-
R2	8/-
R10	15/-
SP2	4/-
SP41	5/-
SP42	8/-
SP61	4/-
SU45	15/-
SU2150A	12/-
TP22	7/-
TP25	5/-
TP2620	7/6
TT21	35/-
TZ40	40/-
U10	8/-
U12/14	8/-
U17	5/-
U18/20	8/6
U21	7/-
U22	6/-
U25	9/6
U26	8/6
U27	7/6
U37	20/-
U50	5/-
U52	6/6
U70	4/6
U76	4/-
U78	4/-
U191	11/-
U193	7/-
U251	6/-

U281	12/-
U282	12/-
U301	11/-
U403	7/-
U404	5/-
U801	17/-
UABC80	5/3
UAF42	9/-
UB41	10/-
UBC41	8/-
UBC81	8/-
UBF80	6/6
UBF89	7/-
UBL21	10/-
UC92	6/-
UCC84	9/-
UCC85	6/6
UCF80	9/6
UCH21	9/6
UCH42	9/-
UCH43	8/-
UCH81	6/3
UCL81	9/-
UCL82	7/3
UCL83	9/-
UF9	10/-
UF41	8/-
UF42	9/-
UF43	8/-
UF80	7/-
UF85	7/6
UF86	9/-
UF89	7/-
UL41	9/-
UL84	6/6
UM4	10/-
UM80	5/-
UM81	10/-
UU5	8/-
UU7	10/-
UU8	7/-
UU9	7/-
UU10	8/-
UY1N	9/-
UY21	9/-
UY41	6/6
UY82	9/6
UY85	6/-
VP23	3/6
VP41	5/-
VU39	8/-
W81M	6/-
W729	10/-
X76M	7/6
XC12	6/6
XC15	4/6
XC16	7/-
Y63	8/-
Y65	5/-
Z22	5/6
Z62	5/-
Z63	9/-
Z66	10/-
Z759	23/-
Z803U	15/-
Z900T	13/-

POWER UNITS TYPE 234

19in. rack mounting fully smoothed and fused for 230v. A.C. input. H.T. output adjustable from 180 v. to 270 v. at 80mA, by means of primary taps and high-low switch in the secondary winding. L.T. output 6.3 v. A.C. at 4 amps. Fitted with M.I meter to read A.C. input and D.C. output volts. Second-hand, tested, in good condition **£3.19.6.**
DITTO model without meter, **£3.10.0.**
Packing and carriage 15/-.

HEADPHONES

DLR5, Low Impedance, balanced armature. Earpieces can be used as sound powered Microphone **10/-.**
CHR, High Impedance (2000 Ω per inset), **15/-.**
No. 10 Assembly. Moving Coil Headphones with moving coil Hand Microphone fitted with press-to-talk switch. Rubber earpads. Cord terminated with army type 5-point moulded connector. Low impedance, Brand new. **20/-** ea. Small quantity available of second hand assemblies, checked, in perfect order. **8/6** ea. P. & P. 3/6 per set.

MOVING COIL METERS

1mA D.C. 2in. round flange, sealed, calibrated 0-30/300	10/-
1mA D.C. 2½in. square flange, Westinghouse	15/-
30mA D.C. 2½in. round flange	10/-
75mA D.C. 1½in. round, clip mounted, G.E.C.	10/-
100mA D.C. 1½in. round clip mounted, G.E.C.	10/-
150mA D.C. 1½in. round, clip mounted, G.E.C.	10/-
500mA D.C. 2½in. round flange	10/-
25A D.C. 3½in. round projecting	10/-

RADIO FREQUENCY THERMOCOUPLE METERS

Scaled 0 to 1 AMP, 2½in. round projecting **12/6**
Packing and postage 2/6 per order.

PLESSEY ELECTROLYTIC CAPACITORS

24µF at 275 V	2/-	100-400µF at 275 V	3/6
200µF at 275 V	2/6	100-20-5-25µF (100-at 350 V; 5µF at 50 V, 25µF at 25V)	3/6
20-20µF at 450 V	3/-		
50-100µF at 275 V.	3/-		

All voltages are D.C. working. Postage 2/- per order.

MULTIMETERS

Type 108-IT; 24 range precision portable meter, 5000 o.p.v. D.C. Volts: 2.5-10-50-250-500-2500V. A.C. Volts: 10-50-100-250-500-2500V; D.C. current 0.5-5-50-500mA Resistance 2000-20,000 ohms; 2-20 megohms. Power output calibration in A.C. for 600 ohms line. Complete with prods and batteries, **£5.5.0.** P. & P. 5/-.

CABLES FOR T.C.S. EQUIPMENT

11ft. long Transmitter-to-P.S.U. cable, terminated with 16-pin socket at each end	30/-
10ft. long Receiver-to-P.S.U. cable, terminated with 12-pin socket at each end	30/-
20ft. long Remote Control Unit-to-P.S.U. cable, terminated with 9-pin socket at each end	30/-

Packing and postage, 7/6 per cable.
SET OF THREE CABLES, **£4.0.0** carriage paid.

Our new price list of Valves, Tubes and Semiconductors is now ready. In addition to listing prices of some 2,300 types it is a useful reference work giving: Valve and Tube Equivalents, Specification of Microwave Tubes, Cathode Ray Tubes and Semiconductors. Send S.A.E. (foolscap) now to get your copy free of charge.

ZENER DIODES

250mW 5%:

BZY11, 60.0V	6/6	BZY13, 80.0V	6/6

260mW 5%

OAZ200, 4.7V	10/-	OAZ204, 6.8V	7/-
OAZ201, 5.1V	9/6	OAZ205, 7.5V	7/-
OAZ202 5.6V	7/-	OAZ206, 8.2V	7/-
OAZ203, 6.2V	7/-	OAZ207, 9.1V	9/6

260mW 15%

OAZ208, 4.3V	6/6	OAZ211, 7.5V	6/-
OAZ209, 4.7V	6/6	OZA212, 9.1V	6/6
OAZ210, 6.2V	6/-	OAZ213, 12.0V	6/6

2.25W 10%

VR425B (4.25V)	6/6	VR575B (5.75V)	6/6
VR475B (4.75V)	6/6		

5.25W 10%

VR7A (7.0V)	8/-	VR13A (13.0V)	8/-
VR11A (11.0V)	8/-		

7.0W 5%

OAZ222 (5.6V)	15/-	OAZ224 (6.8V)	10/-

FERRANTI TRANSISTORS

ZT83	12/-	ZT152	54/-
ZT91	50/-	ZT1484	75/-

TRANSISTOR CIRCUIT COMPONENTS

Variable Twin Gang Miniature Tuning Capacitor, two section, 4-165pF, and 3-65pF, with 1-8pF trimmer, complete with Broadcast Band Oscillator Coil	6/6
WEYRAD RA2W FERRITE ROD AERIAL, LW/MW winding with Car Aerial Coupling	12/6
P50/1AC OSCILLATOR COIL, MW/LW	5/4
P50/2CC, 470 kc/s., 1st and 2nd I.F.	5/7
P50/3CC, 470 kc/s., 3rd I.F.	6/-
OSMOR Subminiature Transformer for Mains-to-Transistor supply conversion, Type MT9, Output 9-0-9 v. at 80mA	10/-
Suitable Germanium Diode GJ7M	3/6

Packing and postage 2/- per order.

PRACTICAL WIRELESS blueprints

The following blueprints are available from stock. ***Descriptive text is not available*** *but the date of issue is shown for each blueprint. Send, preferably, a postal order to cover cost of the blueprint (stamps over 6d. unacceptable) to Blueprint Department, Practical Wireless, George Newnes Ltd., Tower House, Southampton Street, London, W.C.2.*

The Strand Amplifier; The PW Signal Generator	(Oct. 1962)	5/-
The Berkeley Loudspeaker Enclosure; The Luxembourg Tuner	(Dec. 1962)	5/-
The PW Troubadour; The PW Everest Tuner	(June 1962)	7/6
The PW Britannic Two; The PW Mercury Six	(May 1962)	6/-
Beginner's Short Wave Two; S.W. Listener's Guide	(Nov. 1963)	5/-
Beginner's 10-watt Transmitter; Transmitting and Aerial Data	(Dec. 1963)	5/-
PW "Sixteen" Multirange Meter; Test Meter Applications Chart	(Jan. 1964)	5/-
The Celeste 7-transistor Portable Radio; The Spinette Record Player	(June 1963)	5/-
Transistor Radio Mains Unit; 7 Mc/s Transceiver	(June 1964)	5/-
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Electronic Hawaiian Guitar	(June 1965)	5/-
Progressive SW Superhet	(February 1966)	5/-

★ **PLEASE NOTE THAT WE CAN SUPPLY NO BLUEPRINTS OTHER THAN THOSE SHOWN IN THE ABOVE LIST. NOR ARE WE ABLE TO SUPPLY SERVICE SHEETS FOR COMMERCIAL RADIO, TV OR AUDIO EQUIPMENT.** ★

PRACTICAL WIRELESS query service

Before using the query service it is important to read the following notes:

The PW Query Service is designed primarily to answer queries on articles published in the magazine and to deal with problems which cannot easily be solved by reference to standard text books. In order to prevent unnecessary disappointment, prospective users of the service should note that:

(a) We cannot undertake to design equipment or to supply wiring diagrams or circuits, to individual requirements.

(b) We cannot undertake to supply detailed information for converting war surplus equipment, or to supply circuitry.

(c) It is usually impossible to supply information on imported domestic equipment owing to the lack of details available.

(d) We regret we are unable to answer technical queries over the telephone.

(e) It helps us if queries are clear and concise.

(f) **We cannot guarantee to answer any query not accompanied by the current query coupon and a stamped addressed envelope.**

QUERY COUPON

This coupon is available until 8th December, 1966 and must accompany all queries in accordance with the rules of our Query Service.

PRACTICAL WIRELESS DECEMBER 1966

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DECEMBER 1966

Practical Wirel

BEGINNERS' 5-BAN

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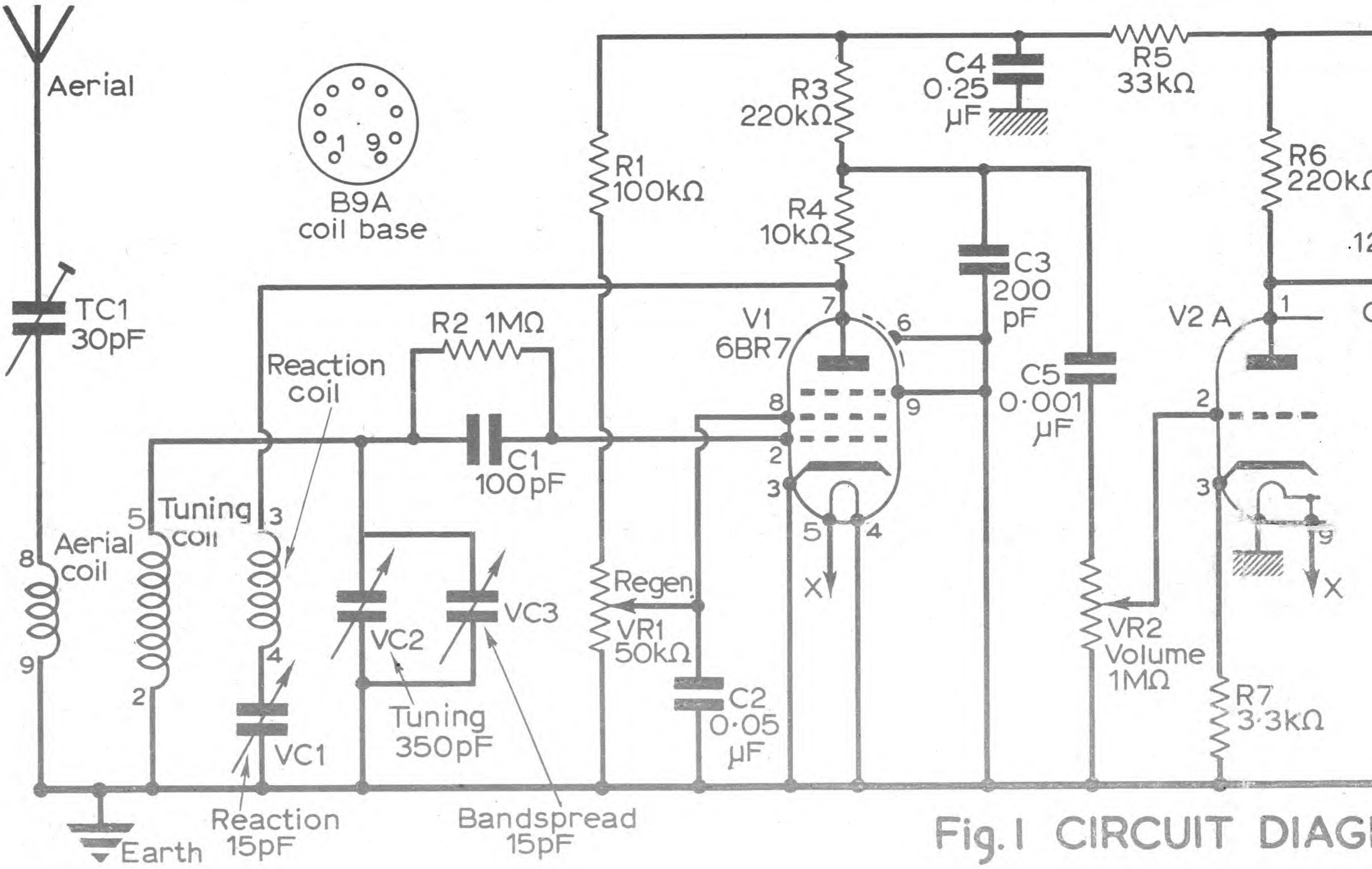
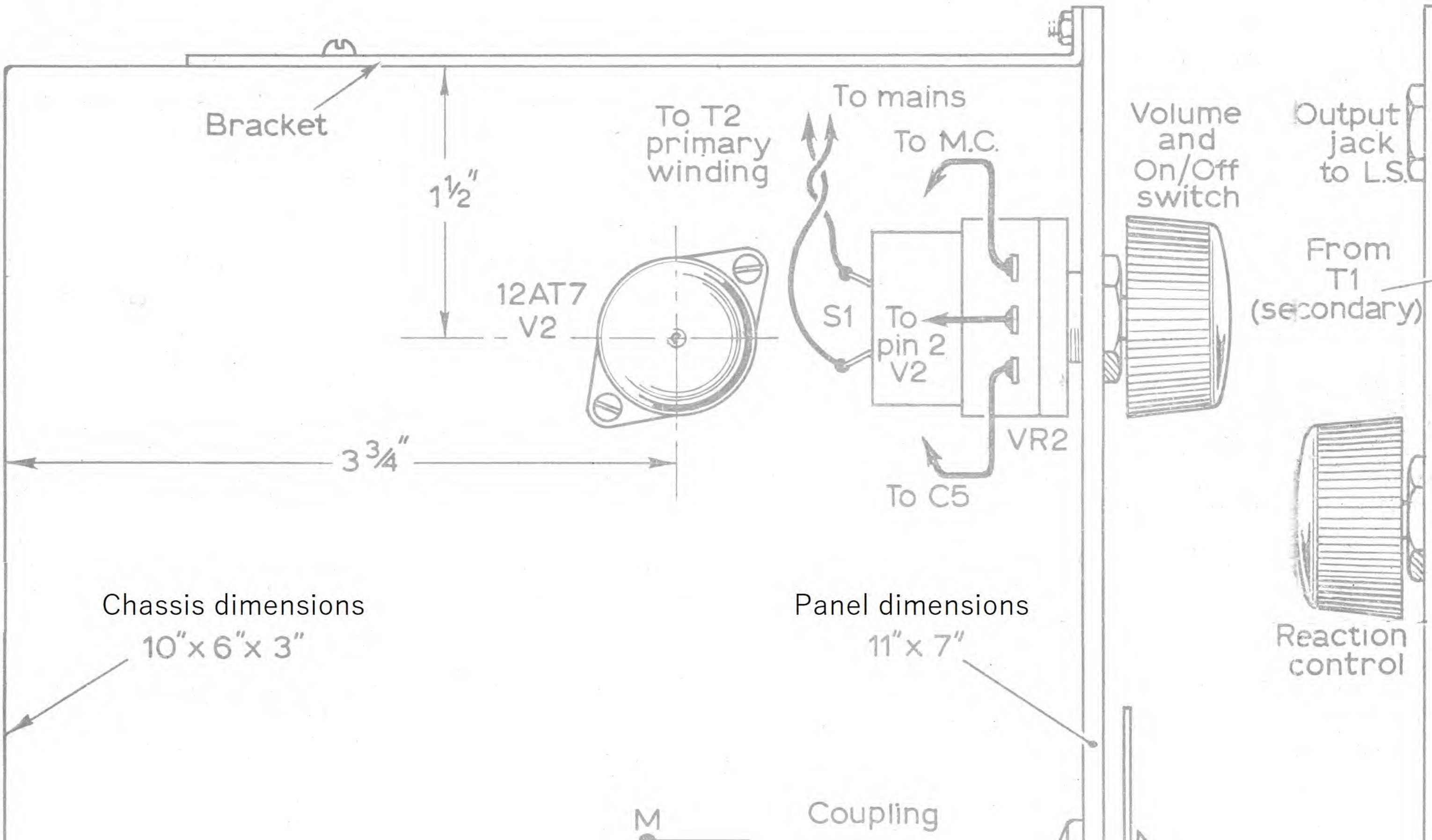


Fig. I CIRCUIT DIAG



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5-BAND RECEIVER

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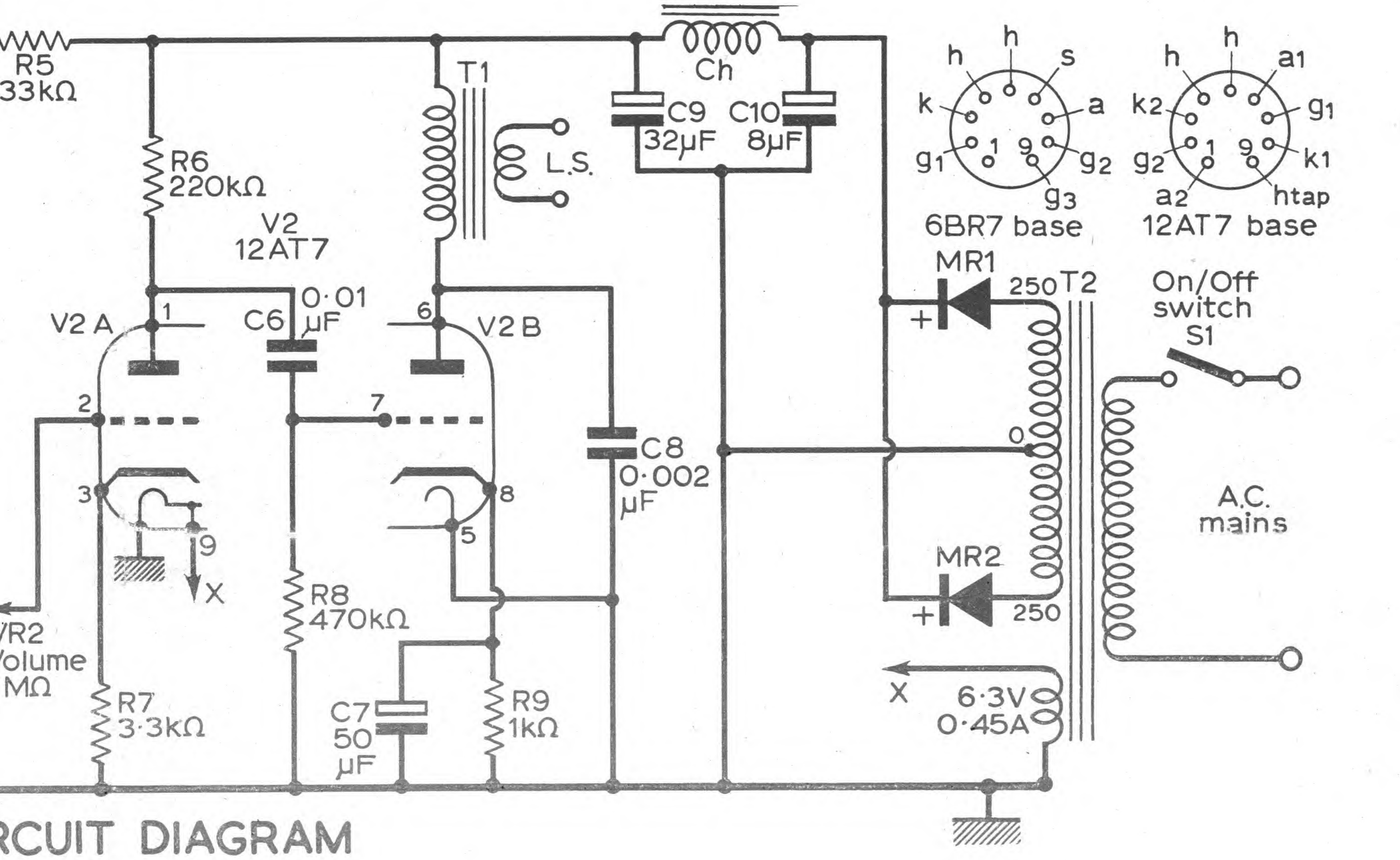
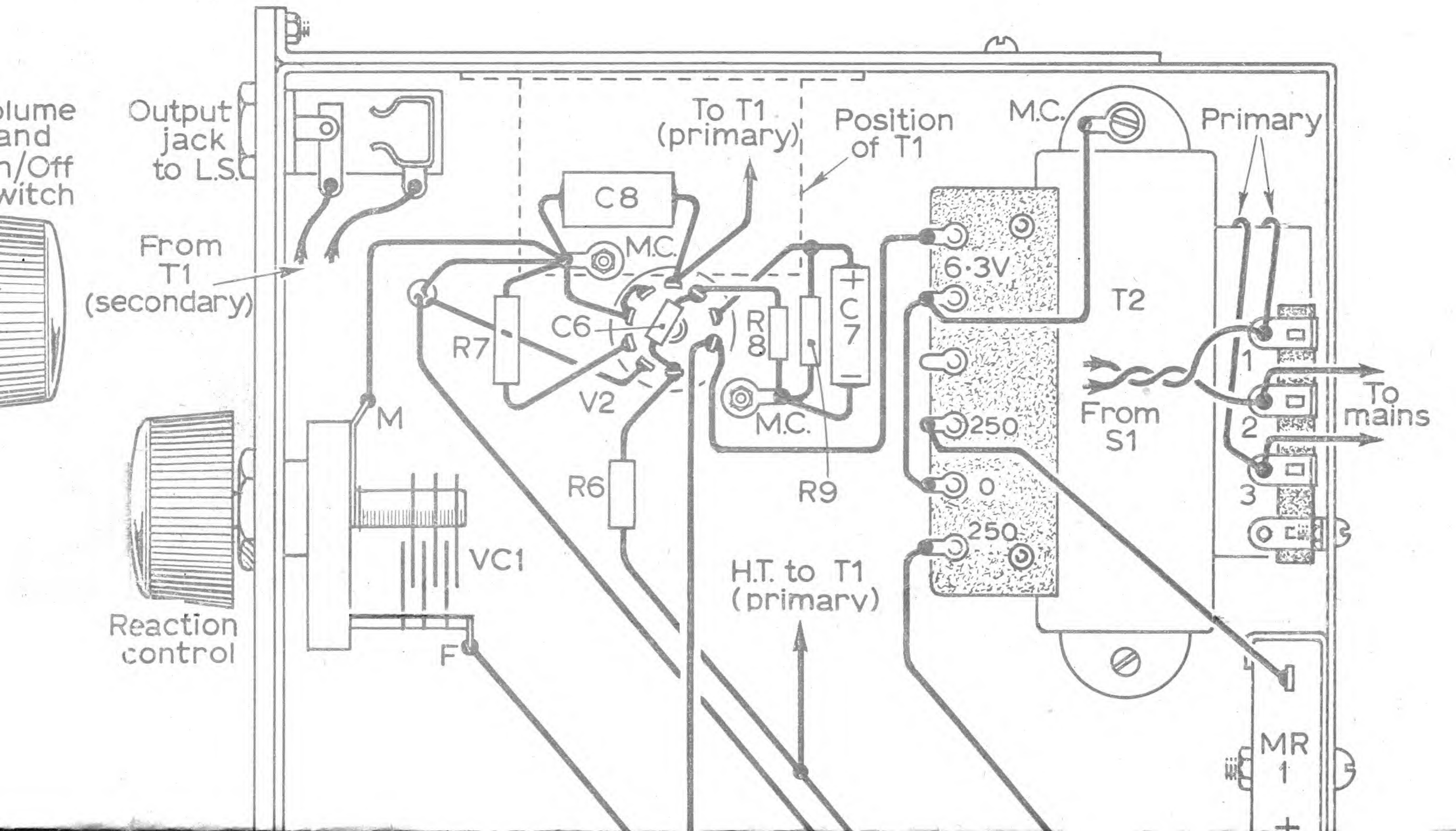


RCUIT DIAGRAM



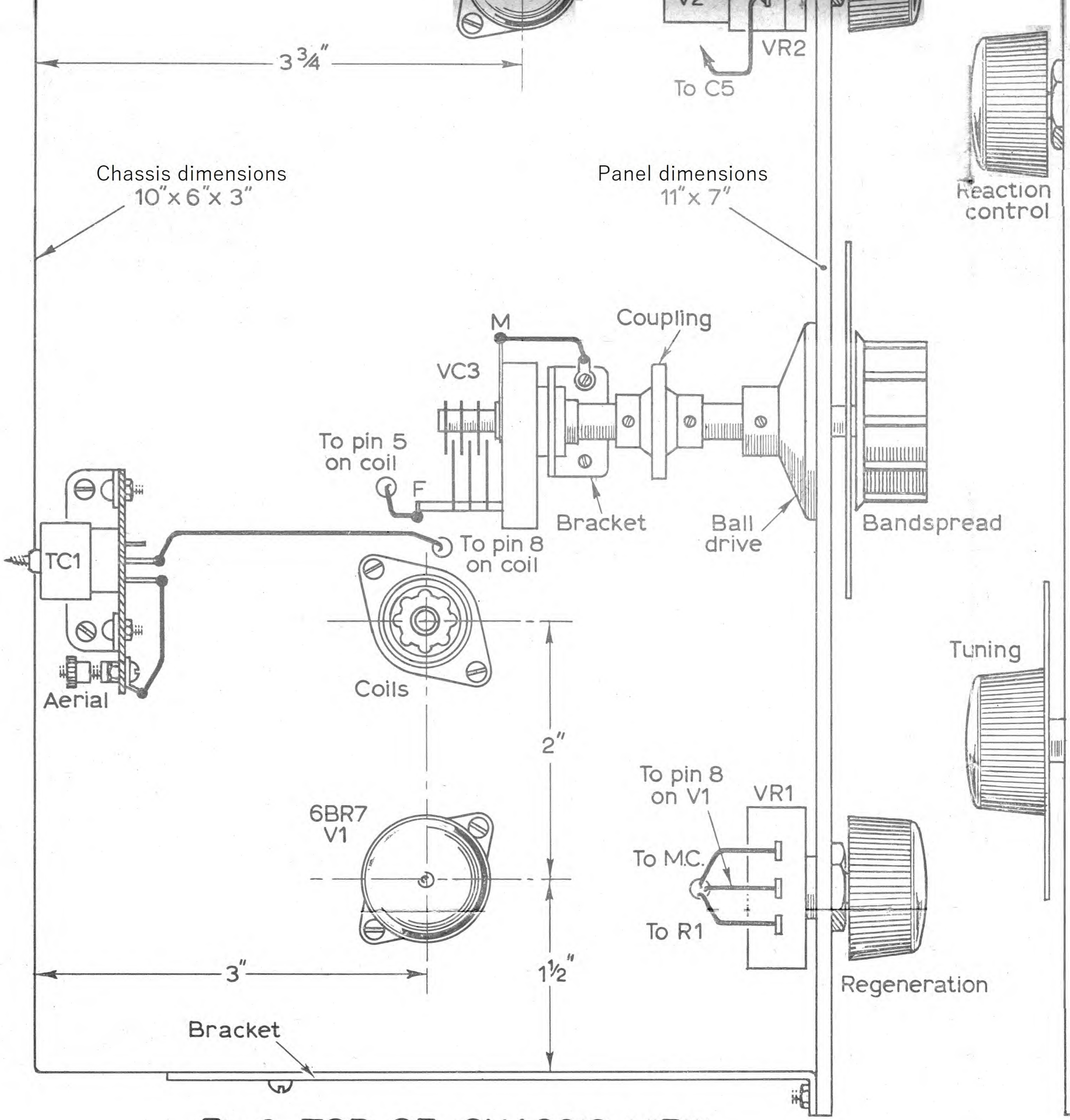


Fig.2 TOP OF CHASSIS VIEW

COMPONENTS LIS

Capacitors:

- C1 100pF mica.
- C2 0·05μF 250V.
- C3 200pF mica.
- C4 0·25μF 350V.
- C5 0·001μF mica.
- C6 0·01μF mica.
- C7 50μF 6V. Electrolytic
- C8 0·002μF mica.
- C9 32μF 450V. Electrolytic
- C10 8μF 450V. Electrolytic
- TC1 30pF trimmer.
- VC1 15pF short wave tuning.
- VC2 350pF or similar air-spaced tuning.
- VC3 15pF short wave tuning.

Resistors:

- R1 100kΩ
- R2 1MΩ
- R3 220kΩ
- R4 10kΩ
- R5 33kΩ
- R6 220kΩ
- R7 3·3kΩ
- R8 470kΩ
- R9 1kΩ

All 10% ½W.

Potentiometer

- VR1 50kΩ p
- VR2 1 MΩ p

Valves:

- V1 6BR7
- V2 12AT7

Miscellaneous

Two B9A ski
Denco (Clac
(1 and 5 opti

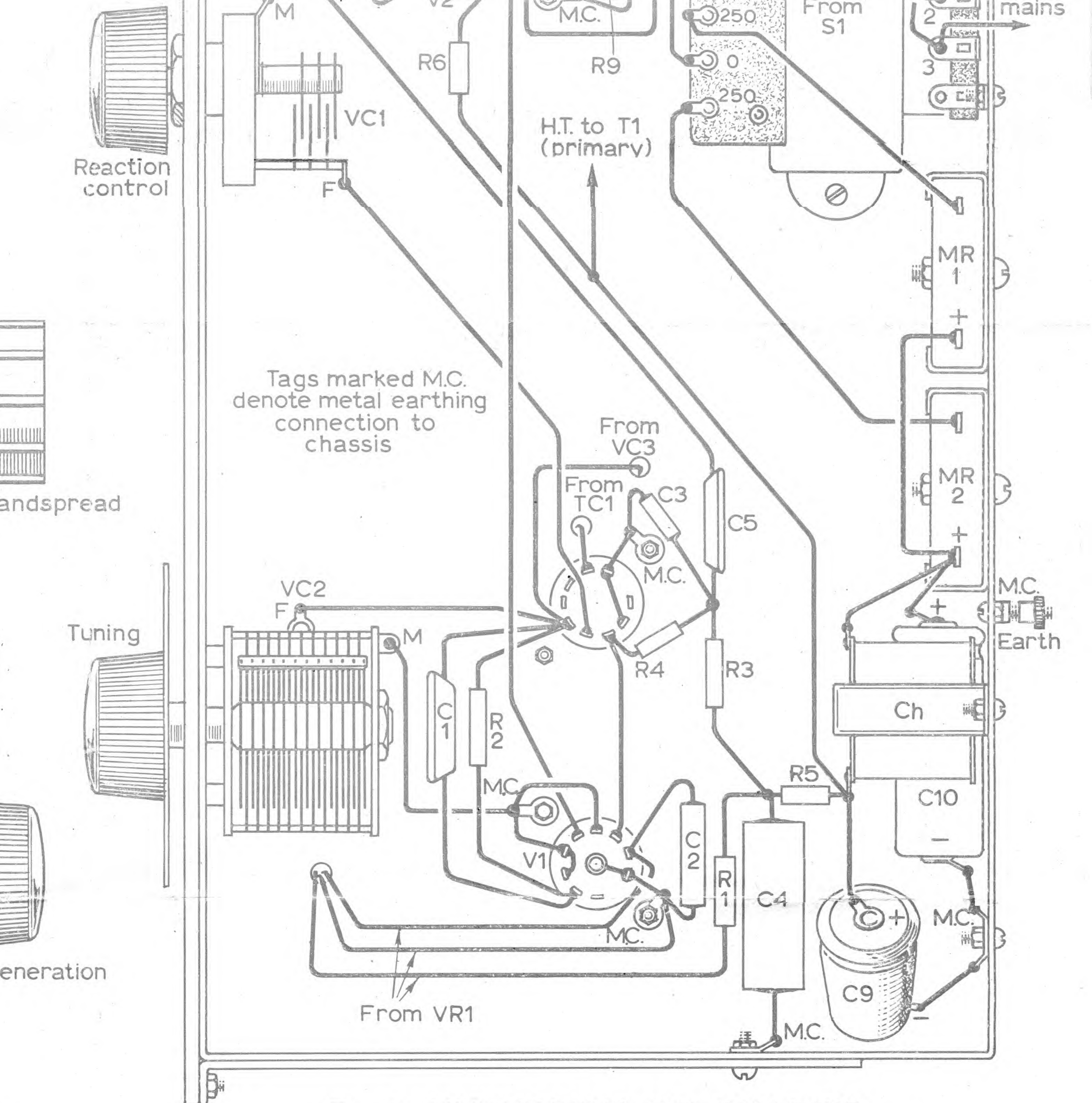


Fig.3 UNDERSIDE OF CHASSIS

OMPONENTS LIST

Potentiometers:

VR1 50kΩ pot.
VR2 1 MΩ pot. with switch S1.

Valves:

V1 6BR7
V2 12AT7

Miscellaneous:

Two B9A skirted holders.
Denco (Clacton) Ltd. Green coils: ranges 2, 3 and 4 (1 and 5 optional).
B9A non-skirted holder.
Chassis 10 x 6 x 3in.
Panel 11 x 7in.
Two 5½in. panel brackets (H. L. Smith & Co. Ltd., 287/289 Edgware Road, London, W.2).

Ch. Small smoothing choke, 15mA or larger.
T1 Small output transformer, ratio about 45 : 1.
T2 250/0/250V 20mA, 6·3V 0·5A or similar mains transformer.

MR1, MR2, 250V 20mA or similar contact cooled rectifiers.
Tag strip, jack socket, ball drive, knobs, dials, etc.

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Practical Wire

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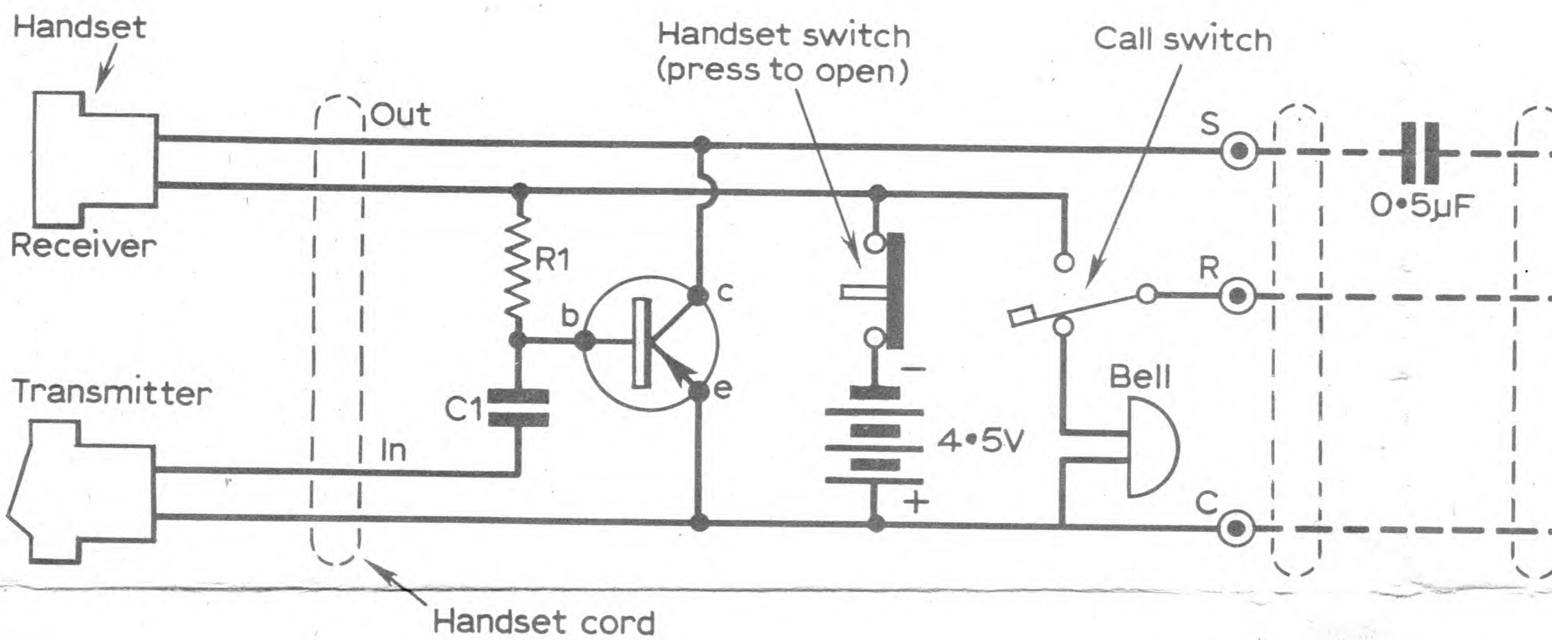
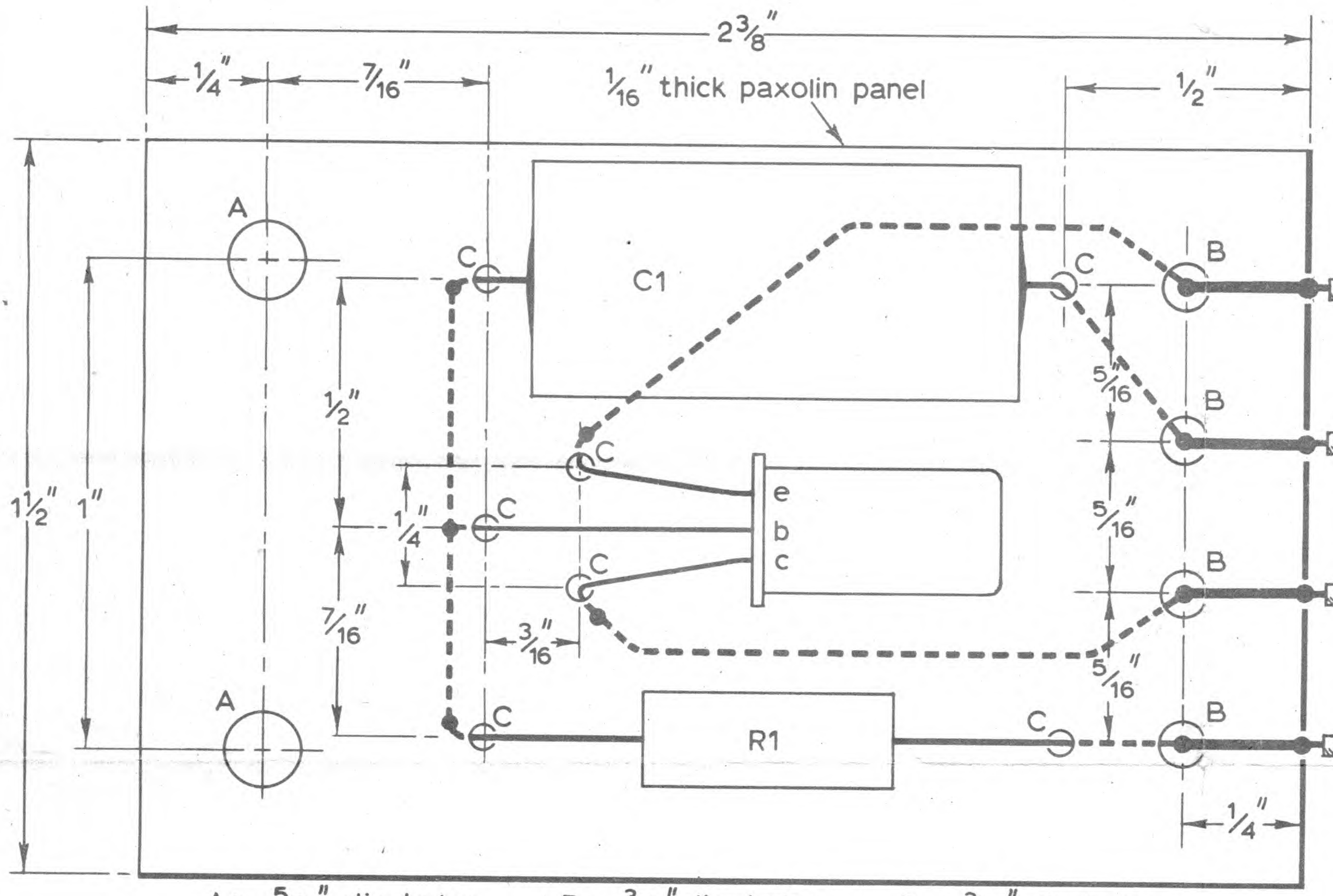


Fig.1 CIRCUIT OF THE COMPLETE



A:– 5/32" dia. holes B:– 3/32" dia. holes C:– 3/64" dia. holes

Underside wiring of paxolin panel is 15A fuse wire (shown dotted)

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TERCOM UNIT

PRICE 5/-

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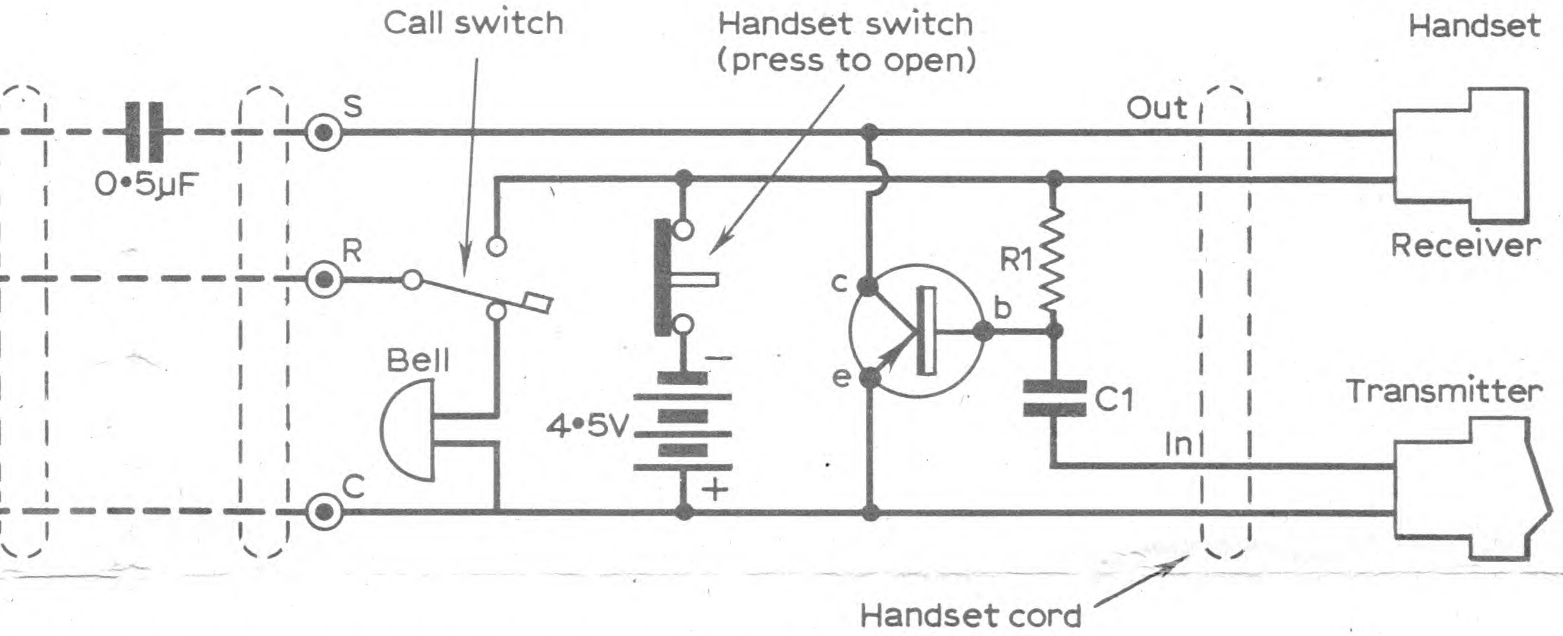
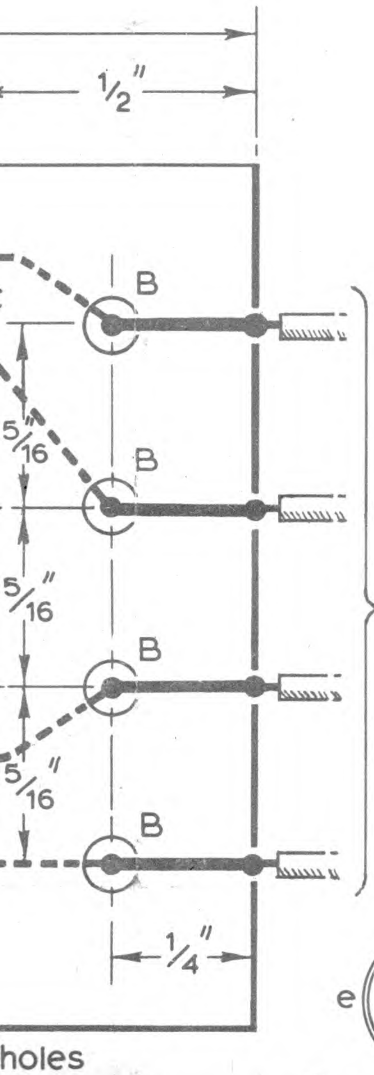
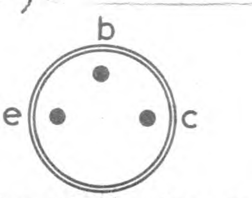


COMPLETE TELEPHONE INSTALLATION





Transistor base

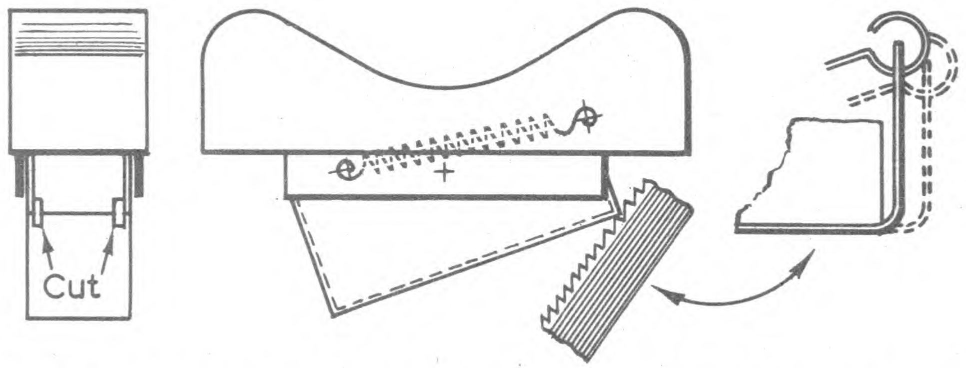
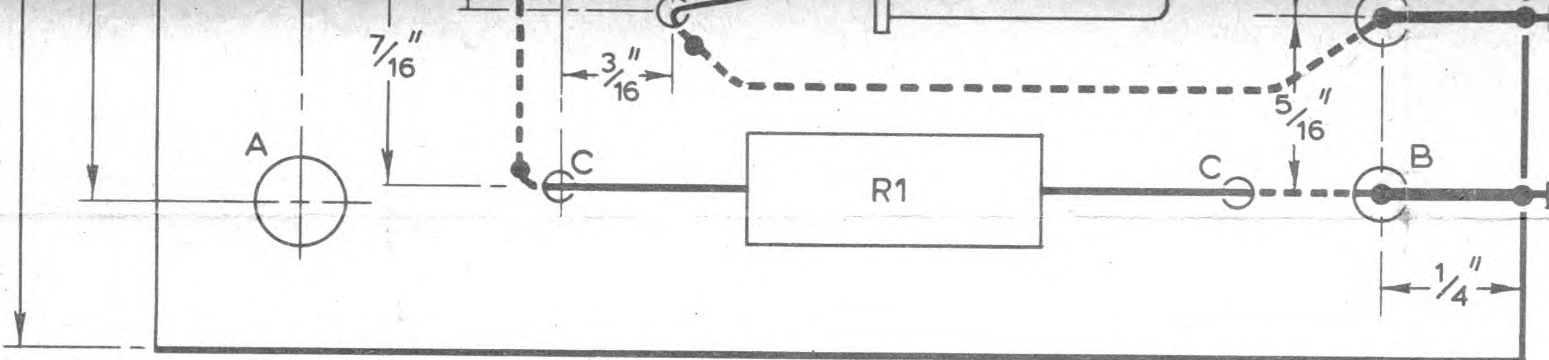


Fig.3 MODIFICATION OF MECHANISM OF A 'VETO' SWITCH

Two views of mechanism illustrating action of 'Veto' switch. The stationary part is cut at the two positions shown. The bend may be moved towards the centre thus changing the line of action of the spring and ceasing to cross the fulcrum point. The rocker then always returns to the position shown. On assembly the cut portion should be at the top

Fitted on battery tray inside instrument

TRANSISTORISED EQUIPMENT
OBSERVE BATTERY POLARITY

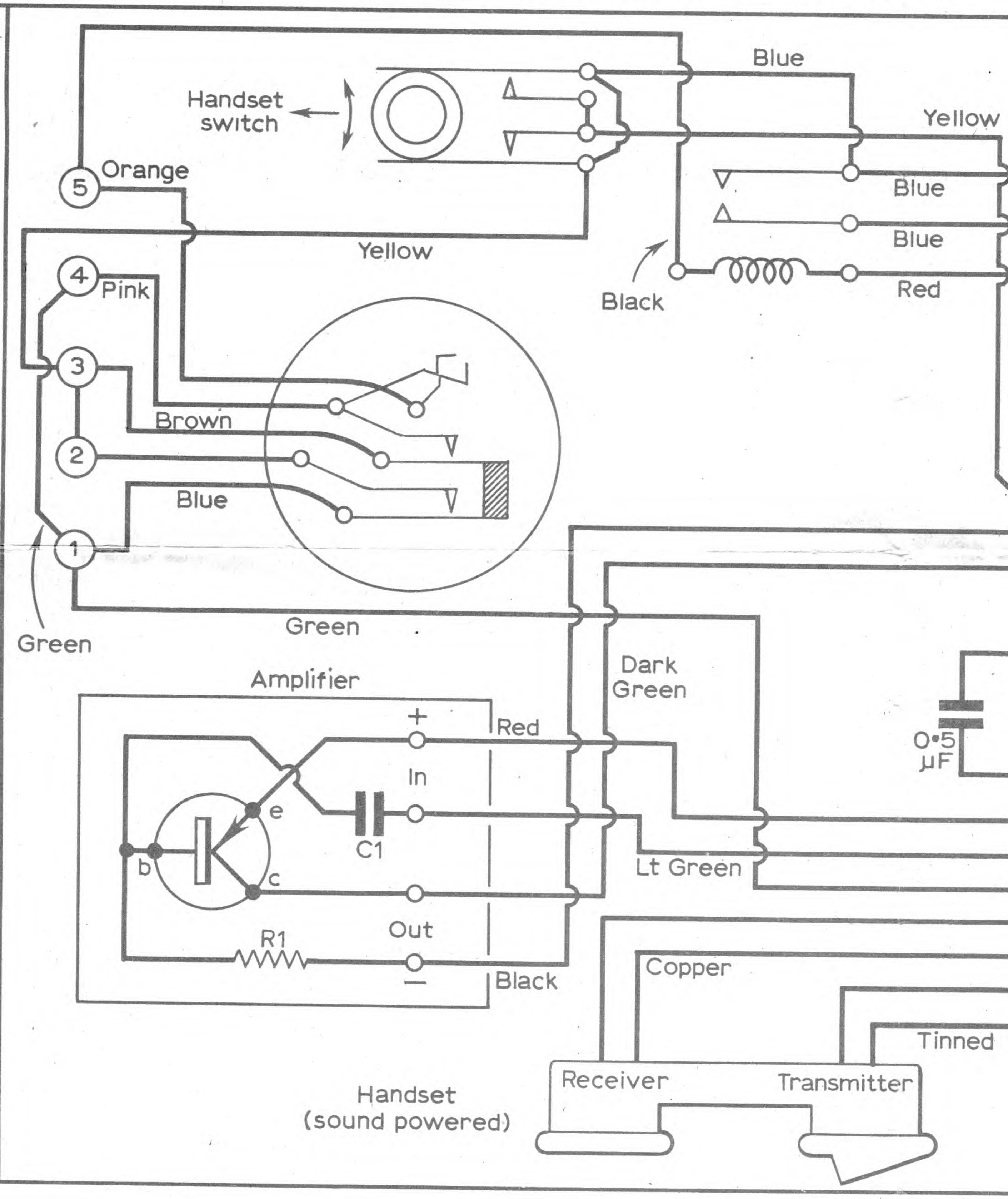


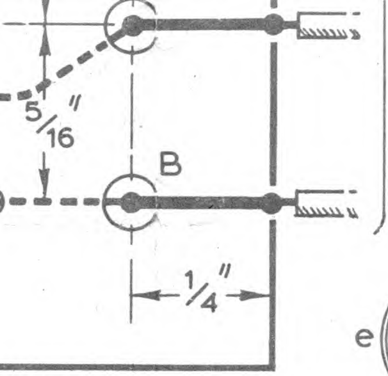
A:- 5/32" dia. holes B:- 3/32" dia. holes C:- 3/64" dia. holes

Underside wiring of paxolin panel is 15A fuse wire (shown dotted)

Fig. 2 CONSTRUCTION DETAILS OF ONE AMPLIFIER

DIRECT-LINE TELEPHONE



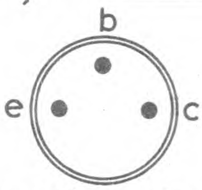


being bared, threaded through (as shown) and soldered

thus changing the line of action of the spring and ceasing to cross the fulcrum point. The rocker then always returns to the position shown. On assembly the cut portion should be at the top

Fitted on battery tray inside instrument

TRANSISTORISED EQUIPMENT
OBSERVE BATTERY POLARITY

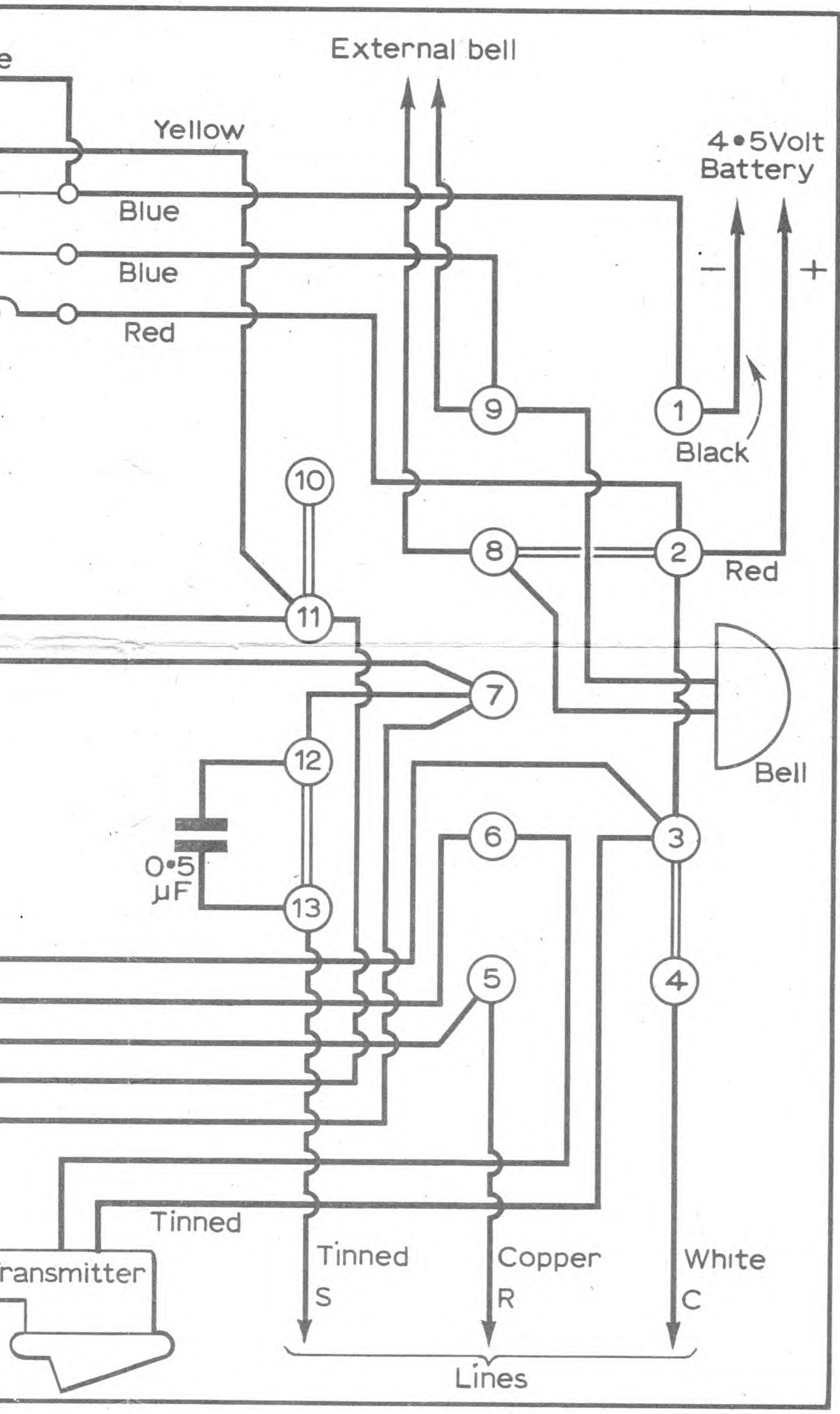


Transistor base

. holes

dotted)

MPLIFIER



The dial-centre disc

COMPONENTS

For each station:

R1—0·1MΩ, $\frac{1}{4}$ watt.
C1—0·25μF, paper, low voltage.
Transistor—OC71 or similar.
Handset—soundpowered, ex-Government.
Call-switch—Woolworth's "VETO", flush, two-way (modified).
Bell or Buzzer—small domestic type, 2–4V.
Battery—4½V bell type, Vidor V8, Ever Ready 126, etc.
Handset switch—lever-type micro-switch, "normally-closed" action.
Materials for case, paxolin for amplifier, terminal strips, wire, screws, etc.

For the system generally:

Wire for interconnecting lines.
0·5μF paper capacitor for 'S' line.