PRACTICAL WIRELESS

SEPTEMBER 1970

3/6

PW VIBRASONIC 25-50 GUITAR AMPLIFIER

ALSO:- ORGAN PEDAL BASS UNIT
LOW BAND VHF CONVERTER

TMK METER KITS

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

MODEL 200

20,000 O.P.V. Multimeter. Features 24 measurement ranges with mirror scale.

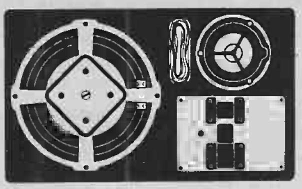
Large 3 2in meter. Full scale accuracy: DCV and current: ±2%, ACV: ±3%, resistance ±3%. Special 0·6V DC range for transistor circuit measurements.

SPECIFICATION
● DCV: 0–0·6–6–30–120–600–1,200V at 20K/OPV. ● ACV: 0–6–30–120–600–1,200V at 10K/OPV. ● DC Current: 0–6·0–6–600mA. ● Resistance: 0–10–K 100K–1M—10M/ohms (58–580–5·8K–58K at mid-scale). ● Capacitance: 0·002–0·2μF (AC 6V range). ● Decibels —20 to +63dB. ● Output: 0·05μF blocking capacitor. Uses two 1·5V (U7 type) batteries. Black bakelite cabinet. Size 5¼ 3¾ 1⅞in. Complete with test leads.

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

WHARFEDALE

UNIT 3 SPEAKER KIT



3in tweeter uses new Wharfedale "Acoustiprene" dome diaphragm. Crossover unit crossover freq. 1,750Hz. ALL accessories, acoustic wadding, mounting bolts, wire, etc., are supplied, you provide the cabinet to suit your needs. 8in. Bass/Mid. range speaker employing a powerful magnet assembly with diecast chassis and Flexiprene roll surround. The Wharfedale Unit 3 speaker kit can be constructed by anybody and with a suitable cabinet will provide a highly sophisticated system giving true Hi-Fi reproduction from 40–17,000Hz. Impedance 4/8 ohms. Max. power handling 15W.

£11.19.6 each Post 5/-   **£20** per pair Post 10/-

UNIT 4 SPEAKER KIT

2 speakers (12in. Bass and 3in Treble) to give full range, balanced reproduction Frequency response of 45–17,000Hz when housed in suitable cabinet. Superior 4-element crossover unit ensures optimum performance from each speaker.

£16 each Post 5/-   **£30** per pair Post 10/-

UNIT 5 MONITOR SYSTEM KIT

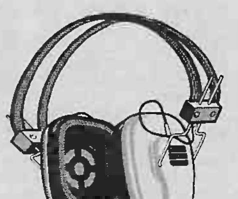
3 speakers (12in Bass, 5in M.-R. unit, 1in Treble) give clean, smooth performance. Frequency response of 40–20,000Hz when housed in suitable cabinet. Unique mechanical/electrical 6 element crossover unit.

£23.10 each Post 7/6   **£42** per pair Post 15/-

TTC HEADPHONES

MODEL G-IIII

Yet another outstanding TTC product which gives you exceptional value plus super quality. These stereo phones use two 3in low imp. high flux density dynamic reproducers. Freq. Res. 25–15,000Hz. Fitted with foam cushioned adjustable earpads for super listening comfort, imp. 8 ohms, matching 16 ohms. Max. Input 0·5W. Complete with 36in shielded grey cable. Pearl grey finish with double spring headband.



ONLY **63/-** Post 3/6

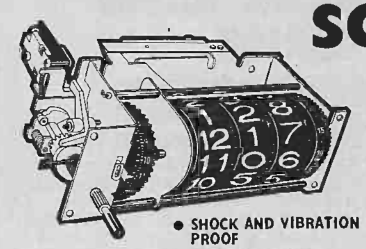
USA MADE CASSETTES

AT LASKY'S BUDGET PRICES

C60 7/6 each post 1/-	35/- post 2/-	65/- post 3/-
C90 12/6 each post 1/-	57/6 post 2/-	115/- post 3/-
C120 17/6 each post 1/-	85/- post 2/-	165/- post 3/-

EXCLUSIVE

DIGITAL CLOCK SCOOP!



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

This unique DIGITAL CLOCK is now available **EXCLUSIVELY FROM LASKY'S** in chassis form for you to mount in any housing that you choose.
All settings are achieved by two dual-concentric controls at the front including: ON-OFF-AUTO and AUTO ALARM, "sleep" switch, 10 minute division "click" set alarm (up to 12 hour delay), time adjustment. Ultra simple mechanism and high quality manufacture guarantee reliable operation and long life.
The sleep switch will automatically turn off any appliance—radio, TV, light etc. at any pre-set time up to 60 min. and in conjunction with the AUTO setting will switch on the appliance again next morning.
The clock measures 4¾W x 1¾H x 3⅝D (overall from front of drum to back of switch).
SPEC: 210/240V AC. 50Hz operation; switch rating 250V. 3A. Complete with instructions. **HUNDREDS OF APPLICATIONS. COMPLETE WITH KNOBS.**

LASKY'S PRICE **£6.19.6** Post 3/6

SPECIAL QUOTATIONS FOR QUANTITIES

Audio Development

AD-309K

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

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

LASKY'S PRICE **£9.19.6** POST 3/6

AUDIO DEVELOPMENT AD-76K

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

90/- Post Free

AUDIO DEVELOPMENT AD-96K

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

£5.18.6 Post Free

Audio Tronics 70

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

This month's voucher worth 30/-

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NOW! A FAST *EASY* WAY TO LEARN BASIC RADIO AND ELECTRONICS

Build as you learn with the exciting new TECHNATRON Outfit! No mathematics. No soldering—but you learn the *practical* way.

Now you can learn basic Radio and Electronics at home—the *fast*, modern way. You can give yourself the essential technical 'know-how' sooner than you would have thought possible—read circuits, assemble standard components, experiment, build . . . and enjoy every moment of it. B.I.E.T's Simplified Study Method and the remarkable new TECHNATRON Self-Build Outfit take the mystery out of the subject—make learning *easy and interesting*.

Even if you don't know the first thing about Radio now, you'll build your own Radio set within a month or so!

. . . and what's more, YOU'LL UNDERSTAND EXACTLY WHAT YOU ARE DOING. The Technatron Outfit contains everything you need, from tools to transistors . . . even a versatile Multimeter which we teach you how to use. You need only a little of your spare time, the cost is surprisingly low and the fee may be paid by convenient monthly instalments. You can use the equipment again and again—and it remains your own property.

You LEARN—but it's as fascinating as a hobby.

Among many other interesting experiments, the Radio set you build—and it's a good one—is really a bonus; this is first and last a *teaching* Course. But the training is as rewarding and interesting as any hobby. It could be the springboard for a career in Radio and Electronics or provide a great new, spare-time interest.

A 14-year-old could understand and benefit from this Course—but it teaches the real thing. Bite-size lessons—wonderfully clear and easy to understand, practical projects from a burglar-alarm to a sophisticated Radio set . . . here's your chance to master basic Radio and Electronics, even if you think you're a 'non-technical' type. And, if you want to carry on to more advanced work, B.I.E.T. has a fine range of Courses up to A.M.I.E.R.E. and City and Guilds standards.

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Like to know more about this intriguing new way to learn Radio and Electronics? Fill in the coupon and post it today. We'll send you full details and a 164-page book—'ENGINEERING OPPORTUNITIES'—Free and without any obligation.

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I would like to know more about your Practical Radio & Electronics Course. Please send me full details and FREE 164-page book.

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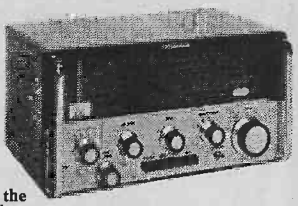
Listen to the world with Eddystone



When you own an Eddystone communications receiver, you have the broadcasting world at your finger tips—wherever you happen to be—on land or at sea. The reputation these sets have attained is proof of their excellence and reliability and at Imhofs, there is a special Eddystone department, where you can see, hear and compare all models listed here.

Same day despatch to any part of the world; free delivery in the U.K.; plus after sales service for which Imhofs and Eddystone are world famous.

EDDYSTONE EB35 Mark II broadcast receiver AM/FM transistorised. A high performance all-band receiver, can also be used as a 'Hi-Fi' tuner. Powered by 6 SP2 torch cells, or, with Type 924 power supply unit, from AC mains. £88.12.3d. Also stereo model. £97.10.9d.

EDDYSTONE 940 (13 valve) communications receiver. A connoisseur's instrument combining 'Professional' appearance with performance; has a world-wide reputation, two RF stages ensure high-sensitivity. £159.0.0d.

EDDYSTONE EC10 transistorised communications receiver. An enthusiast's receiver at a modest price. Embodies features usually only found in much more expensive designs. Powered by 6 SP2 torch cells or Type 924 power unit (AC). £62.10.0d.

EDDYSTONE EC10 Mark II transistorised communications receiver. A de-luxe version of this famous design now incorporating 'S' meter and limited fine tuner. £74.10.0d.

EDDYSTONE EA12 'Ham Band' receiver. Built to professional standards but specifically for the amateur enthusiast. High sensitivity for all reception modes CW, MCW, AM and SSB. FSK adaptor available as ancillary £205.0.0d.

There is an Eddystone Communications receiver for any frequency between 10kHz and 870 MHz full details from Imhofs or your local Eddystone agent.

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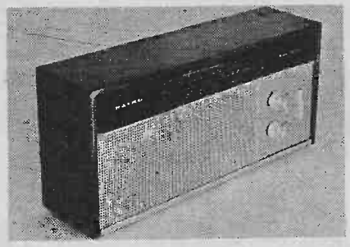
R36D

M. & B. RADIO

38 BRIDGE END, LEEDS 1
Telephone: 0532-35649

VHF FM/MW/LW TRANSISTOR RADIO

BRAND NEW 10 transistor plus 4 diode table model of well known British manufacture. The highly polished wood cabinet, speaker and pre-assembled chassis are supplied separate and only require fitting together and the 2 speaker connections making. CHASSIS & CABINET £9.10.0. SPEAKER 25/- carr. paid.



STC STEREO/MONO HEADPHONES. Brand new lightweight high quality comfortable padded headphones for stereo or mono use. Weight 10 oz. 20 c/s to 20 Kc/s 300 ohms per earpiece. Supplied with details of matching circuit for 15 ohms using only 3 resistors. 54/- plus 4/- pp.

12 VOLT TRANSISTOR INVERTERS. 12vdc input. 270vdc at 150mA approx output. Transformer 2in x 2in x $1\frac{5}{8}$in mounted on aluminium case $1\frac{5}{8}$in x $2\frac{7}{8}$in x 4in. Weight 15oz. 65/- plus 4/- pp.

TRANSISTOR MODULATOR PRE-AMP PANEL. BRAND NEW 4 transistors plus 1 diode. $4\frac{5}{8}$in x $2\frac{7}{8}$in. Fitted with pre-set microphone gain control and mod filter. Originally used to drive an NKT404 which drove a pair of NKT404s. Supplied brand new c/w circuit of complete modulator. 22/6d plus 1/6 pp.

TRANSISTOR AUDIO AND MUTING PANELS. Brand new set of 3 panels. Audio panel with transistor gate originally used to drive an NKT404 output transistor. 2 muting panels with Schmitt trigger circuit to operate the gate on the audio panel. 8 transistors in all. Supplied with full circuit 22/6d plus 2/6 pp.

455Kc/s FM I.F PANEL. Brand new but faulty 6 transistor panel usually low in gain. 12/6 plus 1/6 pp.

HAND TELEPHONES. Brand new radiotelephone type press to talk handsets. 12/6 plus 1/6 pp.

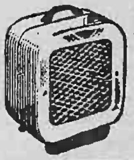
VHF AERIAL C/O RELAYS. Used but OK. 6 or 12v. 4/- plus 1/6 pp

60 UNTESTED MIXED TRANSISTORS 5/- plus 1/- pp.

60 UNTESTED MIXED DIODES 2/6 plus 1/- pp.

USED TESTED VALVES. 12AX7/ECC83 2/6. 6BJ6 1/6. 6AQ5/EL90 2/6. ECF80 2/-. 6AT6 1/6.

ALSO VARIOUS VHF EQUIPMENT IN STOCK
S.A.E. AND 6d. STAMP FOR LISTS



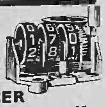
2¼kW FAN HEATER

Three position switching to suit changes in the weather. Switch up for full heater (2¼ kW), switch down for half heat (1¼kW), switch central blows cold for summer cooling—adjustable thermostat acts as auto control and safety cut-out. Complete kit £3.15.0 Post and ins. 7/6.

FLUORESCENT CONTROL KITS

Each kit comprises seven items—Choke, 2 tube ends, starter, starter holder and 2 tube clips, with wiring instructions. Suitable for normal fluorescent tubes or the new "Grolux" tubes for fish tanks and indoor plants. Chokes are super-silent, mostly resin filled. Kit A—15-20 w. 19/6. Kit B—30-40 w. 19/6. Kit C—80 w. 25/6. Kit MF1 is for 6in., 9in. and 12in. miniature tubes, 19/6. Postage on Kits A and B 4/6 for one or two kits then 4/6 for each two kits ordered. Kits C, D and E 4/6 on first kit then 3/6 for each kit ordered. Kit MF1 3/6 on first kit then 3/6 on each two kits ordered.

3 DIGIT COUNTER



For Tape Recorder or other application, re-settable by depressing button. Price 5/6.

TRANSDUCER

Made by Acos, reference No. I.D.1001. For measuring vibration, etc., to be used in conjunction with "G" Meter. Regular price £5. Our price 49/6. Brand new and unused.

ISOLATION SWITCH

20 Amp D.P. 250 volts. Ideal to control Water Heater or any other appliance. Neon indicator shows when current is on. 4/6. 48/- per dozen.

LIGHT CELL

Almost zero resistant in sunlight increases to 10 K Ohms in dark or dull light, epoxy resin sealed. Size approx. 1in. dia. by ½in. thick. Rated at 500 MW, wire ended. 8/6 with circuit.

FLEX BARGAINS

Screened 2 Core Flex. Each core 14/0076 Copper PVC insulated and coloured, the 2 cores laid together and metal braided overall. Price £2.15.0 per 100 yds. coil. p. & p. 6/6.

15 Amp 3 Core Non-kink Flex. 70/0076 insulated coloured cores, protected by tough rubber sheath, then black cotton braided with white tracer. A normal domestic flex as fitted to 3 Kw. fires. Regular price 3/6 per yd. 50 yd. coil £4.10.0, p. & p. 6/6.

10 Amp 3 Core Non-kink Flex. As above but cores are 28/0076 Copper. Normal price 2/6 per yd. 100 yd. coil £7.10.0, p. & p. 6/6.

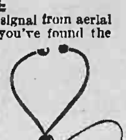
6 Amp 2 Core Flex. As above, but 2 Cores each 23/0076 as used for Vacuum Cleaners, Electric Blankets, etc. 39/6 100 yd. coil. p. & p. 6/6.

23/0076 Triple Core P.V.C. covered, circular, normally sold at 1/6 yd. Our price 100 yd. coil £3.19.6. Post and Insurance 6/6.

6, 12 or 24 VOLT SOLENOID

For energising Reed Switches etc., 4/6 each, please state voltage.

RADIO STETHOSCOPE



Easiest way to fault find—traces signal from aerial to speaker—when signal stops you've found the fault. Use it on Radio, TV, amplifier, anything — complete kits comprises two special transistors and all parts including probe tube and crystal earpiece, 29/6—twin stethoset instead of earpiece 11/- extra—post and ins. 2/9.

TELESCOPIC AERIAL

for portable, car radio or transmitter. Chrome plated—six sections, extends from 7½ to 47in. Hole in bottom for 6BA screw, 7/6. KNUCKLED MODEL FOR F.M. 9/6.

BATTERY OPERATED TAPE DECK

With Capstan control. This unit is extremely well made and measures approx. 6×5×2 in. deep. Has three piano key type controls for Record, Playback and Rewind. Motor is a special heavy duty type intended for operation off 4/5 volts. Supplied complete with 2 spools ready to install. Record, Replayhead is the sensitive M4 type intended for use with transistor amplifier. Price 79/6. Post and insurance 4/6.

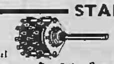
INTEGRATED CIRCUIT BARGAIN

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

DISTRIBUTION PANELS

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

STANDARD WAFER SWITCHES



Standard Size 1¼ wafer—silver-plated 5 amp contact, standard ¼" spindle 2". long—with locking washer and nut.

No of Poles	2 way	3 way	4 way	5 way	6 way	8 way	9 way	10 way	12 way
1 pole	6/6	6/6	6/6	6/6	6/6	6/6	6/6	6/6	6/6
2 poles	6/6	6/6	6/6	6/6	6/6	6/6	6/6	10/6	10/6
3 poles	6/6	6/6	6/6	6/6	10/6	10/6	10/6	14/6	14/6
4 poles	6/6	6/6	6/6	10/6	10/6	10/6	10/6	18/6	18/6
5 poles	6/6	6/6	10/6	10/6	14/6	14/6	14/6	22/6	22/6
6 poles	6/6	10/6	10/6	10/6	14/6	14/6	14/6	26/6	26/6
7 poles	6/6	10/6	10/6	14/6	18/6	18/6	18/6	30/6	30/6
8 poles	10/6	10/6	10/6	14/6	18/6	18/6	18/6	34/6	34/6
9 poles	10/6	10/6	14/6	14/6	22/6	22/6	22/6	38/6	38/6
10 poles	10/6	10/6	14/6	18/6	22/6	22/6	22/6	42/6	42/6
11 poles	10/6	14/6	14/6	18/6	26/6	26/6	26/6	46/6	46/6
12 poles	10/6	14/6	14/6	18/6	26/6	26/6	26/6	50/6	50/6

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

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

THIS MONTH'S SNIP

FRIDGE UNIT (Sealed compressor type)

Suitable for cabinets up to 7 cubic ft. We offer the sealed unit type as fitted to most of the better fridges. Made originally to fit certain Philips and Stella models, the unit comprises a compressor, insulated and sealed in for silent operation, a cooling radiator, a freezer box and tubing, all gassed up ready for operation from our standard 230/240 volt mains.

We offer these unused, in Makers' cartons, £6.19.6 each plus carriage at cost. We suggest you allow 30/- for this, any change will be returned to you.

Horstmann "Time and Set" Switch

(A 15 amp Switch). Just the thing if you want to come home to a warm house without it costing you a fortune. You can delay the switch on time of your electric fires, etc., up to 14 hours from setting time or you can use the switch to give a boost period of up to 3 hours. Equally suitable to control processing. Regular price probably around £5. Special snip price 29/6. p. & ins. 4/6.

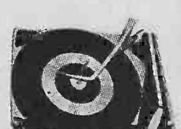
OUT OF SEASON BARGAIN

3kW TANGENTIAL HEATER UNIT

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

MOST AMAZING BARGAIN

PRINCESS AUTO CHANGER



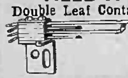
The most amazing bargain ever! A brand new Auto change record player for less than the price of a single player . . . due to a frustrated export order we are able to offer the Balfour Princess 4 speed Autochanger—a really fine machine at about one third of its regular price.

The Balfour has two unique features (1) A patented brush system which automatically cleans stylus after each record playing and (2) at shut off the pick-up locks itself into its recess—other features include pick-up height and stylus pressure adjustments, and motor suitable for our 230/240 or for 115v. continental mains.

Beautifully styled—this is a high class expensive instrument but you can purchase one this month for only 59/6 plus 8/6 post and packing. One point, these changers have been to France and back and the vibrations of the journey, etc., may have loosened screws or otherwise put them out of adjustment. However, with each we supply a 16 page service manual and fault finding chart which is so detailed that if necessary you could completely re-build the changer. So this is truly a bargain that you will not want to miss so order today.

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

NEED A SPECIAL SWITCH



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

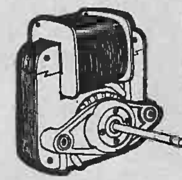
ELECTRIC CLOCK WITH 25 AMP SWITCH

Made by Smith's, these units are as fitted to many top quality cookers to control the oven. The clock is mains driven and frequency controlled so it is extremely accurate. The two small dials enable switch on and off times to be accurately set. Ideal for switching on tape recorders. Offered at only a fraction of the regular price—new and unused only 39/6, less than the value of the clock alone—post and insurance 2/9.

DRILL CONTROLLER

Electronically changes speed from approximately 10 revs. to maximum. Full power at all speeds by finger-tip control. Kit includes all parts, case, everything and full instructions 19/6. plus 2/6 post and insurance. Made up model also available 37/6 plus 2/6 p. & p.

MAINS MOTOR



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

PP3 BATTERY ELIMINATOR

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

AC FAN

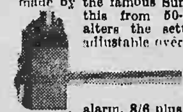
Small but very powerful mains motor with 5½in. blades. Ideal for cooling equipment or as extractor. Silent but very efficient, 17/6, post 4/6. Mounts from back or front with 4BA screws.

BALANCED ARMATURE UNIT
500 ohm, operates speaker or microphone, so useful in intercom or similar circuits, 6/6 ea., £3.10.0 doz. 80 ohm model 5/6.

THERMOSTATS

Type "A" 15 amp. for controlling room heaters, greenhouses, airing cupboard. Has spindle for pointer knobs. Quickly adjustable from 30-80°F. 9/6 plus 1/- post. Suitable box for wall mounting, 5/-. P. & P. 1/-.

Type "B" 15 amp. This is a 17in. long rod type made by the famous Sunvic Co. Spindle adjusts this from 50-550°F. Internal screw alters the setting so this could be adjustable over 30° to 1000°F. Suitable for controlling furnace, oven, kiln, immersion heater or to make flame-stat or fire alarm, 8/6 plus 2/6 post and insurance.

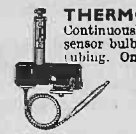


Type "D". We call this the Ice-stat as it cuts in and out at around freezing point. 2/3 amps. Has many uses one of which would be to keep the loft pipes from freezing, if a length of our blanket wire (16 yd. 10/- is wound round the pipes, 7/6. P. & P. 1/-.

Type "E". This is standard refrigerator thermostat. Spindle adjustments cover normal refrigerator temperature. 9/6, plus 1/- post.

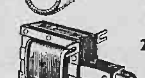
Type "F". Glass encased for controlling the temp. of liquid—particularly those in glass tanks, vats or sinks—thermostat is held (half submerged) by rubber sucker or wire clip—ideal for fish tanks—developers and chemical baths of all types. Adjustable over range 50° to 150°F. Price 18/- plus 2/- post and insurance.

THERMOSTAT



Continuously variable 30°-90°C. Has sensor bulb connected by 33in. of flexible tubing. On operation 15 amp 250 volt switch is opened and in addition a plunger moves through approx. ⅛in. This could be used to open valve on ventilator etc. 29/6 plus 4/6 p. & ins.

230 VOLT SOLENOID



½in. stroke. Size 2⅛in. × 2in. × 1¾in. 14/6, postage 2/9.

ELECTRONICS (CROYDON) LTD

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

Also 102/3 Tamworth Road, Croydon

R+TV

RADIO & TV COMPONENTS (Acton) Ltd.
21c High Street, Acton, London W.3.
Also at 323 Edgware Road, London, W.2.
ALL ORDERS BY POST TO OUR ACTON BRANCH
Terms C.W.O. All enquiries S.A.E.

Complete Stereo System £41

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

This superb stereo system is a real price break through. It comprises the VISCOUNT F.E.T. Mk I amplifier on which full details are given below, the famous Garrard SP 25 Mk II (including teak veneer base and transparent cover) with diamond cartridge or 2025 TC and the very successful DUO type 2 speakers. Measuring 17½in x 10¾in x 6¾in, the Duo type 2 speakers are beautifully finished in teak veneer with matching vynair grills. They incorporate a 10½in x 6¼in drive unit and high frequency speaker, both of which are of 3 ohms impedance. The Duo speaker system is also available separately at £6.6.0 each, plus 15/- p. & p.

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

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

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

Specification—Output per channel 10 watts r.m.s. Frequency bandwidth 20 Hz to 20 kHz + 1db at 1 watt. Total distortion at 1 kHz at 9 watts 0.5% Input sensitivities CER. P.U. 100mV into 3 meg ohms. Tuner 100mV into 100K ohms. Tape 100mV into 100K ohms. Overload Factor Better than 26db. Signal to noise ratio—70db on all inputs (with vol. max). Controls—6 position selector switch (3 pos. stereo and 3 pos. mono). Separate volume controls for left and right channels. Bass ± 14db at 60 Hz. Treble (with D.P.S. on off) ± 12 db at 10 KHz. Tape recording output sockets on each channel. Size 12¼in . 6in . 2⅔in. in teak-finished case. BUILT & TESTED.

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

The £29-10-0 Stereo system

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

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

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

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

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

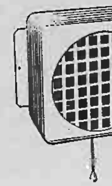
Duetto integrated transistor stereo Amp.	£9.10.0 + 7/6 p&p.
Garrard Changer from	£7.19.6 + 7/6 p&p.
Cover and teak finish plinth	£4.15.0 + 7/6 p&p.
Duo Type I speakers (see opp. page)	ea. £4. 4.0 + 7/6 p&p.
The above items purchased together	£29.10.0 + £1.10 p&p.

CAR TRANSISTOR IGNITION SYSTEM

by famous manufacturer

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

Price **£4.19.6** plus 5/- P. & P.

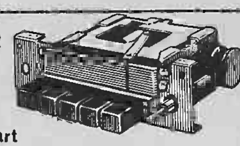


EXTRACTOR FAN

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

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

PYE CAR RADIO



Push Button Tuning Heart

This PRESTOLOCK 5 station Push-Button Tuner Heart with Manual Over-ride is an ideal basis for a quality AM car radio. Size 6½" x 4" x 2". As illustrated but without knobs.

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

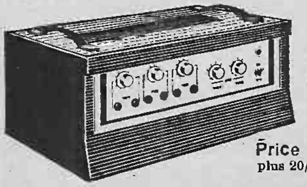
THE DUO SPEAKER SYSTEM

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

Type 1 SPECIFICATION:—

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

50 WATT AMPLIFIER



A.C. Mains 200-250V

Price **£28.10**
plus 20/- p. & p.

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

TECHNICAL SPECIFICATIONS

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

THE RELIANT

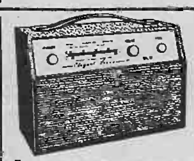
SOLID-STATE GENERAL PURPOSE AMPLIFIER

SPECIFICATIONS

Output—10 watts. Output impedance—3 to 4 ohms
Inputs—1. -xtal mic 10mV Tone Controls—Treble control range ±12dB at 10KHz.
2. -gram/radio 250mV. Bass control range ±13dB at 100Hz.
Frequency Response—(with tone controls central) Minus 3dB points at 20Hz and 40KHz. Signal to Noise Ratio—better than -60dB. Transistors—4 silicon Planar type and 3 Germanium type. Mains input—220/250V. A.C. Size of chassis— 10¼in x 4¾in x 2¼in. For use with Std. or L.P. records, musical instruments, all makes of pick-ups and mikes. Separate bass and treble lift control. Two inputs with control from gram. and mike. Built and tested.

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

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

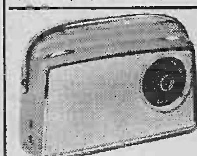


The ELEGANT SEVEN Mk. III

(350mW Output)

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

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



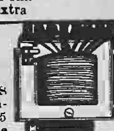
The DORSET

(600mW Output)

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

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

QUALITY MAINS TRANSFORMER



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

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

LIQUIDATED STOCK
DANSETTE
TOURISTE MK3 CAR RADIO

ALL TRANSISTOR

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

Originally sold complete for £15.4.6.

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

SET OF PARTS £6.6.0 plus 7/6 P. & P.
Circuit diagram 2/6. Free with parts

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

See top of previous page for address

RADIO & TV COMPONENTS
R+TV
(ACTON) LIMITED

BI-PAK SEMICONDUCTORS

NEW LOW PRICED TESTED S.C.R's.

PIV	1 A (TO-5 case) each	3 A (TO-66 case) each	7 A (TO-48 case) each	16 A (TO-48 case) each	PIV	30 A each
50	4/6	5/–	9/6	10/6	25	20/–
100	5/–	6/6	10/6	12/6	50	23/–
200	7/–	7/6	11/6	15/–	100	28/–
400	8/6	9/6	13/6	18/6	200	32/–
600	10/6	11/6	15/6	25/–	400	35/–
800	12/6	14/–	18/–	30/–	800	80/–

PRINTED CIRCUITS EX-COMPUTER Packed with semiconductors and components. 10 boards give a guaranteed 30 trans. and 30 diodes. Our price 10 boards 10/–. Plus 2/– p. & p.

TRANSISTOR EQVT. & SPECIFICATION BOOK (German publication). A complete cross reference and equivalent book for European, American and Japanese Transistors. Exclusive to BI-PAK. 15/- each.

2N2060 NPN SIL. DUAL TRANS. CODE D1699 TEXAS. Our Price 5/- ea.

120VCB NIXIE DRIVER TRANSISTOR. Sim. BSX21 & C407, 2N1893 FULLY TESTED AND CODED ND120, 1-24, 3/6 each. TO-5 NPN 25 up 3/- each.

Sil. trans. suitable for P.E. Organ, Metal TO-18 Eqvt. ZTX300 1/– each. Any Qty.

MULLARD I.C. AMPLIFIERS

TAA243, Operational amplifier, 70/- each.
TAA263, Linear AF amplifier, 18/6 each.
TAA293, General purpose amplifier, 21/- each.

CA3020 RCA (U.S.A.) LINEAR INTEGRATED CIRCUITS

Audio Power Amplifier, 30/- each.

SIL. REJECTS TESTED

PIV	750mA	3A	10A	30A
50	1/–	2/9	4/3	9/6
100	1/3	3/3	4/6	15/–
200	1/9	4/–	4/9	20/–
300	2/3	4/6	6/6	22/–
400	2/6	5/6	7/6	25/–
500	3/–	6/–	8/6	30/–
600	3/3	6/9	9/–	37/–
800	3/6	7/6	11/–	40/–
1000	5/–	9/3	12/6	50/–
1200	6/6	11/6	15/–	

TRIACS

VBOM	2A (TO-1)	6A (TO-66)	10A (TO-88)
100	14/–	15/–	22/6
200	17/6	20/–	28/–
400	20/–	25/–	35/–

VBOM = Blocking voltage in either direction.

2N3055 115 WATT SIL. POWER. NPN. *OUR PRICE* **12/6** *EACH*

FULL RANGE OF ZENER DIODES VOLTAGE RANGE 2-16V. 400mV (DO-7 Case) 2/6 ea. 1·5W(T op-Hat) 3/6 ea. 10W. (SO-10 Stud) 5/- ea. All fully tested 5% tol. and marked. State voltage required.

BRAND NEW TEXAS. GERM. TRANSISTORS Coded and Guaranteed.

Pak No.			EQVT
T1	8	2G371A	OC71
T2	8	2G374	OC75
T3	8	2G3744A	OC81D
T4	8	2G381A	OC81
T5	8	2G382T	OC82
T6	8	2G344A	OC44
T7	8	2G345A	OC45
T8	8	2G378	OC78
T9	8	2G399A	2N1302
T10	8	2G417	AF117

All 10/- each pack

SUPER PAKS — NEW BI-PAK UNTESTED SEMICONDUCTORS

Unequalled Value and Quality

Satisfaction GUARANTEED in Every Pak, or money back.

Pak No.		
U1	120 Glass Sub-min. General Purpose Germanium Diodes ..	10/-
U2	60 Mixed Germanium Transistors AF/RF	10/-
U3	75 Germanium Gold Bonded Diodes sim. OA5. OA47	10/-
U4	40 Germanium Transistors like OC81. AC128	10/-
U5	60 200mA Sub-min. Sil. Diodes	10/-
U6	30 Silicon Planar Transistors NPN sim. BSY95A, 2N706	10/-
U7	16 Silicon Rectifiers Top-Hat 750mA up to 1,000V	10/-
U8	50 Sil. Planar Diodes 250mA OA/200/202	10/-
U9	20 Mixed Volts 1 watt Zener Diodes	10/-
U11	30 PNP Silicon Planar Transistors TO-5 sim. 2N1132	10/-
U13	30 PNP-NPN Sil. Transistors OC200 & 2S104	10/-
U14	150 Mixed Silicon and Germanium Diodes	10/-
U15	25 NPN Silicon Planar Transistors TO-5 sim. 2N697	10/-
U16	10 3-amp Silicon Rectifiers Stud Type up to 1,000 PIV	10/-
U17	30 Germanium PNP AF Transistors TO-5 like ACY17-22	10/-
U18	8 6-Amp Silicon Rectifiers BYZ13 Type up to 600 PIV	10/-
U19	25 Silicon NPN Transistors like BC108	10/-
U20	12 1·5 amp Silicon Rectifiers Top-Hat up to 1,000 PIV	10/-
U21	30 AF Germanium alloy Transistors 2G300 Ser. & OC71	10/-
U23	30 Madt's like MAT Series PNP Transistors	10/-
U24	20 Germanium 1-amp Rectifiers GJM up to 300 PIV	10/-
U25	25 300Mc/s NPN Silicon Transistors 2N708, BSY27	10/-
U26	30 Fast Switching Silicon Diodes like IN914 Micro-min.	10/-
U28	Experimenters' Assortment of Integrated Circuits, untested. Gates, Flip-Flops, Registers, etc., 8 Assorted Pieces	20/-
U29	10 1-amp SCR's TO-5 can up to 600 PIV CRS1/25-600	20/-
U31	20 Sil. Planar NPN trans. low noise Amp 2N3707	10/-
U32	25 Zener diodes 400mW D07 case mixed Volts, 3-18	10/-
U33	15 Plastic case 1 amp Silicon Rectifiers 1N4000 series	10/-
U34	30 Sil. PNP alloy trans. TO-5 BCY26, 2S302/4	10/-
U35	25 Sil. Planar trans. PNP TO-18 2N2906	10/-
U36	25 Sil. Planar NPN trans. TO-5 BFY 50/51/52	10/-
U37	30 Sil. alloy trans. SO-2 PNP, OC200 2S322	10/-
U38	20 Fast Switching Sil. trans. NPN. 400 Mc/s 2N3011	10/-
U39	30 RF Germ. PNP trans. 2N1303/5 TO-5	10/-
U40	10 Dual trans. 6 lead TO-5 2N2060	10/-
U41	25 RF Germ. trans. TO-1 OC45 NKT72	10/-
U42	10 VHF Germ. PNP trans. TO-1 NKT667 AF117	10/-

Code Nos. mentioned above are given as a guide to the type of device in the Pak. The devices themselves are normally unmarked.

I.C. AMPLIFIER

Identical encapsulation and pin configuration to the following: SL402-3, IC10 and IC403. Each circuit incorporates a pre-amp and class A.B. Power amp stage capable of delivering up to 3 watts RMS. Fully tested and guaranteed. Supplied complete with circuit details and data. CODED BP1010. OUR LOWEST PRICE 30/-each. 10 up 25/- each.

AD161 *NPN*
AD162 *PNP*
MATCHED COMPLEMENTARY PAIRS OF GERM-POWER TRANSISTORS. For mains driven output stages of Amplifiers and Radio receivers. OUR LOWEST PRICE OF 12/6 *PER PAIR.*

UNIJUNCTION

UT46. Eqvt. 2N2646 Eqvt. TIS43. BEN3000
5/6 EACH
25-99 5/– 100 UP 4/–

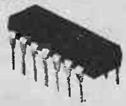
NPN Silicon PLANAR BC107/8/9, 2/– each 50-99, 1/10 100 up, 1/8 each, 1,000 off, 1/6 each. Fully tested and coded TO-18 case.

NPN DIFFUSED SILICON PHOTO-DUODIODE TYPE 1S701 (2N2175) or Tape Readout, high switching and measurement indicators, 50V. 250mV. OUR PRICE 10/– EACH 50 OR OVER 8/6 EACH. FULL DETAILS.

FET'S

2N 3819	8/–
2N 3820	25/–
MPF105	8/6

BI-PAK = LOW COST I.C's



BI-PAK Semiconductors now offer you the largest and most popular range of I.C's available at these **EXCLUSIVE LOW PRICES**. TTL Digital 74N Series fully coded, brand new. Dual in-line plastic 14 and 16 pin packages.

BI-PAK Order No.	SIM-TYPE.	Description	Price and qty. prices 1–24	25–99	100 up
BP00	7400N	Quad 2-Input NAND GATE	6/6	5/6	4/6
BP01	7401N	Quad 2-Input NAND Gate—OPEN COLLECTOR	6/6	5/6	4/6
BP04	7404N	HEX INVERTER	6/6	5/6	4/6
BP10	7410N	Triple 3-Input NAND GATE	6/6	5/6	4/6
BP20	7420N	Dual 4-Input NAND GATE	6/6	5/6	4/6
BP30	7430N	Single 8-Input NAND GATE	6/6	5/6	4/6
BP40	7440N	Dual 4-Input BUFFER GATE	6/6	5/6	4/6
BP41	7441AN	BCD to decimal decoder and NIT Driver	22/6	20/–	17/6
BP42	7442N	BCD to decimal decode (TTL 0/1)	22/6	20/–	17/6
BP50	7450N	Dual 2-Input AND/OR/NOT GATE—expandable	6/6	5/6	4/6
BP53	7453N	Single 8-Input AND/OR/NOT GATE—expandable	6/6	5/6	4/6
BP60	7460N	Dual 4-Input—expandable	6/6	5/6	4/6
BP70	7470N	Single JK Flip-flop—edge triggered	9/–	8/–	7/–
BP72	7472N	Single Master Slave JK Flip-flop	9/–	8/–	7/–
BP73	7473N	Dual Master Slave JK Flip-flop	10/–	9/–	8/6
BP74	7474N	Dual D Flip-flop	10/–	9/–	8/6
BP75	7475N	Quad Bistable Latch	11/–	10/–	9/6
BP76	7476N	Dual Master Slave Flip-flop with preset and clear	11/–	10/–	9/6
BP83	7483N	Four Bit Binary Adder	26/–	22/6	20/–
BP90	7490N	BCD Decade Counter	22/6	20/–	17/6
BP92	7492N	Divide by 12 4 Bit binary counter	22/6	20/–	17/6
BP93	7493N	Divide by 16 4 Bit binary counter	22/6	20/–	17/6
BP94	7494N	Dual Entry 4 Bit Shift Register	22/6	20/–	17/6
BP95	7495N	4 Bit Up-Down Shift Register	22/6	20/–	17/6
BP96	7496N	5 Bit shift register	24/–	21/–	18/6

Data is available for the above Series of Integrated circuits in booklet form, price 2/6

BRAND NEW. FULL TO MANUFACTURERS' SPECIFICATION

	Price each 1–24	25–99	100 up
BP709 Operational Amplifier, dual-in-line 14 pin package = SN72709 and similar to MIC709 and ZLD709C	10/6	9/–	8/–

This is a high performance operational amplifier with high impedance differential inputs and low impedance output.

TTL. INTEGRATED CIRCUITS

Manufacturers' "Fall outs"—out of spec. devices including functional units and part functional but classed as out of spec. from the manufacturers very ridged specifications. Ideal for learning about I.C's and experimental work, on testing some will be found perfect.

PAK No.		PAK No.		PAK No.	
UIC00 = 5 × 7400N	10/–	UIC42 = 5 × 7442N	10/–	UIC80 = 5 × 7480N	10/–
UIC01 = 5 × 7401N	10/–	UIC50 = 5 × 7450N	10/–	UIC82 = 5 × 7482N	10/–
UIC02 = 5 × 7402N	10/–	UIC51 = 5 × 7451N	10/–	UIC83 = 5 × 7483N	10/–
UIC03 = 5 × 7403N	10/–	UIC60 = 5 × 7460N	10/–	UIC86 = 5 × 7486N	10/–
UIC04 = 5 × 7404N	10/–	UIC70 = 5 × 7470N	10/–	UIC90 = 5 × 7490N	10/–
UIC05 = 5 × 7405N	10/–	UIC72 = 5 × 7472N	10/–	UIC92 = 5 = 7492N	10/–
UIC10 = 5 × 7410N	10/–	UIC73 = 5 × 7473N	10/–	UIC93 = 5 × 7493N	10/–
UIC20 = 5 × 7420N	10/–	UIC74 = 5 × 7474N	10/–	UIC94 = 5 × 7494N	10/–
UIC40 = 5 × 7440N	10/–	UIC75 = 5 × 7475N	10/–	UIC95 = 5 × 7495N	10/–
UIC41 = 5 × 7441AN	10/–	UIC76 = 5 × 7476N	10/–	UIC96 = 5 × 7496N	10/–
				UICX1 = 20 × asst'd 74's	30/–

Packs cannot be split but 20 assorted pieces (our mix) is available as PAK UICX1.
Every PAK carries our BI-PAK Satisfaction or money back GUARANTEE.

DUAL-IN-LINE LOW PROFILE SOCKETS

14 AND 16 Lead Sockets for use with Dual-in-Line Intergrated Circuits.

Order No.		Price each 1-24	25-99	100up
TSO14	14 pin type	7/6	6/–	5/3
TSO16	16 pin type	10/–	8/6	7/9

RTL. FAIRCHILD (U.S.A.) I.C's

RTL Micrologic Circuits
Epoxy case To-5 temp range 15°C to 55°C.

	Qty. prices each 1–11	12–24	25–99	100 +
μL 900 Buffer	8/–	7/–	6/6	5/6
μL 914 Dual two-input GATE	8/–	7/–	6/6	5/6
μL 923 J-K Flip-flop	10/6	10/–	9/6	9/–

Full data and circuits for ICS in Booklet form price 1/6 each.

μA703E Linear RF-IF AMPLIFIER	11/–	10/–	9/–	8/3

PLASTIC CASE To-5 6 lead up to 100 m/cs.

DTL. DIGITAL I.C's

DTL dual in-line package.

	Price
Type MC844P expandable dual 4-input NAND Power Gate	10/– each
Type MC845P Clocked Flip-flop	15/– each
Type 862 Triple 3-input NAND/NOR Gate	10/– each

FULL DATA SUPPLIED WITH UNITS

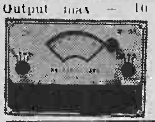
Please send all orders direct to our warehouse and despatch department.

BI-PAK SEMICONDUCTORS
P.O. BOX 6, WARE, HERTS.

Postage and packing add 1/–. Overseas add extra for Airmail. Minimum order 10/–. Cash with order please.

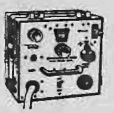
BELCO AF-5A SOLID STATE SINE SQUARE WAVE C.R. OSCILLATOR

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



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

CLASS D WAVEMETERS



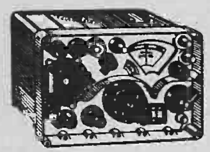
A crystal controlled heterodyne frequency meter covering 1·7-8 Mc/s. Operation on 6 volts D.C. Ideal for amateur use. Available in good used condition. £5.19.6. Carr. 7/6. Or brand new with accessories. £7.19.6. Carr. 7/6.

CLASS D WAVEMETERS No. 2

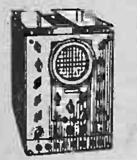
Crystal controlled. 1·2-19 Mc/s. Mains or 12V. D.C. operation. Complete with calibration charts. Excellent condition. £12.10.0. Carr. 30/-.

R209 MK II COMMUNICATION RECEIVER

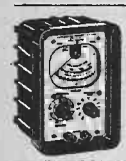
11 valve high grade communication receiver suitable for tropical use. 1·20 Mc/s on 4 bands. AM/CW/FM operation. Incorporates precision vernier driver, B.F.O., aerial trimmer, internal speaker and 12v. D.C. internal power supply. Supplied in excellent condition, fully tested and checked. £15.0.0. Carr. 20/-.



TYPE 13A DOUBLE BEAM OSCILLOSCOPES



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



MARCONI T/44/TF956

AF Absorption Wattmeter

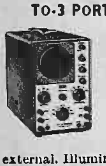
1 μ/watt to 6 watts.

£20. Carr. 10/-.

SOLARTRON CD 711S2 Double Beam Oscilloscopes

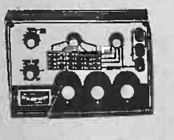
D.C. to 9 Mc/s. Perfect order £65. Carr. 50/–

TO-3 PORTABLE OSCILLOSCOPE



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

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



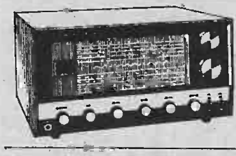
A new portable bridge offering excellent range and accuracy at low cost. Ranges: R. 1Ω-11·1 megΩ 6 Ranges ±1% L.1 μ H - 111 HENRYS 6 Ranges—2% C. 10pF ±1110mFd. 6 Ranges ±2%. TURNS RATIO 1:1/1000-1:11100. 6 Ranges ±1%. Bridge voltage at 1,000 cps. Operated from 9 volts. 100μA. Meter indication. Attractive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

UNR-30 4-BAND COMMUNICATION RECEIVER

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

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

LAFAYETTE SOLID STATE HA600 RECEIVER



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

LAFAYETTE HA-800 SOLID STATE AMATEUR COMMUNICATION RECEIVER

Six bands 3·5-4, 7-7·3, 14-14·35, 21-21·45, 28-29·7, 50-54Mc/s. Dual conversion on all bands. 2 × 455 Kc/s mechanical filters. FET front end, product detector, variable BFO, 100Kc/s crystal calibrator. 'S' Meter. Huge slide rule dial. Operation 230V AC or 12V DC. Size 15 × 9½ × 8½in. Complete with instruction manual. £57.10.0 Carr. Paid. 100Kc/s crystal 39/6 extra.

VARIABLE TRANSFORMERS

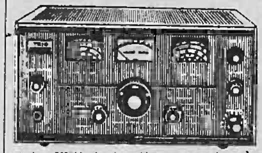
Input 230v. A.C. 50/60 cs.
Output variable 0-260v.

BENCH MOUNTING			
1 amp	£5.10.0.	8 amp	£14.10.0.
2½ amp	£6.15.0.	10 amp	£18.10.0.
5 amp	£9.15.0.	20 amp	£37. 0.0.
PANEL MOUNTING			
1 amp	£5.10.0.	2½ amp	£6.12.6.

B.C. 221 FREQUENCY METERS

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

TRIO COMMUNICATION RECEIVER MODEL 9R-59DE

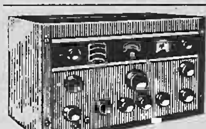


4 band receiver covering 550 Kc/s to 30 Mc/s continuous and electrical bandspread on 10, 15, 20, 40 and 80 metres. 8 valve plus 7 diode circuit, 4/8 ohm output and phone jack. SSB-CW ● ANL ● Variable BFO ● S meter ● Sep. bandspread dial ● IF 455 Kc/s ● Audio output 1.5 W. ● Variable RF and AF gain controls.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

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

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

RCA COMMUNICATIONS RECEIVERS AR88D

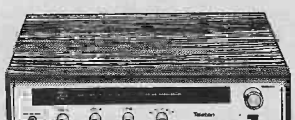


Latest release by ministry BRAND NEW in original cases. 110-250v. A.C. operation. Frequency in 6 Bands. 535 Kc/s—32 Mc/s continuous. Output impedance 2·5-600 ohms. Incorporating crystal filter, noise limiter, variable BFO, variable selectivity, etc. Price £65.0.0. Carr. £2.

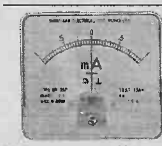
LAFAYETTE PF-60 SOLID STATE VHF FM RECEIVER

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

TELETON CR-10T AM/FM STEREO TUNER AMPLIFIER



A new model from Teleton. 31 solid state devices. 4 + 4 watt output. Inputs for ceramic/crystal cartridge. Frequency range AM 540-1600KHz FM 88-108MHz. Automatic FM Stereo reception. Stereo Indicator. Controls: Tuning, function selector, Tone and R & L volume controls. AFC switch. Stereo headphone socket. Size 13¾" × 3½" × 9½" approx. PRICE £34.0.0. Carr. 7/6.



CLEAR PLASTIC PANEL METERS

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

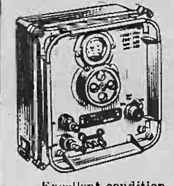
	.500-0-500μA 27/6	50mA 27/6	150V. D.C...27/6
	1mA 27/6	100mA 27/6	300V. D.C...27/6
	1-0-1mA ...27/6	150mA 27/6	500V. D.C...27/6
	2mA 27/6	200mA 27/6	750V. D.C...27/6
	5mA 27/6	300mA 27/6	15V. A.C....27/6
50μA 40/-	10mA 27/6	500mA 27/6	50V. A.C. ..27/6
50-0-50μA 37/6	750mA 27/6	3V. D.C. ..27/6	150V. A.C...27/6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

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

Variable Voltage TRANSFORMERS

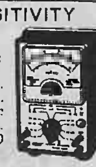
Brand new, guaranteed and carriage paid.
High quality construction. Input 230V. 50-60 cycles.
Output full variable from 0-260 volts. Bulk quantities available.
1 amp.—£5.10.0; 2·5 amp—£6.15.0; 5 amp—£9.15.0;
8 amp.—£14.10.0; 10 amp.—£18.10.0; 12 amp—£21.0.0;
20 amp.—£37.0.0.

CRYSTAL CALIBRATORS NO. 10



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

TE-40 HIGH SENSITIVITY A.C. VOLTMETER

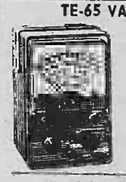


10 meg. input 10 ranges: ·01/·003/·1/·3/1/3/10/30/100 300V. R.N.S. 4cps.-1·2 Mc/s. Decibels −40 to +50dB. Supplied brand new complete with leads and instructions. Operation 230V. A.C. £17.10.0 Carr. 5/-.

LELAND MODEL 27 BEAT FREQUENCY OSCILLATORS

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

TE-65 VALVE VOLTMETER



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

COSSOR 1049 DOUBLE BEAM OSCILLOSCOPES

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

AM/FM SIGNAL GENERATORS

Oscillator Test No. 2. A high quality precision instrument made for the ministry by Airmec. Frequency coverage 20-80 Mc/s. AM CW/FM. Incorporates precision dial, level meter, precision attenuator 1μV-100mV. Operation from 12 volt D.C. or 0/110/200/250 volt A.C. Size 12 × 8½ × 9in. Supplied in brand new condition complete with all connectors fully tested. £45. Carr. 20/-.

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

RUSSIAN C1-16 DOUBLE BEAM OSCILLOSCOPES

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

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

HOSIDEN DH-08S DE-LUXE STEREO HEADPHONES

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

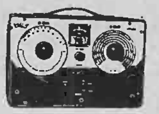
AUTO TRANSFORMERS

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

150 W.	£2. 2.6.	P. & P. 3/6.
300 W.	£3. 5.0.	P. & P. 4/6.
500 W.	£4.10.0.	P. & P. 6/6.
1,000 W.	£6.10.0.	P. & P. 7/6.
1,500 W.	£7.19.6.	P. & P. 8/6.
7,500 W.	£15.10.0.	P. & P. 20/-.

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

ARF-100 COMBINED AF-RD SIGNAL GENERATOR



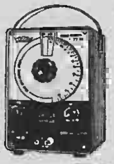
A.F. SINE WAVE 20 – 200,000 c/s. Square wave 20 – 30,000 c/s. O/P. HIGH IMP. 21V. P/P600 Ω 3.8V. P/P TF 100 Kc/s-300 Mc/s. Variable R.F. attenuation int/ext. modulation. Incoporates dual purpose meter to monitor AF output and % mod. on R.F. 220/240V. A.C. £32.10.0. Carr. 7/6.

TE-20D RF SIGNAL GENERATOR

Accurate wide range signal generator covering 120 Kc/s-500 Mc/s on 6 bands. Directly calibrated Variable R.F attenuator, audio output. Xtal socket for calibration. 220/240V. A.C. Brand new with instructions. £15. Carr. 7/6. Size 140 × 215 × 170 mm.

PEAK-SOUND PRODUCTS. Full range of Amplifiers. Kits, Speakers, in stock.

TY75 AUDIO SIGNAL GENERATOR



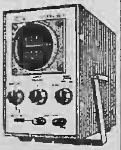
Sine Wave 20c/s to 200 kc/s. Square Wave 20c/s to 30kc/s. High and low impedance output. Output variable up to 6 volts 220/240 volts A.C. Size 210 × 150 × 120 mm. Brand new with instructions. £16. Carr. 7/6.

MARCONI TF142E DISTORTION FACTOR METERS. Excellent condition. Fully tested. £20. Carr. 15/-.

LAFAYETTE TE-46 RESISTANCE CAPACITY ANALYSER

2 pF-2000 mFd 2 ohms 200 megohms. Also checks impedance, turns ratio, insulation. 200/250V. A.C. Brand New £17.10.0 Carr. 7/6.

TO-2 PORTABLE OSCILLOSCOPE



A general purpose low cost economy oscilloscope for everyday use. Y amp. Bandwidth 2 CPS-1 MHZ. Input imp. 2 meg Ω 25 P.F. Illuminated scale. 2in. tube. 115 × 180 × 230mm. Weight 8lb. 220/240 V a.c. Supplied brand new with handbook. £22.10.0. Carr. 10/-.

ADVANCE TEST EQUIPMENT

Brand new and boxed in original sealed cartons

J1B. AUDIO SIGNAL GENERATOR. 15 c/s to 50 Kc/s. Sine wave. Output 600 ohms or 5 ohms £30.0.0.

VM79. UHF MILLIVOLT METER. 100 Kc/s to 1,000 Mc/s. AC 10mV to 3v. DC. 10 mV to 3v. Current 0.01 uA to 0.3 mA. Resistance 1 ohm to 10 megohm. £125.0.0.

TT1S. TRANSISTOR TESTER. Full range of facilities for testing PNP or NPN transistors in or out of circuit. £37.10.0.

Carriage 10/- per item.

HOSIDEN DH04S 2-WAY STEREO HEADSETS

Each headphone contains a 2½in. woofer and a ⅜in. tweeter. Built in individual level controls. 8 Ω imp. 25–18,000c/s with cable and stereo plug. £5.19.6. P. & P. 2/6.

BELCO DA-20 SOLID STATE DECADE AUDIO OSCILLATOR

New high quality portable instrument. Sine 1 Hz to 100 KHz. Square 20 Hz to 20 KHz. Output max + 10 dB (10 K ohms). Operation 220/240v. A.C. Size 215mm x 150mm x 120mm. Price £27.10.0. Carr. 5/-

Latest Catalogue

The latest edition giving full details of a comprehensive range of HI FI EQUIPMENT, COMPONENTS, TEST EQUIPMENT and COMMUNICATIONS EQUIPMENT.... Over 230 pages, fully illustrated and detailing thousands of items—many at bargain prices. FREE DISCOUNT COUPONS VALUE 10/-

SEND NOW—ONLY 7/6 P&P 1/6

GARRARD

FULL CURRENT RANGE OFFERED BRAND NEW AT FANTASTIC SAVINGS

1025 stereo	£7.19.6	SL72B	£24.19.6
40 Mk II stereo	£8.8.0	AP75	£16.19.6
2025T/C stereo	£8.17.6	SL75	£25.19.6
3000 stereo	£9.19.6	SL75B	£27.19.6
SP25 Mk II	£10.19.6	SL95B	£37.10.0
SL55	£11.12.6	A70/11	£11.19.6
SL65B	£14.19.6	401	£25.0.0

Carriage 7/6 extra each item.

TEAK PLINTHS & PERSPEX COVERS

1. For SP25, SL65, SL55, 3000, 2025 T/C 2025, 1000. £4.10.0
2. For AP75, SL75, SL95 £5.19.6.
3. For SP25 etc. to operate with lid in place £5.19.6.

Carriage 7/6 extra each type. Full range of Garrard accessories available.

SPECIAL OFFERS!

Garrard SP25 fitted Goldring G800 cartridge and wooden plinth. Total list price £32.8.5.

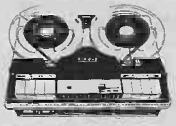
OUR PRICE £19.15.0 Carr. 10/-

Plastic cover 25/- extra

GOLRING GL69 fitted Goldring G800 cartridge complete with deluxe base and cover. Total list price £50.16.0.

OUR PRICE £39 Carr. 20/-

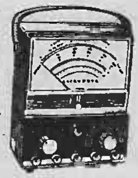
RTC249 4-TRACK TAPE DECK



British Made Speeds 1⅞", 3¾", 7½" P.S. Marriott Heads. 7" reel size. Push Button controls, fully interlocking. Size 13" + 10" + 1½" above unit plate. 4¼" below. Full instructions. £13.19.6 Carr. 7/6

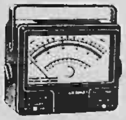
MULTIMETERS for EVERY purpose!

TE-51. NEW 20,000 Ω VOLT MULTIMETER with overload protection and mirror scale. 0/6/60 120/1,200v. A.C. 0/3/30 60/300/600/3,000v. D.C. 0.60μA/12/300mA. D.C. 0/60K/6 meg. ohm. 92/6. P. & P. 2/6.



TE-900 20,000 Ω/VOLT GIANT MULTIMETER mirror scale and overload protection. 6in. full view meter. 2 colour scale. 0/2.5/10/250/1,000/5,000 v. A.C. 0/25/12.5/10/50/250/1,000/5,000v. D.C. 0/50μA/110/100/500mA/10 amp. D.C. 02K/200K/20 MEG. OHM. £15. P. & P. 5/-.

MODEL AS-100D. 100K Ω/VOLT. 5in. mirror scale. Built-in meter protection. 0/3/12/60 120/300/600/1,200v D.C. 0/6/30/120/300/600v A.C. 0/10μA/6/60/300 mA/12 amp. 0/2K/200K /2M/200M Ω. -20 to + 17dB. £12.10.0. P. & P. 3/6.



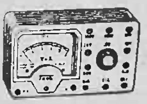
LAFEYETTE 57 Range Super 50k Ω/volt Multimeter' D.C. volts 12 mV —1000V. A.C. volts 1.5V —1000V. D.C. current 25μA–10 amp. Ohms 0–10meg Ω dB —20 to +81 dB. Overload protection. £12.10.0. Carr. 3/6.

MODEL TE-200 20,000 O.P.V. Mirror scale, overload protection. 0/5/25/125/1,000 V.D.C. 0/10/50/250/1,000 V.A.C. 0/50 μA/250 MA. 0/60K/6 meg. -20 to +62 db. 75/-. P. & P. 2/6

MODEL TE-300. 30,000 O.P.V. Mirror scale, overload protection 0/.6/3/15/60/300/1,200V d.c. 0/6/30/120/600/1,200 V A.C. 0/30μA/6mA/60mA 300mA/600mA. 0/8K/80K 800K/8 meg. —20 to + 63 db £5.19.6. P. & P. 3/

MODEL TE-70. 30,000 OPV. 0/3/15/60/300/600 /1200v D.C. 0/6/30/120 600/1200v A.C. 0/30μA /3/30/300mA. 0/16K/160 K/1.6M/16 Meg. Ω £5.10.0. P. & P. 3/-.

MODEL TE-10A. 20k Ω Volt 5/25/50/250/500/2,500v. D.C. 10/50/100/500/1,000 v. A.C. 0/50μA/2.5mA/250mA D.C. 0/6K/6 meg. ohm. - 20 to +22dB. 10.0, 100mFd. 0.100-0.1mFd. 69/6. P. & P. 2/6.



MODEL PT-34. 1,000 OPV. 0/10/50 /250/500/1,000v AC and D.C. 0/1/100/ 500mA D.C. 0/100K Ω. 39/6. P. & P. 1/6.

SAVE UP TO 33⅓% OF HI-FI EQUIPMENT
Send for discount price list

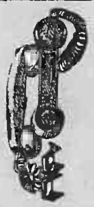
AVO CT471A MULTIMETER

Battery operated, fully transistorised. Sensitivity 100mΩ/v. Measures AC/DC Voltages 12mV to 1,200v. AC/DC Current 12uA to 1.2 Amp. Resistance 12 ohm to 120 mΩ HF, VHF, UHF Voltage with multiplier 4v to 400v up to 50 Mc/s, 40mV to 4v up to 1,000 Mc/s.

Offered in perfect condition.

£55 each. Carr. 10/-

TRANSISTORISED TWO-WAY TELEPHONE INTERCOM

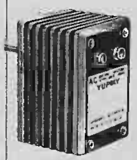


Operative over amazingly long distances. Separate call and press to talk buttons. 2-wire connection. 1000's of applications. Beautifully finished in ebony. Supplied complete with batteries and wall brackets. £6.19.6. P. & P. 3/6.

SINCLAIR EQUIPMENT

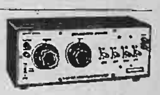
Project 60. Package offers. 2 x Z30 amplifier, stereo 60 pre-amp, PZ5 power supply. £19.0.0. Carr. 7/6. Or with PZ6 power supply £21. Carr. 7/6. 2 x Z50 amplifier, stereo 60 pre-amp, PZ8 power supply. £21.10.0. Carr. 7/6. Transformer for PZ8. 59/6 extra. Add to any of the above £4.17.6 for active filter unit and £16 for a pair of Q16 speakers. All other Sinclair products in stock. 2,000 amplifier £23. Carr. 7/6. Neoteric amplifier £46. Carr. 7/6.

SOLID STATE VARIABLE A.C VOLTAGE REGULATORS



Compact and panel mounting. Ideal for control of lamps, drills, electrical appliances etc. Input 230/240v. A.C. Output continuously variable from 20v—230v. Model MR 2305 5 amp 68 x 46 x 43mm £8.7.6 Model MR 2310 10 amp 90 x 68 x 60mm £11.19.6 Postage 2/6

TE111. DECADE RESISTANCE ATTENUATOR



Variable range 0 - 111dB. Connections. Unbalanced T and Bridge T. Impedance 600 Ω range (0.1dB × 10) + (1dB × 10) + 10 + 20 + 30 + 40dB. Frequency: d.c. to 200kHz (−3dB). Accuracy: 0.05dB. +Indication dB × 0.01. Maximum input less than 4W (50V). Built in 600 Ω load resistance with internal/external switch. Brand new £27.10.0. P. & P. 5/–.

RECORDING HEADS

COSMOCORD ½-track heads. High imp. record/playback 65/–. Low imp. erase 20/-.
MARRIOTT ¼-track heads. High imp. record/playback 65/–. Low imp. erase 20/-. Post extra.

AMERICAN TAPE

First grade quality Americao tapes. Brand new. Discount on quantities.

3in. 225ft. L.P. acetate	3/6
3¾in. 600ft. T.P. mylar	10/–
5in. 600ft. std. plastic	8/6
5in. 900ft. L.P. acetate	10/-
5in. 1,200ft. D.P. mylar	15/-
5¾in. 1,200ft. L.P. acetate	12/6
5¾in. 1,200ft. L.P. mylar	16/-
5¾in. 1,800ft. D.P. mylar	22/6
5¾in. 2,400ft. T.P. mylar	39/6
7in. 1,200ft. std. acetate	12/6
7in. 1,800ft. L.P. acetate	15/ -
7in. 1,800ft. L.P. mylar	20/ -
7in. 2,400ft. D.P. mylar	25/-
7in. 3,600ft. T.P. mylar	45/ -

Postage 2/–. Over £3 post paid.

TAPE CASSETTES

Top quality in plastic library boxes.
C60 60 min 8/6, 3 for 24/6
C90 90 min 12/6, 3 for 36/–
C120 120 min 15/–, 3 for 43/6
Cassette Head Cleaner 11/3. *Post Extra.*

G.W.SMITH & CO.(RADIO) LTD

All Mail Orders to– 147, Church Street, London, W.2 Tel: 01-262 6562 (Trade supplied)

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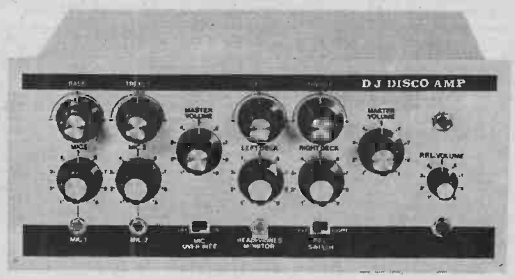
311, EDGWARE ROAD, LONDON, W.2 Tel: 01-262 0387
OPEN 9-6 MONDAY TO SATURDAY (EDGWARE ROAD ½ DAY THURSDAY)

DISCOSOUND

DJ DISCO-AMP



The DJ Disco-amp has been designed specifically for use with discotheques and has many exclusive features not normally found on P.A. amplifiers. The unit will be of use to the professional D.J. as well as in clubs and mobile discotheques.

The pre-amp section features independent inputs and volume controls for two mics with separate bass, treble and master volume, plus two independent inputs and volume controls for turntables, again with separate bass, treble and master volume controls.

A complete Pre-fade listen (P.F.L.) cueing monitor section is also featured with separate input for headphones (either stereo or mono) with an independent volume control for headphone monitoring, and a P.F.L. switch, so that either turntable can be monitored for accurate cueing up of records. A mic over-ride switch is also added which cuts the music volume by half so that mic announcements may be made over the music without altering the volume controls.

The power amplifier section has an output of 70 watts R.M.S. into 8 ohms and has elaborate protection against thermal, short or open circuit. The unit is designed for panel mounting.

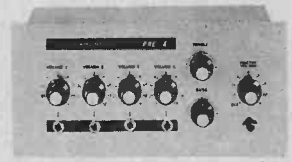
SPECIFICATION

Output power	70 watts R.M.S. ± 1db at 8 ohms.
Frequency response	30-20,000 Hz ± 3 db.
Harmonic distortion	Less than 1% at full output.
Signal/noise ratio	Better than − 65db.
Speaker impedance	8-16 ohms.
Headphone impedance	8-16 ohms.
Bass control	Variable 20 db at 100 Hz.
Treble control	Variable 20db at 10 kHz.
Inputs:	Mic 1 & 2 5 mV at 50 K ohms.
turntable	1 & 2 100mV at 1 meg ohm.

50 ohm or 600 ohm mic inputs may be ordered at extra cost. Size: Front Panel 16½" x 7". Cut out 15½" x 6". Fuses: A.C. 1.5 amp (B.S.) mounted on back panel.

PRICE £85.0.0 inc. P & P.

DISCOSOUND PRE-4



This is a four channel fully mixable pre-amp, with separate treble, bass and master volume controls, and is completely self powered. All four inputs are by standard jack socket on the front panel with the addition of inputs 3 and 4 being duplicated on the back panel, with two paralleled outputs also featured for versatility in use. Frequency response: 30-20,000 HZ ± 3db. Signal/Noise Ratio: −65db. Size: front panel 12½ × 5½ cut out required 11½ × 4½. Completely built and tested.

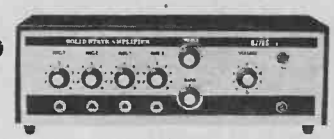
PRICE £18.0.0 inc. P & P.

DJ 30L PSYCHEDELIC LIGHT CONTROL UNIT

3 channel light control unit that handles up to 1,000 watts per channel. Separate bass, middle and treble controls for full frequency separation.
Completely built and tested

PRICE £37.10.0 inc. P & P.

DJ 70S INTEGRATED MIXER-AMPLIFIER



One of the finest units available on the market today, regardless of price. The front end of the unit consists of a four channel mixer with separate inputs and volume controls, plus a separate bass, treble and master volume control. One of the main features of this remarkable amplifier is its elaborate protection against short and open circuit and we can guarantee that it is virtually indestructable. Allied to this is its very high power output (70 watts R.M.S.) a frequency response (30-20,000 Hz ± 3db) that is superb, and distortion that is well below 1% even at full output. The unit is suitable for use with discotheques, groups, P.A., clubs etc., or anywhere that high quality high output is required. Size: 15½in × 5in × 6in.

PRICE £55.0.0 inc. P & P.

Also available DJ105S 30 watt P.A. Amplifier. Similar specification to above.

PRICE £35.0.0 inc. P & P.

DISCOSOUND 70 MAIN AMPLIFIER

A 70 watts RMS (8 Ohms) High Fidelity power Amplifier which utilises all silicon transistors of modular construction and features full automatic overload protection against short or open circuits. Frequency response: 20-20,000 Hz ± 2db. The High output is ideally suited for discotheques, groups, clubs, etc., or anywhere where reliability and quality are required. This unit is the companion model for use with our control pre-amp Discosound PRE-4, or can be used with any other high quality pre-amp control unit. Size: 7" × 9" × 6".
Completely built and tested on steel Chassis.

PRICE £35.0.0 inc. P & P.

For full details of these and all Discosound Products write direct to:—

DISCOSOUND, 122 BALLS POND ROAD, LONDON, N.1. Tel: 01-254 5779

Full money back guarantee if returned within 10 days.
All Discosound Products are guaranteed for 12 months.
Demonstrations given at any time.

R.S.C. SENSATIONAL HIGH FIDELITY STEREO 'PACKAGE' OFFERS

★ Super 30 Amplifier (15+15 watt) in veneered housing
★ Goldring Transcription Turntable on Plinth
★ Shure or Goldring Magnetic Pick-up Cartridge
★ Pair of Stanway II Loudspeaker Units
Special total price. Four fully wired units ready to "plug-in". Carr. 30/-. **86 Gns.**

TA12 Amplifier (6·5+6·5 watt) in veneered housing. Garrard 3000 4 sp. Autochanger unit on plinth. Sonotone 9TA P.U. cartridge. Pair of Dorchester Loudspeaker units. Special Total Price **47½ Gns.** Carr. 25/-.

Or Dep. £6 and 9 monthly payments £5.11.5 (Total £56.2.9). Transp. plastic cover 3 *gns.* extra.

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

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

EXTREMELY ATTRACTIVE PLINTHS finished in Teak or Afrormosia veneer. Trans plastic cover.

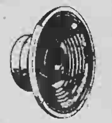
★ Super 30 amplifier (15 + 15 watt) in veneered housing
★ Garrard SP25 Mk II Turntable on Plinth
★ Goldring CS90 Ceramic P.U. Cartridge with diamond stylus
★ Pair Stanway II Speaker Units
Four fully wired units ready to "plug-in". Special total price **76 Gns.** Carr. 30/-.

● TA12 Amplifier (6·5+6·5 watt) in veneered housing
● Garrard SP25 Mk II 4 sp. player unit on plinth
● Goldring CS90 Ceramic P.U. Cartridge
● Pair of Dorchester Loudspeaker Units. **53gns.**
Special total price Carr. 25/-.

Or Dep. £10.0.3 and 9 mthly. payments £5.15.5 (Total 59 gns.). Transparent plastic cover 3 gns. extra.

TERMS AVAILABLE ALL PACKAGE OFFERS

AUDIOTRINE HIGH FIDELITY LOUDSPEAKERS

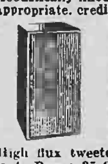


Heavy construction. Latest high efficiency ceramic magnets. Treated Cone surround. "D" indicates Tweeter Cone providing extended frequency range up to 15,000 c.p.s. 'L' indicates Roll Rubber cone surround. Impedance 3 or 15 ohms. Please state choice. Exceptional performance at low cost.

HF801D	8"	8W	54/3	HF120	12"	15W	79/9
HF102D	10"	10W	67/11	HF120D	12"	15W	89/9
HF100D	10"	15W	£4.19.9	HF126	12"	15W	£5.5.0
HF105DL	10"	10W	6gns.	HF126D	12"	15W	£5.15.0

HIGH FIDELITY LOUDSPEAKER UNITS

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



DORCHESTER Size 16 x 11 x 9in. appr. Range 45–15,000 c.p.s. Rating 8-10 watts. Fitted High flux 13x8in. Dual Cone spkr. Imp. 3 or 15 ohms. **£8.19.9** Carr. 7/6

STANWAY II Size 20x10½x9¾in. approx. Rating 10 watts. Including 13x8in. speaker with highly flexible cone surround, long throw voice coil and 11,000 line magnet. High flux tweeter. Handsome Scandinavian design cabinet. Range 35–20,000 c.p.s. Imp. 15 ohms. Gives smooth realistic sound output. **16 Gns.**

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

200-250v. AC mains operated. Frequency Response 30–20,000 c.p.s. –2dB. Harmonic Distortion 0.3% at 1,000 c.p.s. Separate Bass and Treble 'lift' and 'cut' controls. 3 input sockets for Mike, Gram, Radio or Tape. Input selector switch. Output for 3-15 ohm spkrs. Max. sensitivity 5mV. Output rating I.H.F.M. Fully enclosed enamelled case, 9½x2¾x5¾in. Attractive brushed silver finish facia plate 10½ x 3½in. and matching knobs. Complete kit of parts with full wiring diagrams and instructions. **7 Gns.** Carr. 7/6
OR FACTORY BUILT with 12 months' guarantee. £8.19.9

RECORD PLAYING UNITS

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

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

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

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

Limited Number of CLEARANCE LINES in leading makes of Hi-Fi equipment at Branches only

R.S.C. PLINTHS

for Record Playing units, cut for Garrard 1025, 2025, 3000, AT60, SP25 etc.

3 gns.
AVAILABLE WITH TRANSPARENT PLASTIC COVER **6 gns.**

INTEREST CHARGES REFUNDED

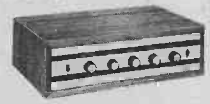
On Credit Sales settled in 3 months.

LINEAR L10 HIGH FIDELITY 10W AMPLIFIER

with separate Pre-amp Magnetic P.U. matching. To clear **10 Gns.**

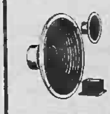
R.S.C. TA12 MKIII 6·5 + 6·5 WATT STEREO AMPLIFIER

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



Designed for optimum performance with any crystal or ceramic Gram P.U. cartridge, Radio tuner, Tape recorder, 'Mike' etc. ★ 3 separate switched input sockets on each channel ★ Separate Bass and Treble controls ★ Slide Switch for mono use ★ Speaker Output 3–15 ohms ★ For 200–250v. A.C. mains ★ Frequency Response 20–20,000 c.p.s. –2dB ★ Harmonic Distortion 0.3% at 1000 cps. Hum and Noise –70dB ★ Sensitivities (1) 50 mV. (2) 400 mV. (3) 100 mV. Output rating I.H.F.M. ★ Handsome finish Facia plate and Knobs. Complete kit of parts with full wiring diagrams & instructions. **13½ Gns.** Car. 7/9.
FACTORY BUILT with 12 mth gntee 17 Gns. or Deposit £3 and 9 monthly payments 38/10 (Total 19½ Gns.).
Or in Teak or Afrormosia veneer housing 20½ Gns. Dep. 3 Gns. and 9 monthly payments 46/8 (Total 23 Gns.).

AUDIOTRINE HI-FI SPEAKER SYSTEMS



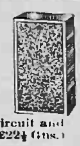
Consisting of matched 12in. 11,000 line 15 Watt 15 ohm high quality speaker, cross-over unit and tweeter. Smooth response and extended frequency range ensure suprisingly realistic reproduction. **£5.15.0**
OR SENIOR 15 WATT INC. HF126 15,000 line 15ohm Speaker £6.15.0. Carr. 6/6 Carr. 5/9

HI-FI SPEAKER ENCLOSURES

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

JE8 Size 16 x 11 x 9in. Pressurised. Gives pleasing results with any 8in. Hi-Fi 'speaker. **£4.14.6**
SE8 For optimum performance with any 8in. Hi-Fi 'speaker. Size 22 x 15 x 9in. Ported **£5.15.0**
SE10 For outstanding results with 10in. Hi-Fi 'spkr Size 24x15x10in. P'td. **£5.19.9**
SE12 For exclnt prfmnce with 12in. Hi-Fi speaker and Tweeter. Size 25 x 16 x 10½in. **£6.19.9**

THE 'YORK' HIGH FIDELITY 3 SPEAKER SYSTEM



★ Moderate size, only 25×14×10in. COMPLETE KIT **20 Gns**
★ Response 30-20,000 c.p.s. Impedance 15 ohms
★ Performance comparable with units costing considerably more. Carr. 12/6
Consists of (1) 12in. 15 watt Bass unit with cast chassis, Roll rubber cone surround for ultra low resonance, and ceramic magnet. (2) 3-way quarter section series cross-over system. (3) 8 x 5in. high flux middle range speaker. (4) High efficiency tweeter. (5) Appropriate quantity acoustic damping material (6) Teak veneered cabinet. (7) Circuit and full instructions. Terms: Dep. 3 Gns. and 9 monthly payments 45/6 (Total £22½ Gns.)
DEMONSTRATIONS AT ALL BRANCHES

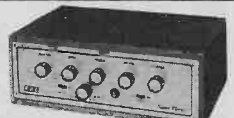
R.S.C. TFM1 SOLID STATE VHF/FM RADIO TUNER

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

R.S.C. SUPER 30 MkII HIGH FIDELITY STEREO AMPLIFIER

High Grade Components Specifications comparable with units costing considerably more.

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



Employing Twin Printed Circuits. 200/250v. A.C. mains operation.
CROSS TALK 52 dB at 1,000 c.p.s.
CONTROLS 5 Position Input Selector. Bass, Treble, Vol., Bal., Stereo/Mono Switch, Tape Monitor Switch, Mains Switch.
INPUT SOCKETS (1) P.U. (2) Tape Amp. (3) Radio, (4) Mic. or Tape Head. (Operation of Input Selector assures appropriate equalisation).
CHASSIS Strong Steel construction. Approx. 12 x 3 x 8in.

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

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

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

R.S.C. BATTERY/MAINS CONVERSION UNITS

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

SUPER 15 HIGH FIDELITY SOLID STATE AMPLIFIER

Approx. as Super 30 but single channel. Complete kit with full constructional details and point to point wiring diagrams. **12½ gns.** Carr. 12/6
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R·S·C HI-FI CENTRES LTD.

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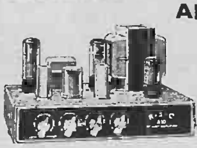
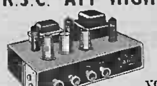
R.S.C. A10 30 WATT ULTRA LINEAR HI-FI AMPLIFIER



Highly sensitive. Push-Pull high output, with Pre-amp. Tone Control Stages. Performance figures of factory built units: Hum level −70dB. Frequency response ± 3dB 30-20,000c/s. Sectionally wound output transformer. All high grade components. Valves EF86, EF86, ECC83, 807, 807, GZ34. Separate Bass and Treble Controls. Sensitivity 36mV. Suitable for high impedance microphones. Crystal or Ceramic P.U's. 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. 50c/s A.C mains. For 3 and 15 ohm speakers. Complete kit of parts with point-to-point wiring diagrams and instructions. **15 Gns.** Carr. 12/6

Twin-handled perforated cover 35/-. Supplied factory built with EL34 output valves. 12 months' guarantee for 18 gns. **TERMS:** Deposit £3.9.0 and 9 monthly payments of £2 (Total £21.9.0). Send S.A.E. for leaflet.

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



PUSH-PULL ULTRA LINEAR OUTPUT "BUILT-IN" TONE CONTROL PRE-AMP. Two input sockets with mixing facilities High sensitivity, 5 valves. Independent Bass and treble controls. Frequency response ± 3dB 30-20,000 c/s. Hum level −60dB. Sensitivity 40 millivolts. For Crystal or Ceramic PUs. High Impedance "mikes". For Musical Instruments etc. Std. AC mains. For 3 & 15 ohm spkrs. SAE for leaflet. COMPLETE KIT. Full instructions and point-to-point wiring diagrams. Carr. 11/6. Twin handled metal cover 35/-. **$9\frac{1}{2}$ Gns.** PRICE FACTORY BUILT 13½ gns. or Deposit £3 and 9 monthly payments of 30/5 (Total £16.13.9). RSC A11T TRANSISTORISED VERSION of above complete kit 9 Gns. (Assembled 13 Gns.)

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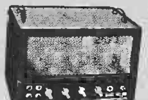

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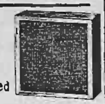
26 Gns. Carr. 15/-
Or Deposit £4 and 9 monthly payments of 58/8 (Total £30.8.0)

HIGH QUALITY LOUDSPEAKERS



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

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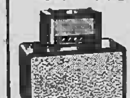

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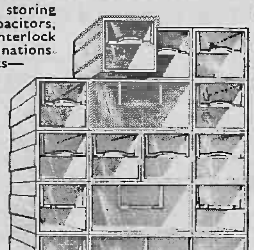

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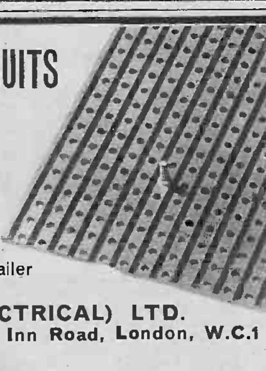

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SP25 MkII £10-15-0 p.p. 10/-

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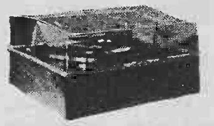

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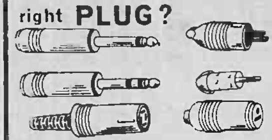

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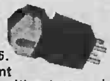

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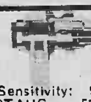

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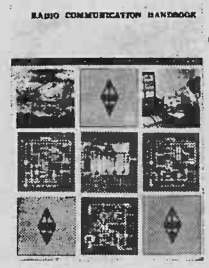

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ULCI 207M ...	£30 0 0	£21 10 0
GOODMANS Maxamp	£54 0 0	£42 10 0
GRUNDIG SV140 ...	£198 15 0	£157 10 0
GRUNDIG SV85 ...	£147 3 9	£125 0 0
LEAK Stereo 30 plus chassis ...	£53 0 0	£43 10 0
LEAK Stereo 30 plus teak ...	£59 10 0	£48 12 6
LEAK Stereo 70 chassis	£65 0 0	£53 10 0
LEAK Stereo 70 teak ...	£71 10 0	£57 10 0
LUX SQ 77T ...	£67 7 6	£59 5 0
LUX SQ 505 ...	£97 10 0	£79 10 0
LUX SQ 1220 ...	£124 10 0	£104 10 0
INEAR LT 66 ...	£18 18 0	£15 10 0
L.L. NOVA AMP	£30 9 0	£22 10 0
METROSOUND ST20	£32 0 0	£27 0 0
NIKKO TRM 30 ...	£36 0 0	£29 19 6
NIKKO TRM 40K ...	£46 10 0	£39 10 0
NIKKO TRM 50 ...	£95 10 0	£50 19 6
NIKKO TRM 120 ...	£95 0 0	£74 10 0
PHILIPS RH 580 ...	£26 0 0	£19 19 6
QUAD 33 and 303 ...	£98 0 0	£85 0 0
ROGERS Ravensbrook	£45 0 2	£37 10 0
ROGERS Ravensbrook Teak	£49 0 0	£39 10 0
ROGERS Ravensbourne	£59 10 0	£48 10 0
Teak	£64 0 0	£52 10 0
ROTEL 100 ...	£44 0 0	£37 10 0
J. E. SUGDEN A51 Mk.2	£59 10 0	£49 10 0
J. E. SUGDEN A51 C51	£108 0 0	£89 10 0
SANSUI AU 222 ...	£62 17 7	£51 10 0
SANSUI AU 555 ...	£80 9 7	£65 0 0
SINCLAIR 2000 ...	£30 9 0	£23 15 0
SINCLAIR project 60 with PZ5		£20 10 0
TELETON SAQ 203E ...	£28 7 0	£20 0 0
TELETON GA 101 ...	£38 5 0	£29 0 0

FM TUNERS

	Rec. Retail Price	Discount Price
ARENA F211 ...	£44 2 0	£36 15 0
ARMSTRONG 523 ...	£52 9 0	£44 17 6
ARMSTRONG 524 ...	£40 4 6	£34 17 6
ARMSTRONG M8 Dec.	£9 10 0	£7 15 0
DULCI FMT7 ...	£22 1 0	£17 19 6
DULCI FMT7S ...	£31 0 0	£25 5 0
GOODMANS Stereomax	£82 10 0	£70 10 0
GRUNDIG R.T. 40M ...	£126 9 3	£104 10 0
GRUNDIG R.T. 100 ...	£181 11 9	£149 10 0
LEAK Stereofetic ...	£59 13 10	£50 19 6
LEAK teak	£67 3 6	£56 19 6
L.L. NOVA Tuner ...	£40 9 0	£32 10 0
NIKKO Fam 12F ...	£68 8 3	£59 10 0
PHILIPS RH690 ...	£39 0 0	£33 0 0
ROGERS Ravensbrook FET Teak	£51 10 0	£44 10 0
ROGERS Ravensbourne FET Teak ...	£61 17 9	£52 12 6
SINCLAIR 2000 ...	£26 14 6	£19 15 0
SANSUI TU555 ...		£69 20 0
SANSUI TU777 ...		£82 10 0
TELETON GT101 ...		£42 0 0

TUNER AMPLIFIERS

	Rec. Retail Price	Discount Price
ARENA T 1500F ...	£72 9 0	£62 15 0
ARENA T 2600 ...	£104 9 0	£89 10 0
ARENA T 2700 ...	£97 13 0	£82 10 0
ARENA T 9000 ...	£303 9 0	£255 0 0
ARMSTRONG 525 ...	£87 16 9	£74 15 0
ARMSTRONG 526 ...	£98 15 6	£85 10 0
GOODMANS 3000 ...	£77 14 9	£67 10 0
GRUNDIG RTV 400 ...	£172 6 5	£145 0 0
GRUNDIG RTV 600 ...	£212 0 0	£177 10 0
GRUNDIG RTV 650 ...	£243 17 10	£207 10 0
LUX SQ 555	£187 10 0	£149 10 0
NIKKO STA 301 ...	£99 10 0	£84 10 0
NIKKO ST 501 ...	£121 17 11	£102 10 0
NIKKO ST 701 ...	£136 3 11	£112 10 0
SANSUI 200	£89 10 0	£79 10 0
SANSUI 350	£129 11 0	£105 0 0
SANSUI 800	£148 0 0	£120 0 0
SANYO DC60E ...	£99 0 0	£84 10 0
ROTEL 130	£79 10 0	£68 0 0

	Rec. Retail Price	Discount Price
PHILIPS RH781 ...	£74 19 6	£63 10 0
PHILIPS RH691 ...	£83 0 0	£71 10 0
TELETON CR10T ...	£39 10 0	£32 0 0
TELETON F2000 ...	£51 19 0	£39 10 0
TELETON MX990 ...	£64 12 0	£49 10 0
TELETON R8000 ...	£69 10 0	£52 10 0
TELETON TFS50 ...	£100 10 0	£79 10 0

SPEAKERS

	Rec. Retail Price	Discount Price
ARENA HT7	£19 19 0	£16 15 0
ARENA HT10	£22 1 0	£18 17 6
ARENA HT20	£32 11 0	£27 15 0
ARENA HT21	£10 10 9	£9 0 0
ARENA HT26	£78 15 0	£65 10 0
ARENA HT27	£18 18 0	£14 15 0
ARENA HT28	£17 17 0	£13 17 6
B & W DM1	£32 0 0	£26 10 0
B & W DM3	£63 0 0	£54 10 0
B & W DM70	£139 0 0	£117 10 0
CESTION Ditton 10 ...	£21 3 2	£17 5 0
CESTION Ditton 15 ...	£29 0 0	£23 0 0
CESTION Ditton 25 ...	£59 17 0	£45 0 0
DULCI AS3	£9 9 0	£8 0 0
GOODMANS Maxim ...	£20 15 6	£16 15 0
GOODMANS Marimba	£24 0 5	£19 15 0
GOODMANS Mezzo II	£30 18 0	£24 0 0
GOODMANS Magnum K	£40 2 0	£29 19 6
GOODMANS Magister	£57 0 0	£45 0 0
GRUNDIG System 300	£66 4 10	£52 10 0
GRUNDIG System 412	£86 7 10	£72 10 0
GRUNDIG System 740	£176 9 10	£145 0 0
KEF Cresta	£22 3 7	£18 0 0
KEF Celeste Mk. 2 ...	£29 0 0	£22 10 0
KEF Concord	£43 10 0	£34 0 0
KEF Concord	£43 10 0	£34 0 0
KEF Concerto	£53 10 0	£42 10 0
LEAK Mini Sandwich ...	£29 15 0	£22 15 0
LEAK Sandwich ...	£43 10 0	£32 10 0
LOWTHER Acousta PM6	£45 10 0	£37 10 0
MORDAUNT SHORT MS 100	£40 19 0	£35 0 0
MORDAUNT SHORT MS 600	£57 15 0	£45 0 0
PHILIPS RH481 per pair	£22 0 0	£17 10 0
PHILIPS RH481 per pair	£36 0 0	£29 0 0
SINCLAIR Q14 per pair	£8 2 5	£7 10 0
SANYO SX-X per pair	£37 16 0	£32 10 0
SANYO SX6 per pair ...	£79 16 0	£65 0 0
WHARFEDALE Denton	£37 16 0	£30 10 0
WHARFEDALE Super Linton	£45 0 0	£37 10 0
WHARFEDALE Melton	£29 10 0	£23 0 0
WHARFEDALE Dovedale III	£39 10 0	£31 0 0
WHARFEDALE Airedale	£69 10 0	£56 10 0
WHARFEDALE Rosedale	£57 0 0	£47 10 0
WHARFEDALE Unit 3	£11 19 0	£9 15 0
WHARFEDALE Unit 4	£16 0 0	£13 10 0
WHARFEDALE Unit 5	£23 10 0	£19 0 0

PLAYING DECKS

	Rec. Retail Price	Discount Price
GARRARD 401 ...	£31 14 2	£27 0 0
GARRARD SL95B ...	£45 9 1	£34 10 0
GARRARD SL75B ...	£35 12 2	£25 10 0
GARRARD SL65B ...	£19 6 5	£15 10 0
GARRARD SP25 ...	£15 15 11	£11 7 6
GARRARD AP75 ...	£23 16 0	£17 15 0
GARRARD 2025 T/C ...	£11 3 11	£9 10 0
GOLDRING GL69 ...	£25 1 6	£19 19 6
GOLDRING GL69D ...	£33 11 9	£27 10 0
GARRARD GL75 ...	£36 8 2	£28 10 0
GOLDRING GL75P ...	£46 18 6	£37 10 0
GOLDRING G99 ...	£24 14 1	£19 10 0
GOODMANS 3025 ...	£37 14 9	£31 10 0
THORENS TD150 A Mk. II	£43 12 7	£33 10 0
THORENS TD150 AB II	£47 8 7	£39 10 0
THORENS TD124 II ...	£46 15 10	£39 0 0
THORENS TD125 ...	£75 17 8	£59 10 0
THORENS TD125 AB...	£120 3 11	£95 0 0

STEREO CARTRIDGES

	Rec. Retail Price	Discount Price
AUDIO TECHNICA AT66...	£6 4 8	£5 10 0
AUDIO TECHNICA AT21S	£8 14 4	£7 10 0
AUDIO TECHNICA AT21X	£15 9 11	£13 0 0

	Rec. Retail Price	Discount Price
ADC 660	£16 6 6	£13 10 0
ADC 10E Mk. II ...	£46 4 2	£36 10 0
GOLDRING G850 ...	£6 10 0	£5 10 0
GOLDRING G800 ...	£13 0 0	£8 10 0
GOLDRING G800E ...	£18 17 1	£15 10 0
GOLDRING G800 S/E	£26 0 0	£19 10 0
GOLDRING CS90 ...	£5 4 0	£4 7 6
GOLDRING CS91E ...	£7 16 1	£6 10 0
NEAT V70	£5 4 8	£4 7 6
NEAT V70EZ	£7 15 3	£6 12 6
PICKERING V15/AME2	£19 5 10	£16 10 0
PICKERING V15 AM2	£13 17 6	£11 10 0
PICKERING V15 AC2	£10 14 8	£8 7 6
PICKERING V115 AC2	£8 8 0	£6 17 6
SHURE M3D M ...	£7 8 3	£6 0 0
SHURE N3D ...	£5 11 2	£4 5 0
SHURE M31E ...	£12 19 5	£10 5 0
SHURE N31E ...	£9 5 3	£7 5 0
SHURE M32E ...	£12 0 11	£9 10 0
SHURE N32E ...	£8 6 9	£6 10 0
SHURE M44 7 ...	£10 3 10	£8 5 0
SHURE N44 7 ...	£6 9 8	£5 2 6
SHURE M44E ...	£14 16 6	£12 0 0
SHURE N44E ...	£10 3 10	£8 2 6
SHURE M55E ...	£16 13 6	£13 0 0
SHURE N55E ...	£11 12 4	£8 5 0
SHURE M75/6 ...	£16 13 6	£13 0 0
SHURE N75/6 ...	£8 6 9	£6 10 0
SHURE M75 EJ ...	£24 1 9	£19 0 0
SHURE N75 EJ ...	£11 2 4	£8 12 6
SHURE V15 II ...	£40 15 3	£31 10 0
SHURE VN15E ...	£16 13 6	£14 10 0

STEREO TAPE DECKS AND RECORDERS

	Rec. Retail Price	Discount Price
AKAI 4000D ...	£87 10 0	£74 10 0
AKAI 1710W ...	£109 0 0	£89 10 0
AKAI 1710L ...	£109 0 0	£89 10 0
AKAI 150D ...	£130 2 4	£109 10 0
AKAI 1800 SD ...	£199 0 0	£165 0 0
REVOX 1104 ...	£204 15 0	£184 10 0
PHILIPS 4404 ...	£80 0 0	£67 10 0
PHILIPS 4407 ...	£103 15 4	£87 0 0
PHILIPS 4408 ...	£136 5 0	£110 0 0
SANYO MR 801 ...	£79 0 0	£67 10 0
SANYO MR 929 ...	£100 16 0	£86 0 0
SANYO MR 939 ...	£110 0 0	£91 10 0
SANYO MR 800 ...	£89 0 0	£75 0 0
TELETON FXB 570D ...	£52 10 0	£43 10 0
SHARP RD 712 ...	£75 0 0	£60 0 0
UHER 4200L ...	£162 14 10	£130 0 0
UHER 4400L ...	£162 14 10	£130 0 0

TRANSCRIPTION ARMS

	Rec. Retail Price	Discount Price
SME 3009 with S2 shell	£31 6 3	£24 19 6
SME 3012 with S2 shell	£33 5 3	£26 19 6
GOLDRING L75 ...	£12 10 0	£9 19 6
GOLDRING L69 ...	£9 5 9	£8 5 0
NEAT G30 ...	£11 14 1	£9 10 0
NEAT G30 B ...	£13 18 5	£11 10 0

STEREO HEADPHONES

	Rec. Retail Price	Discount Price
AKAI ASE9SE ...	£6 16 0	£5 10 0
SANSUI SS2 ...	£7 14 6	£6 10 0
SANSUI SS20 ...	£16 10 0	£13 15 0
TELETON SH301D ...	£4 10 0	£3 10 0
SHARP HP100	£5 17 6	£4 10 0
GARRARD SP25 Mk. II complete with De Luxe plinth and perspex cover ready wired to 5 pin din plug ...	£21 15 0	£15 15 0
GARRARD AP 75 complete with De Luxe plinth and perspex cover ready wired to 5 pin din plug	£33 15 0	£23 19 6
GOLDRING GL75 with goldring plinth and hinged perspex cover ready fitted with Goldring 800E cartridge ready wired to 5 pin din or phono plug	£67 19 10	£54 0 0

All goods are in manufacturer's sealed cartons and are insured against loss or damage in transit. **Guaranteed "by return" service. Carriage 10/- for speakers & stereo tape recorders. 7/6 for amplifiers, tuners, playing decks, tape decks. 5/- for cartridges, headphones and transcription arms,** *Send cash/cheque with order. Personal callers very welcome. 9.30 am—6 pm. Monday to Saturday. Thursday ½ day closing.*

Smith's Radio Service (Wolverhampton) Ltd.

Mail Order Department, 26 Victoria Street, Wolverhampton, Staffs. Tel: Wolv. 29246

PRACTICAL WIRELESS

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TOPIC OF THE MONTH

Showtime

TEMPUS, as they say, certainly fugits. And here we are once again in that fag-end of the British summer which has become known traditionally as "show time". To add emphasis to this exhibition oriented season, the annual RSGB show has, this year, moved up from its usual October date to August, finishing at the time the round of annual radio trade shows begin. It is hoped that regular visitors to the RSGB show (known officially as the International Radio Engineering and Communications Exhibition—or Radiocom 70—) have taken note of this change of date; it is now August 19-22. For full details please refer to page 360. We hope many readers will be there; Practical Wireless will have the usual display of constructional projects on show.

After all this activity, the Audio Fair follows on in October. Once again Practical Wireless will be supporting the exhibition with displays and demonstrations of a range of audio projects, plus a special competition for the occasion. It is all a little feverish for those intimately connected with the trade and the technical press.

With the RSGB exhibition, so far as P.W. is concerned, our participation is very largely a matter of preaching to the converted, yet we think it well worthwhile to take part. Anything that encourages a greater interest in home construction meets with our approval and the RSGB exhibition has always stressed this side of the hobby. This year we are pleased to learn that small stands will be available to non-trade members of the Society to display and sell pieces of equipment.

Until fairly recent times, most radio amateurs built all their station gear. Nowadays the more general thing is to use commercially built transmitters and receivers. Whether this is due to that mysterious phenomena of having more leisure time than ever but less time to spare for building, or merely to being more affluent is hard to calculate.

But if amateurs cannot or will not build their own main equipment, then they can learn one lesson from the P.W. stand. That is, that there are very many auxiliary pieces of equipment that anyone can find the time to build, not only directly connected with the radio amateur station but in the various allied fields of radio, audio and electronics.

W. N. STEVENS—*Editor.*

OCTOBER ISSUE WILL BE PUBLISHED ON SEPTEMBER 4

NEWS AND COMMENT

CONSTRUCTIONAL

OTHER FEATURES

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

Dixons Stereo

When Dixons Photographic entered the Audio HiFi field in depth, their first units were updated versions of existing record reproducing systems, restyled for marketing through the Company's 100-plus Branches under the "PRINZ" label.

Now they are marketing their own Prinz Stereo System 6. Specific points in the system's specification are detailed. Amplifier; Solid state—12 transistors—a.c. Mains 220/250V. 50Hz. Frequency Range 50-18,000Hz. Noise level—55dB. Controls: On/Off and Volume, Bass, Treble and Stereo Balance. Output 5 watts Music Power per Channel. Turntable is a Garrard 4-speed Auto 2025TC, fitted with Acos GP93/1 stereo crystal cartridge with sapphire styli. Speakers are two sealed enclosures each containing one 8in. x 5in. loudspeaker, 10,000 lines, and complete with 8ft. of lead per enclosure, terminating in a 2-pin DIN plug. Cabinets are as in photograph, with teak veneer finish. Price is £55 complete.

Two Metre Vertical

Two metre mobile enthusiasts will be pleased to hear of a new antenna manufactured by the American company Antenna Specialists Co., and available from KW Electronics Ltd., 1 Heath Street, Dartford, Kent.

This is a vertical whip, the ASP 629, which offers a gain of 2·5dB relative to a quarter wave antenna. It consists of a stainless steel whip and matching transformer assembly and may be tuned up anywhere in the range 130-174MHz.

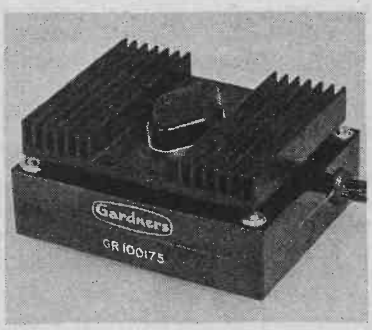
The interference suppression ratio, relative to a quarter wave antenna, is better than 6dB. The mounting hole required is $\frac{3}{4}$in. in diameter and no access is needed from the inside of the vehicle.

The antenna could also prove suitable for a home station and would be extremely useful where space was at a premium. The cost of the ASP 629 is £3 10s. Antenna Specialists also manufacture vertical whip antennas suitable for 4 metres and 70cms.

New Inverter

A new range of Inverter Modules introduce a new service by Gardners Transformers Limited, of Christchurch, Hampshire, England.

The new range, known as the M48 E.H.S. Series, are the product of a development and manufacturing service which has been set up to cater for individual requirements and special applications.



They offer power ratings up to 30 watts stabilised or 50 watts unstabilised in a standard mechanical assembly which will meet a wide variety of electrical parameters. The assembly incorporates a single power stabiliser which would be fitted in the d.c. output line for single output inverters or in the input to the inverter where multiple outputs are specified.

Finished dimensions for the power ratings quoted are 4in.×3·3in.×2in., and the weight is 24ozs. Fixing is by 4BA tapped bushes in the base of the unit.

Full details of the new range and the new service may be obtained from *Gardners Transformers Limited, Christchurch, Hampshire BH23 3PN.*

Bi-Pak I.C.'s

A complete range of Digital T.T.L. Integrated Circuits is to be launched by Bi-Pak Semiconductors to cover the popular 74N series of logic units. These will be available in the dual-in-line plastic package at approximately half the normal distribution price. The range includes gates, flip-flops and complex units such as divide by 16 4-bit binary counters, shift registers and decimal decoders plus nixie tube drivers.

It is hoped that with the low price and guaranteed supply which Bi-Pak have arranged with the manufacturers the teaching and experimental use of Integrated Circuits which up to now have been almost non-existent for most amateur concerns will at last become a reality.

Bi-Pak hope to publish in the near future enough circuitry for building computers, calculators, etc., using the Integrated Circuits mentioned. Bi-Pak say their aim is to further reduce the cost for amateur electronics and at the same time make it the most interesting hobby of this day and age.

Full details and prices are available from: *Bi-Pak Semiconductors, P.O. Box 6, Ware, Herts.*

Going Metric

A new leaflet 'Going Metric—Everyday Units' is now available free from the Metrication Board. The leaflet sets out the more common metric units and correct symbols for 14 everyday quantities including length, area, capacity, temperature and weight.

In the United Kingdom the basis for the metric system now coming into use is the International System of Units, known in all countries by the abbreviation SI. The units contained within this system are sufficient for all present needs of technology, science, industry, commerce and daily life.

Copies of the leaflet can be obtained without charge from *Information Division, Dept. 4, Metrication Board, 22 Kingsway, London, W.C.2.*

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

Quick on the draw

The Ersa Sprint

No, it's not a new kind of space gun—it's an Ersa Sprint soldering iron. Made in West Germany, the retailer in this country is Home Radio Ltd.

The interesting thing about this iron is that it weighs only 7ozs. and heats up in only 10 seconds. The technique used is different from usual quick heat irons because this switch is released once the operating temperature has been reached. Current consumption is 150W during heat-up period, dropping to 80W when operating temperature is reached. Working voltage is 200-250V a.c.

Home Radio stress that they supply a guarantee with these irons and they also stock a complete set of spare parts any of which can be changed in a matter of seconds.

The retail price of the Ersa Sprint is £3 19s. 6d. and the only retail supplier is: *Home Radio (Components) Limited, 234-240 London Road, Mitcham, Surrey, CR4.3HD.*

Preston A.R.C.

The P.A.R.S. are again holding a Mobile Rally. The venue, as in previous years is: Kimberley Barracks, Deepdale Road, Preston (next to Preston North End Football Ground).

The date is August 30th and a talk-in station will be active on 160m. Refreshments, both tea and the "hard stuff" will be available. Numerous trade stands will be in evidence. Further information may be obtained from (s.a.e. please): G. Wright, G3YOT, 56 Queensway, Bamber Bridge, Preston, PR5.6UD.

R.A.I.B.C.

The Radio Amateur Invalid and Bedfast Club will have a corner of their stand at the Radio Engineering and Communication Exhibition devoted to the collection of unwanted foreign stamps. So, if you have any stamps please take them along to the Exhibition and leave them at the R.A.I.B.C. stand. Also, on this stand, visitors will be able to see at first-hand the kind of good work the Club does.

Both the Hon. Sec. of the Club (Mrs. Woolley), G3LWY and Allan Herridge, G3IDG, will be present throughout the exhibition and look forward to meeting Practical Wireless and Practical Television readers.

I.C. Amplifiers

Motorola Semiconductors have announced a range of low-cost integrated circuits for the consumer-equipment field. Known as MFC units, these plastic-encapsulated devices use smaller chips and contain fewer circuit elements than the professional-equipment of i.c's. These new i.c's also have wider pin spacing to make them suitable for the printed-circuit boards used in consumer products.

The first two devices in the range to be introduced are a low-power audio amplifier and a wide-band amplifier. The former, Type MFC 4000, is a 250mW a.f. amplifier with a low total harmonic distortion (typically, 0·7% at 50mW output) and is designed for pocket radios. Contained in a four-lead package, it includes six transistors, three diodes and five resistors and requires no output transformer to match to a 16Ω load. The input sensitivity is 15mV r.m.s. for 50mW output. It requires a 9V d.c. supply and the quiescent current is 3·5mA.

The latter unit, Type MFC 4010, is a high gain (60dB) wide-band (100Hz to 4MHz, −6dB points) amplifier that could be used either as a general-purpose a.f. amplifier or as an i.f. amplifier at 465kHz. Typical output noise is 1mV r.m.s. Maximum power supply potential is 18V and typical current drain is 3mA.

Hugh Greatorex

The retirement was recently announced of Hugh Greatorex who for 37 years has been with the BBC Engineering Information Department. For the last 16 years he has been Assistant Head of that department. During this time his responsibilities included the organisation and management of the BBC technical enquiry stands at exhibitions and conferences. He made significant contributions to the promotion of new BBC services, in particular the v.h.f. radio service and latterly the u.h.f. and colour TV services.

Hugh has been a great friend of the Press for many years and we at *Practical Wireless* would like to wish him all good luck in his retirement.

Do it yourself

A new, inexpensive, educational aid to learning and teaching elements of logic, Boolean algebra and fundamentals of digital computers, COMPUKIT 1, has been announced by Limrose Electronics. It is supplied in kit form ready to be assembled on a specially designed printed circuit board. Logic circuits are constructed by making soldered, or solderless, connections to the terminal pins mounted on the p.c. board. Logic levels are indicated by miniature wire-ended bulbs on the board which is powered by a 4½ volt battery. The gates in the kit use transistors, diodes and resistors, and can be used not only for performing elementary logic functions, but also for wired-or, bistable and polyflop circuits and counters. The kit is complete and requires only a small soldering iron and a pair of cutting pliers to assemble. These can be purchased from the manufacturers as optional extras. The Instruction Book is written by a Fellow of the British Computer Society and avoids the use of jargon.

The basic kit costs only 7 Gns, and can be supplied in assembled form ready for use for an extra 27s. 6d. Further details from *Limrose Electronics, Lymm, Cheshire.*

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

GUITAR AMPLIFIER

Part 1

FOR TREBLE OR BASS GUITAR, ORGAN AND MICROPHONE WITH NEW "TONE TREMULANT" SYSTEM, BUILT-IN MIXING, VISUAL TREMULANT INDICATOR. MAX 50 WATTS R.M.S. POWER. COMPLETELY SELF CONTAINED. OPTIONAL FOOT CONTROLLED TREMULANT AND WAH-WAH.

SELF-CONTAINED high power guitar amplifiers with facilities similar to those of the PW 25-50, and which will be fully dealt with in this and following articles, do not come cheaply. A commercially made equivalent would cost in the region of £150 or more. All the components, including the power module, its power supply, the cabinet materials and the two special Goodmans power loudspeakers specified, can be obtained for approximately half this price.

The finished 50 watt amplifier is neither small nor light in weight because of the twin heavy duty loudspeakers and the very necessary rugged cabinet construction which is essential for power reproduction of guitar bass at the full 50 watts r.m.s. output. The cabinet is constructed from ¾in. thick Weyroc compressed chipboard.

There is, however, an alternative arrangement with regard to the loudspeakers and power output. For those who require the amplifier for treble guitar only with less power, a single type 12P 8 ohm Goodmans power speaker can be used and with this the PA50 power output module will deliver 25 watts r.m.s.

If the full 50 watts should be required at a later date, it will only be necessary to fit the additional loudspeaker. With a pair of type 12P Goodmans 12-inch 8 ohm loudspeakers used in parallel, the power module load becomes 4 ohms across which the module will deliver 50 watts (r.m.s.) power.

These Goodmans loudspeakers are a new range recently released by the manufacturers and have been specially designed for musical instrument amplifiers. Note that the use of loudspeakers, other than those specified, would in all probability spoil the performance of the amplifier. Under no circumstances must the power module output load be less than 3 ohms.

Amplifier Facilities

One of the special features of this amplifier is the 'tone tremulant' system which produces a tremulant effect similar to that obtained from the rotating loudspeaker systems used in electronic organs (Leslie speakers). The tone tremulant can be varied to any degree but when turned off leaves normal amplitude tremulant as found on most guitar amplifiers. The amplifier can, of course, be used without either of the tremulants.

Two inputs are provided for guitars, i.e., two instruments, bass or treble, can be plugged in and for which independent volume controls are provided. There is also an input for a microphone which may be high or low impedance, depending on whether a microphone transformer is used. The microphone channel has its own volume control and being quite separate from the guitar channels is not affected by the tremulant system. A master volume control is provided for all channels.

The completed Vibrasonic amplifier which utilises two 12in. speakers to handle the output of 50 watts (r.m.s.)

The function of the tremulant system is visually indicated by a front panel lamp which shows the tremulant speed and depth. However, when the tremulant is switched off the tone networks of the tremulant amplifier can still be used as a tone control. There is also a separate treble lift control in the guitar input pre-amplifier which together with the tremulant tone control can provide the very sharp tonal quality favoured by pop guitarists.

There are two optional facilities. One is a foot switch on-off control for the tremulant and the other a foot pedal-controlled wah-wah effect. Foot switch control of the tremulant simply requires an extra jack socket and a foot switch with a press 'on' and press again 'off' function. The wah-wah

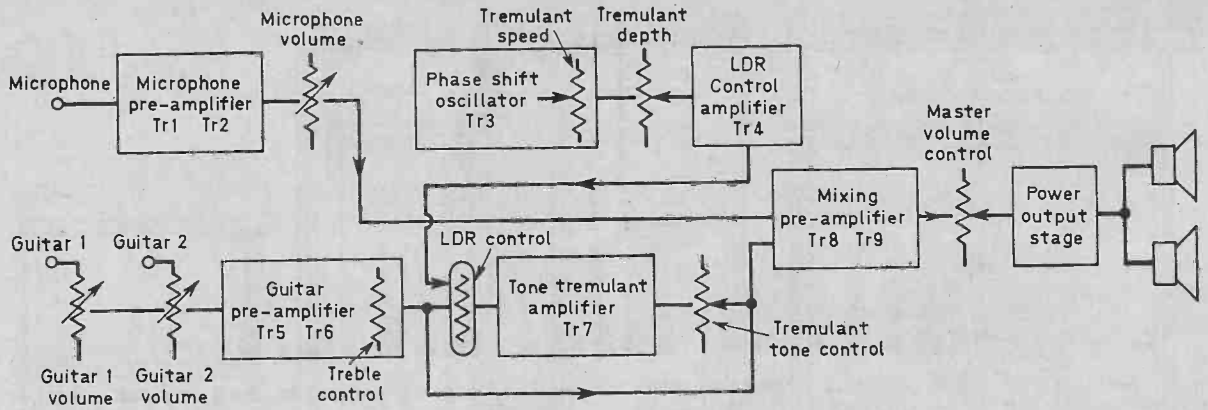


Fig. 1. Block diagram illustrating the function of each stage of the amplifier.

effect can be obtained with a pedal-operated potentiometer which can also be plug and socket connected to the guitar pre-amplifier.

Power Amplifier Module and Power Supply

To facilitate construction for those with little experience in building and testing transistor power amplifiers, modules and regulated power supplies, the new Henelec 50 watt power amplifier module type PA50 and its matching power supply Henelec type MU442 have been chosen for the power output end of the PW25-50.

As previously mentioned the Henelec PA50 module will deliver 50 watts r.m.s. into a 4 ohm load or 25 watts to an 8 ohm load. Hence the reason for the designation PW25-50 and the use of either one or a pair of 8 ohm loudspeakers.

The Henelec PA50 module and its power supply are supplied complete with connecting cables, ready wired to the connectors, DIN loudspeaker plugs, a DIN signal input plug and a 3-pin mains input connector. To mount these units it is only necessary to drill the appropriate fixing holes on the PW25-50 chassis. The Henelec power module and power supply are tested before despatch so that no circuit adjustment whatever is necessary.

Pre-amplifier and Control Circuit

The block diagram in Fig 1 may help to clarify the various functions of the pre-amplifier and tremulant control stages. The two guitar inputs can be mixed, i.e., each can be adjusted for volume independently of the other. The inputs are suitable for all medium to high impedance guitar pick-ups and the sensitivity of each input is 40mV for maximum rated power output.

Signal levels of 1 volt or more can be taken to these inputs and with the tremulant switched off they can be used for signals from other sources such as the output from a portable electronic organ, a tape recorder or high output gramophone pick-up, etc.

The guitar pre-amplifier also has a treble control which provides approximately 15dB lift at 10,000Hz. This has been included as many guitarists favour a tone with a strong upper harmonic content.

New Tremulant System

The signal output from the guitar pre-amplifier is passed to a network which routes the signal via the tremulant l.d.r. (Light Dependent Resistor) to the tone tremulant amplifier and also directly to the input of the mixing pre-amplifier. The l.d.r. is controlled by means of a lamp, the brilliance of which is made to vary sinusoidally.

When the phase shift oscillator is running the amplitude of the guitar signals is varied at the requisite tremulant rate, between 5 and 10Hz as required. The signals that pass through the tone tremulant circuit are modified and the harmonic structure changed by means of the primary inductance of T3 and its RC network. The signals are phased reversed at the primary and therefore appear at the output of the tone tremulant amplifier 'in phase' with signals direct from the guitar pre-amplifier. The result is a complex variation (at tremulant rate) of the higher harmonics produced by the guitar, the aural effect being akin to that obtained with a rotating loudspeaker tremulant system (Leslie speaker).

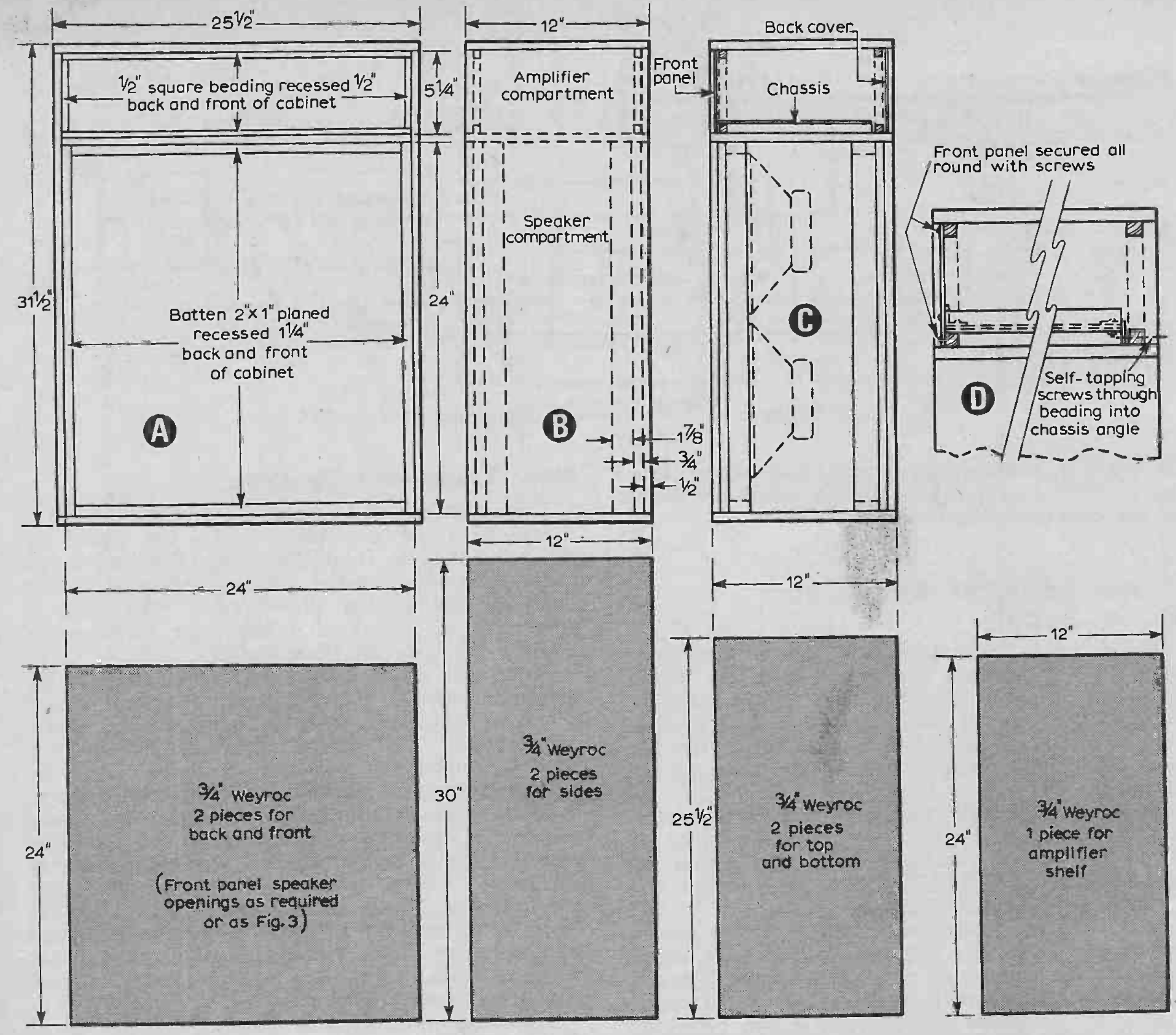
The effect is much more pleasing than the usual straight amplitude variation tremulant used in commercially made amplifiers. The tonal quality of the tremulant is continuously variable and when turned off leaves a normal amplitude tremulant only, the tone of the guitar remaining unaffected.

This too can be switched off but the tone tremulant control can still be used as a tone control for the guitar providing even stronger upper harmonic sounds than those produced by the treble lift control.

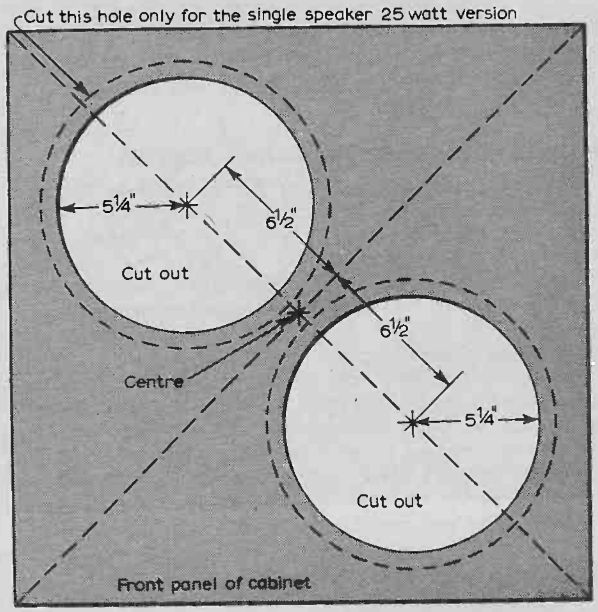
The mixed outputs from the guitar pre-amplifier and the tone tremulant circuit are then taken to the mixing pre-amplifier together with the output from the microphone pre-amplifier. The mixing pre-amplifier output is then connected to the power amplifier module via the master volume control.

Tremulant Control System

The tremulant control circuit consists of a phase shift oscillator with variable frequency control (approximately 5 to 10Hz), the signal from which is used to drive the l.d.r. control amplifier. There are two 6V 0·04A lamps in series with the collector of this transistor, one of which is used to control the



Figs. 2. (above) and 3 (right) give full details for the construction of the cabinet.



l.d.r. and the other as a visual tremulant indicator for the front panel.

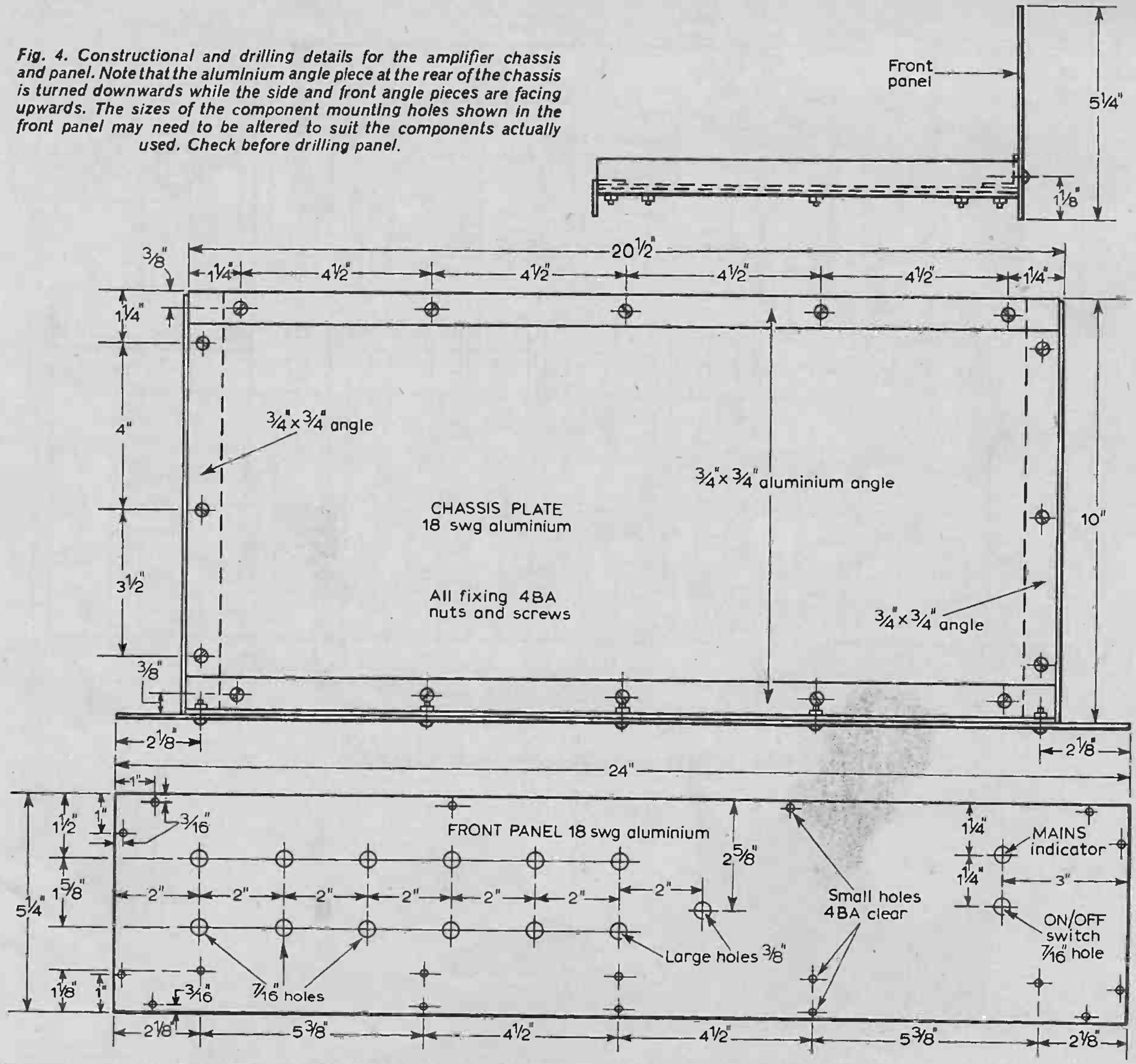
The tremulant depth can be controlled so that a full or light tremulant can be obtained but the system is so arranged that the playing volume does not sharply increase when the tremulant is switched off. The l.d.r. control lamp remains alight when the tremulant is switched off, thus restoring the volume to a mean level. The rise and fall of the tremulant is rather like that of Class A modulation in a transmitter.

The l.d.r. system of control is completely free of the low frequency thump that is common with the usual combination of a phase shift oscillator and signal amplifier. The tremulant variation is perfectly sinusoidal.

Construction (Cabinet)

The cabinet dimensions given in Fig 2 are in accordance with the enclosure space required by the loudspeakers for proper loading and for full

Fig. 4. Constructional and drilling details for the amplifier chassis and panel. Note that the aluminium angle piece at the rear of the chassis is turned downwards while the side and front angle pieces are facing upwards. The sizes of the component mounting holes shown in the front panel may need to be altered to suit the components actually used. Check before drilling panel.



bass response down to about 40Hz. It is made from ¾in. thick Weyroc chipboard with joints strengthened by 2 x 1in. planed battens.

All joints must be screwed as the cabinet is carrying a fair weight when the speakers and amplifiers are installed and because strong joints will prevent cabinet buzz at very low frequencies.

Weyroc is hard to cut but most local timber dealers with a power saw will cut the pieces exactly to size as in Fig. 2. One may then only have to cut the holes for the speaker(s). Fig 2A, B and C give all the cabinet assembly details.

Note the recessed beading around the front and back of the amplifier compartment and the recessed batten around the speaker compartment. It is not absolutely necessary to line the speaker compartment with felt but this may be worth doing to ensure no resonance effects whatsoever from the cabinet. Half-inch thick carpet felt glued around the inside and on the back panel would be sufficient.

The cabinet must have strong carrying handles, one each side, as these will be the only means of carrying it with ease. The base of the cabinet can be fitted with rubber feet or two battens crosswise as can be seen in the photos or with roller castors. The actual finish of the cabinet can be left to the constructor's choice, but the prototype shown on the front cover was covered with plastic material as used for home decorating, the cabinet being finally edged at the front with ¾ x ¾in. aluminium angle fixed with chromed instrument head screws.

The loudspeaker cut-outs are as shown in Fig 3. If the 25 watt version is to be constructed only one speaker will be used but if the second speaker and, therefore, higher output power is anticipated for a later date, then cut one hole for the single speaker in the top left-hand corner as in Fig 3. Otherwise a single speaker may be mounted centrally if desired.

Construction (Amplifier Chassis)

The amplifier chassis occupies most of the area of the amplifier compartment and allows plenty of room for the three circuit boards, the pre-amplifier

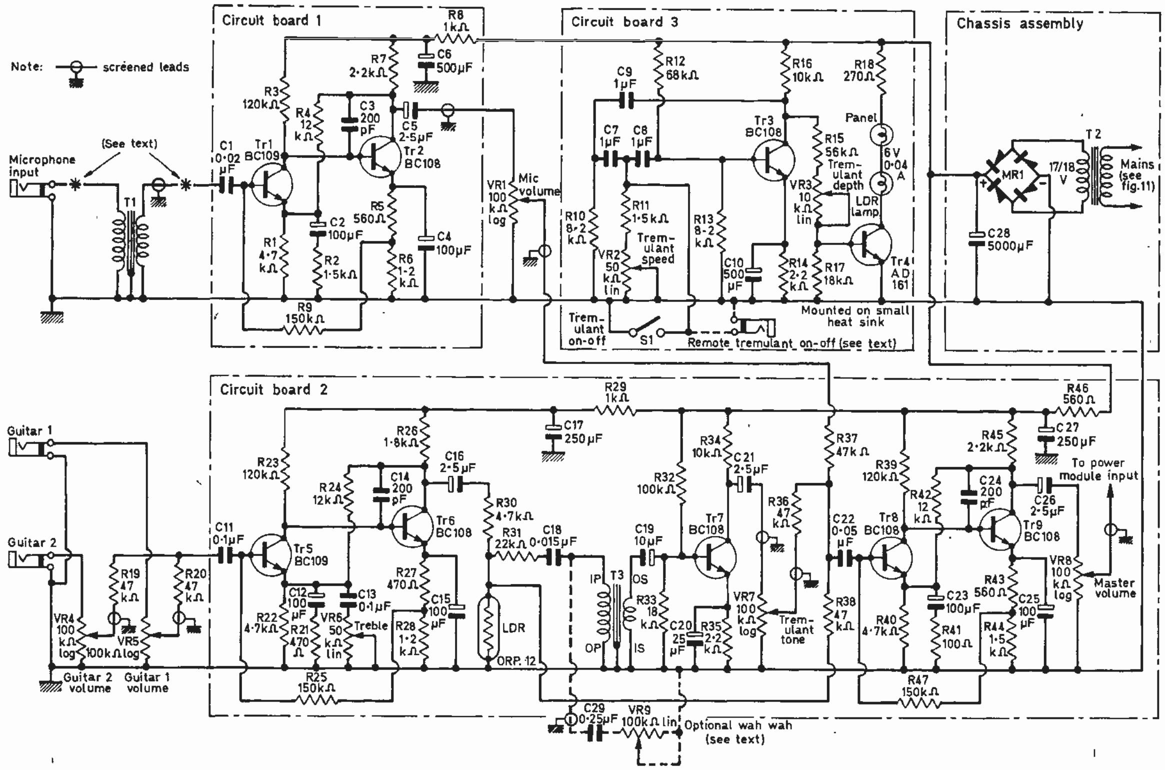
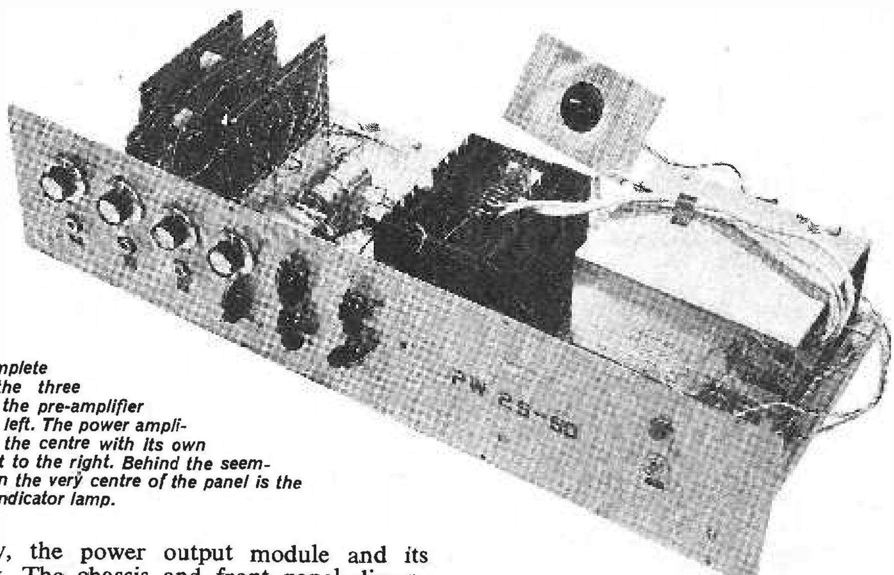


Fig. 5. Circuit of the complete pre-amplifier and its power supply.



View of the complete amplifier with the three circuit boards of the pre-amplifier (see Fig. 5) at the left. The power amplifier module is in the centre with its own power supply unit to the right. Behind the seemingly blank hole in the very centre of the panel is the tremulant visual indicator lamp.

power supply, the power output module and its power supply. The chassis and front panel dimensions with drilling and assembly details are given in Fig 4. Note how the finished chassis fits into and is secured in the amplifier compartment as shown in Fig 2D.

Pre-amplifier Circuit

The full pre-amplifier and tremulant control circuit is shown in Fig 5. This is assembled on three s.r.b.p. circuit boards, the three sections being marked round by the dotted lines. The circuit function has already been explained by means of the block diagram Fig 1, but the following general circuit description may prove useful.

The microphone pre-amplifier Tr1 and Tr2 has a microphone transformer included in the input circuit which should be used if the microphone is low impedance (25 to 30 ohm type). Microphones of 200 ohms impedance can be used without a transformer as also can other microphones with a high impedance output i.e., with a built-in low to high impedance transformer.

—continued on page 354

★ components list

Resistors:

R1	4·7kΩ	R13	8·2kΩ	R25	150kΩ	R37	47kΩ
R2	1·5kΩ	R14	2·2kΩ	R26	1·8kΩ	R38	47kΩ
R3	120kΩ	R15	56kΩ	R27	470Ω	R39	120kΩ
R4	12kΩ	R16	10kΩ	R28	1·2kΩ	R40	4·7kΩ
R5	560Ω	R17	18kΩ	R29	1kΩ	R41	100Ω
R6	1·2kΩ	R18	270Ω	R30	4.7kΩ	R42	12kΩ
R7	2·2kΩ	R19	47kΩ	R31	22kΩ	R43	560Ω
R8	1kΩ	R20	47kΩ	R32	100kΩ	R44	1·5kΩ
R9	150kΩ	R21	470Ω	R33	18kΩ	R45	2·2kΩ
R10	8.2kΩ	R22	4·7kΩ	R34	10kΩ	R46	560Ω
R11	1·5kΩ	R23	120kΩ	R35	2·2kΩ		
R12	68kΩ	R24	12kΩ	R36	47kΩ		

All resistors $\frac{1}{4}$W 10% miniature

VR1 (Microphone Volume)	100kΩ log.
VR2 (Tremulant Speed)	50kΩ linear
VR3 (Tremulant Depth)	10kΩ linear
VR4 (Guitar 1 Volume)	100kΩ log.
VR5 (Guitar 2 Volume)	100kΩ log.
VR6 (Treble Control)	50kΩ linear
VR7 (Tremulant Tone)	100kΩ log.
VR8 (Master Volume)	100kΩ log.
VR9 (Wah-wah Control)	100 kΩ linear

Capacitors:

C1	0·02μF polyester	C11	0·1μF polyester	C21	2·5μF 25VW
C2	100μF 12VW	C12	100μF 12VW	C22	0·05μF polyester
C3	200pF	C13	0·1μF polyester	C23	100μF 12VW
C4	100μF 12VW	C14	200pF	C24	200pF
C5	2·5μF 25VW	C15	100μF 12VW	C25	100μF 12VW
C6	500μF 25VW	C16	2·5μF 25VW	C26	2·5μF 25VW
C7	1μF polyester	C17	250μF 25VW	C27	250μF 25VW
C8	1μF polyester	C18	0·015μF polyester	C28	5000μF 30VW
C9	1μF polyester	C19	10μF 12VW	C29	0·25μF polyester
C10	500μF 12VW	C20	25μF 12VW		

Semi-conductors:

Tr1 BC109	Tr4 AD161	Tr7 BC108
Tr2 BC108	Tr5 BC109	Tr8 BC108
Tr3 BC108	Tr6 BC108	Tr9 BC108
	All Mullard	

Loudspeakers:

50W Amplifier. 2 Goodmans Type 12P-50watt (12in. 8 ohm)
25W Amplifier. 1 Goodmans Type 12P-50watt (12in. 8 ohm)

Power Module and Supply:

Power amplifier module, Henelec Type PA50 (Henrys Radio Ltd)
Mains power unit, Henelec Type MU422 (Henrys Radio Ltd)

Miscellaneous:

Transformer T3 Type CP6713/2 (Henrys Radio Ltd)
Transformer T2 240V/17V Type CT1 (Henrys Radio Ltd)
Light Dependent Resistor LDR (Mullard ORP12). Lamps 6V, 0.04A, (2). Batten lampholder MES.
Dial lampholder MES. Neon panel indicator 240V.
Bridge rectifier MR1, 30V (Henrys Radio Ltd. Type LT 119 or 1H3). Jack sockets (3).
Switch S1, 1 pole 2 way, (Henrys Radio Ltd. Wafer type A)
Switch, 2 pole 2 way, mains toggle.
Plug and socket, 3 pin, mains input (Henrys Radio Ltd. type 373).
Knobs (4), (Henrys Radio Ltd. type NK2)
Knobs (5), (Henrys Radio Ltd. type 7)
Veroboards (3) 7 x 5in., 5 x 4in.; 5 x 4in. plain, 0·1in. matrix. Screened connecting cable.
Mains lead, 3-core cable.

★ materials list

Chassis and Panel:

Aluminium 18 s.w.g. Pieces as in Fig. 4.
Aluminium angle, $\frac{3}{4}$ x $\frac{3}{4}$in. Approx. 6 ft.
Aluminium angle $\frac{3}{8}$ x $\frac{3}{8}$in. Approx 2ft.
Nuts and screws various, 4 BA.

Cabinet:

Weyroc chipboard $\frac{3}{4}$in. Pieces as in Fig. 2.
Planed batten, 2 x 1in. Approx 16ft.
Square beading, $\frac{1}{2}$ x $\frac{1}{2}$in. Approx 10ft
Carrying handles (2). Sundry woodscrews.
Covering material. Felt, $\frac{1}{2}$in. thick if required.

If the microphone transformer is not required (it is not included in the pictorial diagrams to follow later) then simply connect the input jack to C1 as shown at the starred points. Note that the impedance of the microphone input without a transformer is approximately 100kΩ and is not suitable for crystal microphones.

The guitar pre-amplifier Tr4 and Tr5 is similar to the microphone pre-amplifier except that a treble lift control (VR6) has been incorporated which provides approximately 15dB lift at 10,000Hz. The output from the guitar pre-amplifier is divided across R31 and the l.d.r. and routed to the tone tremulant ciricuit input transformer T3 and on to the mixing pre-amplifier Tr8 and Tr9 via R38.

The transformer T3 must be the one specified in the components list and connected exactly as shown. The circuitry drawn in dotted line (C29-VR9) is for the optional wah-wah effect, further details of which will be given later.

The phase shift oscillator Tr3 is quite straightforward but note the optional dotted line circuitry for a foot control tremulant on-off switch which can be connected via a jack socket on the front panel. The tremulant control amplifier Tr4, which is an AD161, must be mounted on a small heat-sink as will be shown in Part 2.

The mixing pre-amplifier Tr8 and Tr9 completes the pre-amplifier section and the output from this is taken via VR8, the master volume control, to the power output module. The pre-amplifier power supply T2, the bridge rectifier MR1 and the smoothing capacitor C28 are mounted directly on the main chassis.

More detailed information concerning the pre-amplifier and tremulant circuitry, its function and performance, will be given in a later article. Next month will deal with the layout of the three circuit boards, the front panel controls and the power module and its supply.

TO BE CONTINUED

"Project Autumn"

ENTRY FORM

Full Name ....

Address ....

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Title of Article ....

....

If my article does not win a prize I should like it

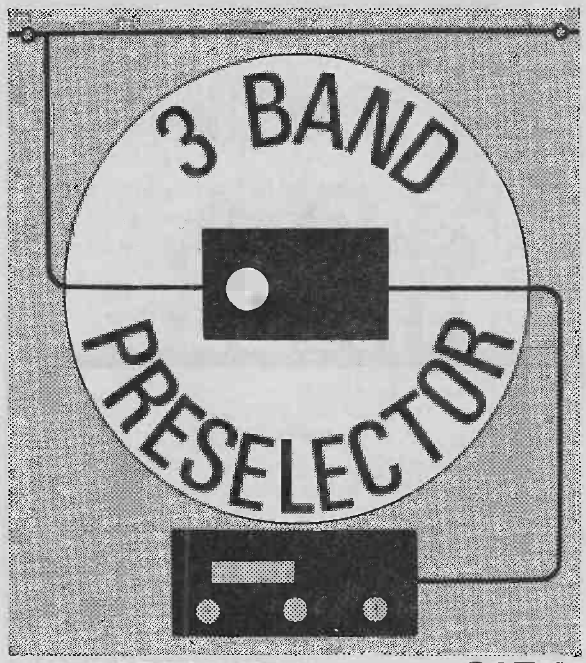
(a) to be considered for publication in the usual way,*

(b) to be returned to me.*

Signature.................................. Date..............

*Delete as required.

Rules on page 390 PA-PW-9



A.S. CARPENTER G3TYJ

THE simple transistorised preselector to be described can be constructed and got working in a single evening. It costs approximately £2 to build and is a worth-while project for listeners who like to search out DX on the h.f. amateur bands.

Some of the communications-type receivers in use function well on the low frequency bands but do tend to become insensitive at higher frequencies of say 21MHz or so. Some operators aware of the problem have gone so far as to replace the older octal-based valves used in some such receivers with more modern types—but not always with complete success!

Some of the more up-to-date receivers too are by no means faultless in this respect; generally speaking the replacement of certain valves with more modern types should be attempted only by experienced persons who have access to reliable test and alignment apparatus; without such test gear results obtained are likely to be problematical.

When first class results are required on the higher frequency bands attention should first be paid to the aerial and its aerial matching unit after which the use of a preselector can be considered, which can make the best possible use of such signals that are available from the aerial system.

CIRCUIT

Reference to Fig.1 shows the final preselector circuit adopted. The components associated with Tr1 confer the required degree of r.f. amplification. Transistor Tr1 operating in common-emitter mode with the necessary tuned circuit L1/VC1 tied to the base element which allows continuous coverage over the frequency range of 13-30MHz. The three principal amateur bands used for DX, 10, 15 and 20 metres, are thus taken care of; in the prototype they appear on the dial pointer at approximately the 10, 1 and 2.30 o'clock positions.

Due to the damping effect of the aerial, preselector tuning tends to be broad and there is thus no need to fit a reduction drive to the peaking control VC1.

Amplified signals appear at the collector of Tr1 and go via capacitor C3 to transistor Tr2 operating as an emitter-follower stage; signals pass via C5 and the screened cable to the receiver aerial socket.

In order that the preselector can be switched off when the user wishes to listen on other bands—say 1·8, 3·5 or 7·0MHz—a combined In/Out/By-pass switch, S1a/b is provided. This disconnects the battery and at the same time allows the aerial to be fed through to the receiver.

The switch can also be used for checking the effectiveness of the unit by comparing receiver 'S' meter readings with the device alternatively 'In' and 'Out'. An increase of at least 2½ 'S' points has been noted on the meter of an Eddystone 888A on the 21MHz band with the signal peaked correctly by means of VC1. This means that the unit is of particular value when copying weak c.w. or a.m. signals.

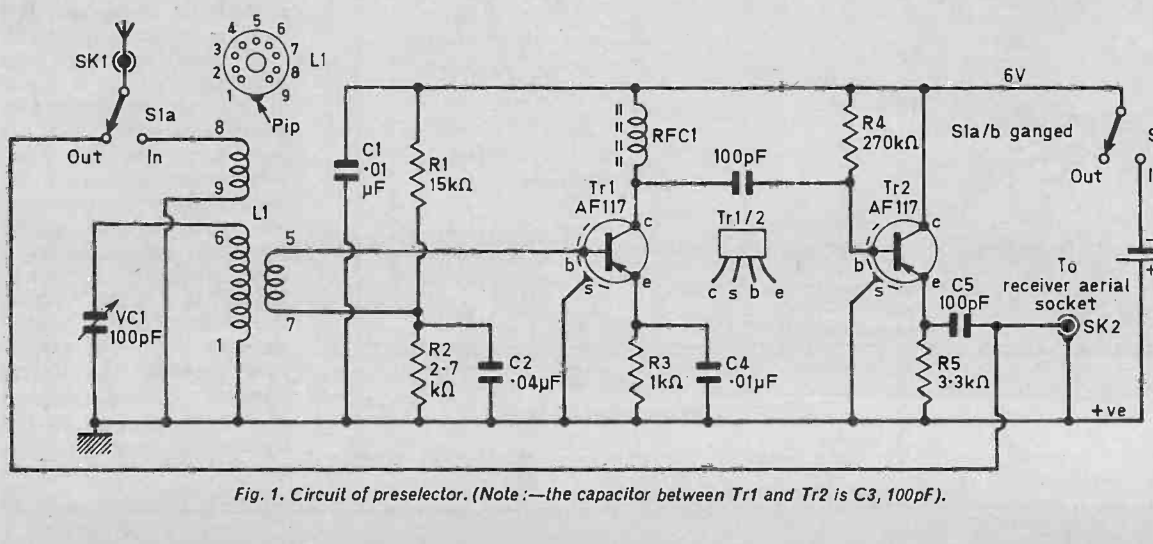


Fig. 1. Circuit of preselector. (Note:—the capacitor between Tr1 and Tr2 is C3, 100pF).

CONSTRUCTION

A 6-in square of 18-s.w.g. aluminium sheet bent centrally into an 'L' shape is used as a combined panel and chassis. As may be seen from the wiring and layout plan of Fig.2 the battery can also be accommodated on the chassis. Two simple 'Lektro-kit' tag strips act as small component anchors; the transistors are soldered in last of all. The coil is fixed to the base-plate in the position shown, its brass-stemmed dust core being removed completely. In connection with the coil, care should be taken when soldering for excessive heat application will cause the polystyrene former to melt.

The length of screened cable to the receiver should be made no longer than required and it should be clamped firmly to the preselector base-plate. It is also necessary to fabricate a small metal bracket to carry the aerial socket SK1. Wiring associated with the slide switch Sla/b is shown inset in the interests of clarity.

TESTING

Initially a test meter set to read 0-10mA may be inserted in series with the battery and S1. When the switch is moved to 'In' a current of approximately 2mA should be noted. Subsequently the test meter is removed and the preselector can be connected to the receiver and aerial with which it is to be used.

With the preselector switch at 'Out' a reasonably steady, but weak, signal should be sought on the receiver on the 14MHz amateur band and the 'S' meter reading noted. If S1 is next moved to its 'In' position the amplifying effect of the preselector will be soon noted as VC1 is tuned to peak the transmission. The preselector can then be similarly tested on the 21 and 28MHz bands and thereafter finalized as required to suit the particular location.

Should it be found that the 21MHz band peaks when the vanes of VC1 are almost fully disengaged it will not be possible to achieve signal peaking on 28MHz; in such cases three turns may be removed from the tuned winding of coil L1. To do this, carefully snip the winding clear where it terminates at pin No. 6, unwind the necessary number of turns slowly, snip off the unwanted wire and re-make the connection to the vacated pin.

Advantages the simple preselector described has over a valved version are a physically small size plus the fact that it is completely independent of any mains connection and is thus safe. On the debit side noise generated by the transistorised preselector tends to be higher than that developed by a good valved specimen. Since to some extent noise-to-signal ratio changes with d.c. potentials supplied the lowest possible battery voltage should be applied to the transistorised unit compatable with adequate amplification. ■

★ components list

Resistors:
R1 15kΩ
R2 2·7kΩ
R3 1kΩ
R4 270kΩ
R5 3·3kΩ
All $\frac{1}{8}$W 10%

Capacitors:
C1 0·01μF ceramic
C2 0.04μF tubular
C3 100pF ceramic
C4 0.01μF ceramic
C5 100pF ceramic
VC1 100pF variable

Semi-conductors:
Tr 1 AF 117 or AF 115
Tr 2 AF 117 or AF 115

Inductors:
L1 Miniature transistor type Denco Range 4 (blue)
RFC 1 Miniature ferrite cored choke 1·5mH.

Miscellaneous:
Miniature switch, 2P 2W slide type K.
6 x 6in aluminium sheet. 6V battery.
Coaxial socket. Tag strips etc.

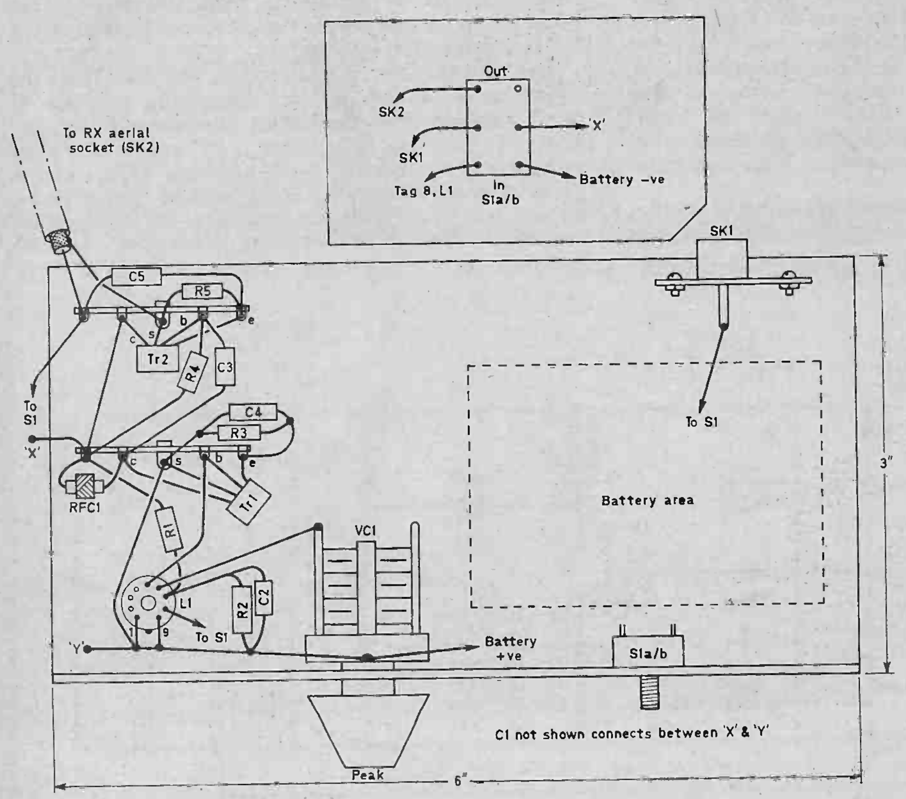


Fig. 2. Layout of the completed pre-selector.

ON THE SHORT WAVES

MONTHLY NEWS FOR DX LISTENERS

Times in GMT • Frequencies in kHz

THE BROADCAST BANDS

Malcolm Connah

THIS month seems to have been a bumper one for Broadcast Bands listeners and I have been swamped with reports and letters.

C. R. S. Stacey of Tunbridge Wells who regularly uses his Lafayette HA-700 and Joystick to send in excellent reports like the following:

5047 *Radio Togo*, Eng. news at 1950
15165 *Syria*, Overseas Service, English, 1930
15300 *NHK*, Japan, Eng. 1800-1815
15435 *DW*, Kigali relay in Amharic 1415
15440 *FEBC*, Philippines in English at 1530.

Glyn Morgan of Tredegar has an impressive line-up of equipment including a Lafayette HA-230, an Eddystone EC10 and a Hallicrafters SX130 and a 50ft. long-wire aerial. This equipment enabled him to send in a report which included:

3232 *R. Brazzaville*, Congo in French at 2205
3376 *CR6RP*, Angola, English music at 2205
4765 *R. TV Congolaise*, French at 2155
4815 *Upper Volta*, talk in French at 2220
4835 *R. Mali*, play in French at 2210
4850 *R. Mauritania* at 2050
4880 *Kinshasa*, Congo, African music at 2245
4885 *Nairobi*, Kenya, pop music at 1845
4905 *R. Relogio*, Brazil, Port. at 2145
4915 *Nairobi*, Kenya often heard at 1900
4926 *R. Ecuatorial*, Guinea, Spanish at 2140
4940 *R. Abidjan*, Ivory Coast, music at 2225
4976 *Kampala*, Uganda, music at 2025
4990 *R. Barquisimeto*, Ven., music at 0745
4995 *R. Brazil Central* with football at 2250
5026 *Kampala*, Uganda in vernacular at 1850
6045 *R. Clube Paranaense*, Brazil, 2300
6055 *R. Panamericana*, Brazil, at 2235
6250 *Santa Isabel*, Guinea, Spanish at 1930.

John Trewick of London Colney has a Perdio six transistor portable receiver with a telescopic antenna and a log which includes:

6145 *Deutsche Welle* to the USA a 0435-0555
7210 *Oslo*, Norway on Sundays at 1200 to 1235
11735 *Rabat*, Morocco with news at 1715
11740 *ABC*, Australia with news at 1700.

John also reports that a new station is *Trans-Europe*, Portugal at 0900-1000 on 9650 and 11720 and at 1345-1415 on 9625 and 11865. The first programme is in English from the Tourist Radio and the second is a relay of Deutsche Welle in English.

Geoffrey Gilham of London S.E.12. is a regular reporter to the column and his log includes:

4835 *R. Mali* with talk in French at 2045
4855 *R. C. Mozambique*, music at 2102
4923 *Radio Quito* with classical music at 0250
4967 *R. Kuwait* with pop music at 2052
6090 *R. Belgrano*, Argentina with talk at 0203
6160 *Emis. Nueva Grenada*, Col. at 0420.

Regular reporter **Roy Patrick** of Derby has sent in some more, very interesting, news items:

FINLAND *Radio Finland* has announced that it intends to drop its DX programme.

IRAQ *Radio Baghdad* has been logged on 9610 at 1930 with a programme in English.

MONACO *Radio Monte Carlo* is now broadcasting twelve hours a day in Italian on 1466 and the shortwave frequencies of 6035 and 7135. The latter frequency provides very good reception.

Philip Batt of Littleborough in Lancashire has a PCR3 receiver and a 60ft. long-wire antenna which enabled him to hear the following stations:

4920 *YVKR*, Caracas, Venezuela, 0600
15060 *Radio Peking* in English at 0930
15140 *Radio Vilnius*, Lithuania, sign-off at 2300
15160 *ABC*, Australia in English to Asia at 0700
15275 *R. Afghanistan* in English at 1800
15370 *R. Tamoio and Tupi*, Rio at 2200
17785 Tentative logging of *Radio New Zealand* with English news at 0700
17855 *Radio Japan* with English news at 0800
21505 *R. Accra*, Ghana in English at 1554.

V. P. Hill of Cwmbran owns a 5-valve domestic superhet. and an 80ft. long-wire and his log included:

9560 *ABC*, Australia in English at 0645
15160 *Voice of Turkey* at 2220
17445 *Radio Havana*, Cuba at 2042
17448 *WINB*, United States of America at 1956
17650 *Trans World Radio*, Bonaire at 2155.

Stephen Wainwright of St. Helens used his Sky-rover Mark II receiver and 100ft. long-wire to hear the following:

9465 *R. Pakistan* in English at 1945-2030
11815 *Bonaire*, Neth. Antilles in English at 0030-0130
15013 *Voice of Vietnam* in English at 2000-2030
17740 *VOA*, Monrovia, Liberia in English at 0800
21690 *Windward Islands Broadcasting Service*, Grenada in English from 1945-2200.

Raymond Peart of Worcestershire used his Spidola transistor receiver and 100ft. long-wire to log:

6145 *Deutsche Welle* in English at 0500-0555
9650 *ABC*, Australia in English at 0645-0915
9770 *Austrian Radio* in German at 0730
9833 *Radio Budapest* in German at 1330
21495 *Radio Portugal* in English at 1345-1430.

Due to the ever increasing number of reporters to this column I will, in the future, only be able to use those reports which contain accurate details of frequency and time and the name of the station.

All reports should arrive at 58 Kensington Gardens, Cranbrook, Ilford, Essex by the 17th of the month.

THE AMATEUR BANDS

David Gibson, G3JDG

LOTS of interesting things happening this last month both on and off the Amateur Bands. For the c.w. versus a.m. versus s.s.b. addicts you've got a nasty shock coming from the professionals. At a recent conference in London a very strong case indeed was put up for double side band diminished carrier. On tests carried out in the field, a 6W d.s.b. transmitter consistently outdistanced a 25W a.m. transmission. The police force are seriously considering using d.s.b. and data transmissions at around 2·4 kilobits/second.

Yet another seminar discussed interference. One point which came out here was that of earthing. It was agreed that any interference problem (and earthing system) was very much an individual thing and that no one simple solution or set of rules existed. Makes you think about t.v.i. and that tiny splinter of copper you call an earth, doesn't it!

Lots of inquisitive ears have been flapping about this month and despite the warm weather many people sent in multiple logs. My thanks to all those owners of hot, swetty little lugs who persisted and perspired. You're doing a grand job slaves.

More mighty magnificence from the majestic **Master Moore.** John, who lives in Leicester bagged GM and GW on topband. On 14MHz, the CR100/2, a.t.u. and 130ft. long wire reported signals from—AX5LC, AXØLD (Macquarie Island), CEØAE, HK4AD, HR1KAS, HR2WTA, KH6BX, YN2EC, YV4YC, 8P6AH.

A quick pilfer round the pertinent portions of 21MHz raised—CN8AH, EL1B, EL2BZ, FØRT/FC/P, JA1EOD, JA2NPC, JA6YSS, TF3BV, VP9BY, VU2OLK, YA1EXZ, YA1GNT, 5H3KA, 5Z4DW, 9E3USA, 9H1BE, 9V1PA. Ten metres a.m. was heard from LU6DRB, and on s.s.b.—HK3AVA, KV4AD, VU2BEO, ZE2JA, ZS6AUD, 5Z4LS.

John is hoping to listen on 432MHz soon when he gets a homebrew converter perking and takes delivery of a 14-element skybeam. (Cor, think of the pleasure all those little prongs will give the birds.)

Roger Boyd is located in Victoria Park, Western Australia and has the distinction of sending the most DX log received this month. The rig is a Trio 9R-59DE and choice of 20 metre dipole or a 25ft. vertical. His log for 7MHz reads—DJØJE, DK1CU, DL6WE, DL8MM, EA4KY, G3VYF/P, HB9ADQ, I1BAF, JA2VGQ, JA8TL, OZ5MV, PY7BPD, SP6DVB, UA1IG, UY5YS, YT1BCD. So, if the path from Europe to Australia is open, why don't more of us hear VK/AX stations on forty? Perhaps it's still the operator that counts and not so much the equipment.

Malcolm Monro (Cumberland) writes a sad tale of holding a G8 licence but the transistor transmitter won't work. Two metre fans will be pleased to hear of the latest Fairchild transistor, the MSA8506 which gives 25 watts at 175MHz from a 12V line. Twist in the tail is the price, which is around the £15 mark. However, the MSA8507 gives 8W for the same parameters and costs around £6. With luck the price should drop as production quantities build up. These devices will, however, withstand any non-oscillatory load from an open to a short circuit at full rated power.

Back to logland again. **Andy Crooks** (Leicester) RA1, PR30 and 45ft. end fed prowled 21MHz to find sigs from—CP5PD, CR6BF, CR6FP, EL2L, EP2BQ, HP1RC, JA1DJL, JA2QUQ, JA3QKU, JA4DGG, JA8BMK, JH1ECU, LJ2L (special prefix for Norwegian schools), LU2CF, LU4DM, OD5BZ, PY2CRN, PY5ATL, PY7GAH, TG9GF, VE7DG, VP2VI, VQ9RK (Seychelles), W5DL, W5GC, W7RI, ZP5GS, ZS3HX, 3V8AL, 5Z4CK, 9J2PV, 9Q5WV. All these using s.s.b.

D. Browning (Herts), CR7OA, PR3OX, 37ft. of bent wire in the loft shows what's been about on 3·5MHz. Heiroglyphics scribed in his log read—AX6HD, CT1BH, CT1GD, CT2AK, DL5YA/MM, FØRT/FC, PY1HA, 4U1ITU, 9H1K, 9H1CC, 9V1PP.

On 14MHz, Douglas bagged—AXOLD, CN8HL, CN8MJ, HV3SJ, HK4AD, KL7BJW, LU5NA, OJØDX (Market Reef), OA4UY, TR8MC, XE1AE, XE1TX, YN2OM, YV5CQM, 3V8AV, 6W8BD, 7X2AL, 9X5AA. Listening on 21MHz, Douglas had the distinction of hearing King Hussein of Jordan, callsign JY1.

N. Richardson (Bucks.) sent in a 144MHz log obtained using earholes backed by a Garex converter into a PR30 and CR7OA tuning 28-30MHz. The antenna is an eight-element Yagi at 28ft. Signals received from—EI2AX/P, G3JQA/P, G8BCL, G8BEU, G8BMC, G8CAF, G8CIL, G8CSJ, G8CVK/P, GW3GIZ/P, GW3SRT/P, GW8ACG/P, GW8BIP, GD2HDZ (Isle of Man). Nicholas will have a rotator on the Yagi by the time you read this which will put the antenna clear of the chimney and roof.

G3QG is located at Luton Hoo and is active on 144·68MHz. Bill would appreciate any DX reports on his signals and will QSL for worthwhile details of his signals. How about it all you 2 metre sleuths?

A reminder to listen for **GB3WRA** operating 160-10 from the 24th. Annual Wycombe Show on Saturday, September 6th. If you can get along, visitors, s.w.ls and licensed amateurs will be welcome. Perhaps a chance to go mobile?

Another one to listen for is G2DRT who will be operating as **EI2VCL** from September 5th. to 22nd. from Fenit County Kerry. Operation will be on 2 metres.

Happenings in August include: August 9th., D/F qualifying even at Chelmsford; 10th., 2 metre s.s.b. contest; 15th. and 16th., 4 metre c.w. contest; September 5th. and 6th., v.h.f. NFD.

Mobile Rallies: August 9th., Woburn Abbey; 9th., Stratford upon Avon Mobile Picnic; 16th., Torbay A.R.S. rally at Newton Abbot; 16th., Mobile Rally at Derby; 23rd., Wroughton Aerodrome near Swindon.

27MHz FIELD STRENGTH METER

RICHARD COLLINS

IN radio control work, it is often useful to use a field strength meter; it should not be regarded as a superfluous piece of equipment. It is a very simple circuit (see Fig. 1), easy to build and provides a very convenient way of checking that a transmitter is working correctly. Also, the field strength meter is handy for comparing the output power of different transmitters.

THE CIRCUIT

Refering to Fig. 1, L1 and VC1 comprise the tuned circuit. The aerial, which should be a small telescopic type, connects to one side of the tuned circuit. The signal is tapped off from the tuned circuit, rectified by D1 and smoothed by C1. The voltage appearing across C1 will, for most applications, be enough to give a decent reading on a meter placed across it, but for further sensitivity this voltage is made to bias the base of Tr1; where this is done the meter is of course not required across C1.

VR1, R1, R2 and Tr1 form a bridge circuit and before taking any readings should be adjusted for zero current. The r.f. signal after being rectified will bias the transistor causing the bridge to unbalance and the meter will show a reading. It will quickly be seen that the higher the r.f. signal, the greater will be the unbalance of the circuit and so

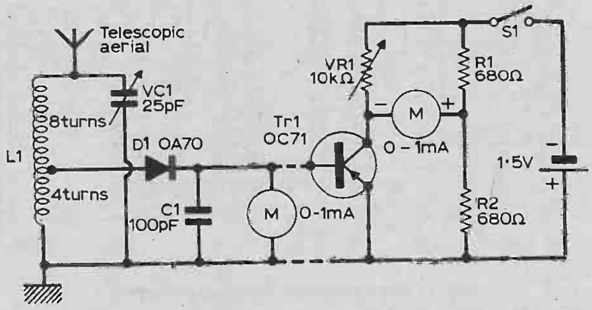


Fig. 1: The circuit of the field strength meter. Components to the right of the dotted line are only needed where the extra sensitivity version is required and here the meter is across the bridge circuit.

the reading on the meter will bear a direct relationship to the strength of the signal received at the tuned circuit.

The on/off switch is incorporated with VR1 but care should be taken to ensure that it is wired as shown. The battery used is a 1·5V pencell.

CONSTRUCTION

The only component to be constructed is L1, the coil. This is wound on ¼in. dowelling or anything of similar diameter, which may be later removed. Starting at one end of the former, using 16s.w.g. enamelled wire, (leaving about 2½in. spare) wind on 8 turns, close wound. A small portion of the wire should then be bared of enamel so that a tapping can be soldered on later. Another 4 turns are now wound making a 12 turn coil tapped at 8 turns. The coil can then be slipped off the former and stretched to a length of 1¼in.

Although the wiring is simple (Fig. 2.), it should be carried out with care. Every wire should be as straight as possible. Stiff wire is best as it is less likely to vibrate and cause slight variations in meter readings.

The unit may be housed in a small box measuring about 2½ x 3 x 6in. and the 25pF capacitor should preferably be of the ceramic base type with silver-plated plates.

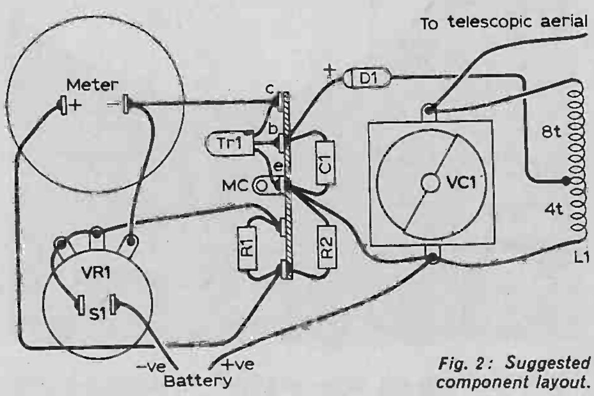


Fig. 2: Suggested component layout.

★ components list

VC1	25pF—see text
C1	100pF
D1	OA70
L1	see text
M1	0-1mA moving coil meter
Tr1	OC71
VR1	10kΩ pot with switch
R1	680Ω
R2	680Ω
B1	1·5V battery

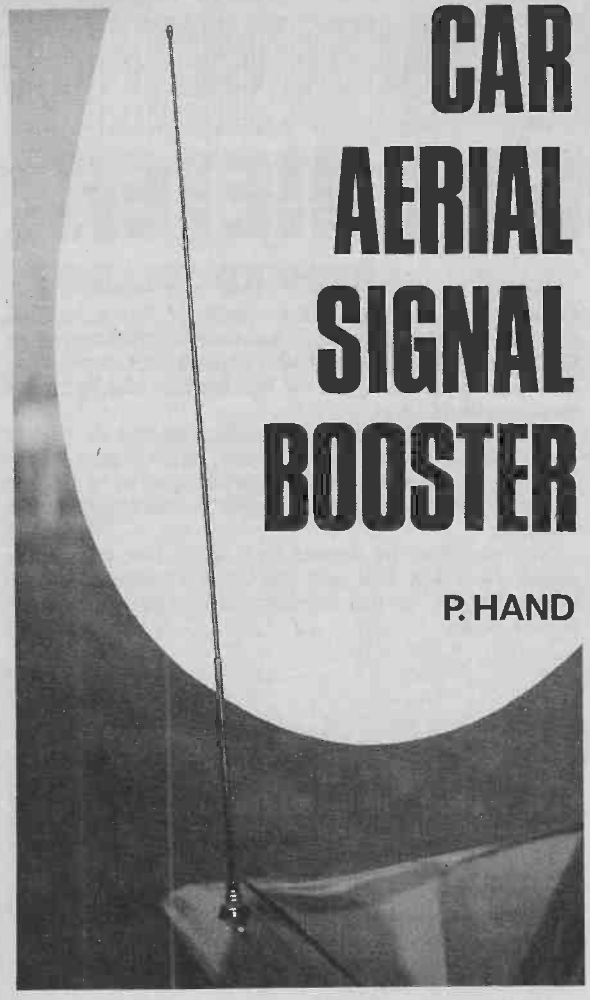
Five way tag strip, case, telescopic aerial, 16 s.w.g. enamelled copper wire.

CALIBRATING AND TESTING

To test the unit, it should be held with its aerial about 18in. from the transmitter aerial. The field strength meter tuning control should then be turned slowly until a reading appears on the meter. It is advisable to get the field strength meter calibrated approximately and the easiest way of doing this is to use a signal generator, the earth of which should be connected to the positive rail. The output lead from

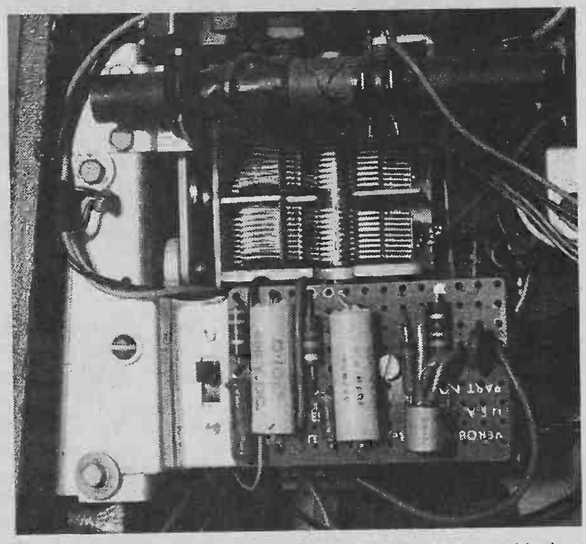
continued on page 365

CAR AERIAL SIGNAL BOOSTER



P. HAND

THE need for this amplifier became apparent because of the reduction in signal strength when operating a portable radio in a car. Listening was made practically impossible, particularly to B.B.C. Radio 2. Although the set has a socket for a car aerial which is connected to a loop winding on the ferrite rod and a proper wing mounted car aerial was used. A large amount of interference was picked up even though the sparking plug leads were suppressed, the car generator output terminal had a 1μF capacitor to chassis and the coil switch terminal a 1μF capacitor to chassis. This was due to the small signal producing practically no a.g.c. voltage, therefore the sensitivity of the set was maximum, making the set acutely responsive to electrical interference. The addition of this small r.f. amplifier made a vast improvement. The increased signal input to the ferrite rod pushes the set hard into a.g.c., cutting out the interference and making listening a pleasure once more.



The signal booster may be mounted inside the existing cabinet as shown.

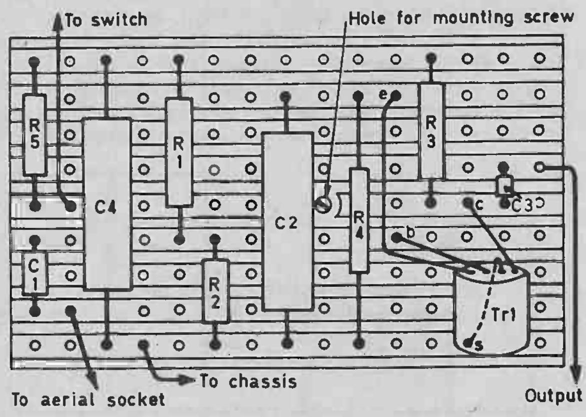


Fig. 2: The component layout on Veroboard.

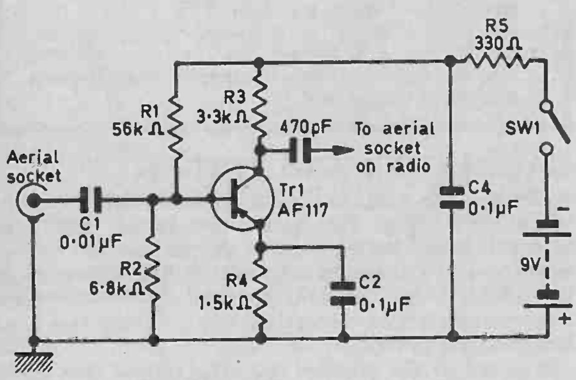


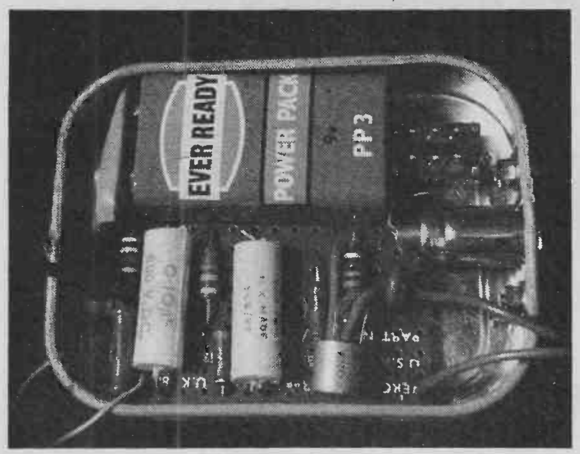
Fig. 1: The circuit of the signal booster.

CIRCUIT DETAILS

The circuit uses an AF117 transistor in the common emitter mode. The base bias is set by the negative voltage at the junction of R1 and R2 and by the voltage across the emitter resistor R4. C2, the emitter by-pass capacitor is to prevent the emitter resistor affecting the signal. The signal is applied to the base via C1, R3 is the collector load and the output is taken from C3. The total current drain from the nine volt battery is under 1mA.

All the components except the switch are mounted on a piece of Veroboard $2\frac{5}{16}$ x $1\frac{3}{8}$ ins. Only one break in the Veroboard is required, the hole for mounting is also drilled at this point. Component layout is shown in Fig. 2.

Two methods of housing the amplifier are possible. The authors method was to mount the amplifier inside the case of the radio with which it is going to be used. A small bracket was made on which a double pole switch is mounted, together with the amplifier. A thin piece of insulating material is put behind the Veroboard to insulate it from the



Alternative method of using the signal booster is to build it into a tin as shown above.

bracket. This method of housing can be used when there is sufficient space.

The second method, should it prove impossible to find sufficient space, is to build the amplifier into a small case as shown in the photograph with its own battery. A short length of co-axial cable is used to connect the amplifier to the radio via the aerial socket. ■

27MHz FIELD STRENGTH METER

—continued from page 363

the generator should then be held near the field strength meter aerial. The signal generator should then be set to 27MHz and the field strength meter control VC1 tuned slowly for the maximum meter reading.

The dial reading on the field strength meter should then be noted and marked. This operation should then be repeated with spot frequencies each side of 27MHz until the full coverage has been calibrated. It should be stressed that the coil should not be bent or touched at all after calibration as this will certainly alter the readings.

USING THE INSTRUMENT

When used to check a transmitter, the field strength meter should be held about 18in. from the transmitter and adjusted for maximum meter reading. The dial setting can be compared with that obtained during calibration and this will indicate the transmitter's approximate frequency. ■

THE MW COLUMN

AUGUST marks the end of the summer season on the medium waves, the effect of the longer hours of darkness being apparent, even at the beginning of the month. North American stations are usually audible as early as 0030 hrs GMT. Canadians appearing first. Look for CBN 640kHz St. John's Newfoundland; CBH 860 Halifax Nova Scotia; CJON 930 St. John's; CHER 950 Sydney N.S.; CHNS 960 Halifax; CKBW 1000 Bridgewater N.S.; CBA 1070 Moncton New Brunswick; CKEC 1320 New Glasgow N.S. Stations from the East Coast of the United States appear a little later, the more prominent being WNBC 660kHz, WOR 710, WABC 770, WCBS 880, WINS 1010 all in New York City; WHDH 850 in Boston; WBAL 1090 Baltimore; WCAU 1210 Philadelphia; WKBW 1520 Buffalo N.Y. By 0230 hrs stations further inland may be heard:— WJR 760kHz 'The Great Voice of the Great Lakes' in Detroit; WBBM 780, WLS 890, WCFL 1000, in Chicago; WHO Des Moines Iowa on 1040; KMOX 1120 *'The Voice of St. Louis'*; WOAI 1200 San Antonio Texas. By the end of the month reception of the West Coast becomes possible from 0400 hrs GMT until sunrise. This is a favourable time of year for the West Coast since European QRM is light just before dawn while locals have not yet signed on. Last year the following stations were logged during the first week in September; KOMO 1000kHz and KING 1090kHz both in Seattle; KNX 1070 Los Angeles, KFBK 1530 Sacramento California. Others that might be heard are KSL 1160 in Salt Lake City Utah and KEX 1190 in Portland Oregon.

The recent interest in Vintage Radio brings to mind that early broadcast receivers operated mainly on the medium and long waves. Many of them could pull-in DX from North America, for in the mid-twenties it was not unusual to read of reception of stations such as 'WGY Schenectady N.Y. on 380 metres' by DXers using straight receivers and indoor aerials. The state of the MW band was more favourable for DX then, as there was little QRM while transmitters used flat-topped aerials which radiate lots of sky wave. Vintage receivers would hardly be successful on the medium waves today (though it would be intriguing to try one out), but many of the early stations are still broadcasting and are often logged by the DXer. WGY is currently on 810kHz; it was heard by the writer as recently as the 13th of June this year. Older DXers may care to look for CBO 910kHz in Ottawa; CBM 940 Montreal; KDKA 1020 Pittsburg; WBZ 1030 Boston; WBT 1110 Charlotte North Carolina; WHAM 1180 Rochester N.Y. A few old-timers have changed callsign. WEAF New York City is still on 660kHz (454m) but is now called WNBC. WLWL Cincinatti, which once had a power of 500kW is now WLW 700kHz with a modest 50 kW. It is interesting to note that a new 50kW transmitter installed at WOR New York City (710kHz) during 1968 replaced one which had been in service continuously since 1922.

CHARLES MOLLOY

checking surplus crystals

ARTHUR DOW

ALTHOUGH surplus crystals are readily available, cheaply and in large quantities, many of them are not marked with their frequencies or at best are marked with a code or 'channel' number.

While it is possible to get information to decode these numbers it is far simpler in the long run to make a direct check on the crystal to determine its fundamental frequency.

In some cases the frequency indicated on the crystal holder is an operating harmonic frequency and not the fundamental. So once again the necessity arises to find the fundamental by direct means.

It is possible to build a simple transistorised oscillator using the Pierce circuit so that just about any crystal plugged into it will oscillate.

But to determine the fundamental frequency of this crystal with a receiver can lead to false answers because of the several spurious signals that can be generated due to the beating together of oscillators in the receiver and the fundamental and harmonics of the crystal under test.

Fortunately there is a simple way by which the fundamental frequency of any crystal can be found quite accurately before a final precise measurement is made.

Conventional use of GDO

All that is required is a Grid-dip Oscillator or g.d.o. This will normally have plug-in coils and a roughly calibrated scale for each range. It should be stressed that this calibration is really quite rough since the coil is subject to outside influences that can seriously affect the frequency at which the g.d.o. will oscillate.

In normal use the g.d.o. is loosely coupled to the tuned circuit being investigated and then tuned until grid current shown on its meter suddenly dips. Fig. 1.

The g.d.o. is then moved away from the tuned circuit to reduce the coupling until a good clean sharp dip is obtained on the meter. The g.d.o. should, if possible, be placed with respect to the tuned circuit, so that it does not have to be held in the hand.

It is at this point that the signal from the g.d.o. can be picked up by a nearby receiver and its frequency determined. This is only an approximate answer since the frequency of the g.d.o. is being measured and not that of the tuned circuit itself.

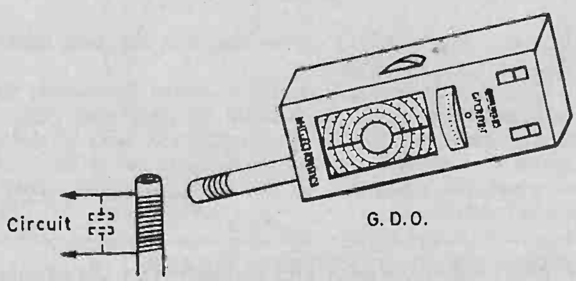


Fig. 1: Conventional use of a g.d.o. to investigate the resonant frequency of a tuned circuit.

It is no use getting a dip on a hand-held g.d.o. and then taking the g.d.o. across the room to a receiver and expecting the frequency to remain constant.

Checking Crystals

When the g.d.o. is used to check the fundamental frequency of a crystal a slightly different technique is used. A few turns of wire are wound on a former which is slightly larger in internal diameter than the g.d.o. coils. The ends of the coil are connected to a suitable holder for the crystal, Fig. 2, but if it is

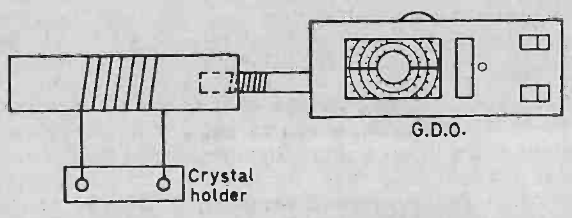


Fig. 2. Using a g.d.o. to "excite" a crystal at its fundamental frequency.

expected that a large number of crystals having different size pins and spacings are to be checked it is suggested that a permanent board be made up with a number of different holders, all connected in parallel.

The lowest frequency range of the g.d.o. is chosen to begin with and its coil inserted into the crystal coil. Tuning from the low end to the high end of the range very slowly a dip will occur as soon as the g.d.o. passes the frequency of the crystal. At this point the crystal is absorbing power from the g.d.o. and it should begin to oscillate at its own natural frequency provided that the coupling between the coils is sufficient.

When the g.d.o. is used to check a conventional tuned circuit the dip in grid current takes the form shown in Fig. 3(a) but when it is used to check a crystal the form changes to that of Fig. 3(b). This is because the g.d.o. frequency becomes locked to that of the crystal once the crystal is oscillating and the tuning of the g.d.o. is ineffective over a small range and its frequency is precisely that of the crystal.

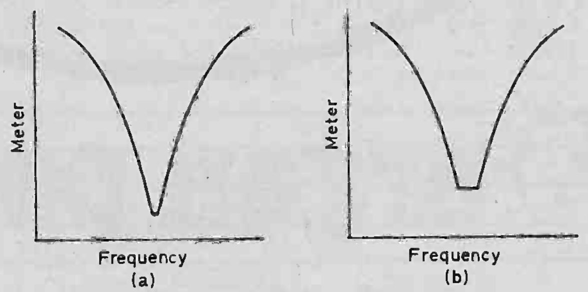


Fig. 3. (a) Grid current of g.d.o. when used conventionally as in Fig. 1. (b) grid current when used to "excite" crystal.

The g.d.o. frequency and hence that of the crystal can now be measured on a receiver in the conventional manner. Depending on the degree of accuracy of measurement required the calibration of the receiver should be cross checked against a standard crystal calibrator with 1MHz, 100kHz, 10kHz and possibly 1kHz check points.

It should be remembered that in practice the precise operating frequency of the crystal will depend upon the type of circuit in which it is used. If it is necessary to order a crystal for a specific frequency from a manufacturer the type of circuit to be employed should be stated.

Notes

The 'locking' effect, mentioned above, between the g.d.o. and the crystal is very marked but if it is not obtained during the initial tests the coupling between the coils should be increased by sliding the g.d.o. coil further into the crystal coil.

It is important to begin with the g.d.o. on its lowest frequency range, probably about 1·5-4MHz, so that the crystal will oscillate initially on its fundamental frequency rather than on an overtone mode. If it should work on such a mode further confusion will arise if an attempt is made to measure the crystal frequency because of the fact that overtone frequencies are not integral multiples of the fundamental frequency. On, say, the fifth overtone the measured frequency may be several kilohertz different from the fundamental frequency multiplied five times.

Alternative method

If a g.d.o. is not available a signal generator or a frequency meter may be used using the set-up shown in Fig. 4. The voltmeter should have a high resistance of about 10,000Ω/volt or a general purpose meter may be used on a low voltage range. A valve voltmeter will be more sensitive and should be used in preference to a conventional test meter.

The procedure is to tune the signal generator from its lowest frequency, about 1MHz, upwards until a deflection is noted on the meter. In this case the peak indication is the point at which the crystal is resonant with the applied signal.

If the calibration of the signal generator is not to be relied upon then an external receiver can be used to measure the frequency as before. The author has found in practice that much too much faith is placed on the calibration of signal generators which do not have their own internal calibration facilities.

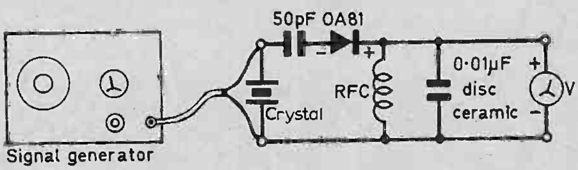


Fig. 4. Use of a signal generator instead of a g.d.o. to determine frequency of crystal.

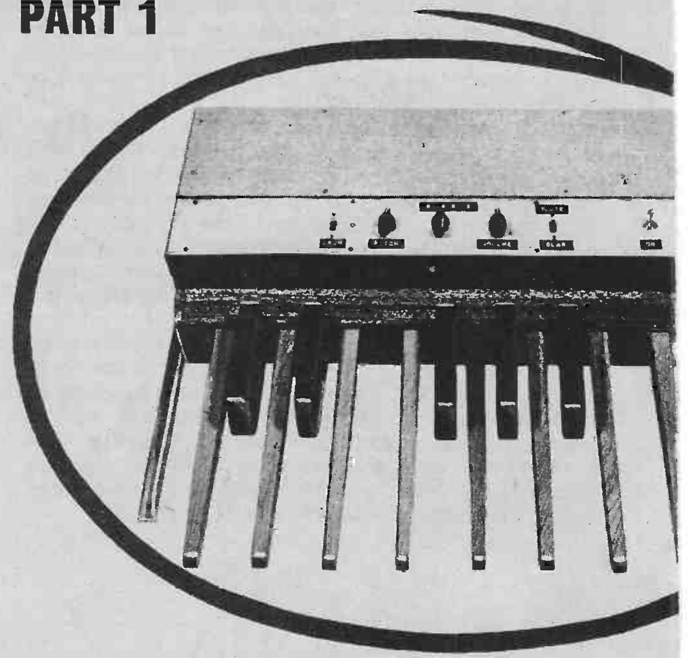
If the output of the signal generator has a calibrated attenuator the 'goodness' of the various crystals can be estimated by keeping the input voltage to the crystals constant and noting the relative deflection on the meter when the signal generator is tuned to the frequency of the crystal under test.

Once the fundamental frequency of a crystal has been found its performance in the overtone mode can be judged by applying signal voltages from the g.d.o. or the signal generator at the third, fifth or higher harmonics. The dip shown on the g.d.o. will be less than that obtained on the fundamental of the crystal and in the same way the output indication using a signal generator will be less, as the order of the harmonic is increased.

Crystals designed especially for operation on the overtone mode will naturally perform better in this test than those that are not, but after testing a number of crystals the good and the bad will be obvious. ■

see page 390

PART 1



organ ped

THIS is a self contained 13 note (single octave) organ pedal bass unit that can be used with any portable or domestic electronic organ having no bass note pedals of its own. It can be tuned to pitch without having to alter the tuning of the individual notes i.e., the pitch of the whole octave can be raised or lowered by approximately one full note.

It features a drum brush accompaniment that sounds each time a pedal is pressed regardless of whether the pedal is pressed and released quickly for a bass note of short duration, or the pedal held down to sustain the bass note. The drum brush sound begins with an attack and decays of its own accord.

The output signal level is sufficient for any external amplifier requiring not more than 1 volt r.m.s. signal input.

The pitch available is 16ft. or 8ft., or 16 and 8ft. combined. The 16ft. octave is C to C (32 to 65Hz approx) and the 8ft C to C (65 to 130Hz approx). These two pitches are combined in equal proportions of amplitude when the 16+8ft. pitch is used. The voicing is flute or clarinet which is fairly conventional for domestic electronic organs.

Circuit

The block diagram (Fig.1) shows the general circuit arrangement which employs a total of nine OC71 transistors. The consumption is quite low so that operation from a PP9 (9V) battery is economical. There is little point, therefore, in making the

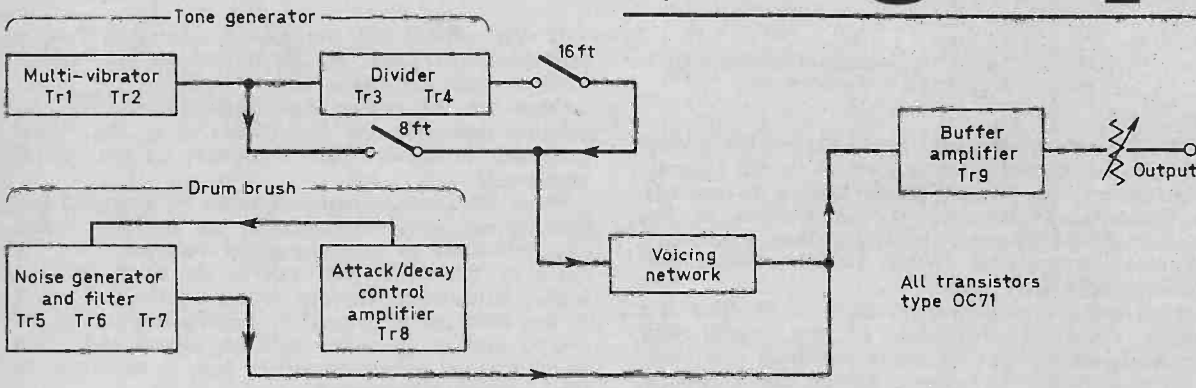
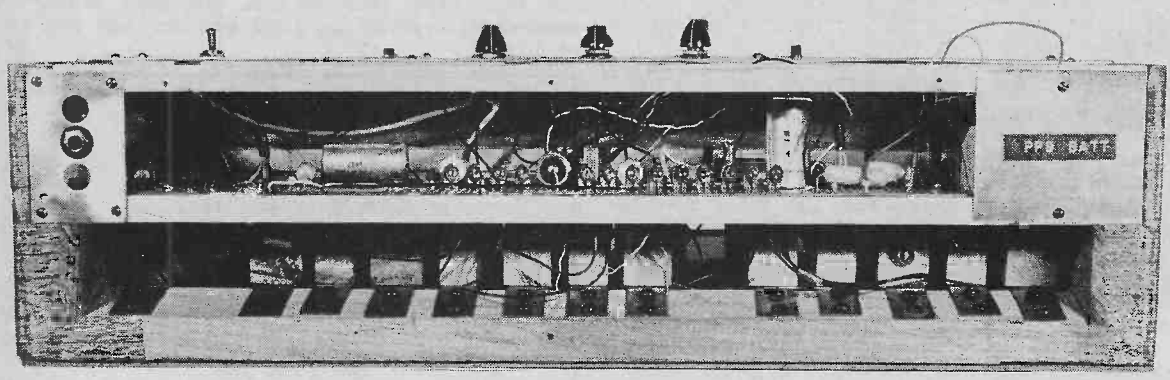
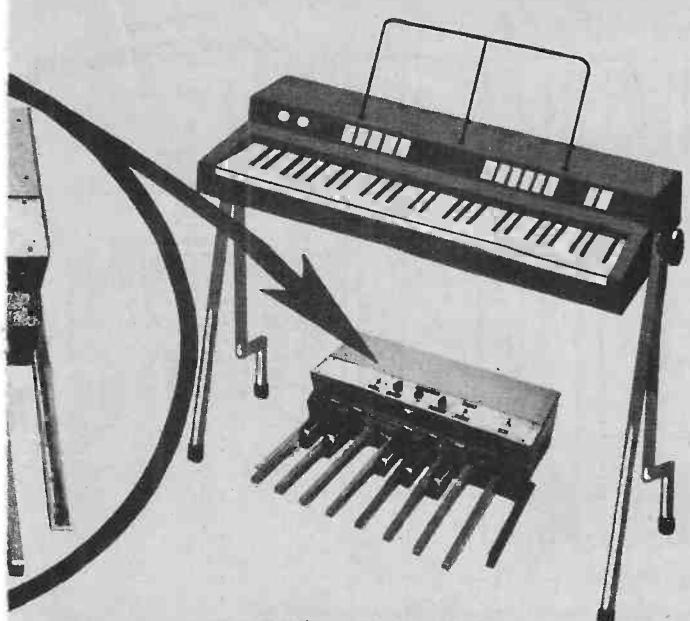


Fig. 1: Diagram showing the function of each stage of the Pedal Bass unit.



Rear view of unit shows, above, the circuit boards with the battery compartment to the right, and, below, the spring mounting of the pedals.



A. LESTER-RANDS

al bass unit

unit mains powered but there is no reason why this should not be done.

The main note generator is a multi-vibrator the output of which provides the 8ft. pitch notes. The pitch for 16ft. is obtained from a divider driven from the multi-vibrator. Then follows the voicing circuitry, the output of which is taken through a buffer amplifier and via a volume control to the output socket. The maximum signal level available at the output is approximately 1V r.m.s.

The drum brush circuit consists of a three stage white noise generator and filter, the output being controlled by a special attack-decay circuit (control amplifier). The drum brush signal is then attenuated to balance with the pedal bass output and passed to the buffer amplifier.

Pedal Frame and Case

The basic pedal frame complete with the thirteen pedals mounted and sprung can be obtained ready-made from Henrys Radio Limited (see materials list). The frame has a plywood top cover which is not required as a case to house the circuit boards and battery etc. has to be built up onto the frame itself. This top cover is $\frac{3}{8}$in. plywood and can be used for making the end pieces of the case.

Those who wish to make the pedal frame and pedals will find the dimensions etc., in the various diagrams. The main frame is shown in Fig.2 (A and B) and made from soft planed wood. Note that the rear member of the frame (the pedal support rail) is bevelled to the dimensions given in Fig.2B. The front main member of the pedal frame is fitted with guide posts for the pedals as shown in Fig.3. These posts are made from $\frac{5}{16}$in. diameter dowel and are glued in so that they just clear the upper pedal stop rail (see inset Fig.3).

Next, the pedals themselves should be made and checked for fitting within the frame but not secured until the case frame work has been completed. Details of the pedals (8 white and 5 black) are given in Fig.4. Note the soft leather or plastic binder around each pedal, a couple of turns of adhesive plastic insulating tape will do, and also the small hardboard pads which press on the keying contacts.

Each pedal is secured to the rear member of the main frame by means of a flat phosphor bronze spring, details of which are given in Fig.5. *Do not bend these strips*, they will bend themselves (Fig.6) when the pedals are finally fitted, and the springs secured to the rear pedal support rail.

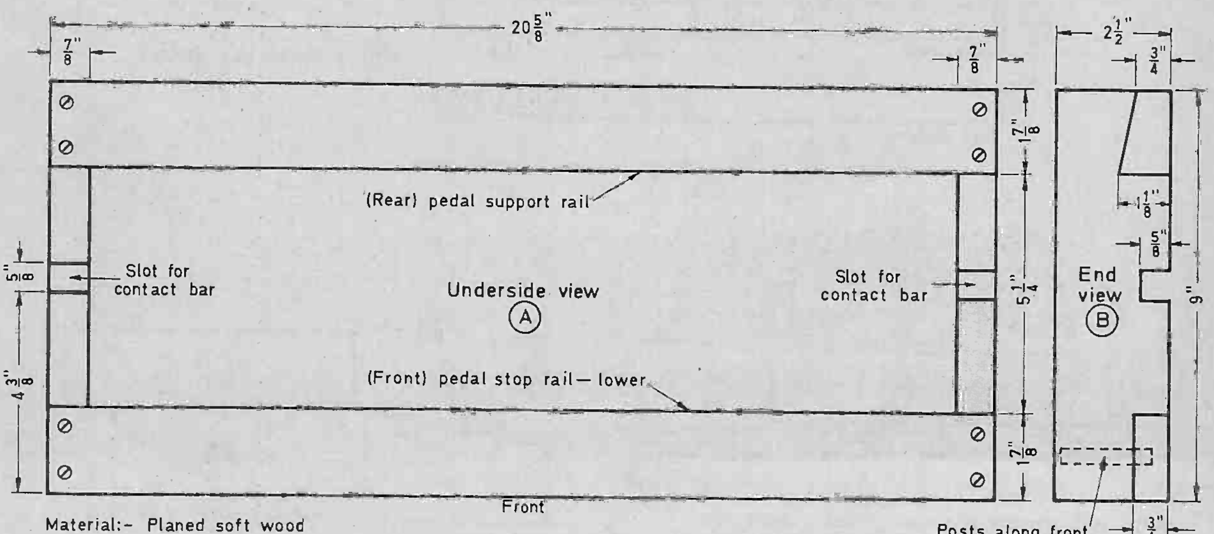


Fig. 2: Constructional details of the wooden pedal frame of the unit.

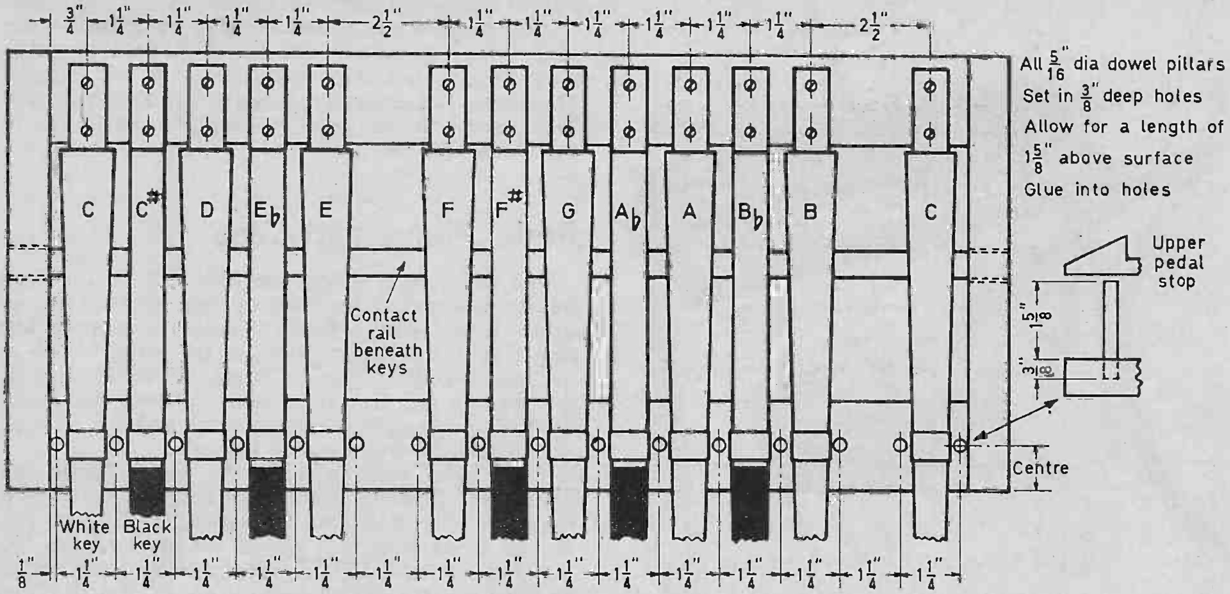


Fig. 3: Positioning of the pedals on the frame. Compare with the heading photograph of the completed unit.

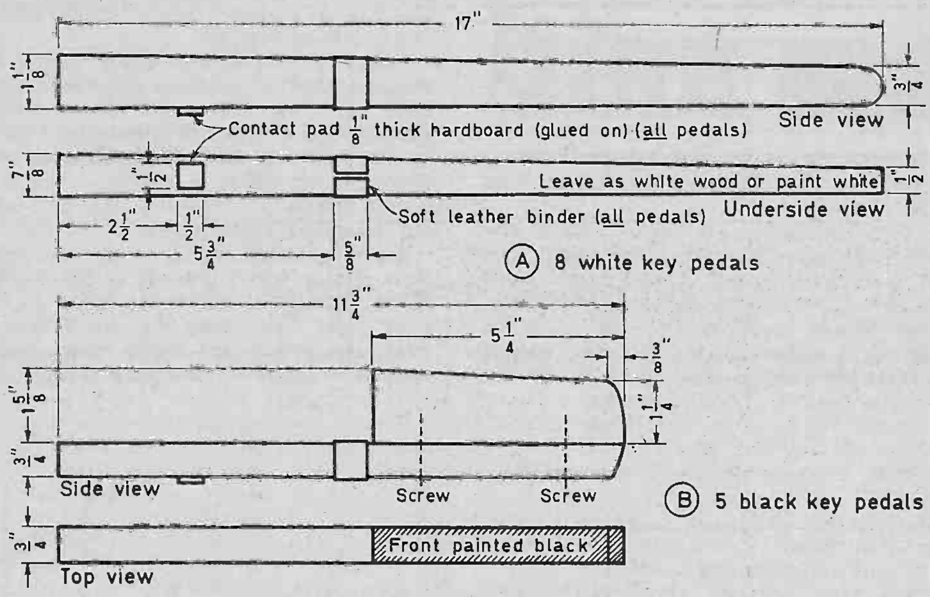


Fig. 4: Details for making the key pedals.

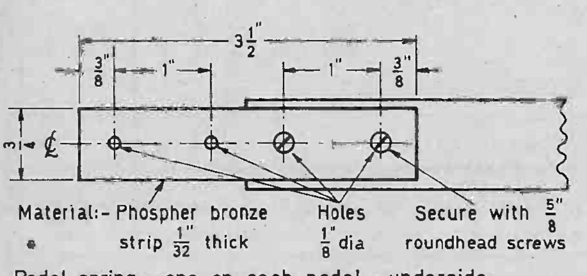


Fig. 5: Details of the phosphor bronze springs and their fitment to the pedals.

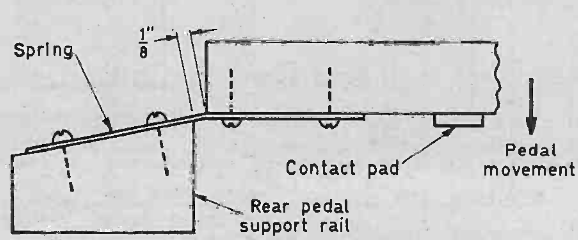


Fig. 6: Fitting of the springs to the pedal frame unit.

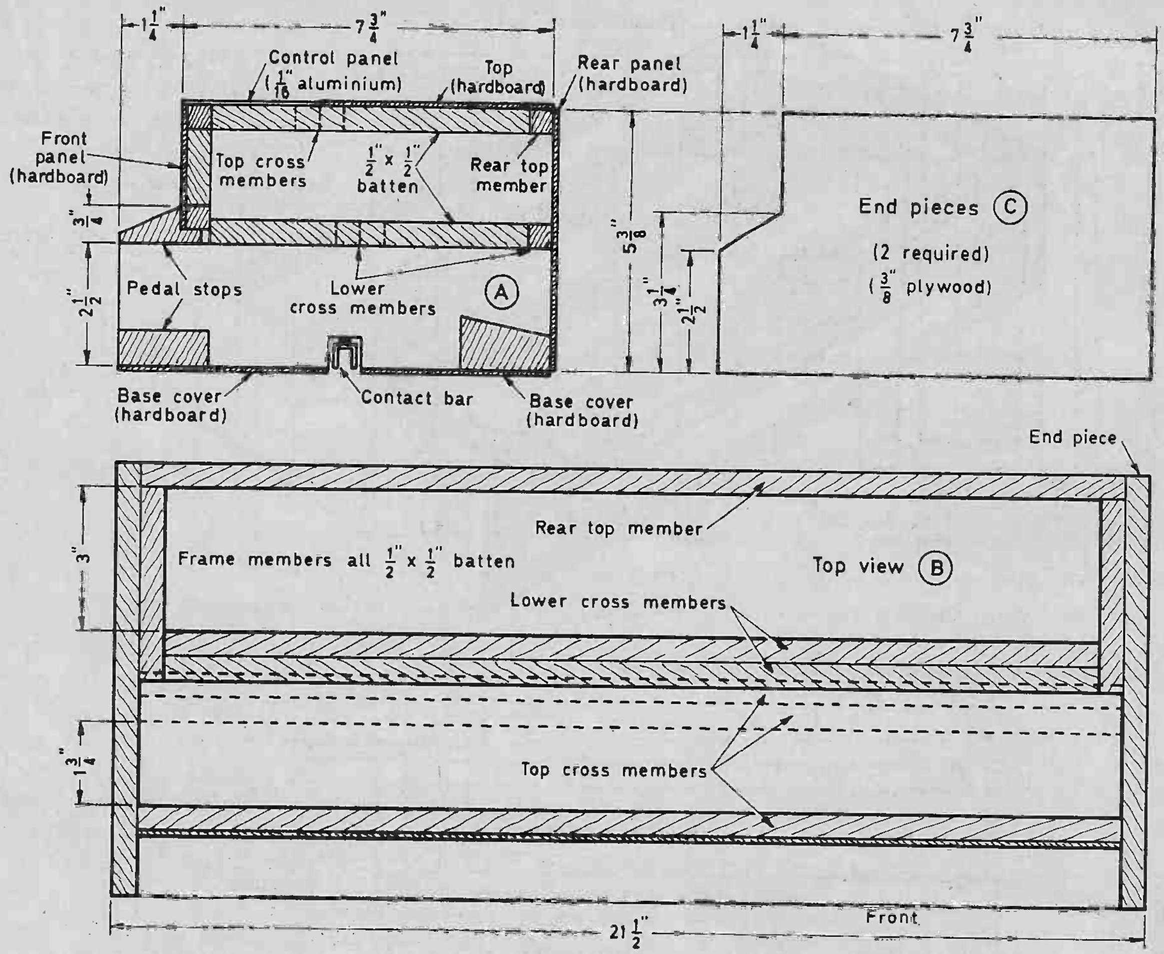


Fig. 7: Construction of the framework for the case.

Before fitting the pedals the case must be completed by first making and assembling the two end pieces (Fig.7C) and then by building up the framework. (Figs.7A and Fig.8). Note the shape of the upper pedal stop rail (Fig.7A). Wood of this shape can be obtained from most D.I.Y. decorating materials shops.

The alternative would be to use a rail 1¼ x ¼in. and drop the front panel accordingly. The frame members, (Fig.8) can be glued in place with Evostik. Leave the 'lower rear member' (Fig.8) until the pedals have been secured in place.

Pieces of hardboard cut to appropriate size can be glued to the frame members to form a box for the PP9 battery at the right hand end of the frame (looking from the rear) as shown in the photograph.

Contact Rail and Keying Contacts

The contact support rail is 'U' shaped aluminium channelling and fits underneath the pedal frame in the slots at the sides (Figs. 2A, 3, 7A and 9). Dimensions and drilling details for the rail are given (Fig.10). Note that the fixing holes for the contact assemblies must be 3/32in. in diameter to take the self tapping screws supplied with them.

The contact assemblies have two pairs of contacts —one pair make as the other pair break and each pair is isolated. The press-to-make pair are used for keying the pedal bass notes and the press-to-break pair are used for actuating the drum bush sound.

The thirteen contact assemblies are mounted on the rail (Fig.10, inset) and the rail is then attached to the pedal frame so that the contact sets are uppermost beneath each pedal (Fig.9). Note the clearance for the downward movement of the pedal. To obtain the requisite spacing between the contact actuating buttons and the pads on the pedals small spacers can be fitted between the contact rail and the slots in the pedal frame.

★ materials list

Planed wood for pedal frame and pedals. (The frame and pedals may be obtained, ready-made, from Henrys Radio Ltd. Type 13/2).
Pedal contact set (13 off), Leaf type, 1 pair make, 1 pair break. (Henrys Radio Ltd.) Aluminium U channelling, ½ x ½ x ⅛in, 20¾in. long.
Aluminium sheet, 18 s.w.g. for output socket panel. Plywood, woodscrews, etc.

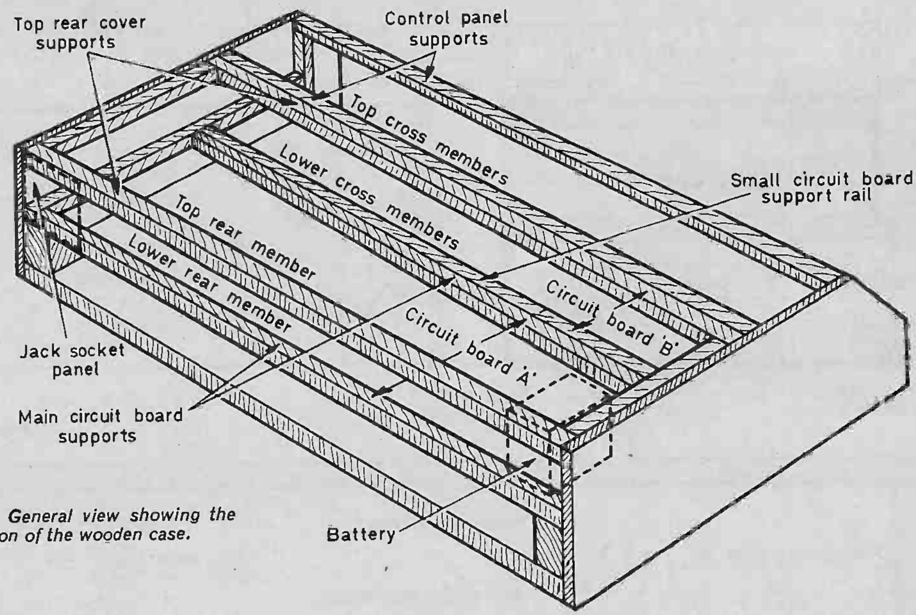
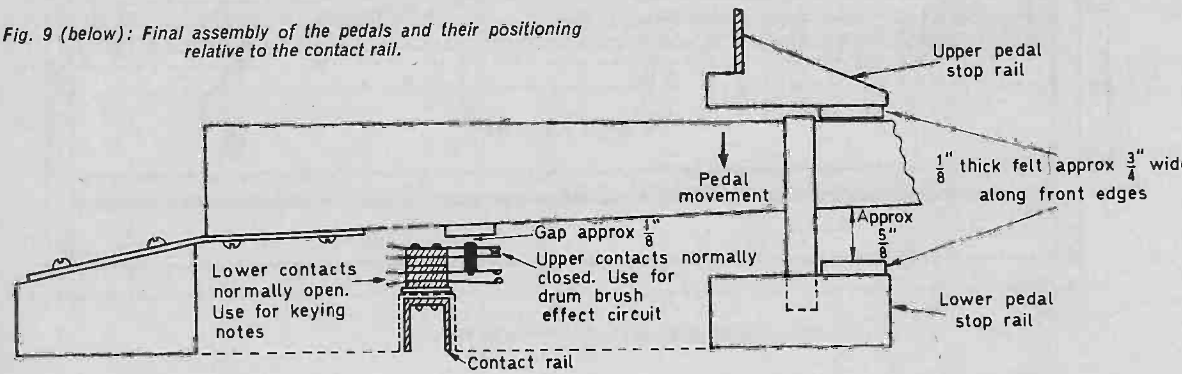


Fig. 8 (above): General view showing the construction of the wooden case.

Fig. 9 (below): Final assembly of the pedals and their positioning relative to the contact rail.



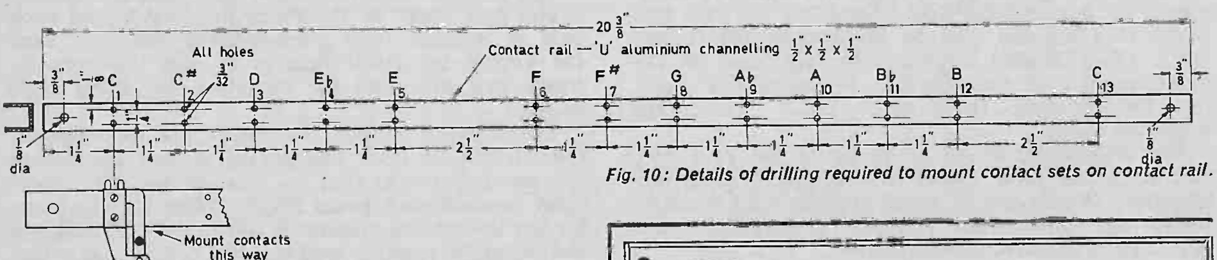


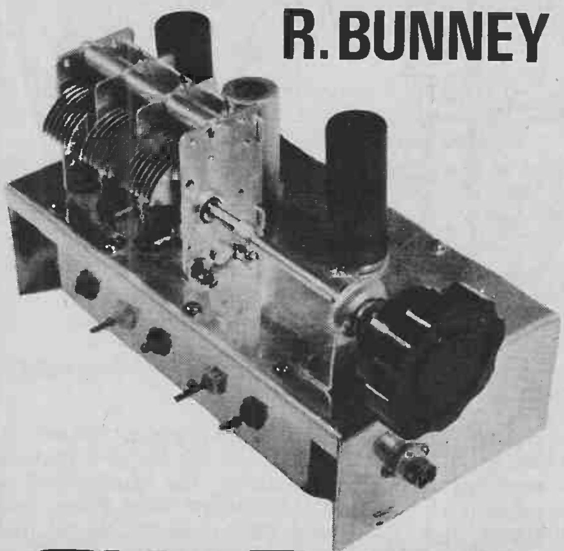
Fig. 10: Details of drilling required to mount contact sets on contact rail.

On completion of the pedals and contact rail assembly, fit felt strips along the front frame members beneath and above the pedals (Fig.9). Carefully check the movement of the pedals and that they do not rub against the guide pillars which, if necessary, can be filed down a little to obtain clearance. Check that all contacts operate on downward movement of the pedals i.e., check actual contact make and/or break with a continuity meter.

Part 2 will give the circuit diagram of the complete unit and describe its functions. There will also be details of the assembly of the circuit boards and a full components list.

TO BE CONTINUED

R. BUNNEY



LOW BAND VHF CONVERTER

CONSIDERABLE importance is attached by the author to the reception in this country of 'paging' stations operating in the United States on frequencies around 35MHz. Not from any 'eaves-dropping' aspect but as a check on the upward movement of the m.u.f. and the possibilities of reception of signals via the F2 layer.

The writer's interest lies with v.h.f. propagation, 30MHz and above, so with the increased activity in the low v.h.f. band over the past few years, due to maximum sunspot activity, need was felt to cover this part of the spectrum with something better than a modified RF25 unit. The RF25 unit, having switched positions, gave only limited coverage. It had been set to the main paging station frequencies, so coverage was inefficient at frequencies removed further than 500kHz from the preset position. Accordingly, a simple converter was made, using commercially available coils, giving fully tunable coverage from 26MHz to 53MHz.

Circuit

Basically the unit (Fig. 1) contains an r.f. stage using an EF80 or EF184 pentode, feeding into an ECF80 frequency changer. Internal coupling between the triode oscillator and pentode mixer is sufficient for frequency conversion to the i.f. of 5MHz. The output from the frequency changer feeds into an i.f. amplifier, prior to feeding into the main receiver. By using an i.f. of 5MHz, the main receiver can be accurately set to 5MHz on a standard frequency station, before inserting the converter output. An alternative circuit is given (Fig. 2) for using an ECC84 cascode stage. No r.f. gain control is fitted, but those readers living adjacent to a channel B1 transmitter may find one necessary to prevent overload (Fig. 3).

Construction

The layout of the various components can be seen from the photographs. The usual precautions of short, direct wiring and single earthing points for each stage should be observed.

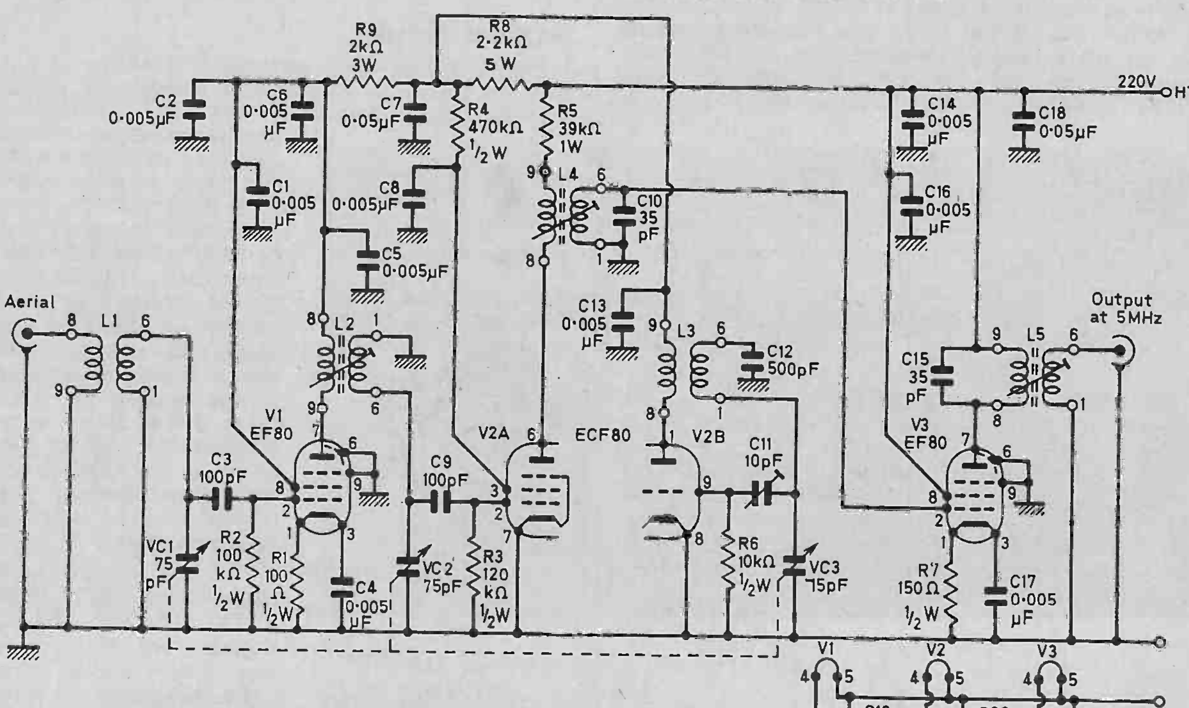


Fig. 1. Circuit of the converter. (Note that C1, C8 and C16 should be wired directly between their respective valve pins and earth).

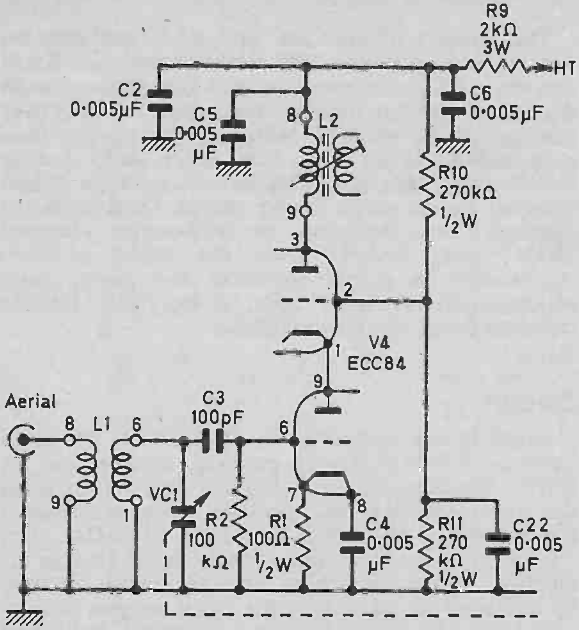


Fig. 2. Alternative r.f. stage using the cascode circuit.

The five coils are mounted on a sub-panel with shields between the coils. The power supply is fed into the unit via a four pin socket but constructors may wish to make their own arrangements in this respect. Likewise a suitable dial can be fitted and calibrated after the alignment of the unit has been finished.

Alignment

The alignment of the converter is simple. Inject a low level modulated signal at 5MHz to pin 2 Valve 3. Adjust the core of L5 to give maximum reading on the main receiver 'S' meter, or for maximum sound output with the a.g.c. switched off. Now shortcircuit the oscillator section tuning gang to

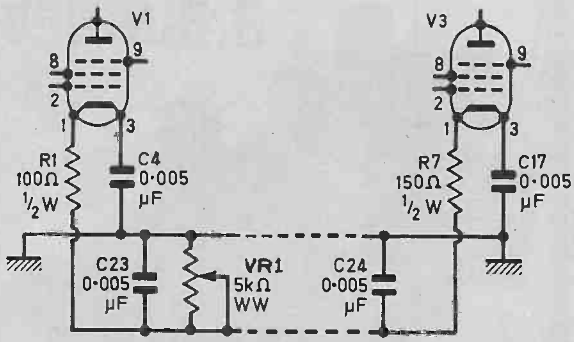


Fig. 3. Modified circuit incorporating an r.f. gain control.

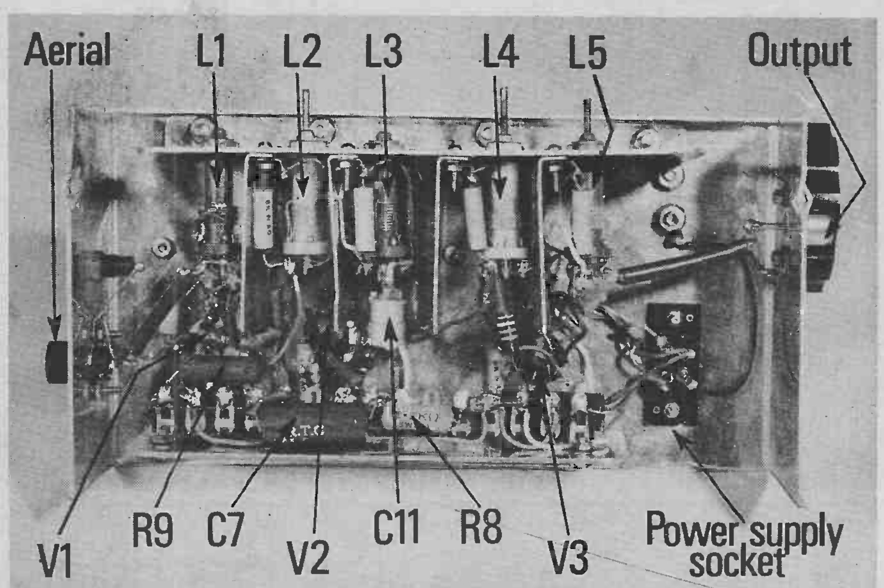
chassis, and inject the 5MHz signal to pin 2 of Valve 2. Adjust the core of L4 to give maximum readings as before. Remove the shortcircuit and adjust C11 to approximately one third value. Find a signal such as Crystal Palace sound on 41.5MHz, and align L2 to give maximum signal. Alternatively inject low level signals from a signal generator at about 40MHz and adjust the core of L2. Check that the range 30-50MHz is covered, then seal C11 with wax to prevent movement.

Denco recommend that 50pF tuning capacitors are used, but at the time of construction a 3-gang unit of these values was not available, hence the use of a Jackson 3-gang 75pF unit was necessary, which tends to increase the l.f. coverage below 30MHz. It may be found that performance falls off below 26MHz, due to the low value of C11. Increasing its value to improve the l.f. coverage tends to deteriorate the h.f. performance at 50MHz. So C11 should be set for optimum v.h.f. reception.

General Notes

During the daytime, particularly in winter at sunspot maximum, a considerable number of signals may be heard, often above the m.u.f. listings and predictions. From the east, forward - scatter networks and r.t.t.y. may be heard from the USSR. The most spectacular reception may be heard from the west, particularly from the United States. A large number of domestic services, such as waterworks undertakings, gas suppliers, private individuals and shops have 2-way communication circuits between 30 and 45MHz, and both base stations and mobiles can be heard in communication.

The most important frequencies are 35·22, 35·58, 43·22, 43·58MHz. Paging stations are situated in most towns, and in some cities there may be three or more. A subscriber carries a small radio receiver,



Bottom view of converter with identification of major components.

tuned to the paging station. If the subscriber leaves his office or home, and is wanted urgently, he is paged by the transmitter. Each transmitter will repeat the message on a tape loop, interspersed with its identification. Consequently it is extremely easy to identify and locate these transmitters by the call sign, and in most cases, the name of the town is given.

★ components list

Resistors:

R1	100Ω ½W	R6	10kΩ ½W
R2	100kΩ ½W	R7	150Ω ½W
R3	120kΩ ½W	R8	2·2kΩ 5W
R4	470kΩ ½W	R9	2kΩ 3W
R5	39kΩ 1W	R10	270kΩ ½W
VR1	5K WW pot	R11	270kΩ ½W

All Resistors ±20%

Capacitors:

C1	0·005μF 500V disc	C13	0·005μF 500V disc
C2	0·005μF 500V disc	C14	0·005μF 500V disc
C3	100pF 500V	C15	35pF 500V 1% S.M.
C4	0·005μF 500V disc	C16	0·005μF 500V disc
C5	0·005μF 500V disc	C17	0·005μF 500V disc
C6	0·005μF 500V disc	C18	0·05μF 500V
C7	0·05μF 500V	C19	1500pF 500V
C8	0·005μF 500V disc	C20	1500pF 500V
C9	100pF 500V	C21	1500pF 500V
C10	35pF 500V	C22	0·005μF 500V disc
C11	10pF trimmer	C23	0·005μF 500V disc
C12	500pF 500V 1% S.M.	C24	0·005μF 500V disc

VC1-2-3 3 gang 75pF per section (Jackson E3)

Inductors:

L1	Blue —Range 6	Denco, miniature dual purpose
L2	Yellow—Range 6	
L3	Red —Range 6	
L4	Yellow—Range 3	
L5	Yellow—Range 3	

Valves:

V1, 3	EF80 (or EF184)
V2	ECF80
V4	ECC84

Miscellaneous:
Chassis 9 x 5 x 2½in. Slow motion drive and knob. 3 B9A Valve holders and screens. 2 co-axial sockets. Tag strips. 4 pin socket.

A number of paging stations is given, but this is only a few of the many presently transmitting, those listed having been received by the author.

KIF	651	Ft. Lauderdale	Fla.	35·58	MHz
KIY	508	Orlando	Fla.	35·22	
KEC	519	Rochester	NY	35·58	
KCC	482	Pembroke	N. Hamp.	35·22	
KQD	303	Detroit	Mich.	35·22	
KIQ	510	Jacksonville	Fla.	35·58	
KIM	905	Charlotte	N.C.	35·22	
KGC	400	Scranton	Penn.	35·58	
KGC	266	Allentown	Penn.		
KGC	223	Philadelphia	Penn.	35·22	
KKI	445	Houston	Tex.	35·58	
WWA	335	San Juan.	P. Rico	35·22	
KKM	248	Oklahoma City	Okl.	35·58	
KGC	397	Wilkes Barrie			
KIF	650	Birmingham	Ala.	35·58	
KIE	953	Atlanta	Ga.	35·58	

During good conditions in the winter of 1969, stations as far west as KKI 445 Houston and KKM 248 Oklahoma City, both on 35·58MHz were heard. Usually reception is easiest from the east coast, and especially down to KIY 508 Orlando, Fla. One rare pager, only heard twice here is WWA 335 San Juan, P. Rico on 35·22MHz. The aerial in use for these various signals in the lower v.h.f. band has been a vertical 12 foot whip. Activity in the west is usually from 1300-1800 b.s.t.

The Worldwide TV-FM DX Association often publishes articles and lists on activity within the 30-40MHz spectrum, in addition to their normal coverage of t.v. and f.m. DX proper. Information on this club may be obtained from W.TV.FM. DX Assoc., P.O. Box 5001, Harbor Sta., Milwaukee, Wis., 53204 U.S.A. For a sample bulletin enclose 2 IRC.

It should be pointed out that reception upon these high frequencies of ionospheric signals is dependent on sunspot activity (other than sporadic E). Consequently, there may be periods during which little or no activity is heard. However conditions can improve over the space of a few days. During January, 1970, the highest frequency noted was 39·8MHz, after which conditions deteriorated.

It must be stressed at this point, that NO ATTEMPT MUST BE MADE TO VIEW THE SUN DIRECTLY, to observe sunspot activity. One second is sufficient to damage the eye. A telescope on a tripod may be used to project the sun on to a card, and spots can then be observed upon the card, indicating sunspot activity.

Never look at the sun through a telescope, even though it may be supplied with a special filter to fit over the lens. These filters can fracture under concentrated heat. Even when the sun is setting, no attempt must be made to view the sun directly. ■

TAKE 20

JULIAN ANDERSON

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

No. 17
MULTIMETER EXTRAS

THERE is one piece of equipment that all of us own (if we take the hobby at all seriously) and that is a multimeter. These cost anything from under £2 to over £30 though the majority fall in the £3 to £7 range. Although all of them will measure voltage, current and resistance the ranges are often inadequate, especially on the cheaper types. For a few bob several additional features can be added to the cheaper and simpler testmeters. We shall describe four circuits but with a little imagination and application of Ohms law it will be seen that still further ranges can be added.

TRANSISTOR TESTER

Many readers will occasionally wish to test transistors but do not feel that the construction of a separate piece of equipment is justified. For these people a separate and simple circuit can be kept for the odd occasions on which it is needed—the cost should be no more than a few shillings as it uses only a three-pole four-way switch and a 100kΩ resistor.

Although this tester only measures the transistor using the internal battery (almost universally 1·5V in the cheaper range on multimeters) it will give an

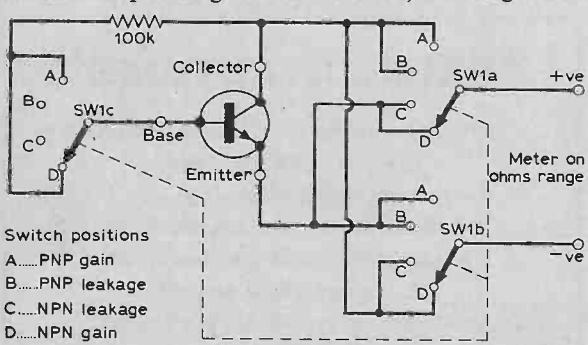


Fig. 1: The circuitry necessary for converting a multimeter to a transistor tester.

indication of leakage and gain. In position A the meter's battery negative is applied to the collector and the positive to the emitter, the resistor connected between the collector and the base applying a bias of about 10μA. A good device should show quite a deflection on the scale. In position B the bias is removed and the meter indicates the leakage. Positions C and D do the same for NPN transistors. Note that there is not a mistake in the circuit; the positive connection to the meter is in fact connected to the battery negative.

LOW VOLTAGE RANGE

The base bias voltage on transistors is usually

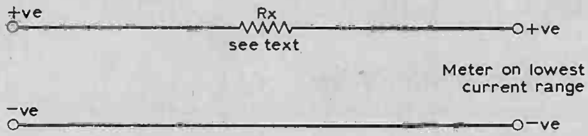


Fig. 2: Adding a 1V range is a simple matter but refer to the text for the value of Rx

between 0·3V and 0·8V but only a few meters have a 1V range. However this can be added simply by the addition of a resistor. With the meter on its lowest current range and a resistor equal to the meters sensitivity a 1V range is added. Thus a 1,000Ω/V meter would need a 1kΩ and a 20,000Ω/V meter a 20kΩ resistor. Unfortunately the internal resistance of the meter has to be subtracted from this. The simplest way to find the correct value is to fix a 100Ω pot across a 1·5V battery and adjust so that a 1V reading is obtained on your testmeter. This should be done with care as the accuracy of the scale will depend upon it. Then change over to the lowest current range and select a resistor that will give full scale deflection from the 1V supply. This will probably mean using two or even three resistors in series; once the exact value has been found the resistors can be soldered together.

A.C. CURRENT RANGE

Only the most expensive multimeters include an a.c. current range and although this is rarely needed it is sometimes necessary to measure mains current. If a 1Ω resistor is inserted in the line a 1A current will drop 1V and a 10Ω resistor will drop 10V and of course we can measure a.c. volts. We won't attempt to describe this further but make sure that the resistor is a high wattage type and if used on the mains that careful insulation is used (we don't want to lose too many *Take 20* readers!).

HIGH RESISTANCE RANGE

Many of the cheaper meters have very inadequate resistance ranges—the centre scale reading is usually only 3kΩ and it is practically impossible to get an accurate reading over 50kΩ. The additional com-

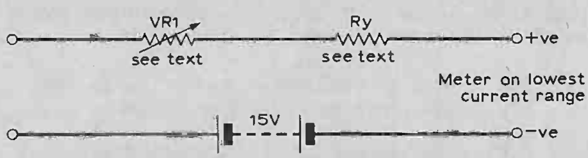


Fig. 3: A high resistance range can be added to nearly all test meters by using the above arrangement on the lowest current range.

ponents in Fig. 3 will improve the best resistance range by a factor of 10. Again we use the meter on it's lowest current range and instead of the integral 1·5V battery we use an external 15V one (B154 or similar). The combined resistance of VR1 and R_y should be 15kΩ for a 1,000Ω/V type and 300kΩ for a 20,000Ω/V meter so for the former type a 12kΩ resistor and a 5kΩ pot should be used. ■

I.C. OF THE MONTH

L.A.J. IRELAND

Number 11 — Motorola MFC 4000P Audio Amplifier

IN presenting this month's integrated circuit there is the question of whether or not it would fit more appropriately in the "Take 20" slot, since the unit in question, the Motorola MFC4000P, costs little more than £1, and to date is probably the simplest unit to use. In a package occupying less than 1/100th of a cube inch it provides a $\frac{1}{4}$ watt audio amplifier, matching a 16 ohm loudspeaker.

To add to the simplicity, only four leads connect the silicon monolithic chip to the outside world, d.c. power supply, signal input and output, and a common earth. The unit is the first of a series of "consumer" circuits, intended for the amateur constructor and for manufacturers of utility equipment such as portable radios and baby alarm or intercom units.

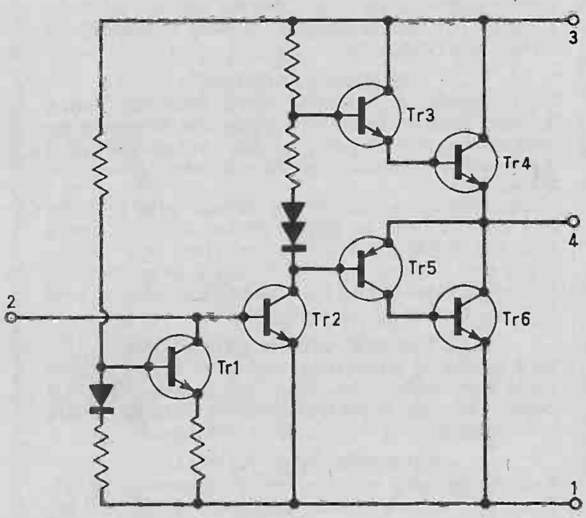
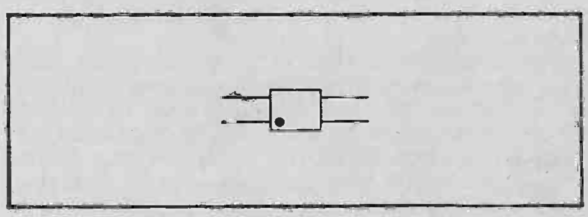


Fig. 1. Equivalent circuit of the MFC 4000P

As such, it does not match the G.E series of audio integrated circuits introduced to our readers in March 1970 "P.W.", or the increasingly familiar Plessey SL403, which are essentially hi-fi devices with internal noise levels 65dB. or more down, or with less than 0·5% total harmonic distortion.

On the other hand, those devices require feedback and decoupling connections to the chip, with multiple pins and an external metallic heat sink. Further, previous audio units required a d.c. supply higher than the 9 volt battery which powers the standard pocket radio or domestic transistor device; the MFC 4000P on the other hand, will operate at full rating down to 6 volts d.c., though with the harmonic distortion raised to 4% due to crossover difficulties. At a nominal 9 volts a harmonic distortion figure of 0·7% is attained, a better performance than is common in the standard pocket radio preamplifier, driver and class B output lineup.



Actual size of the MFC 4000P. The dot identifies pin 1, the numbering going clockwise

Finally, the device is used in a completely transformerless circuit, enabling a degree of compactness to be achieved previously unobtainable in home built equipment. In use, the slightly higher noise and distortion figures are not significantly reflected in the output sound, since in the type of equipment for which this unit is intended, quality is inevitably loudspeaker limited, and there is no advantage to be attained by incorporating more expensive semiconductor complements.

Circuit

Now for a brief consideration of the circuit itself, Fig. 1. It is a six transistor unit, with Tr1 acting as a stabilising element across the input, and therefore controlling all stages of the direct-coupled circuit. The preamplifier transistor, Tr2, is in an orthodox common emitter configuration and biased by d.c. feedback from the output stage of the circuit (shunted, as mentioned already, by the regulator Tr1, which however, does not affect the signal appearing at the base of Tr2 since the collector circuit of a transistor has a high impedance to applied signals).

It will be noted also that there is also a frequency-dependent element (the 0·003μF capacitor) in this negative feedback loop to determine the frequency response of the complete amplifier, Fig. 2.

The driver transistors, Tr3 and Tr5, are a complementary pair, as indicated by the direction indications on the emitter symbols. Therefore, although the same signal is applied to each from the collector of Tr2, there is 180° phase difference between the signals passed on to the output pair, since Tr3 may be regarded as an emitter follower while Tr5 is common emitter and therefore signal inverting. Tr4 and Tr6, then, act as class B push-pull output transistors.

However, due to the presence of the diodes and small resistance between the bases of Tr3 and Tr5,

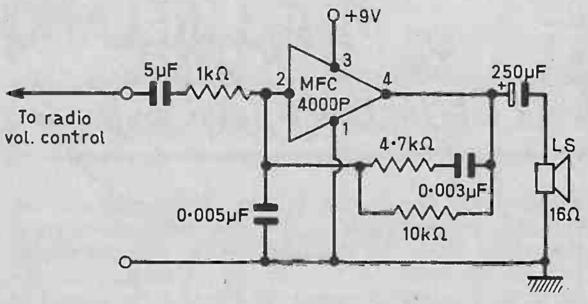


Fig. 2. Circuit of an audio stage suitable for a pocket radio

there is a small standing current in the output pair even in the no-signal or quiescent condition, to minimise the crossover distortion sometimes found in class B systems.

In practice, the current drain of the circuit rises from an average of 3·5mA in the quiescent condition to 60 mA on full load. The advantage of class B operation, with battery drain highly dependent on output, is evident. Sensitivity is high, with a power output of 50mW (average pocket radio listening level) available on an input signal of only 15 mV, but Fig. 3 indicates the use of an external preamplifier should one be desired for special low-signal applications, such as operation from a tape head. Otherwise the circuit shown in Fig. 2 should be fully satisfactory.

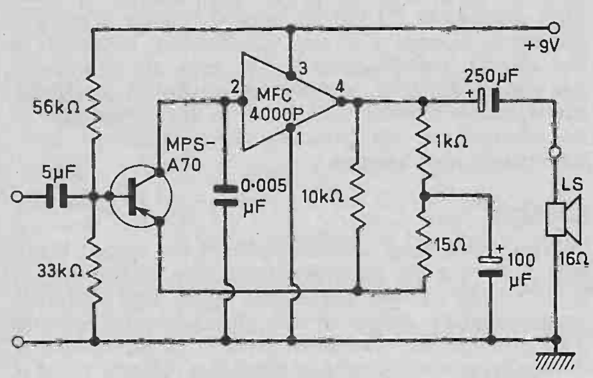


Fig. 3. Alternative circuit using a discrete pre-amplifier

It is hoped to introduce shortly the Motorola MFC4010P, as the next element in this series of sub-miniature 4-pin i.c.'s (it is a general purpose direct coupled amplifier, for a.f. or i.f. applications); until then, this attractive little unit should provide food for thought and work for the soldering iron! The unit is available from Jermyn Industries, Vestry Estate, Sevenoaks, Kent or Henrys Radio Ltd. who can also supply the transistor MPS A70. ■

QUERY COUPON

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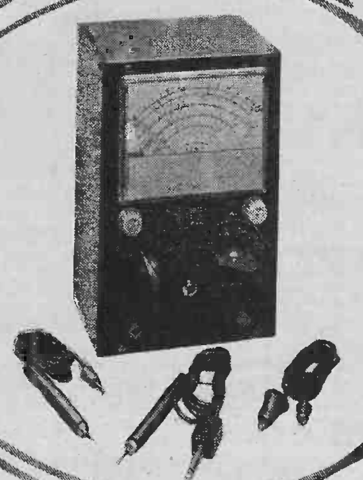

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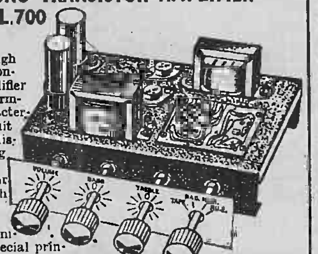
MONO TRANSISTOR AMPLIFIER HSL.700



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PU2-110m/v. 1 meg input impedance.
Tape—110m/v. 1 meg input impedance.
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Output power measured at 1Kc—6.2 watts RMS into 3 ohms. 5.8 watts RMS into 15 ohm. Overall frequency response 30 c/s-18 Kc/s: Continuously variable tone controls: Bass, +8db to—12db at 100c/s. Treble, +10db to—10db at 10Kc/s. The HSL.700 has been designed for true high fidelity reproduction from Radio Tuner, Gramophone deck and Tape Recorder preamp. Supplied ready built and tested, complete with knobs, attractive anodised aluminium front escutcheon panel, long spindles (can be cut to suit your housing requirements) full circuit diagram and operating instructions.

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Circuit diagram, construction details and parts list (free with kit) 1/6 (S.A.E.).

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

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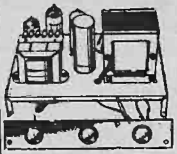

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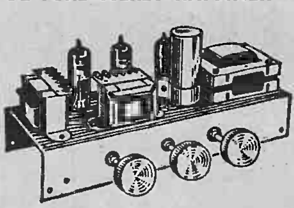
DE LUXE STEREO AMPLIFIER



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

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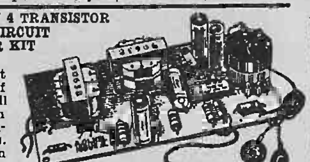
Type TA1



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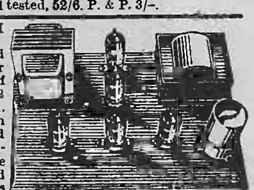

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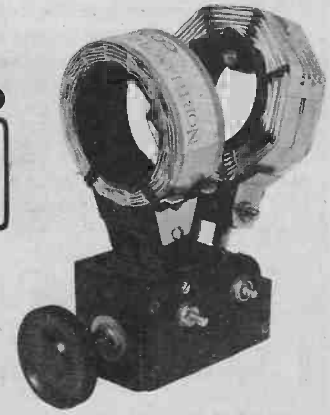


COLIN RICHES
ARTHUR DOW

NOW that the name of Hertz has come into everyday use in the jargon of the electronic engineer it is perhaps opportune to look back at the work of that early pioneer in radio communication, Professor Heinrich Hertz, and to consider whether or not the perpetuation of his name as a technical term is really justified.

Heinrich Hertz, born in 1857, became a pupil of the famous physicist von Helmholtz and received a good grounding in electricity as far as the "state of the art" permitted at that time.

Although dying in 1894 at the early age of 36 Hertz was able to carry out many experiments that had the most far reaching effect on man's attempt to communicate at a distance.

In 1888 Hertz had progressed enough to be able to demonstrate the propagation of electromagnetic waves, or Hertzian waves as they were then known, thus confirming the earlier theoretical work of Maxwell.

Hertz showed that the waves conformed to the same laws as applied to the propagation of light namely that they could be bent and reflected.

Earlier experimenters had noticed spurious effects in the vicinity of large spark coils, when they were operating, such as secondary sparking between metal objects completely isolated from the coil.

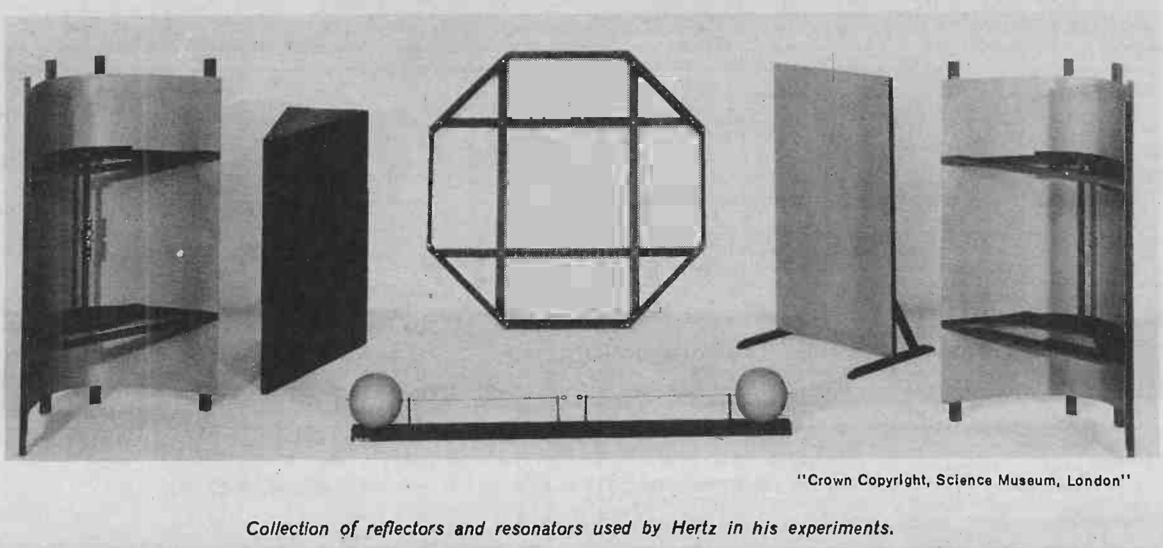
Among those experimenters was Edison who coined the phrase "etheric force" to explain away the effect of secondary sparking at a distance.

Hertz's "receiver" consisted of nothing more than a length of wire formed into a circle leaving a minute gap at the ends across which a spark would jump when Hertzian waves were induced into the loop from the nearby spark coil "transmitter".

Hertz found that he could increase the effective range of his equipment by adding metal spheres and plates to the spark gap on the transmitter and to the ends of the receiver loop. He was in fact using what we now call "dipoles" and towards the end of his experiments Hertz was able to "resonate" his transmitter and receiver to approximately the same wavelength. The frequencies involved were in fact what we would now term v.h.f.!

As if these incredible experiments were not enough Hertz then demonstrated the phenomenon of "standing waves" using a long cage of wires strongly resembling the present-day Lecher wire system of measuring wavelength.

Using sheet metal reflectors and reflectors made of wire stretched on wooden frames Hertz showed that his Hertzian waves could be treated as light waves and bent or reflected at will. Little did Hertz realise that he was really demonstrating the basic principle of radar!



"Crown Copyright, Science Museum, London"

Collection of reflectors and resonators used by Hertz in his experiments.

Since many modern v.h.f. and u.h.f. aerial systems strongly resemble the equipment used by Hertz in his famous experiments it would not be ungenerous if he were to be regarded as the "father" of v.h.f. communication. It is surely little enough reward for his name to be associated with the basic unit of frequency, the cycle per second, or Hertz (Hz), since he was the first to devise a method of measuring the frequency or perhaps the wavelength of electromagnetic waves.

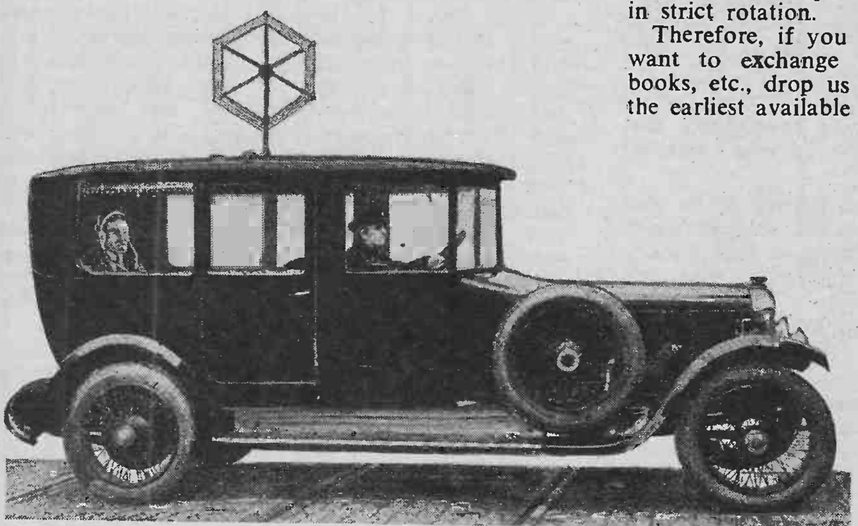
Mobile 1922

IN 1922 experiments were being made with radio receivers in cars and there follows a description of one of the first car radios: "The receiving apparatus used is a Marconiphone 6-valve set, five of the valves being high-frequency amplifiers and the other a rectifier. The valves are of the special low-current consumption type. The aerial is fitted on the roof of the car and is so constructed that it can be raised and lowered at will by means of a hand-wheel.

"The receiver is bedded in spongy rubber and mounted in a compartment under the floor boards immediately in front of the rear seats. Control is effected by means of three levers in the car interior and on the control panel there is an indicating 'pilot' bulb which shows the intensity of the filament lighting of the valves. The valve filament lighting is effected from the starting and lighting battery of the car. High-tension batteries of the usual type are fitted in the same compartment as the receiver. In order to prevent interference from the ignition and lighting equipment of the car, the magneto and generator are screened.

Two pairs of double earpieces and two single earpieces may be employed, so that four persons can listen in at once.

The effective receiving range of the equipment is approximately fifty miles radial distance from a broadcasting centre when used with the frame aerial fitted to the car roof. When all the broadcasting stations are in operation a car fitted with this apparatus, will, therefore, practically be within range of broadcast."



This photograph shows a Daimler car equipped with a Marconiphone receiver and frame aerial. A similar car was used in the Lord Mayor of London's procession 1922.

Vintage CQ

Should readers wish to have a "Vintage CQ" published, we will be prepared to accept letters for inclusion. They will of course be inserted in the magazine when space permits and will be dealt with in strict rotation.

Therefore, if you have any queries on old gear, want to exchange or obtain vintage equipment, books, etc., drop us a line and we'll put a note in the earliest available issue.

PRACTICAL WIRELESS

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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 textbooks. 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.

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DULCI 207	£25 0 0	£17 0 0
DULCI 207M	£30 0 0	£20 19 6
GOODMANS Maxamp	£54 0 0	£44 19 6
LEAK Stereo 30 Plus	£53 0 0	£43 19 6
LEAK Stereo 30 Plus in teak case	£59 10 0	£47 19 6
LEAK Stereo 70	£65 0 0	£52 19 6
LEAK Stereo 70 in teak case	£71 10 0	£56 19 6
LINEAR LT.66	£18 18 0	£15 19 6
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ARMSTRONG M8 decoder	£9 10 0	£7 19 6
DULCI FMT.7FM	£22 1 0	£17 19 6
DULCI FMT.7S Stereo	£31 0 0	£25 5 0
GOODMANS Stereomax	£82 10 5	£71 19 6
LEAK Stereofetic Chassis	£59 18 0	£53 19 6
LEAK Stereofetic in teak case	£67 3 6	£59 19 6
PHILIPS RH 690	£39 0 0	£31 19 6
PIONEER TX500 AM/FM	£77 18 0	£63 19 6
PIONEER TX900 AM/FM	£153 13 10	£125 0 0
QUAD Stereo FM	£51 0 0	£39 19 6
ROGERS Ravensbourne	£61 17 9	£49 19 6
ROGERS Ravensbrook	£45 0 2	£39 19 6
ROGERS Ravensbrook (cased)	£51 5 3	£42 19 6
SINCLAIR 2000	£26 14 6	£19 4 6
TRUVOX FM 200/1C	£60 11 10	£39 19 6

All above tuners are complete with MPX stereo decoder

TUNER/AMPLIFIERS

	Rec. Retail Price	Comet Price
ARENA 2400	£90 6 0	£71 19 6
ARENA 2600 Stereo AM/FM	£111 6 0	£94 0 0
ARENA 2700 Stereo	£105 0 0	£85 0 0
ARENA T1500F	£72 9 0	£59 19 6
ARENA T9000	£303 9 0	£258 0 0
ARMSTRONG 525	£87 16 9	£68 19 6
ARMSTRONG 526	£98 15 6	£79 19 6
ARMSTRONG M8 decoder	£9 10 0	£7 19 6
GOODMANS 3000	£77 14 7	£66 19 6
PHILIPS RH781	£74 19 6	£54 19 6
PHILIPS RH790	£125 0 0	£101 19 6
PHILIPS RH691	£83 0 0	£70 10 0
PIONEER KX330 AM/FM/SW	£78 12 4	£62 19 6
PIONEER SX770 AM/FM	£160 8 6	£129 19 6
PIONEER SX990 AM/FM	£194 14 8	£155 0 0
TELETON F.2000	£51 0 0	£37 19 6
TELETON 7ATI	£133 0 0	£85 0 0
TELETON R4200	£51 15 0	£39 19 6
TELETON CR/10T	£39 0 0	£29 19 6
TELETON TFS50	£74 0 0	£59 19 6

All above Tuner Amplifiers are complete with MPX decoder

CARTRIDGES ALL MAKES STOCKED AT DISCOUNT PRICES

PICKUP ARMS

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

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TURNTABLES

	Rec. Retail Price	Comet Price
ARENA SP25 with base, cover	£22 1 0	£17 19 6
B.S.R. McDONALD MP60	£15 0 0	£10 19 6
B.R.S. McDONALD 610	£18 19 6	£13 19 6
GARRARD SP25, fully wired with Goldring G800 magnetic cartridge, complete with base, plinth and cover	Special price	£20 19 6
GARRARD SP.25 Mk II	£15 11 4	£10 19 6
GARRARD AP.75	£23 16 0	£17 19 6
GARRARD SL.55	£13 17 9	£11 12 6
GARRARD SL.65B	£19 6 5	£14 9 6
GARRARD SL.75B	£35 12 4	£28 19 6
GARRARD SL.95B	£45 9 1	£37 19 6
GARRARD 401	£31 14 2	£26 10 0
GARRARD SL.72B	£30 2 0	£24 19 6
GARRARD 3500 with GKS Cartridge	£15 15 0	£11 19 6
GOLDRING GL69	£25 1 6	£21 5 0
GOLDRING 69P	£33 11 9	£28 19 6
GOLDRING GL.75	£36 8 2	£29 19 6
GOLDRING 75P	£46 18 8	£38 19 6
GOLDRING Covers for 69P and 75P	£4 4 3	£3 8 0
GOODMANS 3025	£37 14 9	£32 19 6
PHILIPS 228	£19 19 6	£16 19 6
PHILIPS GA146	£29 19 6	£24 19 6
PHILIPS 217	£32 0 9	£27 4 0
PHILIPS 202 Electronic	£64 0 0	£54 0 0
THORENS TD.125	£75 17 8	£59 19 6
THORENS 125AB	£120 3 11	£99 19 6
THORENS 150A Mk II	£43 12 7	£32 19 6
THORENS 150AB Mk II	£47 8 7	£40 19 6
THORENS TD.124/11	£46 15 10	£39 19 6

Bases, plinths, and covers stocked.

SPEAKERS

	Rec. Retail Price	Comet Price
ARENA HT 27	£18 18 0	£13 19 6
ARENA HT 28	£17 17 0	£12 19 6
ARENA HT 21	£10 10 0	£9 5 0
ARENA HT 7	£19 19 0	£17 0 0
ARENA HT 10	£22 1 0	£18 19 6
ARENA HT 20	£32 11 0	£26 19 6
ARENA HT 26	£78 15 0	£65 19 6
B & W DM3	£63 0 0	£53 6 0
B & W P2H	£94 10 0	£79 0 0
B & W DM1	£32 0 0	£25 19 6
CELESTION Ditton 10	£21 3 2	£17 5 0
CELESTION Ditton 15	£29 0 0	£22 10 0
CELESTION Ditton 25	£59 17 0	£49 0 0
DULCI AS 3	£8 8 0	£6 19 6
GOODMANS Majesta	£57 0 0	£48 19 6
GOODMANS Maxim	£20 7 9	£16 19 6
GOODMANS Mezzo II	£30 18 0	£23 10 0
GOODMANS Magnum-K	£40 2 0	£29 19 6
GOODMANS Marimba	£24 0 1	£19 19 6
GOODMANS Mambo	£22 5 6	£17 19 9
GOODMANS 3005 (pair)	£25 0 0	£21 0 0
KEF Celeste	£29 0 0	£21 10 0
KEF Concord	£43 10 0	£31 19 6
KEF Concerto	£53 10 0	£42 19 6
KEF Cresta	£22 3 4	£18 19 6
LEAK Sandwich	£45 10 0	£34 19 6
LEAK Mini-Sandwich	£29 15 0	£22 19 6
LOWTHER Acousta (with PM6)	£45 10 0	£38 7 6
LOWTHER Ideal Baffle	£35 10 0	£29 17 6

	Rec. Retail Price	Comet Price
LOWTHER Acousta (with PM7)	£53 0 0	£45 19 6
QUAD Electrostatic	£66 0 0	£52 19 6
PHILIPS RH 481	£11 0 0	£9 2 6
PHILIPS RH 482	£18 0 0	£14 19 6
WHARFEDALE Speakers		
Airedale	£69 10 0	£57 14 0
Denton	£19 0 0	£14 19 6
Super Linton	£22 10 0	£18 10 0
Melton	£29 10 0	£22 19 6
Dovedale 3	£39 10 0	£29 19 6
Rosedale	£59 10 0	£48 19 6
WHARFEDALE UNIT 3 Speaker Kit	£11 19 6	£9 19 6
WHARFEDALE UNIT 4 Speaker Kit	£16 0 0	£13 10 0
WHARFEDALE UNIT 5 Speaker Kit	£23 10 0	£19 19 6

CHASSIS SPEAKERS

	Rec. Retail Price	Comet Price
GOODMANS Axiette 8	£7 2 1	£5 13 6
GOODMANS Twinaxiette 8	£8 0 7	£6 8 0
GOODMANS Axiom 10	£8 8 0	£6 14 0
GOODMANS Axiom 201	£12 10 0	£9 7 6
GOODMANS Axiom 301	£17 18 0	£13 8 6
GOODMANS Audiom 51	£11 6 0	£8 9 6
GOODMANS Audiom 61	£16 7 0	£12 5 6
GOODMANS Audiom 81	£27 12 0	£20 14 0
GOODMANS Audiom 91	£31 5 0	£23 8 6
GOODMANS Audiom 91/100	£34 17 0	£26 2 9
GOODMANS ARU 180	£3 17 8	£2 18 6
GOODMANS ARU 280	£3 17 8	£2 18 6
GOODMANS ARU 480	£5 8 5	£4 1 3
GOODMANS ARU 172	£3 17 8	£2 18 6
GOODMANS Trebax 100	£7 9 0	£5 11 6
GOODMANS Trebax 5K/20KL	£8 8 0	£6 6 0
GOODMANS Midax	£11 4 0	£8 8 0
GOODMANS Attenuator	£3 1 4	£2 6 0
GOODMANS Crossover Networks XO/950/5000	£8 8 7	£6 6 0
GOODMANS Crossover Networks XO/950	£6 7 9	£4 15 9
GOODMANS Crossover Networks XO/5000	£2 6 0	£1 14 6
WHARFEDALE 8 inch Bronze/RS/DD	£4 8 0	£3 13 6
WHARFEDALE Super 8/RS/DD	£7 12 0	£6 6 0
WHARFEDALE Super 10/RS/DD	£12 14 0	£10 10 0
WHARFEDALE WMT 1 Matching Transformer	16 9	13 6

HI-FI STEREO TAPE DECKS AND TAPE RECORDERS

	Rec. Retail Price	Comet Price
AKAI 150D	£130 2 4	£109 0 0
AKAI X-360	£339 0 0	£284 0 0
AKAI X-360D deck	£290 0 0	£243 0 0
AKAI 1710	£109 0 0	£85 19 6
AKAI 1800	£158 0 0	£133 0 0
AKAI 1800SD	£199 0 0	£167 0 0
AKAI 4000	£124 18 0	£99 19 6
AKAI 4000 D deck	£89 19 6	£72 19 6
ALBA R22 Battery/Mains	£50 5 0	£29 19 6
BUSH TP 60 Cassette Tape Recorder	£27 15 8	£24 19 6
FERGUSON 3224 Twin Track	£33 14 0	£24 19 6
FERGUSON 3246	£41 14 0	£32 19 6
FERGUSON 3247 4-track	£47 1 0	£37 19 6
FERGUSON 3244 Stereo 4-track	£97 18 0	£79 19 6
GRUNDIG C200 Cassette	£37 19 10	£29 19 6
GRUNDIG TK 120 Continental	£39 5 0	£29 19 6
GRUNDIG TK 124	£44 18 0	£34 19 6
GRUNDIG TK 144	£49 19 6	£39 19 6
GRUNDIG 149	£57 12 8	£47 19 6
MARCONI 4218 Stereo tape Recorder	£89 11 2	£69 19 6
PHILIPS 3302 Cassette Tape Recorder	£28 7 0	£21 19 6
PHILIPS 4302 Twin Track Auto.	£35 17 6	£25 19 6
PHILIPS 4307 4-track	£49 10 0	£38 19 6
PHILIPS N4404 (4 track stereo)	£83 0 0	£69 19 6
PHILIPS N4407 Stereo	£105 0 0	£89 19 6
PHILIPS N4308	£60 10 0	£49 19 6
TELETON FXB 510D Stereo	£52 10 0	£43 19 6
TRUVOX PD 102 Stereo Tape Recorder	£114 15 3	£79 0 0

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6F6	12/6
6F6G	5/-
6F12	3/3
6F13	3/6
6F15	10/-
6F18	7/6
6F23	14/3
6F24	13/6
6F25	13/-
6F28	14/-
6F32	3/-
6H6GT	3/-
6J5G	3/9
6J6	3/-
6J7G	4/9
6J7GT	6/6
6K7G	2/-
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12BA6	6/-
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12Q7GT	5/-
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12SC7	5/-
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12SH7	3/-
12SJ7	4/6
12SK7	4/9
12SQ7GT	8/-
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14S7	15/-
19AQ5	4/9
19H1	40/-
20D1	13/-
20D4	20/5
20F2	14/-
20L1	20/-
20P1	17/6
20P3	18/-
20P4	18/6
20P5	20/-
25A6G	5/9
25L6	5/6
25Y5	6/-
25Y5G	8/6
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25Z5	8/-
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30C1	6/6
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30F5	16/-
30FL1	13/9
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30L17	15/6
30P4	12/-
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35D5	12/6
35L6GT	8/6
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35Z3	10/-
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50C5	6/3
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72	6/6
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303	15/-
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DF96	6/6
DF97	10/-
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DK32	7/8
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EBF83	8/-
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ECC82	4/6
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ECC84	6/3
ECC85	5/6
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ECH83	8/-
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EF92	2/6
EF97	10/-
EF98	10/6
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EL34	10/6
EL37	17/3
EL41	11/-
EL42	10/6
EL81	10/-
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EL85	8/-
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N78	40/3
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N308	17/6
N339	25/-
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PABC80	7/3
PC86	10/3
PC88	10/3
PC95	8/3
PC97	8/6
PC900	7/6
PCC84	6/3
PCC85	6/6
PCC88	9/9
PCC89	9/6
PCC189	10/6
PCF80	6/6
PCF82	6/3
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PCF200	13/3
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PCH200	12/3
PCL82	7/3
PCL83	10/-
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PL36	9/6
PL81	9/6
PL81A	10/6
PL82	6/6
PL83	6/6
PL84	6/6
PL302	12/-
PL500	13/-
PL504	13/6
PL505	28/9
PL508	27/10
PL509	28/9
PL802	15/-
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PY80	6/-
PY81	5/3
PY82	5/3
PY83	5/9
PY88	6/9
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PY801	6/9
PZ30	9/6
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R16	34/11
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R20	11/9
R52	7/6
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UBF89	6/9
UBL21	9/-
UC92	5/6
UCC84	8/-
UCC85	7/3
UCF80	8/3
UCH21	9/-
UCH42	12/-
UCH81	6/6
UCL82	7/-
UCL83	10/-
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U18/20	10/-
U19	34/6
U22	7/9
U25	13/-
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U31	6/-
U33	29/6
U35	16/6
U37	34/11
U45	15/6
U47	13/-
U49	11/9
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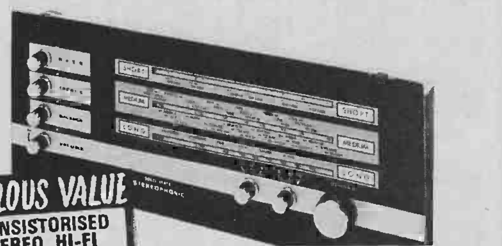

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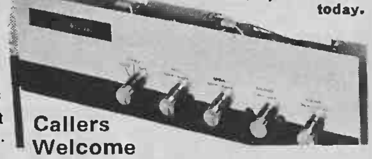

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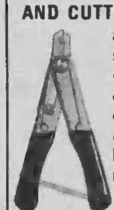

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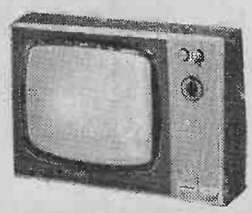

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FURTHER NOTES

Since the appearance of the LF bands transmitter/receiver in the June/July 1970 issues of "Practical Wireless" it is apparent that the v.f.o. coil unit is no longer available. There has also been interest in 2-band switching for the equipment. This has been employed for some time with excellent results, and results on 80m have been surprisingly good.

The VFO

Fig. 1 is the circuit of a v.f.o. which can be built in the original v.f.o. box, using easily obtainable components, and giving correct coverage for both 160m and 80m, with the minimum of difficulty.

There are three 1% silver mica capacitors, and the coil is a Denco (Clacton) Ltd. "Yellow" Range 3. It is mounted inside the box, with the threaded rod protruding. So that all circuits can be screened, the holder for the EF91 was mounted on the box, and thus encloses all the components in Fig.1. The r.f. choke is a miniature cored type (as used in transistor receivers).

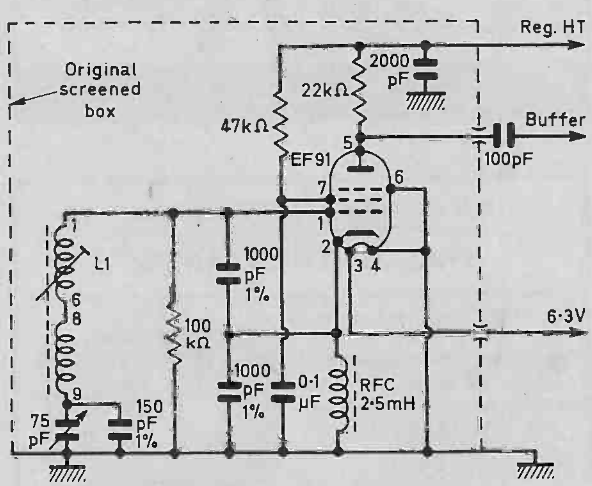
It is only necessary to adjust the core of L1 until coverage is from 1·75MHz to 2·0MHz, with a little to spare at the extreme settings of the v.f.o. tuning capacitor.

For 160m, the dial is calibrated from 1·8-2·0MHz. For the 80m band, frequencies from 1·75-1·9MHz are doubled, giving coverage of 3·5MHz to 3.8MHz.

Buffer and PA

Fig. 2 shows the switching of the buffer amplifier and p.a. circuits. S1 is a single pole 2-way rotary wafer switch, mounted under the chassis, below the v.f.o. tuning control. L2 is for 160m, and is a Denco "Blue" Range 2 coil, with the small coupling winding wholly removed. L3 is for 80m, and is a Denco "Red" Range 2 coil the small winding being removed, and 28 turns taken off the tuned winding.

These coils are under the chassis, with the threaded rods above. The switch S1 is set for 160m, the v.f.o. tuned to about 1·9MHz, and L2 core peaked for best p.a. grid current. With the v.f.o. tuned to about 3.7MHz, and S1 at 80m, L3 is similarly adjusted.



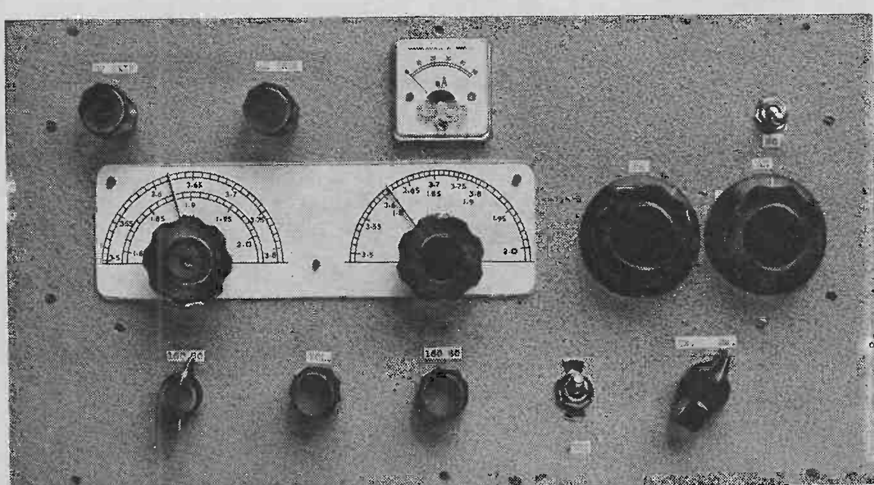
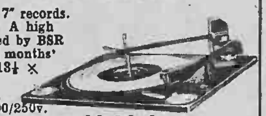


Fig. 1. (above) shows the circuit of the modified v.f.o. stage using readily available components.

The photograph (left) will assist in identifying the additional components required for 2-band operation. The receiver bandswitch is below the receiver tuning dial at the left of the panel. The b.a. bandswitch S1 is below the v.f.o. dial, centre. The p.a. bandswitch is located in the top right hand corner of the panel.

—continued on page 390

BSR 4-SPEED SUPERSLIM
AUTO RECORD CHANGER



Plays 12", 10" or 7" records. Auto or Manual. A high quality unit backed by BSR reliability with 12 months' guarantee. Size 13¼ × 11¼in. Above motor board 3¼in. below 2½in. AC 200/250v.

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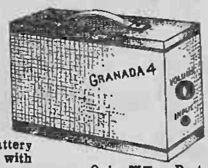

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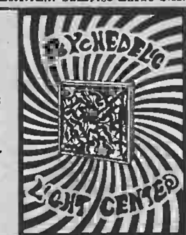

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practically wireless commentary by HENRY

No. 71

The Facer Faced

THE paths of progress are many and devious. Woe betide the inventive gambler who stakes his all on a technical dead-end. Pitying, progress watches the John Logie Bairds picking up the shards of mirror from a dusty floor, and sweeps on to electronic miracles that we unfeeling fellows take in our stride.

The rewards of progress come closer home. Henry is inspired this month by a recent visit to a Mullard Film Show, where Ian Nicholson was in fine form, chiding his audience because they dared to query the reliability of integrated circuits, and were so reactionary as to want plug-in devices.

Plugs and sockets are a technological cul-de-sac, we were given to understand. Despite the arguments of some industrial electronics boys who were slumming in Bristol that night, the signposts decidedly pointed to a 'solder-in, de-solder out' future, with aspirated soldering irons and a ruined 'chip'. 'What does it matter, if you have to break it to take it out?' said Mr. N., 'If you test intelligently, you will know it is faulty *before* you get to that stage. The emphasis must be upon logical diagnosis.'

But, of course, the implication was that things never went wrong with Mullard chips, and when one chap persisted he was asked in what sphere these plug-in whatsits were to be found. It turned out that he was a shipboard electronics engineer. 'Oh, that explains it,' said Mr. Nicholson, 'I-Cs on the 'igh seas.'

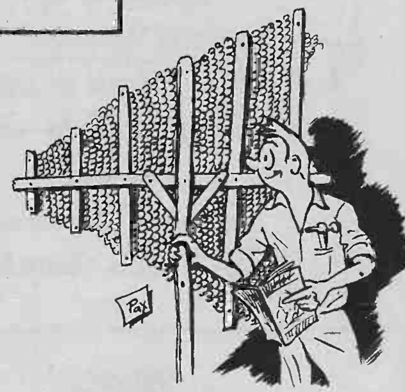
He can be a tongue-tied mug.

Henry often wishes he had the gift of turning away the awkward question and dissolving his audience in friendly laughter. When things go wrong at one of his lectures, he can be a tongue-tied mug. Only last week there was the most appalling faux pas.

The occasion was a lecture on recording, and a number of musical illustrations had been taped. For the purposes of demonstration these were at different speeds and as is usual with one of Henry's lectures, time had us all by the forelock. A complicated chart had to be drawn on a rickety blackboard, demanding the utmost concentration, both to prevent the latter falling and the former degenerating into illegible graffiti. Henry craftily set the trusty 2000 in motion as he drew . . . and drew. . . .

Minutes later, as a man dredges up his consciousness from dreamland, Henry became aware of something vaguely wrong. The horns of the New York Philharmonic had never sounded like that, no, not even in Mahler's day.

I am ashamed to say that, without blinking an eyelid, our villain said: 'Let's go on to the third movement,' and while winding the tape forward, slyly switched the tape recorder to its higher, correct speed. And none of the class protested, although one did telephone the next day to say: 'What *was* that piece you played just after the interval?'



. . . chicken wire and wood batten.

Such a contretemps can happen to anybody. In the wireless world it happens even to the boffins. A little while ago, the British engineers at the Gloucester factory of Bang & Olufsen were instructed by their parent factory in Denmark to make one or two modifications to a stereo tuner-amplifier to cure 'viups'. Their radio wizard made the changes and noted an improvement in stability, especially at the top of the medium wave band.

A message went off to Denmark: 'Viups cured—what are they please?' And the answer returned from the Danes: 'Isn't it obvious? That's the sound the receiver makes when the fault is present!' And it was.

By the same token, Henry's new FET-IC tuner has a fault best described as Fizzz-crick-Hhhh!

But the trouble there is very simple; largely mechanical. Henry is patiently waiting for Gordon King or one of his colleagues to publish another of those revealing articles in *Practical Wireless* which show how an effective loft FM aerial for stereo multiplex FM reception 80 miles from the transmitter in the shadow of a hill can be constructed from a bale of chicken wire and a few lengths of wood batten.

PROJECT

Autumn

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

RULES.

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

ENTRY FORM

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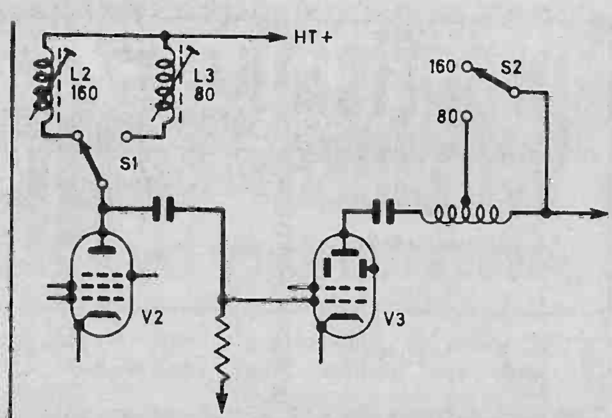

Fig. 2. Switching arrangements for 2-band operation of the b.a. and p.a. stages.

Lock v.f.o. and buffer/doubler cores with 6BA nuts. On 80m S2 shorts out one-half of the tank coil and is a toggle switch, fitted to the panel immediately behind the coil.

Receiver Coils

Readily-available Denco coils are used for 160m and 80m, in the receiver section, Range 2 coils for 160m, and Range 3 coils for 80m. "Blue" coils are required for the aerial circuit, "Yellow" coils for the mixer grid, and "Red" coils for the oscillator.

The Range 2 "Blue" and "Yellow" coils each have 32 turns removed from the tuned winding.

Count these as they are unwound, and re-solder the wire to the pin. The "Red" coil for this band has 20 turns removed from the tuned winding.

A rotary wafer switch with three wafers, each having 2-pole 2-way sections, is fitted under the chassis below the ganged tuning capacitor. Connections for the coils are as follows:

Blue. 1 and 9 to chassis. 8 to aerial, via switch. 6 to r.f. grid, via switch.

Yellow. 8 to h.t. positive. 1 to chassis. 9 to r.f. anode via switch; 6 to mixer grid via switch.

Red. Range 2: 9 to chassis. 2 to 300pF padder, returned to chassis. 8 to oscillator anode capacitor via switch. 1 to oscillator grid capacitor via switch. Range 3: As Range 2, but no padder and pin 3 wired directly to chassis.

An individual 60pF trimmer is wired across the tuned section of "Yellow" and "Red" coils. Aerial coils are peaked with the panel trimmer. Coverage is of the 160m and 80m bands, with a little to spare, and the cores and trimmers are adjusted in the usual way. ■

LiND-AiR AUDiO

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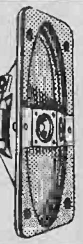

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J1008	7"	L.P.	PVC	1800ft.	17/6	P & P 2/6
J1009	7"	D.P.	Poly	2400ft.	25/-	P & P 2/6
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C90 Cassette (Library cased)					13/-	P & P 1/-
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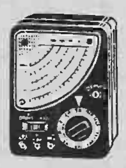
C.1001 MULTI-TESTER



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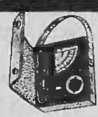
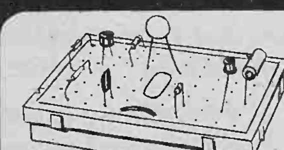
62D. MULTI-TESTER



20,000 p.p.v. DC voltage 5 - 25 - 50 - 250 - 500 - 2. 5 K (20,000 ohms per volt). AC voltage: 10-50-100-500-1000 volts (10,000 ohms per volt). DC Current: 0-50 uA, 0-2.5 mA, 0-250 mA. Resistance; 0-6K, 0-6 Mg (300 ohm and 30K at centre scale). Capacitance: 10f. to .001 mfd. .001 uf to .1 uf. Decibels: —20 to + 22dB. Size 4¾ x 3½ x 1in. **71/-** P. & P. 3/6.

S-DEC BREADBOARD



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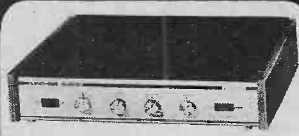

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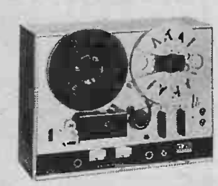

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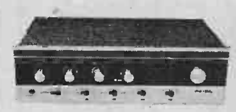

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28733	9/6	BFY64	8/6	OCP71	19/6
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AAY12	5/-	BLY11	22/6	ORP60	8/-

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A TWO-TONE TESTER

A.S. CARPENTER G3TYJ

THERE is nothing unique in the circuitry presented here being rather a practical presentation of a transistorised device very useful in the modern amateur radio station. The device may also be used in other ways as will be mentioned later. It is easily copied and can be constructed in a few hours and will cost approximately 35s. even if every item has to be purchased. As the illustration shows the finalised unit is attractive in appearance and ruggedly built.

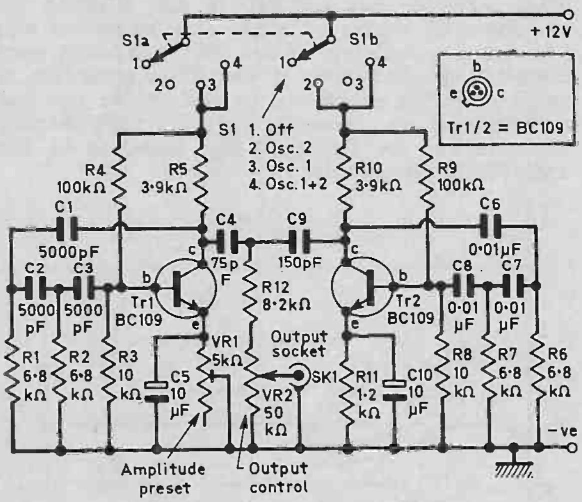


Fig. 1. Circuit of the Two-Tone Tester.

The use of a two-tone audio oscillator unit in conjunction with a suitable oscilloscope is the accepted way of adjusting a single-sideband transmitter and it is convenient if the tones used approximate to 1000 and 2000Hz.

The phase-shift type oscillator employing a ladder network is one of the simplest ways of producing a sine wave in conjunction with a single transistor. The required degree of phase-shift between input and output circuits necessary to ensure reliable oscillations at audio frequency can be obtained by using a transformer as the feedback element.

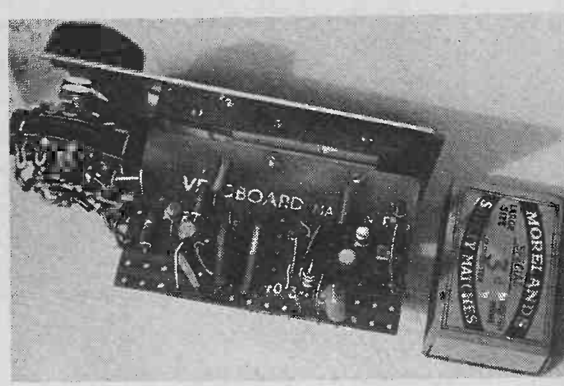
Control of the operating frequency is not easily achieved in this way however and it is preferable to dispense with the transformer and to use capacitors connected in series between input and output. Resistors associated with the feedback capacitors complete the RC network.

Circuit

The complete circuit of the two-tone oscillator is given in Fig. 1 and will be seen to comprise two separate phase-shift audio oscillators. Resistor values used in each are identical but capacitors differ. The output is fed via a crude attenuator to outlet socket SK1, blocking capacitors C4 and C5 being chosen to offer similar reactance at the differing output frequencies.

Switch S1 offers four alternatives and when at position '1' the unit is 'Off'. At position '2' the output should approximate to 1000Hz whilst at position '3' 2000Hz signals are available. Both tones are available when position '4' is selected. The output amplitudes are equalised by preset potentiometer VR1. If necessary resistor R11 may also be a preset potentiometer but this has not been found necessary.

The purist might consider it an advantage however to make both VR1 and R11 2kΩ preset potentiometers with capacitors C5 and C10 connected to the respective sliders thereby introducing a degree of waveshaping. Dissimilar output amplitudes can also be equalized by making either R4 or R9 partially variable.



A very useful instrument in a very small space!

Construction

The oscillators can be accommodated on a piece of Veroboard measuring approximately 3¼ x 1⅞in. with 0.1in. matrix and ten conductor strips are required. Considerable thought has been given to the layout and, due to this, little preparation of the Veroboard is required.

Looking at Fig. 2 it is seen that after cutting a piece of the board to suit it is only necessary to cut the strips in six places, indicated by 'X', along strips D, E, F, G, I and J.

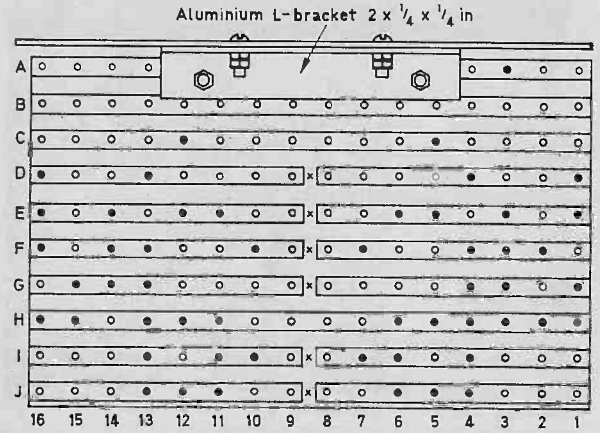


Fig. 2. Circuit board showing breaks required in conductor strips.

The Veroboard is then turned over and with the conductor strips on the underside the various small components are positioned as shown in Fig. 3. It is desirable to use modern high grade miniature resistors and capacitors and to test them prior to soldering them into position.

A piece of 18s.w.g. aluminium, 5 x 2¾in., is required for the panel and the Veroboard is fixed to this using a small L-bracket with ¼in. sides and approximately 2in. in length. The panel is connected to earth by the link wire indicated in Fig. 3. The panel also carries the function switch, attenuator and outlet socket; these components together with essential dimensions and the remainder of the wiring can be seen in Fig. 4.

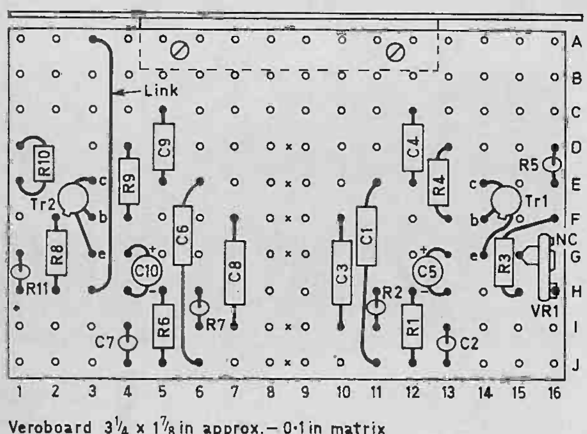


Fig. 3. Component layout on top of circuit board.

★ components list

Resistors:

R1	6·8kΩ	R7	6·8kΩ
R2	6·8kΩ	R8	10kΩ
R3	10kΩ	R9	100kΩ
R4	100kΩ	R10	3·9kΩ
R5	3·9kΩ	R11	1·2kΩ
R6	6·8kΩ	R12	8·2kΩ

All ¼W 10%

VR1 5kΩ skeleton pot.
VR2 50kΩ miniature pot.

Capacitors:

C1	5000pF ceramic	C6	0·01μF ceramic
C2	5000pF ceramic	C7	0·01μF ceramic
C3	5000pF ceramic	C8	0·01μF ceramic
C4	75pF ceramic	C9	150pF ceramic
C5	10μF12VW elec.	C10	10μF 12VW elec.

Semiconductors:
Tr1/2 BC109

Miscellaneous:
Switch, 2 pole 4 way wafer. Veroboard 3¼ x 1⅞in, 0·1in. matrix. Panel, 5 x 2¾in., 18 s.w.g. aluminium. Output socket. Knobs. Case.

Testing

The prototype was tested by connecting the output to an oscilloscope which showed a satisfactory waveform when the Tr2 circuit was functioning. The other oscillator was switched in and adjusted for amplitude by means of VR1. This waveform was also found satisfactory. When both oscillators were operating simultaneously it was found necessary to make a small re-adjustment to VR1, which also had an effect on the operating frequency. The outputs were checked for frequency and found to be 950 and 1900Hz respectively.

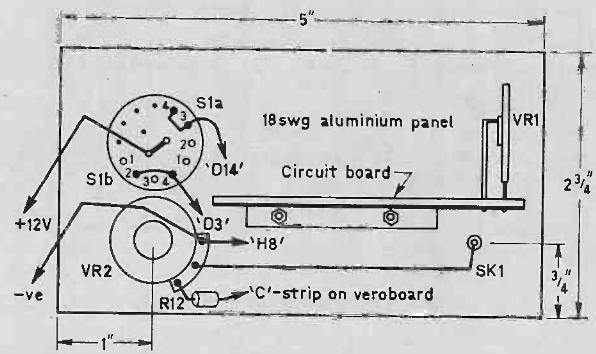
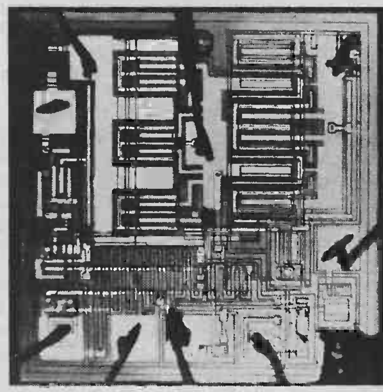


Fig. 4. Mounting of circuit board, function switch, attenuator and output socket on panel.

Conclusion

Although intended mainly for use when adjusting s.s.b. transmitters other uses for the unit are possible and some will doubtless spring to mind! If preferred only one half of the unit, a single sine-wave oscillator, may be constructed. Recording enthusiasts may find the device useful as a 'Tape Tailer' and if its signal is introduced as the recording nears the end of the tape, on playback the warning note will save much re-threading on to an empty spool! ■

MONOLITHIC INTEGRATED CIRCUIT HIGH FIDELITY AMPLIFIER AND PRE-AMP



the world's most advanced high fidelity amplifier

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

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

■ SPECIFICATIONS

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

■ CIRCUIT DESCRIPTION

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

■ APPLICATIONS

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

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

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Z.30 20 WATT R.M.S. POWER AMPLIFIER (40 WATTS PEAK)

The Z.30 together with the higher powered Z.50 are both of advanced design using silicon epitaxial planar transistors to achieve unsurpassed standards of performance. Total harmonic distortion is an incredibly low 0.02% at full output and all lower outputs. Whether you use the Z.30 or Z.50 power amplifiers in your Project 60 system will depend on personal preference, but they are both the same physical size and may be used with other units in the Project 60 range equally well. The Z.30 is unique in that it may be used with any power source between 8 and 35 volts without need for adjustment and may thus be driven from a car battery for example. For operating from mains, for the Z.30 use PZ.5 power supply unit for most domestic requirements, or PZ.6 if you have very low efficiency loudspeakers. For Z.50, use the PZ.5, PZ.6 or the PZ.8 described below.

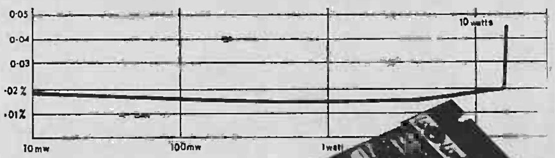
SPECIFICATIONS

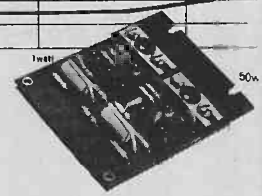
Power Outputs

Z.30 15 watts R.M.S. into 8 ohms, using 35V: 20 watts R.M.S. into 3 ohms using 30 volts.
Z.50 40 watts R.M.S. into 3 ohms: 30 watts R.M.S. into 8 ohms, both continuous, using 50V.
Frequency response 30 to 300,000 Hz ± 1 dB
Distortion 0.02% into 8 ohms
Signal to noise ratio better than 70 dB unweighted
Input sensitivity 250mV into 100 Kohms
For speakers from 3 to 15 ohms impedance
Size 3½" x 2¼" x ½"

Z.50 40 WATT R.M.S. POWER AMPLIFIER (80 WATT PEAK)

APPLICATIONS
Hi-fi amplifier; car radio amplifier; record player amplifier fed directly from pick-up; intercom; electronic music and instruments; P.A.; laboratory work etc. Full details for these and many other applications are given in the manual supplied with the Z.30.





Power versus distortion curve of Sinclair Z.30 and Z.50

The Z.50 is completely interchangeable with the Z.30 and can be used in all Z.30 applications

Z.30 *Built tested and guaranteed with circuits and instructions Manual* **89/6**

Z.50 *Built, tested and guaranteed with circuits and instructions manual* **109/6**

STEREO 60 Pre-amplifier and tone control unit

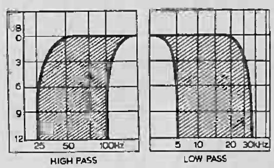
The Stereo 60 is a stereo preamplifier and control unit designed for the Project 60 range but suitable for use with any high quality power amplifier. Again silicon epitaxial planar transistors are used throughout and great attention has been paid to achieving a really high signal-to-noise ratio and excellent tracking between the two channels. Input selection is by means of push buttons and accurate equalisation is provided for all the usual inputs. The tone controls are also very carefully designed and tested.

- Input sensitivities—Radio—up to 3mV Mag. p.u.—3mV: correct to R.I.A.A. curve ±1dB: 20 to 25,000Hz. Ceramic p.u.—up to 3mV: Aux.—up to 3mV.
- Output—250mV
- Signal-to-noise ratio—better than 70 dB.
- Channel matching—within 1dB.
- Tone controls—TREBLE +15 to −15dB. at 10 kHz: BASS +15 to −15dB at 100Hz.
- Power consumption 5mA.
- Front panel—brushed aluminium with black knobs and controls.
- Size 8¼ x 1½ x 4 ins.

Built, tested and guaranteed **£9.19.6**

ACTIVE FILTER UNIT High Pass and Low Pass

For use between Stereo 60 unit and to Z.30s or Z.50s, the Active Filter Unit matches the Stereo 60 in styling and is as easily mounted. It is unique in that the cut-off frequencies are continuously variable, and as attenuation in the rejected band is rapid (12dB/octave), there is less loss of the wanted signal than has previously been possible. Amplitude and phase distortion are negligible by reason of the careful design and generous negative feed back employed.
Supply voltage—15 to 35V. Current—3mA
H.F cut-off (−3dB) variable from 28kHz to 5kHz.
L.F cut-off (−3dB) variable from 25Hz to 100Hz.
Filter slope, both sections 12dB per octave
Distortion at 1kHz (35V supply) 0.02% at rated output



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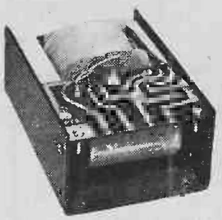
BUILDING A PROJECT 60 ASSEMBLY

The illustration here shows quite clearly how easily Project 60 can be contained in one of today's slim, modern plinths. Very little space is required to house these Sinclair units, and within the space of the motor plinth, you can install a stereo amplifier of the very highest quality. If, for example you have already put together an assembly as illustrated here, adding the Active Filter Unit would be very easy.

The new Project 60 Manual — 50 pages 2/6d.

SINCLAIR POWER SUPPLY UNITS



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

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5Y3GT	6/-	6F11	6/6	6SL7GT	6/-	12C8GT	5/-	30P12	16/-	ATP7	8/6
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6/30L2	15/-	6F14	12/6	6SQ7	7/6	12J5GT	2/6	30PL1	16/-	AU5	8/9
6A7	15/-	6F23	16/-	6U4GT	12/-	12J7GT	6/6	30PL13	18/6	AZ1	8/-
6A8G	12/6	6F24	14/-	6U5G	7/9	12K7GT	7/-	30PL14	15/-	AZ31	10/-
6AC7	4/-	6F25	15/-	6V6M	12/-	12K8GT	8/-	35A5	12/6	CBL31	16/-
6AK5	5/-	6F28	14/-	6V6G	4/6	12Q7GT	6/-	35L6	9/-	CCH35	15/-
6AM5	4/6	6F32	2/9	6V6GT	6/6	12SA7	8/-	35W4	4/6	CL33	20/-
6AM6	3/6	6G6	3/6	6X4	4/6	12SG7	6/-	35Z3	10/-	CV450	25/-
6AQ5	6/3	6H6	3/-	6X5G	4/6	12SH7	3/-	35Z4GT	8/6	CY30	12/6
6AS7G	15/-	6J5M	9/-	6X5GT	6/-	12SJ7	3/9	35Z5	6/-	CY31	8/6
6AT6	4/9	6J5G	4/-	7B6	11/6	12SK7	4/9	37	6/6	DAC32	7/-
6AU6	5/-	6J5GT	5/6	7B7	7/6	12SR7	5/-	42	6/-	DAF91	4/6
6B4G	20/-	6J6	3/6	7C5	22/6	14H7	9/6	50B5	6/6	DAF96	7/6
6B8G	2/-	6J7M	8/6	7C6	15/-	19AQ5	5/-	50C5	6/3	DCC90	20/-
6BA6	5/-	6J7G	6/-	7D5	8/-	20D1	10/-	50CD6G	31/-	DF33	8/-
6BE6	5/-	6J7GT	7/6	7H7	6/6	20F2	14/-	50L6GT	8/-	DF70	9/-
6BH6	9/-	6K6GT	8/-	7R7	13/-	20L1	20/-	75	9/6	DF91	4/-
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DY87	6/6	EF41	10/-	KT61	22/6	PCL85	9/3	T41	17/6	UY41	8/6
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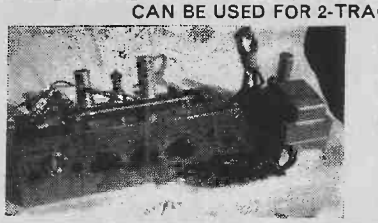

Chassis 12½ x 5½ x 4½in. high. Plastic front panel finished in Black and "Silver". 200-250 A.C. Record/Playback amp. switch; Off/On-Tone. Vol./Mc.; Vol./Gram; Mic. Input: Gram. Input; Valves 6BR7; 12AX7; EM84; EL84 and EZ80. Separate Output Transformer (Already wired to amp). **PRICE £12** (10/- P. & P.). 3-ohm speaker 7" x 4" 16/- extra.

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2 x 3 Watts for 200-250V. A.C.

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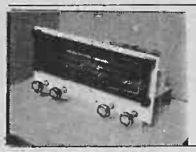

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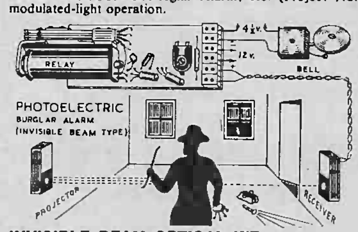

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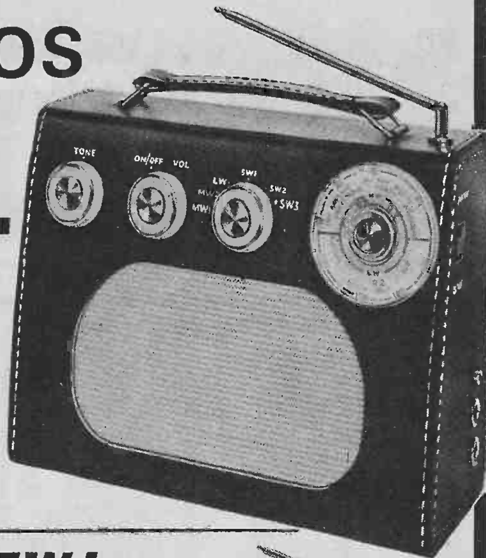
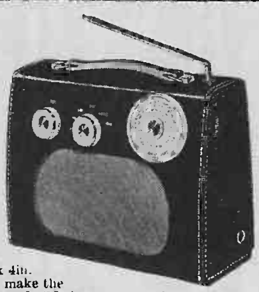


NEW! roamer eight mk 1
WITH VARIABLE TONE CONTROL

7 Tunable Wavebands: Medium Wave 1, Medium Wave 2, Long Wave, SW1, SW2, SW3 and Trawler Band. Built in Ferrite Rod Aerial for Medium and Long Waves. Five section 22in. chrome plated Telescopic aerial for Short Waves can be angled and rotated for maximum performance. Push pull output using 600 mW transistors. Socket for car aerial. Tape record socket. Selectivity switch. Switched earpiece socket complete with earpiece for private listening. Eight transistors plus 3 diodes. Famous make 7in. x 4in. Speaker. Air spaced ganged tuning condenser. On/Off switch volume control. Wave change switch and tuning control. Attractive case in rich chestnut shade with gold blocking. Size 9 x 7 x 4in. approx. Easy to follow instructions and diagrams make the Roamer Eight a pleasure to build. Total Building Costs **£6.19.6**
Parts Price List and Easy Build Plans 5/- (FREE with parts). P. & P. 7/6

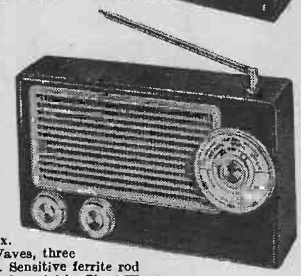
roamer seven mk IV



SEVEN FULLY TUNABLE WAVEBANDS—MW1, MW2, LW, SW1, SW2, SW3 and Trawler Band. Extra Medium waveband provides easier tuning of Radio Luxembourg, etc. Built in ferrite rod aerial for Medium and Long Waves. Retractable 4 section 24in. chrome plated telescopic aerial for peak Short Wave listening. Socket for Car Aerial. Powerful push-pull output. Seven transistors and two diodes including Micro-Alloy R.F. Transistors. Famous make 7 x 4in. P.M. speaker. Air spaced ganged tuning condenser. Volume/on/off control, wave change switches and tuning control. Attractive case with carrying handle. Size 9 x 7 x 4in. approx. Easy to follow instructions and diagrams make the Roamer 7 a pleasure to build. Parts price list and easy build plans 3/- (FREE with parts). Personal Earpiece with switched socket for private listening, 5/- extra.

Total building costs **£5.19.6** P. & P. 7/6

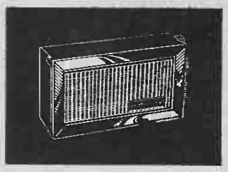
NEW! trans eight
SIX WAVEBAND PORTABLE WITH 3in. SPEAKER



Attractive case in black with red grille and cream knobs and dial with polished brass inserts. Size 9 x 5½ x 2¾in. approx. Tunable on Medium and Long Waves, three Short Waves and Trawler Band. Sensitive ferrite rod aerial for M.W. and L.W. Telescopic aerial for Short Waves. Eight improved type transistors plus 3 diodes. Push pull output. Battery economiser switch for extended battery life. Ample power to drive a larger speaker. Parts price list and easy build plans 5/- (FREE with parts). Earpiece with switched socket for private listening 5/- extra.

Total building costs P. & P. 5/6 **89/6**

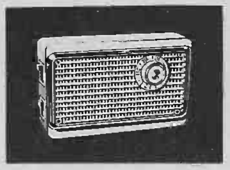
pocket five
MEDIUM WAVE, LONG WAVE AND TRAWLER BAND PORTABLE WITH SPEAKER



Attractive black and gold case. Size 5½ x 1¼ x 3½in. Tunable over both Medium and Long Waves with extended M.W. band for easier tuning of Luxembourg, etc. 7 stages—5 transistors and 2 diodes, supersensitive ferrite rod aerial, fine tone moving coil speaker. Easy build plans and parts price list 1/6 (FREE with parts).

Total building costs **44/6** P. & P 3/6

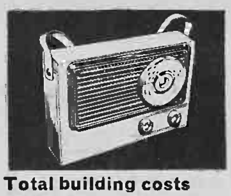
transona five
MEDIUM WAVE, LONG WAVE AND TRAWLER BAND PORTABLE WITH SPEAKER



Attractive case with red speaker grille. Size 6¼ x 4¼ x 1½in. 7 stage—5 transistors and 2 diodes, ferrite rod aerial, tuning condenser, volume control, fine tone moving coil speaker. Easy build plans and parts price list 1/6 (FREE with parts).

Total building costs **47/6** P. & P. 3/9

roamer six
SIX WAVEBAND PORTABLE WITH 3in. SPEAKER



Attractive case with gilt fittings. Size 7½ x 5¼ x 1½in. Tunable on Medium and Long waves, two short waves, Trawler Band Plus an extra M.W. band for easier tuning of Luxembourg, etc. Sensitive ferrite rod aerial and telescopic aerial for Short waves. 8 stages—6 transistors and 2 diodes including Micro-Alloy R.F. Transistors etc. (Carrying strap 1/6 extra). Easy build plans and parts price list 2/-. (FREE with parts). (Note: When present stocks of these cases are exhausted a new case similar to "Transeight" will be supplied).

Total building costs **79/6** P. & P. 4/6

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2N3054	14/3	2N5458	9/9	BA156	4/-	BF194	7/-	ZTX500	5/-
2N3055	16/-	2N5459	9/9	BA130	4/6	BF195	7/6	ZTX501	5/-
2N3325	10/9	40250	14/3	BA145	5/6	BFX29	10/9	ZTX502	6/-
2N3663	11/6	40361	12/6	BC107	2/9	BFX84	7/5	ZTX503	5/-
2N3702	3/6	40362	16/-	BC108	2/6	BFX85	8/3	ZTX504	12/-
2N3703	3/3	40406	16/3	BC109	2/9	BFX87	8/6	ZTX530	5/5
2N3704	3/9	40408	14/6	BC125	12/-	BFX88	6/9	ZTX531	6/9
2N3705	3/5	40430	37/-	BC126	12/-	BFY50	4/6		

RESISTORS

Code	Power	Tolerance	Range	Values available	1 to 9	10 to 99 (see note below)	100 up
C	1/20W	5%	82 Ω–220K Ω	E12	·18	16	15
C	1/8W	5%	4·7 Ω–330K Ω	E24	2·5	2	1·75
C	1/4W	10%	4·7 Ω–10M Ω	E12	2·5	2	1·75
C	1/2W	5%	4·7 Ω–10M Ω	E24	3	2·5	2·25
C	1W	10%	4·7 Ω–10M Ω	E12	6	5	4·5
MO	1/2W	2%	10 Ω–1M Ω	E24	9	8	7
WW	1W	10% ± 1/20 Ω	0·22 Ω–3·9 Ω	E12		15d all quantities	
WW	3W	5%	12 Ω–10K Ω	E12		15d all quantities	
WW	7W	5%	12 Ω–10K Ω	E12		18d all quantities	

Codes: C = carbon film high stability low noise
MO = metal oxide Electrosil TR5 ultra low noise
WW = wire wound Plessey.

Prices are in pence each for same ohmic value and power rating, NOT mixed values. (Ignore fractions of 1d. on total resistor order)

Values:
E12 denotes series: 10, 12, 15, 18, 22, 27, 33, 39, 47, 56, 68, 82 and their decades.
E24 denotes series: as E12 plus 11, 13, 16, 20, 24, 30, 36, 43, 51, 62, 75, 91 and their decades.

INTEGRATED CIRCUIT AMPLIFIERS

SINCLAIR IC10 complete with instruction book giving amplifier circuit details and range of applications. 59/6 nett.

PLESSEY SL403A Now only 42/6 nett 3W into 7·5 Ω for 18V supply. Application data sent with two more.

WAVECHANGE SWITCHES LONG SPINDLES

1P 12W; 2P 6W; 3P 4W; 4P 3W — 4/9 each

SLIDER SWITCHES D.P.D.T. — 3/- each

NEON INDICATOR LAMPS

all 200/250V. Square bezel, red only — 3/9
Round chrome bezel red, amber, clear — 4/9 each

Toggle switches, 250V a.c. 1.5A.
chrome dolly and chrome milled nut S.P.S.T. 3/9; S.P.D.T. 4/6; D.P.D.T. 5/9; S.P.D.T. centre off 5/-.

S-DeC's put an end to "birdsnesting". Components just plug in. Saves valuable time. Use components again and again. S-DeC only 30/-. Compact T-DeC, increased capacity, may be temperature-cycled. T-DeC only 50/- post free. Full range stocked.

MULLARD polyester C280 series

250V 20%: 0·01; 0·022; 0·033, 0·047 8d ea. 0·068; 0·1 9d ea., 0·15 11d., 0·22 1/-, 10%: 0·33 1/5, 0·47 1/8, 0·68 2/3, 1μF 2/9. 1·5μF 4/2, 2·2μF 4/9.

MULLARD SUB-MIN ELECTROLYTIC

C426 range axial lead — 1/3 each

Values (μF/V): 0·64/64; 1/40; 1·6/25; 2·5/16; 2·5/64; 4/10; 4/40; 5/64; 6·4/6·4; 6·4/25; 8/4; 8/40; 10/2·5; 10/16; 10/64; 12·5/25; 16/40; 20/16; 20/64; 25/6·4; 25/25; 32/4; 32/10; 32/40; 32/64; 40/16; 40/2·5; 50/6·4; 50/25; 50/40; 64/4; 64/10; 80/2·5; 80/16; 80/25; 100/6·4; 125/4; 125/10; 125/16; 160/2·5; 200/6·4; 200/10; 250/4; 320/2·5; 320/6·4; 400/4; 500/2·5.

LARGE CAPACITORS

High ripple current types: 1000/25 5/6; 1000/50 8/2; 1000/100 16/3; 2000/25 7/4; 2000/50 11/4: 2000/50 11/4; 2000/100 28/9; 2500/64 15/5; 2500/70 19/6; 5000/25 12/6; 5000/50 21/11; 5000/100 58/3; 10000/15 17/-; 10000/25 24/6; 10000/50 44/-; 10000/70 61/-.

MEDIUM RANGE ELECTROLYTICS

Axial leads: 50/50 2/-; 100/25 2/-; 100/50 2/6; 250/25 2/6; 330/25 2/6; 250/50 3/9; 500/25 3/9; 500/50 4/6; 1000/25 4/-; 1000/50 6/-; 2000/25 6/-.

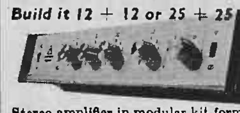
SMALL ELECTROLYTICS

Axial leads: 4·7/10; 4·7/25; 5/50 1/- ea. 10/10; 10/25; 10/50, 33/10; 50/10 1/- ea. 22/25; 25/50; 47/25; 100/10; 220/10 1/3 ea.

PEAK SOUND PRODUCTS

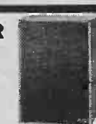
ENGLEFIELD CABINET KITS

Build it 12 + 12 or 25 + 25



Stereo amplifier in modular kit form 12 watts per channel £38/9/-; 25 watts £58/15/- Cabinet kit only £6. These prices nett.
As recently reviewed in Hi Fi Sound.

BAXANDALL SPEAKER SYSTEM



Designed by Peter Paxandall. Superb reproduction for its size. Handles 10 watts with ease. Uses ELAC 15 Ω 59RM109 speaker Unit. Kit £13/12/ nett; built £19/8/6 nett.

STEREO AMPLIFIER S.A. 10-10.

Developed from the very successful SA.8–8 amplifier giving first class stereo amplification featuring separate volume controls for each channel, bass and treble controls. 10 watts per channel into 5 to 8 Ω. Kit £19/7/6 nett; built £24/16/8 nett. Suitable 8 Ω wide range soeakers available £13/15/- each nett.

MAINLINE AMPLIFIER KITS

RCA/SGS designed main amplifier kits.
Input sensitivity 500–700mV for full output into 8 Ω.

Power	Kit price including components	Suitable unreg. power supply kit
12W	168/- nett	92/-
25W	190/- nett	N/A
40W	210/- nett	115/1
70W	252/- nett	138/10

30 WATT BAILEY AMP. PARTS

Special summer reduction (to Sept. 30th 1970 only)
Sensitivity 1·2V for full output into 8 Ω
Transistors for one channel £7/5/6 list, **£6** only nett.
Transistors for two channels £14/11/- list **£11** only nett.
Capacitors and resistors (metal oxide) **30/-** per channel nett.
Complete unregulated power supply kit **87/6** nett

ZENER DIODES

5% full range E24 values: 400mW: 2·7V to 30V 4/6 each 1W: 6·8V to 82V 9/- each 1·5W: 4·7V to 75V 12/- each Clip to increase 1·5W rating to 3 watts (type 266F) 9d.

CARBON TRACK POTENTIOMETERS, long spindles

Double wiper ensures minimum noise level.

Single gang linear	220 Ω, to 2·2M Ω	2/6
Single gang log	4·7K Ω to 2·2M Ω	2/6
Dual gang linear	4·7K Ω to 2·2M Ω	8/6
Dual gang log	4·7K Ω to 2·2M Ω	8/6
Log/antilog	10K, 47K, 1M Ω only	8/6
Any type with ½A D.P. mains switch, extra		2/3

Please note: only decades of 10, 22 and 47 are available within ranges quoted.

CARBON SKELETON PRE-SETS

Small high quality, type PR, linear only 100 Ω, 220 Ω 470 Ω, 1K, 2K2, 4K7, 10K, 22K, 47K, 100K, 220K, 470K, 1M, 2M2, 5M, 10M Ω Vertical or horizontal mounting 1/- each.

COMPONENT DISCOUNTS

10% on orders for components for £5 or more. 15% on orders for components for £15 or more (No discount on nett items).

POSTAGE AND PACKING

Free on orders over £2. Please add 1/6 if under. Overseas orders welcome: carriage charged at cost.

ELECTROVALUE (Dept. PW.8) 28 ST. JUDES ROAD, ENGLEFIELD GREEN, EGHAM, SURREY
Hours: 9—5.30: Sat. 1 p.m. Tel.: Egham 5533 (STD 0784-3) Telex 264475

TRANSISTORS etc.

				OC26	7/6	OC81	2/6
				OC28	8/6	OC81D	2/3
AC107	3/-	OA5	1/6	OC35	9/-	OC82D	2/6
AC126	2/3	OA9	1/8	OC44	2/9	OC140	5/-
AF115	3/-	OA10	1/6	OC45	2/3	OC169	3/6
AF116	3/-	OA47	1/9	OC70	2/3	*OC170	4/-
*AF117	4/-	OA81	1/6	OC71	2/3	OC171	2/3
BFY18	4/6	OA85	1/6	OC72	2/3	OC202	4/6
BFY51	4/-	OC23	6/6	OC73	2/3	TK22C	1/6
GET113	2/6	OC25	6/-	OC75	2/3	General purpose	1/6

* WITH 4 LEADS

SILICON DIODE RECTIFIERS—BY 100—**2/10 EACH**
SIX AMP. SERIES: BYZ13 300 PIV **4/-** BYZ12 600 PIV **5/-**
BYZ11 900 PIV **6/-**. BYZ10 1200 PIV **7/-**
THYRISTORS: 5 AMP SERIES 100 PIV **7/6**. 200 PIV **9/-**
300 PIV **10/6** 400 PIV **12/-** 800 PIV **25/-**
10 AMP SERIES. 50 PIV **10/-** 100 PIV **12/-**
(POSTAGE PACKING & INS. ON ALL ABOVE, 1/- UP TO 11, 12 & OVER PAID
MULLARD STACK F. W. BRIDGE 12A 100 PIV **39/6** (3/-)

ELECTROLYTIC CONDENSERS
Full details of many types from 6d each in our list (see below).

SUB-MIN TRANSFORMER: Output (3 Ω for OC72 etc) **2/9** driver, **3/-** (up to 6 either **1/-**).
MULTIMETER: 20,000 Ω/V D.C., 10,000 Ω/V A.C. 0–5/25/50/500/1K volts D.C. ●–10/50/100/500/1K volts A.C. ●0–50μA 2.5mA/250mA D.C. ●0–6K Ω/6 meg Ω. ●10μF–.001mfd/1mfd. ●-20 to ×22dB. ●Complete with test leads and instructions– ●Over-load protected 1970 model with every refinement. **£4.10.0** (2/6). **JUNIOR MODEL** at **47/6** (2/6). 1000 Ω/V described in free list. Spec. subject to slight variation.
SOLDERING IRON. Slim Mod. British High speed, 8¼in., all parts replaceable, fully guaranteed for professional, radio and general D.I.Y. use, 19/6 (1/6).

DIAMOND STYLII
Replacements for BSR TC8LP, TC8/8 and TC8LP/STEREO: COLLARO "O"; RONETTE BF40LP; GARRARD GC2LP and GC8LP; ACOS GP65/67: all at **7/6** each (1/-). ACOS GP73 and GP91: **BSR ST4** (ST3. ST5), ST8 (ST9); **SONOTONE** 8TA, 9TA and 9TAHC: **PHILIPS** AG3306, 3060, (3063, 3066, 3301, 3302, 3304), all at **15/-** (1/-). All are of the very highest quality.
DOUBLE DIAMOND Types: If you don't use the 78 side—this is the best buy—now available only in **ST4** (ST3, ST5,). ST9 (ST8). 9TA. 9TAHC. 3306. GP91 (for GP92, 93 and 94 Cartridges and GP91SC for GP91SC cartridges. **30/- each** (1/-)
SAPPHIRE all the above 7/6 types only, also ACOS GP37 at **3/3** each (1/-). ACOS GP91 at **7/6** (1/-). No other types at present, and no 78 rpm available in any type.

PICK-UP CARTRIDGES
All fitted Styli and Standard fittings, Mono GP67/2, 15/-. ●Stereo compatible—Mono which also plays Stereo records monaurally with min. wear, **GP91/SC, 21/-**. ●latest Stereo **GP93, 25/6.** ●Ceramic Stereo, top quality for expensive outfits, **GP94, 38/6.** ●Sonotone stereo 9TAHC diamond fitted cartridge **55/-** (all at 1/-). More diamond types in list. Goldring cartridges in stock.
PP3 ELIMINATOR (A.C.) **17/6** (1/6). **TWO STATION TRANS. INTER-COM.** Excellent baby alarm. Instant, easy fitting with leads, plugs and battery. All you require **52/6** (5/-).
TRANSISTORISED AMPLIFIER, 3 watt, 9V operation, **45/6** (1/6).
Extra High Torque **MINI-MOTOR,** 4½ to 12V, 1¼ × ¾in. **5/-** (1/-). 9,000 r.p.m.
SUBSTITUTION BOXES. Capacitance **25/6** (1/6). Resistance **32/6** (1/6). Both full range and complete. Full details in list.
TEST PRODS: Flexible, unbreakable 24in. Red and Black leads, thin 4¼in. prods, 1¼in. plugs **4/9** (1/-). **CROC. CLIPS:** Plated with screw, or with red/black hndles, **6d.** each, 5/- doz. (1/-). Many other types in list.

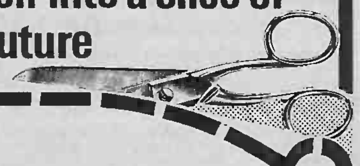
RECORDING TAPE
Finest quality British Mylar. **STANDARD:** 5in. 600ft. **7/3** 5¾in. 900ft **10/-**, 7in 1200ft. **11/3. LONG PLAY** 5in. 900ft **10/-**, 5¾in. 1200ft. **11/3,** 7in. 1800ft.**18/-** (1/3 reel). Still the finest quality and value obtainable.
MICROPHONES—CRYSTAL. MIC91, Desk, **16/3**; MIC45, curved hand grip **17/6**; Stick "60" **20/3**; (1/6 each type). Cream plastic hand type with "Strut" stand, switch and 2 leads with 2.5 and 3.5 plugs **12/6** (1/3). Lapel (or hand) with clip **6/6** (1/-). CM70. Machined metal tapered stick type with neck cord and adaptor to fit standard floor stands. **29/6** (1/6).
DYNAMIC: Cream hand/table **15/6** (1/6). **MS10** 50K Ω, 34 + pin. with Base. Adaptor **37/6** (2/6). **MS11,** similar but fixed on flexible Swan neck to switch-fitted base **42/6** (2/6).
CARDIOD DYNAMIC OMNI-DIRECTIONAL: Highly successful "BALL" type, 209, 50K/600 ohms imp., **£6.6.0.** ● "Uni-directional ball type", switch cord adaptor—DM160—**£3.17.6** (both these types 5/-).
MICROPHONE INSERTS: Diameter 1.75in. or 0.9in., either size **5/6** (1/-).
SPEAKERS 12in. round, fitted Tweeter, 6W, 3 or 15 Ω (state which), **37/6** (5/6); or for stereo, **80/-** per paid (charges paid), 2¼in. 3 Ω **7/6** (1/-); Limited quantity powerful 2¼in. PM transistor replacement speaker, high ohms, excellent **5/9** (1/-). **HEADPHONES:** Stereo Dyn 8-16 Ω **63/-** (3/-). **EARPIECES** with lead and min. jack plug, magnetic **1/9.** Crystal **4/9** (up to **3** for 1/- on either). State if 2.5 mm. of 3.5mm, plug required. (Crystal 3.5mm. only).
AERIALS CAR TYPES—Telescopic vandal proof locks retracted, 2 keys and all fittings **27/6** (2/6) Superior type, slightly longer, **30/-** (2/6).
Extended Aerials for Portables 9 F.M. Sets—4-section 6½-23", ⅜" sliding threaded base, needs ¼" hole **4/-**. ●6-section 5¼–25¼", screw hole in base **4/-**. ●7-section 5½–32", screw hole in base **6/6**. ●10-section, 6/47½", screw hole in base **15/9**. ●**DISAPPEARING,** with swivel and sliding threaded socket, fixing nut on bottom section—8-section 5¼–29½", ½" dia. **12/6.** ● 10-section 7¾–56½, ⅜" dia. **15/9.**
All are strongly plated (P. P. & 1. on all above, up to three 1/-)
SWITCHES: Standard toggle, metal, 250V 2A. One hole fixing: **SPST 2/3, SPDT 2/9, DPST 3/- DPDT 3/3.** Slide type, Sub-min. **DPDT 1/6** each. Small **DPDT** 3 way, centre "off" **1/9,** Reed magnetic on/off **1/9** (up to three, 1/-; 1d each all additional). Rotary Switches etc. in list.
VIBRATORS: Famous makes only, 12 volt 4 pin non-synch, **4/6.** 12 volt 7 pin synch. **12/6** (1/- each either type). No other types available.
MAINS NEON TESTER: Fly leads **2/-**. Pocket screwdriver type **3/6. PLUGS:** Std. Jack, plastic body **2/3.** Screened **3/-. VALVE HOLDERS:** B7G or B9A, **6d.** (all above 1/- up to three). Many more British and Continental standard and miniature PLUGS & SOCKETS detailed in list. Also STANDARD AND SURPLUS VOLUME CONTROLS.
CONNECTING WIRE: 5 coils asstd. coils. each 5 yds. Solid Core **2/9.** Flexible **3/3.** Super thin for transistor wiring etc. **3/3** (1/- all types per 5 coils). **PICK-UP WIRE:** Twin Super thin Flex, Screened, Sheathed, **1/3** yd. (6d. up to 6 yds., over 6 yds. post free). **TWIN MIKE CABLE: 1/3** yd. **SINGLE MIKE CABLE: 8d.** yd. Both flexible, screened and sheathed. (Up to 3 yds. 8d., each additional yard 1d. extra.)
R.F. FIELD INDICATOR, 5-band with antenna, monitoring crystal earpiece, visible indicator etc. **48/6** (1/6). Details in list.
RETRACTABLE FLEXIBLE LEADS. Space saving "Curly", many uses in car and home: with phono plug each end, 6ft., **4/6**; 12ft., **7/9**; With phono plug one end, phono socket at other, 6ft., **5/-**, 12ft., **8/6** (1/- each all types).
SPECIAL PURCHASE—COMPUTER PANELS, clean and unused.
TYPE 'A', 4¾" x 4" with eight Mullard OC43 transistors, 24 OA81 diodes, 32 resisters, etc. **8/6** per panel.
TYPE 'B' 5" x 4" two Mullard OC43 transistors, six OA47 and four OA91 diodes, resisters and other items **5/6** per panel.
POT CORES type LA2, exactly as sold elsewhere at **15/-**. New and unused at **8/6** each (P.P. and 1 all three items 1/- up to 3 and pro rata).
CURRENT LIST: With many more items sent if requested with all orders or free for S.A.E. (Post free overseas.) This advertisement cancels all previous ones and lists supplied prior to July 31st, 1970.

FELSTEAD ELECTRONICS

(PW34) LONGLEY LANE, GATLEY, CHEADLE, CHESHIRE, SK8 4EE

TERMS: Cash with order only. No C.O.D. or caller service. Post, packing and insurance charges are shown in brackets after all items. Regret orders under 5/- plus carriage cannot be accepted, and a minimum charge of 1/- is now made. Charges apply to G.B. and Eire only. Overseas orders welcomed. Air or surface mail at cost. Sent at buyer's risk, unregistered and uninsured unless specified and min. insurance/reg. fee of 3/2 sent.
S.A.E. please or all enquiries otherwise regret cannot be replied to.

If you're a telecommunications man and match up to the qualifications below **cut yourself into a slice of Britain's future**



Become a

Radio Technician

in the fast-growing world of Air Traffic Control

Please send me an application form and details of how I can join the fascinating world of Air Traffic Control Telecommunications

Name ....

Address ....

.... PWT/E1

Not applicable to residents outside the United Kingdom

To: A J Edwards, C Eng, MIEE,
The Adelphi, Room 705, John Adam Street,
London WC2
marking your envelope 'Recruitment'

Sending this coupon could be your first step to a job that's growing in importance every year.

The National Air Traffic Control Service needs Radio Technicians to install and maintain the vital electronic aids that help control Britain's ever-increasing air traffic.

This is the kind of work that requires not only highly specialised technical skills but also a well developed sense of responsibility, and candidates must be prepared to undergo a rigorous selection process. Those who succeed are assured a steadily developing career of unusual interest and challenge. Starting salary varies from £1044 (at 19) to £1373 (at 25 or over): scale maximum £1590 (higher rates at Heathrow). There is a good annual leave allowance and a non-contributory pension for established staff.

You must be 19 or over, with at least one year's practical experience in telecommunications, ('ONC' or 'C and G' qualifications preferred).

NATCS

National Air Traffic Control Service

Practical Wireless Classified Advertisements

The pre-paid rate for classified advertisements is 1/8d. per word (minimum order 20/-), box number 1/6d. extra. Semi-displayed setting £5 10s. 0d. per single column inch. All cheques, postal orders, etc., to be made payable to PRACTICAL WIRELESS and crossed "Lloyds Bank Ltd." Treasury notes should always be sent *registered post*. Advertisements, together with remittance, should be sent to the Classified Advertisement Manager, PRACTICAL WIRELESS, IPC Magazines Ltd., Fleetway House, Farringdon Street, London, E.C.4 for insertion in the next available issue.

MISCELLANEOUS

THE NEW
ELECTRONIC MUSIC FOR YOU

Then how about making yourself an electric organ? Constructional data available—full circuits, drawings and notes! It has 5 octaves, 2 manuals and pedals with 24 stops—uses 41 valves. With its variable attack you can play Classics and Swing. Write NOW for free leaflet and further details to C. & S., 20 Maude Street, Darlington, Durham. Send 4d. stamp.

BUILD IT in a DEWBOX quality cabinet. 2in.x 2½in. x any length. D.E.W. Ltd., Ringwood Road, FERNDOWN, Dorset. S.A.E. for leaflet. Write now—Right now.

PARAPHYSICAL LABORATORY, Downton, Wilts. Telekinetic photographs/data. S.A.E. for list. Samples 20s.

2 WATT TRANSISTOR AMPLIFIERS (not a kit). Standard 3 ohm output. Frequency response ±2db from 12 to 12000 cps, on board measuring 2½ x 3½ in. Ideal record players etc., 22s 6d each, pp 1s 6d. A. Manley, 111 Mayow Road, Sydenham, S.E.26.

TOP TRANSISTORS

ACY22	1/9	BFY51	1/9	OC201	1/9
BC108	1/9	BFY52	1/9	OC202	1/9
BC109	1/9	OC45	1/9	ZTX300	1/9
BC168	1/9	OC71	1/9	2N706	1/9
BC169	1/9	OC72	1/9	2N2926	1/9
BSY27	1/9	OC200	1/9	2N3708	1/9

All the above types are available at 16 for £1. Brand New. Individually Tested, unmarked but guaranteed to be within their correct specification, or money refunded.

ANTEX SOLDER IRON

A lightweight iron with a 15 watt nickel plated bit. Designed to enable you to weld reliable joints accurately. Model CN240 volts. Special low price. Act Now Only 29/11

MONEY BACK GUARANTEE P. & P. 1/-

J. M. KING (R), 17 Buckridge, Portpool Lane, London, E.C.1

GOOD CONNECTIONS take seconds with the revolutionary new Keynector. Cuts out plugs, sockets and dangers from bare wires. Just the job for high speed testing of electronic equipment. A must for the do-it-yourself enthusiast. Send for leaflet to E.B. Instruments, Dept. P.W., 49/53 Pancras Road, London N.W.1 (837 7781). Only 46/6d plus postage.

TV NOTES FOR UFO DETECTION, and 2 Optical Detector circuits, 9/6. All-night Optical/Radiation circuit with electronic "memory," 9/6. Radar & Electronic Publications, "Highlands," Needham Market, Suffolk.

ALL THOSE LITTLE ITEMS which you can never find are available from our stock. Also speaker fabrics, BAF wadding, Peerless speakers, cabinet kits, cross-overs. For full details send 9d in stamps to **Audioscan**, Dept. P.W., 4 Princes Square, Harrogate, Yorks.

MISCELLANEOUS
(continued)

ENAMELLED COPPER WIRE

S.W.G.	Per ½lb reel	Per 1lb reel
18-22.	11/3d	16/6d
23-30.	11/9d	17/6d
31-35.	12/3d	18/6d
36-40.	15/-	24/-
41-44.	17/9d	29/6d

Orders despatched by return of post. Please add 1/- per item P. & P.
Supplied by: Banner Transformers, 84 Old Lansdowne Rd, West Didsbury, Manchester. 20.
TRADE ENQUIRIES INVITED

SERVICE MANUALS for Pre 1958 H.M.V. and E.M.I. MODELS. Radio and Record Player Manuals 5/- each. Television Manuals 7/6 each. Send C.W.O. stating model required. Also limited range of components and spares. Send details of your requirements. R.D.I. Ltd., Chilton Works, Garden Road, Richmond, Surrey.

"SHURE" TAPE HEADS

Record/playback and erase in one unit, Mounted on bracket with tape guide etc. 10/- post paid "MARRIOT" Single record/playback heads. 5/- post paid.

PHOTO ELECTRIC SWITCH KIT

Light cell, transistor, relay etc. Elegant case in hammer finish 5¼" x 2¾" x 4½" fitted with light hood, ideal counter alarm. Dawn/Dusk switch, etc. 35/- Post Paid.

6 OR 12 VOLT FLUORESCENT LIGHTS

12 ins. 8 Watt tube ample light for caravan, tent etc. Fully transistorised, low battery drain. Unbeatable at 65/6 post paid.
or in kit form 57/6

4 WATT GRAM AMPS.

Volume and tone controls, mains operation, 3Ω output, new and boxed 72/6 POST PAID

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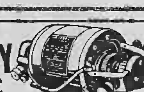

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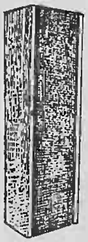

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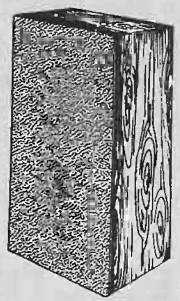

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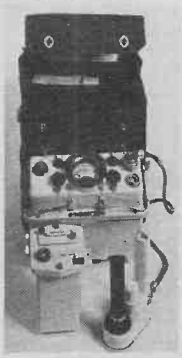

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Amplifier Unit Type A1413. Complete with Valves Type 5Z4 and 6V6GT. 230-250 Volt, 50 Cycles Transformer. Clean Condition. Untested 25/. Carriage B.R.S. 15/-.

Airmileage Units. Complete with 24 Volt Motor, and Gears, etc. less Relay. Clean Condition. Untested 15/-. Carriage B.R.S. 12/-.

Panel with two Miniature Relays and one Carpenter Relay with Base. Ex units 7/6. Post Paid.

Panels of Resistors and Condensers. Ex Equipment. 8/- per doz. Post Paid.

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AW43/88 T.V. Tube. Reclaimed with 6 months Guarantee £2. Plus 15/- Carriage. **MW43/69** 30/- Plus 15/- Carriage.

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EB91	9d.	PCF80	2/-	PL81	4/-	6BW7	2/6
EBF89	3/-	PCC89	3/-	PY81	1/6	6U4	4/-
ECC82	3/-	PCL85	5/-	PY800	3/6	20D1	3/-
ECL80	1/6	PCL84	4/-	PY82	1/6	20P1	5/-
EF183	3/-	PCL82	4/-	PY33	5/-	20P3	2/6
EF184	3/-	PCF86	4/-	U191	4/-	30PL1	5/-
EY86	4/-	PCL83	3/-	6F23	4/-	30P12	4/6
						30F5	2/9

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Output Transformer	OPT1	10/6
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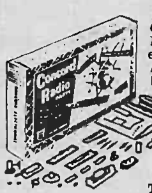

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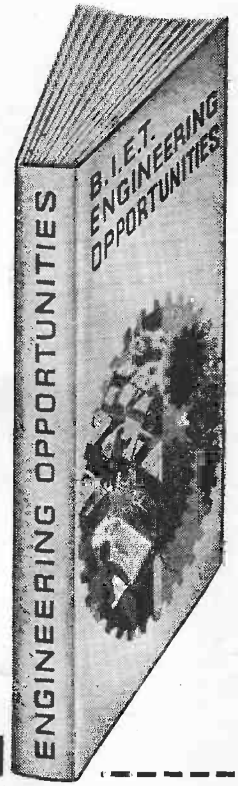

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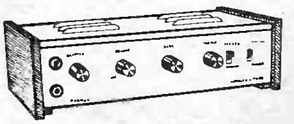

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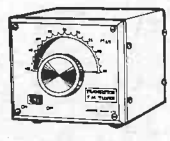

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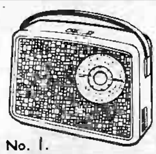

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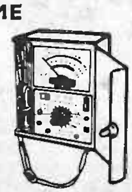

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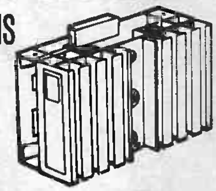

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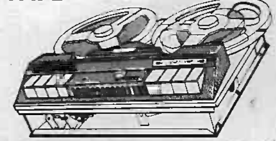

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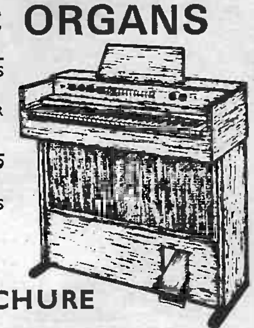

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