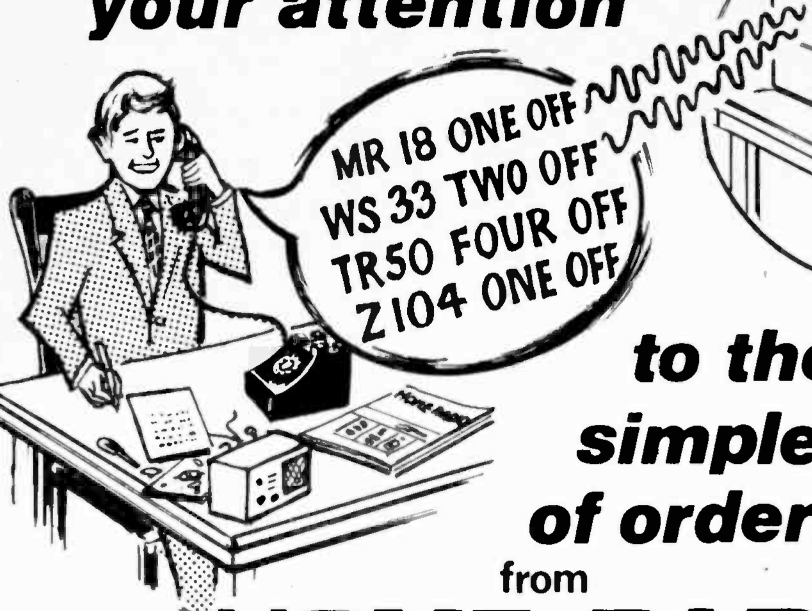
An exciting hobby.... for everyone

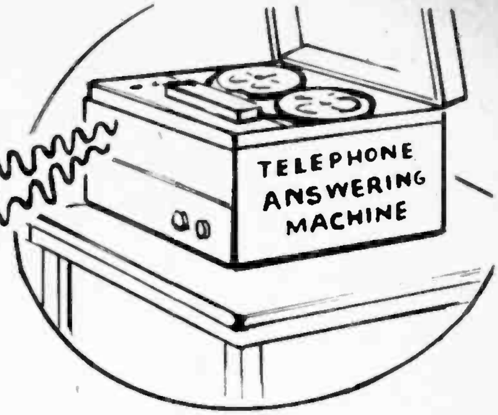
everyday electronics

JULY 72

15p

May we draw your attention





to the simplest way of ordering goods

from

HOME RADIO (COMPONENTS) LIMITED

240 London Road, Mitcham. CR4 3HD **Tel: 01-648 8422**

It would help us considerably if we knew whether this was your first Home Radio Components Catalogue. If it is, please place a tick in the box.

It's late at night but that doesn't stop our young electronics enthusiast from ordering some urgently required components. He just dialled 01-648 8422 and telephoned his requirements, knowing that our Answering Machine will store his message ready for us to deal with next morning. As a seasoned member of our Credit Account Service he is well aware of the advantages it brings him. He has, for instance, a free supply of our pre-paid envelopes and order forms, for use when it suits him better to write his requirements rather than telephone them. This alone saves him quite a bit. He averages four orders a month and simply sends us a single cheque or postal order. *Without* our Credit Account Service his monthly cost would be: Four stamps at 3 pence each...12p, four cheques or postal orders at 5 pence each...20p, four envelopes 2p. Total, 34 pence. Over the year, quite an item! Not to mention his *time* spent in buying the stamps, envelopes and postal orders!

We have well over 300 customers using our Credit Account Service—some sending us several orders every week, other just a few a year; but they *all* appreciate the fact that when they have been in the service for 12 months we send them up-dated Catalogues and Price Lists *free of charge*.

Now—If *you* have not already got a copy of our famous Components Catalogue send the coupon with a cheque or postal order for 70 pence. More than 8,000 items clearly listed and indexed, over 1,500 of them illustrated. Moreover, with the catalogue you get a sheet of 10 vouchers, each worth 5 pence when used as instructed.

POST THIS COUPON with your cheque or postal order for 70p

This is my first H.R. Components Catalogue ☐

Name ____________________

Address ____________________

____

HOME RADIO (COMPONENTS) LTD., Dept. EE
234-240 London Road, Mitcham, Surrey CR4 3HD.

If you call at our shop (open 9 to 5.30 Monday to Saturday inclusive, except Wednesday 9 to 1) you can buy the catalogue for 50 pence, thus saving the 20p packing and postage. Full details and entry forms for our Credit Account Service are included in each catalogue. Send today.

The price of 70p applies only to catalogues purchased by customers in the U.K. and to BFPO addresses.

DISCOUNTS UP TO 60%* ON BRANDED GOODS

ALL BRAND NEW
In manufacturer's sealed cartons.
GUARANTEED 12 MONTHS.

SPECIAL OFFER £17·75

Garrard SP25 Mk. III
Goldring G800
Teak plinth and tinted cover. All leads supplied.
Please add £1·25 for P & P.

TURNTABLES

Please add 75p for P. & P.

Garrard SP25 Mk. III	£9·45
Garrard AP76	£18·75
Garrard SL65B	£12·95
Garrard 401	£26·50
Garrard Zero 100 (Auto)	£38·95
Garrard Zero 100 (Single)	£36·75
Garrard SL72B	£23·50
Garrard SL75B	£25·50
Garrard SL95B	£34·25
BSR MP60	£9·45
Goldring GL72	£21·95
Goldring GL72/P	£27·95
Goldring GL75	£25·75
Goldring GL75/P	£34·25
Wharfedale Linton & cart.	£27·95
Thorens TD125	£57·00
Thorens TD125AB	£88·00
Thorens TD150 Mk. II	£26·00
Thorens TD150A Mk. II	£33·30

AMPLIFIERS

Please add 75p P. & P.

Amstrad 8000 Mk. II	£16·25
Amstrad IC2000	£27·45
Armstrong 521 (teak cased)	£43·95
Alpha Highgate 212	£25·00
Alpha Highgate FA300	£27·95
Alpha Highgate FA400	£31·95
Leak Delta 30	£47·95
Leak Delta 70	£55·95
Metrosound ST20E	£24·45
Metrosound ST60	£45·95
Pioneer SA600	£58·00
Pioneer SA700	£66·50
Pioneer SA800	£73·95
Pioneer SA900	£92·00
Pioneer SA1000	£94·00
Rogers R/brook (Chassis)	£35·00
Rogers R/brook (Cased)	£37·00
Rogers R/bourne (Chassis)	£41·95
Rogers R/bourne (Cased)	£47·50
Sinclair PRO60 2 x Z30/PZ5	£15·00
Sinclair PRO60 2 x Z30/PZ6	£17·00
Sinclair PRO60 2 x Z50/PZ8/Trans	£21·50
Sinclair AFU (Filter Unit)	£4·40
Sinclair 605	£18·50
Sinclair 2000 Mk. II	£21·50
Sinclair 3000 Mk. II	£29·50
Wharfedale Linton	£37·50
Goodmans Max Amp	£37·95
Teleton SAQ206B	£20·50
Teleton SAQ306B	£22·50
Europhon 10 + 10	£16·95

TUNERS

Please add 75p P. & P.

Armstrong 523	£39·50
Armstrong 524	£30·95
Rogers Ravensbrook FET4 (Chassis)	£31·00
Rogers Ravensbrook FET4 (Cased)	£35·00
Rogers Ravenbourne FET4 (Chassis)	£43·00
Rogers Ravensbourne FET4 (Cased)	£48·00
Sinclair PRO60 (Module)	£17·95
Sinclair 2000/3000 Tuner	£32·75
Philips RH690	£33·00
Leak Delta FM (Cased)	£54·75
Leak Delta AM/FM (Cased)	£64·50

TUNER/AMPLIFIERS

Please add 75p for P. & P.

Alpha Highgate 150	£44·25
Armstrong 525 (Teak cased)	£67·95
Armstrong 526 AM/FM (Teak cased)	£77·75
Leak Delta 75	£127·95
Philips RH781	£50·00
Philips RH702	£82·50
Teleton 2100	£29·95
Goodmans One Ten	£99·50
Rogers R/brook (Teak)	£78·50
Rogers R/brook (Chassis)	£72·75

SPEAKERS

Please add £1·25 P. & P.

	per pair
Amstrad 138	£15·95
Wharfedale Denton 2	£28·40
Wharfedale Linton 2	£35·95
Wharfedale Melton 2	£47·45
Wharfedale Dovedale 3	£60·95
Celestion Ditton 120	£39·50
Celestion Ditton 15	£53·50
Celestion Ditton 25	£87·00
Goodmans Double Maxim	£48·25
Goodmans Mezzo 3	£44·95
Goodmans Magister	£74·00
Sinclair Q16	£12·50

£3·20*

Plus 35p p. & p.
Finished in teak veneer with tinted dust cover fully assembled. For Garrard SP25; 2025TC; 3000; AT60; 2000; 2500; 3500; 5100; 1025; SL65B; Also for BSR McDonald MP60 and others.
For AP76; AP75; SL72B; SL75; SL95B; £4·20 plus 55p P. & P.
Also finished in walnut to match Japanese equipment—at no extra.

CARTRIDGES

Please add 10p for P. & P.

Goldring G850	£3·45
Goldring G800	£5·95
Goldring G800E	£9·75
Goldring G800 Super E	£15·00
Shure M3D	£4·15
Shure M44E	£5·25
Shure M55E	£5·85
Shure M75E Type 2	£10·75
Sonotone 9TAHC	£1·40

All prices correct at time of press E. & O.E.

GLOBAL AUDIO DISCOUNT WAREHOUSES

Dept. (EE8) 174 Pentonville Road, London, N1. Telephone 01-278 1769
Or: 4 High View Parade, Redbridge Lane East, Woodford Avenue, Ilford, Essex. Tel: 01-550 1086.

Open Monday to Saturday 9.30 a.m. to 6 p.m. LATE NIGHT FRIDAY 7 p.m.

MAIL ORDERS: Order with confidence. Send Postal Order, Cheque, Money Order, Bank Draft, Giro or Cash by Registered Mail. CALLERS: Please note that cheques can only be accepted together with cheque cards (not Barclay Card).

2 minutes from KING'S CROSS, EUSTON & ST PANCRAS on main road leading to the East and West Country

Are you alright for Jacks?

Ask for Rendar Jack plugs and sockets at your local stockist. They come in a wide variety of configurations, and in cases of difficulty can be ordered DIRECT from the Rendar factory.

Standard, mini and sub-miniature sizes . . . plugs in both screened and unscreened versions . . . socket bodies in high melting point thermoplastic . . . several unique features (some protected by UK and US Patents) . . . Post Office and NATO specifications.

If you want to study all the facts and figures, all the ingenious construction details, send for the Rendar Electronic Components Catalogue of technical data sheets covering their entire range of products.

The cost of the catalogue is 25p, including P & P, and it's money very well spent!

COMPONENTS FOR LAND SEA & AIR

RENDAR®

Rendar Instruments Ltd., Victoria Road
Burgess Hill, Sussex. Tel. Burgess Hill 2642-4
Cables: Rendar, Burgess Hill

SOUND BARGAINS

GIANT POWER MULTI-WAVEBAND COMMUNICATIONS RECEIVER

WITH 3 in 1 AC/DC POWER SUPPLY SYSTEM
MAINS/BATTERY plus BUILT-IN BATTERY BOOSTER

OUR PRICE £10·50 +40p P. & P.

THIS NEW 1972 RADIO. No less than 3 VHF BANDS. Picks up Aircraft Transmissions, Pop Pirates, Taxis, Ambulances, Local Radio, Continental and all BBC, VHF Stations plus fascinating Public Service Transmissions we are not allowed to mention! Even TV sound in certain areas. PLUS A SPECIAL WEATHER-BAND. Frequency ranges: MW540–1600 KHZ, FM88–108MHZ, Airband 108–145 MHZ, VHF 145–175MHZ, 23 semi-conductors—12 transistors, 11 diodes and thermistors. Automatic frequency control. 31" telescopic aerial. Runs off mains AC 230/250 volts or off 4 U2 batteries, or use re-chargeable nickel alkali cell. Finished in strong leather grained case with carrying handle. Approx. size 10½" x 6½" x 3½". Written guarantee. Special magnetic ear-piece for personal listening, dry batteries FREE. HURRY! Limited quantity only from Marktyme. Money back guarantee.

OUR PRICE £28·95 +50p P. & P.

Tune into the world with this amazing communications receiver. A truly exceptional unit in performance and looks—leatherette with stainless steel trim. Looks good anywhere. Use either as a portable with standard batteries or plug it directly into 220–240 volt domestic mains supply. 14 Transistors; 9 diodes; 1 thermistor. Internal ferrite rod antenna plus telescopic aerial. Separate tone, volume and tuning controls with push-button selectors for the 8 WAVEBANDS. Complete with Hi-Fi earphone for personal listening. Frequency ranges: Long wave 150–350Kcs. Medium 353–1605Kcs. Marine 1·6–4·5Mcs. Short Wave 12–24Mcs. FM/VHF 88–108Mcs. Aircraft 108–135 Mcs. PUBLIC SERVICE BANDS 135–174Mcs. Fully guaranteed.

N.B.—The Ministry of Post & Telecommunications has pointed out that a licence (not generally available to the public) is required for reception of transmissions by Fire Brigade, Aircraft, Shipping, etc.

MARKTYME (Dept. ED2), 372 EDGWARE ROAD, LONDON, W.2. Tel. 01-723 0094. Callers welcome Monday to Saturday 9 a.m.–6 p.m.

DRILL CONTROLLER

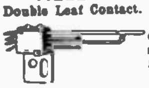
NEW IKW MODEL
Electronically changes speed from approximately 10 revs. to maximum. Full power at all speeds by finger-tip control. Kit includes all parts, case, everything and full instructions. £1·50 plus 13p post and insurance. Made up model also available. £2·25 plus 13p post & p.

MAINS OPERATED CONTACTOR

220/240v. 50 cycle solenoid with laminated core so very silent in operation. Closes 4 circuits each rated at 10 amps. Extremely well made by a German Electrical Company. Overall size 2½ × 2 × 2in. £1 each.

NEED A SPECIAL SWITCH?

Double Leaf Contact. Very slight pressure closes both contacts. 6p each, 60p doz. Plastic push-rod suitable for operating. 5p each, 45p doz.



AUTO—ELECTRIC CAR AERIAL

with dashboard control switch—fully extendable to 40in. or fully retractable. Suitable for 12v. positive or negative earth. Supplied complete with fitting instructions and ready wired dashboard switch. £5·75 plus 25p post and ins.

TOGGLE SWITCH

3 amp. 250v. with fixing ring 7½p each, 75p doz.

MICRO SWITCH

5 amp changeover contacts. 9p each, £1 doz. 15 amp Model 10p each or £1·05 doz.

MINIATURE WAFER SWITCHES

2 pole, 2 way—4 pole, 2 way—3 pole, 3 way—4 pole, 3 way—2 pole, 4 way—3 pole, 4 way—2 pole 6 way—1 pole, 12 way. All at 20p each, £1·80 for ten, your assortment.

WATERPROOF HEATING ELEMENT
26 yards length 70W. Self-regulating temperature control. 50p post free

15 AMP ELECTRICAL PROGRAMMER

Learn in your sleep: Have radio playing and kettle boiling as you awake—switch on lights to ward off intruders—have warm house to come home to. All these and many other things you can do if you invest in an electrical programmer. Clock by famous maker with 15 amp. on/off switch. Switch on time can be set anywhere to stay on up to 6 hours. Independent 60 minute memory jogger. A beautiful unit. Price £1·95 + 20p p & p or with glass front chrome bezel 75p extra.

TREASURE TRACER MARK II

Complete Kit (except wooden battens) to make the metal detector similar to the circuit in Practical Wireless August issue. £2·95 plus 20p post and insurance.

QUICK CUPPA

Mini Immersion Heater. 350w 200/240v. Boils full cup in about two minutes. Use any socket or lamp holder. Have at bedside for tea, baby's food, etc. £1·25, post and insurance 14p. 12v. car model also available same price. Jug heater £1·50 plus p. & p. 14p

SNAP ACTION SLIDE SWITCH

Rated 5a. 240v. Made by Arrow. Type fitted in the handles of electric drills, vacuums, etc. 5p each, 10 for 45p.

NUMICATOR TUBES

For digital instruments, counters, timers, clocks, etc. Hi-vac XN. 3. Price £1·45 each. 10 for £13.

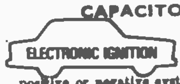
12 WAY SUB-MINIATURE MULTI-CORE CABLE

7·0076 copper cores each core P.V.C. insulated and of different colour. P.V.C. covered overall and approx. 3/16in. thick. Price 20p per yard.

LIGHT CELL

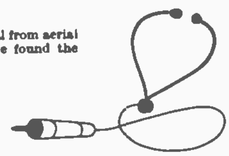
Almost zero resistant in sunlight increases to 10 K Ohms in dark or dull light, epoxy resin sealed. Size approx. 1in. dia. by ½in. thick. Rated at 500 MW, wire ended. 43p with circuit. Also ORP 12 light cell 45p.

CAPACITOR DISCHARGE CAR IGNITION



This system which has proved to be amazingly efficient. We offer a kit of parts as PW circuit £5·95 + 20p. De-luxe model with prepared circuit boards £6·95. When ordering please state whether for positive or negative systems. Also available, ready made ignition systems for 6v vehicles. £5·95 plus 20p.

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 kit comprises two special transistors and all parts including probe tube and crystal earpiece. £2—twin stethoset instead of earpiece 75p extra post and ins. 20p.

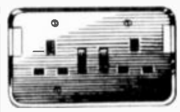
STANDARD WAFER SWITCHES

Standard size 1½" 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	10way	12way
1 pole	40p	40p	40p	40p	40p	40p	40p	40p	40p
2 poles	40p	40p	40p	40p	40p	40p	40p	70p	70p
3 poles	40p	40p	40p	40p	70p	70p	70p	95p	95p
4 poles	40p	40p	40p	70p	70p	70p	70p	£1·20	£1·20
5 poles	40p	40p	70p	70p	95p	95p	95p	£1·45	£1·45
6 poles	40p	70p	70p	70p	95p	95p	95p	£1·70	£1·70
7 poles	70p	70p	70p	95p	£1·20	£1·20	£1·20	£1·95	£1·95
8 poles	70p	70p	70p	95p	£1·20	£1·20	£1·20	£2·20	£2·20
9 poles	70p	70p	95p	95p	£1·45	£1·45	£1·45	£2·45	£2·45
10 poles	70p	70p	95p	£1·20	£1·45	£1·45	£1·45	£2·70	£2·70
11 poles	70p	95p	95p	£1·20	£1·70	£1·70	£1·70	£2·95	£2·95
12 poles	70p	95p	95p	£1·20	£1·70	£1·70	£1·70	£3·20	£3·20

THIS MONTHS SNIP

13 AMP TWIN GANG SOCKETS



Offered at less than wholesale price your opportunity to replace those dangerous adaptors—brown bakelite flush mounting—standard fitting. Unswitched 20p each, separately switched 30p each. Separately switched and with neon on/off indicators 45p each. Single sockets unswitched 10p each. Less 10% ten or more +20p postage if order under £5.

THYRISTOR LIGHT DIMMER

For any lamp up to 200 watt. Mounted on switch plate to fit in place of standard switch. Virtually no radio interferences. Price £2·50 plus 20p post and insurance.

MULLARD AUDIO AMPLIFIER MODULE

Uses 4 transistors, and has an output of 750mW into 8 ohms speakers. Input suitable for crystal mic. or pick-up 9V battery operated. Size 2in long × 1½in wide × 1in high. SPECIAL SNIP PRICE 60p each. 10 for £5.

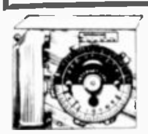
HORSTMANN "TIME & SET" SWITCH

(A30 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 on period of up to 3 hours. Equally suitable to control processing. Regular price probably around £5. Special snip price £1·50 Post and ins. 23p.

SHAVER INVERTER
HORSES FOR COURSES
ELECTRONOME

and other featured projects. To receive these kits quickly send quoted approx. price and any change due will be refunded.

24-HOUR TIME SWITCH



Made by Smiths, these are AC mains operated, NOT CLOCKWORK. Ideal for mounting on rack or shelf or can be built into box with 13A socket. Two completely adjustable time periods per 24 hours, 5A changeover contacts will switch circuit on or off during these periods. £2·50 post and ins. 25p. Additional time contacts 50p pair.

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. 4 of the ICs are single silicon chip GP amplifiers. The 5th is a monolithic NPN matched pair. Regular price of parcel well over £5. Full circuit details of the ICs are included and in addition you will receive a list of many different ICs available at bargain prices 25p upwards with circuits and technical data of each. Complete parcel only £1 post paid.
DON'T MISS THIS TERRIFIC BARGAIN.

BATTERY CONDITION TESTER

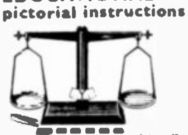
Made by Mallory but suitable for all batteries made by Ever Ready and others, most of which are zinc carbon types but also mercury manganese—nicad—silver oxide and alkaline batteries may be tested. The tester puts a dummy load on the battery and the meter scale indicates the condition depending upon which section the pointer rests. The section reads "replace" "weak" or "good". The tester is complete in its case, size 3½" x 6½" x 2" with leads and prods. Price £1·75 plus 20p postage.

KITS FOR PREVIOUS PROJECTS

Unless otherwise stated, kits contain electronic parts only. The case and special items can be obtained locally. Also batteries are not included. Kits may be returned for refund if construction has not been started. We reserve the right to substitute components should deliveries be protracted so as to avoid undue delay.

HOME SENTINEL INTRUDER ALARM £3·75
SNAP INDICATOR 75p
WINDSCREEN WIPER CONTROL £3
RECORD PLAYER. Amplifier components only. £5·50
DEMO DECK .... £6·75 POST PAID
FUZZ BOX .... £1·85
PHOTOGRAPHIC COLOUR TEMPERATURE METER .... £2·65
ASTRON RADIO £3
REMOTE TEMPERATURE COMPARATOR .... £4·25
ELECTRO LAUGH £2
AUTO ALERT .... £2·50
RAIN WARNING ALARM .... £1·80
WA-WA PEDAL .... £2·90
DARKROOM TIMER .... £4·50
SIGNAL INJECTOR 80p
SOIL MOISTURE METER .... £3·00
SIMPLE CALCULATOR .... £2·80
D.C. POWER SUPPLY .... £5·00
BABY ALARM .... £4·00
AUDIO TONE GENERATOR .... £2·60
METAL LOCATOR .... £4·00
LIGHT TO SOUND CONVERTER .... £1·70
WASH/WIPE CONTROLLER .... £2·20

EDUCATIONAL KITS—all with pictorial instructions



THIS BALANCE KIT FREE
Eagle educational kits. Japanese made these are excellent value for money. We do not expect to be able to repeat this offer once stocks are sold. Brief description of each kit is given below and with 3 kits or more we give FREE an accurate 11 piece balance kit. Price of kits 40p each post paid. Special price for all 7 kits £2·50 with free balance kit.

KA3 Lens Kit. Eleven parts, including candle, one concave lens, one convex lens, stage and slit frame, etc. Watch light rays bend as they pass through different lenses.
KA3 Water Pump Kit. Thirteen parts. Top of pump is transparent so that operating parts may be observed. Small parts are brightly coloured to be seen easily while working. Three types of pump may be made: Lift pump, Force Pump and Force Pump with reservoir and nozzle.
KA4 Buzzer Kit. Eleven parts. Transparent covers allow the operation of buzzer to be seen. Illustrates and teaches how electromagnetism with an automatic switch results in an operating buzzer.
KA6—2-Pole Motor Kit. Twenty-four parts, including enamel wire, armature and pole piece, etc. Motor operates from 1½ volt battery. Illustrates and teaches how electro-magnetism operates a motor.
KA7 Electro-Magnet Kit. Fifteen parts, includes compass. Makes two electro-magnets, one with one layer of wire and one with several layers of wire. Picks up tacks, nails and any small parts showing how magnetism works.
KA8 Current and Resistance Kit. Twenty-nine parts, including bench and light bulb. Conduct interesting and educational projects to learn the application of "OHMS LAW" and see the difference in current and resistance with different types and lengths of wire.
KA9 Bell Kit. Eight parts, including bell and push button switch. Build a complete electric bell and see how the hammer is triggered to make the bell ring.

PULSE GENERATORS

Sectronic, made by Smiths. Operated by single 1·5 volt battery or transformer and rectifier. Two models, one gives 10 pulses per second the other gives 8. In plastic enclosures, size approx. 2" × 1½" × 1½" deep. Price £2 each 10 for £16.

AMPLIFIER IN CASE & SPEAKER. Marketed by British Relay under the name Luxistor. This is in a very neat looking cabinet and is ideal around the home or in the workshop for trouble shooting or for testing out a quick lash up. Size approx. 9½" × 6½" × 3½" deep. Input is via a matching transformer and volume control and amplifier may be powered by an internal 9v battery or an external 110v source Speaker is an R-A elliptical 6" × 3½" 10,000 gauss. The amplifier proper is a Newmarket model ref. P.C.4. Price £3·50 each, 10 for £31·50. Post and insurance 20p.

MAIN TRANSFORMER SNIPS
Mains Transformer. Primary 240v. tapped 220v. Secondary 20v. ½ amp. Price 60p each or 10 for £5·40.
Transformers. Primary 230-240v. Secondary 6·5-0-6·5 1 amp. With fitted primary screen 85p each or 10 for £5·85.

Where postage is not stated then orders over £5 are post free. Below £5 add 20p. Semi-conductors add 5p post. Over £1 post free. S.A.E. with enquiries please.

J. BULL (ELECTRICAL) LTD.

(Dept. E.E.) 7 Park Street, Croydon CRO 1YD
Callers to: 102/3 Tamworth Road, CROYDON

BI-PRE-PAK

COMPLETE TELEPHONES

EX. G.P.O. NORMAL HOUSEHOLD TYPE

95p EACH P. & P. 35p each

TELEPHONE DIALS

Standard Post Office type. Guaranteed in working order.

ONLY 50p

TESTED AND GUARANTEED PAKS

B2	4	Photo Cells, Sun Batteries. 0·3 to 0·5V. 0·5 to 2mA.	50p
B79	4	IN4007 Sil. Rec. diodes. 1,000 PIV lamp plastic	50p
B81	10	Reed Switches, mixed types large and small	50p
B99	200	Mixed Capacitors. Approx. quantity, counted by weight	50p
H4	250	Mixed Resistors. Approx. quantity counted by weight	50p
H7	40	Wirewound Resistors. Mixed types and values.	50p
H8	4	BY127 Sil. Recs. 1000 PIV. 1 amp. plastic	50p
H9	2	OCP71 Light Sensitive Photo Transistor	50p
H12	50	NKT155/259 Germ. diodes, brand new stock clearance	50p
H28	20	OC200/1 2/3 PNP Silicon uncoded TO-5 can	50p
H30	20	1 Watt Zener Diodes, Mixed Voltages 6.8 – 43V.	50p
H35	100	Mixed Diodes, Germ. Gold bonded, etc. Marked and Unmarked.	50p
H38	30	Short lead Transistors, NPN Silicon Planar types.	50p

UNMARKED UNTESTED PACKS

B66	150	Germanium Diodes Min. glass type	50p
B83	200	Trans. manufacturers' rejects all types NPN, PNP, Sil. and Germ.	50p
B84	100	Silicon Diodes DO-7 glass equiv. to OA200, OA202	50p
B86	50	Sil. Diodes sub. min. IN914 and IN916 types	50p
B88	50	Sil. Trans. NPN, PNP equiv. to OC200/1 2N706A, BSY95A, etc.	50p
B1	50	Germanium Transistors PNP, AF and RF	50p
H6	40	250mW. Zener Diodes DO-7 Min. Glass Type	50p
H17	20	3 amp. Silicon Stud Rectifiers, mixed volts	50p
H15	30	Top Hat Silicon Rectifiers, 750mA. Mixed volts	50p
H16	8	Experimenters' Pak of Integrated Circuits. Data supplied	50p
H20	20	BY126/7 Type Silicon Rectifiers 1 amp plastic. Mixed volts.	50p
H34	15	Power Transistors, PNP, Germ. NPN Silicon TO-3 Can.	50p

MAKE A REV COUNTER FOR YOUR CAR

The 'TACHO BLOCK'. This encapsulated block will turn any 0-1mA meter into a linear and accurate rev. counter for any car with normal coil ignition system.

£1 each

OUR VERY POPULAR 3p TRANSISTORS

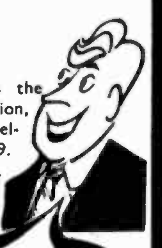
TYPE "A" PNP Silicon alloy, TO-5 can.
TYPE "B" PNP Silicon, plastic encapsulation.
TYPE "E" PNP Germanium AF or RF.
TYPE "F" NPN Silicon plastic encapsulation.

FULLY TESTED AND MARKED SEMICONDUCTORS

	£p		£p
AC107	0·15	OC170	0·23
AC126	0·15	OC171	0·23
AC127	0·17	OC200	0·25
AC128	0·15	OC201	0·25
AC176	0·20	2G301	0·13
ACY17	0·20	2G303	0·13
AF239	0·30	2N711	0·50
AF186	0·20	2N1302-3	0·15
AF139	0·30	2N1304-5	0·17
BC154	0·20	2N1306-7	0·20
BC107	0·10	2N1308-9	0·22
BC108	0·10	2N3819FET	0·45
BC109	0·10	2N4416FET	0·35
BF194	0·15	Power Transistors	
BF274	0·20		
BFY50	0·15	OC20	0·50
BSY25	0·13	OC23	0·30
BSY26	0·13	OC25	0·25
BSY27	0·13	OC26	0·25
BSY28	0·13	OC28	0·30
BSY29	0·13	OC35	0·25
BSY95A	0·10	OC36	0·37
OC41	0·15	AD149	0·30
OC44	0·13	AUY10	1·25
OC45	0·10	2S034	0·25
OC71	0·10	2N3055	0·50
OC72	0·10	Diodes	
OC81	0·13	AAY42	0·10
OC81D	0·13	OA95	0·07
OC83	0·18	OA79	0·07
OC139	0·13	OA81	0·07
OC140	0·15	IN914	0·0[illegible]

.E.T. PRICE REAKTHROUGH !!

his field effect transistor is the N3823 in a plastic encapsulation, ›ded as 3823E. It is also an excellent replacement for the 2N3819. ata sheet supplied with device. 10 **30p** each, 10-50 **25p** each,)+**20p** each.



TRANSISTOR IGNITION!

AS USED BY RACING DRIVERS

NOW We introduce a Transistorised Ignition that is NOT a Kit at LESS than Kit price! The Super Spark, Mark II, is ready to go. Installation time—10 minutes. It operates on a unique and newly discovered principle that drives a standard ignition coil with a fantastic peak of 400V. The solid impact gives 45,000 Volts right to the sparking plug and gives cooler running, longer plug life, more M.P.G. and greater B.H.P. Contact breaker life is extended indefinitely and no visible burning will ever take place. The circuitry is all silicon solid state and is engineered for top dependable performance on any car with standard ignition coil. 4 and 6 cylinder. Every unit is tested before despatch and each carries a full guarantee. Gives a full spark at up to 8,000 RPM!

Super Spark—**£10·95**
P & P 25p

FREE CATALOGUE FOR

TRANSISTORS, RECTIFIERS, DIODES, INTEGRATED CIRCUITS, FULL PRE-PAK LISTS

8 RELAYS FOR VARIOUS TYPES £1

P & P 25p

COLOUR T.V. LINE OUTPUT TRANSFORMERS

Designed to give 25kV when used with PL509 and PY500 valves. As removed from colour receivers at the factory.

NOW ONLY 50p each
post and packing 23p.

Quantity	*1–10*	*10-50*	*50+*
BB105 Varicap Diodes	10p	8p	6p
OC71 or 72 Fully Tested Unmarked	5p	5p	4p
Matched Sets 1–OC44 and 2–OC45's. Per Set.	25p	20p	15p
OA47 Gold-Bonded Diodes, Marked and Tested	3p	3p	2p
1-watt Zener Diodes 7·5, 24, 27, 30, 36, 43 Volts	5p	4p	3p
10-watt Zener Diodes 5·1, 8·2, 11, 13, 16, 24, 30, 100 Volts	20p	17p	15p
Micro Switches, S/P, C/O	25p	20p	15p
1-amp Bridge Rec's 25-volt	25p	22p	20p

INTEGRATED CIRCUITS

SL403D Audio Amp.,3-Watts	1·50	1·37	1·32
709C Linear Opp. Amp.	25p	20p	15p
Gates, Factory Marked and Tested by A.E.I.	10p	9p	8p
J. K. Flip-Flops Factory, Marked and Tested by A.E.I.	20p	18p	15p
SN7490 Decade Counter	50p	45p	40p
UL914 Dual 2 I/P Gate	40p	35p	30p

LOW COST DUAL INLINE I.C. SOCKETS

14 pin type at 15p each
16 pin type at 16p each.

BOOKS

We have a large selection of Reference and Technical Books in stock.
These are just two of our popular lines:
B.P.I Transistor Equivalents and Substitutes; 40p
This includes many thousands of British U.S.A., European and C.V. equivalents.
The Iliffe Radio Valve & Transistor Data Book 9th Edition; 75p
Characteristics of 3,000 valves and tubes, 4,500 Transistors, Diodes, Rectifiers and Integrated Circuits.
Send for lists of these English publications.

Please send me the FREE Bi-Pre-Pak Catalogue.

NAME.......................................

ADDRESS.......................................

....

MINIMUM ORDER 50p. CASH WITH ORDER PLEASE. Add 10p post and packing per order OVERSEAS ADD EXTRA FOR POSTAGE

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

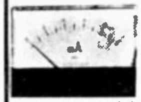
SEW PANEL METERS

USED EXTENSIVELY BY INDUSTRY, GOVERNMENT DEPARTMENTS, EDUCATIONAL AUTHORITIES, ETC.

● LOW COST ● QUICK DELIVERY ● OVER 200 RANGES IN STOCK ● OTHER RANGES TO ORDER

NEW "SEW" DESIGNS!

CLEAR PLASTIC METERS



TYPE SW.100
100 x 80 mm.

50μA	£3·60	20V. D.C.	£3·10
50-0-50μA	£3·45	50V. D.C.	£3·10
100μA	£3·45	300V. D.C.	£3·10
100-0-100μA	£3·35	1 amp. D.C.	£3·10
500μA	£3·20	5 amp D.C.	£3·10
1mA	£3·10	300V. A.C.	£3·10
		VU Meter	£3·75

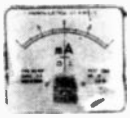
BAKELITE PANEL METERS

TYPE S-80
80 mm.
square fronts

50μA	£3·20	50V. D.C.	£2·60
50-0-50μA	£3·10	300V. D.C.	£2·60
100μA	£3·10	1 amp. D.C.	£2·60
100-0-100μA	£3·00	5 amp. D.C.	£2·60
500μA	£2·75	300V. A.C.	£2·60
1mA	£2·60	VU Meter	£3·37
20V. D.C.	£2·20		

"SEW" CLEAR PLASTIC METERS

Type MR.85P. 4¼in. × 4¼in. fronts.



50μA	£3·60	50mA	£2·80
50-0-50μA	£3·10	100mA	£2·80
100μA	£3·10	500mA	£2·80
100-0-100μA	£3·00	1 amp.	£2·80
200μA	£3·00	5 amp.	£2·80
500μA	£2·90	15 amp.	£2·80
500-0-500μA	£2·80	30 amp.	£2·90
1mA	£2·80	20V. D.C.	£2·80
1-0-1mA	£2·60	50V. D.C.	£2·80
5mA	£2·60	150V. D.C.	£2·80
10mA	£2·80	300V. D.C.	£2·80
		15V. A.C.	£2·80
		300V. A.C.	£2·80
		S Meter 1mA	£2·87
		VU Meter	£3·60
		1 amp. A.C.*	£2·80
		5 amp. A.C.*	£2·80
		10 amp. A.C.*	£2·80
		20 amp. A.C.*	£2·80
		30 amp. A.C.*	£2·80

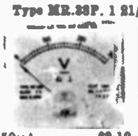
Type MR.52P. 2½in. square fronts.

50μA	£3·10	10V. D.C.	£2·00
50-0-50μA	£2·60	20V. D.C.	£2·00
100μA	£2·60	50V. D.C.	£2·00
100-0-100μA	£2·50	300V. D.C.	£2·00
500μA	£2·30	15V. A.C.	£2·10
1mA	£2·00	300V. A.C.	£2·10
5mA	£2·00	S Meter 1mA	£2·10
10mA	£2·00	VU Meter	£3·20
50mA	£2·00	1 amp. A.C.*	£2·00
100mA	£2·00	5 amp. A.C.*	£2·00
500mA	£2·00	10 amp. A.C.*	£2·00
1 amp.	£2·00	20 amp. A.C.*	£2·00
5 amp.	£2·00	30 amp. A.C.*	£2·00

Type MR.65P. 3½in. × 3¼in. fronts.

50μA	£3·37	10V. D.C.	£2·20
50-0-50μA	£2·75	20V. D.C.	£2·20
100μA	£2·75	50V. D.C.	£2·20
100-0-100μA	£2·65	150V. D.C.	£2·20
200μA	£2·65	300V. D.C.	£2·20
500μA	£2·40	15V. A.C.	£2·30
500-0-500μA	£2·20	50V. A.C.	£2·30
1mA	£2·20	150V. A.C.	£2·30
5mA	£2·20	300V. A.C.	£2·30
10mA	£2·20	500V. A.C.	£2·30
50mA	£2·20	S Meter 1mA	£2·37
100mA	£2·20	VU Meter	£3·37
500mA	£2·20	50mA A.C.*	£2·20
1 amp.	£2·20	100mA A.C.*	£2·20
5 amp.	£2·20	200mA A.C.*	£2·20
10 amp.	£2·20	500mA A.C.*	£2·20
15 amp.	£2·20	1 amp. A.C.*	£2·20
20 amp.	£2·20	5 amp. A.C.*	£2·20
30 amp.	£2·30	10 amp. A.C.*	£2·20
50 amp.	£2·50	20 amp. A.C.*	£2·20
5V. D.C.	£2·20	30 amp. A.C.*	£2·20

Type MR.38P. 1 21/32in. square fronts.



50μA	£2·10	200mA	£1·60
50-0-50μA	£1·90	300mA	£1·60
100μA	£1·90	500mA	£1·60
100-0-100μA	£1·75	750mA	£1·60
200μA	£1·75	1 amp.	£1·60
500μA	£1·65	2 amp.	£1·60
500-0-500μA	£1·60	5 amp.	£1·60
1mA	£1·60	10 amp.	£1·60
1-0-1mA	£1·60	3V. D.C.	£1·60
2mA	£1·60	10V. D.C.	£1·60
5mA	£1·60	15V. D.C.	£1·60
10mA	£1·60	20V. D.C.	£1·60
20mA	£1·60	100V. D.C.	£1·60
50mA	£1·60	150V. D.C.	£1·60
100mA	£1·60	300V. D.C.	£1·60
150mA	£1·60	500V. D.C.	£1·60
		750V. D.C.	£1·60
		15V. A.C.	£1·70
		50V. A.C.	£1·70
		150V. A.C.	£1·70
		300V. A.C.	£1·70
		500V. A.C.	£1·70
		S Meter 1mA	£1·70
		VU Meter	£2·10

Type MR.45P. 2in. square fronts.

50μA	£2·25	5 amp.	£1·70
50-0-50μA	£2·10	10V. D.C.	£1·50
100μA	£2·10	20V. D.C.	£1·50
100-0-100μA	£1·87	50V. D.C.	£1·50
200μA	£1·87	300V. D.C.	£1·50
500μA	£1·75	15V. A.C.	£1·80
500-0-500μA	£1·70	300V. A.C.	£1·80
1mA	£1·70	S Meter 1mA	£1·85
5mA	£1·70	VU Meter	£2·25
10mA	£1·70	1 amp. A.C.*	£1·70
50mA	£1·70	5 amp. A.C.*	£1·70
100mA	£1·70	10 amp. A.C.*	£1·70
500mA	£1·70	20 amp. A.C.*	£1·70
1 amp.	£1·70	30 amp. A.C.*	£1·70

"SEW" BAKELITE PANEL METER

Type MR.65. 3½in. square fronts.

25μA	£3·50	1 amp.	£1·95
50μA	£2·75	2 amp.	£1·95
50-0-50μA	£2·35	5 amp.	£1·95
100μA	£2·35	15 amp.	£1·95
100-0-100μA	£2·25	30 amp.	£1·95
500μA	£2·20	50 amp.	£1·95
1mA	£1·95	5V. D.C.	£1·95
1-0-1mA	£1·95	10V. D.C.	£1·95
5mA	£1·95	20V. D.C.	£1·95
10mA	£1·95	50V. D.C.	£1·95
50mA	£1·95	150V. D.C.	£1·95
100mA	£1·95	300V. D.C.	£1·95
500mA	£1·95	30V. A.C.*	£1·95
		50V. A.C.*	£1·95
		150V. A.C.*	£1·95
		300V. A.C.*	£1·95
		500mA A.C.*	£1·95
		1 amp. A.C.*	£1·95
		5 amp. A.C.*	£1·95
		10 amp. A.C.*	£1·95
		20 amp. A.C.*	£1·95
		30 amp. A.C.*	£1·95
		50 amp. A.C.	£1·95
		VU Meter	£3·10

*MOVING—IRON
ALL OTHERS MOVING COIL
Please add postage

SEW EDUCATIONAL METERS

Type ED.107. Size overall 100mm × 90mm × 108mm. A new range of high quality moving coil instruments ideal for school experiments and other bench applications. 3" mirror scale. The meter movement is easily accessible to demonstrate internal working. Available in the following ranges:

50μA	£5·00	20V d.c.	£4·80
100μA	£4·65	50V d.c.	£4·40
1mA	£4·40	300V d.c.	£4·40
50-0-50μA	£4·65		
1-0-1mA	£4·40	Dual range	
1A d.c.	£4·40	500mA/5A d.c.	£4·65
5A d.c.	£4·40	5V/50V d.c.	£4·65
10V. d.c.	£4·40		

EDGWISE METERS

Type PE.70. 3 17/32in × 1 15/32in. × 2⅝in. deep

50μA	£3·10	500μA	£2·75
50-0-50μA	£3·00	1mA	£2·45
100μA	£3·00	300V. A.C.	£2·45
100-0-100μA	£2·90	VU Meter	£3·40
200μA	£2·90		

Send for illustrated brochure on SEW Panel Meters—discounts for quantities.

MULTIMETERS for EVERY purpose!

HIOKI MODEL 720X 20,000 O.P.V. Overload protection 5/25/100/500/1000 VDC. 10/50/250/1000 VAC. 50uA/250mA. 20K/2 meg ohm. −5 to + 62db. £4·97. P. & P. 15p.

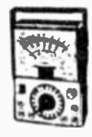
MODEL LT.101 1000 O.P.V 0/10/50/250/1000 V. D.C. 0/10/50/250/1000 V. A.C. 0/1/100 M.A. 0/150 K ohms. £1·97. P. & P. 15p.

MODEL PL436 20kΩ/Volt D.C. 8kΩ/Volt A.C. Mirror scale. ·6/3/12/30/120/600V D.C. 3/30/120/600V A.C. 50/600uA/60/600 mA. 10/100K/1 Meg/10 MegΩ −20 to +46db. £6·97½ P & P 12½p

TMK MODEL MD.120 Mirror scale. 20k/Volt D.C. 10k Ω Volt A.C. 30/60/300/600/3,000 V. D.C. 6/120/1,200 V. A.C. Current 0-60μA/0—12/0 300mA. 0-60K/0-6 MegΩ. −20 to + 63 dB. £4·62½ P & P 15p

MODEL 5025 57 Ranges. Giant 5½in. Meter, Polarity Reverse Switch. Sensitivity: 50K/Volt D.C. 5K/Volt A.C. D.C. Volts ·125, ·25, 1·25, 5, 10, 25, 50, 125, 250, 500, 1,000V. A.C. Volts: 1·5, 3, 5, 10, 25, 50, 125, 250, 500, 1,000V. D.C. Current 25, 50IA, 2·5, 5, 25, 50, 250, 500mA, 5, 10 amp. Resistance: 2K, 10K, 100K, 1MEG, 10 MEG. Decibels· −20 to +85 dB. £12·50. P. & P. 17½p.

MODEL 500 30,000 O.P.V with overload protection mirror scale 0/·5/2·5/10/25 100/250/500/1,000v. D.C 0/2·5/10/25/100/250/500/1,000V. A.C. 0/50μA/5/50/500mA. 12 amp. D.C. 0/60/K/6 Meg./60 Meg Ω. £8·87½. Post paid.



HIOKI MODEL 700X 100,000 O.P.V. Overload protection. Mirror scale. ·3/·6/1·2/1·5/3/6/12/30/60/120/300/600/1200VDC 1·5/3/6/12/30/60/150/300/600/1200 V.A.C. 15/30μA/3/6/30/60/150/300mA 6/12 AMP. DC. 2K/200K/2 Meg/20 Meg ohm −20 to +63 db £13·50. P. & P. 20p.

TMK LAB TESTER. 100,000 O.P.V. 6½in. Scale Buzzer Short Circuit Check. Sensitivity: 100,000 O.P.V. D.C. 5K/Volt A.C. D.C. Volts: ·5, 2·5, 10, 50, 250, 1,000 V. A.C. Volts: 3, 10, 50, 50, 250, 500, 1,000V. D.C. Current: 10, 100μA, 10, 100, 500mA, 2·5, 10 amp. Resistance: 1K, 10K, 100K, 10MEG, 100MEG Ω. Decibels: −10 to +49 db. Plastic Case with Carrying Handle. Size: 7½in. × 6¾in. × 3¼in. £18·90. P. & P. 25p

ROUND SCALE TYPE PENCIL TESTER MODEL TS.68

Completely portable, simple to use pocket sized tester. Ranges 0/3/30/300V AC and DC at 2,000 o.p.v. Resistance 0·20K ohms. ONLY £1·97 P. & P. 15p

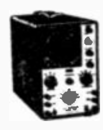
RUSSIAN 22 RANGE MULTIMETER

Model U437 10,000 o.p.v. A first class versatile instrument manufactured in U.S.S.R. to the highest standards. Ranges: 2·5/10/50/250/500/1000v D.C. 2·5/10/50/250/500/1000v A.C. DC Current 100 μA/1/10/100mA/1A. Resistance 300 ohms/3/30/300K/3m Ω. Complete with batteries, test leads, instructions and sturdy steel carrying case. OUR PRICE £5·97 P. & P. 25p.

TMK MODEL 117 F.E.T. ELECTRONIC VOLTMETER

Battery operated, 11 meg input, 26 ranges. Large 4¾" mirror scale. Size 5¾" × 4¾" × 2¼". DC VOLTS 0.3 - 1200V. AC VOLTS 3 - 300V RMS. 8·4 - 800V P-P. DC CURRENT ·12 - 12MA. Resistance up to 2000M ohm. Decibels − 20 to + 51 db. Complete with leads/instructions. £17·50. P. & P. 20p.

TO-3 PORTABLE OSCILLOSCOPE

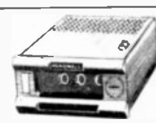


3in. tube, Y amp. Sensitivity 0·1v p-p/CM. Bandwidth 1·5 cps-1·5 MHz. Input imp. 2 meg Ω 25pF X amp. sensitivity 0·9v. p-p/CM. Bandwidth 1·5cps -800kHz. Input imp. 2 meg Ω 20pF. Time base. 5 ranges 10 cps-300kHz. Synchronization. Internal/external. Illuminated scale 140×215×330 mm. Weight 15½lb. 220/240V. A.C. Supplied brand new with handbook. £40·00. Carr. 50p.

TE-20C 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. 37½p. Size 140 × 215 × 107 mm.

HONEYWELL DIGITAL VOLTMETER VT.100



Can be panel or bench mounted. Basic meter measures 1 volt D.C. but can be used to measure a wide range of AC and DC volt, current and ohms with optional plug in cards. Specification: Accuracy: ±0·2, ±1 digit. Resolution: 1mV. Number of digits: 3 plus fourth overrange digit. Overrange: 100% (up to 1·999). Input impedance: 1000 Meg ohm. Measuring cycle: 1 per second. Adjustment: Automatic zeroing, full scale adjustment against an internal reference voltage. Overload: to 100v. D.C. Input: Fully floating (3 poles). Input power: 110-230v. A.C. 50/60 cycles. Overall size: 5⅛in.×3 13/16in.×8 3/16in. AVAILABLE BRAND NEW AND FULLY GUARANTEED AT APPROX. HALF PRICE. £49·97½. Carr. 50p.

TE22 SINE SQUARE WAVE AUDIO GENERATORS

Sine: 20cps to 200 kc/s on 4 bands. Square: 20cps to 30 kc/s. Output impedance 5,000 ohms, 200/250V. A.C. operation. Supplied brand new and guaranteed with instruction manual and leads. £17·50. Carr. 37½p.

TE-20RF SIGNAL GENERATOR

Accurate wide range signal generator covering 120 kc/s-260 Mc/s on 6 bands. Directly calibrated variable R.F. attenuator. Operation 200/240V A.C. Brand new with instruction. £15 P. & P. 37½p. S.A.E. for details.

240° Wide Angle 1mA Meters
MW1-6 60mm square £3·97½
MW1-8 80mm square £4·97½
P. & P. extra

G. W. SMITH & CO (RADIO) LTD.
Also see next two pages

SEMI-CONDUCTORS/VALVES

ALL DEVICES BRAND NEW AND FULLY GUARANTEED

Transistors											
		2N3415	22p	2N5458	35p	BC114	15p	BFW90	22p	NKT219	30p
		2N3416	37p	2N5459	40p	BC115	15p	BFW91	20p	NKT223	27p
2G301	20p	2N3417	37p	2S102	25p	BC116	15p	BFX12	22p	NKT224	22p
2G302	20p	2N3439	130p	2S103	25p	BC118	15p	BFX13	22p	NKT225	22p
2G303	20p	2N3440	97p	2S104	25p	BC119	30p	BFX29	25p	NKT229	30p
2G306	42p	2N3564	17p	2S301	50p	BC121	20p	BFX30	25p	NKT237	35p
2G308	30p	2N3565	15p	2S302	50p	BC122	15p	BFX37	30p	NKT238	25p
2G309	30p	2N3566	22p	2S303	60p	BC125	15p	BFX44	37p	NKT240	27p
2G371	15p	2N3568	25p	2S304	75p	BC126	20p	BFX68	67p	NKT241	27p
2G374	20p	2N3569	25p	2S501	32p	BC134	12p	BFX84	25p	NKT242	20p
2G381	22p	2N3570	125p	2S502	35p	BC135	12p	BFX85	30p	NKT243	62p
2N388A	49p	2N3572	97p	2S503	27p	BC136	15p	BFX86	25p	NKT244	17p
2N404	20p	2N3605	27p	3N83	40p	BC137	15p	BFX87	25p	NKT245	20p
2N696	15p	2N3606	27p	3N128	70p	BC138	20p	BFX88	20p	NKT261	20p
2N697	15p	2N3607	22p	3N140	77p	BC140	35p	BFX89	62p	NKT262	30p
2N698	25p	2N3638	18p	3N141	72p	BC141	35p	BFX93A	70p	NKT264	20p
2N699	30p	2N3638A	20p	3N142	55p	BC147	10p	BFY11	42p	NKT271	20p
2N706	10p	2N3641	18p	3N143	67p	BC148	10p	BFY18	25p	NKT262	20p
2N706A	12p	2N3642	18p	3N152	87p	BC149	12p	BFY19	25p	NKT274	20p
2N708	15p	2N3643	20p	40050	55p	BC152	17p	BFY21	42p	NKT275	20p
2N709	62p	2N3644	25p	40250	50p	BC153	20p	BFY24	45p	NKT278	25p
2N718	25p	2N3645	25p	40251	32p	BC154	20p	BFY29	40p	NKT281	27p
2N718A	30p	2N3691	15p	40309	32p	BC157	15p	BFY30	40p	NKT401	87p
2N726	30p	2N3692	18p	40310	45p	BC158	11p	BFY41	50p	NKT402	90p
2N727	30p	2N3693	15p	40311	35p	BC159	12p	BFY43	62p	MKT403	75p
2N914	17p	2N3694	18p	40312	47p	BC160	35p	BFY50	20p	NKT404	55p
2N916	17p	2N3702	10p	40314	37p	BC167	11p	BFY51	20p	NKT405	75p
2N918	30p	2N3703	10p	40315	37p	BC168B	10p	BFY52	20p	NKT406	62p
2N929	22p	2N3704	11p	40316	47p	BC168C	11p	BFY53	15p	NKT451	62p
2N930	20p	2N3705	10p	40317	37p	BC169B	11p	BFY56A	57p	NKT452	62p
2N987	40p	2N3706	9p	40319	55p	BC169C	11p	BFY76	42p	NKT453	47p
2N1090	22p	2N3707	11p	40320	47p	BC170	12p	BFY77	57p	NKT713	20p
2N1091	22p	2N3708	7p	40323	32p	BC171	15p	BFY90	65p	NKT717	42p
2N1131	25p	2N3709	9p	40324	47p	BC172	15p	BSX19	17p	NKT734	27p
2N1132	25p	2N3710	9p	40326	37p	BC175	22p	BSX20	15p	NKT736	35p
2N1302	17p	2N3711	12p	40329	30p	BC177	20p	BSX21	20p	NKT773	25p
2N1303	17p	2N3713	187p	40344	27p	BC178	20p	BSX26	45p	NKT781	30p
2N1304	22p	2N3714	200p	40347	57p	BC179	20p	BSX27	47p	OC16	50p
2N1305	22p	2N3715	123p	40348	52p	BC182	10p	BSX28	32p	OC19	37p
2N1306	25p	2N3716	130p	40360	40p	BC182L	10p	BSX60	82p	OC20	75p
2N1307	25p	2N3773	240p	40361	40p	BC183	9p	BSX61	62p	OC22	50p
2N1308	25p	2N3791	206p	40362	50p	BC183L	9p	BSX76	15p	OC23	60p
2N1309	25p	2N3819	34p	40370	32p	BC184	11p	BSX77	20p	OC24	60p
2N1507	17p	2N3820	55p	40406	57p	BC184L	11p	BSX78	25p	OC25	40p
2N1613	20p	2N3823	50p	40407	40p	BC186	25p	BSY24	15p	OC26	25p
2N1631	35p	2N3854	27p	40408	52p	BC187	27p	BSY25	15p	OC28	60p
2N1632	30p	2N3854A	27p	40409	55p	BC212L	12p	BSY26	17p	OC29	60p
2N1637	30p	2N3855	27p	40410	62p	BC213L	12p	BSY27	15p	OC35	50p
2N1638	27p	2N3855A	30p	40412	50p	BC214L	15p	BSY28	17p	OC36	60p
2N1639	27p	2N3856	30p	40467A	57p	BCY10	27p	BSY29	17p	OC41	22p
2N1701	169p	2N3856A	35p	40468A	35p	BCY30	27p	BSY32	25p	OC42	25p
2N1711	24p	2N3858	25p	40528	72p	BCY31	30p	BSY36	25p	OC44	15p
2N1889	32p	2N3858A	30p	40600	57p	BCY32	50p	BSY37	25p	OC45	12p
2N1893	37p	2N3859	27p	40603	50p	BCY33	25p	BSY38	20p	OC46	15p
2N2147	72p	2N3859A	32p	AC107	30p	BCY34	30p	BSY39	22p	OC70	15p
2N2160	57p	2N3860	30p	AC126	20p	BCY38	40p	BSY43	50p	OC71	12p
2N2193	40p	2N3866	150p	AC127	24p	BCY39	60p	BSY51	32p	OC72	12p
2N2193A	42p	2N3877	40p	AC128	20p	BCY40	50p	BSY52	32p	OC73	30p
2N2194	27p	2N3877A	40p	AC151	18p	BCY41	15p	BSY53	37p	OC74	30p
2N2194A	30p	2N3900	37p	AC152	22p	BCY42	15p	BSY54	40p	OC75	22p
2N2217	25p	2N3900A	40p	AC154	22p	BCY43	15p	BSY56	90p	OC76	22p
2N2218	20p	2N3901	97p	AC176	20p	BCY54	32p	BSY79	45p	OC77	30p
2N2219	20p	2N3903	20p	AC187	25p	BCY58	22p	BSY90	57p	OC78	20p
2N2220	25p	2N3904	25p	AC188	25p	BCY59	22p	BSY95A	12p	OC81	20p
2N2221	25p	2N3905	30p	ACY17	27p	BCY60	97p	C424	15p	OC81D	20p
2N2222	20p	2N3906	25p	ACY18	24p	BCY70	15p	C450	15p	OC82	25p
2N2222A	25p	2N4058	12p	ACY19	24p	BCY71	20p	GET102	30p	OC82D	15p
2N2297	30p	2N4059	10p	ACY20	20p	BCY72	15p	GET113	20p	OC83	25p
2N2368	15p	2N4060	12p	ACY21	20p	BCY78	30p	GET114	20p	OC84	25p
2N2369	15p	2N4061	12p	ACY22	10p	BCY79	30p	GET118	20p	OC139	25p
2N2369A	15p	2N4062	12p	ACY28	17p	BCZ10	27p	GET120	25p	OC140	32p
2N2410	42p	2N4244	47p	ACY39	47p	BCZ11	40p	GET873	12p	OC170	25p
2N2483	27p	2N4248	15p	ACY40	20p	BD112	50p	GET880	30p	OC171	30p
2N2484	32p	2N4249	15p	ACY41	15p	BD116	112p	GET887	20p	OC200	40p
2N2539	22p	2N4250	18p	ACY44	25p	BD121	65p	GET889	22p	OC201	60p
2N2540	22p	2N4254	42p	AD140	47p	BD123	80p	GET890	22p	OC202	75p
2N2613	35p	2N4255	42p	AD149	47p	BD124	60p	GET896	22p	OC203	40p
2N2614	30p	2N4284	17p	AD150	62p	BD131	75p	GET897	22p	OC204	40p
2N2646	40p	2N4285	17p	AD161	35p	BD132	80p	GET898	22p	OC205	75p
2N2711	25p	2N4286	17p	AD162	35p	BDY10	125p	MAT100	25p	OC206	95p
2N2712	25p	2N4287	17p	AF109	45p	BDY20	105p	MAT101	25p	OC207	75p
2N2713	27p	2N4288	15p	AF114	25p	BDY61	125p	MAT120	25p	OCP71	45p
2N2714	30p	2N4289	17p	AF115	25p	BDY62	100p	MAT121	25p	ORP12	50p
2N2904	20p	2N4290	12p	AF116	25p	BF115	25p	MJ400	107p	ORP60	40p
2N2904A	25p	2N4291	15p	AF117	20p	BF117	47p	MJ420	80p	ORP61	42p
2N2905	25p	2N4292	15p	AF118	60p	BF152	28p	MJ421	80p	P346A	22p
2N2905A	20p	2N4294	17p	AF121	30p	BF154	20p	MJ430	102p	ST140	15p
2N2906	20p	2N4303	47p	AF124	22p	BF158	15p	MJ440	95p	ST141	20p
2N2906A	25p	2N4964	15p	AF125	19p	BF159	35p	MJ480	97p	TI834	62p
2N2907	23p	2N4965	18p	AF126	19p	BF163	35p	MJ481	125p	TI843	40p
2N2923	15p	2N5027	52p	AF127	19p	BF167	18p	MJ490	100p	TI844	10p
2N2924	15p	2N5028	57p	AF139	28p	BF170	33p	MJ491	137p	TI845	27p
2N2925	15p	2N5029	47p	AF178	42p	BF173	19p	MJE340	50p	TI846	11p
2N2926G	10p	2N5030	42p	AF179	45p	BF177	30p	MJE370	80p	TI847	11p
2N2926O	10p	2N5172	12p	AF180	50p	BF178	25p	MJE371	80p	TI848	12p
2N2926Y	10p	2N5174	20p	AF181	40p	BF179	30p	MJE520	60p	TI849	12p
2N3011	20p	2N5175	52p	AF186	39p	BF180	35p	MJE521	70p	TI850	12p
2N3014	32p	2N5176	45p	AF239	30p	BF181	32p	MPF102	42p	TI851	10p
2N3053	18p	2N5232A	30p	AF279	47p	BF182	30p	MPF103	35p	TI852	11p
2N3054	45p	2N5245	45p	AF280	47p	BF184	20p	MPF104	37p	TI853	22p
2N3055	60p	2N5246	42p	AFZ11	32p	BF185	20p	MPF105	37p	XB112	12p
2N3133	30p	2N5249	67p	ASY26	25p	BF194	15p	MPS3638	32p	XC141	35p
2N3134	15p	2N5265	325p	ASY27	25p	BF195	15p	NKT124	42p	ZTX107	15p
2N3135	25p	2N5305	37p	ASY28	24p	BF196	15p	NKT125	27p	ZTX108	12p
2N3136	25p	2N5306	40p	ASY29	27p	BF197	15p	NKT126	27p	ZTX109	15p
2N3390	25p	2N5307	37p	ASY50	25p	BF198	15p	NKT128	27p	ZTX300	12p
2N3391	20p	2N5308	37p	ASY51	32p	BF200	35p	NKT135	27p	ZTX301	15p
2N3391A	30p	2N5309	62p	ASY54	25p	BF224	14p	NKT137	32p	ZTX302	20p
2N3392	17p	2N5310	42p	ASY67	45p	BF225	19p	NKT210	30p	ZTX303	20p
2N3393	15p	2N5354	27p	ASY86	32p	BF237	22p	NKT211	30p	ZTX304	25p
2N3394	15p	2N5355	27p	ASZ21	51p	BF238	22p	NKT212	30p	ZTX500	15p
2N3402	22p	2N5356	32p	AUY10	150p	BF244	23p	NKT213	30p	ZTX501	15p
2N3403	22p	2N5365	47p	BC107	10p	BFW61	47p	NKT214	20p	ZTX502	20p
2N3404	32p	2N5366	32p	BC108	10p	BFW87	25p	NKT215	22p	ZTX503	17p
2N3405	45p	2N5367	57p	BC109	10p	BFW88	23p	NKT216	35p	ZTX504	40p
2N3414	22p	2N5457	30p	BC113	10p	BFW89	20p	NKT217	40p	ZTX531	25p

Integrated Circuits

CA3000	180p	FJH111	70p	SN7437	64p
CA3005	117p	FJH121	25p	SN7440	20p
CA3007	262p	FJH131	25p	SN7441AN	75p
CA3011	75p	FJH141	25p	SN7442	75p
CA3012	88p	FJH151	25p	SN7446	100p
CA3013	105p	FJH161	70p	SN7447	135p
CA3014	124p	FJH171	25p	SN7448	125p
CA3018	84p	FJH181	25p	SN7450	20p
CA3018A	110p	FJH221	25p	SN7451	20p
CA3019	84p	FJH231	25p	SN7453	20p
CA3020	126p	FJH241	25p	SN7454	20p
CA3020A	160p	FJH251	25p	SN7460	20p
CA3021	156p	FJJ101	50p	SN7472	30p
CA3022	130p	FJJ111	50p	SN7473	40p
CA3023	126p	FJJ121	60p	SN7474	40p
CA3026	100p	FJJ131	60p	SN7475	45p
CA3028A	74p	FJJ141	125p	SN7476	45p
CA3028B	105p	FJJ181	75p	SN7483	87p
CA3029	87p	FJJ191	65p	SN7486	33p
CA3029A	165p	FJJ211	125p	SN7490	87p
CA3030	137p	FJJ251	125p	SN7492	87p
CA3035	122p	FJL101	125p	SN7493	87p
CA3036	72p	FJY101	25p	SN7495	87p
CA3039	82p	IC12	£1·80	SN7496	87p
CA3041	109p	L900	40p	SN74107	52p
CA3042	109p	L914	40p	SN74153	135p
CA3043	137p	L923	40p	SN74154	200p
CA3044	120p	LM380	122p	SN74160	180p
CA3045	122p	MC724P	60p	SN74161	260p
CA3046	81p	MC780P	247p	SN74164	220p
CA3047	187p	MC788P	146p	SN74165	225p
CA3048	204p	MC790P	124p	SN74192	175p
CA3049	160p	MC792P	66p	SN74193	175p
CA3050	185p	MC799P	66p	TAA241	162p
CA3051	134p	MC1303L	200p	TAA242	425p
CA3052	165p	MC1304P	225p	TAA243	150p
CA3053	46p	MC1305P	386p	TAA263	75p
CA3054	109p	MC838P	549p	TAA293	97p
CA3055	240p	MC1435P	345p	TAA300	175p
CA3059	165p	MC1552G	461p	TAA310	125p
CA3064	120p	MC1709CG	94p	TAA320	72p
FCH101	85p	MFC4000P	55p	TAA350	175p
FCH111	105p	SN7400	20p	TAA435	147p
FCH121	105p	SN7401	20p	TAA521	132p
FCH131	50p	SN7402	20p	TAA522	360p
FCH141	105p	SN7403	20p	TAA530	495p
FCH151	105p	SN7404	20p	TAA811	445p
FCH171	105p	SN7405	20p	TAB101	97p
FCH181	105p	SN7406	80p	TAD100	150p
FCH191	105p	SN7408	20p	TAD110	150p
FCH201	130p	SN7409	20p	SL403D	15 p
FCH211	130p	SN7410	20p	SL702C	147p
FCH221	130p	SN7411	23p	UA702A	280p
FCH231	150p	SN7412	48p	UA702C	77p
FCJ101	160p	SN7413	30p	UA703C	137p
FCJ111	150p	TE7416	84p	UA709C	45p
FCJ121	275p	SN7417	84p	UA710C	125p
FCJ131	275p	SN7420	20p	UA716	187p
FCJ141	525p	SN7423	51p	UA723C	100p
FCJ201	100p	SN7427	48p	UA730C	160p
FCJ211	275p	SN7428	80p	UA741C	80p
FCK101	430p	SN7430	20p		
FCL101	230p	SN7432	48p		
FCY101	102p	SN7433	80p		
FJH101	25p				

BRIDGE RECTIFIERS PLASTIC ENCAPSULATED

		50 PIV 4A	40p
		100 PIV 4A	50p
		200 PIV 4A	55p
		400 PIV 4A	65p
		600 PIV 4A	70p
600 PIV 1A	50p	50 PIV 6A	45p
50 PIV 2A	45p	100 PIV 6A	55p
100 PIV 2A	50p	200 PIV 6A	65p
200 PIV 2A	55p	400 PIV 6A	75p
400 PIV 2A	60p	600 PIV 6A	85p

SILICON RECTIFIERS MINIATURE WIRE ENDED PLASTIC

SERIES	IN 1 AMP	PL 1·5 AMP	CL 3 AMP
4001 50PIV	7p	8p	19p
4002 100PIV	7p	9p	20p
4003 200PIV	8p	10p	22p
4004 400PIV	8p	10p	25p
4005 600PIV	10p	12p	26p
4006 800PIV	12p	15p	27p
4007 1000PIV	15p	16p	30p

50+ less 15% 100+ less 20%

SILICON RECTIFIERS STUD MOUNTING

	6A	10A	17·5A	35A
100PIV	—	45p	50p	£1·22
200PIV	25p	50p	55p	£1·42
400PIV	30p	55p	62p	£1·77
600PIV	32p	60p	72p	£2·12
800PIV	35p	75p	87p	£2·47
1000PIV	40p	85p	£1·05	£2·77

50+ less 15% 100+ less 20%

ZENER DIODES

400MW	1·5 WATT	10 WATT
3·3-33 V	2·4—100	3·9—100V
10p each	25p each	40p each

25+ less 15% 100+ less 20%

TRANSISTOR DISCOUNTS:- 12 + 10%; 25 + 15%; 100 + 20% any one type. Postage on all Semi Conductors 7p extra.
S.A.E. FOR FULL LISTS.

VALVES

OA2	38p	25Z4	30p	EM80	45p
OB2	45p	25Z5	42p	EM81	60p
OZ4	30p	25Z6	65p	EM84	35p
1L4	20p	30C15	80p	EM85	£1·00
IR5	40p	30C17	90p	EM87	70p
IS5	30p	30C18	80p	EY51	40p
IT4	25p	30F5	85p	EY86	40p
1U4	30p	30FL1	75p	EY87	42p
1U5	60p	30FL12	120p	EZ40	55p
2D21	35p	30FL14	95p	EZ41	50p
3Q4	50p	30L15	85p	EZ80	27p
3S4	35p	30L17	80p	EZ81	29p
3V4	48p	30P12	80p	GZ32	48p
5R4	75p	30P19	85p	GZ34	60p
5U4	35p	30PL1	75p	KT66	£2·05
5V4	45p	30PL13	93p	KT88	£2·00
5Y3	40p	30PL14	90p	MU14	75p
5Z4G	40p	35L6	50p	PABC80	40p
6/30L2	80p	35W4	35p	PC86	60p
6AC7	40p	35Z4	35p	PC88	60p
6AG7	40p	35Z5	50p	PC97	45p
6AK5	35p	50B5	50p	PC900	48p
6AK6	60p	50C5	50p	PCC84	40p
6AL5	20p	80	55p	PCC85	40p
6AM6	30p	85A2	50p	PCC88	55p
6AQ5	38p	807	50p	PCC89	50p
6AS6	40p	1625	50p	PCC189	55p
6AT6	35p	5763	70p	PCF80	30p
6AU6	25p	6146	160	PCF82	34p
6AV6	30p	AZ31	55p	PCF84	60p
6BA6	25p	CY31	35p	PCF86	60p
6BE6	30p	DAF91	30p	PCF800	80p
6BH6	75p	DAF96	45p	PCF801	50p
6BJ6	50p	DF91	22p	PCF802	50p
6BQ7A	40p	DF96	45p	PCF805	80p
6BR7	90p	DK91	40p	PCF806	70p
6BR8	70p	DK92	55p	PCF808	75p
6BW6	85p	DK96	50p	PCL82	35p
6BW7	80p	DL92	35p	PCL83	65p
6BZ6	40p	DL94	48p	PCL84	45p
6C4	33p	DL96	45p	PCL85	40p
6CD6	125p	DM70	40p	PCL86	45p
6CL6	50p	DY86	32p	PFL200	65p
6CW4	65p	DY87	33p	PL36	55p
6F1	62p	E88CC	100p	PL81	50p
6F6G	35p	E180F	100p	PL82	45p
6F13	45p	EABC80	35p	PL83	45p
6F14	70p	EAF42	35p	PL84	40p
6F15	65p	EB91	20p	PL500	75p
6F18	50p	EBC41	55p	PL504	80p
6F23	85p	EBC81	30p	PY32	55p
6H6	17p	EBF80	40p	PY33	63p
6J4	50p	EBF83	40p	PY80	40p
6J5	25p	EBF89	32p	PY81	30p
6J5GT	30p	EBL21	60p	PY82	35p
6J6	20p	EC86	60p	PY83	38p
6J7	45p	EC88	60p	PY88	40p
6K8G	40p	ECC40	65p	PY800	40p
6L6GT	45p	ECC84	30p	PY801	50p
6LD20	50p	ECC85	40p	U25	80p
6Q7	40p	ECC88	40p	U26	80p
6SA7	40p	ECF80	35p	U50	40p
6SG7	40p	ECF82	35p	U52	35p
6SJ7	40p	ECF86	65p	U191	75p
6SK7	40p	ECH21	57p	U281	40p
6SL7	35p	ECH35	100p	U282	40p
6SN7	35p	ECH42	75p	U301	40p
6SQ7	40p	ECH81	30p	U801	£1·80
6U4	65p	ECH83	45p	UABC80	40p
6V6G	25p	ECL80	45p	UAF42	55p
6V6GT	32p	ECL82	35p	UBC41	50p
6X4	35p	ECL83	70p	UBC81	40p
6X5G	30p	ECL86	40p	UBF80	40p
6X5GT	40p	EF37A	120p	UBF89	35p
10C2	50p	EF39	50p	UCC84	49p
10F1	75p	EF40	50p	UCC85	40p
10P13	60p	EF41	65p	UCF80	55p
10P14	£1·10	EF42	70p	UCH21	60p
12AT6	30p	EF80	25p	UCH42	70p
12AT7	30p	EF85	35p	UCH81	40p
12AU7	30p	EF86	30p	UCL82	35p
12AX7	30p	EF89	28p	UCL83	60p
12AV6	40p	EF91	30p	UF41	60p
12BA6	40p	EF92	35p	UF80	35p
12BE6	40p	EF183	35p	UF85	40p
12BH7	45p	EF184	35p	UF89	40p
19AQ5	35p	EH90	40p	UL41	65p
20D1	50p	EL34	50p	UL84	40p
20F2	65p	EL41	60p	UY41	48p
20L1	£1·10	EL42	65p	UY85	40p
20P1	50p	EL81	55p	VR105/30	38p
20P3	60p	EL84	25p	VR150/30	35p
20P4	£1·10	EL85	43p		
20P5	£1·20	EL91	35p	*Add 12p in £*	
25L6	50p	EL95	35p	*for postage*	

DIODES & RECTIFIERS

1N34A	10p	BA154	12p	GJ7M	87p
1N914	7p	BAX13	12p	OA5	17p
1N916	10p	BAX16	7p	OA6	12p
AA119	7p	BAY31	7p	OA10	22p
AA129	10p	BAY38	15p	OA9	10p
AAZ13	10p	BY100	15p	OA47	8p
AAZ15	10p	BY103	22p	OA70	7p
BA100	15p	BY122	37p	OA73	10p
BA102	30p	BY124	15p	OA79	7p
BA110	25p	BY126	12p	OA81	8p
BA111	27p	BY127	15p	OA85	7p
BA112	70p	BY164	52p	OA90	7p
BA115	7p	BY210	35p	OA91	7p
BA141	32p	BYZ11	30p	OA95	7p
BA142	32p	BYZ12	30p	OA200	7p
BA144	12p	BYZ13	25p	OA202	10p
BA145	20p	BYZ16	40p	OA210	17p

◄ See previous page • G.W. SMITH & Co. (RADIO) LTD. • See opposite page ►

HI-FI EQUIPMENT

SAVE UP TO 33⅓% OR MORE

SEND S.A.E. FOR DISCOUNT PRICE LISTS AND PACKAGE OFFERS!

RECORD DECKS

BSR	
UA50†	£4·97
C129†	£6·50
MP60	£10·40
610	£14·07
510	£11·50
310	£9·40
810	£32·45
MP60 TPD1	£17·12
MP60 TPD2	£15·40
610 TPD1	£20·35
510 TPD1	£18·20
210 Package*	£9·55
HT 70	£14·99
HT 70 Pack	£21·60

GARRARD	
2025 T/C*	£8·50
40B*	£9·25
5-300*	£8·50
SP25 III	£10·25
SP25/G800*	£14·50
SL65B	£13·45
AP76	£18·85
AP76/G800*	£22·50
SL72B	£22·95
SL75B	£26·00
SL95B	£32·50
401	£26·60
ZERO 100A	£29·95
ZERO 100S	£37·50

GOLDRING	
GL69/2	£18·97
GL69/2/P	£24·20
GL72	£22·25
GL72/P	£29·05
GL75	£29.05
GL75P	£34·95
LID75	£3·33
LID72	£3·65
G99	£19·30
GL85	£46·50
GL85P	£54·30
LID85	£4·80
G101	£21·95

PIONEER	
PL12AC	£35·15
PL15C	£50·25
PLA25	£62·85

THORENS	
TD125	£57·65
TD125AB	£91·15
TX25	£6·40
TD150	£27·90
TD150A II	£23·20
TD150AB II	£27·80
150 Plinth	£3·47
TX11	£3 65

* Stereo Cartridge † Mono
All others less cartridge
Carriage 50p extra any model.

RECORD DECK PACKAGES

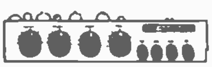
Decks supplied with cartridge ready wired in teak veneered plinth with cover.

Garrard 2025TC/9TAHCD	£12·95
Garrard SP25 III/9TAHCD	£15·95
Garrard SP25 III/G800	£18·50
Garrard SP25 III/M75-6	£19·50
Garrard SP25 III/M44-7	£20·35
Garrard SP25 III/M44-E	£22·80
SP25 III/G800 (Play-on P&C)	£19·75
Garrard AP76/G800*	£29·50
Garrard AP76/M75-6*	£30 25
Garrard AP76/M55E	£32·95
Garrard AP76/M75EJ	£34·90
BSR McDonald MP60/AT55	£19·25
Goldring GL72/G800	£24·50
Goldring GL75/G800	£29·70
Goldring GL75/G800E	£44·15

*Also available with silver metal plinth £1 extra
Carriage 50p any item

SINCLAIR EQUIPMENT

Project 60 Package offers.



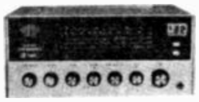
2 × Z30 amplifier, stereo 60 pre-amp, PZ5 power supply. £15·95 Carr. 37½p. Or with PZ6 power supply £18 00 Carr. 37½p. 2 × Z50 amplifier, stereo 60 pre-amp, PZ8 power supply. £20·25. Carr. 37½p.
Transformer for PZ8. £2·97½ extra.
Add to any of the above £4·45 for active filter unit and £13·90 for pair of Q16 speakers.
Project 60 FM Tuner £16·95. Carr. 37½p.
All other Sinclair products in stock.
2000 Amp £23·50 Carr. 37½p.; 3000 Amp £30·95 Carr. 37½p.; Neoteric Amp £43·95 Carr. 37½p IC12 £1·80 p. & p. 10p.
NEW PROJECT 605 — £20·97. Carr. 37p.

LATEST CATALOGUE

Our new 6th edition gives full details of a comprehensive range of HI-FI EQUIPMENT, COMPONENTS, TEST EQUIPMENT and COMMUNICATIONS EQUIPMENT. FREE DISCOUNT COUPONS VALUE 50p 272 pages, fully illustrated and detailing thousands of bargains.

SEND NOW
ONLY 37½p
P & P 10p

SKYWOOD CX203 COMMUNICATION RECEIVER



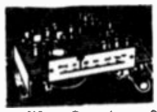
Solid state. Coverage on 5 bands 200-420 KHz and ·55 to 30 MHz. Illuminated slide rule dial. Bandspread. Aerial tuning. BFO, AVC, ANL, 'S' meter. AM/CW/SSB. Integrated speaker and phone socket. Operation 220/240v AC or 12v DC. Size 325 x 266 x 150 mm. Complete with instructions and circuit. £28·50. Carr. 50p

TELETON F.2000 AM/FM STEREO TUNER AMPLIFIER

Probably the most popular budget Tuner/Amp. and now offered at a ridiculous low price. 5 watts r.m.s. per channel. Tape/Cer phono inputs. AFC/Built-in MPX. List £51. OUR PRICE £38·75. Carr. 50p.

● SUGGESTED SYSTEM ●
F.2000, Garrard 2025T/C Changer fitted stereo cartridge, with plinth and cover and pair of G.W.S. Speakers. Total Rec. Price £97·73½. OUR PRICE £52·95. Carr. £1

★ TRANSISTORISED FM TUNER



6 TRANSISTOR HIGH QUALITY TUNER, SIZE ONLY 6×4×2½in. 3 I.F. stages. Double tuned discriminator. Ample output to feed most amplifiers. Operates on 9 V battery. Coverage 88–108Mc/s. Ready built ready for use. Fantastic value for money. £6·87½. P. & P. 12½p. Stereo multiplex adaptors £4·97½.

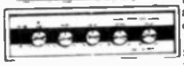
MP7 MIXER PREAMPLIFIER

5 microphone inputs each with individual gain controls enabling complete mixing facilities. Battery operated. 9½" × 5" × 3". Inputs Mics: 3 × 3mV 50K; 2 × 3mV 600 ohm. Phono mag. 4mV 50K. Phono ceramic 100mV 1 meg. Output 250mV 100K. £8·97. P. & P. 20p.

SINCLAIR IC-12

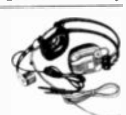
List Price £2·98
OUR PRICE £1·80
P. & P. 10p

NS-1600W STEREO AMPLIFIER



Exceptional budget price amplifier. All silicon transistor. Handsome Walnut case. Switched input selector, separate balance, volume, treble, bass controls. Output 2×6W RMS. Inputs Mag. Tape. Xtal, Tuner, Tape Out. £14·75. Carr. 37p.

SH.001 HEAD SET AND BOOM MICROPHONE



Moving coil. Ideal for language teaching, communications. Headphone imp. 16 ohms. Microphone imp. 200 ohms. £4·62. P. & P. 15p.

Model S-100TR MULTIMETER TRANSISTOR TESTER 100,000 o.p.v. MIRROR SCALE OVERLOAD PROTECTION

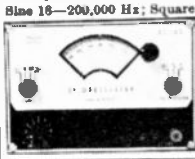
0/·12/·6 / 3 /12 / 30 /120/ 600 V DC. 0/6/30/120/600 V AC. 0/12/600μA/12 / 300MA / 12 AMP DC. 0/10K/1 MEG/ 100 MEG. – 20 to +50 db. 0·01 –2 MFD. Transistor tester measures Alpha, Beta and Ico. Complete with batteries, instructions and leads. £13·50. P. & P. 25p.

MCA.220 AUTOMATIC VOLTAGE STABILISER

Input 88–125 VAC. or 176–250VAC. Output 120V AC. or 240 VAC. 200 VA rating. £11·97. carr. 50p.

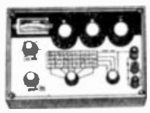
BELCO AF-5A SOLID STATE SINE SQUARE WAVE C.R. OSCILLATOR

Sine 16—200,000 Hz; Square 16—50,000 Hz



Output max. + 10 dB (10 K ohms) Operation internal batteries Attractive 2-tone case 7¾" × 5" × 2" Price £17·50. Carr. 17½p.

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 7¾ × 5 × 2in. £20. P. & P. 25p

E.H.T. TESTER 0-30KV

Completely self contained with built-in voltmeter. Easy to read, very accurate, robust construction. An essential for colour television servicing, etc. Size 360mm long. 50mm dia. £6·95 P. & P. 25p.

230V/240V SMITHS SYNCHRONOUS GEARED MOTORS

Built in gearbox. All brand new and boxed. 60 RPM CW; 30 RPH CW; 2R/HR ACW; 2R/HR CW; 8R/DAY CW; 10 RPM CW; 20R/HR ACW.
50p each Post 12p.

SDH 8V HI-FI PHONES

Input 8–16 Ω. Frequency 20–18,000Hz stereo or mono switch, separate volume controls each earpiece, padded headband. £3·97. P. & P. 20p.

HELICAL POTENTIOMETERS ITT MCPMI5 10 TURN 2¼ WATTS

Available 500 ohm, 1K, 5K ohm. £1·25 each P. & P. 15p.

POWER RHEOSTATS

High quality ceramic construction. Windings embedded in vitreous enamel. Heavy duty brush wiper. Continuous rating. Wide range ex-stock. Single hole fixing, ¼in. dia. shafts. Bulk quantities available.
25 WATT. 10/25/50/100/250/500/1000/2500 or 5000 ohms, 90p, P. & P. 7½p.
50 WATT. 10/25/50/100/250/500/1000/2500 or 5000 ohms, £1·15 P. & P. 7½p.
100 WATT. 1/5/10/25/50/100/250/500/1000 or 2500 ohms, £1·65 P. & P. 7½p.

"YAMABISHI" VARIABLE VOLTAGE TRANSFORMERS

Excellent quality · Low price · Immediate delivery

S-260 General Purpose Bench Mounting

1 Amp	£7·00
2·5 Amp	£8·05
5 Amp	£11·75
8 Amp	£15·90
10 Amp	£22·50
12 Amp	£23·60
20 Amp	£49·00

S-260B Panel Mounting

1 Amp	£7·00
2·5 Amp	£8·05

Please add postage
ALL MODELS
INPUT 230 V 50/60 CYCLES
OUTPUT VARIABLE 0-260 VOLTS
Special discounts for quantity

SPECIAL OFFER! SINCLAIR PROJECT 60 STEREO FM TUNER

The first tuner in the world to use the phase lock loop principle—as used for receiving signals from space craft because of its vastly i · proved signal to noise ratio. Provides fantastic results even in difficult areas. Tuning range 87·5 to 108MHz. Automatic stereo indicator. Sensitivity: 2μV. AFC range ± 200KHz. Signal to noise ratio: 65dB. Output voltage 2 × 150mV. Operating voltage 25–30V DC. Size 93 × 40 × 207 mm. REC. LIST PRICE £25.

OUR PRICE ONLY **£16·95** P. & P. 25p

Unrepeatable offer—buy now and save over £8.

RP214 REGULATED POWER SUPPLY

Solid state. Variable output 0–24V DC up to 1 amp. Dual scale meter to monitor voltage and current.

Input 220/240V AC. Size 185 × 85 × 105mm. £8·97 P. & P. 25p.

PS.1000B REGULATED POWER SUPPLY

Solid state. Output 6, 9 or 12 volt DC up to 3 amps. Meter to monitor current. Input 220/240v AC. Size 4" × 3½" × 6½". £11·97. P. & P. 25p.

LAFAYETTE HA-600 SOLID STATE RECEIVER

General coverage 150–400kc/s, 550 kc/s–30mc/s. FET front end. 2 mech. filters, product detector, variable B.F.O., noise limiter. S. Meter, Bandspread. RF Gain. 15" × 9½ × 8½". 18 lbs. 220/240v. A.C. or 12v. D.C. Brand new with instructions. £50. Carr. 50p.

UHR-30 RECEIVER

4 Bands covering 550kc/s–30mc/s. B.F.O. Built-in Speaker 220/240v. A.C. Brand new with instructions. £15 75. Carr. 37½p.

AUTO TRANSFORMERS

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

80 W	£2·10	P. & P. 18p
150 W	£2·70	P. & P. 18p
300 W	£3·60	P. & P. 23p
500 W	£5·25	P. & P. 33p
1000 W	£7·50	P. & P. 38p
1500 W	£10·20	P. & P. 43p
2250 W	£17·25	P. & P. 50p
5000 W	£35·00	P. & P. £1

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

10 TOTTENHAM CT. RD. LONDON, W.1 Tel: 01-637 2232
27 TOTTENHAM CT. RD. LONDON, W.1 Tel: 01-636 3715
3 LISLE STREET, LONDON, W.C.2 Tel: 01-437 8204
34 LISLE STREET, LONDON, W.C.2 Tel: 01-437 9155
311 EDGWARE ROAD, LONDON, W.2 Tel: 01-262 0387

CALLERS WELCOME MONDAY TO SATURDAY 9AM-6PM

All Mail Orders to– 11-12, Paddington Green, London, W.2 Tel: 01-262 6562

everyday electronics

PROJECTS...
THEORY......

VANISHING TRICK

The uninitiated might well be mystified as to how the private constructor obtains the circuit components and other special items he needs for his hobby. The sources of supply are certainly not all that apparent to an outsider.

Taking the country as a whole, outside the larger cities and certain towns it is rare indeed to find a shop dealing exclusively in electronic components. Nor do the numerous radio and television shops that grace every high street any longer offer that incidental service to the private constructor they, or their predecessors did, years ago.

MAIL ORDER

And yet in all, the turnover in electronic components and sundry items for private constructors has never been higher than at present. Likewise, the range and variety of parts offered to the individual has never been so extensive.

So what is the answer to this apparent paradox?

It is, quite simply, mail order. This method accounts for the greater bulk of business transacted in this area today.

AVAILABLE TO ALL

Mail order has considerable advantages to the individual purchaser. He can select from the retailers' advertisements or from their catalogues and lists, and order with confidence no matter what part of the country he resides in.

The system has certain snags, it has to be admitted. Occasional delays can cause irritation, and the need often to divide one's requirements among several suppliers can be a bit tiresome. But taking all into account the growth of the mail order retail business has been a great boon, especially to those living in the remote and less populated areas. No matter how isolated, they have the same extensive choice of components as constructors living in the large towns and cities.

UNDER THE BONNET

If the electronics industry had not invented the transistor, we feel sure the automobile industry would eventually have done so!

That ever available 12 volt battery is a prime mover in more senses than one. Since the arrival of the semiconductor it has been the inspiration for countless electronic gadgets.

This month we pamper the motorist yet again. We help him keep up appearances while touring or camping. It's a real face saver.

Our August issue will be published on Friday, July 21

Subscription Rates including postage for one year, to any part of the world, £2·35.
Everyday Electronics, Fleetway House, Farringdon Street, London, E.C.4. Phone: *Editorial* 01-634-4452; *Advertisements* 01-634-4202.

..EASY TO CONSTRUCT
..SIMPLY EXPLAINED

VOL. I NO. 9

JULY 1972

CONSTRUCTIONAL PROJECTS

GENERAL FEATURES

Please Note~ no back issues

We regret to inform readers that the publishers are no longer able to supply copies of past issues. Nor will any back issues be available in the future.

Sorry about this—but to avoid possible disappointment we can only urge our readers to place a regular order with their normal supplier; or alternatively to take out an annual subscription (for details see foot of facing page).

SHAVER INVERTER

A 240V a.c. supply for electric shavers from a 12V car battery
by C. J. Mills

THIS inverter has been specially designed to power any mains type electric razor from a 12 volt car battery. Many inverters provide a d.c. output and will only power a.c./d.c. type razors. Most of the vibrating type razors can only work on a suitable a.c. supply.

Using the design given, a razor can be used anywhere a 12 volt supply (normally a car battery) is available; such as when camping, caravanning or boating. The unit is thus ideal for anyone who enjoys the "outdoor life" during the summer months.

DESIGN

The main problem usually encountered in making a low frequency inverter to drive mains equipment from batteries is the design and construction of a special transformer to suit the power output required. For small inverters with outputs up to about 20 watts, standard mains transformers with a centre tapped secondary winding can be used in reverse, with a separate circuit to drive the power transistors.

The driving circuit must provide two output square waves in anti-phase such as is obtained from a multivibrator.

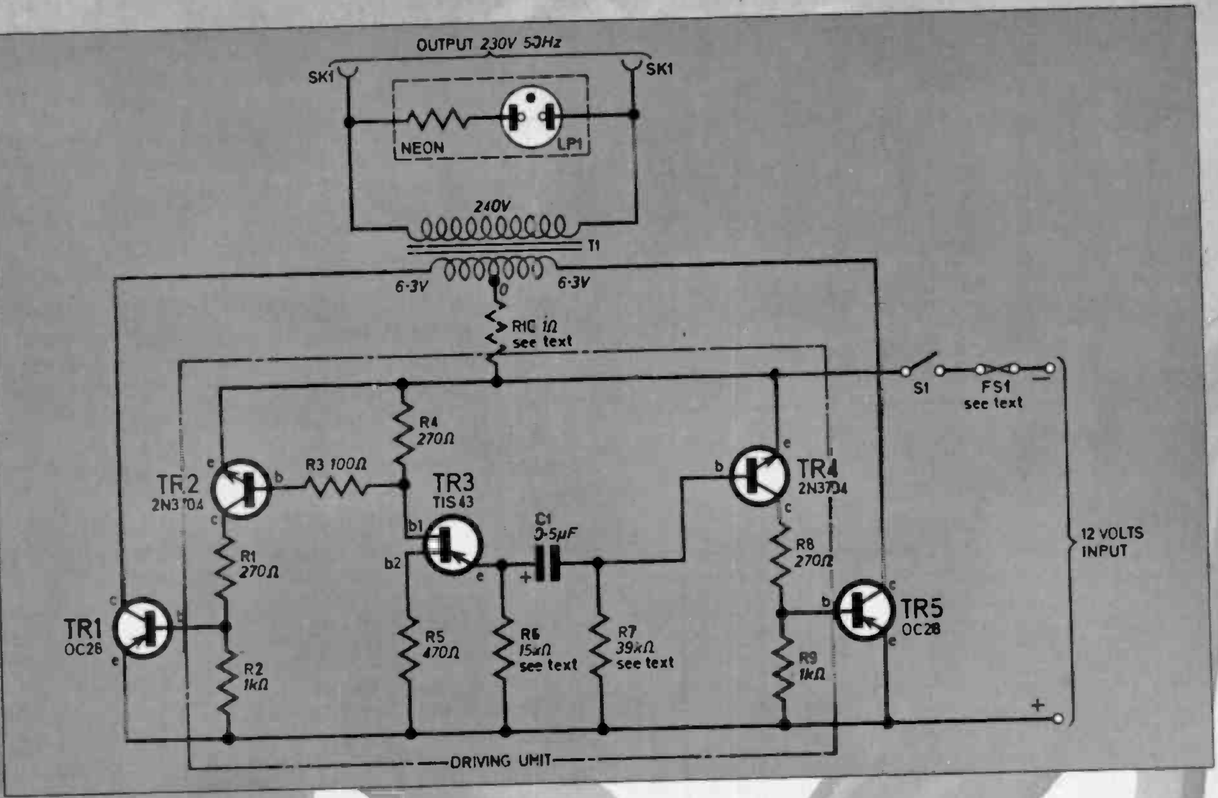


Fig. 1 Complete circuit diagram of the Shaver Inverter.

A unique type of multivibrator circuit developed by the author uses a unijunction because of its excellent frequency stability, in conjunction with two bipolar transistors as shown in the circuit diagram, Fig. 1.

CIRCUIT DESCRIPTION

The basic unijunction oscillator circuit will give a square wave output if a forward biased diode is connected in series with the capacitor.

Components....

SEE SHOP TALK

Resistors

R1 270Ω
R2 1kΩ
R3 100Ω
R4 270Ω
R5 470Ω
R6 15kΩ
R7 39kΩ
R8 270Ω
R9 1kΩ
R10 1Ω 5W wirewound (if used—see text)
All ¼W ± 10% carbon except where stated

Capacitor

C1 0·5μF, 16V tantalum

Semiconductors

TR1 OC28 germanium *pnp* (or OC29—see text)
TR2 2N3704 silicon *npn*
TR3 TIS43 unijunction
TR4 2N3704 silicon *npn*
TR5 OC28 germanium *pnp* (or OC29—see text)

Transformer

T1 240V primary with: 16·3V, 0·3A centre tapped secondary (for 5 watts output) or 9V-0-9V, 0·6A secondary (for 10 watts output) or 6·3V–0–6·3V, 0·6A secondary used with R10 in circuit (for 10 watts output)—see text for details and higher power types. In all cases the mains primary is used as the secondary winding in this circuit.

Miscellaneous

FS1 Fuse and holder (see text)
S1 S.p.s.t. toggle switch
LP1 Neon mains indicator lamp
SK1 Two pin mains line socket for connection to shaver, 6 way stand-off tag strip, mica washers and plastic insulation bushes for TR1 and TR5, metal case 4½ x 3½ x 2 inches, plain perforated Veroboard 2½ x 2 x 0·1 inch matrix with Veropins to suit, grommets, wire, 4BA fixings and earth tags.

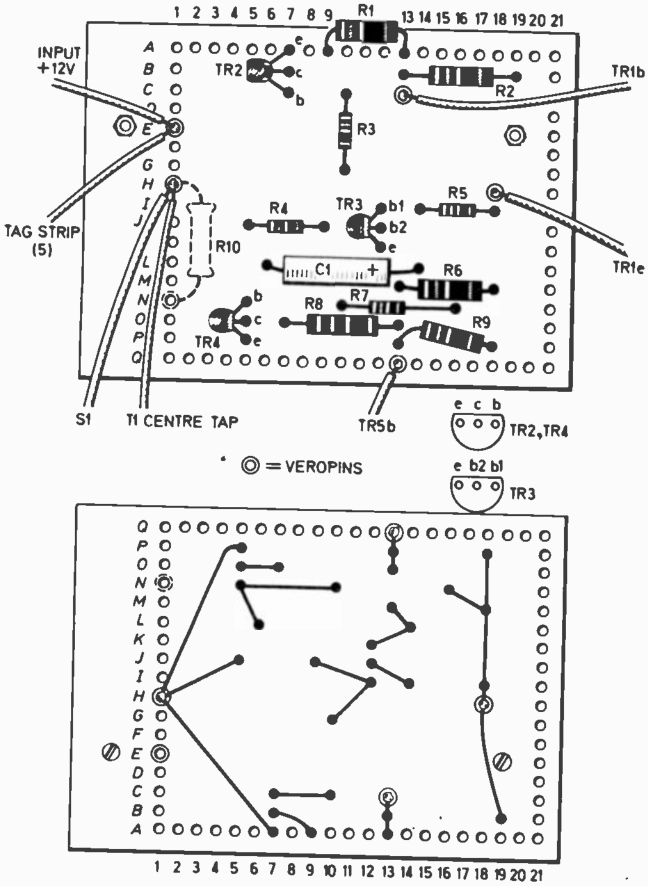


Fig. 2 Layout and wiring of components on the Veroboard.

In Fig. 1 the base, emitter diode of transistor TR4 is used and it is biased "on" by the base resistor R7. The collector is connected to a suitable resistor to provide one of the outputs. A second *npn* transistor, connected to the b1 base of the unijunction as shown, gives an output in phase opposition to the first.

CIRCUIT ACTION

When the supply voltage is connected the capacitor charges up through the base emitter diode of TR4 and through the 15 kilohm timing resistor, R6, until the trigger voltage of the unijunction is reached. During this charging time TR4 is held on by the charging current.

When the unijunction fires, its emitter voltage drops due to the emitter to base b1 current and this voltage drop is transferred to the base of TR4 by the capacitor, so that TR4 is turned off and the capacitor discharges through the TR4 bias resistor R7. At the same time the unijunction emitter, base b1 current flowing through the base resistance produces a voltage which switches on TR2 which stays on until the capacitor has discharged sufficiently to allow TR4 to conduct.

At this point the unijunction and TR2 are switched off, the capacitor starts charging again and the cycle is repeated.

The outputs from the collectors of TR2 and TR4 are coupled to the power transistors which switch the supply voltage across each half of the transformer alternately.

OUTPUT POWER

Using a 16·3 volt centre tapped 0·3 amp filament transformer with a test load resistance of 12 kilohms an output voltage of about 250 volts (approximately 5 watts) is obtained with a 12V d.c. input—alternatively, an 18 volt 0·6 amp transformer gives an output of 235 volts across 12 kilohms with an input voltage of 13 volts d.c.

For higher wattage outputs (up to 20 watts maximum for this design) a transformer with a 16 volt centre tapped secondary winding rated at 1 amp is required and the power transistors should be changed to OC 29 types.

Alternatively, if a 6·3-0-6·3 volt transformer is more readily available it can be used with a 1 ohm 5 watt resistor (R10) in series with the centre tap as shown dotted in Fig. 1. If this resistor is not used a link is made in its place.

CONSTRUCTION

A medium sized die cast box measuring 2 x 3½ x 4½ inches is a convenient form of case for the inverter and the power transistors can be mounted on the side to provide a heat sink, if they are suitably insulated by mica washers and plastic bushes.

The components of the driver circuit can be mounted on a piece of plain perforated Veroboard and connected up as shown in Fig. 2, using Veropins for support as shown. The layout is not critical but if it is similar to the circuit it makes checking easier.

The transistors should be soldered into circuit last and protected by using a heat shunt on each lead while soldering.

Wiring of the Veroboard to the remaining components is shown in Fig. 3. The wiring shown does not include R10 which is needed if a 6·3V-0-6·3V transformer is used. If R10 is used it is mounted as shown in Fig. 2 and the wire from T1 centre tap is connected to N1 not H1.

The fuse used depends on the transformer and output power. For a 5 watt unit use a 1 amp fuse, 10 watt use a 2 amp, and for 20 watt use a 5 amp fuse.

The input and output leads are brought out through grommets and a mains neon (LP1) connected across the transformer secondary winding is used as an indicator (mains type neons usually incorporate a resistor as shown in Fig. 1). A small tag strip is added for connection of transformer leads and some of the components.

Continued on page 482

SHAVER INVERTER

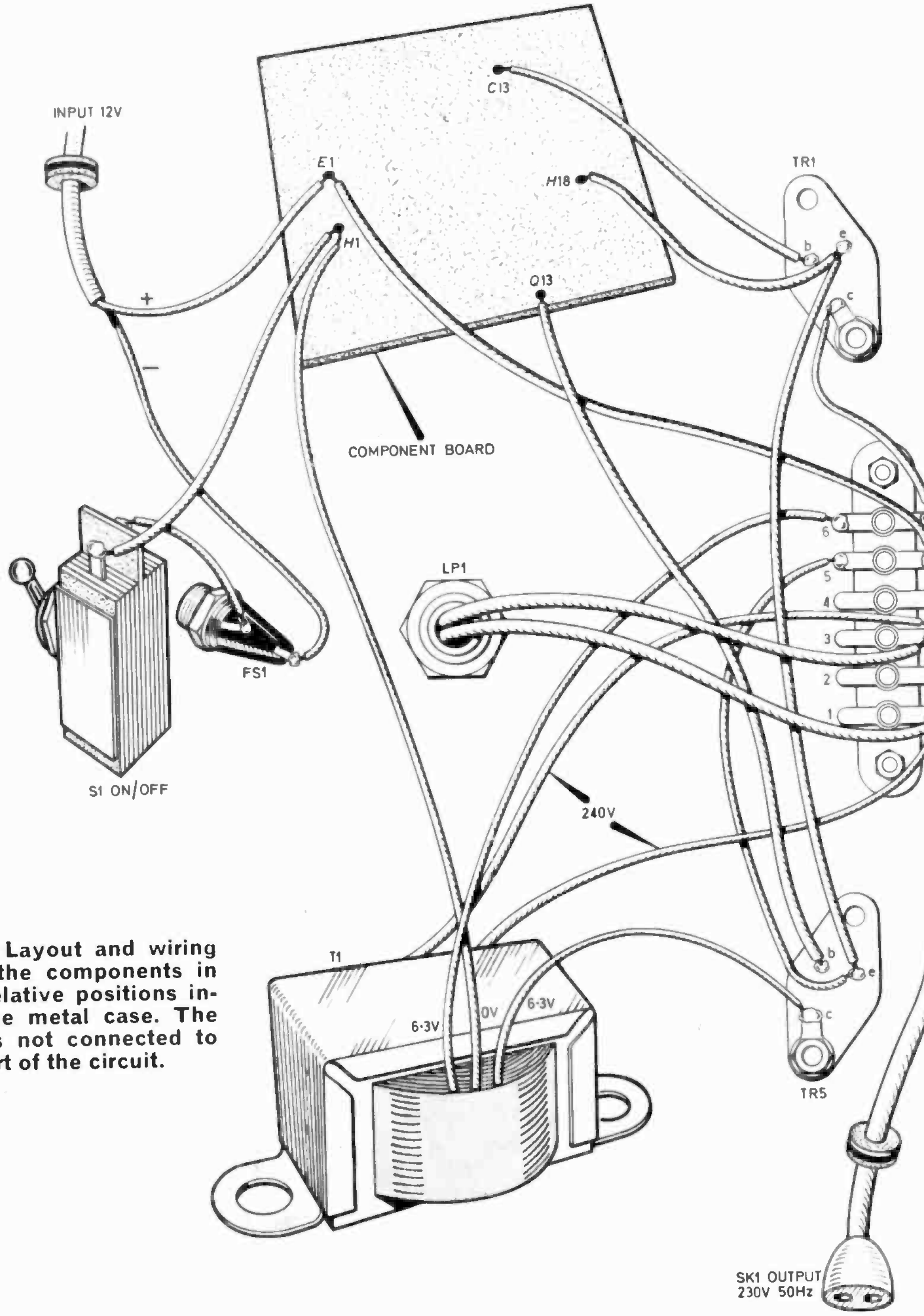
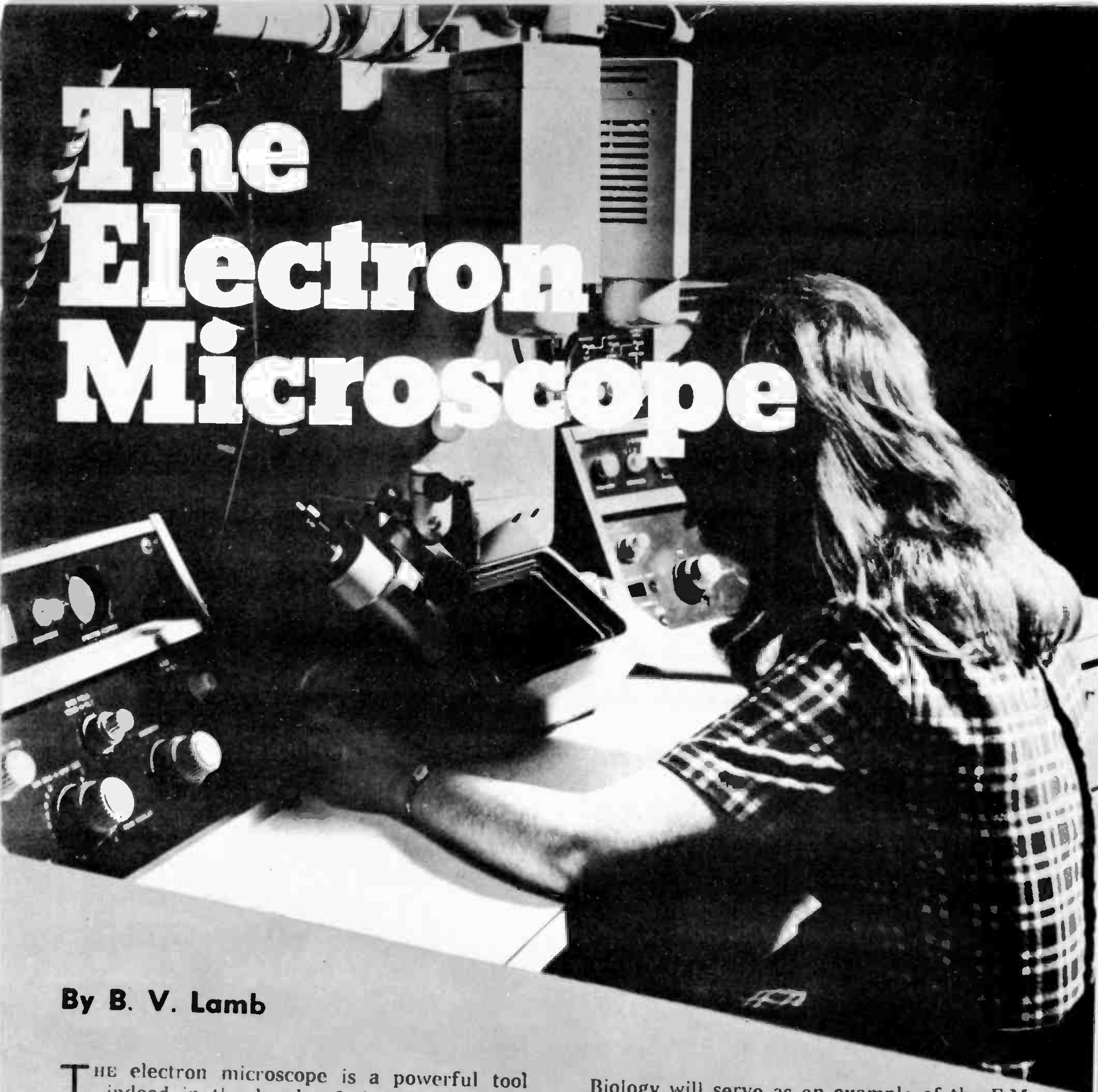


Fig. 3. Layout and wiring of all the components in their relative positions inside the metal case. The case is not connected to any part of the circuit.

The Electron Microscope



By B. V. Lamb

THE electron microscope is a powerful tool indeed in the hands of the modern technologist. Its use covers the whole spectrum of science. As man continues to enjoy the results of recent discoveries in his environment, so the electron microscope (E.M.) will play an ever growing part in applied science.

APPLICATION

Application of the E.M. may be split into two main groups, discovery and diagnosis. Often of course, these two merge and overlap. An example of its diagnostic use may be drawn from the electricity generating industry. A steam pipe has burst. What caused it? Was there a flaw in the pipe? Did corrosion eat into the metal? A sample of the pipe seen under the E.M. will reveal the facts.

Biology will serve as an example of the E.M. as an instrument of discovery. Whilst looking at a section of tissue, some new feature of a cell make up might be noticed or some fresh aspect on a certain disease seen.

As we shall see later, there is much more to electron microscopy than merely looking at an image of a specimen. To look is not necessarily to "see"; looking is passive whilst seeing is active. The electron microscopist is a scientist, the image on the screen of his instrument is often the result of much careful planning and reasoning on what he can expect to see.

E. M. FOUNDATIONS

The E.M. owes its development to early work

Heading photograph: the Jeol—JEM 100B electron microscope.

done in the field of electron dynamics—that is, the study of electrons moving under the influence of an applied electric field. (A Cathode Ray tube is an example of applied electron dynamics.)

Electronics and vacuum techniques are vital too. E.M.s have been in use for several decades now but not until the early 1960s were some of the most exciting developments made.

TYPES OF E. M.

Two distinct types of E.M. exist. Both use electrons to bombard the sample. The first type is called the transmission electron microscope (T.E.M.) and this was the earliest E.M. design to appear.

The operation of the T.E.M. is similar to the light microscope in that it has lenses and apertures as has the optical instrument. The difference being of course, that the lenses on the T.E.M. are magnetic and they focus electrons.

The second type of E.M. is the scanning electron microscope (S.E.M.). This microscope is essentially like a closed television system in its working. Early S.E.M.s can be traced back to the 1930s and these were made in-house by universities and ambitious research organisations. It was not until the early 1960s that a commercial S.E.M. appeared.

Both the T.E.M. and the S.E.M. have their relative merits. The recent commercial availability of the S.E.M. although of great interest, has by no means replaced the T.E.M., indeed many laboratories have both instruments. After describing the working principles of these quite different microscopes, the advantages of each will be seen.

COST

Great Britain, Japan, Germany, Holland and the United States of America all produce front line instruments of exceptional specifications. As is to be expected, E.M.s are expensive and the rule "you get what you pay for" applies well here; £5,000 to £250,000 covers the whole range The very high prices include special attachments and unusually high voltage installations.

An average T.E.M. might cost £25,000 and an S.E.M. of high specification the same. Because of the skills required in operating an E.M. and in preparing samples, any electron microscope unit involves large capital expenditure and running costs.

HOW THE T. E. M. WORKS

The basic essentials of a T.E.M. are shown in Fig. 1. At the top of the microscope sits the electron gun—so called because it emits electrons continuously at very high velocity.

The electron gun consists of the tungsten filament, the shield and the anode. The anode is connected to earth as is the positive side of the high voltage supply. A negative bias (V_b) is maintained between the filament and the shield. When current is supplied to the filament so that it is raised to a high temperature and air is pumped from the system, electrons are accelerated towards the anode.

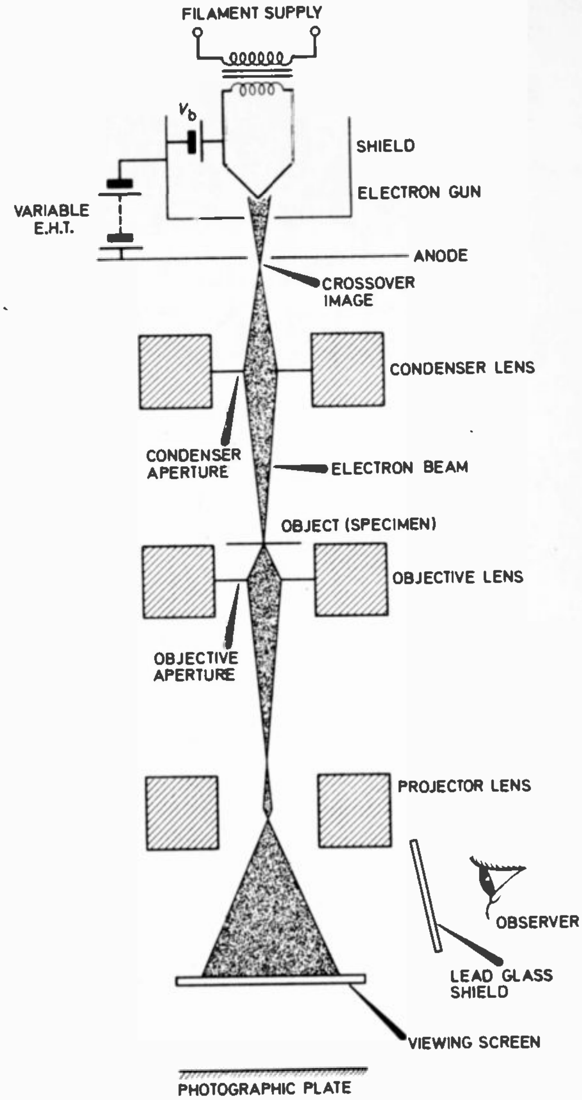


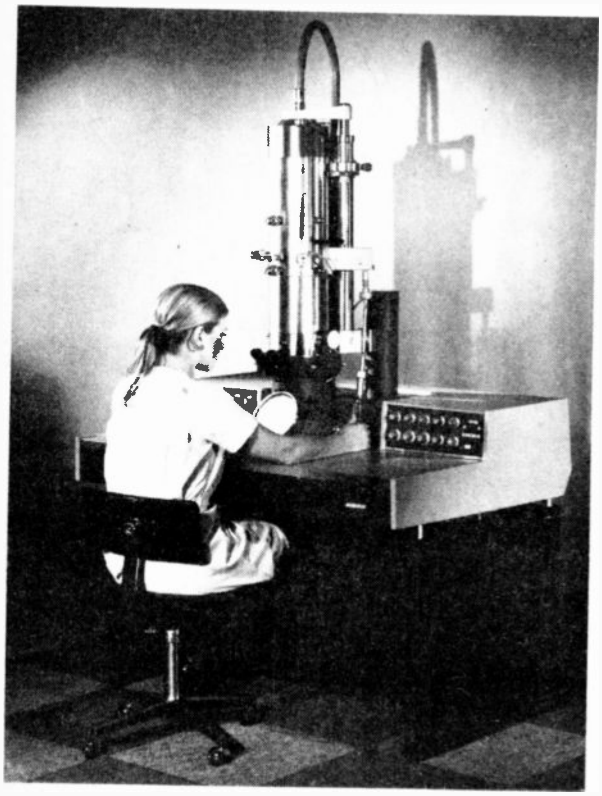
Fig. 1. Basic form of the transmission electron microscope. Additional optical accessories may be added to increase magnification.

The shield, being negatively biased, causes the beam of electrons to converge so that a crossover image of the filament is formed in the anode aperture. In this way a beam of electrons is projected from the gun and is now able to be aimed down the microscope.

As soon as the electron beam leaves the electron gun it is already beginning to diverge. The condenser lens is used to focus the diverging beam onto the sample.

This magnetic lens consists of a number of turns of copper wire on an iron ring. By varying the current through the coil the focus can be adjusted. The condenser lens also has an aperture that behaves in a similar way to optical microscope apertures—an opening of between 0·1 and 0·3 mm is typical.

The object (specimen) is held in a special holder either in or near to the objective lens. The finely focused pencil like beam of electrons strikes the specimen; and because the specimen is very thin and the electrons are travelling with great velocity, most of the electrons pass through the specimen. Once into the objective lens the electrons pass through the objective lens aperture (10 to 50 microns diameter) and are again focused to an intermediate image lower down the electron column.



The Philips high-resolution transmission electron microscope (EM201). This instrument can attain a resolution of 7 angstroms.

PROJECTOR LENS

The final lens is the projector and this gives the great magnification that one may expect. This lens projects the electron beam onto a flat glass viewing screen. The viewing screen has a layer of phosphorescent material coated to it; electrons striking the phosphor screen cause it to glow.

Underneath the screen is a compartment to take photographic plates when a permanent record is required. The operator sits and looks down on the viewing screen through a lead-glass shield. Sometimes external optical magnification is used to increase the image size even more. T.E.M.s can give useful magnifications up to 500,000 times and the best instruments claim to be able to resolve detail down to 2 Angstroms.

The electron microscopist talks in terms of angstroms and microns as the mechanical engineer speaks of the thou. (1/1000 inch). An idea of just how small an angstrom (Å) is can be gathered by measuring the diameter of a human hair and expressing it in angstrom units. A human hair is about $1\frac{1}{2}$ thou. in diameter.

1 Å = 10,000 Microns (10^{m} Metre) and 1 thou. = 25·4 microns. Therefore $1\frac{1}{2}$ thou. = 25·4 × 1·5 × 10,000 = 380,000 Å!!!

Although the ability to resolve smaller and smaller in detail is the goal towards which the E.M. manufacturer constantly works, this extremely fine resolution presents the operator with many difficulties. An illustration will help in understanding a major problem.

If we look at an area on an Ordinance Survey map, although the area will be given in fine detail its relation to the rest of the map can only be understood by looking at the whole of the map in "coarse resolution", i.e. taking a broad view of surrounding landmarks etc. So it is with the E.M. operator. Great resolution without knowledge of the image in relation to the whole structure can be meaningless.

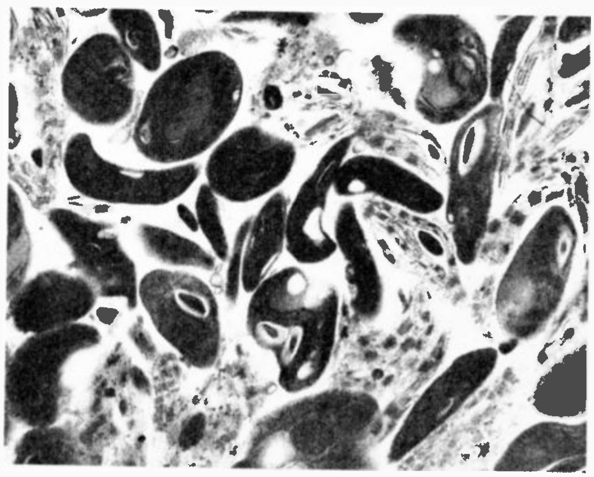
SAMPLE PREPARATION

As we have just seen by considering the basics of the T.E.M. the specimen must:—

1. Be cut thin, i.e. less than 1,000 Å thick.
2. Be able to withstand a vacuum.
3. Be undamaged by electrons striking it.

Considering each of these points separately. A thin slice of the specimen is required so that

A 0.5μm section of spinach chloroplasts at a magnification of 12000x, taken on the AEI, EM7 electron microscope.



most electrons will pass right through to form an image on the fluorescent screen. Actually, detail (contrast) in the sliced specimen is made apparent in the image because some of the electrons are scattered in their journey through it.

All atoms scatter electrons, the amount of scattering increases with atomic weight. As we shall see later, by staining the specimen with heavy atoms, a significant increase in contrast can be obtained.

The second requirement is that the specimen is able to stand up to a vacuum. When air is pumped from the electron column, gases and water vapour are rapidly sucked from the sample.

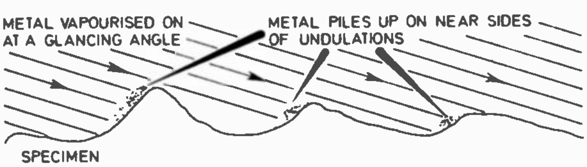
If a water-containing specimen such as a biological sample is subjected to vacuum it would quickly be rendered useless for viewing. Biological specimens are freeze-dried and are fixed in thin films and are then supported on grids of very thin wire. Micrographs are made through one mesh of the gauze.

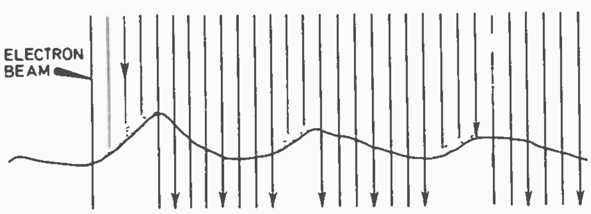
Sample preparation requires skill and patience and is vital to producing meaningful images. To prepare some biological specimens can take two weeks from the time the sample arrives in its raw state to the moment it can be placed in the sample chamber of the T.E.M. Other samples of course, due to their inert make-up may be viewed with the minimum of preparation time.

REPLICAS

Sometimes it is necessary to produce a replica of the specimen. In this case the specimen surface is etched to produce relief and then the surface is plastic coated or metal is evaporated on. Carbon from an arc may also be used as the coating. The replica is then peeled off and introduced into the microscope sample chamber.

Fig. 2. Method of shadow casting using vaporised metal to provide greatly enhanced details.





As was discussed earlier, if the scattering of electrons in the sample is not sufficient to disclose fine detail (contrast in the image) then the specimen can be stained with a heavy metal. Osmium, atomic number 76, is frequently used.

Another method for showing up fine detail is known as shadow casting. This is achieved by vapourising metal onto the sample at a glancing angle. Metal piles up on the near side of undulations (see Fig. 2), and when the electron beam strikes the sample, greatly enhanced details are evident.

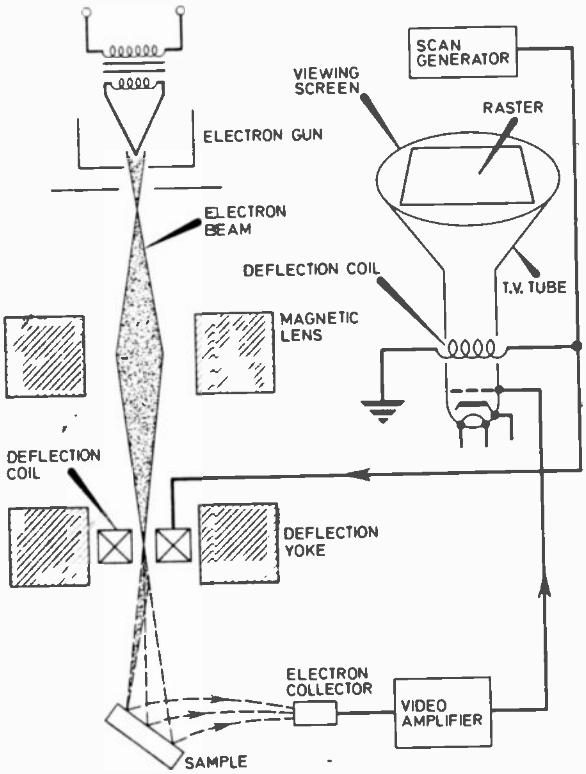


Fig. 3. Basis of the scanning electron microscope. Photograms of the screen can be taken using a special camera.

SCANNING ELECTRON MICROSCOPE

The S.E.M. is essentially a closed circuit T.V. system with refinements (see Fig. 3). Again there is the electron gun emitting electrons at high velocity, and magnetic lenses to focus and magnify. Also aperture plates to sharpen the image are present, just as in the T.E.M.

The inclusion of the deflection yoke and its associated circuitry marks the distinction of the S.E.M. from the T.E.M. The deflection yoke is powered by an a.c. waveform that causes the fine beam of electrons to scan across the sample in a regular way. (The a.c. waveform powering the deflection coil is also coupled to the T.V. monitor. This causes a raster on the T.V. tube.)

This very fine beam of electrons covering an

The Cambridge Scientific Instruments Stereoscan S4. This is the latest scanning electron microscope from this company.

adjustable area of the sample causes secondary electrons to be emitted which in turn are collected by a secondary electron detector. The secondary electron detector is a device which converts electrons into photons of light which in turn are collected by a photomultiplier. The electrical output from the detector is connected to the T.V. monitor so that the spot causing the raster is modulated with information relative to the specimen surface.

Again, as in the T.E.M. the viewing screen can either be watched by the operator or photographed for a permanent record. Useful magnifications up to 50,000 times can be achieved in the S.E.M. The electron beam energy can vary from as little as 1kV to 50kV.

ADVANTAGES

The main attraction of the S.E.M. is in its ability to produce a three dimensional image of the specimen surface. Great depth of field is also achieved. The reason for these features is that the electron beam striking the surface resembles a fine sharp pin which is able to probe into the irregularities of the specimen. Unlike the T.E.M. the picture is formed by electrons emerging from the surface of the sample.

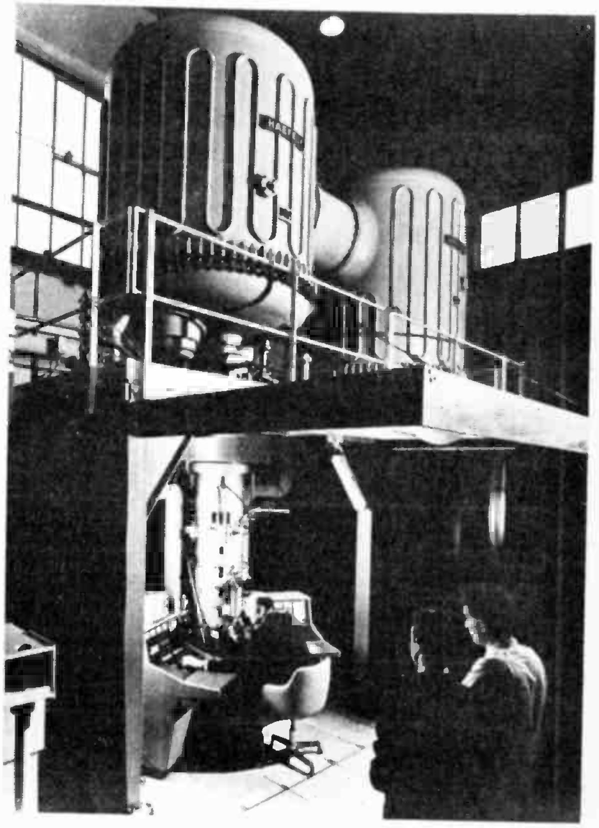
Although the T.E.M. has good depth of field, the usable depth is limited because the specimen has to be very thin.

In the S.E.M. sample size is only limited by sample chamber considerations. Because sample slices are not required for the S.E.M. preparation time is dramatically lowered. Preparation for electrically conducting specimens consists of fixing them to the moveable specimen stage with a conducting glue. Biological samples and others that are not conductors need to be made conducting by evaporating a thin film of gold onto them. Coating thicknesses fall in the 10 to 100's of angstrom region. As with the T.E.M., biological specimens require fixing and drying.

Over the past few years many photographs of sample images produced in the S.E.M. have been published. Many of these excite the imagination as the microscopical region of such objects as the wing of a butterfly or the detail of a nerve cell is revealed in three dimensions.

Key performance characteristics of both the T.E.M. and the S.E.M. will continue to improve as manufacturers strive to meet the demands of modern technology. ▣

The AEI, EM7 million volt electron microscope installed at the United Kingdom Atomic Energy Authority at Harwell.



PLEASE TAKE NOTE

Bee Counter circuit description—see Readers Letters page.

Potentiometer VR1 in the Demo Deck is 100Ω not 300Ω as mentioned last month.

Wash Wipe control second paragraph page 441, the emitter wire of TR 3 should be soldered to J2, not the collector wire as stated.

ELECTRONOME

A simple design giving a performance similar to that of a mechanical metronome.

by F. C. Judd

ASIDE from being a simple exercise in electronics, the Electronome has a real application in music practice, for it produces a sound very like that made by a mechanical metronome and covers the same tempo range of approximately 40 to 225 beats per minute.

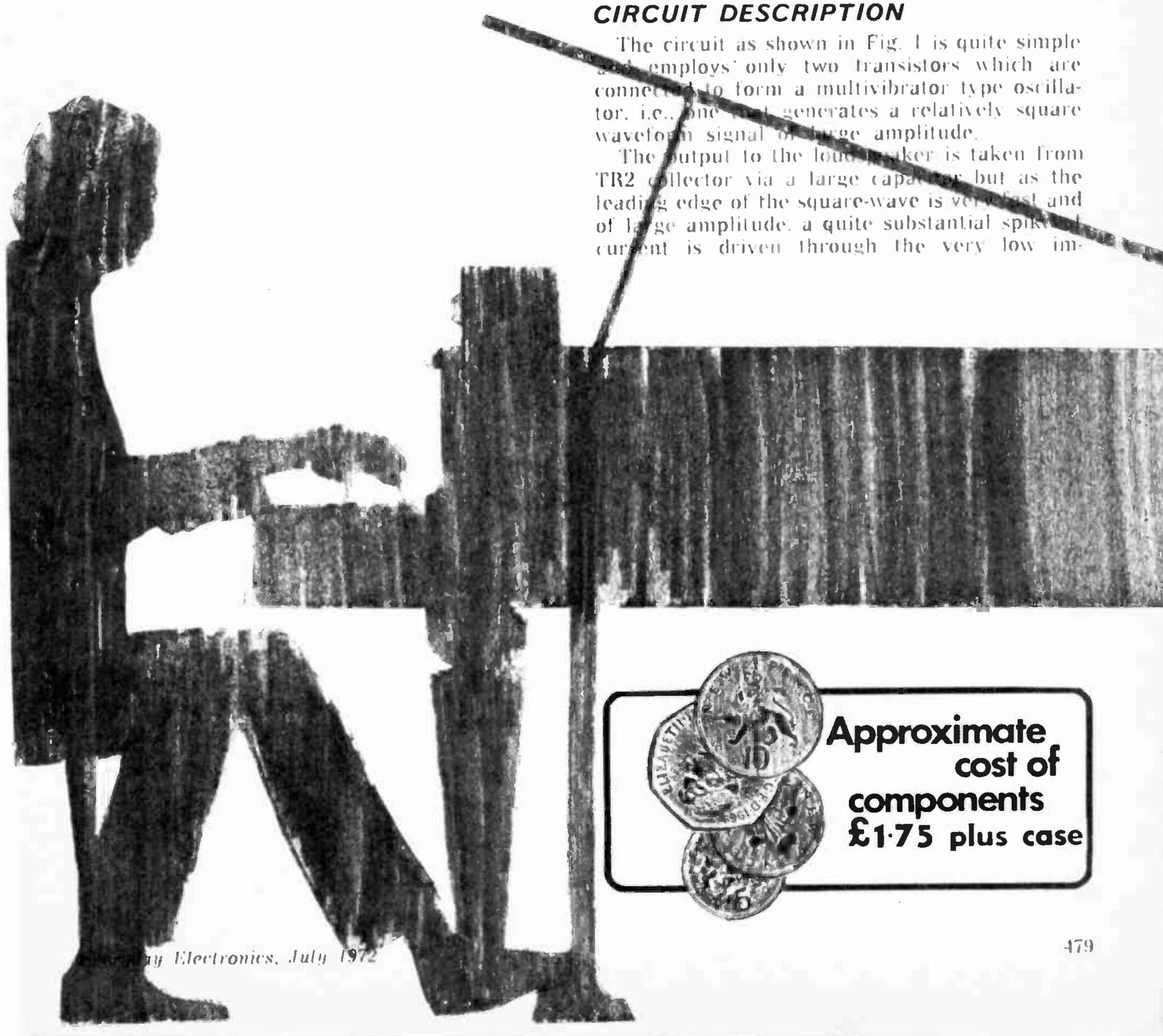
The resonant click is loud enough for music practice with piano, guitar, electronic organ and other musical instruments and the tempo rate is continuously variable.

Few components are required and almost any 3 to 5 ohm loudspeaker can be used for reproducing the sound.

CIRCUIT DESCRIPTION

The circuit as shown in Fig. 1 is quite simple and employs only two transistors which are connected to form a multivibrator type oscillator, i.e., one that generates a relatively square waveform signal of large amplitude.

The output to the loudspeaker is taken from TR2 collector via a large capacitor but as the leading edge of the square-wave is very fast and of large amplitude, a quite substantial spike of current is driven through the very low im-



Approximate cost of components £1·75 plus case

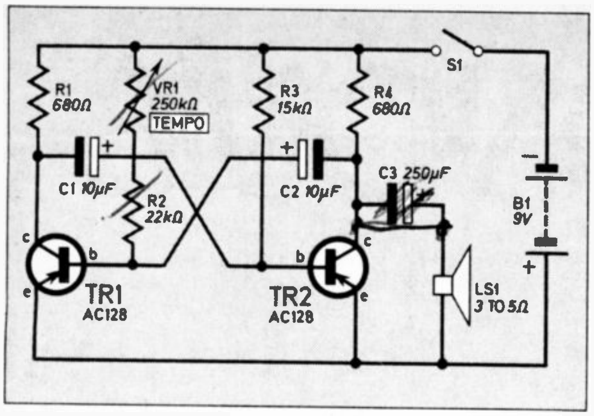


Fig. 1. Complete circuit diagram of the Electronome

pedance speaker coil. The speaker, therefore, responds only once, i.e., to the leading edge of the square-wave and thus produces a single loud click.

The same effect would be produced by momentarily connecting a 9V battery straight across the speaker coil. The multivibrator is in effect doing this repeatedly the repetition rate being variable by means of the tempo control VR1.

CONSTRUCTION

The prototype shown in the photograph is housed in a small box made of $\frac{1}{8}$ inch hardboard with joins at sides, top and bottom strengthened with $\frac{1}{2}$ inch by $\frac{1}{2}$ inch batten, or small blocks of wood. The front panel aperture for the speaker may be covered with any loose weave material. The tempo control VR1 and the on/off S1 switch are mounted on the front panel of the case.

The components for the oscillator are mounted on a piece of plain perforated circuit board $3\frac{1}{2}$ inches by $2\frac{1}{2}$ inches, as shown in Fig. 2, supported on a $\frac{3}{8}$ by $\frac{3}{8}$ inch piece of aluminium angle $3\frac{1}{2}$ inches long. The circuit board is attached inside the box by the aluminium angle.

The component layout and wiring on the board are shown in Fig. 2.

COMPONENT MOUNTING

Commence construction of the circuit board by attaching the positive and negative rails to the underside of the component board. These wires can be 16 or 18 s.w.g. tinned copper wire and they are attached by placing each end through the indicated holes and bending them over on top of the board. The components are mounted by their leads and soldered to the two rails or to each other as indicated in Fig. 2.

Mount all the components except the two transistors, check the layout and wiring with particular reference to the capacitor and battery polarities and, when satisfied that all is correct, mount the transistors.

Use a heat sink on each transistor lead, while it is being soldered, thus preventing the transistor from being overheated. Mount the transistors so that the spot (collector) is toward the negative rail. Connections for the AC128 transistors are also shown in Fig. 2.

The circuit can be checked out before assembly into the case by connecting up VR1 (tempo control), the loudspeaker and battery as shown in Fig. 3. A clearly defined repetitive click should be produced which, with VR1 at zero resistance, should be approximately 225 beats per minute and approximately 40 beats per minute at maximum resistance.

SCALE

Insert all the components in the case and mount the battery using a clip or an elastic band. A scale can be made up similar to that shown in Fig. 4 and calibrated by counting the clicks of the Electronome over a 15 second period.

If the clicks are counted in tens it is just possible to count at a rate of 225 per minute. It should be emphasised that Fig. 4 is given as a **guide only** and should not be used as the actual scale.

A back cover for the box, which can be made from hardboard, will complete assembly but if the box is to be painted or covered in fabric do this before mounting the speaker and controls.

Components....

SEE SHOP TALK

Resistors
R1 680Ω
R2 22kΩ
R3 15kΩ
R4 680Ω
All $\frac{1}{4}$W 10% carbon

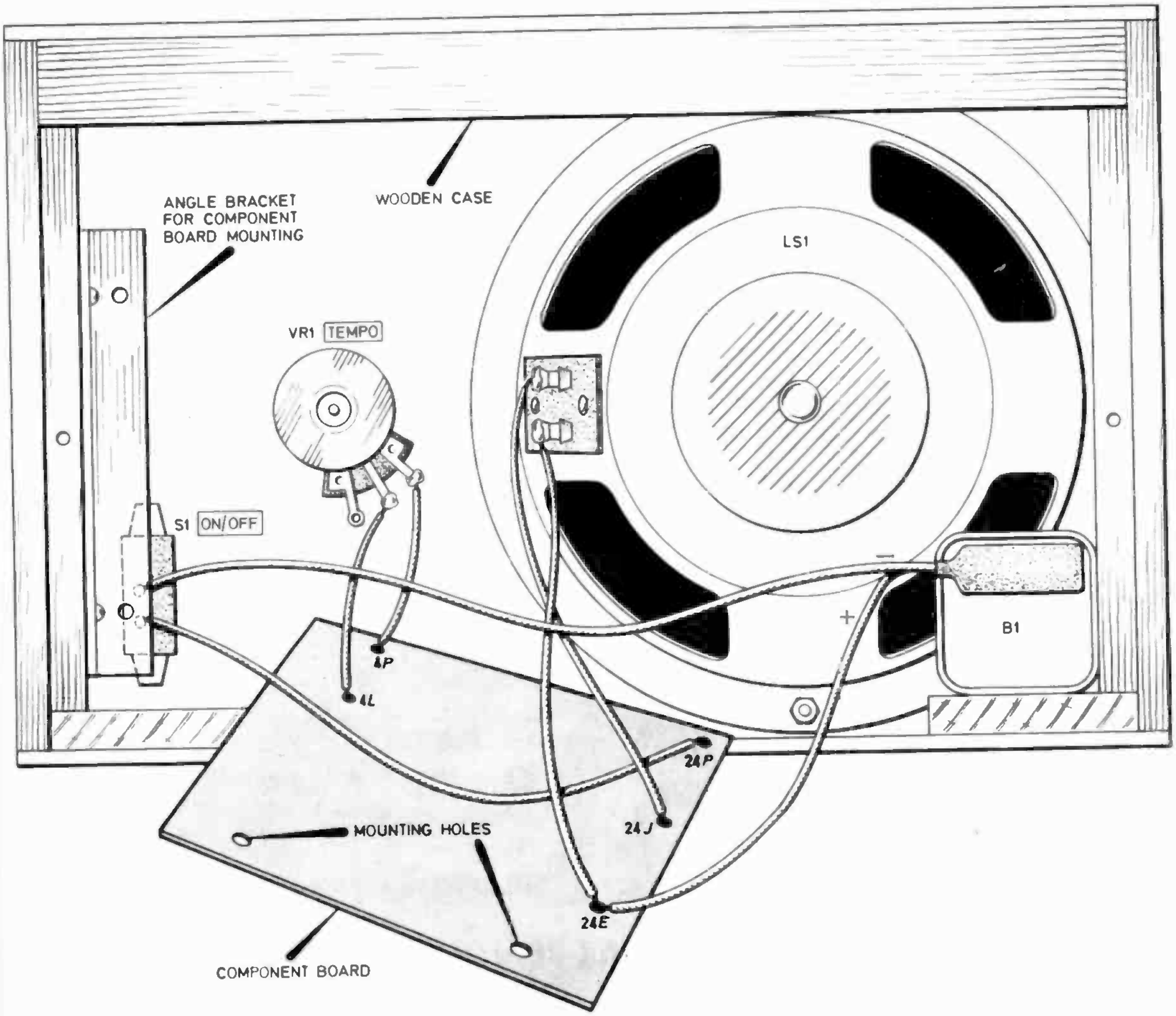
Capacitors
C1 10µF elect. 12V
C2 10µF elect. 12V
C3 250µF elect. 12V

Variable Resistor
VR1 250kΩ log. carbon

Transistors
TR1 AC128 germanium *pnp*
TR2 AC128 germanium *pnp*

Miscellaneous
S1 s.p.s.t. toggle or slide switch
LS1 3 to 5Ω moving coil loudspeaker approximately 3 to 5 in. diameter
B1 PP9, 9V battery and connector
Pointer knob, Veroboard—plain perforated $3\frac{1}{2}$ x $2\frac{1}{2}$ x 0.15 inch matrix, aluminium angle $3\frac{1}{2}$ x $\frac{3}{8}$ x $\frac{3}{8}$ inches, wire, materials for case and dial, speaker grill material.

ELECTRONOME



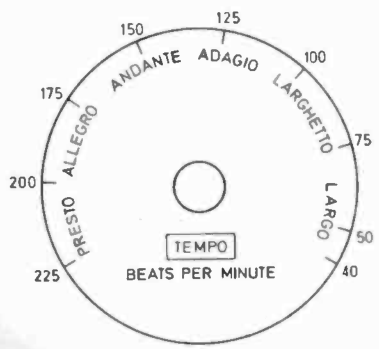


Fig. 3. Layout and wiring of the complete Electronome. The circuit board is shown removed for clarity.

Fig. 4. A suggested design for the scale for VR1. The markings are given as a guide only.

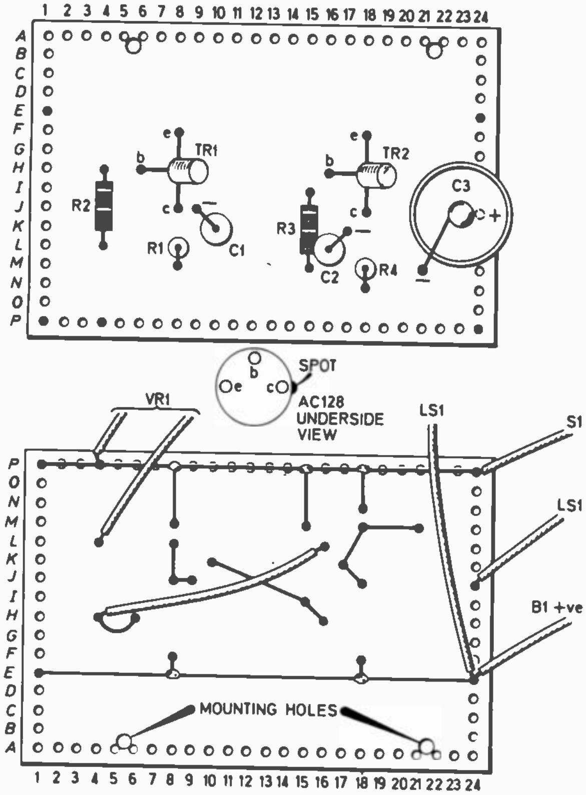
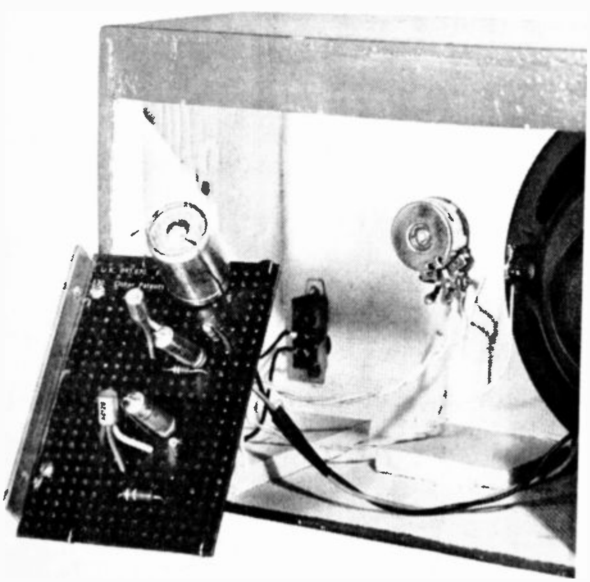


Fig. 2: Layout and wiring of the components mounted on the Veroboard

The battery should be an Eveready type PP9 for long life as the current consumption is 12 to 15mA. If the box is made to about the size given there will be plenty of room for the circuit board, speaker and a PP9 battery. The complete unit could, together with a small speaker, be housed in a smaller case should this be desired. ▣



Continued from page 472

TESTS AND ADJUSTMENTS

When the driving unit (the circuit mounted on the Veroboard—see Fig. 1) is completed it should be tested before connecting it to the power transistors and the transformer. Connect the circuit to a 12 volt supply observing polarity and measure the d.c. collector voltage (voltage between collector and positive line) of TR2 and TR4. They should read approximately half the supply voltage if the unit is operating correctly.

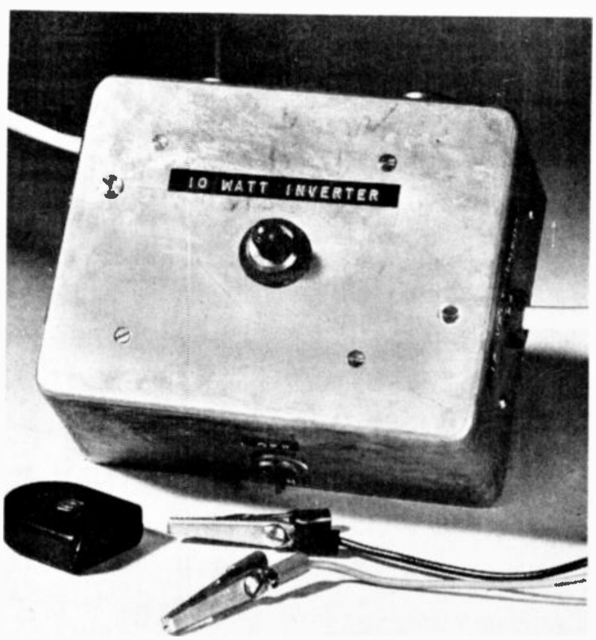
Any difference in the collector voltages will indicate an unequal mark to space ratio which can be corrected by adjustment of R6 or R7. If the collector voltage of TR4 is below 1 volt and TR2 is above 11 volts the unit is not oscillating. This may be due to the spread of the unijunction characteristics and R6 and/or R7 should be adjusted until oscillation is obtained. The resistors should be adjusted alternately in each direction and finally trimmed in small steps, to give approximately equal collector voltage readings. If an oscilloscope is available it is easy to see the effect of any adjustments and to trim the components R6, R7 and C1 for the correct wave shape and frequency.

The frequency of the complete unit is not critical if the shaver works satisfactorily.

WARNING

Although powered from a 12V supply the output of this inverter is high enough to deliver a very unpleasant shock.

Under certain circumstances **the output from the unit could be very dangerous indeed** and should be treated with the respect afforded to any mains supply. ▣



SHOP TALK

By Mike Kenward

BEFORE we discuss buying problems this month we will try and clear up a few points of general interest that many readers seem to be unaware of. Firstly let us make it quite clear once again—we do not supply components in any shape or form.

The only thing we sell is this magazine, providing designs for which the necessary parts may be purchased from firms advertising in our pages or any other components retailer.

The approximate cost of components is not a price for the components available from any one shop, it is an approximate cost arrived at by us by selecting components from a number of suppliers, catalogues. It is not necessarily the cheapest price and it is quite definitely not the most expensive, it is published for your guidance only.

Many readers have written to us saying that they have paid £5 or £6 for components that we estimated would cost about £2; well this is quite possible. We point out that if you are cost conscious then look around before buying.

Letters

A second point that we would like to bring to your attention is the situation concerning readers letters. Although we have published notices stating that readers must enclose a stamped addressed envelope and that we can only answer letters concerning published articles, (there is such a notice on the *Readers Letters* page) we are still receiving many letters with no s.a.e or letters requiring information or designs that, due to lack of time and, in some cases, information we are simply unable to answer.

As you can imagine we receive quite a few letters every day and unfortunately those with no s.a.e. or those requiring information we are unable to supply tend to be put at the bottom of the pile.

We cannot claim to answer letters by return of post but, provided you do as we request we will do our best to supply a satisfactory reply. If you feel like voicing your views—good or bad—on any electronic or associated subject we are always pleased to receive them and, if they are worthwhile, we may well publish your letter. Your criticisms are, in many cases, more useful than praise; so don't be frightened to put pen to paper.

Problems

Now to try and deal with some of the problems. We have had a number of reader's asking where the universal chassis parts that we have specified for some projects are available, the answer is Home Radio Components Ltd., who advertise their catalogue in our pages regularly.

Electronome

No buying problems for the *Electronome* but it may well be worth while to find a secondhand speaker from a radio or T.V. Since the sound quality is not an important factor in this design any speaker of the right impedence will be suitable and ex-equipment speakers are much cheaper than new ones.

Shaver Inverter

Few buying problems for the *Shaver Inverter* but do read the text and find out exactly what you need for the power output you require. Also note that depending on the transformer you use, you may or may not require resistor R10 which is a 1 ohm 5 watt wirewound type.

When buying the neon make sure it is a mains type incorporating a series resistor as there are others available. Please take note of the warning given at the end of this article. Although this unit is powered from a battery it provides mains output.

Horses for Courses

The switches used in *Horses for Courses* are a compromise on what is actually required. The unit only needs one three-pole four-way switch, one three-pole three-way switch and one single-pole three-way switch. However, since these types are not all available, two three-pole four-way switches and one single-pole 12-way switch were used in the prototype; these are all wafer switches of the break before make type. Only the required poles or switch positions being used, the others being left unconnected. The chance switch must be capable of being modified as shown in the text, so check this before buying.

This is one project where a number of different colour wires are very useful when wiring up. One way to get these without buying a vast number of coils of wire is to buy a length of multicore wire and strip the outer insulation off, leaving the coloured inner wires.

The only other point to watch when buying for this project is the type and size of the chance knob. This knob should have no markings or pointers of any kind and be as heavy as possible so that it acts as a flywheel.

Supplier

This month's news item on the supply front is from Zeta Windings Limited who have supplied us with a 17-page catalogue listing many types of T.V. line output transformers, resistors, capacitors, cathode ray tubes and semiconductors plus a few other items. The main facility offered by this firm is its ability to manufacture transformers of any type to individual requirements for readers or authors. They operate a rewind and 1 off prototype service that takes about 3 to 5 days. The firm's facilities are available through the following addresses:

For callers only—Zeta Windings Ltd., 26 All Saints Road, London, W.11.

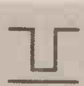
For mail order and callers—Tidman Mail Order, 236 Sandycombe Road, Richmond; or H. L. Smith Ltd., Edgware Road, London, W.2.

guide to circuit

Signal Waveforms

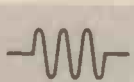
Alternating current or voltage

Positive going pulse



Negative going pulse

Sawtooth waveform



Pulse or burst of a.c.

Connectors

1

Twin tags or screw terminals

Short wire link with terminals numbered

2

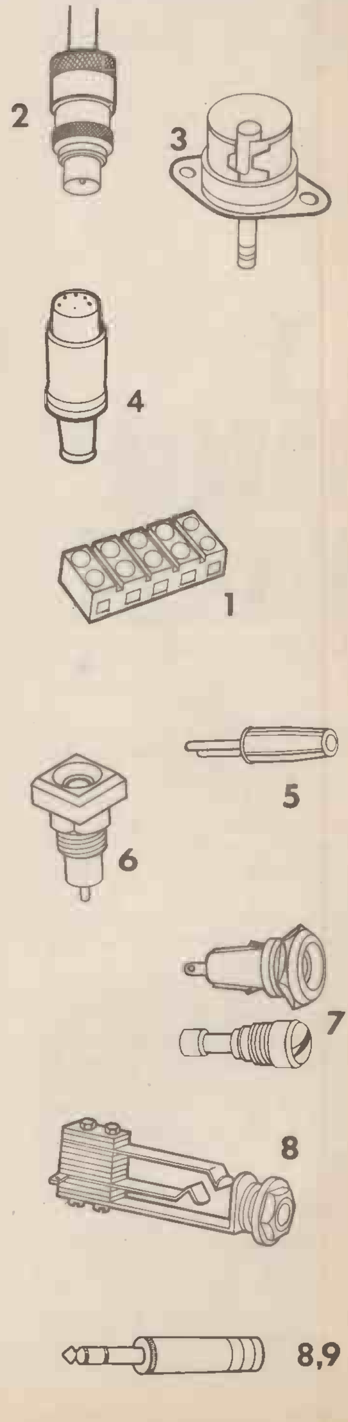
Coaxial plug

3

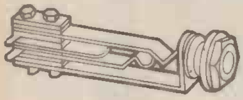
Coaxial socket

4

Multipin plug and socket



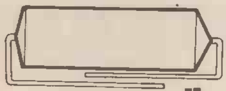
symbols . . . part 2



9

5

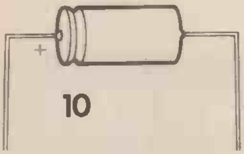
Single pin plug



11

6

Single socket



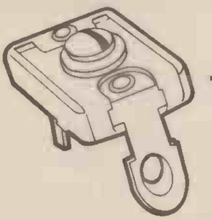
10

7

Fuse link, general symbol

8

Three pole concentric plug and jack

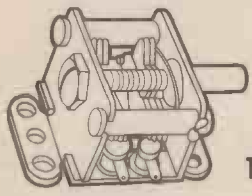


13

9

Three pole concentric plug and break jack

Capacitors



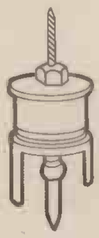
12

10

Polarized electrolytic capacitor

11

Fixed value capacitor (polarized if + sign added)



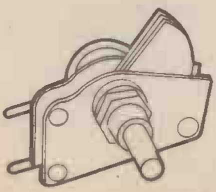
13

11

Non-polarized electrolytic capacitor

12

Variable capacitor



12

13

Capacitor with pre-set adjustment (trimmer)

ELECTRONIC CIRCUITS– .....IN THEORY and PRACTICE

TEACH-IN ...FOR BEGINNERS

By Mike Hughes M.A.

9 ALTERNATING CURRENT

NEARLY everything we have come across so far has concerned voltages which, although varying in magnitude, have stayed of the same polarity relative to a reference line (usually called the common or ground line). The reason for this is that all the experiments to date have been carried out with a battery, one terminal of which has been connected to this common line.

Because of this we have been able to limit our thoughts to current always passing through components in one direction (or not at all). All the experiments have been of the direct current or d.c. type. Last month, however, we did see that it was possible to get negative voltages generated even though we were working with a positive supply.

REFERENCE LINE

This is where we have to be very careful about defining the reference line, when circuits are being described, because potentials can often be positive or negative in a given circuit.

In the multivibrator last month, the potential at the collector of TR2 varied from approximately zero to +9V relative to the line common to the emitters; we measured this because we connected the negative terminal of our meter to the common rail.

We could have connected the positive terminal of the voltmeter to the positive rail and measured changes of collector potential with the negative terminal of the meter; we could have said that the potential varied from zero to about −9V **relative to the positive rail.**

Both of these measurements mean exactly the same and the important thing to grasp is that voltages always have to be related to a reference.

In the absence of a stated reference it is usual to assume that voltages are relative to the common line that is running (on the theoretical circuit drawing) right through the system as an unbroken straight line. Generally speaking this can be recognised as the line to which emitters of transistors are connected (sometimes through resistors).

This is not always the case and another way of recognising the reference line is to ascertain whether *pnp* or *npn* transistors predominate.

If *npn*—as is usually the case these days—the negative terminal of the power supply or battery can be taken as the common point and vice-versa for *pnp* transistors.

ALTERNATING CURRENT

Referring to the slow running multivibrator (last month's *Teach-In*) try measuring the potential of TR2 collector relative to +4·5V. See Fig. 1(a).

Do this by using VR1 (100 ohm) on the Demo Deck as a potential divider across the battery. Set its wiper to provide a potential of +4·5V and connect the negative terminal of your voltmeter to it and the positive terminal to the collector of TR2. Now see what voltages you read as the circuit oscillates.

You should see about +4·5V for positive half cycles and the meter will try to read backwards for negative half cycles. See Fig. 1(b). Reverse

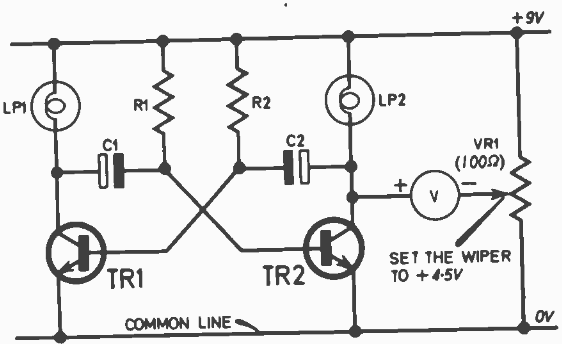
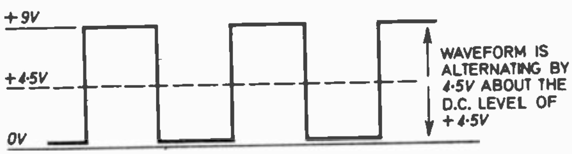


Fig. 1(a) (above). Measurement of the output voltage from the multivibrator of last month, about a d.c. level of +4·5V.

Fig. 1(b) (below). Voltage levels with respect to time observed on the voltmeter.



the meter connections and you will see that the voltages fluctuate from about +4·5V to −4·5V about our new reference point. We say that the voltage is **alternating** and the current flowing through the meter is **alternating current (a.c.).**

We say that the voltage is alternating with an amplitude of 4·5V about the d.c. level of +4·5V. Again this means exactly the same as the other two methods of measuring we have mentioned.

ALTERNATOR

We very often come across voltages that alternate about a common line, e.g. from record player pick-ups and microphones, but perhaps the most common is the a.c. mains fed to our homes.

Mains is generated at the power station by an alternator which in its simple form is a coil of wire rotating between the poles of a magnet. See Fig. 2.

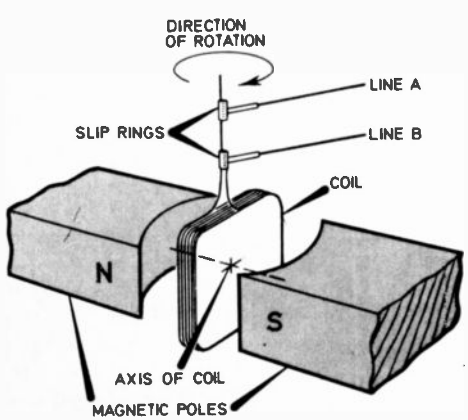


Fig. 2. Schematic diagram of an alternator.

When the axis of the coil is in line with the pole pieces, no voltage is generated but as the coil turns the e.m.f. between the wires coming from the slip-ring contacts increases until it reaches a maximum (peak) when the coil's axis is at right-angles to the pole pieces; it then starts to fall towards zero as the coil rotates towards 180 degrees of rotation (i.e. its axis is in line with the poles again but its direction is reversed). Fig. 3(a) (b) and (c).

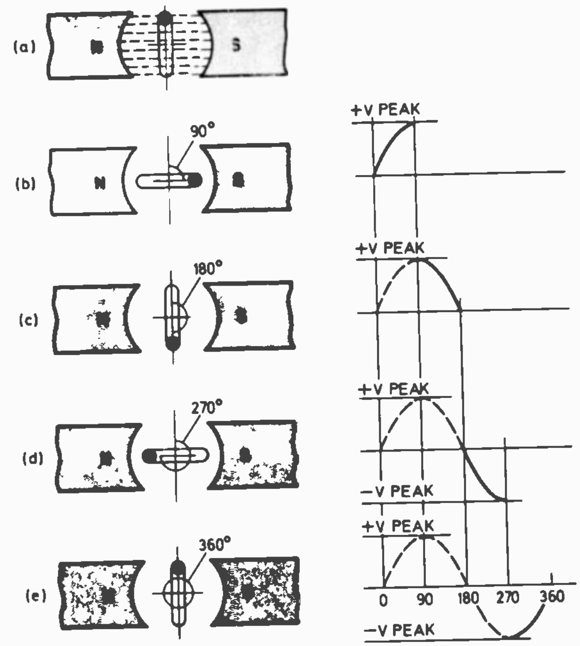


Fig. 3. Shows how one complete "sine wave" is generated from one complete revolution of the coil. The waveform is measured in terms of voltage on line B relative to line A.

Continuing its rotation the e.m.f. will rise again but with opposite polarity and after passing the 270 degree point will fall back to zero as 360 degrees of rotation is reached. Fig. 3(d) and (e).

If we consider the line "A" of Fig. 2 as the common (or neutral) the potential on the other will vary smoothly from zero through maximum positive, back through zero to maximum negative and back to zero.

SINE WAVE

If the coil turns at a constant rate, the waveform of the voltage produced is called a "sine wave" (because the voltage produced at any point of the coil rotation is equal to the maximum positive voltage, multiplied by the sine of the angle of rotation).

One cycle of the sine wave is equal to one complete turn of the coil, hence the number of revolutions of the coil per second sets the frequency, see Fig. 4.

In electronics you will find sine waves appearing very frequently because they are the most pure and simple waves that exist.

Because they are associated with circular movement, formulae based on sine wave theory frequently incorporate the term 2π which is merely another way of expressing angle of rotation.

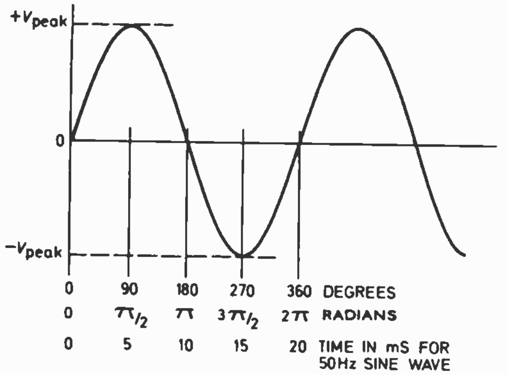


Fig. 4. A continuous sine wave. The discrete points marked can be considered in degrees or radians of rotation—or time if the frequency is known. Time is given for a 50Hz wave.

When the coil turns through 360 degrees (1 complete revolution) we say it has passed through 2π radians (where π (pi) is a constant equal to 3·142). You will see this expression used later on in the series.

TRANSFORMERS

One of the greatest attractions of alternating current is that it can be used in conjunction with a transformer to change voltage levels (both up and down) with insignificant loss of power.

A transformer consists of two coils of wire on a core of soft iron. This is shown by the circuit symbol in Fig. 5 together with some common types of transformer.

One of the coils on the transformer is called the "primary", which normally consists of many thousands of turns (for mains inputs) and the other, which is on the same core but electrically insulated from the primary, is called the "secondary".

The ratio of the turns between the primary and secondary controls the amount of voltage transformation in direction proportion.

On the Friedland transformer which we will be using in our experiments, there are three alternative secondary outputs: 3, 5 and 8V. In the case of the 8V output, the turns ratio would be about 8 on the secondary for every 230 on the primary.

If we pass a current through the primary we will magnetise the core, and the change in magnetisation will induce an e.m.f. across the secondary, the magnitude of this e.m.f. being proportional to the turns ratio. This e.m.f. will only be induced while the magnetic field is being changed by the primary current.

Thus, if we pass a direct current into the primary and keep it flowing, we will only get a brief e.m.f. produced in the secondary while the initial magnetisation takes place. When we stop the primary current, the magnetisation will die away fairly quickly (if the transformer is a good one) and this change of field in the opposite direction will induce another brief voltage pulse of opposite polarity.

You can see this using a 9V battery and the 1mA meter of the Demo Deck, Fig. 6.

Connect the 1mA meter directly across the 8V output of the transformer and then connect the battery across the primary (mains input terminals). If you watch the meter you will see a short "kick" (the direction depending on which way round you connect the battery). Break the primary circuit and you will see the meter needle "kick" in the opposite direction.

The movement will be so fast that you will not be able to make any actual measurement

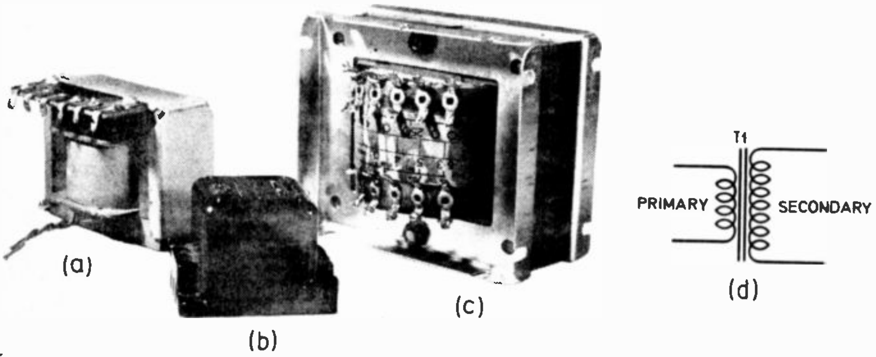


Fig. 5. (a) Ordinary mains / low voltage tapped transformer. (b) Friedland Bell transformer—used in this months experiments. (c) Heavy duty mains type, three secondary windings, HT (500V) and heaters (6·3V). (d) Circuit symbol for an iron cored transformer.

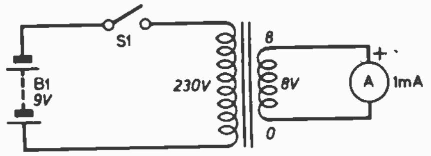


Fig. 6. Circuit diagram for showing current will only flow in the secondary when a change of current occurs in the primary.

but you will see the effect. After doing the experiment once, you might notice a reduction in pulse amplitude if you repeat the experiment; this is caused by residual magnetism held within the core (it does not demagnetise itself completely when you stop the current, hence the change in magnetisation will not be so great the next time you do it). To overcome this, reverse the battery connections between each experiment.

While a direct current in the primary will not cause a continuous current to flow in the secondary, variations in the primary will produce variations in the secondary voltage. This is very similar to the effect we had with capacitors where changes in potential on one plate caused changes on the other although continuous d.c. produced no change after the initial reaction.

Alternating voltages when applied to a circuit will cause current to flow in alternate directions. If we apply a.c. mains to the 230V input of our transformer, the current, and hence the magnetisation, will be constantly changing direction at the mains frequency—50Hz (50 complete sine wave cycles per second). This induces a 50Hz sine wave across the secondary winding but at a lower voltage.

POWER IN EQUALS POWER OUT

An important fact about this type of transformation is that, by and large, the power put into a transformer equals the power taken out (there are certain losses caused by core magnetisation but these are negligible and will be ignored at present). For example a medium voltage input at medium current will enable a secondary to give either a higher voltage at lower current or a lower voltage at higher current—depending on the turns ratio, see Fig. 7.

Power-wise you never get more out than you put in!

We are going to do some simple experiments using alternating current but first let's see how we can measure alternating voltages.

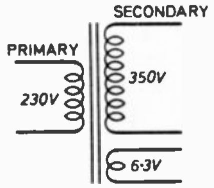


Fig. 7. This circuit symbol signifies a mains transformer with two secondary windings, the output voltages of which are shown.

A.C. MEASUREMENT

First just try and measure the 8V output of the transformer when its primary is connected to the mains. **Remember to take great care that you do not touch any connections on the primary side**—it is quite safe to handle the secondary.

Make a simple 10V voltmeter with a 10 kilohm resistor and the 1mA meter and connect it across the transformer's secondary terminals, Fig. 8.

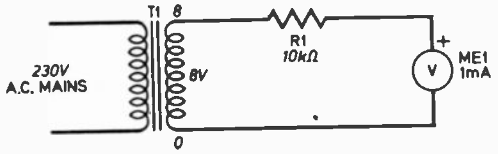


Fig. 8. The voltmeter will read zero volts because the meter settles at the average level.

You should read zero volts which you might think rather strange. It is not so strange if you realise that the needle is trying to swing up in a positive direction then back towards negative 50 times a second—it is physically impossible for it to move this fast. Instead it will settle down and register the average voltage, which is zero. Had you done this on the collector of TR2 of the 700Hz multivibrator (last month) you would again have read the average value but that would have been +4·5V.

In the case of a square wave of unity mark space ratio oscillating between zero and +9V, the peak voltage could be ascertained simply by doubling the average, but in the case of a sine wave alternating to equal amplitudes in both positive and negative directions, this is not possible.

HALF-WAVE RECTIFICATION

We can however prevent negative current flowing through the meter by incorporating a diode see Fig. 9. This is called "half wave rectification." Now only positive half cycles will affect the meter and we shall get a reading that is a form of average between zero and the peak of the positive half cycle but obviously it is not a simple average and the response of the meter movement will still play an important role in our measurement.

R.M.S.

Whatever happens, we are never going to be able to measure peak voltage using a moving coil meter. Meters designed for measuring alternating current work on the basis of measuring a special type of average level; this level is called the root mean square value (r.m.s.) for the sine wave in question (and is indicated in Fig. 10). This value is the peak value divided by $\sqrt{2}$ (square root of 2).

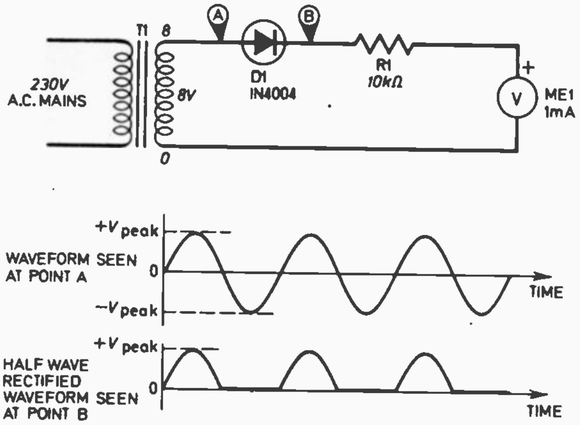


Fig. 9. After half-wave rectification the meter will display a reading of between zero and V_{peak}.

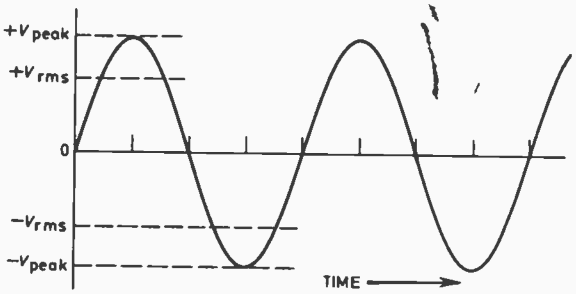


Fig. 10. A sine wave showing relative positions of V_{peak} and V_{rms}.

Conversely if we know our meter is calibrated in terms of r.m.s. values we can calculate the peak voltage by multiplying the r.m.s. value by $\sqrt{2}$. (The square root of 2 is approximately 1·414.)

$$\text{Thus } V_{peak} = V_{rms} \times \sqrt{2} \text{ or } V_{rms} = \frac{V_{peak}}{\sqrt{2}}$$

Unless otherwise stated **always** assume that the outputs of transformers are given in r.m.s. values. A mains voltage stated as 240V a.c. is an r.m.s. value; this means that on positive and negative peaks the sine wave will reach +340 and −340V respectively (this is why you should always use at least 400V rated components in mains circuits!). The output of our transformer is 8V r.m.s. therefore its peaks will be +11·2V and −11·2V.

A.C. VOLTMETER

You could experiment with series resistors, the 1mA meter and the single diode to make a simple 10V r.m.s. full scale a.c. voltmeter. You will find that the series resistor will have to be less than 10 kilohm—probably 5·6 kilohm, but this will depend on the mechanical response of your meter. For the following experiments you would be well advised to use a high resistance voltmeter already calibrated for a.c. working.

DC POWER SUPPLY

We can use the components we have available to make a simple battery eliminator. This means we can use the mains to produce a low d.c. voltage that could be used to power simple transistor experiments—see circuit in Fig. 11. All we do is turn our transformed a.c. into a half wave rectified signal—which could be called an intermittant d.c. voltage. This is then fed to a large capacitor C1, which smooths out the ripples—rather like the diode pump circuit (*Teach-In Part 6*).

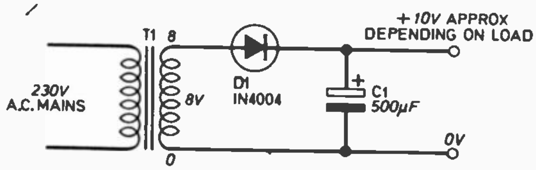


Fig. 11. Simple half-wave rectified power supply. The output voltage will vary, depending on the load, being at peak value for zero load.

Provided the current we draw from the capacitor is very much less than the charging up current, there should not be too much residual ripple caused by the half-wave rectified a.c.

The interesting thing about this circuit is that even though you use an 8V output transformer the d.c. voltage you obtain across the capacitor will be higher (between 10V and the peak of 11·2V). The actual value will depend on the amount of current you draw.

FULL WAVE RECTIFICATION

With half-wave rectification you do not use the full amount of energy available, because the negative half cycles are not used. We can carry out a process called full-wave rectification which in effect changes the negative going excursions of the a.c. waveform to positive going signals. These fill the "gaps" between the half wave rectified signals (see Fig. 9). In Fig. 12(a) the diodes are in a circuit called a "diode bridge."

When the potential of line "A" is postive with respect to line "B" (i.e. positive half cycles) current will flow through D2 and D3 which are forward biassed, but both D1 and D4 will be reverse biassed, thus the positive half cycle will charge the capacitor. During the negative half cycle (i.e. line "B" is now positive with respect to line "A") D4 and D1 will be forward biassed hence charging the capacitor; D2 and D3 will be reverse biassed—preventing a short circuit across the transformer secondary.

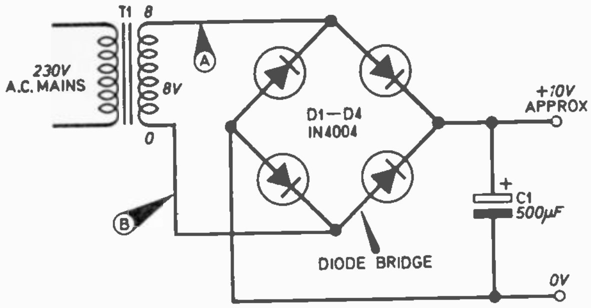
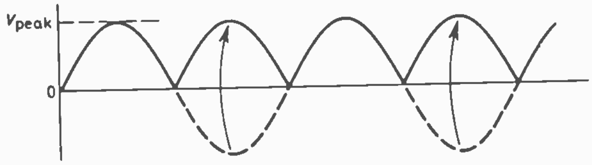


Fig. 12(a) (above). Circuit for demonstrating the principle of full-wave rectification.

Fig. 12(b) (below). Full-wave rectified sine wave.



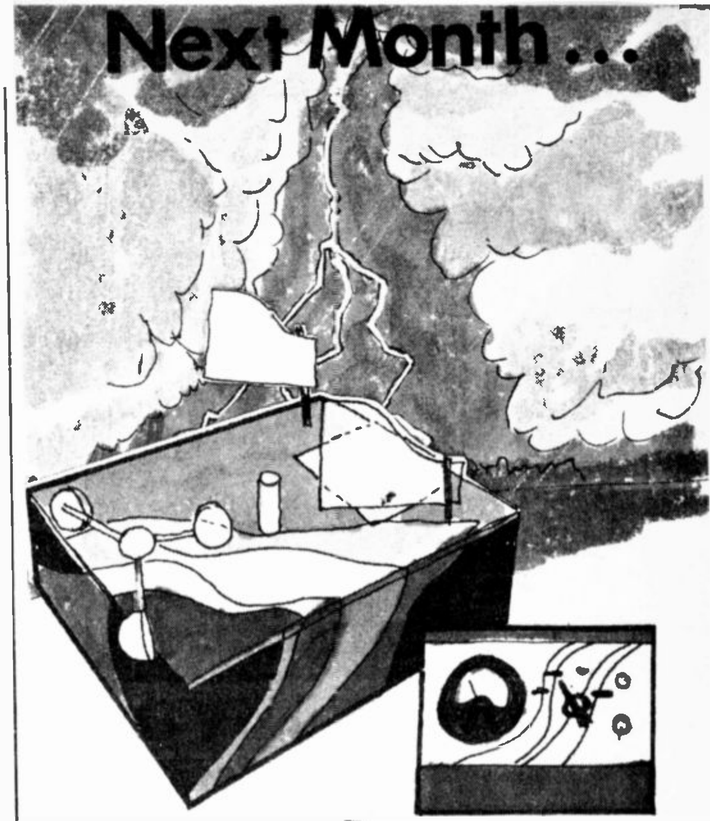
The ripple will now be a signal having a frequency of 100Hz (see Fig. 12(b)) which can be more effectively smoothed by the capacitor, and since more total energy is being fed to the capacitor more current can be drawn out before the ripple increases to an objectionable level.

COMPONENTS

If you make these circuits we suggest you use 1 amp diodes such as the 1N4004 and 500µF 25V working smoothing capacitor for voltage measurement experiments; however if you want to make a good d.c. supply you should use the bridge circuit with a capacitor of about 5,000 µF at 25V working.

Next month: Reactance and Inductance

Additional components required for next months experiments are: resistors, 100 kilohm (1 off); capacitors, 0·22µF polyester (1 off); Ferrite rod, 6 inches long ⅜ inch diameter; 28 swg enamelled copper wire (2 oz.); 60/70V neon bulb without built in resistor.



Weather Station

Build your own weather station with an indoor monitor. This basic design monitors temperature, ambient light level, wind strength and direction, and incorporates a rain warning alarm.

Through the lens light meter.

A simple but ingenious design of light meter for single lens reflex cameras. Ensures good results whatever lens is used.

Drill speed control.

Provides continuously variable speed control without the loss of too much power. For all mains type electric drills.

All in the August issue of

On sale July 21

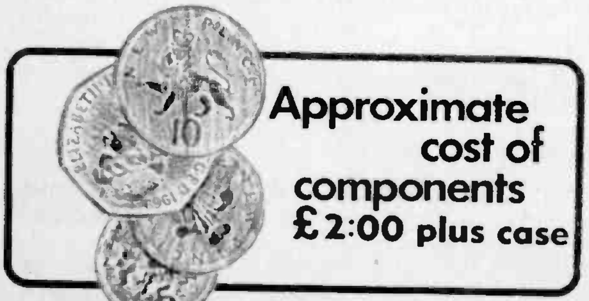
No radio listener or TV viewer on Saturday afternoons can fail to notice the emphasis on, and the interest in, the pedigree of race-horses. The same interest is shown at Cruft's, in the market garden and even the maternity home!

Now although the genetics of breeding is based upon very simple rules, chance also plays a very important part and the project to be described has been designed as a perfect demonstration of the theory of genetics known as Mendelism.

It should appeal immensely to teachers of genetics, zoology, biology or mathematics. For other readers the very simple unit may be used in conjunction with some paper "stage" money to produce a fascinating table-top game suitable for all the family in which horses are bred and raced.

MENDEL

Father Greggor Mendel (1822-1884) was a German monk who based his theory of genetics upon a study of the edible pea over a considerable number of years. It is possible that he had a general theorem to start with and proved it by his observations.



He published his findings in 1866 but they aroused little interest. Sixteen years after his death however, his work was revived and tested independently and simultaneously by three researchers, and Mendel became famous. His work is the foundation of all modern genetics.

Mendel proved that every inborn characteristic is the result of an equal contribution from the mother and father. These contributions he called "gamenes."

Let us assume that a certain species of moth has either a green, blue or yellow wing colour. The blue moth has two blue gamenes, the yellow moth has two yellow gamenes, while the green moth has one blue gamene and one yellow gamene.

If a blue moth mates with another blue moth, the offspring must all be blue, since neither parent can contribute a yellow gamene. Similarly for two yellow parents, only a yellow strain can be produced.

If however a blue/yellow mating occurs, the only possible offspring is green. There is no possibility of a yellow or blue strain since only one gamene is donated by each parent. With reference to Fig. 1(a) we can see that there is no chance of a blue, two chances of a green and no chances of a yellow.

If we let "0" represent blue, "1" green and "2" yellow, then the chance ratio of offspring from a blue/yellow mating is seen to be no "0", two "1" and no "2".

It can be seen from Fig. 1(b) that a blue/green

Horses for Courses

A device to explain simple genetics which can also be used to play an interesting horse breeding and racing game.

By D. R. DAINES

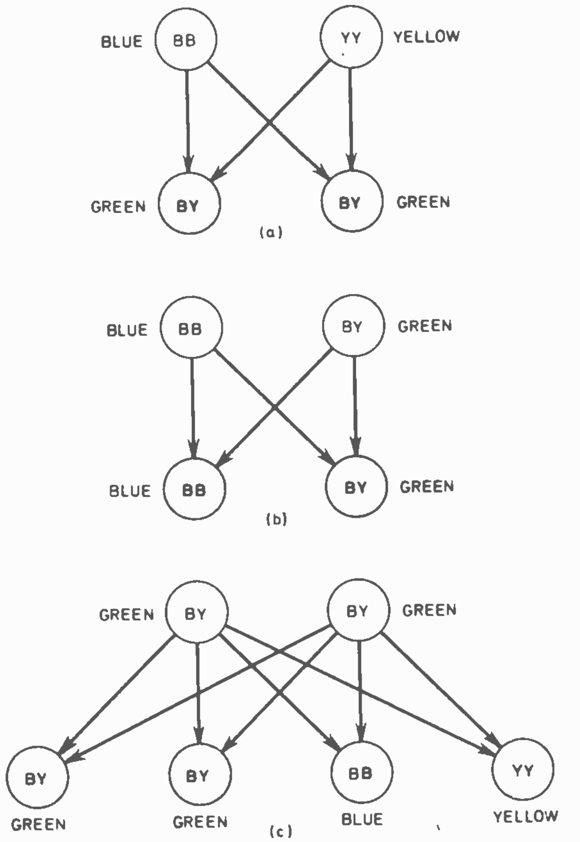


Fig. 1. Schematic diagram of the mating of moths of different wing colour. Offspring are shown shaded.

mating produces either two green or two blue offspring—no pure yellow since a yellow gamene is only evident in one of the parents. The ratio here is two "0", two "1" and no "2".

A green/green mating is shown in Fig. 1(c). Here it is possible to obtain one blue strain, two greens and one yellow, i.e. one "0", two "1" and one "2".

CHANCE

So far we have dealt with moths, where great numbers of offspring occur at each mating. What happens with animals, where there is usually only one or twc progeny such as horses.

Here we can say that, over a large number of matings, and a large number of progeny, the same two parents will tend towards the above ratios.

It is clear where the chance factor lies. If a coin is spun, it may come down heads or tails. If it comes down heads it can't be said that it will come down tails next time, nor is it more likely to. It still remains an even chance.

All that can be said is that over a large number of throws, the number of heads will tend to equal the number of tails. Similarly with genetics. The chances are known but cannot be forecast.

HORSES

With the moths mentioned above, "0", "1" and "2" represented wing colours—blue, green, and yellow respectively.

If we now let "0", "1" and "2" represent the total absence of a trait, a weak trait, and a strong trait respectively, we can apply this simple theory of genetics to horse breeding.

If we assume we are dealing with one of the many characteristics (traits) of horses, such as stamina, speed, action etc. then the degree of the trait (trait factor) present can be represented by "0", "1" or "2".

If, for example, the factor of a particular trait in the sire is "1" and that the same trait in the dam is "2", then there are equal chances of the foal having a "1" or "2" trait.

We can therefore make up a "truth" table using the three trait factors of the parents. This is shown in Table 1.

Table 1: CHANCES OF OFFSPRING TRAITS AS A FUNCTION OF PARENTAL TRAITS

Sire	Dam	Offspring (Foal)
0	0	0
0	1	0 or 1 (equal chances)
1	0	0 or 1 (equal chances)
1	1	0, 1, or 2 (two chances of a 1)
0	2	1
2	0	1
1	2	1 or 2 (equal chances)
2	1	1 or 2 (equal chances)
2	2	2

CIRCUIT

The circuit diagram for illustrating this simple theory of genetics with a built in chance factor is shown in Fig. 2.

It is merely a passive switching network which is wired up to give the required results of Table 1.

The output is in the form of illuminated lamps LP1, LP2 and LP3, representing the "0", "1" and "2" trait factors respectively.

SWITCHES

Switch S1 is used to turn the unit on/off, this should be a toggle, push-to-make/release-to-break type. This ensures no cheating, or "fixing" of the chance selector can result; this will be evident later.

The "sire" switch S2 should be a single-pole three-way type. This type of switch is not generally available, so the prototype was built using a single-pole 12-way type.

The "dam" switch S3 should be a three-pole three-way type. The prototype, however, used a more readily available type, four-pole four-way, hence the unconnected terminals on this switch seen in the wiring diagram of Fig. 3.

The chance switch, S4, must be a three-pole four-way type—but it has to be modified to allow it to be spun freely. This is done by dismantling S4 and cutting away the sprung stops, see Fig. 4.

To dismantle, remove the small circlip located on the spindle just above the threaded portion. This is a fairly difficult task and is best done using a pair of long nose pliers to grip the clip and prising it apart with a pair of side cutters.

Next, bend back the four fixing legs enabling the backplate to be removed, and remove the rotor from its bearing. Cut away the sprung stops and fixed stop with a hacksaw or side cutters, file smooth and reassemble. The spindle should spin freely.

WIRING UP

The complete wiring diagram is shown in Fig. 3. It is advisable to use as many different coloured wires as possible to help identify connections and check-out after completion.

To begin, attach the three switches, S2, S3 and S4 to the labelled front panel of the case (see Fig 5 for dimensions) together with the lamps

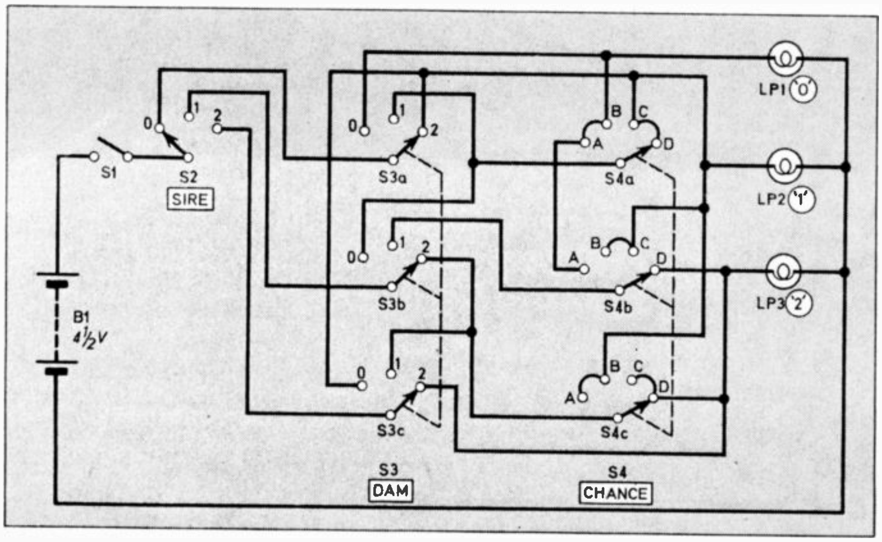


Fig. 2. The complete circuit diagram of the unit.

Horses for Courses

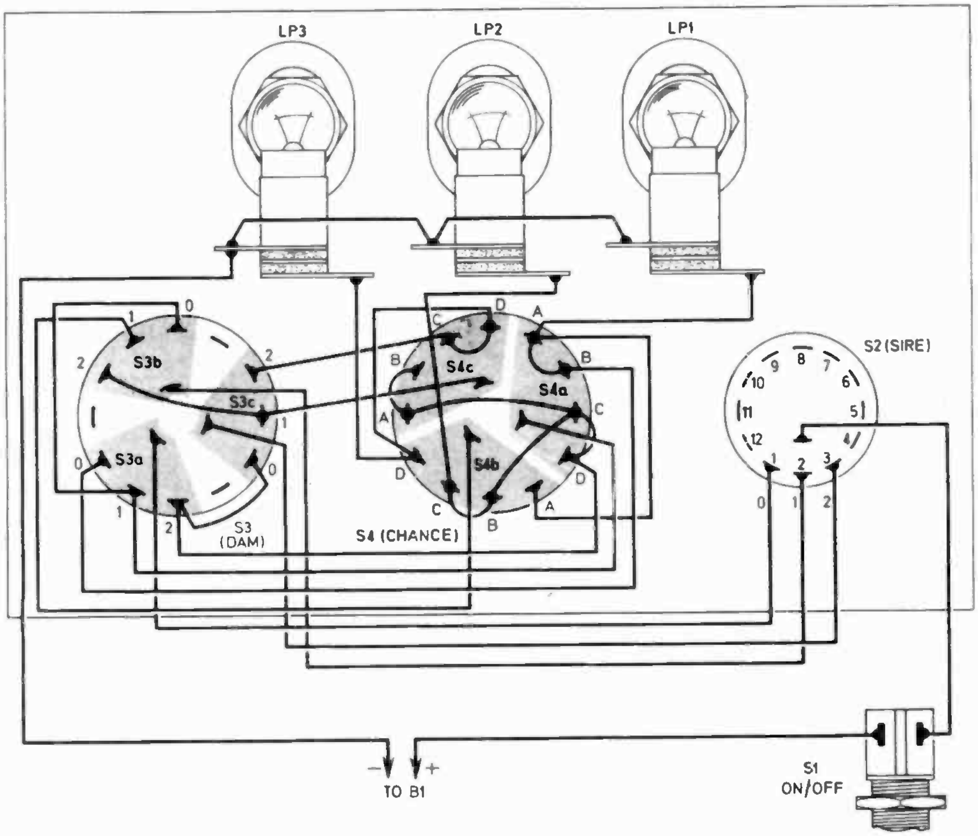


Fig. 3. The complete wiring diagram. The shaded region on S3 and S4 shows the pin connections associated with each of the three poles. B1 can be connected either way round.

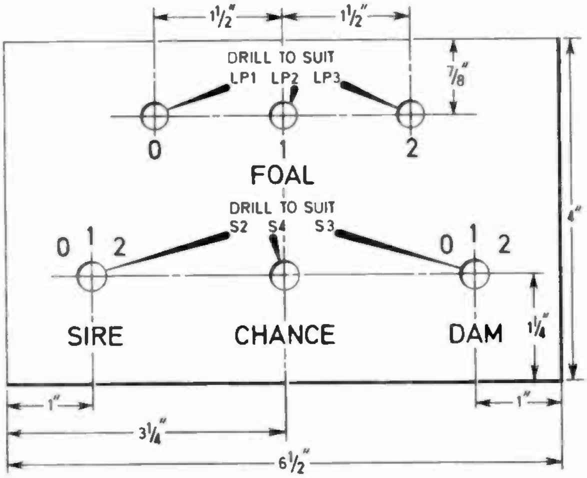
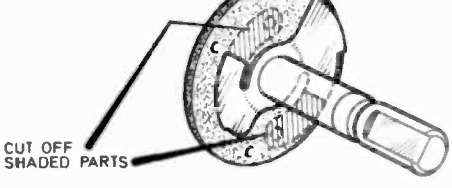
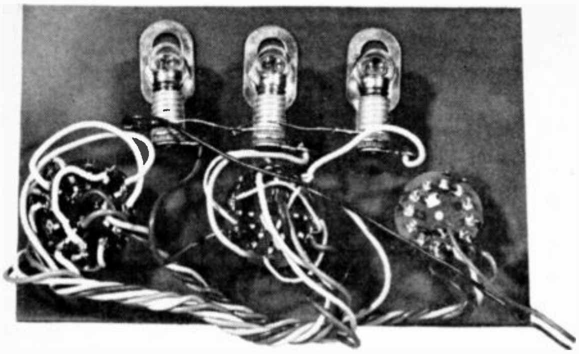


Fig. 4 (left). A suggested layout of the components on the front panel which in the prototype was made from coloured Perspex—but any material can be used.

Fig. 5 (below). The rotor of S4 removed. The shaded regions are to be cut away to enable it to be spun freely.





LP1, LP2 and LP3. Some sort of pin labelling is recommended to eliminate errors.

On each switch identify the poles and their corresponding pins—**in the correct switching order:** This can be done with a felt-tipped pen on the inside of the front panel alongside the switches.

Begin wiring from switch S2 to the poles of S3, and then connect the links between the three banks. This done, connect suitable lengths of wire from each of the nine pins from S3 to go to S4.

Next make the necessary link connections between the pins on this switch and then connect all the wires from S3 to the respective pins on S4.

To complete the wiring, connect the lamps, S1 and the battery in circuit.

Table 2: SWITCH POSITION/INDICATOR LAMP CHECK-OUT

S2 (Sire)	S3 (Dam)	S4 (Foal) A	B	C	D
0	0	0	0	0	0
0	1	0	0	1	1
1	0	0	0	1	1
1	1	0	1	1	2
0	2	1	1	1	1
2	0	1	1	1	1
1	2	1	1	2	2
2	1	1	1	2	2
2	2	2	2	2	2

TESTING

Table 1 shows the various off-spring traits as a function of parental traits, and the chances of obtaining them. These conditions are realised by the circuit and are indicated visually by the three lamps labelled "0", "1" and "2".

There are four positions on S4 (A, B, C, D) and for each of the combinations of S2 (sire) and S3 (dam) the lamps should light in accordance with Table 2. Test each combination carefully against Table 2, every combination should agree with this table.

Components....

Switches

- S1 Push to make/release to break toggle
- S2 Single-pole three-way wafer } see text
- S3 Three-pole three-way wafer } see text
- S4 Three-pole four-way wafer (modified, see text)

Lamps

- LP1, LP2, LP3 4·5 or 6V bulbs (three off) and holders to suit

Miscellaneous

B1 4·5V bell type battery (type 126)
Knobs: Three off; 2 pointer types, 1 heavy unmarked type (for chance switch). Connecting wire—as many different colours as possible—use stranded type.

Example: When the sire switch is set to "1" and the dam to "2", for the four different positions of S4, the "1" lamp should light twice and the "2" lamp should light twice. The "0" lamp should never light for this combination.

Not more than one bulb should ever be on at the same time for any combination.

USING THE UNIT

The unit can be used to demonstrate the Mendelian theory in the following way.

With S1 in the off position, set the pointers of S2 and S3 to the chosen trait factors and then spin the chance switch S4. Depress S1 and take a note of the result (i.e. which lamp lights).

Do this a number of times recording the results each time and you will see that as a number of samples increases, so the tabulated result moves closer to the given ratio.

Alternatively, students may be instructed to formulate their own ratio's over a number of samples using statistical methods.

BREEDING AND RACING GAME

This device can also be used to form the basis of a very interesting table top game for all the family in which horses are bred (using the unit described above) with the intention of producing horses for racing and further breeding. There is no limit to the number of players that may participate.

Other equipment required for the complete game are a race track, owners cards, paper "stage" money (Monopoly money is ideal), and a dice.

The race track can be made to any size or design. Fifty spaces between start and finish were found to be adequate.

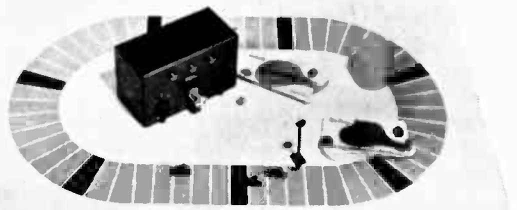
Every eighth space should be distinguishable from the rest—coloured black for example as shown in photograph opposite. These black squares are to confer advantages (or disadvantages) to horses landing thereon as detailed later.

Owners' cards should be drawn up as detailed in Fig. 4 and one should be issued to each player.

Nº — **OWNERS CARD**

TRAIT		1st GENERATION	HORSE						
CODE	POINTS		I	II	III	IV	V	VI	VII
A	6	0							
B	4	0							
C	3	1							
D	2	0							
E	1	0							
F	−2	0							
POINTS TOTAL		3							
GENDER		F							
STUD									

Fig. 6. An owner's card. When the traits and gender of each horse have been determined, they should be marked as indicated. When a horse has been mated it should be marked accordingly in the space provided.



TRAITS

Six traits have been chosen for the horses and these have been coded A, B, C, D, E, F. The "A" trait being most advantageous and "F" being a positive disadvantage.

When a horse lands on a black space on the race track, depending on its traits, it advances (or goes back) a number of spaces given by Table 3.

Table 3: BLACK-SQUARE-ADVANTAGES FOR THE SIX TRAITS

A	B	C	D	E	F
6	4	3	2	1	−2

After breeding several generations it is probable that a horse will emerge with more than one trait. The total advantage when landing on a black square is given by the sum of the individual trait advantages.

Example:

A horse with traits "A", "C" and "F" would advance seven spaces when landing on a black square. This is made up (using Table 3) of $6+3-2=7$. If a horse has a strong trait denoted by a "2" on the owners card, then the advantage (or disadvantage) is doubled, i.e. a horse with a strong ("2") "C" trait advances 6 spaces when landing on a black space.

PRELIMINARIES

Every player is given an owners' card which he keeps throughout the game. Each in turn throws a dice twice, the first throw to determine the gender of the horse—stallion or mare (odd or even respectively). The second throw is to determine the trait of this first generation horse i.e. A, B, C, D, E or F. A throw of "six" gives trait "A"; "five" trait "B"; "four" trait "C"; "three" trait "D"; "two" trait "E"; "one" trait "F".

The first generation horse can only have one trait and this must be weak (denoted by a "1" written alongside the appropriate trait).

When this has been carried out by each player, racing or breeding can begin.

BREEDING

Breeding can be instigated in two ways: (1) by agreement between any two owners—the owner of the stallion charging the owner of the dam an agreed sum of money for the stallion's services. The foal resulting belongs to the owner of the dam.

The gender of the foal is determined by a throw of the dice, odd for colt, even for filly.

(2) By use of the National Stud for which the player pays a fee to the bank.

The National Stud horse has only one characteristic for which a dice is rolled as before. The characteristic is weak (i.e. "1"). The gender of the National Stud horse is assumed to be opposite to that of the players horse, and the resultant foal belongs to the player. The owner's horse must be selected prior to drawing a horse from the National Stud, and these horses must then be bred.

Whether breeding is carried out using facilities (1) or (2), the procedure is the same, the owner of the eventual foal sets the trait factors of the sire and dam for each trait in turn to "0", "1" or "2" and spins the chance switch.

The trait factors (for each of the six traits in turn) are indicated by the three lamps. This factor is then entered alongside the trait in question on the owners' card.

Further breeding can be carried out between races by methods (1) and (2) above, or, if an owner has two or more horses on his card, of opposite sex, he can mate these to produce others.

Once a horse has been put to stud (mated) it can no longer race, but there is no limit to the number of times a horse can be mated or the number of times an unmated horse can take part in a race.

RACING

The first race should be run after each owner has acquired one horse and subsequent races after another horse has been bred by one or more owners.

Owners are allowed to enter only one horse for each race, which must be declared before the start of the race, for which a standard sum is paid, and a fixed amount is added to this by the bank to constitute the prize money.

The horses are moved around the course with the aid of a dice in the usual way, coupled with the "black-space advantages" acquired by each.

MONEY MATTERS

The introduction of paper money into the game makes it much more interesting. This paper money can either be made up or, if Monopoly money is available this would be ideal.

The money should be located in a central bank and should contain a large number of monetary denominations such as £100, £50, £25, £10, £5 and £1 notes.

With an initial capital of £500 each player is sufficiently equipped to meet breeding and race entrance fees. This amount is supplied by the bank.

Breeding charges between owners have to be agreed jointly by the owners making the contract—payment being made to the stallion owner.

For use of the National Stud for breeding purposes a fixed sum of £50 is payable to the bank.

If an owner wants to raise some cash, he can offer any of his stock for sale to the highest bidder, otherwise he may sell to the National Stud—if his horse has a point value of three or more—for a sum of £30 (payable to him by the bank). Once a horse is sold into the National Stud its racing and breeding days are over; it is put to grass (discarded).

The entrance fee per horse per race is £20 and the bank puts £40 to the total to form the prize money. On completion of a race, the prize money is divided up as follows: for two players, winner takes all; for three players, winner takes three-quarters, second one-quarter; four or more players, winner takes half, second and third, a quarter each.

WINNING POST

At the end of the game the winner is the owner with the most money and, incidentally, the most successful breeder. ▣

Ruminations
By Sensor

The Worm Will Turn

I was reading about some of the work now being done to enable an operator to communicate directly with a computer, using normal spoken English words. The computer would be designed to recognise certain words and to act appropriately when they are spoken.

The idea interested me because I feel that the operator ought to have a chance to answer back. For far too long he has been at the beck and call of his electronic "servant"; obeying instantly when told by the computer's flashing lights to; Input programme, Change tape, Input data, Call engineer; and so on. And if he fails to carry out his duties in the required manner, on flashes the light; Operator error and he gets a rocket from the computer manager for wasting his computer's time!

But imagine how different things could be with direct speech input—*Scene:* A computer room. Time. A.D. 1984.

Operator enters and switches computer on.

Computer: "Operator number two. Input programme."

Operator, (after late night party): "Don't shout, I'm having a coffee first—and don't call me number two."

Computer: "You are identified in records as operator number two"

Operator: "Change the records, my name is Bert."

Computer: "Records cannot be changed except by use of master programming key held by director of MI55. Input data immediately."

Operator: (Looking at crossword and talking to himself). "Ah, anagram, seven letters, "He makes the sea pant"—must be an anagram of SEA PANT."

Computer: "Peasant."

Operator: "When I want your opinion I'll ask for it, bighead."

Computer: "All data must be input before 08.30 hours. Your records will be marked unpunctual, inefficient, undesirable. You will be fined and downgraded."

Operator: "I resign. So you can put that into your register and process it, you electronic moron. I'm dropping out." Exit operator pursued by cries of Input data.

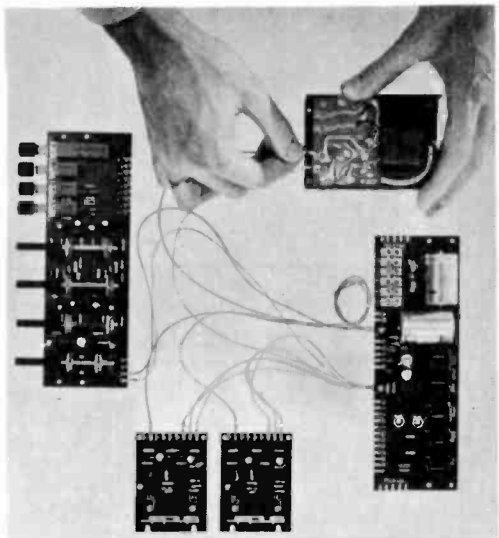
Computer Voice

Thinking about the way a computer speaks reminds me of the peculiar way of speaking that some of our radio announcers have these days? Their voices go up and down like a roller coaster with odd little pauses here and there. The female announcers are particularly prone to affect this mode of speech, and one assumes that somewhere there is a training school, probably very expensive and very exclusive, where young ladies with normal, interesting voices, are coached to produce what some official has decided is a "well modulated voice suitable for radio and television."

The writers of *Monty Python's Flying Circus* must have noticed what has been going on and they have parodied it brilliantly on several occasions.

There seem to be many organisations now that are intent on selling to us so many things that we are not only don't need but positively don't want. In my list of these unwanted goods and services I include "the well modulated voice" along with car parking fees and a few others.

Project 605 the new simple way to assemble Sinclair high fidelity modules



For several years now you have been able to assemble your own high fidelity system to world beating standards using Sinclair modules. We have progressively improved these technically but hitherto the method of assembly at your end has remained the same – there has been no alternative to a soldering iron. Now for those who prefer not to solder, there is an alternative – Project 605.

In one neat package you can now obtain the four basic Project 60 modules plus a fifth completely new one – Masterlink – which contains all the input sockets and output components you previously bought separately. Also in the Project 605 pack are all the inter-connecting leads, cut to length and fitted at each end with plugs which clip straight onto the modules, eliminating soldering completely. The pack contains everything you need to build a complete 30 watt stereo amplifier together with a clear well illustrated Instruction Book. All you have to do is to arrange your modules in the plinth or case of your choice and then clip them together – the work of a few minutes.

Your hi-fi system will, as we said, match the finest in the world and you can add to it at any time to increase power or extend the facilities. For example a superb stereo FM Tuner unit is obtainable for only £25.

Guarantee If within 3 months of purchasing Project 605 directly from us, you are dissatisfied with it, 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 service thereafter. No charge for postage by surface mail. Air-mail charged at cost.

sinclair

Sinclair Radionics Ltd., London Road.,
St. Ives, Huntingdonshire PE17 4HJ.
Telephone : St. Ives (04806) 4311

Specifications

Output – 30 watts music power (10 watts per channel R.M.S. into 3 Ω).
Inputs – Mag. P.U. – 3mV correct to R.I.A.A. curve 20–25,000 Hz ± 1dB. Ceramic pick-up – 50mV. Radio – 50 to 150mV. Aux. adjustable between 3mV. and 3V.
Signal to noise ratio – Better than 70dB.
Distortion – better than 0.2% under all conditions.
Controls – Press buttons for on-off, P.U., radio and aux. Treble +15 to —15 dB at 10 kHz. Bass +15 to —15 dB at 100 Hz. Volume. Stereo Balance.
Channel matching within 1dB.
Front panel – brushed aluminium with black knobs.

Project 605 comprises Stereo 60 pre-amp/control unit, two Z-30 power amplifiers, PZ-5 power supply unit, the unique new Masterlink, leads and instructions manual complete in one pack. Post free

£29.95

To SINCLAIR RADIONICS LTD., ST. IVES, HUNTINGDONSHIRE PE17 4HJ
Please send Project 605 post free ☐ Details and list of stockists ☐
Name ....
Address ....
....
for which I enclose £29.95 cheque/money order/cash. **E.E.88**

NATION WIDE SERVICE + ATTRACTIVE DISCOUNTS

ELECTROVALUE—an independent company since its establishment in 1965

ELECTROVALUE

Electronic Component Specialists

SEMI-CONDUCTORS

Brand new, guaranteed to spec. No seconds or surplus.

1B40K10	175p	2N2925	18p	2N5163	20p	AD142	50p	BC149	10p	BF167	18p	NKT212	25p
1N914	5p	2N2926	11p	2N5172	8p	AD149	58p	BC153	15p	BF173	19p	NKT213	25p
1N316	10p	2N3053	27p	2N5192	77p	AD150	50p	BC154	16p	BF177	25p	NKT214	23p
1N1763A	24p	2N3054	55p	2N5195	90p	AD161	33p	BC157	12p	BF178	31p	NKT217	50p
1N3754	20p	2N3055	50p	2N5457	30p	AD162	36p	BC158	11p	BF194	14p	NKT261	21p
1N5399	24p	2N3325	51p	2N5459	30p	*AD161/162	60p	BC159	12p	BF195	15p	NKT271	18p
1N5402	23p	2N3405	40p	40250	71p	AF114	24p	BC167	11p	BF244	30p	NKT274	18p
1N5407	35p	2N3663	52p	40251	89p	AF115	24p	BC168	10p	BF254	14p	NKT275	23p
1844	5p	2N3702	10p	40361	45p	AF116	22p	BC169	11p	BF255	15p	NKT403	65p
18940	5p	2N3703	10p	40362	45p	AF117	22p	BC177	14p	BFX18	90p	NKT404	61p
2N696	17p	2N3704	1up	40406	53p	AF118	82p	BC178	13p	BFX29	31p	NKT405	79p
2N697	18p	2N3705	10p	40408	54p	AF124	24p	BC179	14p	BFX84	25p	NKT603F	30p
2N706	12p	2N3706	10p	40412	67p	AF125	24p	BC182L	11p	BFX85	32p	NKT613F	30p
2N930	21p	2N3707	10p	40430	122p	AF126	22p	BC1838	10p	BFX87	29p	NKT674F	24p
2N1131	25p	2N3708	8p	40432	160p	AF127	22p	BC184L	11p	BFX88	26p	NKT677F	22p
2N1132	25p	2N3709	1up	40512	179p	AF129	33p	BC186	30p	BFY50	25p	NKT713	30p
2N1302	19p	2N3710	10p	40602	45p	AF239	36p	BC212L	14p	BFY51	20p	NKT773	25p
2N1303	19p	2N3711	10p	40669	120p	AL102	77p	BC213L	18p	BFY52	23p	OA47	8p
2N1304	26p	2N3731	120p	AC107	46p	ASY26	27p	BC214L	14p	BRY39	30p	OA90	6p
2N1305	26p	2N3794	15p	AC126	23p	ASY27	36p	BC257	9p	BSX20	18p	OA91	5p
2N1306	33p	2N3819	25p	AC127	20p	ASY28	27p	BC258	8p	BY164	44p	OA95	6p
2N1307	33p	2N3820	58p	AC128	20p	ASY29	36p	BC259	9p	BY238	16p	OA200	9p
2N1308	36p	2N3904	18p	AC141H	34p	AU111	97p	BC267	17p	BYX38-300	37p	OA202	10p
2N1309	36p	2N3906	20p	AC141HK	37p	B30C250	24p	BC268	13p	BYX38-300R	37p	OC19	50p
2N1596	76p	2N4036	52p	AC142H	25p	B30C550/300	34p	BC269	17p	C407	17p	OC25	42p
2N1599	76p	2N4058	13p	AC142HK	29p	B1912	31p	BC300	49p	C762	19p	OC28	70p
2N1613	22p	2N4059	11p	AC153K	22p	B5041	72p	BC301	37p	C1412	60p	OC29	76p
2N1711	26p	2N4060	11p	AC176	16p	BA102	21p	BC303	50p	E2512	107p	OC35	60p
2N1893	54p	2N4061	11p	AC176K	17p	BA130	5p	BCY30	49p	EA403	10p	OC36	65p
2N2147	114p	2N4062	11p	AC187K	17p	BA145	21p	BCY31	60p	EB383	10p	OC41	42p
2N2218	33p	2N4124	15p	AC188K	23p	BA155	15p	BCY70	18p	EC401	18p	OC42	46p
2N2218A	44p	2N4126	22p	*AC187K/188K		BA156	13p	BCY71	33p	EC402	16p	OC44	42p
2N2219	38p	2N4284	24p		40p	BAX13	8p	BCY72	15p	ER900	33p	OC45	38p
2N2219A	51p	2N4286	15p	ACY17	31p	BB103/B	16p	BD121	105p	MC140	25p	OC70	21p
2N2270	62p	2N4289	15p	ACY18	19p	BB103/G	16p	BD123	105p	MJ481	120p	OC71	38p
2N2369A	19p	2N4291	15p	ACY19	23p	BC107	12p	BD124	100p	MJ491	135p	OC72	38p
2N2483	35p	2N4292	15p	ACY20	20p	BC108	11p	BD130	50p	MJE371	68p	OC75	40p
2N2484	42p	2N4410	24p	ACY21	21p	BC109	12p	BD131	77p	MJE521	62p	OC81	25p
2N2646	47p	2N4443	88p	ACY22	16p	BC122	21p	BD132	81p	MJE2955	106p	OC81D	25p
2N2904	38p	2N4906	274p	ACY39	62p	BC125	15p	BD135	38p	MJE3055	68p	OC83	25p
2N2904A	42p	2N4915	227p	ACY40	17p	BC126	15p	BD136	44p	MPF102	37p	OC84	25p
2N2905	44p	2N4991	44p	ACY41	18p	BC140	30p	BD141	227p	MPS6531	28p	P346A	17p
2N2905A	47p	2N5062	42p	ACY44	31p	BC147	10p	BDY20	92p	MPS6534	24p	S2CN1	12p
2N2924	16p	2N5088	46p	AD140	63p	BC148	9p	BF115	23p	NKT211	25p	* Matched pair	

1972 ELECTROVALUE CATALOGUE (No.6)

Biggest and best edition yet—96 pages, plus covers. Well printed and generously illustrated, packed with hundreds of items at keen prices, valuable information and diagrams post free 10p.

DISCOUNTS

allowed on all items other than those at NETT prices.

10% on orders for £5 or more **15%** on orders for £15 or more

POSTAGE & PACKING FREE on orders for £2·00 or more. Please add 10p Handling charges if under.

Overseas orders welcomed. Prices subject to alteration without prior notice.

Terms of business—C.W.O. as in catalogue

We are now approved distributors for

ELREMCO WOLF SOLDERSTAT SOLDERING IRONS

A popular and beautifully made lightweight example from a wide and versatile range of soldering irons of exceptional quality. Type HMS for 16 or 24 watts, A.C. mains. **£1·87**

Solderstat Infinitely Variable Temperature Controlled Soldering Iron. Stays constant at desired temperature. For printed circuits, delicate work etc. complete **£9·20**

De soldering braid per 6 ft.—50p.

SLIDER POTENTIOMETERS

In usual values from 47K to 1 megohm, log or linear. Robust construction, smooth action, ea. **26p**. Slider control knobs—Black/Red/Yellow/Green/Blue/Lt Grey/Dk Grey/White, each 5p.

CAPACITORS

SIEMENS 5% TOLERANCE POLYCARBONATE

250V. up to 0·1μF: 100V 0·1μF and above.
0·01; 0·012; 0·015; 0·018; 0·022; 0·027; 0·033; 0·047; 0·056, each **3p**.
0·068; 0·082; 0·1; 0·12; 0·15 each **4p**.
0·018; 0·22, ea. **5p**: 0·27; 0·33, **6p**: 0·39 **7p**: 0·47, **8p**: 0·56, **10p**: 0·68, **11p**; 1μF **13p**.

SIEMENS ELECTROLYTIC

with axial leads: Values in μF/V m
0·47/100; 1/100; 2·2/63; 4·7/35; 10/25; 22/16; 47/10; 47/25; 100/10; 220/3—each **5p**.
10/63; 22/35; 47/35; 100/16; 100/25; 220/6, 220/10; 220/16; 470/3, each **6p**.
47/50; 47/63; 100/35; 470/10, each **7p**.
100/50; 220/35; **9p**: 100/63; 470/25; 100/10, ea. **10p**.
220/63; 470/35; 1000/16, ea. **14p**.
1000/25, **16p**: 470/63; 1000/35, **19p**: 2000/200, **29p**: 1000/63; 2200/35; 4700/16, ea. **33p**

MULLARD SUB-MIN ELECTROLYTICS

C426 range, axial lead ... ... 6p 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; 16/10; 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; 100/6·4 152/4; 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, **28p**; 1000/50, **41p**: 1000/100, **82p**; 2000/25, **37p**; 2000/50, **57p**; 2000/100, **£1·44**: 2500/64, **77p**; 2500/70, **98p**; 5000/25, **62p**: 5000/50, **£1·10**; 5000/100, **£2·91**.

Simple to Build, Astoundingly Good

10W/15Ω BAXENDALL SPEAKER

As originally designed by P. J. Baxendall and described in Wireless World. 10 watt/15 ohm loudspeaker with equaliser network speaker unit and specially designed cabinet in kit form. Size when built approx. 18" x 12" x 10". Price inc. carriage paid in U.K. Nett **£13·81**.

Speaker unit and equaliser kit with instructions **£4·81**

Cabinet kit, all parts cut to size ready to assemble, in natural teak finish **£9·00**

HANDBOOK OF TRANSISTOR EQUIVALENTS & SUBSTITUTES 40p.

HANDBOOK OF TESTED TRANSISTOR CIRCUITS (H. Ness), 40p.

RADIO & ELECTRONICS Colour codes & data wall chart, 15p

ENGINEERS REFERENCE HANDBOOK & TABLES 20p.

(Add 3p. for postage on each of above if bought separately.)

RESISTORS—10%, 6%, 2%

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	9	8·0	7
C	1/8W	5%	4·7 Ω–470K Ω	E24	1	0·8	0·7
C	1/4W	10%	4·7 Ω–10M Ω	E12	1	0·8	0·7
C	1/2W	5%	4·7 Ω–10M Ω	E24	1·2	1	0·9
C	1W	10%	4·7 Ω–10M Ω	E12	2·5	2	1·8
MO	1/2W	2%	10 Ω–1M Ω	E24	4	3	2 nett
WW	1W	10% ± 1/20 Ω	0·22 Ω–3·9 Ω	E12	7	7	6
WW	3W	5%	1 Ω–10K Ω	E12	7	7	6
WW	7W	5%	1 Ω–10K Ω	E12	9	9	8

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

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.

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

CARBON TRACK POTENTIOMETERS, long spindles. Double wipers

SINGLE GANG linear 100 Ω to 2·2M Ω, 12p; Single gang log, 4·7K Ω to 2·2M Ω, **12p**; **Dual gang** linear 4·7k Ω to 2·2M Ω, 42p; Dual gang log, 4·7K Ω to 2·2M Ω, **42p**; Log/antilog, 10K, 47K, 1M Ω only 42p; Dual antilog, 10K only, 42p. Any type with 2A D.P. mains switch, 12p extra.

Only decades of 10, 22 & 47 available in ranges quoted.

DUAL CONCENTRIC in any combination of above values, 60p; with switch, 72p.

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, **5p each**.

ZENER DIODES 5% full range E24 values: 400mW: 2·7V to 36V, **15p each**; 1W, 6·8V to 82V, **27p each**; 1·5W: 4·7V to 75V, **48p each**.

Clip to increase 1·5W rating to 3 watts (type 266F). 4p.

NEWMARKET LINEAR I.C.s

LIC 709 C/14 Dual in line **34p**.
LIC 741 C/14 Dual in line **40p**.

I.C. SOCKETS (low cost) 14 way 14p: 16 way **15p**. In-line or staggered pin arrangements available

MAIN LINE AMPLIFIER KITS

70 watt power amp. module kit. **£12·60 nett.** Power supply kit, **£6·50 nett.** Matching pre-amp kit, **£3·30 nett.** (Above prices for mono.) Stereo **Kit.** 2 power amps, pre-amp kit, power supply kit and matched controls for building into your own cabinet, **£38·90 nett.**

THERMISTORS

VA1039, VA1040, VA1055, VA1066, VA1077, CZ-6, K151-1K, VA1100, 15p. R24, R53, R54, **£1·35**.

INSULATED SCREW TERMINALS in range of seven colours, each **11p**. Matching plugs: 2mm, each **4p**; 4mm, each **6p**.

MINIATURE TOGGLE SWITCHES

2A/250V. DP/DT **48p**.

ELECTROVALUE LTD.

DEPT. EE772, 28 St. Judes Road, Englefield Green, Egham, Surrey. TW20 OHB *Hours: 9-5.30, 1.0 p.m. Saturdays.*
Phone: Egham 3603; Telex 264475

THEY MADE THEIR MARK

No 3 Ampère

By J. E. Gregory

Photograph: Science Museum London

Table I: AMP (A)

The flow of electric current is measured in amps. Just as last month we used the water pressure analogy for the volt, so we can compare electric current with the flow of water.

As a practical example the current which flows through a domestic chandelier holding four, 60 watt lamps connected to a 240V mains supply is one ampere.

In 1881 the ampere along with the volt was adopted at the first meeting of the International Electrotechnical Committee.

LAST month's article showed how Volta's discovery enabled man to produce small electric power from batteries, but to obtain larger powers he had to make magnets move. The man who did much to establish the relationship between electricity and magnetism was the French mathematician and physicist Ampère who gave his name to the practical unit of electrical current. See Table 1.

INFANT PRODIGY

Andre Marie Ampère was born on January 22, 1775, in the village of Polemiex, near Lyons, the son of a merchant, who was also Justice of the Peace.

Young Andre showed his astonishing capabilities at a very early age, and it is said that he was calculating before he could read or write.

It was in 1793, Andre now eighteen that tragedy struck. Lyons had revolted against the tyranny of the French Revolution. The army of the Convention who hated all forms of authority captured the town, Andre's father was thrown into prison, and soon after publicly guillotined.

The shock of this was so great that Ampère remained in a state of apathy and near madness for almost three years.

Then in 1796 he met Julie Carron who gave him back his reason for living.

On August 2, 1799 at the age of 24, he married Julie and one year later a son John Jacque was born. Once again Andre was a happy man.

In 1804 tragedy struck Ampère a second blow, his wife died of a chest disease; he did little for five years. Then in 1809 after publishing a thesis on the mathematical theory of gambling he was recommended for the post of Professor of Mathematics at the Polytechnic in Paris. In 1814 he was elected to the Academy of Science.

OERSTED GETS THE NEEDLE

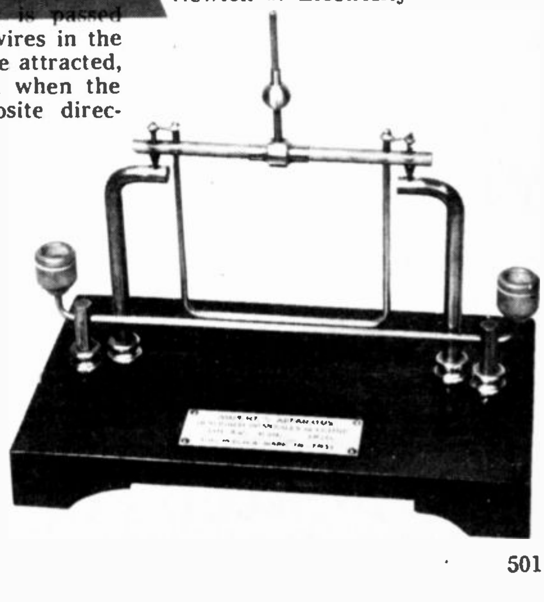
On 11th September 1820 Ampère heard that the Dane Oersted had discovered that a magnetic compass needle moved when placed near a wire carrying an electric current.

The news of this discovery so excited Ampère that he worked night and day experimenting on the relationship of electricity and magnetism, and on 18th September just one week later, presented to the academy the results of his experiments. These showed that when electric current is passed through two parallel wires in the same direction they are attracted, and they are repelled when the current flows in opposite directions. He also proved that the force of attraction or repulsion is directly proportional to the strength of the currents. This became known as Ampère's rule.

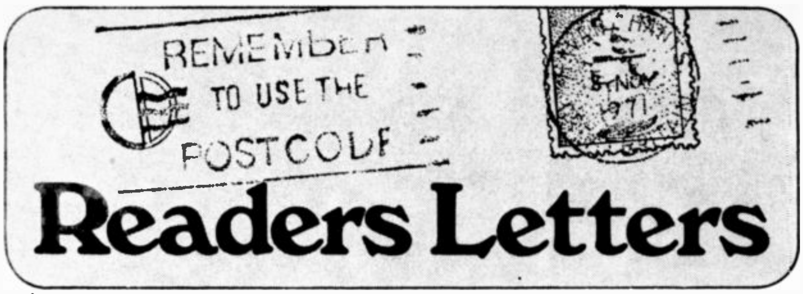
Ampère gave public demonstrations and one of his contemporaries reports "a gasp would go up from the audience as Ampère twisted insulated copper wire round an iron horseshoe, joined the ends of the wire to Volta's battery, and showed how the horseshoe attracted a quantity of nails, and how it let them fall the moment the current from the battery was shut off."

Ampère died in Marseilles on June 10, 1836 from a chest illness. James Clark Maxwell another famous 19th century physicist later described Ampère as "The Newton of Electricity"

Ampère's aparatus



Photograph: Crown copyright, Science Museum, London.



Readers Letters

Saw Point

As a musician interested in the electronic aspects of music, I read with interest Mr. Judd's article on the *Audio Tone Generator*. He is however misleading about the question of sawtooth waveforms.

Although he is quite right when he says that a square wave contains only odd harmonics and the sawtooth wave consists of both odd and even harmonics, the waveform which he draws and which the integrating network on his generator will produce is not a sawtooth wave but, what is known in electronic music as a triangle wave. (I have also seen it referred to as a back-to-back sawtooth wave).

This waveform is symmetrical, and, like all symmetrical waveforms, consists only of odd harmonics. The difference between this and the square waveform lies in the phase relationship of the harmonic series and in the fact that they diminish in amplitude much more rapidly as their frequency increases.

The clarinet also has a symmetrical waveform and therefore only odd harmonics are present, but its timbre is totally unlike that of a square wave because the relative amplitude of their harmonics is different. If anything, a triangle wave sounds more like a clarinet.

R. Sherlaw Johnson
Stonesfield.

Stock Control

There is still one very basic problem which has slipped your attention, i.e. the building up of stock by the beginners. I wish you could advise us on the minimum quantity of various components we should keep in stock all the time, e.g. resistors (type, ratings, ohmic values and quantity of each type, etc.). Capacitors, diodes, transistors, nuts and bolts, chassis, cases, panels, heat-sinks, etc.

Very often when I set myself to build a project, I find it very embarrassing to get stuck for the shortage of some components and it gets more painful if the local shop cannot help me either. I feel all the enthusiastic beginners would be very grateful if you could kindly help us in setting our stocks right at the beginning. Without proper guidance, at the start, all the component catalogues seem to be useless.

J. Whyte
London.

This is something we have been looking at and an article may be published in the future.

Solder Injector

Thank you for your very useful article on the *Signal Injector* in your March issue. I have constructed one with a few modifications, and I thought that some of your readers may be interested in the financial savings I made.

Firstly, I did not use the recommended Steradent tube (having no false teeth), but (to me) a more readily available case—the standard multicore solder tube. To the pointed end I fixed my nail directly using fibreglass paste (eg. Isopon), this did away with the need for a miniature plug and socket. The switch was fixed to the plastic cap.

As regards the construction, I used a smaller piece of Veroboard, given away in your first issue (after making a *Windscreen Wiper Control)*. The components specified were not at all critical; I used two OC 71 transistors and 0·1 μF capacitors throughout to get excellent results.

May I take this opportunity to suggest a few ideas for future projects in your excellent magazine:—

1. A stabilised voltage dropper, so that a portable cassette player may be used off a car battery.
2. Short range transmitter (if legal?).
3. More audio and hi-fi projects.
4. Lighting effects controlled by music from an amplifier.

K. J. Twydell
Portsmouth.

Of the four items you suggest the transmitter is not legal in this country without a radio amateur's licence, the other three things will probably be future articles.

Join the Club

Readers may be interested in my slightly modified version of the *Demo Deck*.

I made my top in Formica and cut a recess to take a commercial "breadboard"; the single S-Dec unit with little spring-loaded clips and holes to take components. Hence there is no need for soldering or, even more important, dodgy desoldering which can result in damage. My S-Dec cost me £1, but I think, for a beginner, it is a good investment.

I am glad to see EVERYDAY ELECTRONICS making good progress. There certainly was a crying need for a journal of this type catering for raw amateurs. I would suggest that at some future date you consider forming a national club for electronics enthusiasts of humble skills. Who knows, it could lead to a healthy exchange of ideas, a feeling of camaraderie and (I've got grandiose ideas!) eventually a national exhibition. Why not? Indeed your E.E. symbol on the contents page would make a perfect badge.

Pity about these errors that are creeping in with too much frequency; it tends to undermine confidence a little. However, as a fellow journalist, I'll make allowances for a little while yet.

Incidentally, do I dare suspect a slip in Mike Hughes' Teach-in last month (May) where on page 371, top of column one, he refers to VR1 as "a 300 ohm potentiometer". I'm afraid those of us with *Demo Decks* followed an earlier design and made this a 100 ohm pot—or have I got my things in a twist?

Never mind, for an expert to try to put over an advanced science that's constantly on the move is one big headache when he has pupils at all levels of training and can't thump those of us who are a bit thick on the uptake.

T. Milligan
Kempston.

We must point out that The British Amateur Electronics Club caters for all interested in electronics. Details from the Hon. Secretary, Mr. J. G. Margetts, 17 Saint Francis Close, Abergavenny, Monmouthshire.

The value of VR1 should be 100 ohms.

Enlightening

Upon reading "Sensor's" article *Let There Be Light* I was surprised at his lack of knowledge concerning street lighting. Light operated switches have been used in street lighting systems for several years, the reason for not using them on every light is that

HENRY'S LOW COST FIRST GRADE BRAND NEW BRANDED GERMANIUM and SILICON TRANSISTORS, DIODES, RECTIFIERS, TRIACS, FETS, ZENERS, BRIDGES and INTEGRATED CIRCUITS

BY ATES · EMIHUS · FAIRCHILD · FERRANTI · I.T.T. · MULLARD · NEWMARKET · PHILIPS · R.C.A. · TEXAS

TRANSISTORS

A SELECTION FROM OUR LIST

AAY30	10p
AAY42	15p
AAZ13	10p
AAZ15	10p
AAZ17	10p
AC107	35p
AC126	30p
AC127	25p
AC127Z	50p
AC128	20p
AC176	20p
AC187	25p
AC188	25p
ACY17	30p
ACY18	25p
ACY19	25p
ACY20	20p
ACY21	20p
ACY22	10p
ACY39	55p
ACY40	20p
ACY41	15p
ACY44	25p
AD140	50p
AD149	50p
AD161	35p
AD162	35p
AF114	25p
AF115	25p
AF116	25p
AF117	20p
AF118	60p
AF124	25p
AF125	20p
AF126	20p
AF127	20p
AF139	30p
AF180	50p
AF181	45p
AF185	50p
AF186	40p
AF239	40p
ASY26	25p
ASY27	30p
ASY28	25p
ASY29	30p
ASZ21	55p
BA100	15p
BA102	30p
BA110	25p
BA115	7p
BAX13	5p
BAX16	7p
BAY31	7p
BAY38	15p
BC107	10p
BC108	10p
BC109	10p
BC109C	12p
BC113	10p
BC114	20p
BC115	20p
BC116	20p
BC116A	25p
BC117	20p
BC118	20p
BC119	30p
BC134	20p
BC135	15p
BC136	20p
BC137	20p
BC138	20p
BC147	12p
BC148	10p
BC149	12p
BC153	20p
BC154	20p
BC167	15p
BC169	12p
BC169C	15p
BC177	20p
BC178	20p
BC179	20p
BC182L	10p
BC183L	10p
BC184L	12p
BC212L	12p
BC213L	12p
BC214L	15p
BCY30	35p
BCY31	40p
BCY32	60p
BCY33	30p
BCY34	35p
BCY38	45p
BCY39	£1·00
BCY40	50p
BCY70	15p
BCY71	20p
BCY72	15p

BD115	75p
BD123	85p
BD124	80p
BD131	75p
BD132	80p
BDY11	£1·50
BDY17	£1·50
BDY38	65p
BDY60	£1·00
BF115	25p
BF154	20p
BF158	15p
BF159	35p
BF180	35p
BF194	15p
BF195	15p
BF196	15p
BF197	15p
BFX13	25p
BFX29	25p
BFX30	25p
BFX84	25p
BFX85	30p
BFX86	25p
BFX87	25p
BFX88	20p
BFY18	25p
BFY50	20p
BFY51	20p
BFY52	20p
BFY53	15p
BFY90	65p
BSX20	15p
BSX21	20p
BSY27	15p
BST95A	12p
BSY95	12p
BU105	£2·25
BY100	15p
BY126	12p
BY124	15p
BY182	90p
BYZ10	85p
BYZ11	30p
BYZ12	30p
BYZ13	25p
BZY78	£1·00
GET102	35p
GET103	25p
GET111	45p
GET113	25p
GET114	20p
GET115	50p
GET116	55p
GET880	45p
GET882	30p
GEX66	£1·50
GM378A	55p
MAT101	25p
MAT121	25p
MC724P	60p
MJ420	80p
MJ421	80p
MJ2801	£1·10
MJ2901	£1·50
MJE340	50p
MJE370	20p
MJE371	80p
MJE520	75p
MJE521	70p
MJE2955	£1·10
MJE3055	75p
MPSA06	25p
MPSA56	20p
MPSA70	15p
MPSU06	50p
MPSU56	55p
NKT214	20p
NKT216	35p
NKT403	75p
NKT404	55p
OA5	25p
OA10	25p
OA47	10p
OA70	10p
OA79	10p
OA81	8p
OA90	8p
OA91	7p
OA95	7p
OA200	7p
OA202	10p

OC16	50p
OC20	85p
OC22	50p
OC23	60p
OC24	60p
OC25	40p
OC26	25p
OC28	60p
OC29	60p
OC35	50p
OC36	60p
OC42	40p
OC43	50p
OC44	15p
OC45	12p
OC70	12p
OC71	12p
OC72	20p
OC75	25p
OC76	25p
OC77	40p
OC81	20p
OC81D	20p
OC81Z	40p
OC83	25p
OC84	25p
OC139	25p
OC140	40p
OC141	60p
OC170	25p
OC171	30p
OC200	40p
OC201	75p
OC202	80p
OC206	95p
OCP71	97p
ORP12	50p
ORP60	40p
ST140	15p
ST141	20p
TIP29A	50p
TIP30A	60p
TIP31A	60p
TIP32A	70p
TIP33A	£1·00
TIP34A	£1·50
TIS43	40p
TIS50	12p
TIS51	10p
TIS52	10p
TIS60	18p
TIS61	20p
TIS62	25p
V405A	25p
VR525	35p
WO1	30p
WO6	45p
ZTX107	15p
ZTX108	12p
ZTX109	15p
ZTX300	12p
ZTX301	15p
ZTX302	20p
ZTX303	20p
ZTX304	25p
ZTX500	15p
ZTX501	15p
ZTX502	20p
ZTX503	17p
ZTX504	40p
ZTX531	26p
IN914	7p
IN916	10p
IN4148	7p
IS44	7p
IS921	7p
IS922	8p
2G301	25p
2G302	30p
2G303	35p
2N404	20p
2N696	15p
2N697	15p
2N698	30p
2N706	10p
2N706A	12p
2N708	15p
2N930	20p
2N987	40p
2N1131	25p
2N1132	25p
2N1302	18p

2N1303	18p
2N1304	22p
2N1305	22p
2N1306	25p
2N1307	25p
2N1308	25p
2N1309	25p
2N1613	20p
2N2147	75p
2N2160	60p
2N2217	25p
2N2218	20p
2N2218A	25p
2N2219	20p
2N2219A	25p
2N2220	25p
2N2221	20p
2N2221A	25p
2N2222	20p
2N2222A	25p
2N2369	15p
2N2369A	15p
2N2646	40p
2N2904	20p
2N2904A	25p
2N2905	25p
2N2905A	25p
2N2906	20p
2N2906A	25p
2N2907	23p
2N2907A	25p
2N2925	15p
2N2926	10p
2N3011	20p
2N3053	20p
2N3054	50p
2N3055	75p
2N3525	£1·00
2N3614	55p
2N3702	10p
2N3703	10p
2N3704	12p
2N3705	10p
2N3707	12p
2N3708	10p
2N3714	£2·00
2N3715	£2·20
2N3716	£2·85
2N3771	£2·00
2N3772	£2·05
2N3773	£2·35
2N3791	£2·75
2N3819	35p
2N3820	55p
2N3823	50p
2N3824	95p
2N3903	20p
2N3906	25p
2N4058	12p
2N4061	12p
2N4062	12p
2N4289	12p
2N4290	12p
2N4871	35p
2N5457	30p
2N5458	35p
2N5459	40p
40250	50p
40360	40p
40361	40p
40362	50p
40430	£1·00
40543	65p
40594	£1·05
40595	£1·05
40636	£1·10

Full transistor list available— send for your free copy today!

HENRY'S LOW COST INTEGRATED CIRCUITS

BRAND NEW FULL SPECIFICATION TTL74 SERIES BRANDED FAIRCHILD, I.T.T. AND TEXAS

DEVICES MAY BE MIXED TO QUALIFY FOR QUANTITY PRICES

No.	Description	1-11	12-24	25-99	100+	250+
7400	Quadruple 2-input NAND gates	20p	18p	14p	14p	12p
7401	Quad 2-input open collector NAND gates	20p	18p	16p	14p	12p
7402	Quad 2-input NOR gates	20p	18p	16p	14p	12p
7403	Quad 2-input open collector NAND gates	20p	18p	16p	14p	12p
7404	Hextuple inverters	20p	18p	16p	14p	12p
7405	Hex inverters with open collector outputs	20p	18p	16p	14p	12p
7410	Triple 3-input NAND gates	20p	18p	16p	14p	12p
7413	Dual 4-input Schmitt triggers	30p	27p	25p	22p	20p
7420	Dual 4-input NAND gates	20p	18p	16p	14p	12p
7430	Single 8-input NAND gates	20p	18p	16p	14p	12p
7440	Dual 4-input NAND buffer gates	20p	18p	16p	14p	12p
7441	BCD-Decimal decoder/Nixie driver	75p	72p	70p	60p	55p
7442	BCD-Decimal decoder (4-10-line) TTL O/P	75p	72p	70p	60p	55p
7443	Excess 3-Decimal decoder TTL outputs	£1·00	95p	90p	80p	70p
7447	BCD-Decimal 7 seg. decoder/indicator driver	£1·75	£1·60	£1·45	£1·30	£1·15
7448	BCD-Decimal 7 seg. decoder/driver TTL O/P	£1·75	£1·60	£1·45	£1·30	£1·15
7450	Expand dual 2-input AND-OR-INVERT gates	20p	18p	16p	14p	12p
7451	Dual 2-wide 2-input AND-OR-INVERT gates	20p	18p	16p	14p	12p
7453	Quad 2-input expand AND-OR-INVERT gates	20p	18p	16p	14p	12p
7454	4-wide 2-input AND-OR-INVERT gates	20p	18p	16p	14p	12p
7460	Dual 4-input expanders	20p	18p	16p	14p	12p
7470	Single J-K flip-flop (gated inputs)	30p	27p	25p	22p	20p
7472	Single J-K flip flop (gated inputs)	30p	27p	25p	22p	20p
7473	Dual J-K flip flop	40p	37p	35p	33p	30p
7474	Dual D flip flop	40p	37p	35p	33p	30p
7475	Quadruple bistable latch	45p	42p	40p	38p	35p
7476	Dual J-K flip-flops with Preset and Clear	40p	37p	34p	31p	28p
7480	Gated Full Adder	80p	72p	67p	59p	55p
7481	16-bit read/write memory	£1·25	£1·15	£1·10	£1·00	90p
7482	2-bit binary Full Adder	87p	80p	70p	65p	60p
7483	4-bit binary Full Adder	£1·00	90p	85p	80p	73p
7484	16-bit RAN with gated write inputs	90p	85p	80p	75p	71p
7486	Quadruple 2-input Exclusive OR gates	45p	41p	38p	35p	33p
7490	BCD decade counter	75p	70p	65p	60p	55p
7491	8-bit shift register	£1·00	95p	90p	80p	70p
7492	Divide twelve counter	75p	70p	65p	60p	55p
7493	4-bit binary counter	75p	70p	65p	60p	55p
7494	Dual entry 4-bit shift register	80p	75p	70p	65p	60p
7495	4-bit up-down shift register	80p	75p	70p	65p	60p
7496	5-bit parallel/serial in/out shift register	£1·00	97p	95p	90p	83p
74100	8-bit bistable latch	£2·50	£2·30	£2·00	£1·75	£1·50
74118	Hextuple Set-Reset latches	£1·00	95p	90p	80p	70p
74121	Monostable multivibrators	60p	55p	50p	46p	41p
74141	BCD-Decimal decoder/Nixie driver	£1·00	95p	90p	80p	70p
74145	BCD-Decimal decoder (1-4-line) TTL O/P	£1·50	£1·40	£1·30	£1·10	£1·00
74150	16-bit data selector/multiplexer	£3·35	£3·20	£2·95	£2·15	£2·05
75151	8-bit data selector/multiplexer	£1·10	95p	90p	80p	70p
74153	Dual 4-line to 1-line data selector multiplexer	£1·35	£1·27	£1·20	£1·15	£1·10
74154	16-bit decoder/demultiplexer	£2·00	£1·75	£1·55	£1·30	£1·05
74155	Dual 2-line to 4-line decoder/demultiplexer	£1·55	£1·47	£1·35	£1·10	£1·05
74156	Dual 2-line to 4-line decoder/demultiplexer	£1·55	£1·47	£1·35	£1·10	£1·05
74190	Sync decade up-down counter, 1-line mode	£1·95	£1·85	£1·75	£1·60	£1·50
74191	Sync 4-bit up-down counter, 1-line mode	£1·95	£1·85	£1·75	£1·60	£1·50
74192	Sync decade up-down counter, 2-line mode	£2·00	£1·90	£1·80	£1·65	£1·55
74193	Sync 4-bit up-down counter, 2-line mode	£2·00	£1·90	£1·80	£1·60	£1·40
74196	Asynchronous presettable decade counter	£1·50	£1·40	£1·30	£1·10	£1·00
74197	Asynchronous presettable 4-bit binary counter	£1·50	£1·40	£1·30	£1·10	£1·00

Complete data on the above in booklet 20 pages, Ref. 29, issue 2 at 15p post paid.

Texas I.C. Handbook. Complete information on 100 types. 40p. Post 10p.

Integrated circuit sockets 14 pin D.I.L. 25p; 16 pin D.I.L. 30p.

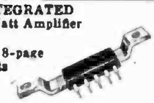
INTEGRATED CIRCUITS

MFC4000P	55p
MFC4010P	60p
1C12	£2·50
PA246	£1·50
TAD100	£1·50
TAD110	£1·50
MC724P	50p
702C (TO5)	75p
709C (TO5)	45p
709C (D.I.L.)	45p
723C(TO5)	£1·00
741C(TO5)	80p
MC1303P	£2·00
MC1304P	£2·25
SL403D	£1·50
741C(DIL)	75p
914(TO5)	40p
923(TO5)	40p
TOSHIBA 20 watt amp.	£4·47
TOSHIBA Pre amp	£1·50

PLESSEY INTEGRATED CIRCUIT 3 Watt Amplifier SL403D

Complete with 8-page booklet, circuits and data

£1·50 ea.



ZENER DIODES

	1-24	25+	100+	500+	1000+
400m/w BZY 88 series*	12p	10p	8p	7p	6p
1½ watt ZL series	25p	23p	20p	17p	15p
3 watt 3TZ series	30p	27p	25p	22p	20p
10 watt ZS series +	40p	37p	35p	30p	25p

All types are 5%. Wire Ended + these Stud. in voltages 3·3-100 volt in all standard values. *3·3-33 volt.

TRIACS

Stud with accessories

Type	P.I. volts	Current	1-11
SC35A	100	3 amps	80p
SC35B	200	3 amps	85p
SC35D	400	3 amps	90p
SC40A	100	6 amps	90p
SC40B	200	6 amps	£1·05
SC40D	400	6 amps	£1·00
SC45A	100	10 amps	£1·05
SC45B	200	10 amps	£1·15
SC45D	400	10 amps	£1·25
SC50A	100	15 amps	£1·35
SC50B	200	15 amps	£1·45
SC50D	400	15 amps	£1·75
SC40E	500	6 amps	£1·25
SC46E	500	10 amps	£1·45
SC50E	500	15 amps	£1·95
DIAC SD2			25p

SILICON RECTIFIERS

1 AMP MINIATURE PLASTIC WIRE ENDED

Type	P.I.V.	1-49	50+	100+	500+	1000+
1N4001	50	6p	5p	4½p	4p	3½p
1N4002	100	7p	6p	5p	4½p	4p
1N4003	200	8p	7p	6p	5p	4½p
1N4004	400	8p	7p	6p	5p	4½p
1N4005	600	10p	9p	8p	7p	6p
1N4006	800	12p	10p	9p	8p	7p
1N4007	1000	15p	12p	10p	9p	8p

BRIDGE RECTIFIERS

Miniature Potted Silicon ½" × ½" × ½"

Type	P.I.V.	Current	1-12	Type	P.I.V.	Current	1-11
1002	100	2a	55p	4004	400	4a	75p
2002	200	2a	65p	6004	600	4a	80p
4002	400	2a	75p	1006	100	6a	70p
6002	600	2a	80p	2006	200	6a	75p
1004	100	4a	65p	4006	400	6a	£1·00
2004	200	4a	70p	6006	600	6a	£1·10

QUANTITY OFFERS! FROM STOCK

AF117 Mullard 20p
25 + 17p
100 + 15p
500 + 12p
1000 + 10p

2N2646 Motorola 40p
25 + 35p
100 + 32p
500 + 28p
1000 + 25p

OC170 Mullard 25p
25 + 20p
100 + 18p
500 + 15p
1000 + 13p

BY127 Mullard 15p
25 + 12p
100 + 10p
500 + 9p
1000 + 8p

OC35 Mullard 50p
25 + 45p
100 + 40p
500 + 35p
1000 + 30p

2N2926 Green 10p
25 + 9p
100 + 8p
500 + 6p
1000 + 5p

BC107 All Makes 10p
25 + 8p
100 + 7p
500 + 6p
1000 + 5p

2N3055 Fairchild 75p
25 + 65p
100 + 50p
500 + 40p
1000 + 35p

BYZ13 Mullard 25p
25 + 20p
100 + 17p
500 + 15p
1000 + 12p

OA202 10p
25 + 8p
100 + 7p
500 + 6p
1000 + 5p

OC28 Mullard 60p
25 + 55p
100 + 50p
500 + 45p
1000 + 40p

2N3819 Texas 35p
25 + 30p
100 + 25p
500 + 20p
1000 + 17p

BC108 and 9 All Makes 10p
25 + 8p
100 + 7p
500 + 6p
1000 + 5p

AD161 AD162 35p each
25 + 32p
100 + 28p
500 + 25p
1000 + 22p

OUR RANGE IS ALWAYS EXPANDING — Enquiries invited for new types arriving daily

ADDITIONAL DISCOUNTS — 10% 12+ : 15% 25+ : 20% 100+ — DELIVERY IS FROM STOCK

HENRY'S RADIO LTD. SEMI-CONDUCTOR DEPARTMENT
303 EDGWARE RD., LONDON, W2. TEL: 01-723 1008/9
CALLERS 356 EDGWARE ROAD W2.

NEW LIST - NEW PRICES 1971 TRANSISTOR LIST 1500+ SEND FOR YOUR FREE COPY TODAY...

DISCOUNTS 10% 12+, 15% 25+, 20% 100+ ANY ONE TYPE
POSTAGE 7p. ALL ORDERS

We respectfully ask customers to include a minimum £1.00 per order, it helps to plan ahead & saves postage as well.

—apart from major towns—most street lights are extinguished at midnight, light operated switches cannot do this. Another reason is that the electricity boards own most of the time switches and to install light operated switches in place of these costs in the region of £12 to £15 per column. This cost has to be found out of the rates we pay because councils have to purchase these as opposed to timeswitches—the other side effect is higher electricity bills to councils due to the permanent all night lighting. We do not get enough power cuts to warrant this vast extra expense on the rates.

I am employed by a firm of street lighting contractors, fitting and maintaining public lighting.

B. W. Hawkins
Herts.

Clanger

I have been reading your magazine since it was first published and found it quite good. Unfortunately under the article about the *Bee Counter* in the May issue I think you have dropped a proverbial "clanger". The *Bee Counter* works as drawn in the circuit but the write up is all wrong. You say that TR1 is conduction when the l.d.r. has a low resistance (i.e. when illuminated) which of course it will not because it is a *pnp* transistor; TR2 will therefore be "off" until TR1 conducts.

When a bee passes between the lamp and the l.d.r. the resistance of the l.d.r. increases and the base potential becomes negative with respect to the emitter. This causes TR1 to conduct and a negative potential is then applied to TR2 causing it to conduct and the counter to operate.

I think your write up should have been along these lines. It looked especially funny after the previous article on semiconductors. Perhaps Mike Hughes will give a few lessons to the editorial staff!

W. Raymond
Old Trafford.

You are of course quite right—we have asked Mike if he has any free time!

Circuit Operation

I was very pleased to receive the booklet *Constructors Companion* with the May issue. Now I know that little bit more about the modes of transistors, the explanation although brief was easily understood.

Will you please publish a feature about how circuits work, that is, the a.c. (signal) and d.c. conditions in circuits when in operation? For example, the progress of a signal from aerial to speaker; through all the components also the d.c. conditions of the circuit at the same time.

You will probably have noticed that, in all receiver circuits authors never give this explanation which I believe would be of considerable help to the understanding of how the circuits "work" especially in receivers.

Would it also be possible to have either a regular feature or a regular pull-out supplement of a list of circuits for doing a variety of things.

J. Bradley
Yorks.

We may well be publishing a series on basic circuit operation describing the function and operation of many of the "standard circuits" we use.

Convention

I would be most grateful if you could explain to me the logic of using "conventional current" in contemporary circuit diagrams.

You see, when I was at school my physics master dismissed this as being "guesswork on the part of the ancients (electrically speaking)." Thus he explained electrical phenomena in the light of "electron flow" and I was able to understand him sufficiently to construct simple valve radios, home electroplating appliances etc.

Similarly an R.A.F. radar instructor was able to acquaint us with the principles of the cathode ray tube etc., whilst we blockheads were undergoing operational training in bomber command during the war.

Much later in life I decided to take an exam involving some knowledge of electronics and thus went through a "refresher". Again, the instructor used "electron flow" as his means of explanation; again I understood.

To the best of my knowledge, all electro/mechanical devices which demonstrate a "current flow" visibly, do so in a way which shows that, whatever *is* flowing, is flowing from negative to positive (except in the interiors or prime sources).

Would you therefore be kind enough to inform me:

a) who re-introduced "conventional current flow"?

b) Why?

You see, if I knew the reason for using this terminology I would possibly better be able to reconcile myself with it and thus get *down* to some learnings instead of getting het *up* at symbols which appear, to me, just plain stupid!

A. K. Robinson
London, W.7.

As far as we know no one re-introduced conventional current flow—it has always been with us, ever since Volta's battery.

Unfortunately it is not easy to simply drop conventional current and use electron flow as all the laws concerning electricity and magnetism—which are, after all, the basis of the whole thing—are in terms of conventional current flow. Thus, although it is easy to explain such things as cathode ray tubes and transistors using electron flow, when it comes to teaching the basics of electricity then all the universal basic rules which are in terms of conventional current flow would have to be changed.

One-sided

While experimenting with tape loops, prompted by your May article, I discovered some promising effects by giving the tape a half turn before joining the loop. This produces a "one-sided" tape, with the interesting result that both tracks of the tape are scanned successively.

Unfortunately, half the cycle presents the shiny side of the tape to the head. However, by using triple-play (very thin) tape and turning the loop over after recording, interesting reverse/echo effects were obtained.

By the way, inserting a 1MΩ linear potentiometer in the collector load of TR2 of the *Signal Injector* circuit (March issue) makes an excellent tone generator, serving both purposes, at a saving of some £2·50.

R. Darbishire
Surrey.

If you write to us for advice, and wish to have a personal reply you must include a s.a.e. Unfortunately, we cannot prepare special designs, circuits or wiring diagrams, to meet individual requirements nor can we supply back issues or answer queries concerning commercial equipment, or subjects or designs not published by us.

For all technical and editorial matters, write to: The Editor, Everyday Electronics, Fleetway House, Farringdon Street, London, E.C.4. Phone 01-634 4452.

For all enquiries concerning advertisements or advertisers write to: The Advertisement Manager, Everyday Electronics, at the above address. Phone 01-634 4202.

FOR RAPID SERVICE

GARLAND BROS. LTD,

DEPTFORD BROADWAY, LONDON, SE8 4QN

TRANSISTORS

AC127	17p	BFX29	38p
AC128	18p	BFX84	25p
AC176	22p	BFX88	30p
AC187	28p	BFY50	21p
AC188	27p	BFY51	21p
ACY19	23p	BFY52	22p
AD149	47p	MAT100	25p
AD161/162	72p	MAT101	29p
ADT140	62p	MAT120	25p
AF118	45p	MAT121	29p
AF124	22p	OC28	58p
AF125	19p	OC35	48p
AF126	20p	OC44	12p
AF127	19p	OC45	12p
AF178	67p	OC71	11p
AF179	66p	OC72	12p
AF180	45p	OC75	20p
AF239	32p	OC200	27p
BC107	11p	OC201	38p
BC108	11p	OCP71	60p
BC109	11p	ST140	15p
BC147	12p	ST141	23p
BC148	12p	UT46	35p
BC149	12p	2N696	15p
BC157	15p	2N706A	12p
BC158	14p	2N2926G	14p
BC159	14p	2N2926Y	13p
BD131	75p	2N2926O	12p
BD132	75p	2N3053	25p
BF115	25p	2N3054	60p
BF178	32p	2N3055	72p
BF179	56p	2N3702	15p
BF180	30p	2N3703	14p
BF181	32p	2N3704	15p
BF184	30p	2N3705	14p
BF185	32p	2N3706	14p
BF194	14p	2N3711	14p
BF195	14p	2N3819	35p
BF196	28p	2N4058	17p
BF197	15p	2N5459	60p
BFW10	70p		

DIODES

AA119	11p	OA202	10p
OA47	7½p	BY100	15p
OA90	7½p	BY127	22½p
OA91	6p	BYZ12	22½p

ZENER DIODES

From 2 to 33 volts.
400mW, 15p ; 1·5W, 22½p

SILICON BRIDGE RECTIFIERS

40 P.I.V., 1·5A
200 P.I.V., 2·0A

50p

MISCELLANEOUS ITEMS

Mercury Switch, 2 Amp., 25p
B9A valve bases, 2p
5k Ω edge control, fits most small, imported radios, 7p
20 Ω volume control for 3 Ω speakers, 20p
Antex CN240, 15W miniature soldering iron, £1·70
Valve and Transistor Data book, 9th edition, 75p
Transistor equivalent book, BPI, 40p

PANEL FUSEHOLDERS

For 1¼in. fuses	18p
For 20mm fuses	15p

CONTROLS, Log. or Lin.

Single, less switch, 15p
Single, D.P. switch, 24p
Tandem, less switch, 40p
5k Ω, 10k Ω, 25k Ω, 50k Ω, 100k Ω, 250k Ω, 500k Ω, 1M Ω, 2M Ω

RESISTORS

Carbon
All 5%, high-stability, E12 values.
¼W, 1½p; 1W, 4p; 2W, 6p
Wire-wound
5W, 10p ; 10W, 12p

ELECTROLYTICS

1µF	450V	19p	1,000µF	25V	27p
2µF	500V	20p	1,000µF	50V	39p
4µF	350V	14p	2,000µF	25V	36p
8µF	450V	16p	2,000µF	50V	53p
16µF	450V	17p	2,500µF	25V	45p
25µF	50V	8p	2,500µF	50V	60p
32µF	450V	24p	3,000µF	25V	48p
50µF	50V	10p	5,000µF	25V	55p
100µF	25V	10p	5,000µF	50V	98p
100µF	50V	10p	8–8µF	450V	18p
250µF	25V	12p	8–16µF	450V	20p
250µF	50V	17p	16–16µF	450V	27p
500µF	25V	18p	16–32µF	450V	63p
500µF	50V	25p	32–32µF	450V	49p
			50–50µF	350V	38p

MINIATURE ELECTROLYTICS

1µF	25V	10µF	64V
2·5µF	64V	16µF	40V
4µF	40V	25µF	25V
5µF	64V	30µF	15V
8µF	15V	50µF	15V
8µF	40V	100µF	15V
10µF	15V		

7p

VARIABLE POWER SUPPLY

Input : 240V, a.c.
Output : Switched 3, 4·5, 6, 7·5, 9,12 volts d.c. at 500mA **£4·20**

NEW NEW

ILLUSTRATED 1972-73 CATALOGUE

Post Free 15p

VEROBOARD

Size	0·1 matrix	0·15 matrix
2½in × 3¾in	22p	16p
2½in × 5in	24p	25p
3¾in × 3¾in	24p	25p
3¾in × 5in	27p	29p
17in × 2½in	75p	57p
17in × 3¾in	£1	75p

Pins—both sizes : packet of 36, 18p

ALUMINIUM BOXES with lids and screws

Type	Length	Width	Depth	Price
GB7*	2¾in	5¼in	1½in	38p
GB8*	4in	4in	1½in	38p
GB9*	4in	2¾in	1½in	38p
GB10*	4in	5¼in	1½in	44p
GB11	4in	2½in	2in	38p
GB12	3in	2in	1in	33p
GB13	6in	4in	2in	52p
GB14	7in	5in	2½in	63p
GB15	8in	6in	3in	81p
GB16	10in	7in	3in	92p

* These sizes fit standard Veroboards.

CASSETTE OWNERS!

For Philips and similar cassette recorders.
PU12 Power unit for connection to 12V + or − E car electrical systems, giviug 7½V, stabilised output. **£3·25**
PP75 Mains power supply, output 7½V. d.c. **£1·95**
Both units are complete with cable and 5 pin D.I.N. plug.

BONDED ACRYLIC FIBRE

B.A.F. wadding, 18in wide, 1in thick. The ideal lining for speaker enclosures. 25p per yard.

LOW-OHM RESISTORS

2½ watt wire-wound.
1 Ω, 1·8 Ω, 2·7 Ω, 3·3 Ω, 3·9 Ω, 4·7 Ω, 5·6 Ω, 6·8 Ω, 8·2 Ω **10p**

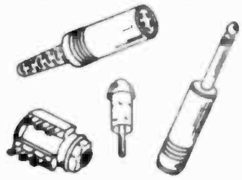
CAPACITORS

2·2pF	500V	S/M	7½p
3·3pF	500V	S/M	7½p
5pF	500V	S/M	7½p
10pF	125V	P.S.	5p
10pF	500V	S/M	7½p
15pF	125V	P.S.	5p
15pF	500V	Cer.	4p
18pF	500V	S/M	7½p
22pF	125V	P.S.	5p
22pF	500V	S/M	7½p
25pF	500V	S/M	7½p
27pF	500V	Cer.	4p
33pF	125V	P.S.	5p
33pF	500V	S/M	7½p
39pF	500V	S/M	7½p
47pF	125V	P.S.	5p
47pF	500V	Cer.	4p
50pF	500V	S/M	7½p
56pF	500V	S/M	7½p
68pF	125V	P.S.	5p
68pF	500V	S/M	7½p
75pF	500V	S/M	7½p
82pF	500V	S/M	7½p
100pF	125V	P.S.	5p
100pF	500V	S/M	7½p
100pF	500V	Cer.	5p
120pF	500V	S/M	7½p
150pF	125V	P.S.	5p
150pF	500V	S/M	7½p
150pF	500V	Cer.	5p
180pF	500V	S/M	7½p
200pF	500V	S/M	7½p
220pF	125V	P.S.	5p
220pF	500V	Cer.	5p
250pF	500V	S/M	8p
270pF	500V	Cer.	5p
300pF	500V	S/M	8p
330pF	125V	P.S.	5p
330pF	500V	S/M	8p
390pF	500V	S/M	8p
470pF	125V	P.S.	5p
470pF	750V	Disc	5p
500pF	500V	S/M	8p
560pF	500V	S/M	8p
680pF	125V	P.S.	6p
680pF	500V	S/M	8p
820pF	500V	S/M	8p
0·001µF	100V	Mylar	3p
0·001µF	125V	P.S.	6p
0·001µF	400V	Poly.	3p
0·001µF	500V	S/M	10p
0·001µF	500V	Cer.	5p
0·001µF	1,000V	MDC	6p
0·0015µF	400V	Poly.	3p
0·0015µF	500V	S/M	10p
0·0015µF	500V	Cer.	5p
0·0018µF	500V	S/M	10p
0·002µF	100V	Mylar	3p
0·002µF	500V	Cer.	5p
0·0022µF	125V	P.S.	6p
0·0022µF	500V	S/M	10p
0·0022µF	1,000V	MDC	6p
0·0027µF	500V	S/M	15p
0·003µF	500V	Cer.	5p
0·0033µF	125V	P.S.	6p
0·0033µF	500V	Poly.	6p
0·0033µF	1,000V	MDC	6p
0·0036µF	500V	S/M	15p
0·0047µF	125V	P.S.	9p
0·0047µF	500V	Poly.	6p
0·0047µF	500V	S/M	20p
0·0047µF	1,000V	MDC	6p
0·005µF	100V	Mylar	3p
0·005µF	500V	Cer.	5p
0·0068µF	125V	P.S.	10½p
0·0068µF	500V	S/M	30p
0·0068µF	500V	Poly.	6p
0·0082µF	125V	P.S.	10½p
0·0082µF	500V	S/M	30p
0·01µF	18V	Disc	4p
0·01µF	125V	P.S.	10½p
0·01µF	160V	Pol.	4p
0·01µF	250V	M.F.	3p
0·01µF	400V	Poly.	3p
0·01µF	500V	Cer.	5p
0·01µF	500V	S/M	30p
0·01µF	600V	MDC	7p
0·01µF	1,000V	MDC	9p
0·015µF	160V	Poly.	3p
0·015µF	400V	Poly.	3p
0·02µF	100V	Mylar	3p
0·022µF	18V	Disc	5p
0·022µF	250V	M.F.	3p
0·022µF	400V	Poly.	3p
0·022µF	600V	MDC	7½p
0·022µF	1,000V	MDC	9p
0·033µF	250V	M.F.	4p
0·033µF	400V	Poly.	4p
0·047µF	12V	Disc	6p
0·047µF	160V	Poly.	3p
0·047µF	250V	M.F.	3p
0·047µF	400V	Poly.	4p
0·047µF	600V	MDC	8p
0·047µF	1,000V	MDC	10p
0·1µF	30V	Disc	6p
0·1µF	250V	M.F.	4p
0·1µF	400V	Poly.	5p
0·1µF	600V	MDC	10p
0·1µF	1,000V	MDC	13p
0·15µF	250V	M.F.	5p
0·22µF	160V	Poly.	6p
0·22µF	250V	M.F.	5p
0·22µF	400V	Foil	10p
0·22µF	1,000V	MDC	15p
0·33µF	250V	M.F.	8p
0·47µF	250V	Foil	8p
0·47µF	400V	Foil	15p
0·47µF	1,000V	MDC	20p
1·0µF	250V	M.F.	15p

Note :
S/M = silver mica 1% tol.
P.S. = polystyrene 2½% tol.
MDC = a.c. rating = 300V.
M.F. = Mullard min. foil.
Cer. = ceramic.

PLUGS

Car aerial	14p
Co-axial	8p
D.I.N. 2 pin (speaker)	10p
D.I.N. 3 pin	13p
D.I.N. 4 pin	14p
D.I.N. 5 pin, 180	13p
D.I.N. 5 pin, 240	15p
D.I.N. 6 pin	15p
Jack, 2½mm unscreened	9p
Jack, 2½mm screened	10p
Jack, 3½mm unscreened	8p
Jack, 3½mm screened	12p
Jack, ¼in unscreened	12p
Jack, ¼in screened	20p
Jack, stereo, unscreened	20p
Jack, stereo, screened	35p
Phono, plastic top	5p
Phono, plated metal	12p
Phono, fitted 4ft lead	8p
Wander, red or black	3p
Banana 4mm, red or black	6p



LINE SOCKETS

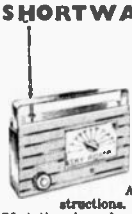
Car aerial	14p
Co-axial	17p
D.I.N. 2 pin (speaker)	15p
D.I.N. 3 pin	16p
D.I.N. 5 pin, 180	16p
D.I.N. 5 pin, 240	16p
Jack, 3½mm	15p
Jack, ¼in screened	43p
Jack, stereo, screened	30p
Phono, plated metal	14p

SOCKETS

Car aerial	8p
Co-axial, surface	8p
Co-axial, flush	8p
D.I.N. 2 pin (speaker)	10p
D.I.N. 3 pin	9p
D.I.N. 5 pin, 180	9p
D.I.N. 5 pin, 240	9p
Jack, 2½mm	10p
Jack, 3½mm	10p
Jack, ¼in unswitched	15p
Jack, ¼in switched	17p
Jack, stereo, switched	24p
Phono, single	5p
Phono, 2 on a strip	7p
Phono, 3 on a strip	9p
Phono, 4 on a strip	10p
Wander, single, red or black	5p
Wander, twin strip	7p
Banana 4mm, red or black	6p

MAIL ORDERS : C.W.O. only. Please include 10p P. & P. (Air mail extra). S.A.E. with all enquiries please. Telephone 01-692 4412

SHORTWAVE TRANSISTOR RADIO

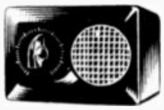


only **£2·75**

Anyone from 9 years up can follow the step-by-step, easy as ABC fully illustrated instructions. No soldering necessary. 76 stations logged on rod aerial in 30 mins.—Russia, Africa, USA, Switzerland, etc. Experience thrills of world wide news, sport, music, etc. Eavesdrop on unusual broadcasts. Uses PP3 battery. Size only 3" x 4½" x 1½" Only £2·75 + 20p p. & p. Kit includes cabinet, screws, instructions, etc. (Parts available separately).

INGENIOUS ELECTRONIC SLEEP INDUCER

ONLY **£3·25**



CAN'T SLEEP AT NIGHTS? DO YOU WAKE UP IN THE NIGHT AND CAN'T GET OFF TO SLEEP. AGAIN? WOULD YOU LIKE TO BE GENTLY SOOTHED OFF TO SATISFYING SLEEP EVERY NIGHT? Then build this ingenious electronic sleep inducer. *It even stops by itself so you don't have to worry about it being on all night!* The loudspeaker produces soothing audio-frequency sounds, continuously repeated—but as time goes on the sound gradually becomes less and less—until they eventually cease altogether, *the effect it has on people is amazingly very similar to hypnosis.* A control is provided for adjusting the length of times, etc., all transistor, can be built by anyone over 12 years of age in about two hours. No knowledge of electronics or radio needed. Extremely simple, easy-to-follow, step-by-step, fully illustrated instructions included. *No soldering necessary.* Works off standard batteries, extremely economical. Size only 3" x 4½" x 1½"—take it anywhere. Kit includes case, nuts, wire, screws, etc. SEND £3·25 + 25p p. & p. (parts available separately).

BUILD 5 RADIO AND ELECTRONIC PROJECTS

only **£2·45**

Amazing Radio Construction set! Become a radio expert for £2·45. A complete Home Radio Course. No experience needed. Parts including simple instructions for each design. Illustrated step-by-step plans, all transistors, loudspeaker, personal phone, knobs, screws, etc. all you need. Presentation box 45p extra as illus. (if required) (parts available separately) no soldering necessary. Send £2·45 + 20p p. & p.

SOOTHE YOUR NERVES, RELAX WITH THIS AMAZING RELAXATRON

Only **£2·75**

CUTS OUT NOISE POLLUTION—SOOTHES YOUR NERVES! Don't underestimate the uses of this fantastic new design—the RELAXATRON is basically a pink noise generator. Besides being able to mask out extraneous unwanted sounds, it has other very interesting properties. For instance, many people find a rainstorm mysteriously relaxing, a large part of this feeling of well-being can be directly traced to the sound of falling raindrops!—a well known type of pink noise IF YOU WORK IN NOISY OR DISTRACTING SURROUNDINGS, IF YOU HAVE TROUBLE CONCENTRATING, IF YOU FEEL TENSED, UNABLE TO RELAX—then build this fantastic Relaxatron. Once used you will never want to be without it—TAKE IT ANYWHERE. Uses standard PP3 batteries (current used so small that battery life is almost shelf-life). CAN BE EASILY BUILT BY ANYONE OVER 12 YEARS OF AGE using our unique, step-by-step, fully illustrated plans. No soldering necessary. All parts including case, a pair of crystal phones. Components, nuts, screws, wire, etc. no soldering. £2·75 + 25p p. & p. *Parts available separately.*

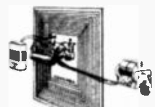
ELECTRONIC ORGAN

ONLY **£3·25**

Don't confuse with ordinary electronic organs that simply blow air over mouth-organ type reeds etc. Fully transistorised. SELF CONTAINED LOUDSPEAKER. *Fifteen separate keys span two full octaves—play the "Yellow Rose of Texas", play "Silent Night", play "Auld Lang Syne" etc. etc.* You have the thrill and excitement of building it together with the pleasure of playing a real, live, portable electronic organ. NO PREVIOUS KNOWLEDGE OF ELECTRONICS NEEDED. No soldering necessary, Simple as ABC to make. *Anyone over nine years can build it easily in one short evening following the fully illustrated, step-by-step, simple instructions* ONLY £3·25 + 25p p. & p. for kit, including case, nuts, screws, simple instructions, etc. Uses standard battery (parts available separately). Have all the pleasure of making it yourself, finish with an exciting gift for someone.

Find buried treasure with this READY BUILT & TESTED TREASURE LOCATOR MODULE

ONLY **£4·95**



FULLY TRANSISTORISED PRINTED CIRCUIT METAL DETECTOR MODULE. *Ready built and tested*—just plug in a PP3 battery and 'phones and it's working. Put it in a case, screw a handle on and YOU HAVE A PORTABLE TREASURE LOCATOR EASILY WORTH ABOUT £20! Extremely sensitive—penetrates through earth, sand, rock, water, etc.—EASILY LOCATES COINS, GOLD, SILVER, JEWELLERY, HISTORICAL RELICS, BURIED PIPES, ETC. Signals exact location by "beep" pitch increasing as you near buried metallic objects. *So sensitive it will detect certain objects buried* SEVERAL FEET BELOW GROUND! GIVES CLEAR SIGNAL ON ONE COIN £4·95 + 30p carr. etc. (High quality Danish Stethoscope headphones £2·75 extra if required.) EXAMINE AT HOME FOR 7 DAYS. YOUR MONEY REFUNDED IN FULL IF NOT 100% DELIGHTED.

FIND BURIED TREASURE! Transistorised Treasure Locator

This fully portable transistorised metal locator detects and tracks down buried metal objects—it signals exact location with loud audible sound (no phones used)—uses any transistor radio which fits inside—no connections needed. FINDS GOLD, SILVER, COINS, JEWELLERY, ARCHAEOLOGICAL PIECES ETC. ETC. *Extremely sensitive, will signal presence of certain objects buried several feet below ground* No knowledge of radio or electronics required. *Can be built with ease in one short evening by anybody from nine years of age upwards*, with the clear, easy to follow, step-by-step, fully illustrated instructions—Uses standard PP3 battery. No soldering necessary. Kit includes nuts, screws, wire, etc. ONLY £2·85 + 25p p. & p. (Sectional handle as illustrated 95p extra). Parts available separately. Made up looks worth £15.

ONLY **£2·85**

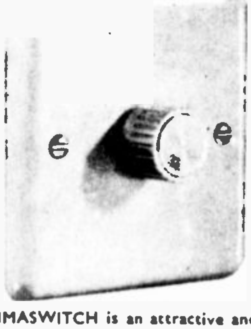
Eavesdrop on the exciting world of Aircraft Communications V.H.F. AIRCRAFT BAND CONVERTOR

ONLY **£2·85**

Listen in to AIR-LINES, PRIVATE PLANES, JETPLANES. *Eavesdrop on exciting cross talk between pilots, ground approach control, airport tower, Hear for yourself the disciplined voices hiding tenseness on talk downs.* Be with them when they have to take nerve ripping decisions in emergencies—Tune into the international distress frequency. Covers the aircraft frequency band including HEATHROW, GATWICK, LUTON, RINGWAY, PRESTWICK, ETC. ETC. CLEAR AS A BELL. This fantastic fully transistorised instrument *can be built by anyone over nine in under two hours.* No soldering necessary. Fully illustrated simple instructions take you step-by-step. Uses standard PP3 battery. All you do is extend rod aerial, place close to any ordinary medium wave radio (even tiny portables). NO CONNECTIONS WHATEVER NEEDED. SEND ONLY £2·85 + 20p p. & p. for kit including case, nuts, screws, wire, etc. etc. (parts available separately).

CONCORD ELECTRONICS LTD. (EE7U) 8 Westbourne Grove, London, W.2. *Callers welcome 9 a.m.—5.30 p.m. inc. Saturday*

Vary the strength of your lighting with a DIMMASWITCH



The DIMMASWITCH is an attractive and efficient dimmer unit which fits in place of the normal light switch and is connected up in exactly the same way. The ivory mounting plate of the DIMMASWITCH matches modern electric fittings. Two models are available, with the bright chrome knob controlling up to 300 w or 600 w of all lights except fluorescents at mains voltages from 200-250 v, 50Hz. The DIMMASWITCH has built-in radio interference suppression:

600 Watt £3·20. Kit Form £2·70
300 Watt - £2·70. Kit Form £2·20

All plus 10p post and packing.
Please send C.W.O. to:

DEXTER & COMPANY
5 ULVER HOUSE, 19, KING STREET, CHESTER CH1 2AH Tel: 0244-25883,
As supplied to H.M. Government Departments.

AERIAL BOOSTERS

We make four types of Aerial Boosters. L45 625 UHF, L12 VHF 405, L11 VHF Radio L10 M/W & S/W. Price L45, L12 & L11 £2·95. L10 £2·45

VALVE BARGAINS

Any 5—45p, 10—70p:
ECC82, ECL80, EF80, EF85, EF183, EF184, EBF89, EB91, EY86, PCC84, PCC89, PC97, PCF80, PCF86, PCL82, PCL83, PCL84, PCL85, PL36, PY33, PY82, PY800, PY801, 30L15, 30C15, 6-30L2.

19" TV £6·50

19" 405 Slimline Televisions in good working order, with complete set of spare valves. Price £6·50. Carriage £1·50.

PRINTED CIRCUIT BOARD

2-8 ins by 4 ins boards complete with etching compound and instructions—40p

500MFD CAPACITORS

500mfd-25v/w Brand New Electrolytic with long leads. 11p each.

POST & PACKING under £1·5p Over £1·10p. S.A.E. for leaflets on all items. Money back guarantee if not completely satisfied.

VELCO ELECTRONICS
62A Bridge Street, Ramsbottom, Bury, Lancs.

B.H. COMPONENT FACTORS LTD.

For Eagle, Sinclair, Data Books and Components. ¼w 5% resistors 1p, or 50p/100. Electrolytic C426 4/40, 8/40, 10/16, 32/10, 25/25, 100/6·4, all 4p. IN914 8p, 100v 1A Bridge 40p. Panel neon 15p. Mains Transformer 32-0-32 @ 150 mA 50p. Bargain Electrolytics—Send for list. Electrolytic 100/50 10p, 500/50 12p, 1000/12 12p. 1000/25 25p. 1000/50 35p. uL914 30p. 7400/01/10/30 15p. C.W.O. p.p. U.K. 10p. Discount £10–10%
Money back guarantee. Brand new to spec.
SEND STAMP FOR FULL LIST
P.O. BOX 18, LUTON, BEDS, LU1 1SU
DEPT. EE

T.V.'s T.V.'s T.V.'s

COLOUR SETS Guaranteed working from £125. (Also some not working)
Regret callers only
*4 Channel 19in UHF T.V.'s Despatched tested, and in full working order. £20.
*19in Slimline, only requires UHF tuner for BBC2, untested, complete, £8.
*As above but with UHF tuner, £12.
*2 Channel 19in 110° tube, untested, £5.
(Carriage £1·50 extra all models.)

GY-NORMOUS RADIO BARGAINS!

*3 types, all superhets with push-pull output to internal loudspeaker. Supplied complete with carrying case, earphone and batteries.
Type A—Very neat little set, still only £1·50 + p. & p. 20p.
Type C—Large portable radio as sold nationally, A.M. and F.M. coverage (Yes F.M.—88–108MHz). Horizontal pointer tuning scale. Operates from own dry batteries or a.c. mains from internal transformer isolated power pack, with provision for rechargeable cells (not supplied). £8 + p & p 50p.
All these sets are BRAND NEW and complete in manufacturers original cartons, but may require slight attention—hence bargain prices—cheaper than kits!
*CASSETTE PLAYERS—last few only—uses standard musicassettes—possible conversion to full recorder. Deck alone worth our price of £8·99 + p & p 55p.
CASSETTE RECORDER/PLAYER. Leatherette case, complete with cassette, mic & stand, batteries etc, £12·80 + p & p 55p.
*C120 Cassettes. Top quality. 75p + p & p 7½p.

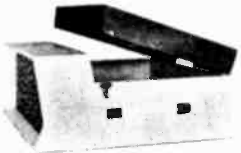
SUMIKS
7 High Street
Langley, Warley, Worcs.
Callers Welcome

BSR LATEST SUPERSLIM STEREO AND MONO

Plays 12", 10" or 7" records, Auto or Manual. A high quality unit backed by BSR reliability with 12 months' guarantee. AC 200/250v. Size 13½ x 11½in. Above motor board 3¼in, below motor board 2½in. with STEREO and MONO XTAL **£8·75** Post 25p.
MONO-COMPATIBLE. Plays all records **£7·75** Post 25p.

RCS 3 WATT AMPLIFIER. Ready made tested. 2-stage triode pentode valve UCL82. 3 watts output. Tone and volume controls. Rectifier valve UY85. Knobs. With high performance Loudspeaker. Response 50-12,000 cps. Sensitivity 200mV. **£4** Post 25p

R.C.S. PORTABLE PLAYER CABINET



£4 Post 25p.

Really smart appearance with space for R.C.S. Amplifiers and most modern autochangers. Size 18 x 15 x 8in. Metal fittings. Carrying handle. Popular colours. Two-tone rexine covered.

GARRARD SINGLE PLAY TA MK II Complete with stereo/mono plug in head. Ideal Discotheque or Hi-Fi **£10**

GARRARD AUTOCHANGERS with Sonotone Cartridges Stereo Diamond and Mono Sapphire. Model 1025 £10. Model 3500 Stereo and Mono Autochanger £14. Post 25p.

BSR JUNIOR SINGLE PLAYER Turntable, 4-speed motor and separate pick-up **£4.50**

HI-FI PICK-UP CARTRIDGES. Diamond LP/Stereo Stereo/Mono 9TA £2·50; GP94 £2·50; GP93 £2·00; Sapphire Mono GP91 £1·50; Power-point LP/78. 60p.

E.M.I. WOOFER AND TWEETER KIT

£5·75 Post 25p

Comprising a fine example of a Woofer 10½ x 6½in. with a massive Ceramic Magnet, 44oz, Gauss 13,000 lines. Aluminium Cone centre to improve middle and top response. Also the E.M.I. Tweeter 3½in. square has a special light-weight paper cone and magnet flux 10,000 lines. Filter condenser included.

Impedance Standard	8 ohms
Maximum Power	12 watts
Useful Response	35 to 18,000 cps
Base Resonance	45 cps

SUITABLE ENCLOSURE 20 x 13 x 9in, £9 POST 25p

WEYRAD P50—TRANSISTOR COILS

RA2W Ferrite Aerial	72p	Spare Cores	3p
Osc. P50/1AC	33p	Driver Trans. LFDT4	58p
I.F. P50/2CC 470 kc/s	36p	Printed Circuit, PCA1	58p
3rd I.F. P50/3CC	36p	J.B. Tuning Gang	65p
P51/1 or P51/2	36p	Weyrad Booklet	10p
P50/3V	36p	OPTI	58p

Mullard Ferrite Rod 8 x ⅜in. 20p, 6 x ¼in. 20p.

VOLUME CONTROLS

Long spindles. Midget Size 5 K. ohms to 2 Meg. LOG or LIN. L/S 15p. D.P. 25p. STEREO L/S 55p. D.P. 75p. Edge 5K. S.P. Transistor 25p

80ohm Coax 4p. yd.

BRITISH AERIALITE AERAXIAL-AIR SPACED 40 yd. £1·40; 60 yd. £2
FRINGE LOW LOSS Ideal 625 and colour. **10p yd.**

8in ELAC HI-FI SPEAKERS

Dual cone plasticised roll surround. Large ceramic magnet. 50-16,000 cps. Bass resonance 55 cps. 8 ohm impedance. 10 watts music power. **£4·80**

BLANK ALUMINIUM CHASSIS 18 s.w.g. 2in. sides. 7 x 4in. 45p; 9 x 7in. 60p; 11 x 7in. 70p; 13 x 9in. 90p; 14 x 11in. 95p; 15 x 14in. 99p; 11 x 3in. 50p; 16 x 10in. £1.
ALUMINIMUM PANELS 18 s.w.g. 6 x 4in. 9p; 8 x 6in. 15p; 14 x 3in. 16p; 10 x 7in. 19p; 12 x 5in. 20p; 12 x 8in. 28p; 16 x 6in. 28p; 14 x 9in. 34p; 12 x 12in. 40p; 16 x 10in. 50p

1¼ inch DIAMETER WAVE-CHANGE SWITCHES 25p. 2 p. 2-way, or 2 p. 6-way or 3 p. 4-way 25p each. 1 p. 12-way, or 4 p. 2-way, or 4 p. 3-way 25p.
TOGGLE SWITCHES. sp. 14p; dp. 18p; dp. dt. 23p.

"THE INSTANT" BULK TAPE ERASER & HEAD DEMAGNETISER

200/250v. A.C. Leaflet S.A.E. **£2·35** Post 15p

R.C.S. STABILISED POWER PACK KITS

All parts and instructions with Zener Diode, Printed Circuit, Bridge Rectifiers and Double Wound Mains Transformer input 200/240v. AC. Output voltages available 6 or 9 or 12 or 15 or 18 or 20v. DC at 100mA or less. PLEASE STATE VOLTAGE REQUIRED. Details S.A.E. Size 3½ x 1½ x 1½in. **£2** POST FREE

GENERAL PURPOSE TRANSISTOR PRE-AMPLIFIER BRITISH MADE

Ideal for Mike, Tape, P.U., Guitar, Can be used with Battery 9-12v. or H.T. line 200-300v. D.C. operation. Size 1⅜" x 1⅜" x ⅝". Response 25 c.p.s. to 25 Kc/s. 26db gain. For use with valve or transistor equipment. Full instructions supplied. Details S.A.E. **90p** Post 10p

NEW TUBULAR ELECTROLYTICS				CAN TYPES	
2/350V	14p	250/25V	14p	50+50/250V	35p
4/350V	14p	500/25V	20p	60+100/350V	58p
8/450V	14p	100/25V	35p	32+32/250V	18p
16/450V	15p	100/50V	47p	32+32/450V	33p
32/450V	20p	8+8/450V	18p	350+50/325V	50p
25/25V	10p	8+16/450V	20p	32+32+32/350V	43p
50/50V	10p	16+16/450V	25p	100+50+50/350V	48p
100/25V	10p	32+32/350V	25p		

LOW VOLTAGE ELECTROLYTICS
1, 2, 4, 5, 8, 16 25, 30, 50, 100, 200mF. 15V. 10p
500mF. 12V. 15p; 25V. 20p; 50V. 30p.
1000mF. 12V. 17p; 25V. 35p; 50V. 47p; 100V. 70p.
2000mF. 6V. 25p; 25V. 42p; 50V. 57p.
2500mF. 50V. 62p; 3000mF. 25V. 47p; 50V. 65p.
5000mF. 6V. 25p; 12V. 42p; 25V. 75p; 35V. 85p; 50V. 95p

CERAMIC 1pF to 0·01mF, 4p. Silver Mica 2 to 5000pF. 4p.
PAPER 350V-0·1 4p, 0·5 13p; 1mF 15p; 2mF 150V 15p.
500V-0·001 to 0·05 4p; 0·1 5p; 0·25 8p; 0·47 25p.
SILVER MICA. Close tolerance 1% 2·2-500pF 8p; 500-2·200 pF 10p; 2,700-5,600pF 20p; 6,800pF-0·01, mfd 30p; each.
TWIN GANG. "0-0" 208pF+176pF, 65p; Slow motion drive 365+365 with 25+25pF, 50p; 500pF slow motion, standard 45p; small 3-gang 500pF £1·60.
SHORT WAVE, SINGLE. 10pF 30p; 25pF 55p; 50pF 55p.
NEON PANEL INDICATORS 250V AC/DC Red or Amber 20p.
RESISTORS, ¼ w., ½ w., 20% 1p; 2 w. 5p 10 ohms to 10 meg
HIGH STABILITY. ½ w. 2%, 10 ohms to 1 meg., 10p.
Ditto 5% Preferred values 10 ohms to 10 meg , 4p.
WIRE-WOUND RESISTORS 5 watt, 10 watt, 15 watt 10 ohms to 100K, 10p each; 2½ watt. 1 ohm to 8·2 ohms 10p.

DECCA DECCADEC GARRARD MOTOR UNIT MK II

Single play Stereo Mono Deram transcription head and arm. Four speeds. 10½in. turntable. Anti-rumble filter. Bias compensation. Laboratory motor.

SPECIAL PRICE **£18·50** Post 25p

METAL PLINTH & PLASTIC COVER

Cut out ready for Garrard or B.S.R. Will play with cover in position. Latest design. Covered in black leatherette. Antimagnetic. 12½ x 14½ x 7½in. **£5·50** POST 25p

ALSO AVAILABLE IN SOLID NATURAL MAHOGANY WAX POLISHED FINISH AT SAME PRICE

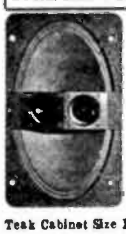
MAINS TRANSFORMERS

ALL POST 25p each

250-0-250 80 mA. 6·3v. 4 amp	£1·50
250-0-250 80 mA. 6·3v. 3·5a. 6·3v. 1a or 5v. 2a.	£2·50
350-0-350 80 mA. 6·3v. 3·5a. 6·3v. 1a. or 5v. 2a.	£3·00
300-0-300v. 120mA., 6·3v. 4a. C.T.; 6·3v. 2a	£3·25
MINIATURE 200v. 200mA., 6·3v. 1a. 2½ x 2½ x 2in.	75p
MIDGET 220v. 45 mA., 6·3v. 2a. 2⅝ x 2½ x 2in.	90p
MINI-MAINS 20v, 100mA. 1⅝ x 1⅝ x 1⅝in.	50p
HEATER TRANS. 6·3v. 3 a.	60p
Ditto tapped sec. 1·4 v., 2, 3, 4, 5, 6·3 v. 1½ amp	80p

GENERAL PURPOSE LOW VOLTAGE. Tapped Outputs at 2 amp. 3, 4, 5, 6, 8, 9, 10, 12, 15, 18, 24 and 30 v. £2·25
1 amp., 6, 8, 10, 12, 16, 18, 20, 24, 30, 36, 40, 48, 60. £2·25
2 amp. 6, 8, 10, 12, 16, 18, 20, 24, 30, 36, 40, 48, 60. £3·25
5 amp. 6, 8, 10, 12, 16, 18, 20, 24, 30, 36, 40, 48, 60. £8·75
AUTO TRANSFORMERS 115v. to 230v. or 230v. to 115v. 150w. £2·25; 500w. £6·25; 750w. £10; 100w. £14.
CHARGER TRANSFORMERS. Input 200/250v. for 6 or 12v., 1½ amp., £1·50; 2 amp £1·80; 4 amp. £2·50.
FULL WAVE BRIDGE CHARGER RECTIFIERS: 6 or 12v. outputs, 1½ amp. 40p; 2 amp. 55p; 4 amp. 85p
LUCAS 2DS500 Bridge 70V 5 amp £1.

E.M.I. 13½ x 8in. LOUDSPEAKERS



With twin tweeters and crossover, 10 watt State 3 or 8 or 15 ohm. (As illustrated) **£4·25** Post 15p

With flared tweeter cone and ceramic magnet, 10 watts. Bass res. 45-60 cps. Flux 10,000 gauss. State 3 or 8 or 15 ohm. **£2·75** Post 15p

Teak Cabinet Size 16 x 10 x 9in. Post 25p **£5**

ALL MODELS "BAKER SPEAKERS" IN STOCK
Hi-Fi Enclosure Manual containing 20 plans, crossover data and cubic tables. 42p Post Free.

BAKER 12in. MAJOR £9

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

Module kit, 30-17,000 c.p.s. with tweeter, crossover, baffle and instructions. **£11·50**

BAKER "BIG—SOUND" SPEAKERS

'Group 25'	'Group 35'	'Group 50'
12 inch 25 watt 3 or 8 or 15 ohm **£7**	12 inch 35 watt 3 or 8 or 15 ohm **£9**	15 inch 50 watt 8 or 15 ohm **£19**

TEAK HI-FI SPEAKER CABINETS. Fluted wood front
For 12in. or 10in. dia. speaker 20 x 13 x 9in. £9. Post 25p
For 13 x 8in. or 8in. speaker 16 x 10 x 9in. £5. Post 25p
For 10 x 6in. or 6in. speaker 16 x 8 x 6in. £4. Post 25p
LOUDSPEAKER CABINET WADDING 18in. wide, 15p ft

GOODMANS 6½ in. HI-FI WOOFER

8 ohm, 10 watt. Large ceramic magnet. Special Cambric cone surround. Frequency response 30-12,000 cps. Ideal P.A. Columns. Hi-Fi Enclosures Systems, etc. **£4**

ELAC CONE TWEETER

The moving coil diaphragm gives a good radiation pattern to the higher frequencies and a smooth extension of total response from 1,000 cps to 18,000 cps. Size 3½ x 3½ x 2in. deep. Rating 10 watts. 3 ohm or 15 ohm models. **£1·90** Post 10p

SPEAKER COVERING MATERIALS. Samples Large S.A.E.
Horn Tweeters 2-16kc/s. 10W 8 ohm or 15 ohm £1·50.
De Luxe Horn Tweeters 2-18 Kc/s, 15W, 15 ohm £3.
TWO-WAY 3000cps CROSSOVERS 3 or 8 or 15 ohm 95p.
SPECIAL OFFER! 80 ohm 2½in.; 2⅝in.; 35 ohm, 2in.; 3in. 25 ohm, 2½in. dia.; 3in. dia.; 6 x 4in.; 8 x 5in. 15 ohm. 3½in. dia.; 6 x 4in.; 7 x 4in.; 3 ohm. 2½in. 3in. 5 x 3in. **£1** EACH TYPE
LOUDSPEAKERS P.M. 3 OHMS. 7 x 4in. £1·25; 6½in. £1·50; 8 x 5in. £1·60; 8 x 2½in. 90p 8 in. £1·75; 10 x 6in. £1 90.
RICHARD ALLAN TWIN CONE LOUDSPEAKERS. 8in. dia. 4 watt; 10in. dia. 5 watt; 12in. dia. 6 watt 3 or 8 or 15 ohm models £2·00 each. Post 15p.
VALVE OUTPUT TRANS. 25p; MIKE TRANS. 50:1 25p.
5 WATT MULTI-RATIO, 3, 8 and 15 ohms 80p.

BAKER 100 WATT ALL PURPOSE TRANSISTOR AMPLIFIER

4 Inputs speech and music. Mixing facilities. Response 10-30,000 cps. Matches all loudspeakers. A.C. 200/250V. Separate Treble and Bass Controls. Guaranteed. Details S.A.E. **£39** Post Free

BARGAIN AM TUNER. Medium Wave. Transistor Superhet. Ferrite aerial. 9 volt. **£4·50**

BARGAIN 4 CHANNEL TRANSISTOR MONO MIXER Add musical highlights and sound effects to recordings. Will mix Microphone, records, tape and tuner with separate controls into single output. 9 volt. **£3·50**
STEREO VERSION OF ABOVE £4·50

BARGAIN FM TUNER 88-108 Mc/s Six Transistor. 9 volt Printed Circuit. Calibrated slide dial tuning. Walnut Cabinet. Size 7 x 5 x 4inch **£12·50**

BARGAIN FM TUNER as above less cabinet **£8·85**

BARGAIN 3 WATT AMPLIFIER. 4 Transistor Push-Pull Ready built, with volume control. 9v. **£3·50**

COAXIAL PLUG 6p. PANEL SOCKETS 6p. LINE 18p.
OUTLET BOXES, SURFACE OR FLUSH 25p.
BALANCED TWIN FEEDERS 5p yd. 80 ohms or 300 ohms.
JACK SOCKET Std. open-circuit 14p, closed circuit 23p; Chrome Lead Socket 40p. Phono Plugs 5p. Phono Socket 5p.
JACK PLUGS Std. Chrome 15p; 3·5mm Chrome 14p. DIN SOCKETS Chassis 3-pin 10p; 5-pin 10p. DIN SOCKETS Lead 3-pin 18p; 5-pin 25p. DIN PLUGS 3-pin 18p; 5-pin 25p.
VALVE HOLDERS. 5p; CERAMIC 8p; CANS 5p.

E.M.I. TAPE MOTORS Post 15p. 120v. or 240v. AC. 1,200 r.p.m. 4 pole 135mA. Spindle 0·187 x 0·75in Size 3½ x 2½ x 2½in. (Illustrated) **£1·25**

BALFOUR GRAM MOTORS 120v. or 240v. A.C. 1,200 r.p.m. 4 pole 50mA. Spindle ⅛ x 3/20. Size 2½ x 2½ x 1½in. Post 15p **85p**

HI-FI STOCKISTS   RETURN OF POST DESPATCH   MINIMUM POST AND PACKING 15p   CUSTOMERS FREE CAR PARK   CALLERS WELCOME

RADIO COMPONENT SPECIALISTS

337 WHITEHORSE ROAD, CROYDON
Open 9—6 p.m. (Wednesdays 9—1 p.m., Saturdays 9—5 p.m.)

Radio Books & Component Lists 5p. Written guarantee. (Export: Remit cash and extra postage.) Buses 50, 68, 159 Rail Selhurst. Tel. 01-684-1665

Everyday Electronics Classified Advertisements

Classified Advertisements, "EVERYDAY ELECTRONICS," Fleetway House, Farringdon Street, London EC4A 4AD.

RECEIVERS and COMPONENTS

COMPUTER PANELS 5BC108, diodes, 4-50p post 10p. PANELS WITH SILICON AND GERM/TRANS. at least 50. 6—£1 00 post 15p. UNIT WITH 4-LA2 POT CORES + 11 2% CAPS 50p post 15p. ICs 7400 SERIES ON PANEL(S) 10—75p post 10p. FALLOUTS 5—13p. ORP12 on panel ex equipt. 35p cp. BANK 20 WIRE ENDED NEONS 50p post 8p. SEND LARGE S.A.E. FOR LIST OF PANELS ETC.
7LB ASSORTED COMPONENTS £1 30 cp.

J.W.B. RADIO
75 HAYFIELD ROAD SALFORD 6 LANCS
MAIL ORDER ONLY

ILLUSTRATED COMPONENT
CATALOGUE
WITH USEFUL
DATA
AND
DISCOUNT VOUCHERS
25p POST FREE (UK)

W.E.C. LTD.
HIGH STREET, RIPLEY
SURREY

ARE YOU LOOKING FOR VALUE?
3watt i.c. amplifier SL403D £1·20 each
AS SPECIFIED FOR EE RECORD PLAYER
CIRCUITS AND LAYOUTS SUPPLIED
TWO FOR £2·35
Limited period only

WHY NOT GET THE BEST EASILY!
BUILD YOUR EE PROJECT ON READY MADE PRINTED CIRCUIT BOARD **NIPPIBOARD**
LAYOUTS AND CONNECTIONS SUPPLIED
PLEASE STATE PROJECT LAYOUT REQUIRED. SRBP BASE
2A METAL LOCATOR; AUDIO TONE GENERATOR BABY ALARM; WAA WAA; DARKROOM TIMER 28p
1A WASH 'N WIPE; BEE COUNTER; ASTRON RADIO LIGHT TO SOUND CONVERTER; SOIL MOISTURE METER 15p
Fibreglass types also available 1A – 18p ; 2A – 34p
Send 15p today for sample and details
NIP ELECTRONICS P.O. Box 11, St Albans, Herts

ALWAYS USEFUL. Assortment washers (plain, locking, insulating), circlips, clips, rivets, etc. 200-15p, 1,000-65p. Components used 100-60p, new 100-£1. New resistors (P.V. to 1W) 100-60p. All good mixtures. Postal only. Chaplin, 5 Brewhouse Hill, Wheathampstead, Herts.

ELECTRONIC KITS FOR EE PROJECTS

HAVE you waited weeks (or months) for your electronic components to arrive in the past ??? Well you won't have to anymore—not if you buy from us.

It is our intention to satisfy our customers—quickly and completely !!!

We are starting this month offering all the electronic components for the **WASH/WIPE CONTROLLER** at a cost of **£2·10 including postage and packing.**

Send SAE for any other kits advertised and cost of **ELECTRONOME, HORSES - FOR - COURSES, SHAVER INVERTER,** advertised this month.

Get *express* satisfaction or your **money back** from

EXPRESS COMPONENTS
17 Albert Square, Stratford, London, E15 1HJ

SERVICE SHEETS

SERVICE SHEETS (1925-1972) for Televisions, Radios, Transistors, Tape Recorders, Record Players, etc., by return post, with free Fault-Finding Guide. Prices from 5p. Over 8,000 models available. Catalogue 13p. Please send S.A.E. with all orders/enquiries. HAMILTON RADIO, 54 London Road, Bexhill, Sussex. Telephone: Bexhill 7097.

MISCELLANEOUS

RECORD TV SOUND using our loudspeaker isolating transformer. Provides safe connection to recorder. Instructions included. £1 post free. CROWBOROUGH ELECTRONICS (E.E.), Eridge Road, Crowborough, Sussex.

CHROMASONIC ELECTRONICS is well and living at 56 Fortis Green Road, London N10 3HN. 40 page illustrated catalogue 20p post free.

NO NEED TO WORRY ABOUT A TRANSMITTING LICENCE

because this GPO approved transmitter/receiver kit does not use R.F. and you can get one easily. Your transmissions will be virtually SECRET since they won't be heard by conventional means. Actually it's TWO KITS IN ONE because you get all the printed-circuit boards and components for both the transmitter AND receiver. You're going to find this project REALLY FUN-TO-BUILD with the EASY-TO-FOLLOW instructions. An extremely flexible design with quite an AMAZING RANGE—has obvious applications for SCHOOL PROJECTS, LANGUAGE, LABORATORIES, SCOUT CAMPS, etc.

GET YOURS! SEND £5·50 NOW
S.A.E. fc details

TO: BOFFIN PROJECTS,
DEPT. KEE.
4 CUNLIFFE ROAD,
STONELEIGH, EWELL, SURREY

SOUND SUPPLIES (LOUGHTON) CO. LTD.
for
Eagle International and International Rectifier Products TOA P.A. Equipment and Mikes.

Capacitors, Resistors, Plugs, Sockets, Cables, Audio Leads, Semiconductors, Valves, Vero Board, etc., for the constructor.

ELECTRONICS DEPT. Tel. 01-508-2715
12 Smarts Lane, Loughton, Essex.
Hours. 9.30 a.m.-1 p.m., 2-6 p.m. Mon., Tues. Wed. and Fri. ; 9.30 a.m.-1 p.m., 2-5.30 p.m. Sat. Closed all day Thursday.

C. R. HADLEY 24 WOODHILL, HARLOW, ESSEX. Add 5p P. & P.
Catalogue 5p stamp or free with order.
All our stocks are brand new with money back GUARANTEE

TRANSISTORS

AC 107	15p	AL 102	59p	BC 212L	8p	ME 6101	14p	OC 140	17p	2N 2926	9p	1N 4007	13p
AC 126	13p	AL 103	49p	BC 213L	8p	ME 6102	15p	OC 170	23p	2N 3053	20p	W005	30p
AC 127	16p	AU 103	85p	BC 214L	8p	MP 8111	32p	OC 171	23p	2N 3055	49p	W02	35p
AC 128	12p	AU 111	95d	BD 121	50p	MP 8112	34p	OC 200	25p	2N 3702	12p	OA 90	6p
AC 176	22p	BC 107	8p	BD 123	60p	MP 8511	34p	OC 23	30p	2N 3704	12p	OA 91	6p
AC 141	16p	BC 108	8p	BD 130	46p	MP 8513	45p	OC 25	25p	2N 3705	12p	1N 4148	4p
AC 142	16p	BC 109	8p	BFY 50	18p	OC 41	13p	OC 28	30p	40636	55p	400mW Zeners	
AC 141K	20p	BC 154	20p	BFY 51	12p	OC 44	13p	OC 29	36p			3·3–30v	10p
AC 142K	20p	BC 168	10p	BFY 52	12p	OC 45	13p	OC 35	26p	Rectifiers			
AD 142	39p	BC 169	11p	BSY 95A	15p	OC 71	13p	OC 36	36p	1N 4001	5p		
AD 149	40p	BC 148	10p	ME 0402	18p	OC 72	13p	2N 697	19p	1N 4002	5p		
AD 150	44p	BC 149	10p	ME 0404	14p	OC 81	13p	2N 1171	24p	1N 4003	6p		
AD 140	40p	BC 182L	8p	ME 4101	10p	OC 81D	13p	2N 1304	25p	1N 4004	8p		
AD 161 }	m/p	BC 183L	8p	ME 4102	12p	OC 83	20p	2N 1305	25p	1N 4005	11p		
AD 162 }	65p	BC 184L	8p	ME 6002	14p	OC 139	13p	2N 2646	47p	1N 4006	12p		

CAPACITORS

MULLARD POLYESTER CAPACITORS C280 SERIES
250V P.C. mounting: 0·01μF, 0·015μF, 0·022μF, 3p. 0·033μF, 0·047μF, 0·068μF, 3½p. 0·1μF, 4p. 0·15μF, 0·22μF, 5p. 0·33μF, 6½p. 0·47μF, 8½p. 0·68μF, 11p. 1·0μF, 13p. 1·5μF, 20p. 2·2μF, 24p.

ELECTROLYTIC CAPACITORS—MULLARD C426 SERIES 6p each. (μF/V) 10/2·5, 40/2·5, 80/2·5, 160/2·5, 320/2·5, 500/2·5, 8/4, 32/4, 64/4, 125/4, 250/4, 400/4, 6·4/6·4, 25/6·4, 50/6·4, 100/6·4, 200/6·4, 320/6·4, 4/10, 16/10, 32/10, 64/10, 125/10, 200/10, 2·5/16, 10/16, 20/16, 40/16, 80/16, 125/16, 1·6/25, 6·4/25, 12·5/25, 25/25, 50/25, 80/25, 1/40, 4/40, 8/40, 16/40, 32/40, 50/40, 0·64/64, 2·5/64, 5/64, 10/64, 20/64, 32/64.

SILVERED MICA. 500v d.c. 6p each
Values (PF):
2·2, 5, 8·2, 10, 12, 15, 18, 22, 24, 27, 30, 33, 35, 39, 47, 50, 56, 68, 75, 82, 100, 120, 150, 180, 200, 220, 250, 7p each—270, 300, 330, 390, 400, 470, 500, 556, 680, 800, 10p each.—1000, 1500, 1800, 2200, 16p each.—2700, 3600, 20p each.—4700, 5000, 30p each.—5600, 6800, 8200, 10000.

RESISTORS
¼ watt 10% carbon ½ watt 10% carbon 1p each
Range 2·2 ohms to 10 meg.
TR5 triple rated at ⅛–¼–½ watt tin oxide resistor ±2% 3p each. Range 10 ohms–1 meg ohm.

SLIDE SWITCH
SPST 10p each SP Three Positions 12p each

MINIATURE NEON LAMPS
240v or 110v 1–4 5p. 5 plus 4½p each.

LINEAR IC's
709c TO99 28p 741c TO99 60p
709c DIL 28p 741c DIL 36p

BARGAIN TTL's at 15p each
7400, 7401, 7402, 7403, 7404, 7410, 7420, 7430, 7440, 7450, 7451, 7453, 7454.
35p each:
7442, 7470, 7472, 7473, 7474, 7476, 7486.

AND LOTS MORE

12 VOLT FLUORESCENT LIGHTS
(as illustrated)

Beat power cuts, be Independent. Ideal for Caravans, Tent, Emergency Lighting, etc. Works anywhere where 12V is available. Guaranteed for six months, READY TO USE at:-

12ins 8watt £3·60 post paid
21ins 13watt £4·60 post paid

SALOP ELECTRONICS
23 Wyle Cop
Shrewsbury,
Shropshire.
Callers welcome for lists or Enquiries Large S.A.E.

Cases for EVERYDAY ELECTRONICS Projects.
Specially made to suit actual specifications in EVERYDAY ELECTRONICS in two tone moulded plastic.

Examples—many others available	£
Moisture Meter	0·65
Darkroom Timer	0·75
Rain Alarm	0·65
Home Sentinel	0·65
Remote Temp. Control ...	0·75

Write (SAE) stating project required for Brochure and Price List.

M.P.E. Ltd., Dept. EE., Bridge Street, Clay Cross, Chesterfield, S45 9NU.

Build yourself a TRANSISTOR RADIO

NEW! ROAMER 10 WITH VHF INCLUDING AIRCRAFT

10 TRANSISTORS. 9 TUNABLE WAVEBANDS, MW1, MW2, LW, SW1, SW2, SW3, TRAWLER BAND. VHF AND LOCAL STATIONS AND AIRCRAFT BAND

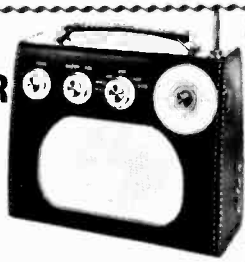
Built in Ferrite Rod Aerial for MW/LW. Retractable, chrome plated Telescopic Aerial, for peak short wave and VHF listening. Push Pull output using 600mw Transistors. Car Aerial and Tape Record Sockets. Switched Earpiece Socket complete with Earpiece. 10 Transistors plus 3 Diodes. 8" × 2½" Speaker. Air Spaced ganged Tuning Condenser with VHF section. Volume on/off, Wave Change and Tone Control. Attractive Case in black with silver blocking. Size 9" × 7" × 4". Easy to follow instructions and diagrams. Parts price list and easy build plans 30p (FREE with parts).

Total building cost £8·50

P. P. & Ins. 50p

(Overseas P. & P. £1)

ROAMER EIGHT Mk I



NOW WITH VARIABLE TONE CONTROL

7 Tunable Wavebands: MW1, MW2, LW, SW1, SW2, SW3 and Trawler Band. Built in Ferrite Rod Aerial for MW and LW. Retractable chrome plated Telescopic aerial for Short Waves. Push pull output using 600mW transistors. Car aerial and Tape record sockets. Selectivity switch. Switched earpiece socket complete with earpiece. 8 transistors plus 3 diodes. 8" × 2½" Speaker. Air spaced ganged tuning condenser. Volume/on/off, tuning, wave change and tone controls. Attractive case in rich chestnut shade with gold blocking. Size 9 × 7 × 4in. approx. Easy to follow instructions and diagrams. Parts Price List and Easy Build Plans 25p (FREE with parts).

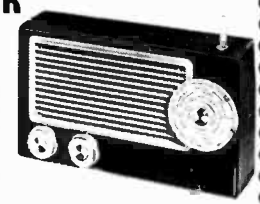
Total building cost £6·98 P. P. & Ins. 41p.
(Overseas P. & P. £1)

ROAMER SEVEN MK IV

7 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 MW and LW. Retractable 4 section 24in. chrome plated telescopic aerial for SW. Socket for Car Aerial. Powerful push-pull output. 7 transistors and 2 diodes, including Micro-Alloy R.F. Transistors. 8" × 2½" speaker. Air spaced ganged tuning condenser. Volume/on/off, tuning and wave change controls. Attractive case with carrying handle. Size 9 × 7 × 4in. approx. Easy to follow instructions and diagrams. Parts price list and easy build plans 15p (FREE with parts). Earpiece with plug and switched socket for private listening, 30p extra.

Total building costs £5·98 P. P.& Ins. 41p.
(Overseas P. & P. £1)

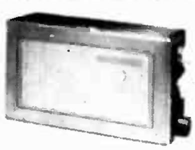
ROAMER SIX



6 Tunable Wavebands: MW, LW, SW1, SW2, Trawler band plus an extra M.W. band for easier tuning of Luxembourg etc. Sensitive ferrite rod aerialand telescopic aerial for Short Waves. 3in. Speaker. 8 stages—6 transistors and 2 diodes including Micro-Alloy R.F. Transistors, etc. Attractive black case with red grille, dial and black knobs with polished metal inserts. Size 9 × 5½ × 2½in. approx. Easy build plans and parts price list 15p (FREE with parts). Earpiece with plug and switched socket for private listening 30p extra.

Total building costs £3·98 P. P. & Ins. 26p
(Overseas P. & P. £1)

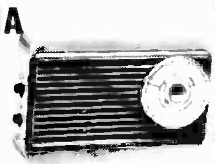
POCKET FIVE



3 Tunable Wavebands: MW, LW, Trawler Band 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. Attractive black and gold case. Size 5½ × 1¼ × 3½in. Easy build plans and parts price list 10p (FREE with parts). Earpiece with plug and switched socket for private listening 30p extra.

Total building costs £2·23 P. P. & Ins. 21p
(Overseas P. & P. 63p)

TRANSONA FIVE

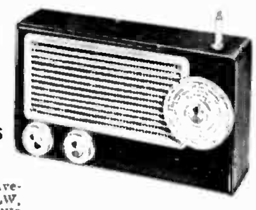


5 TRANSISTORS AND 2 DIODES

3 Tunable Wavebands: MW, LW and Trawler Band. 7 stage—5 transistors and 2 diodes, ferrite rod aerial. tuning condenser volume control, fine tone moving coil speaker. Attractive case with red speaker grille. Size 6½ × 4½ × 1½in. Easy build plans and parts price list 10p (FREE with parts). Earpiece with plug and switched socket for private listening 30p extra.

Total building costs £2·50 P. P. & Ins. 22p
(Overseas P. & P. 63p)

TRANS EIGHT



8 TRANSISTORS and 3 DIODES

6 Tunable Wavebands: MW, LW, SW1, SW2, SW3 and Trawler Band. Sensitive ferrite rod aerial for M.W. and L.W. Telescopic aerial for Short Waves. 3in. Speaker. 8 improved type transistors plus 3 diodes. Attractive case in black with red grille, dial and black knobs with polished metal inserts. Size 9 × 5½ × 2½in. approx. Push pull output. Battery economiser switch for extended battery life. Ample power to drive a larger speaker. Parts price list and easy build plans 25p (FREE with parts). Earpiece with plug and switched socket for private listening 30p extra.

Total building costs £4·48 P. P. & Ins. 31p
(Overseas P. & P. £1)

NEW! "EDU-KIT"

BUILD RADIOS, AMPLIFIERS, ETC., FROM EASY STAGE DIAGRAMS. FIVE UNITS INCLUDING MASTER UNIT TO CONSTRUCT.

COMPONENTS INCLUDE:
Tuning Condenser: 2 Volume Controls: 2 Slider Switches: 4"x2½" Speaker: Terminal Strip: Ferrite Rod Aerial: 3 Plugs and Sockets: Battery Clips: 4 Tag Boards: Balanced Armature Unit: 10 Transistors: Diodes: Resistors: Capacitors: Three ¾" Knobs. Units once constructed are detachable from Master Unit, enabling them to be stored for future use. Ideal for Schools, Educational Authorities and all those interested in radio construction.

All parts including Case and Plans £5·50 P. P. & Ins. 31p
(Overseas P. & P. £1)

FULL AFTER SALES SERVICE

- Callers side entrance Barratts Shoe Shop
- Open 10-1, 2.30-4.30 Mon.-Fri. 9-12 Sat.

RADIO EXCHANGE CO

61 HIGH STREET, BEDFORD. Tel. 0234 52367

I enclose £.................. please send items marked

ROAMER TEN	☐	ROAMER SEVEN	☐
ROAMER EIGHT	☐	TRANS EIGHT	☐
TRANSONA FIVE	☐	ROAMER SIX	☐
POCKET FIVE	☐	EDU-KIT	☐

Parts price list and plans for ....

Name ....

Address ....

.... (Dept. E.E.9.)

Published approximately the third Friday of each month by IPC Magazines Ltd., Fleetway House, Farringdon Street, London, E.C.4A 4AD. Printed in England by Index Printers Ltd., Dunstable, Beds. Sole Agents for Australia and New Zealand—Gordon & Gotch (A/Sia) Ltd. South Africa—Central News Agency Ltd.; Rhodesia and Zambia—Kingstons Ltd.; East Africa—Stationery and Office Supplies Ltd. Subscription Rate (including postage): For one year to any part of the world £2·35. Everyday Electronics is sold subject to the following conditions namely that it shall not, without the written consent of the Publishers first given, be lent, resold, hired out or otherwise disposed of by way of Trade at more than the recommended selling price shown on the cover, and that it shall not be lent, resold or hired out or otherwise disposed of in a mutilated condition or in any unauthorised cover by way of Trade, or affixed to or as part of any publication or advertising, literary or pictorial matter whatsoever.