everyday electronics

JAN. 72

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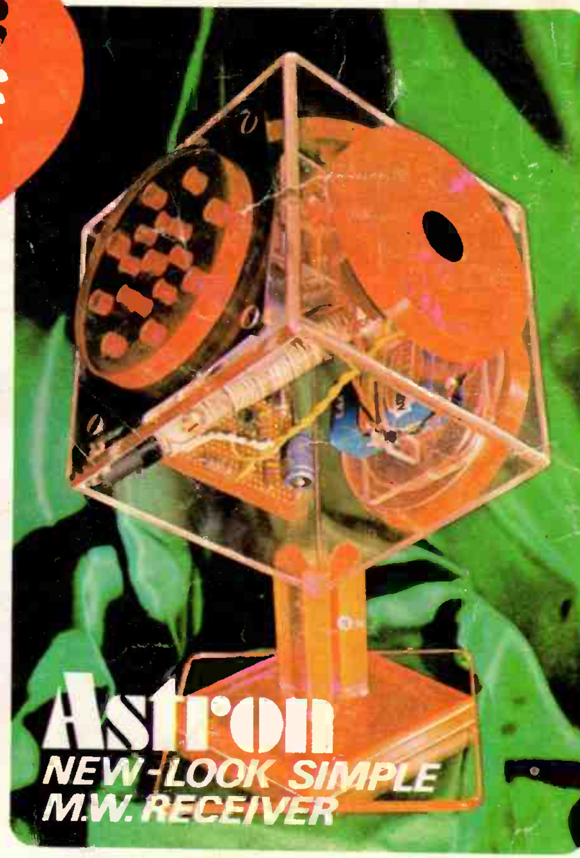
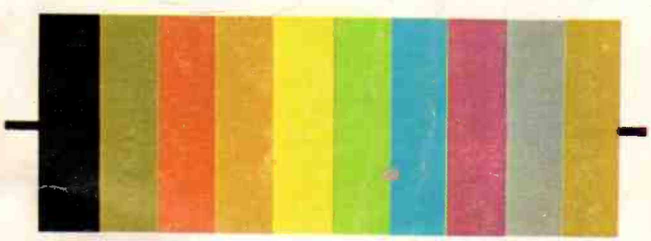
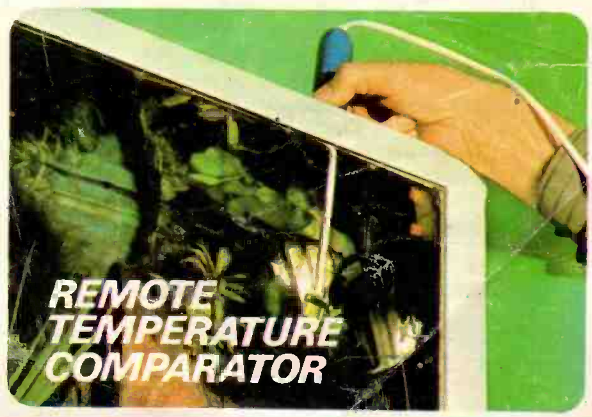


Astron
NEW-LOOK SIMPLE M.W. RECEIVER

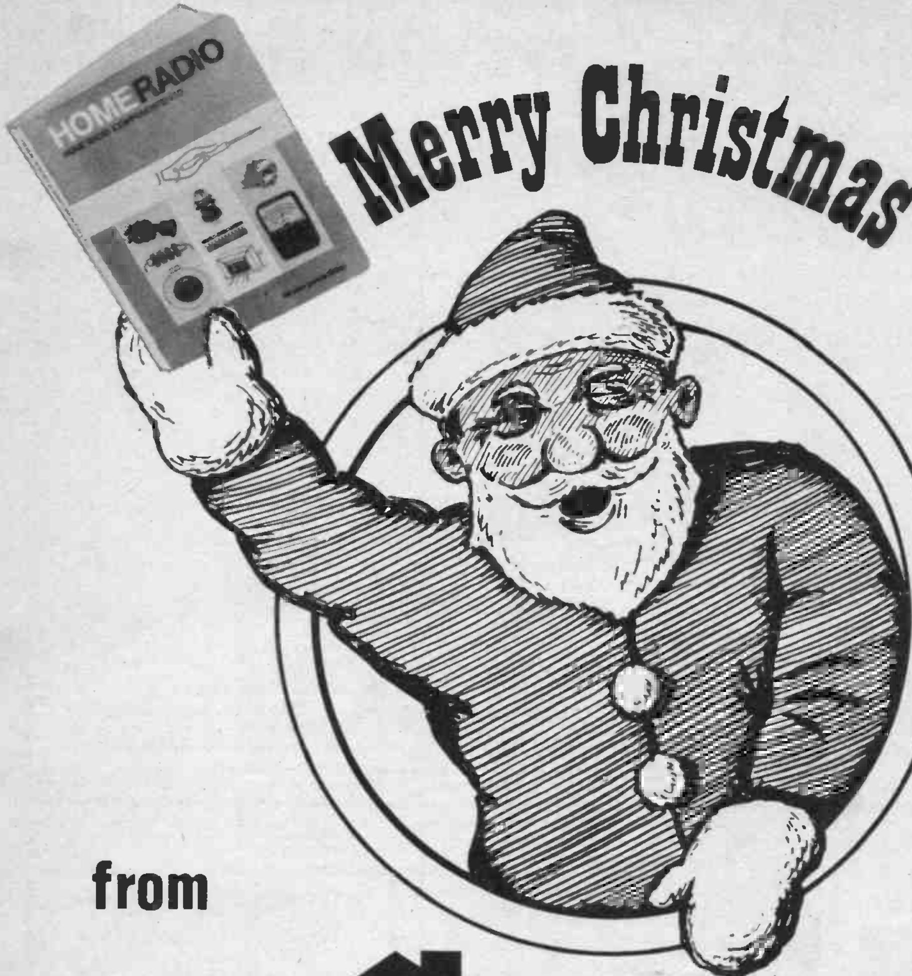


TEACH-IN PART 3
RESISTOR COLOUR CODE EXPLAINED



REMOTE TEMPERATURE COMPARATOR

Merry Christmas



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HOME RADIO

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To all customers—past, present and future—Home Radio send the Season's Greetings, hoping not only that you have a happy Christmas, but that the fun and satisfaction you get from radio and electronics will continue through the coming years.

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Catalogue which contains data sheets for most of the components listed will be sent free on request. 5p stamp appreciated.
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RESISTORS
½W Iskra high stability carbon film—very low noise—capless construction. ¼W Mullard CR25 carbon film—very small body size 7·5 x 2·5mm. 4W Erie wire wound.

Power watts	Tolerance	Range	Valves available	Price 1–99	Price 100+
½	5%	4·7Ω–2·2MΩ	E24	1·0p	0·8p
½	10%	3·3MΩ–10MΩ	E12	1·0p	0·8p
¼	10%	1Ω–3·9Ω	E12	1·0p	0·8p
¼	5%	4·7Ω–1MΩ	E12	1·0p	0·8p
4	10%	1Ω–10Ω	E12	6p	5·5p

Quantity price applies for any selection. Ignore fractions on total order.

DEVELOPMENT PACK
0·5 watt 5% Iskra resistors 5 off each value 4·7Ω to 1MΩ.
E12 pack 325 resistors £2·40. E24 pack 650 resistors £4·70.

POTENTIOMETERS
Carbon track 5kΩ to 2MΩ, log or linear (log ¼W, lin ½W).
Single, 12p. Dual gang (stereo), 40p. Single D.P. switch 24p.

SKELETON PRESET POTENTIOMETERS
Linear: 100, 250, 500Ω and decades to 5MΩ. Horizontal or vertical P.C. mounting (0·1 matrix).
Sub-miniature 0·1W, 5p each. Miniature 0·25W, 6p each.

SEMICONDUCTORS

AC126	12p	BFY52	22p	OC81	12p	2N3055	72p
AC127	12p	BSY56	30p	OC82	12p	2N3702	15p
AC128	12p	BSX21	25p	ORP12	48p	2N3703	14p
AD140	40p	BY124	7½p	1N4001	7½p	2N3704	17½p
AF115	20p	BYZ10	20p	1N4002	10p	2N3705	15p
AF117	20p	BYZ13	20p	1N4003	11p	2N3706	12p
BC107	10p	OA85	7p	1N4004	12p	2N3707	18½p
BC108	10p	OA91	5p	1N4005	13p	2N3708	10p
BC109	10p	OA202	7p	1N4006	13p	2N3709	11p
BFY50	22p	OC71	12p	1N4007	13p	2N3710	12p
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ZENER DIODES
400mW 5% 3·3V to 30V, 15p.

ROTARY SWITCHES
2P2W, 1P12W, 2P6W, 3P4W, 4P3W, 23p.

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12in x 6in=25p; 12in x 2½in=10p; 9in x 2in=7p.

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400V: 0·001μF, 0·0015μF, 0·0022μF, 0·0033μF, 0·0047μF, 2½p. 0·0068μF, 0·01μF. 0·015μF, 0·022μF, 0·033μF, 3p. 0·047μF, 0·068μF, 0·1μF, 4p. 0·15μF, 6p. 0·22μF, 7½p. 0·33μF, 11p. 0·47μF, 13p.
160V: 0·01μF, 0·015μF, 0·022μF, 0·033μF, 0·047μF, 0·068μF, 3p. 0·1μF 3½p. 0·15μF, 4½p. 0·22μF, 5p. 0·33μF, 6p. 0·47μF, 7½p. 0·68μF, 11p. 1·0μF, 13p.

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MYLAR FILM CAPACITORS 100V, 0·001μF, 0·002μF, 0·005μF, 0·01μF, 0·02μF 2½p. 0·04μF, 0·05μF, 0·068μF, 0·1μF, 3½p.

CERAMIC DISC CAPACITORS
100pF to 10,000pF, 2p each.

CAPACITOR DEVELOPMENT PACK
Selection of 100 ceramic and polyester capacitors, 100pF to 1·0μF, £2·90.

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.

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(μF/V): 10/12, 50/12, 100/12, 200/12, 5/25, 10/25, 25/25, 100/25.

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17 x 2½	75p	57p
17 x 3¾	100p	78p
17 x 5 (plain)	—	82p
17 x 3¾ (plain)	—	60p
17 x 2½ (plain)	—	42p
2½ x 5 (plain)	—	12p
2½ x 3¾ (plain)	—	11p
Pin insertion tool	52p	52p
Spot face cutter	42p	42p
Pkt. 50 pins	20p	20p

JACK PLUGS AND SOCKETS

Standard screened	18p	2·5mm insulated	8p
Standard insulated	12p	3·5mm insulated	8p
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Standard socket	15p	2·5mm socket	8p
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2 pin, 3 pin, 5 pin 180°, 5 pin 240°, 6 pin
Plug 12p. Socket 8p.

BATTERY ELIMINATOR £1·50
9V mains power supply. Same size as PP9 battery.

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
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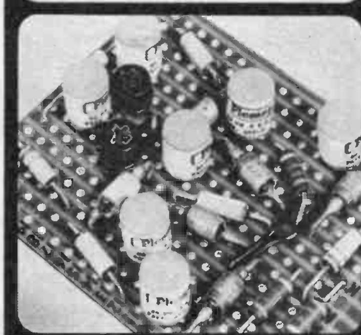

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WALSALL, STAFFS. WS1 1UZ

28watts, r.m.s. 40Hz to 40kHz ± 3dB

Viscount III Audio Suite complete £49

There are two stereo amplifiers—the R100 for ceramic cartridges, the R101 for magnetic and ceramic. Both incorporate FETs (FIELD EFFECT TRANSISTORS), just like top-priced units. FETs give you more of the signal you want, and almost none of the background hiss you don't. Both units have a jack socket to plug in headphones and there's a separate output for tape recorder. Filters (an unusual feature in this price range) and tone controls give a wide range of bass and treble adjustment which compensate for input deficiencies and domestic acoustic conditions.

PRICES SYSTEM 1

Viscount III R101 amplifier	£22·00+90p p&p
2 x Duo Type II speakers,	£14·00+£2 p&p
Garrard SP25 Mk. III with MAG. cartridge plinth and cover	£23·00+£1·50 p&p
Total	£59·00

Available complete for only £52·00+£3·50 p&p

SYSTEM 2

Viscount R101 amplifier	£22·00+90p p&p
2 x Duo Type III speakers	£32·00+ £3 p&p
Garrard SP25 Mk. III with MAG. cartridge, plinth and cover	£23·00+£1·50 p&p
Total	£77·00

Available complete for £69+£4 p&p

SYSTEM 3

Viscount III Amplifier R100	£17·00+90p p&p
2 x Duo Type II speakers, pair	£14·00+£2 p&p
Garrard SP25 Mk. III with CER. diamond cartridge, plinth and cover	£21·00+£1·50 p&p
Total	£52·00

Available complete for only £49·00+£3·50 p&p

SPEAKERS Duo Type II
Size approx 17" x $10\frac{3}{4}$" x $6\frac{1}{4}$". Drive unit 13" x 8" with parasitic tweeter. Max. power 10 watts. 3 ohms. Simulated Teak cabinet.
£14 pair+£2 p&p.

Duo Type III Size approx $23\frac{1}{2}$" x $11\frac{1}{2}$" x $9\frac{1}{2}$". Drive unit $13\frac{1}{2}$" x $8\frac{1}{4}$" with H.F. speaker. Max. power 20 watts at 3 ohms. Freq. range 20Hz to 20kHz. Teak veneer cabinet. **£32 pair+£3 p&p.**

SPECIFICATION R101
14 watts per channel into 3 to 4 ohms. Total distortion @ 10W @ 1kHz 0·1%. *P.U.1* (for ceramic cartridges) 150mV into 3 Meg. *P.U.2* (for magnetic cartridges) 4mV @ 1kHz into 47K. equalised within ± 1dB R.I.A.A. *Radio* 150mV into 220K. (Sensitivities given at full power). Tape out facilities; headphone socket, power out 250mW per channel. *Tone controls and filter characteristics.* Bass: +12dB to −17dB @ 60Hz. Bass filter: 6dB per octave cut. Treble control: treble +12dB to −12dB @ 15kHz. Treble filter: 12dB per octave. *Signal to noise ratio:* (all controls at max) R101—P.U.1 and radio—65dB. P.U.2. −58dB. R100 same as R101 but P.U.2 (for crystal cartridges) 450mV into 3 Meg. *Cross talk* better than −35dB on all inputs. *Overload characteristics* better than 26dB on all inputs. Size approx $13\frac{3}{4}$" x 9" x $3\frac{1}{4}$".

R+TV

Radio and TV Components (Acton) Ltd. 21E High Street, Acton, London W3 6NG
323 Edgware Road, London, W.2. Mail orders to Acton. Terms C.W.O. *All enquiries S.A.E.*
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Sinclair Q16/Micromatic

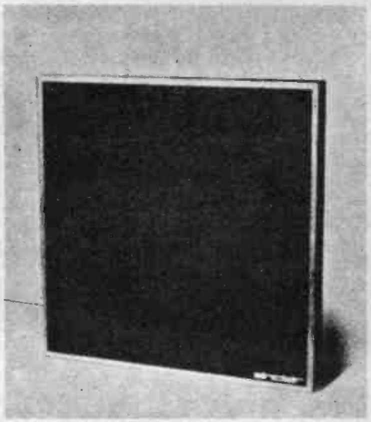
Q16 High fidelity loudspeaker

The Q16 employs the well proven acoustic principles specially developed by Sinclair in which a special driver assembly is meticulously matched to the characteristics of the uniquely designed cabinet. In reviewing this exclusive Sinclair design, technical journals have justly compared the Q16 with much more expensive loudspeakers. Its shape enables the Q16 to be positioned and matched to its environment to much better effect than is the case with conventionally styled enclosures. A solid teak surround with a special all-over cellular foam front is used as much for appearance as its ability to pass all audio frequencies without loss.

This elegantly designed shelf mounting speaker brings genuine high fidelity within reach of every music lover.

Specifications:

Construction: Special sealed seamless sound or pressure chamber with internal baffle.
Loading: up to 14 watts RMS.
Input Impedance: 8 ohms.
Frequency response: From 60 to 16,000 Hz. confirmed by independently plotted B and K curve.
Driver unit: Special high compliance unit having massive ceramic magnet of 11,000 gauss, aluminium speech coil and special cone suspension for excellent transient response.
Size and styling: $9\frac{3}{4}$ in. square on face x $4\frac{3}{4}$ in. deep with neat pedestal base. Black all over cellular foam front with natural solid teak surround.
Price £8.98.



Britain's smallest radio

Considerably smaller than an ordinary box of matches, this is a multi-stage AM receiver brilliantly designed to provide remarkable standards of selectivity, power and quality for its size. Powerful AGC counteracts fading from distant stations; bandspread at higher frequencies makes reception of Radio 1 easy. The plug-in magnetic earpiece provided, matches the Micromatic's output to give wonderful standards of reproduction. Everything including the special ferrite rod aerial and batteries is contained within the minute attractively designed case. Whether you build a Micromatic kit or buy this amazing receiver ready built and tested, you will find it as easy to take with you as your wrist watch, and dependable under the severest listening conditions.

Specifications:

Size: 36 x 33 x 13 mm (1.8 x 1.3 x 0.5 in.)
Weight: including batteries, 28.4 gm (1 oz.)
Case: Black plastic with anodised aluminium front panel and spun aluminium dial.
Tuning: medium wave band with bandspread at higher frequencies (550 to 1,600 KHz).
Earpiece: Magnetic type.
On/off switching: By inserting and withdrawing earpiece plug.
Kit in pack with earpiece, case, instructions and solder **£2.48.**
Ready built, tested and guaranteed, with earpiece **£2.98.**
Two Mallory Mercury batteries type RM675 required from radio shops, chemists, etc.

To: SINCLAIR RADIONICS LTD LONDON ROAD ST. IVES HUNTINGDONSHIRE PE17 4HJ

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for which I enclose cash/cheque/money order	E.E. 3A

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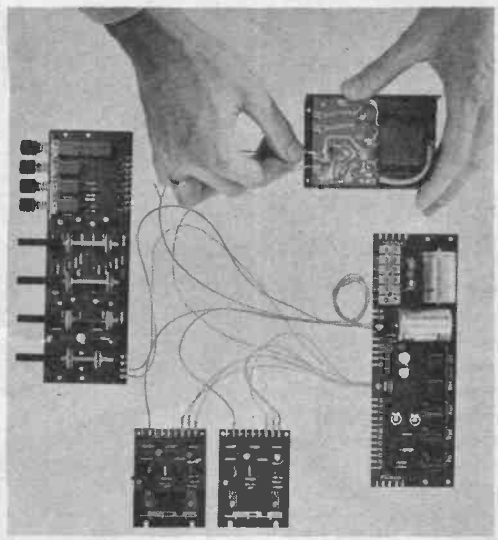
Project 605 the new simple way to assemble Sinclair high fidelity modules



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

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Please send Project 605 post free ☐ Details and list of stockists ☐
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Makes an exceptional Christmas present

ONLY £4·95

FIND BURIED TREASURE WITH THIS READY BUILT & TESTED

Treasure Locator Module

BRAND NEW 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, wood dirt, water, etc.—**EASILY LOCATES COINS, GOLD, SILVER, WATCHES, JEWELLERY, NUGGETS, METALLIC ORE, HISTORICAL RELICS, BURIED PIPES, KEYS, NAIL-IN-TREES, ETC., ETC.** Signals exact location by "beep" pitch increasing as you near buried metallic objects. **PRINTED CIRCUIT SEARCH COIL** *so stable and sensitive it will detect certain objects buried* **SEVERAL FEET BELOW GROUND! GIVES CLEAR SIGNAL ON ONE COIN!** *You could even pay for your holidays with two or three days electronic beachcombing—it's almost like having a licence to print money!* Unclaimed treasure now exceeds the combined wealth of all nations. **ORDER NOW WHILE PRESENT STOCKS LAST—TREMENDOUS DEMAND EXPECTED AT THIS REMARKABLY LOW PRICE. DEMONSTRATIONS DAILY. ORDERS DESPATCHED IN STRICT ROTATION. SEND NOW £4·95+30p carr. etc.**
(High quality Danish Stethoscope headphones £2·75 extra if required).

SHORTWAVE TRANSISTOR RADIO

ONLY £2·25

Can be built in one evening

Ideal Xmas Gift

At last! After trying countless circuits searching for easy build, work first-time short waver. Giving advanced world-wide performance, we chose this 'Sky Roma'. Anyone from 9 years up can follow the step-by-step, easy-as-ABC, fully illustrated instructions. (We built ten prototypes and everyone worked first time) 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. Transistorised (no valves!). Size only 3″×4¾″×1¾″. As tremendous demand anticipated price held to only £2·25 +17p p. & p. for all parts incl. Cabinet, screws, instructions etc. (Parts available separately).

FIND BURIED TREASURE!

TREASURE LOCATOR TRANSISTORISED

NOW IT'S HERE AT LAST, after experimenting for four and a half months with a multitude of different circuits and carrying out actual field tests with prototypes, our design team have come up with this real winner. This fully portable transistorized 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, LOST COINS, JEWELLERY, KEYS, WAR SOUVENIRS, ARCHAEOLOGICAL PIECES, METALLIC ORE, NUGGETS ETC., ETC.** Outdoors or indoors. *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 wonderfully clear, easy to follow, step-by-step, fully illustrated instructions—it really is as easy as A.B.C. transistorized — no valves. Uses standard PP3 battery. No soldering necessary. Size of detector head 13¾″ × 10″ × 2¼″. Great demand **expected** at this remarkably low price—**ORDER WHILE PRESENT STOCKS LAST.** All parts including detector head case, nuts, screws, wire, simple instructions etc., etc. **ONLY £2·37 + 27p p. & p.** (Sectional handle as illustrated 75p extra). Parts available separately. Made up looks worth £15

ONLY £2·37

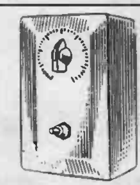
Makes Fantastic Christmas Gift

SOOTHE YOUR NERVES, RELAX WITH THIS AMAZING

RELAXATRON

Ideal Christmas Gift

only £2·25



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 based on avalanche operated transistors. 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. *A group of Dentists have experimented on patients with this pink noise*—**NO ANESTHETICS WERE USED!** The noise ostensibly created a most definite reaction on these patients, nervous systems with the results that their pain systems were blocked. **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—use this amazing pink noise generator whenever you feel uneasy, can't relax or wish to concentrate. **TAKE IT ANYWHERE,** pocket sized. 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. etc. no soldering. Send only £2·25+25p p. & p. (parts available separately.)

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INGENIOUS ELECTRONIC

SLEEP INDUCER

Ideal Xmas Gift

only £2·75

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 sounds gradually become 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″×4¾″×1¾″—"take it anywhere." All parts including case, loudspeaker, components, nuts, wire, screws, etc. etc. **THERE WILL BE A GREAT DEMAND FOR THIS UNIQUE NEW DESIGN—SEND NOW £2·75+25p p. & p.** (parts available separately).

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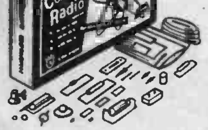

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Amazing Radio Construction set! Become a radio expert for £1·97 A complete Home Radio Course. No experience needed. Parts including simple instructions for each design. Illustrated Step-by-step plans, all Transistors, loudspeaker, personal phone, knobs, screws, etc. all you need. Presentation Box 37p extra as illus. (if required) (extra parts available separately) No soldering necessary. Send only £1·97 +23p p. & p.

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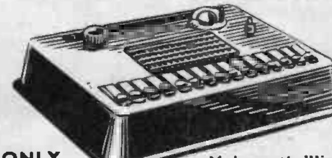

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100-0-100μA	£3·10	5 amp. D.C.	£2·60
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Type MR.85P. 4½in. × 4¼in. fronts.

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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	£2·80	50V. D.C.	£2·80
5mA	£2·80	150V. D.C.	£2·80
10mA	£2·80	300V. D.C.	£2·80
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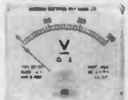
50μA	£3·10	10V. D.C.	£2·00
50-0-50μA	£2·60	20V. D.C.	£2·00
100μA	[illegible]	50V. D.C.	£2·00
100-0-100μA	[illegible]	300V. D.C.	£2·00
500μA	£2·30	15V. A.C.	£2·10
1mA	£2·00	300V. A.C.	£2·10
5mA	£2·00	8 Meter 1mA	£2·10
10mA	£2·00	VU Meter	£3·20
50mA	£2·00	1 amp. A.C.*	£2·00
100mA	£2·00	5 amp. A.C.*	£2·00
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	8 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
		8 Meter 1mA	£1·70
		VU Meter	£2·10

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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	8 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

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50μA	£2·75	1 amp.	£1·90
50-0-50μA	£2·35	5 amp.	£1·90
100μA	£2·35	15 amp.	£1·90
100-0-100μA	£2·25	30 amp.	£1·90
500μA	£2·20	50 amp.	£1·90
1mA	£1·90	5V. D.C.	£1·90
1-0-1mA	£1·90	10V. D.C.	£1·90
5mA	£1·90	20V. D.C.	£1·90
10mA	£1·90	50V. D.C.	£1·90
50mA	£1·90	150V. D.C.	£1·90
100mA	£1·90	300V. D.C.	£1·90
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100-0-100μA	£2·90	VU Meter	£3·40
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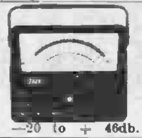
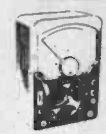


MODEL PL436 20kΩ/Volt D.C. 8kΩ/Volt AC. Mirror scale. ·6/3/12/30/120/600V D.C. 3/30/120/600V A.C. 50/600uA/60/600 mA. 10/100K/1 Meg/10 MegΩ. —20 to + 46db. £6·97½ P & P 12½p.



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 0-60uA/0 —12/0 300mA. 0-60K/0-6 MegΩ. —20 to + 63 dB. £4·62½ P & P 15p

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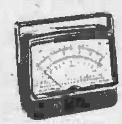

TMK LAB TESTER. 100,000 O.P.V. 6½in. Scale Buzzer Short Circuit Check. Sensitivity: 100,000 O.P.V. D.C. 5K /Volt A.C. D.C. Volts: ·5, 2·5, 10, 50, 250, 1,000 V. A.C. Volts: 3, 10, 50, 50, 250, 500, 1,000V. D.C. Current: 10, 100μA. 10, 100, 500mA, 2·5, 10 amp. Resistance: 1K, 10K. 100K, 10MEG, 100 MEGΩ.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

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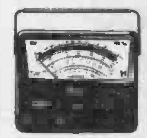
TMK MODEL 117 F.E.T. ELECTRONIC VOLTMETER



Battery operated, 11 meg input, 26 ranges. Large 4⅜" mirror scale. Size 5⅞" x 4⅜" x 2⅜". DC VOLTS 0.3–1200V. AC VOLTS 3–300V RMS. 8·0–800V 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.

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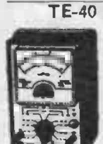

10 meg. input 10 ranges: 01/·003/·1/·3/1/3/10/30/100/300V. R.M.S. 4cps.-1-2 Mc/s. Decibels —40 to +50dB. Supplied brand new complete with leads and instructions. Operation 230V. A.C. £17·50. Carr. 25p.

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Full capabilities for measuring A, B and ICO. NPN or PNP. Equally adaptable for checking diodes. Supplied complete with instructions, battery and leads. £6·97½. P. & P. 15p.

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

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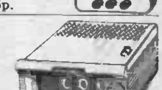

Can be panel or bench mounted. Basic meter measures 1 volt D.C. but can be used to measure a wide range of AC and DC volt, current and ohms with optional plug in cards. Specification: Accuracy: ± 0·2, ± 1 digit. Resolution: 1mV. Number of digits: 3 plus fourth overrange digit. Overrange: 100% (up to 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: 5⅝in. x 2 13/16in. x 8 3/16in. AVAILABLE BRAND NEW AND FULLY GUARANTEED AT APPROX. HALF PRICE. £49·97½. Carr. 50p.

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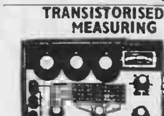
TRANSISTORISED L.C.R. A.C. MEASURING BRIDGE



A new portable bridge offering excellent range and accuracy at low cost. Ranges: R. 1 Ω–11·1 meg Ω 6 Ranges ± 1% L.1 μ H - 111 HENRYS 6 Ranges 2 = %C 10pF ± 1110mFd. 6 Ranges ± 2%. TURNS RATIO 1:1/1000–1:11100. 6 Ranges ± 1%. Bridge voltage at 1,000 cps. Operated from 9 volts. 100μA. Meter indication. Attractive 2 tone metal case. Size 7¾ × 5 × 2in. £20. P. & P. 25p

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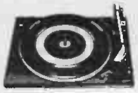

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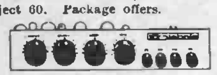

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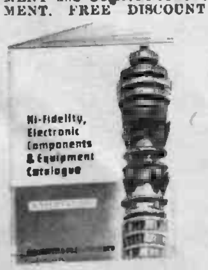

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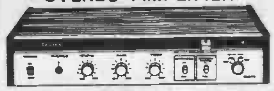

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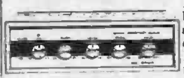

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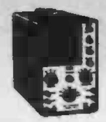

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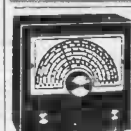

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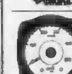

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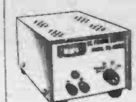

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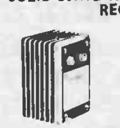

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PROJECTS....
THEORY......

CONTACT MADE

First, we wish to thank all who have written and commented on our new publication. The friendly and congratulatory remarks will encourage all those concerned with the production of *Everyday Electronics* to ensure it fulfills our declared intentions. The various suggestions and advice offered, and yes the critical (yet generally pertinent) comments, will all be given consideration. Some will undoubtedly make their mark on our pages in the course of time.

There is just one little point to emphasise at this stage. There is a limit to what we can fit into any single issue, so have patience please if *your* particular special requirement has not appeared so far. *Everyday Electronics* is, after all, still very young: although (we admit with some pleasure) the warm and familiar manner already adopted by many of our correspondents tends to belie this fact.

FULL CYCLE

One of our readers remarks that electronics appears to have turned a complete cycle, since we are back again to dry batteries. One could, in fact, look back a stage further and recall that radio or "wireless" reception relied on the solid state crystal. So, strange as it may seem to some, there is in a sense a similarity between the primitive equipment used in those far off days and the highly developed devices employed in the advanced technology of today.

Back once more to batteries; the possibility of operating transistors and other semiconductor "crystal" devices from low voltage supplies is of course one of the reasons why modern electronics has acquired a wide popular appeal as a constructive pastime.

GROWTH AREA

While thinking figuratively of turning full cycle, the vast growth in coverage and influence that has taken place over the years must not be overlooked.

The current situation is vastly different to those ancestral days when radio was the one and only useful function performed by electronics, outside the physicist's laboratory. Nowadays, the area embraced by electronics is tremendous in extent—practically boundless in fact—and is conveniently divided into a number of fields of specialised activity. It is our intention to explore in time as many of these different fields as possible—bearing in mind, of course, the limits we have set ourselves in terms of technical complexity and material cost.

CHEERS!

Finally, we take this opportunity to wish all our readers—young or old, novice or old hand, including bottle reared types now undergoing conversion to solid state—a Merry Christmas and a happy and constructive 1972.

Fred Bennett

Our February issue will be published on Friday, January 21

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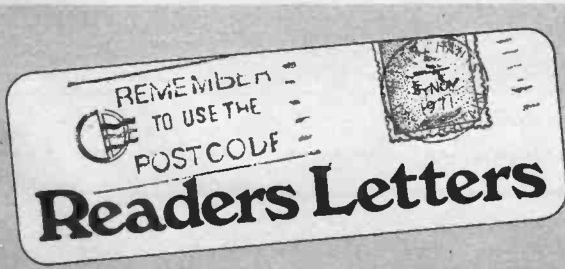
VOL. I NO. 3 JANUARY 1972

CONSTRUCTIONAL PROJECTS

GENERAL FEATURES

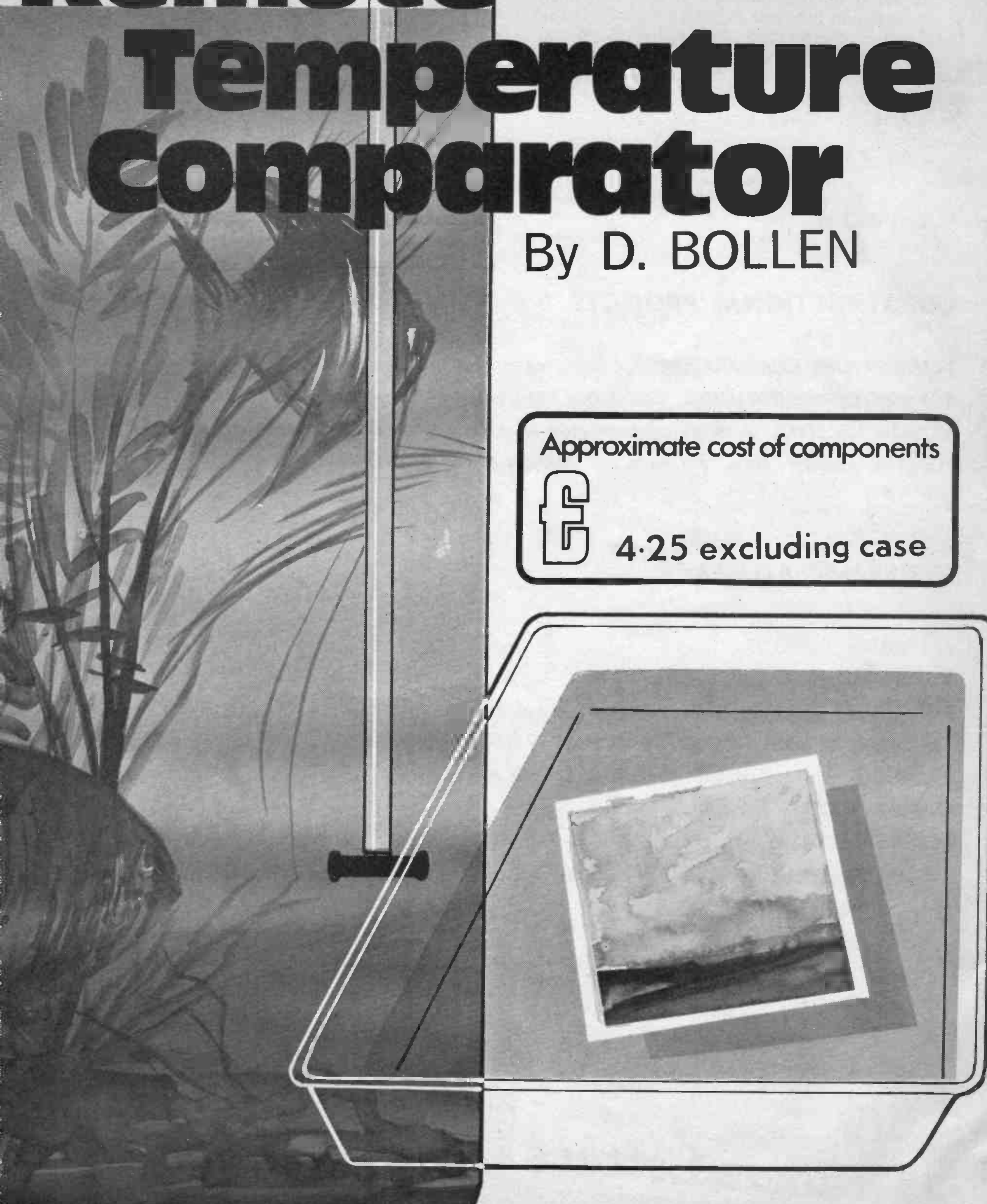


We welcome your views and suggestions concerning Everyday Electronics, and this month we publish a selection of readers' letters. If you write to us for advice please note you must include a s.a.e.

Unfortunately we cannot prepare special designs, circuits or wiring diagrams, nor can we answer technical queries over the telephone, or queries concerning commercial equipment or subjects or designs not discussed in our pages.

Remote Temperature Comparator

By D. BOLLEN



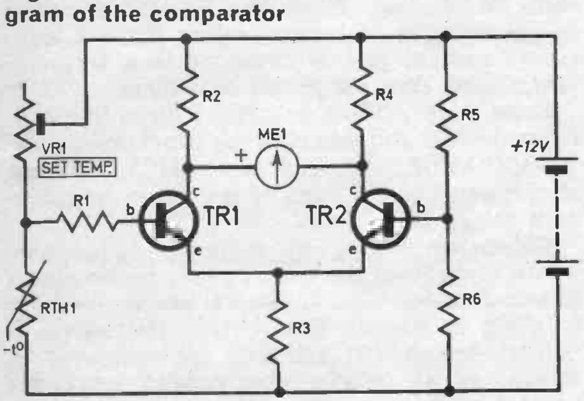
Approximate cost of components
£ 4·25 excluding case

VERY small fluctuations of temperature, such as occur in fish tanks, in photographic solutions, and in thermostatically controlled rooms, are quite difficult to observe with an ordinary thermometer. The concern here is not so much with accuracy as sensitivity.

A highly accurate mercury thermometer covering 0 to 40 degrees Centigrade would be incapable of measuring increments of, say, 0·1 degrees C unless it had a stem several feet long and even then would suffer from an appreciable thermal lag.

The electronic expanded scale thermometer described here was designed to offer a high sensitivity at low cost, and can measure short-term temperature changes as 0·01 degree C. Deviations from any pre-selected temperature between 0-40 degrees C are displayed on a centre zero meter, with three switched ranges covering 0·1-0-0·1 degrees C, 1-0-1 degrees C, and 10-0-10 degrees C. The coarse range is useful for quick checks of relatively large temperature differences, in a glasshouse for example.

Fig. 1. Shows the basic theoretical circuit diagram of the comparator



THERMISTOR SENSOR

In the basic circuit of the thermometer, Fig. 1, a thermistor sensor (RTH1) and a variable resistor VR1 form a voltage divider across the battery supply rails. Over a limited range of temperature, and for differing settings of VR1, the voltage across the thermistor will vary linearly, and inversely with temperature at a rate of approximately 100mV per degree C.

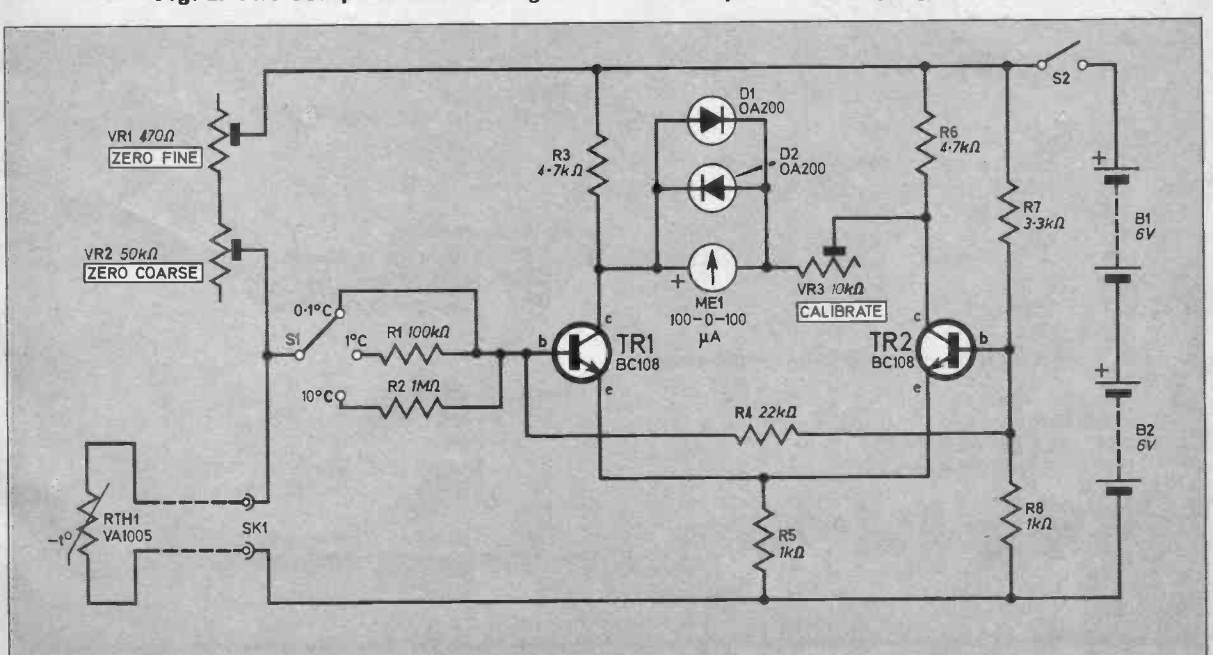
BASIC CIRCUIT

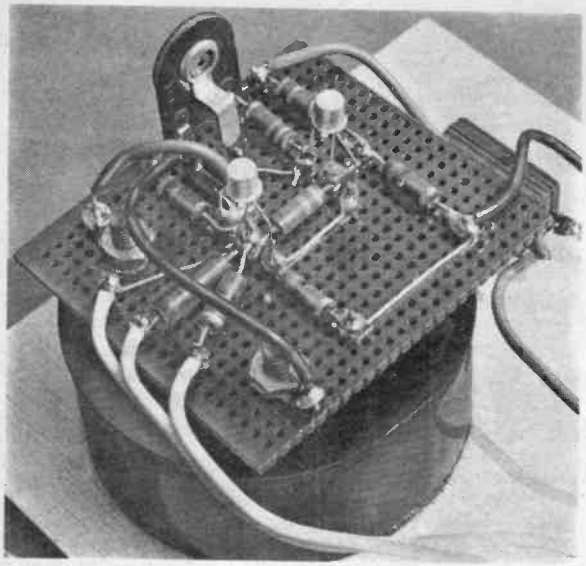
The basic circuit diagram shown in Fig. 1 operates as follows: at a selected temperature VR1 is first adjusted to make the voltage present at the base of TR1 equal to that of TR2, and thus gives zero volts between the collectors of the two transistors. Subsequently, any small change of thermistor temperature will produce a voltage change at the base of TR1, which will be amplified by TR1 and TR2 and displayed by the meter. Circuit amplification is determined by R1, hence this resistor can be selected for the required full scale temperature reading.

THERMOMETER CIRCUIT

The complete circuit diagram of the thermo-

Fig. 2. The complete circuit diagram of the comparator with plug-in probe.





Shows the component board mounted on the back of meter.

meter is shown in Fig. 2. VR1 and VR2 provide fine and coarse adjustment of the initial voltage across thermistor RTH1, and circuit parameters are arranged to yield an input resistance of approximately 10 kilohm at the base of TR1. Hence, switched values of 100 kilohm and 1 Megohm, for R1 and R2 respectively, will offer decadal gain steps. Although this method of range switching is not particularly accurate, it is at least simple and does allow the instrument to be calibrated on its 10 degree C range against an ordinary thermometer.

Meter ME1 in Fig. 2. is protected against severe overloads when the circuit is unbalanced by the limiting diodes D1 and D2. Variable resistor VR3 in series with the meter is used to calibrate the thermometer.

CONSTRUCTION AND WIRING

To keep construction as simple as possible, the circuit panel used is a piece of plain, 0·1 inch matrix perforated s.r.b.p. (synthetic resin bonded paper), measuring 2·2 x 2·5 inches, with terminal pins, and all components and interconnecting wiring links are on one side only, see Fig. 3.

Cut the panel to size and drill two holes to fit the meter terminals, then insert all terminal pins and solder resistors, VR3, links, and panel leads in position. When the panel has had a few minutes to cool down, solder the two transistors and the pair of diodes to their terminal pins, taking care not to overheat them.

Front panel drilling details are given in Fig. 4. After drilling and lettering the panel, mount S1, S2, VR1, VR2, SK1, and meter ME1. Bolt the circuit panel to the back of the meter complete with solder tags.

Commence wiring by soldering the appropriate leads from the circuit panel to the meter terminal solder tags. A general wiring diagram is given in Fig. 5. Ensure that the wires to potentiometers VR1 and VR2 are connected as shown, so as to give the correct rotational "sense" when zeroing the meter.

Components....

Resistors

R1	100kΩ ½ watt metal oxide ±2%
R2	1MΩ ½ watt metal oxide ± 2%
R3	4·7kΩ
R4	22kΩ
R5	1kΩ
R6	4·7kΩ
R7	3·3kΩ
R8	1kΩ

All ½ watt carbon ± 10% unless otherwise stated

Transistors

TR1	BC108 Silicon *npn*
TR2	BC108 Silicon *npn*

Diodes

D1	OA200
D2	OA200

Thermistor

RTH1	VA 1005 (or R.S. Components Ltd., TH2A)

Potentiometers

VR1	470Ω carbon linear
VR2	50kΩ wirewound
VR3	10kΩ skeleton preset

Miscellaneous

ME1	100-0-100μA 1kΩ internal resistance meter
S1	Single pole three-way wafer
S2	Single pole on-off toggle
BY1, BY2	PP1 (2 off, 6V each)
SK1	Two-way socket with plug

Piece of s.r.b.p. 2·2 x 2·5 inches

Remote Temperature Comparator

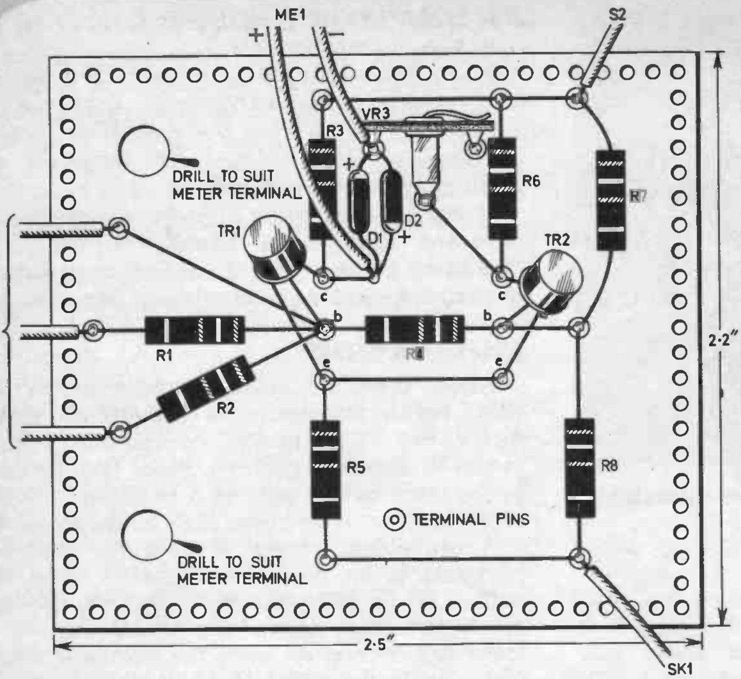


Fig. 3. The wiring and component layout. There are no connections on the underside.

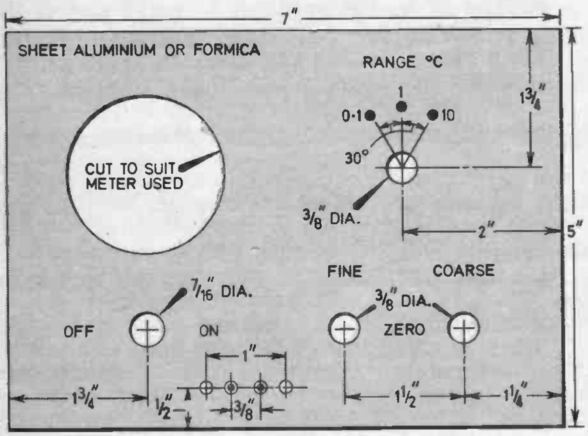


Fig. 4. (left) The dimensions of the front panel which can be made from aluminium sheet or formica.

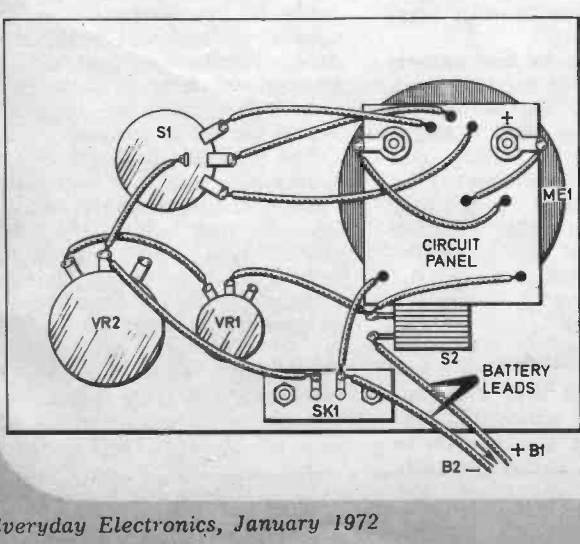


Fig. 5. (bottom left) The wiring and components on the rear of the front panel. Note the wiring to potentiometers VR1 and VR2

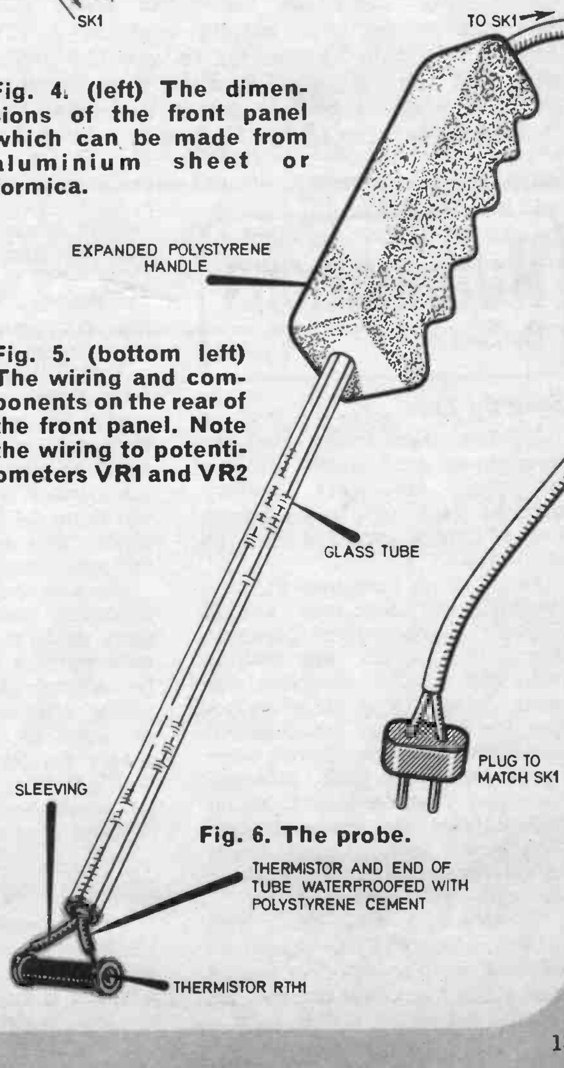
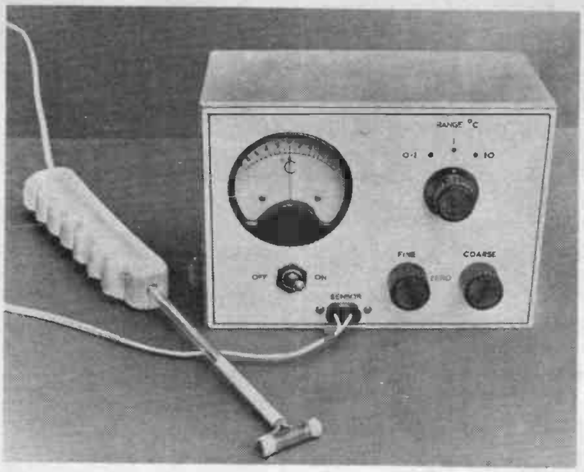


Fig. 6. The probe.



The assembled remote temperature comparator in case complete with probe.

As a preliminary check that the circuit is functioning, insert the thermistor wires into SK1 and connect the battery leads to a 12V supply. It should be possible to zero the meter with VR1 and VR2 at each of the three settings of S1. The meter pointer should rise when the thermistor is warmed by the fingers.

THERMISTOR PROBE

Details of a thermally insulated probe are given in Fig. 6, where the thermistor is mounted at one end of a length of glass tubing which is in turn retained in a hand grip made of expanded polystyrene. Both glass and expanded polystyrene are very poor conductors of heat.

If the probe is to be used for measuring temperature changes in liquids, the thermistor should be given a liberal coating of polystyrene cement to render it completely impervious.

CALIBRATION

Allow time for soldering heat to be dissipated before attempting to calibrate the thermometer. Set VR1 and VR3 to mid-track, and S1 in the 10 degree C position. Place the thermistor probe close to the bulb of a centigrade thermometer on a table and zero ME1 by means of VR2.

A convenient source of heat for calibration purposes is an adjustable reading lamp fitted with a 60 or 100 watt bulb. Position the lamp about two feet above the thermometers and leave it switched on until the standard thermometer indicates a rise of 10 degrees C. Allow a minute or so for readings to settle down, then adjust VR3 for full scale deflection of ME1. If necessary, switch the lamp on again to maintain the 10 degree C rise above ambient. ▣

Ruminations

By Sensor

Speedy Fido

My homeward route takes me through an area where terraces of small nineteenth century cottages, each with its yard wide strip of garden, crowd to the edge of the road.

As I drove southwards, one evening, the sun was setting behind the cottages and I became aware that a car approaching from the opposite direction was being driven by a large yellow dog. My feelings of astonishment and fear were soon allayed when I saw that the car, although travelling fast, was well under control. The dog sat erect and alert in his seat, swaying gently as the car followed the bends in the road.

Reassured, although still curious, I watched the dog-driven car and as our vehicles passed each other I saw that the car was a left-hand drive model with a human driver at the wheel. I had not seen him earlier because the right hand side of the road was in shadow, although the dog, sitting up in the right hand seat, was clearly visible.

Well, I thought, "Why shouldn't dogs drive cars?" They can be taught to lead the blind and to herd and pen sheep, perhaps they could be taught to drive! A dog's intelligence is somewhat limited, but then, we have all met human drivers who appear to suffer from the same disability.

Dogs appear to be less aggressive, less competitive, less arrogant and therefore potentially safer drivers than men. It might be argued that a driving dog whose attention is distracted by the scent of a bitch could cause a very dangerous traffic situation —this is true; but men in similar situations are equally dangerous to other road users!

Master and Slave

I read recently that a system has been devised which will prevent the starting of a vehicle to which it is fitted, if the seat belts of the driver and front seat passenger are not worn correctly. Contacts beneath the front seats and in the buckles of the belts, together with an ultra sonic transmitter and receiver, ensure that the ignition cannot be switched on, when the seats are occupied, until the belts have been fastened correctly. The ultrasonic transmitter is positioned within the belt such that the receiver is only activated when the seat belt is in its correct position. Provision is made for manœuvering, at slow speeds, without seat belts, and a delay mechanism prevents the ignition switching off immediately should the belts be unbuckled whilst the car is moving.

The idea fills me with dismay. I normally wear my safety belt, I find it comfortable and comforting. My seat belt is the "automatic" type which allows the wearer to move freely and only locks when the car is accelerated or decelerated rapidly.

I wouldn't mind an electronic "watchdog" reminding me to fasten the belt (I do forget sometimes) but I rather resent the role of slave to an inanimate

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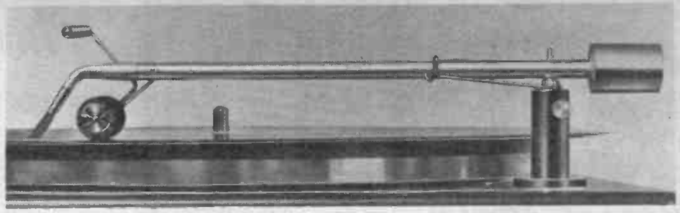
SHOP TALK

By Mike Kenward



Transistors

We have received some enquiries about the coding of 2N2926 transistors. There are three types Green (G), Orange (O), and Yellow (Y) and the prices can vary by relatively large amounts, some suppliers sell all three types at one price while others charge more for Green types. The only difference between them is the gain, the Green are the best, then Orange and lastly Yellow. In applications such as the *Snap Sequence Indicator* (November 1971 issue) any type can be used, in some applications the Green type must be used. If we do not give a specific type buy the cheapest—or Green if they are all the same price. If we quote Orange then Green or Orange will suit but Yellow may not work.

Having said something about component buying in general, let us now get down to specific problems arising from this issue.

Astron

After looking through all the adverts, and all the catalogues that we have been sent we can only find one supplier of the tuning capacitor for the *Astron* and that is Home Radio. The price is rather high and if you find another supplier you may be able to undercut our approximate cost.

Diodes for the *Astron* may also prove difficult, Davian Electronics, P.O. Box 38, Oldham, Lancs., can supply at a very competitive price. One other buying problem could be the loudspeaker, however you do not have to use that specified, any 35 ohm loudspeaker will do provided it is not bigger than the one given.

Perspex buying may be difficult in some areas, we managed to buy ours from a small sign making firm. They cut the pieces to size and sold us a small bottle of chloroform to glue it all up with. You will just have to hunt around for your nearest supplier or buy the kit from Kaspex, 16 Seymour Road, Tilbury, Essex.

Remote Temperature Comparator

Few buying problems with the *Remote Temperature Comparator*, the glass tube will probably be more difficult to get than any of the components. We get Biro pen refills in glass tubes and these would be good for the job if the closed end were carefully cut off. If you cannot find a source of tube then a chemist may be able to help. As a last resort thin Paxolin tube could be used.

Electro Laugh

Unusual though the *Electro Laugh* is the components are all readily available. Main point to watch on this one is the price of the transistors, because there are a number of them in the circuit any slightly high priced will push up the cost of the project beyond reason. We have given no case details as the unit could be incorporated in other equipment (as an alarm) or encased in any way required.

Transistor-Microphone

The only problem we can forsee with the *Transistor-Microphone* is not concerned with the electronic component buying but with obtaining the Paxolin tube used for the handle. If you cannot find a supplier write to Home Radio. You could also use Paxolin tube for the insert and preamp housing —the $1\frac{3}{8}$ inch size should be suitable.

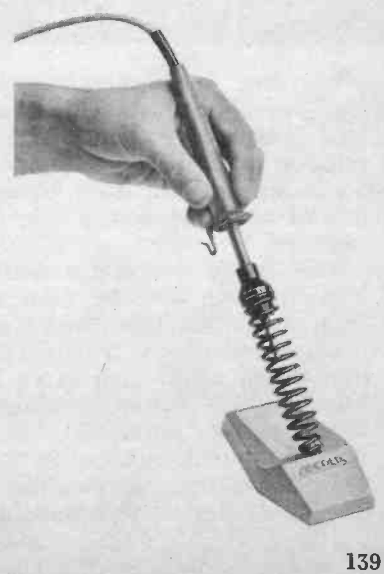
It is important to use a miniature horizontal type skeleton preset for the microphone as this fits on the board and is clear for adjustment—vertical types are not easy to adjust due to other components getting in the way.

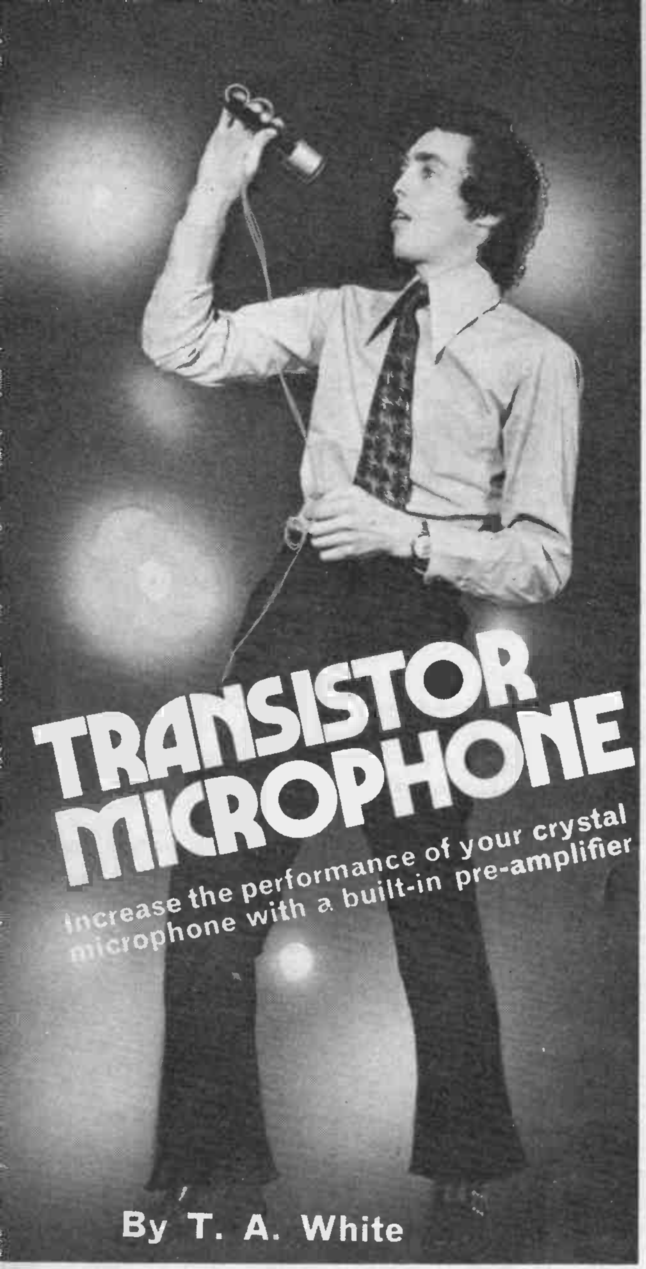
New Products

Three new products that may interest you have appeared in the office this month, first, a Groove-Kleen from Bib (shown above). This record cleaner is chrome finished, has a pre-set balance weight and a self adhesive stand. Complete with a brush for cleaning the dust roller, the cleaner costs £1·99.

Also from Bib is a 36-page booklet entitled Hi-Fi Stereo Hints and Tips by John Borwick, B.Sc. (technical editor of *The Gramophone*). This booklet deals with the installation, care and use of hi-fi equipment and costs 25p, available from audio dealers and newsagents.

Having mentioned an iron stand last month and shown it with an Adcola Products Invader soldering iron we have now been sent information on a stand specially made for the Invader iron. Shown below, the stand has a non-slip rubber base and integral bit wiping sponge. Price for this portable stand that can also be used with other irons is £1·49.





TRANSISTOR MICROPHONE

Increase the performance of your crystal microphone with a built-in pre-amplifier

By T. A. White

CRYSTAL and high impedance dynamic microphones cannot usually be used with long leads unless a transformer of some description is inserted, since hum and noise pick-up is high. A miniature transformer, however, is expensive, especially when high fidelity is required.

This article describes a method whereby such a microphone may be used at long distances from equipment with which it is to be employed. A microphone pre-amplifier is fitted at the microphone end which acts as an impedance transformer (high to low), whilst also providing useful voltage gain.

This circuit is unusual in that the power for the pre-amplifier is obtained from the main equipment and is fed along the same coaxial lead as used for transmitting the signal from the microphone to the main amplifier.

PRE-AMP SUPPLY

The principle of operation is shown in Fig. 1. First let us consider the d.c. power supply to the pre-amplifier; this is derived from the main amplifier power supply, through the centre conductor to the positive terminal of the pre-amplifier. Resistors R_a and R_b determine the voltage supplied to the pre-amplifier.

Therefore, if the pre-amplifier takes a current I amps, then the voltage reaching the pre-amplifier is given by:—

$$V_{pre\text{-}amp} = V_s - I(R_a + R_b) \quad \ldots \quad (1)$$

where V_s is the supply voltage.

The pre-amplifier described here was designed to operate with a 10V supply. The current required is 2mA.

If the voltage tapping on the main amplifier is V_s and we make R_a equal to R_b, equation (1) reduces to:—

$$R_a = R_b = 250(V_s - 10) \text{ ohms}$$

It must be stressed at this point that this particular method of obtaining the power supply from the main amplifier should only be used with low voltage transistor amplifiers with a maximum voltage tapping of 50V.

The prototype was designed for use with a Baily amplifier which has a 20V tapping. Any transistor amplifier with a similar supply may be used.

Therefore, with a 20V supply,

$$R_a = R_b = 2{\cdot}5 \text{ kilohm}$$

Since the supply to the pre-amplifier is not critical 2·2 kilohm was used for R_a and R_b.

To understand how the signal gets through to the power amplifier we must take a look at Fig. 2. Since both R_a and R_b are decoupled, they appear as extra loads on the pre-amplifier output. In other words, instead of just R_L (the input resistance of the main amplifier) loading the pre-amplifier, R_a and R_b also appear, in parallel.

It is obvious that these must not load heavily; in other words each resistor (R_a and R_b) must not be less than 2 kilohm. The signal voltage developed at the output of the pre-amplifier still appears at the input of the main amplifier, merely by travelling along the centre conductor as usual.

CIRCUIT

The pre-amplifier circuit is shown in Fig. 3.

Approximate cost of components

£1·70 inclusive

Components....

Resistors

R1	100kΩ
R2	100kΩ
R3	1·5MΩ
R4	15kΩ
R5	100Ω
R6	1kΩ
R7	1kΩ
R8	470Ω
R_a, R_b	See text

All ¼ watt ± 10% carbon

Capacitors

C1	0·05μF ceramic
C2	100μF elect. 6V
C3	100μF elect. 6V
C4	25μF elect. 12V
C5	160μF elect. 12V
C6	160μF elect. 50V (See text)

Transistors

TR1	2N2926 (G) silicon *npn*
TR2	2N3702 silicon *pnp*

Potentiometers

VR1	1kΩ horizontal skeleton preset

Miscellaneous

MIC 1 Microphone insert (Acos), 0·1 inch matrix Veroboard (10 × 14 holes), ¾ inch diameter Paxolin tube, screened cable, sheet aluminium

It is simply a high impedance input two-stage amplifier having a variable voltage gain, from 1·5 to 10; this is varied by VRI and is useful where the sensitivity of the microphone may vary. As drawn, the circuit is suitable for crystal microphones or ceramic cartridges.

If the pre-amplifier is to be used for matching magnetic pick-ups, tape heads or dynamic microphones the input must be modified as shown in Fig. 4.

If to be used with an amplifier which has a stabilised supply as the prototype was, C6 is not required. However, for unstabilised supplies this will be necessary.

COMPONENT ASSEMBLY

The complete circuit is built on a piece of

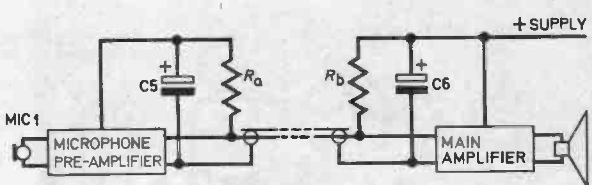


Fig. 1. Shows how the power supply for the pre-amplifier is obtained from the main amplifier.

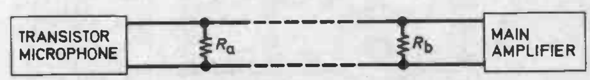
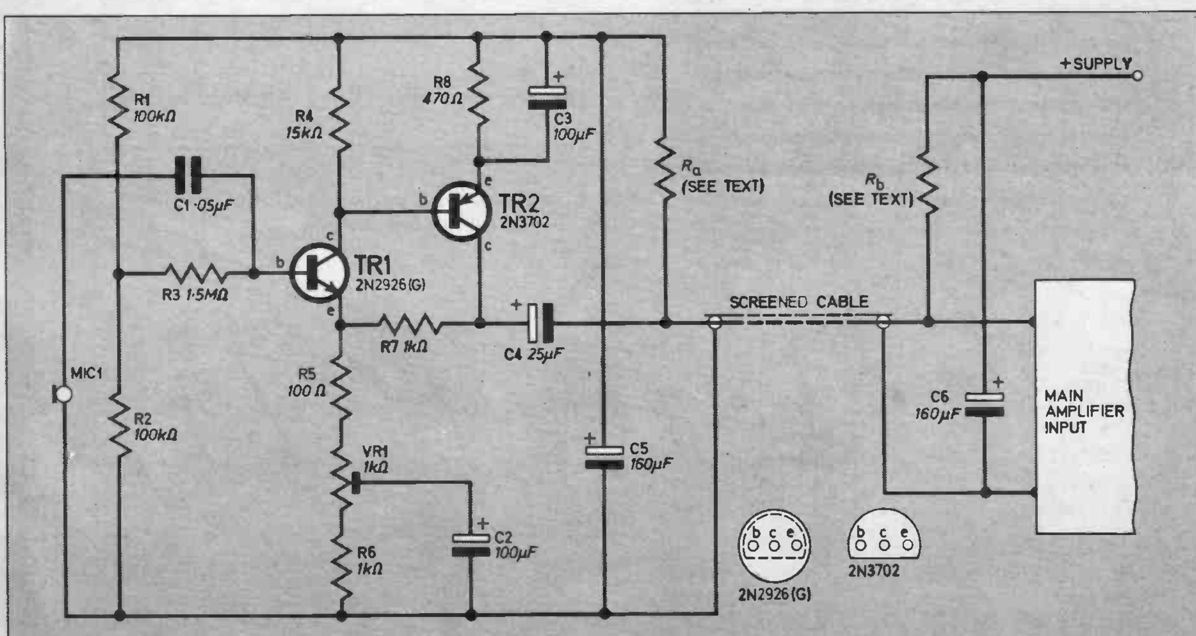
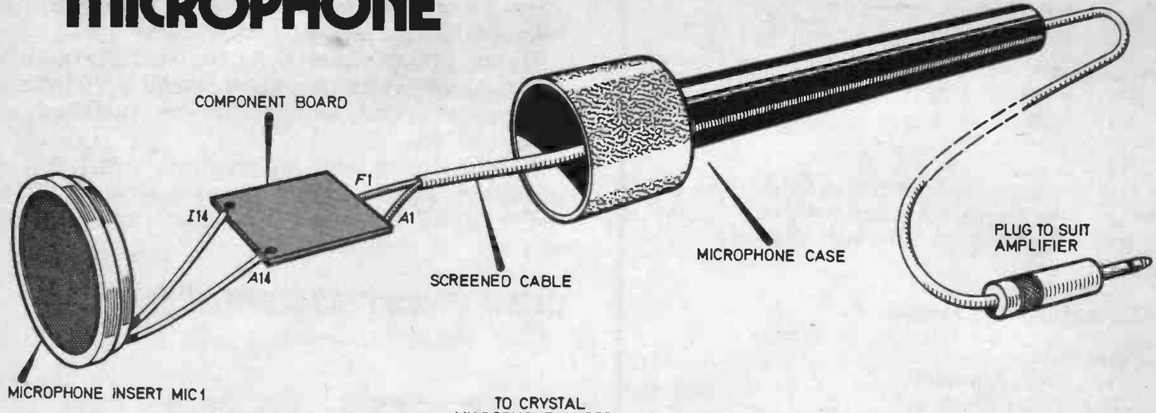


Fig. 2. Schematic diagram indicating additional loads on the pre-amplifier output.

Fig. 3. The circuit diagram of the pre-amplifier. Also shown are the base connections of TR1 and TR2.



TRANSISTOR MICROPHONE



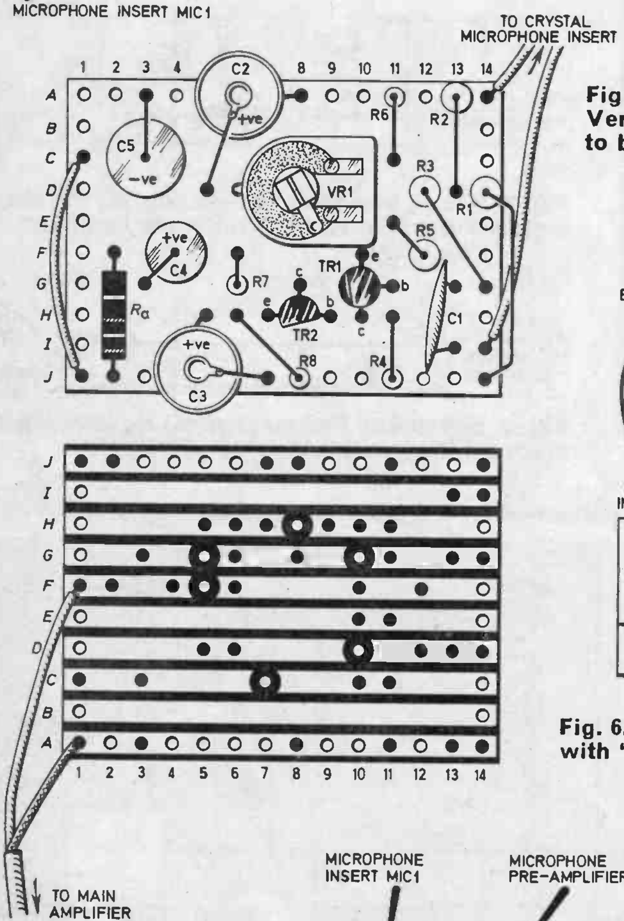


Fig. 5. (left) The layout on the top side of the Veroboard with (below) regions of copper strip to be removed.

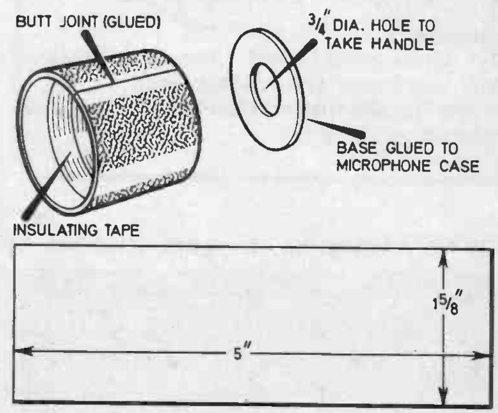


Fig. 6. (above) The cylindrical microphone head with "unrolled" dimensions.

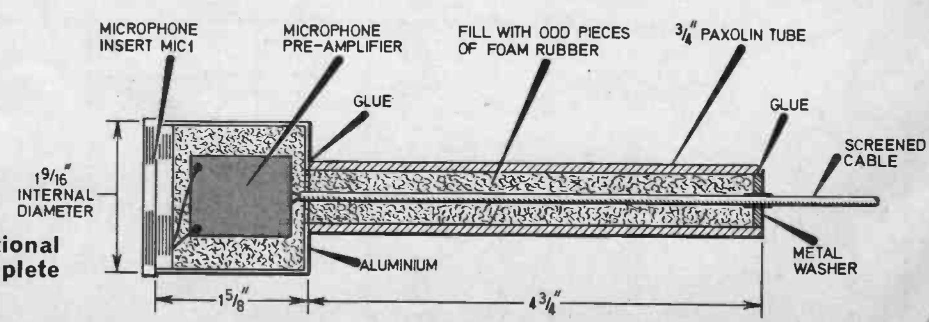


Fig. 7. Cross sectional view of the complete transistor microphone.

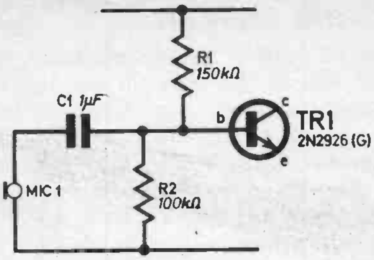


Fig. 4. Circuit diagram of the modification to be made at the input for matching to magnetic pick-up, tape head or dynamic microphone.

0·1 inch matrix Veroboard (10 x 14 holes). The layout of the components is shown in Fig. 5. Note that most of the components are mounted on their ends; this has been done to limit the overall size of the board so that the microphone head is as small as possible.

All components should be soldered in position on the top side of the Veroboard as shown. The transistors should be the last components to be mounted and a heat shunt should be used on the leads when soldering them in position. Before soldering TR1 and TR2, refer to the lead connections given in Fig. 3. to check that they are correctly mounted.

Also, be careful when soldering the leads to the crystal insert as too much heat may damage the crystal.

It is important to use screened cable for the output from the pre-amplifier, otherwise a lot of interference will be picked up.

CASE

The transistor-microphone is shown in Fig. 7 in cross-section. The top cylindrical part is made from a piece of $^1{}_{16}$ inch aluminium sheet, dimensions 5 x $1^5{}_8$ inches which is bent as shown in Fig. 6. and glued in position. The Paxolin tube is then pushed through the hole and held in position with Araldite as is the small metal washer at the other end of this tube.

ASSEMBLY

Begin to assemble by threading the screened cable through the Paxolin tube and then fill the tube with small pieces of foam rubber. Next line the inside of the cylinder and base with insulating tape and place the component board in position as shown in Fig. 7. Fill with more foam rubber.

The insert should then be placed in position and secured with glue. The transistor microphone is now complete and ready for connection to main amplifier.

Finally the circuit may also be used for high impedance transducers, the response of the pre-amplifier going well beyond the audio spectrum. ▣

ELECTRONICS and the MUSIC SCENE

By B. W. Terrell B.Sc.

The application of electronics to "pop" music—musical instruments and special effects devices

How many people, when they are listening to a piece of music either on the radio, record player, tape recorder, or live performances, realise the extent to which electronics plays in bringing this music to them.

Without electronics, modern-day "pop" music would not exist, for it is from basic electronic principles that these "new" sounds are derived.

Musical sounds relying almost entirely on electronic principles and theory really only started in a big way back in the "mid-fifties", with the introduction of the solid "electric" guitar. The sound produced by this instrument caught on immediately and was an overnight success with the younger generation of this time—and still is with present-day teenagers although the overall sound has become more sophisticated with the addition of special effect devices to be described in this article.

It is true to say that electronics and its application to the musical field has played a major role in shaping the music we hear today. It is fair to say that electronics has revolutionised modern-day music, and in the future will play an even bigger part both in existing sounds and creating totally new ones.

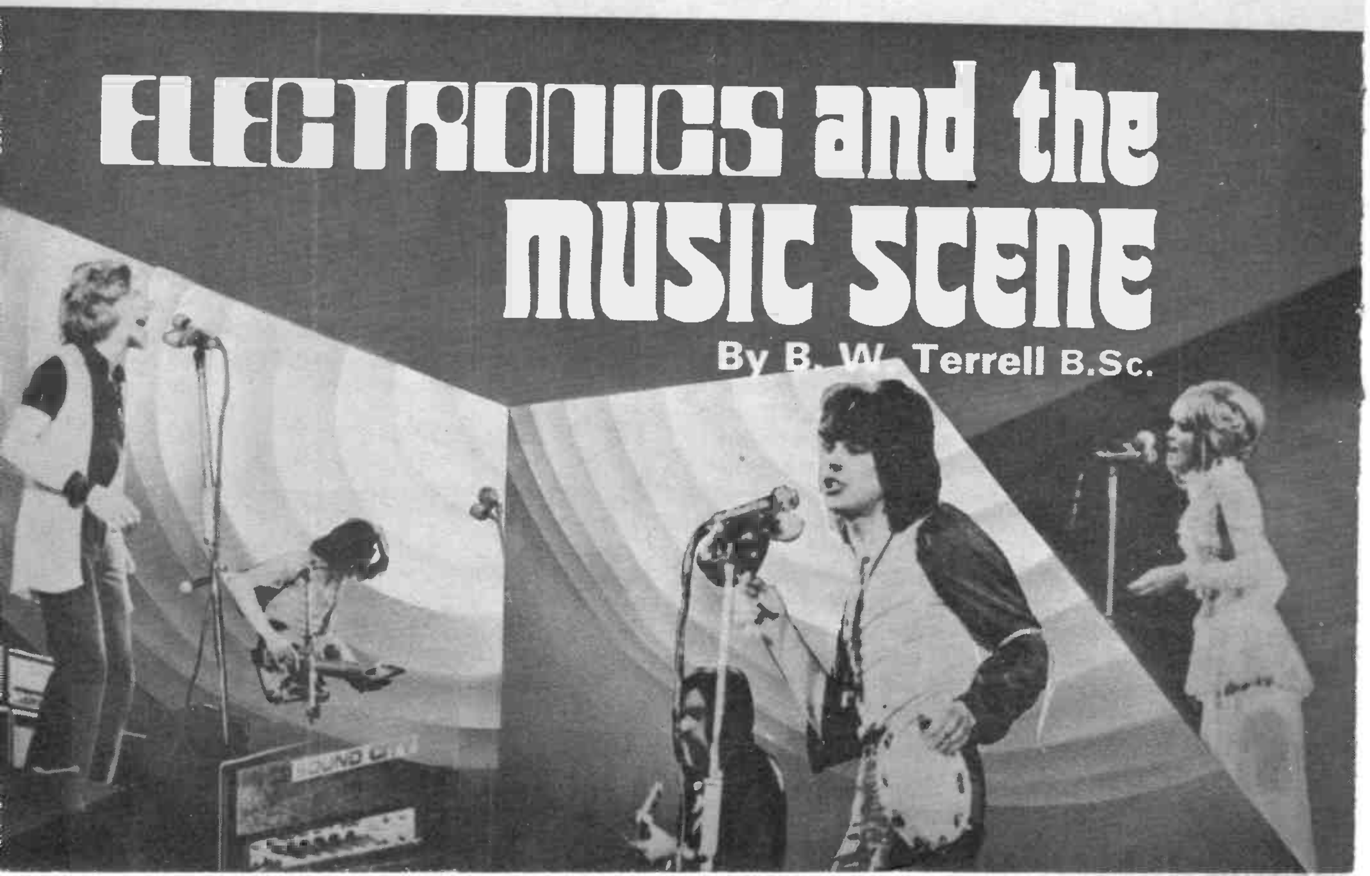
ELECTRIC GUITAR

Without doubt the "electric" guitar has become one of the most (if not the most) popular musical instruments. Although tuned in the same way as an ordinary acoustic guitar, having similar string length and fretting arrangement, the sound produced is vastly different—a much smoother and at the same time, harder, more solid, sound is produced with a wide range of tone.

Now all electric guitars have situated below the strings a magnetic pick-up which consists of a central magnet located under each string with copper wire (many turns) wound around this magnet. When the steel strings are plucked and caused to vibrate, the steel, being magnetic, affects the magnetic field around the string causing a current to flow in the copper coil (conductor). This current (signal) as then passed to an amplifier where it is made more powerful—powerful enough to drive a loudspeaker.

Interposed between the pick-up and amplifier there is usually a tone and volume unit, the volume being nothing more complicated than a potential divider, while the tone control is a little more involved. A typical tone circuit merely provides a control over the amount of bass and treble that is required. A full tone circuit usually has both treble boost/cut and bass boost/cut.

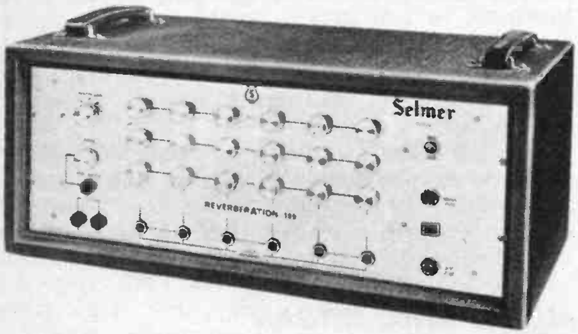
For convenience, these controls are located on the guitar itself, and are separate and additional to those incorporated in the main amplifier.



AMPLIFIERS

All electric guitars and other electronic musical instruments need an amplifier of one sort or another to enable them to be heard.

The amplifier is the most used piece of electronic circuitry in the modern music field. Without it hardly anybody would be able to hear what is being played. It is an absolutely essential piece of equipment when playing to an audience, whether for amplifying an "electronic" sound, or amplifying conventional musical instruments such as acoustic guitar, violin, piano or trumpet via a microphone.



A typical amplifier in use on the "pop" scene today. It can deliver up to 100 watts. There are six independent inputs with individual treble/ bass controls and two of these inputs have built-in "reverb" units.

TREMOLO/VIBRATO

The tremolo and vibrato units were of the very first "special effects" devices to be devised, and they are often confused with one another because they produce very similar sounds. Nowadays they are nearly always incorporated in power amplifiers designed for "pop" work.

The electronic principle evident in both of these devices is that of modulation, that is to say, the signal produced by the musical instrument is mixed with the output from a low-frequency oscillator whose amplitude (vibrato) or frequency (tremolo), can be varied. The sound produced in both cases is a low frequency regular pulsating effect superimposed on the signal, which is both pleasant and melodious.

Most tremolo units also incorporate the vibrato effect as well, and the two controls found on this unit are marked "depth" and "speed" and can be used in any combination to provide the desired effect. The depth control varies the amplitude of the oscillator output, while the speed control alters the frequency.

ECHO CHAMBER

Another "effectual" box that falls into the same general category as the above is the echo-chamber. This electro-mechanical instrument had its heyday with the music played by such groups as the "Shadows" and at the time was extremely popular. It sounds novel, and as its name implies, produces an echo (or echoes) a short time after the original signal has been played, each successive echo being attenuated.

The idea is fairly simple, but its design and operation are quite involved. Its operation relies on the technology of the tape recording industry since in effect it is a small magnetic tape recorder but with a difference—the tape used takes the form of a small loop about 1 foot in circumference and there are several playback heads set specific distances apart. Basically what happens is that the input signal is recorded on to the tape by the record head of the machine, and then played back at each of the playback heads in turn, thus producing an echoing sound.

A completely electronic portable echo and reverberation unit combined. Can be used with both electronic musical instruments and microphone.

REVERBERATION UNIT

A similar device to the "echo-chamber" is the reverberation unit—more commonly referred to as a "reverb".

The effect on the musical instrument input signal is to make it sound "ghostly" rather like the sound produced when singing, talking, or playing an instrument in an empty room or hall.

This effect called reverberation is produced naturally in such enclosures because the hard surfaces, walls, ceiling and floor, cause the sounds to be bounced back and forth across the room or hall, gradually being attenuated and eventually dying away.

This effect can be simulated electronically by applying a theory of electricity which says that the velocity of sound through materials such as air, water and metals is considerably slower than when it is passed as electronic signals through circuitry. The input signal firstly passes into a pre-amplifier and is then split into two channels. One half passes straight through to the output whilst the other half is transmitted as sound pressure waves through a "delay" spring line via an electromagnetic unit, and then picked up at the other end by a similar device which reconverts the acoustic signal to an electrical one again.

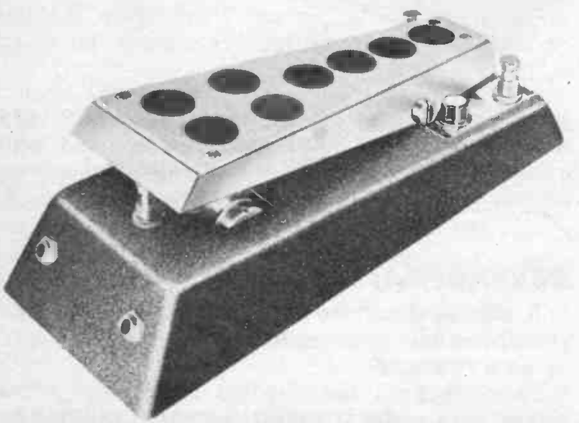
The two split signals are then mixed and passed to the main amplifier. The output sound is composed of two distinct effects, a short-term echo and the reverberation sound which continues for some time.

FUZZ BOX

Perhaps the most popular special effect so far devised is the fuzz sound which has only really been made possible by the introduction, and relative cheapness, of the transistor. It is very rarely incorporated "inside" any other equipment and is usually found in a small box and operated by a footswitch when desired.

The fuzz unit, or as it is sometimes called—tone bender—can be used with any musical instrument but is found usually in use by "heavy pop" groups on lead guitar and here again is limited in most cases to solos. The effect is quite dramatic.

The circuitry of the fuzz box is quite simple—a two-stage transistor amplifier with the second stage in an overdriven state so that the input waveform is clipped and distorted.



A combined fuzz and waa-pedal for use with guitar and electronic organ.

WAA-WAA

In recent years a new sound emerged which has been given the name waa-waa and whose sound bears little resemblance to the input signal.

The waa-waa effect used chiefly in the pop music field by inputting a guitar or other electronic musical instrument to a band-pass filter whose resonant frequency can be varied. When this is done rapidly, the so called waa-waa effect is obtained.

This instrument again is entirely dependent on transistors and in this case, on their "noiseless" switching properties.

The heart of this device is the band-pass filter whose resonant frequency is able to be continually changed from a position in the bass spectrum to one in the treble spectrum, in a smooth but fast operation. This can quite easily be done by switching the capacitors in the filter mechanically, but then loud clicks will be heard and these are unwanted.

The noiseless switching is accomplished by using the output from a transistor multivibrator to suitably bias the other transistors "loaded" with the capacitors so that they can be switched in and out of the filter network.

ELECTRONIC ORGAN

Although the electronic organ has been in existence for quite a considerable time its presence was not felt to any great extent until comparatively recently when the transistor appeared on the scene of commercial musical products.

Previous to this, electronic organs were constructed using valves, and since many valves are required in their circuitry they were extremely heavy and bulky and not easily transportable.

The transistor, because of its size and low weight, solved the problem of transportation and overall size, and now that transistors are considerably cheaper (and have been for sometime) than their valve equivalents, people have been able to afford to buy themselves an electronic organ and keep it in their own homes. Thus electronic technology has made possible an extremely popular and versatile musical instrument for use by many.

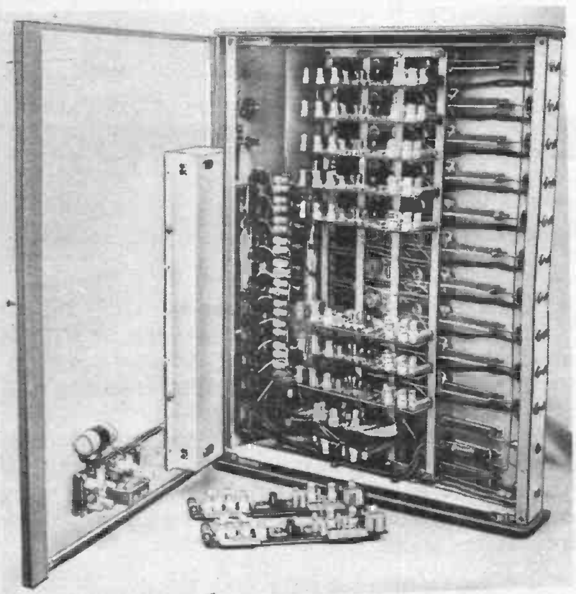
On inspecting the "workings" of a modern transistorised organ one may think the circuitry is extremely complicated due to the many hundreds of components and wires to be seen, but when it is broken down into sections it is seen to consist of quite basic circuits and principles.

Essentially, the electronic organ is a bank of oscillators, in general, twelve very stable and accurate oscillators each made to oscillate at each of the frequencies of the twelve notes in the musical scale in a high pitch region above soprano.

These oscillators, generally with outputs of the square and sawtooth variety to ensure the presence of harmonics, are then stepped down by successive frequency-dividers to give a wide range of musical notes extending over many octaves.

Depressing the keys on the keyboard merely "completes the circuit" of the oscillator and produces an audible sound.

There are many "stops" on the larger type of organ which when placed in circuit by pushing down bring in wave shaping circuits to produce sounds of similar pitch and character to other musical instruments—in fact nearly all musical instruments in use. Also a lot of organs have the built-in special effects, discussed above, such as fuzz, waa-waa, tremolo, echo, reverberation and many others.



A ten-channel audio mixing unit with built-in "reverb". Each channel has its own tone controls and slider volume control. (above) The electronics within—its size and compactness is due to the use of semiconductors.

The Ring Modulator—a new addition to the special effects field producing music with a decidedly "electronic" character—for use with musical instrument and microphone.

OTHER DEVICES

Other "electronic-music-boxes" on the market include the electronic piano, electronic drumbeats, ring modulator, the music sythesiser, and the latest device—a completely electronic drum kit.

The present trend in designing these devices is firstly to completely analyse the waveform of the audio signal produced by musical instruments, with the aid of an oscilloscope and filter networks, and then devise wave shaping circuits to shape the output from various kinds of oscillators, to produce a similar, if not exact sound.

The Moog synthesiser was the first commercial instrument of this kind but the EMS Synthi-100 is perhaps the ultimate in present electronic music and is an extremely complex piece of equipment which can produce almost any sound desired. The main use of the electronic synthesiser is in the professional recording studio using multitrack recording systems, and really falls outside the scope of this article—but, however, deserves a mention.

Yes, electronics really has played a leading part in recent years in changing the musical sound, especially on the pop scene. Many of the effects devices mentioned in this article are easy to construct and full theoretical and construction details of some of these will be published in later issues of EVERYDAY ELECTRONICS. A fuzz box was described in the December 1971 edition, and there will be a waa-waa in the February 1972 issue. ■

ELECTRONIC CIRCUITS–

.....IN THEORY and PRACTICE

TEACH-IN

...FOR BEGINNERS

By Mike Hughes M.A.

3 RESISTANCE

LAST month, we implied that there was a relationship between electrical current, voltage and resistance. This month we shall show what this relationship is but first of all let us see the effect of controlling an electric current with a resistor, and then talk a little about resistors themselves.

To do this we shall have to be a little in advance of our knowledge of the workings of an electronic component called a potentiometer. This does not matter provided one realises that it is only a device for controlling the electrical resistance of a circuit. We have built four such potentiometers into the Demo Deck; now is the time to start making use of this piece of equipment.

EXPERIMENT

We shall start by controlling the brightness of a bulb using a potentiometer. This is a technique that most people understand in practice but may not fully understand in principle. First connect up the simple circuit shown in Fig. 1. This uses the battery B1, the potentiometer VR1 (which has a value of 100 ohms) and the lamp LP1. Ensure that the battery is 9V (i.e. two 4·5 volt batteries connected in series) and that the lamp is a 6 volt 0·06 amp type.

No soldering is needed at this stage. Simply cut some insulated wires to length, strip off about a quarter of an inch of insulation from each end and interconnect the terminals of the Demo Deck. Before making the final connection make sure that the knob of VR1 is turned fully anticlockwise.

When this connection is made the lamp should light up, but only dimly. If the knob of VR1 is now turned clockwise the lamp will brighten. By turning the knob we are in fact reducing the resistance of VR1. The lamp needs an electric current of 0·06 amp to flow to light up to its brightest level. The lamp itself has a resistance to the flow of current and is so designed that when it is connected across a battery of 6 volts this is the current that flows.

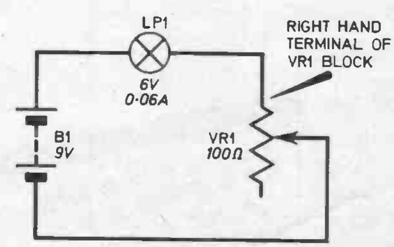


Fig. 1. Circuit diagram for illustrating the current flow through a bulb. VR1 controls the brightness of the bulb.

By introducing VR1 into the circuit we are increasing the total resistance and even though we are operating from a higher voltage, i.e. 9V than the bulb should be run from, we are not allowing the necessary 0·06 amp to flow. As we reduce the value of VR1 we allow more and more current to flow, until the resistance of VR1 becomes zero. At this point maximum current will flow, which, incidentally, will be greater than that which should be allowed to flow through the lamp because we are operating from 9V instead of 6V. If the bulb is allowed to run at this full current for too long it will "blow". You are therefore advised to carry out the experiment with some discretion.

UNITS OF RESISTANCE

Electrical resistance is measured in units called ohms. Because of the wide range of currents we come across in electronics from amperes to millionths of an ampere, it should, even at this stage seem reasonable to expect that resistance values range from ohms to millions of ohms. This is indeed the case. Because we shall frequently be referring to resistance value in diagrams, we use the symbol Ω (omega) to represent "Ohm" and to save writing large numbers of zeros (which could lead to errors) we use abbreviations to denote thousands and millions of ohms. One thousand ohms would be written 1kΩ (k standing for kilo). When speaking we say "one kay"; 120,000 ohms would be 120 kilohm. The abbreviation for a million is M (mega); 2,200,000 ohms would be written 2·2 Megohm and would be stated as "two point two meg".

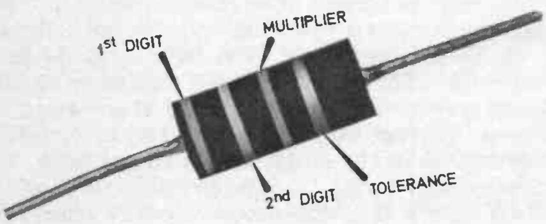


Fig. 2. A carbon composition type resistor showing international colour coding used to identify the values of such resistors.

COLOUR CODE

Due to the small size of ¼ watt and smaller carbon resistors, it is impracticable to print values on the body. To indicate the ohmic value and tolerance of a resistor a colour code, known as the international colour code, has been devised and is given in Table 1. Due to its versatility it is used on all carbon resistors.

Usually there are four coloured bands on the resistor body, the first three indicating the ohmic value and the fourth band giving the tolerance limit. The code should be read starting with the band nearest to the end of the resistor body (usually the other end has a metallic, gold or silver, band).

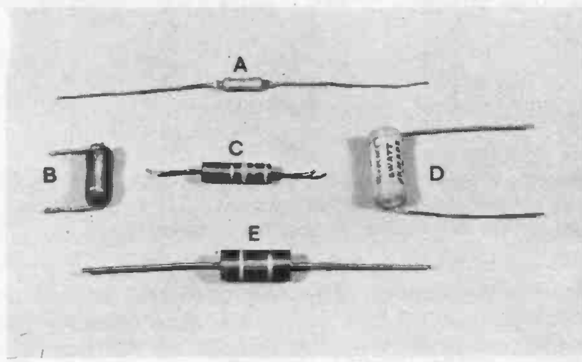
The first band gives the value of the first digit, the second band gives the second digit whilst the third band gives the multiplying constant, or more simply, the number of zeros to place after the first two digits. The fourth band indicates the tolerance, see Fig. 2.

Table 1: RESISTOR COLOUR CODE

Colour	Digit (1st 2 bands)	Multiplying Factor (3rd band)	Tolerance ± per cent (4th band)
Black	0	1	—
Brown	1	10	1
Red	2	100	2
Orange	3	1000	3
Yellow	4	10,000	4
Green	5	100,000	—
Blue	6	1,000,000	—
Violet	7	10,000,000	—
Grey	8	100,000,000	—
White	9	1,000,000,000	—
Gold	–	0·1	5
Silver	–	0·01	10

No fourth band indicates a tolerance of ±20 per cent

If the third band is a metallic one, i.e., gold or silver, then the multiplying factor is less than unity, 0·1 and 0·01 respectively. Therefore, when the third band is gold, divide the first two digits by 10. If it is silver divide by 100.



Various types of resistor: (A) high stability (B) low value (C) and (E) carbon composition types (D) high wattage wire wound.

PREFERRED VALUES

Because of the wide range of possible values of resistors, an international standard of "preferred values" has become universally accepted. These values are based on the following grid of numbers:

1·0	1·5	2·2	3·3	4·7	6·8
1·1	1·6	2·4	3·6	5·1	7·5
1·2	1·8	2·7	3·9	5·6	8·2
1·3	2·0	3·0	4·3	6·2	9·1

The values may be the above numbers expressed directly as ohms or as any multiples of ten of these numbers.

It is very difficult to make a resistor having exactly one of these values and so all resistors have a tolerance to their actual value. Usual tolerances are ±20, ±10 and ±5 per cent (%).

VARIABLE RESISTORS

We have already experienced the use of a variable resistor—in actual fact we used a device which in electronics is more commonly called a potentiometer. The difference between a variable resistor and a potentiometer is that the former has only two connections, one to the end of a resistive strip and the second to a wiper that is made to traverse the resistive strip, usually in a circular path. The potentiometer has three terminals one to each end of the resistive strip and the third to the wiper. Fig. 3 shows the circuit symbol for potentiometers.

One can come across a range of values of potentiometer very similar to fixed resistors and again, power dissipation has to be specified. Usually ½ watt devices are used and these are certainly the least expensive but power ratings can go as high as 5 watts in quite everyday circuits.

Tolerance does not usually matter a great deal with variable components, but an important feature of a potentiometer is its "Law". A linear

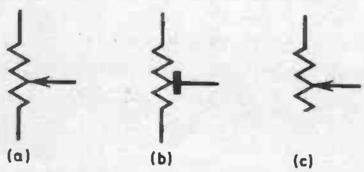


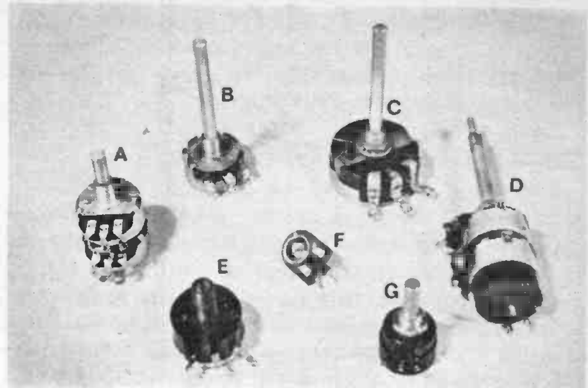
Fig. 3. Circuit symbols for (a) spindle type (b) preset potentiometers. Diagram (c) is what should really be termed a "variable resistor".

law potentiometer (usually referred to as a "Linear pot") has a resistance that changes in exact proportion to the degree of rotation of the shaft; a logarithmic device ("Log pot") has a resistance that increases logarithmically with the degree of shaft rotation. This type of potentiometer is most usually encountered when used as a volume control, because there is a logarithmic relationship between the sensitivity of the ear and electrical signal that produces the power in the loudspeaker.

There are two physical types of potentiometer; one is a manually controlled device for use with a knob, and the other is a preset device which is usually set up with a screwdriver.

In some circuits, particularly experimental ones, it may be found that a fixed resistor is called for, but the exact value cannot be accurately specified. In this case the designer may call upon a "skeleton preset" potentiometer. This is identical to a conventional preset potentiometer except that it is usually smaller and as the name suggests has no enclosure.

For the next stage you will be needing three fixed resistors, so see if you can work out the colour codes for the values and identify them. We need 1 kilohm, 10 kilohm and 22 kilohm.

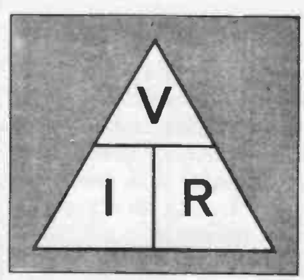


Different kinds of potentiometers: (A) ganged (B) and (C) general carbon types (D) ganged with on/off switch (E) T.V. type preset (F) skeleton preset (G) general wire wound.

OHM'S LAW

We shall now carry out a simple experiment to verify Ohm's Law. This is the fundamental relationship on which all electronics is based. While we promised the bare minimum of mathematics this is one simple piece which ought to be fully understood. We have already encountered Ohm's Law without realising it. It simply states that the magnitude of an electric current flowing through a resistor is directly proportional to the e.m.f. across the resistor. In mathematical terms I is proportional to V or $V = I \times R$ where R is the proportionality constant and is called the resistance.

Therefore by knowing two values, say V and R we can calculate I. Knowing I and V we can calculate R. The triangle below is a simple way of remembering Ohm's Law.



$$R = \frac{V}{I}$$

$$V = IR$$

$$I = \frac{V}{R}$$

V is measured in volts
I is measured in amperes
R is measured in ohms

These units must be used otherwise you will obtain wrong answers from your calculations.

VERIFICATION OF OHM'S LAW

Let us show that the current flowing through a resistor is exactly inversely proportional to the value of resistance for a given voltage. Ensure

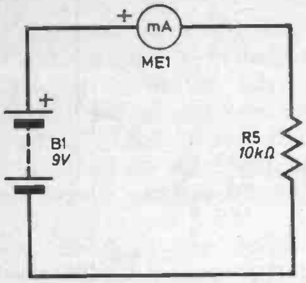


Fig. 4 (a). The circuit used to verify Ohm's Law.

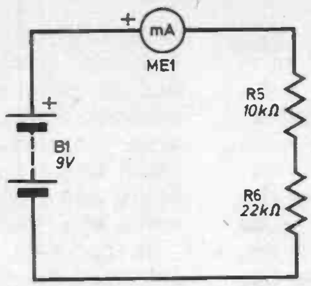


Fig. 4 (b). Resistors in series.

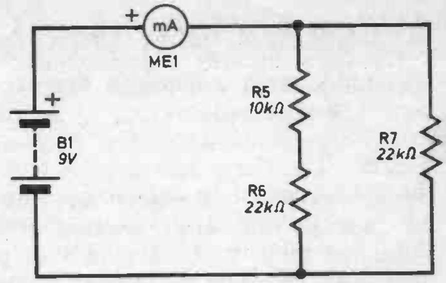


Fig. 4 (c). Resistors in parallel.

that B1 of the Demo Deck is set for 9 volts and connect a 10 kilohm resistor between two terminal lugs by careful soldering (only solder the resistor by the ends of the wires so that it may be re-used later). Now connect the resistor, battery and meter in series according to the circuit diagram of Fig. 4(a). Note that we have now introduced a symbol ME for the meter. For the purpose of this experiment we can ignore the fact that the meter has a resistance of its own. Use a meter with a full scale deflection of 1mA.

Provided that you have connected the meter the correct way round (the positive terminal connected to the leg of the circuit which is closest to the positive terminal of the battery), the meter should show a reading. The meter should read approximately 0·9mA (1mA is 0·001 amperes and is referred to as 1 milli-amp). Remember that all components have a tolerance and that the output voltage of a new battery is always nominally high therefore do not expect to get an exactly similar reading. Therefore we can say that an e.m.f. of 9 volts across a 10 kilohm resistor will force a current of 0·9mA through the resistor: we could have calculated this by Ohm's Law,

$$I = \frac{V}{R}$$

$$I = \frac{9}{10{,}000}$$

$$= 0{\cdot}0009 \text{ amperes or } 0{\cdot}9\text{mA}$$

We can now carry out a simple but very significant experiment by working the equation backwards thus finding out the value of unknown resistors.

RESISTORS IN SERIES AND PARALLEL

Connect a 10 kilohm and 22 kilohm resistor in series and measure the current when they are placed in the circuit shown in Fig. 4b. The current measured should be approximately 0·28mA. Using Ohm's Law, calculate the effective resistance of both resistors in series.

Obviously it is

$$R = \frac{9}{0{\cdot}00028}$$

$$= 32{,}000 \text{ ohms or } 32 \text{ kilohm.}$$

We could have arrived at this result simply by adding the values of the two resistors together. The rule for calculating the total resistance of any number of resistors in series is

$$R_{total} = R1 + R2 + R3 + \text{etc.}$$

Leaving the 10 kilohm and 22 kilohm resistors in series, now connect a third resistor of 22 kilohm in parallel across both as shown in the circuit of Fig. 4c. Now what is the total resistance of the three resistors? First of all measure it experimentally: the current should be approximately 0·69mA giving, using Ohm's Law, a resistance of 13 kilohm. Obviously the relationship is not quite so simple as it was with series resistors, nevertheless it is fairly straightforward. The rule for calculating the total effect of resistors in parallel is

$$\frac{1}{R_{total}} = \frac{1}{R1} + \frac{1}{R2} + \frac{1}{R3} + \text{etc.}$$

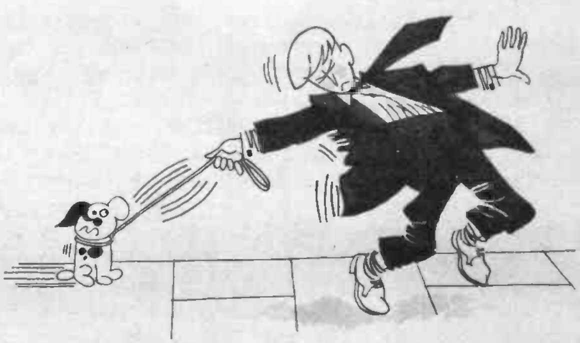
For the simple case of two resistors in parallel this simplifies to

$$R_{total} = \frac{R1 \times R2}{R1 + R2}$$

In our case the resistance of the two resistors in series is 32 kilohm therefore (if we work in thousands of ohms)

$$R_{total} = \frac{32 \times 22}{32 + 22} = 13 \text{ kilohm}$$

Next Month: Building a simple voltmeter on the Demo Deck, and a discussion on power in electronic circuits.



A simple m.w. reflex circuit receiver. Easy to build, with a modern design case.

THIS receiver contains no coils or chokes except the aerial winding which has been designed to be made as easily as possible. The resulting receiver is simple to construct and must be considered one of the best designs published for the inexperienced home constructor.

Providing the Veroboard layout drawing is followed carefully and the aerial wound as described the Astron should work "first time" without any instability or tuning problems.

The Astron employs four transistors, the first transistor being used in the reflex mode. This enables one transistor to do the work of two and hence much more gain can be obtained than is normally possible. The performance is not to the same standard as that of a superhetrodyne but is adequate for the reception of local stations. Operating the receiver in the London area the three medium wave B.B.C. stations could be received together with Radio Luxembourg and some continental stations during the hours of darkness.

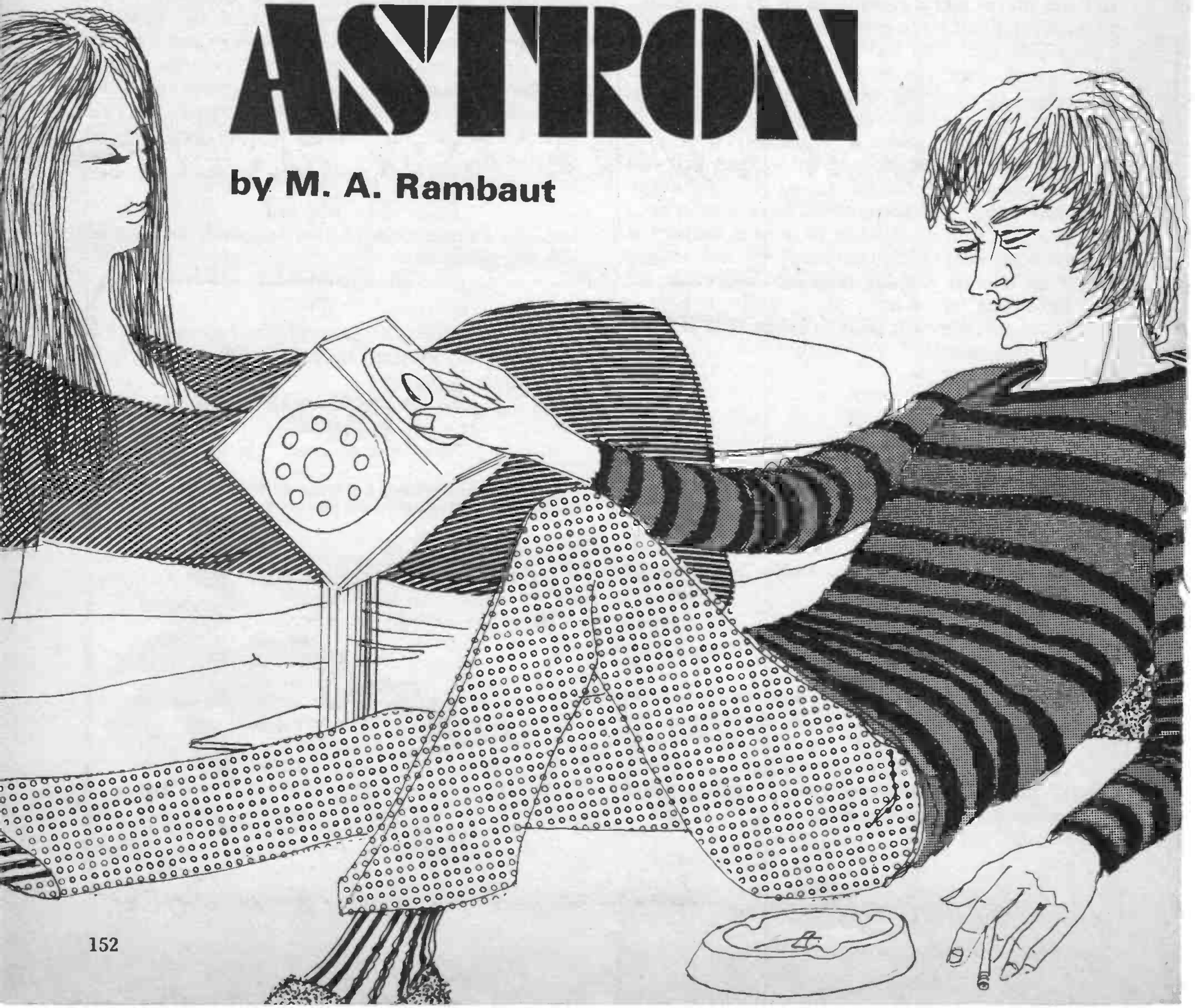
In the past many reflex designs have been published but the majority require complicated, and other hard to get components.

Approximate cost of components

£ 3:00 excluding case

ASTRON

by M. A. Rambaut



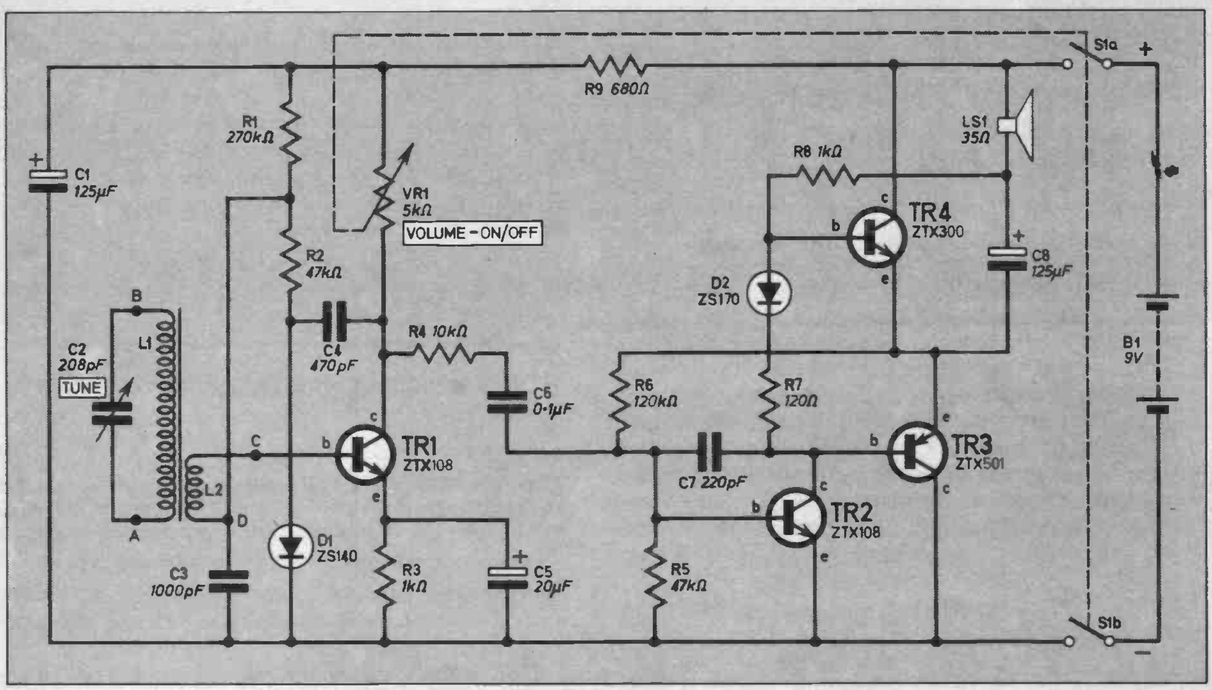
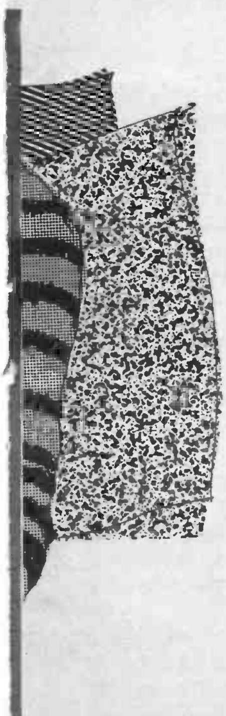


Fig. 1. Circuit diagram of the Astron m.w. receiver.

NEW LOOK SIMPLE M.W. RECEIVER



Components....

Resistors

R1 270kΩ
R2 47kΩ
R3 1kΩ
R4 10kΩ
R5 47kΩ
R6 120kΩ
R7 120Ω
R8 1kΩ
All $\frac{1}{4}$W ±10% carbon

Capacitors

C1 125μF elect. 16V
C2 208pF variable
C3 1000pF
C4 470pF
C5 20μF elect 16V
C6 0·1μF
C7 220pF
C8 125μF elect 16V

Semiconductors

TR1 ZTX 108 silicon *npn*
TR2 ZTX 108 silicon *npn*
TR3 ZTX 501 silicon *pnp*
TR4 ZTX 300 silicon *npn*
D1 ZS 140
D2 ZS 170

Miscellaneous

VR1 5kΩ log carbon potentiometer with d.p.s.t. switch (S1)
LS1 $3\frac{3}{8}$ inch 35Ω loudspeaker
B1 9V battery (PP3 type) and connector
L1 formed from 90 turns of 28 s.w.g. enamelled copper wire
L2 formed from 8 turns of p.v.c. covered 7/0076in connecting wire
6 inch ferrite rod, $\frac{3}{8}$ inch diameter
Connecting wire, Veroboard 2in x 3in x 0·1in matrix, materials for case (see Fig. 5 and text)
4BA fixings
A kit of Perspex parts for a similar case to that described, including turned knobs, is available from KASPEX (mail order only).

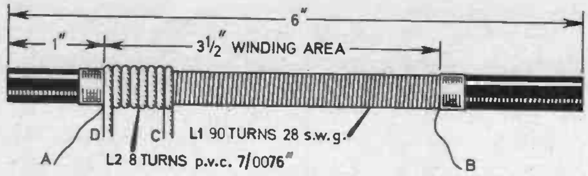
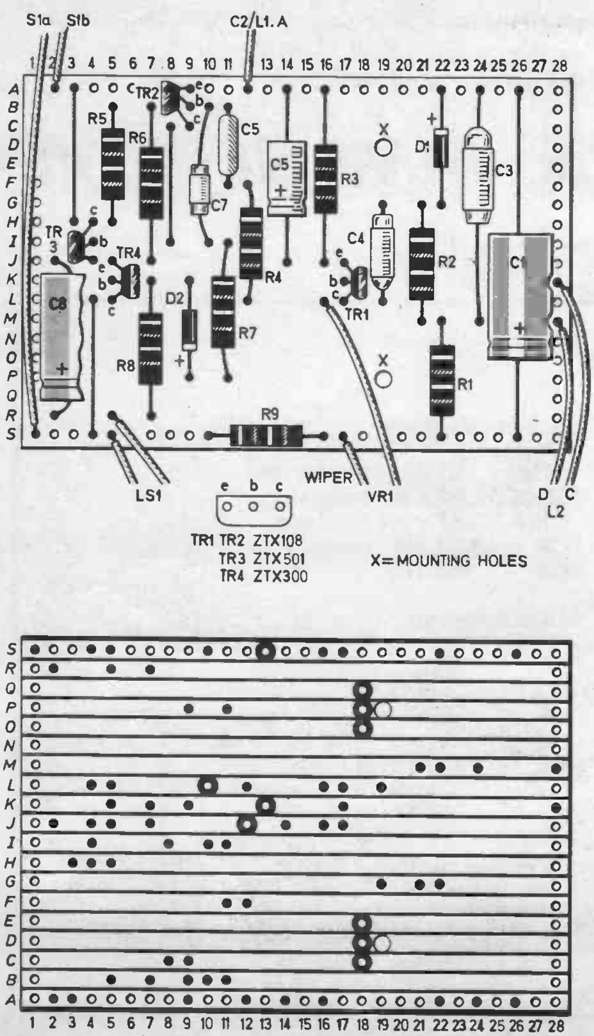


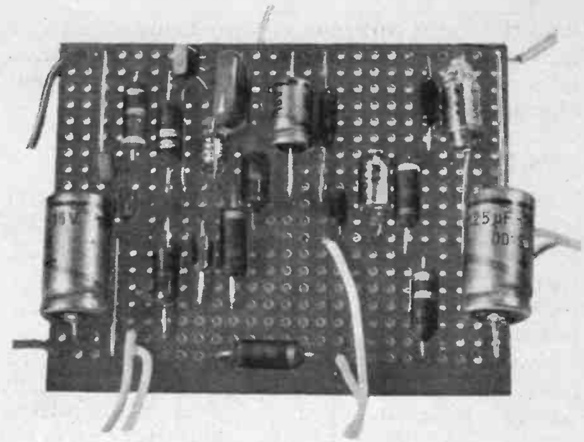
Fig. 2. Detail of aerial coil on ferrite rod.

CIRCUIT DESCRIPTION—First Stage

The signal is picked up by the ferrite rod aerial and tuned by the tuned circuit C2, L1 Fig. 1. it is then coupled from the tuned circuit to the first transistor TR1 by L2. This allows the high impedance of the tuned circuit C2, L1 to be matched to the low impedance of the transistor input without damping the tuned circuit and losing selectivity and gain. Transistor TR1 then amplifies the signal and feeds it to the detector circuit containing D1.

Fig. 3. Veroboard layout and wiring, showing both sides of the board.





The top side of the Veroboard showing all the components mounted in position ready for connection to the other components shown in Fig. 4.

The 470pF capacitor C4 is a much lower impedance to the r.f. (radio frequency) than the 10 kilohm resistance R4 hence the signal tends to go through the capacitor. The a.f. (audio frequency) component now left after detection by D1 is passed through R2 and L2 to the base of the first transistor; C3 helps to filter out any residual r.f. The signal is now amplified for the second time by TR1. This time the a.f. signal sees C4 as a high impedance compared with R4 and so the signal current flows to TR2 base.

AUDIO STAGE

Transistors TR2, TR3 and TR4 make up a push-pull amplifier, TR3 and TR4 are a complimentary output pair and TR2 is the driver. The signal is amplified by TR2 and the positive cycles of the audio signal are fed through TR4 via D2 and the negative cycles are fed through TR3. The two signals recombine at C7 after amplification, giving the output signal. This is then fed to the loudspeaker LS1.

THE DIODE

Diode D2, R7 and R8 set the standing or bias current in the output stage and R5 and R6 set the working point and gain of the stage. Capacitor C6 removes the residual r.f. component from TR1 output waveform. Resistor R9 and C1 smooth out variations in supply voltage caused by large a.f. currents in the output stage so preventing low frequency feedback and possible oscillation.

The volume control VR1 works by adjusting the load on TR1; if there is no load resistance then the collector is connected to the supply voltage and cannot swing up or down in voltage with varying collector current. The larger the load the more collector voltage swing is possible in theory, but in practise the load is limited because distortion occurs due to non-linear characteristics of the device.

WINDING THE AERIAL

Most people do not like winding coils and many are put off building a radio simply because of this. The drawings and photograph show clearly how the aerial coils in the Astron are wound and the winding should not present any problems.

Take the ferrite rod and mark where the coil has to go (Fig. 2.). Wind on one turn of plastic adhesive tape just outside the winding area and then reverse the tape so that the adhesive side is on the outside. Continue to wind on enough tape, inside out to cover the winding area, finish by reversing the tape for one turn to secure it to the rod. The primary (L1) is now wound on, the reversed adhesive tape holding it in position.

Simply hold one end of the 28s.w.g. enamelled copper wire and wind 90 turns around the rod trying to keep a small space between each turn. Do not worry if some turns touch each other but try not to get any turn on top of previous turns. When all 90 turns are in place wind one turn of adhesive tape around each end to hold the coil. The wires at each end should be left about 6 inches long so that they can be connected to the board.

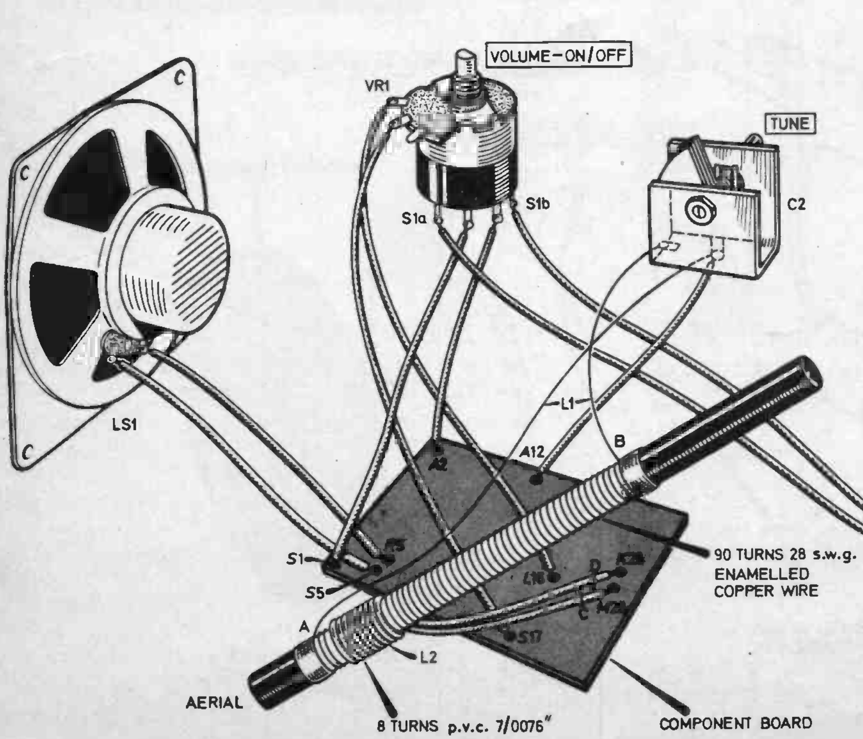
Next wind on the secondary (L2) on top of L1. L2 is wound in the same direction as L1, using p.v.c. covered seven strand wire (the type normally used for connecting up wire); this wire is called 7/0076 inch p.v.c. covered. Starting at the earth end of the previous winding put on 8 turns of this wire keeping each turn tight and close together. Leave about 4 inches of wire at each end to connect to the Veroboard and tie a knot or twist these wire ends together to hold the coil.

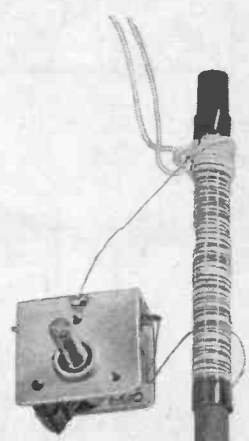
CIRCUIT BOARD

With the aerial wound the components can be mounted on the Veroboard. The board shown in Fig. 3. is cut to size and drilled for mounting holes before the copper strips are cut away as shown. Mount all components and flying leads except the transistors and leads to L2. Next check for correct polarities and positions and then mount the transistors, if in doubt about your ability to solder transistor leads quickly and cleanly use a heat shunt on the leads.

The next stage is to wire the board to the remaining components as shown in Fig.4, but do not place them in a cabinet yet. Finally check the circuit and connect the battery observing correct polarity, switch on the receiver, turn the volume fully up and listen for a hissing sound that will show that the output stages are functioning. Slowly tune C1 using a plastic knob

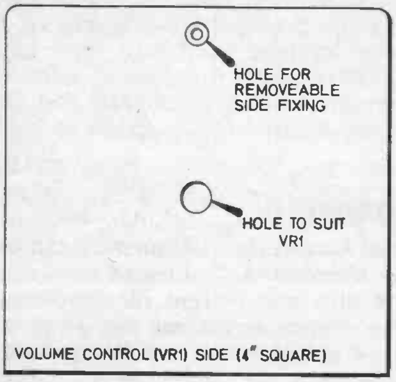
Fig. 4. Wiring diagram of the components of the Astron. The parts are shown in their relative positions as they are mounted in the case.

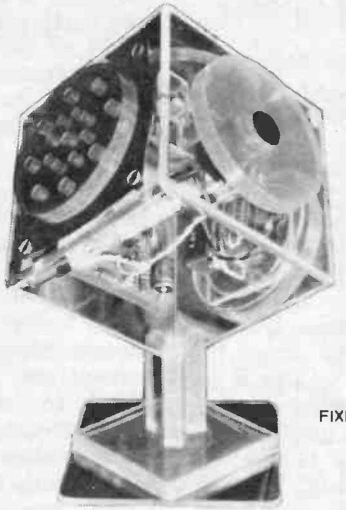


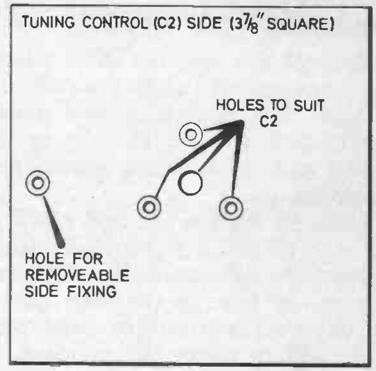


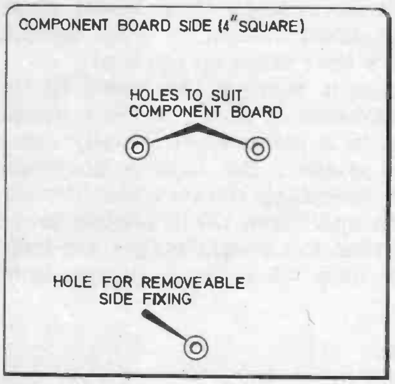
Photograph of aerial and tuning capacitor.

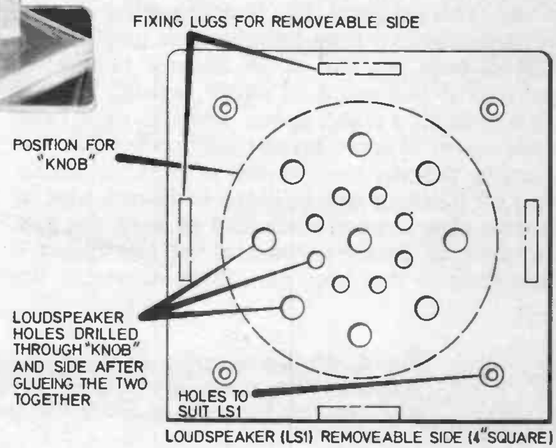
ASTRON



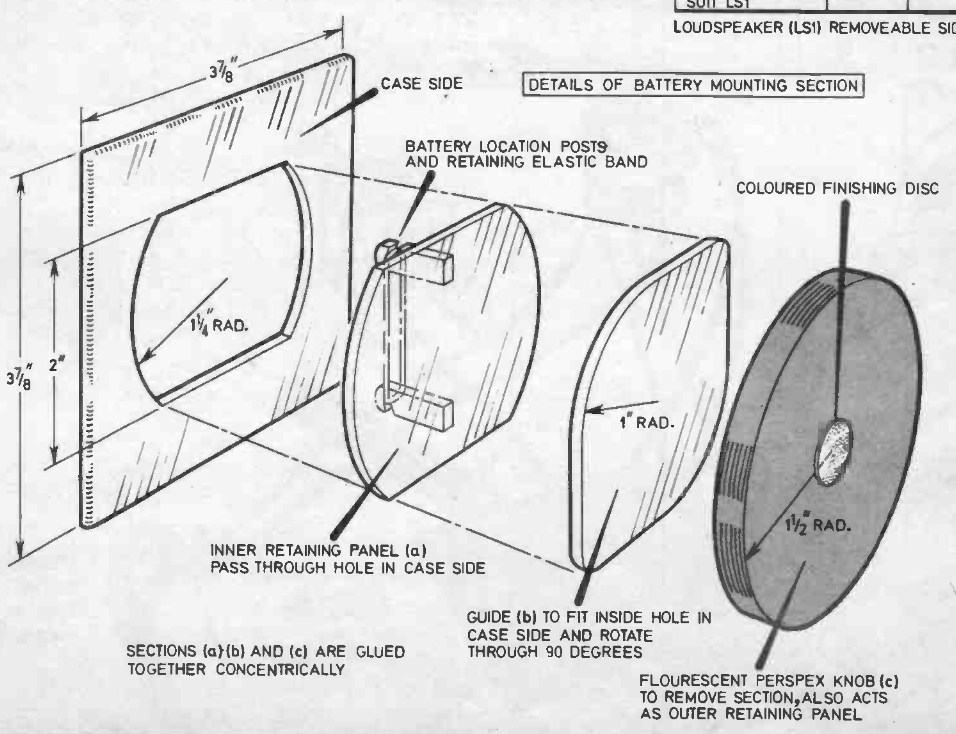








DETAILS OF BATTERY MOUNTING SECTION



until a station is heard and revolve the aerial for maximum output. If all is well the receiver can be set aside and the cabinet constructed. If the receiver fails to operate this is probably due to a wiring fault or a damaged transistor.

CABINET

The cabinet shown in the photograph is a cube of 4 inch side made entirely from Perspex. Fig. 5. shows the basis of construction of the case which consists of four squares of $\frac{1}{8}$ inch thick perspex each having 4 inch sides and two squares of $\frac{1}{8}$ inch Perspex having $3\frac{7}{8}$ inch sides.

In the prototype a section of one side was made removable for battery replacement, drawings of the construction of this section are shown in Fig.5. The side housing the loudspeaker was also made completely removable for insertion of the receiver parts and servicing; this side is held by four countersunk 4BA screws.

All sides should be cut and filed to shape with all mounting holes cut and cleaned up before assembly. The case is glued together using chloroform or polystyrene cement as used for model making. When the five fixed sides have been glued up the sixth side should be fixed with screws—the nuts can be held on the flanges using Evostick—and all corners rounded, using a file and polished with emery paper and metal polish; Solvol Autosol polish is very useful for this purpose (obtainable from motor accessory shops).

The prototype "knobs" are made of 3 inch squares of $\frac{3}{8}$ inch thick fluorescent Perspex. these were turned to form a disc on a metal turning lathe, $\frac{1}{4}$ inch holes through the centre of each disc can be used with suitable bolts to hold the material. An $\frac{1}{8}$ inch by $\frac{5}{8}$ inch diameter recess should be made in the centre of one side of one knob for the volume control nut. Four "knobs" are used, one for volume on/off, one for tuning, one stuck over the speaker with holes drilled through it and the fourth for the battery section.

The tuning knob is made a tight fit on the tuning capacitor C1 by indenting the spindle with a large pair of pliers (the cutting part is useful for this) and twisting the knob on. A similar fixing can be used for the volume control unless the spindle is made of plastic. In this case file a flat on the spindle—if it does not already have one—and glue a small "flat" (made of Perspex) in the hole, carefully file the flat on the spindle until the knob will just press tightly on to the spindle.

Fig. 5. (opposite), The case in part form. The base and plain side are not shown. The plain side is 4in square and has one hole for the removeable side fixing.

MATERIALS: $\frac{1}{8}$ inch thick clear Perspex for all sides, sections (a) and (b), fixing lugs and lower part of base. $\frac{3}{8}$ inch thick fluorescent Perspex for knobs (4 off), upper part of base and mounting pillars (3 off).

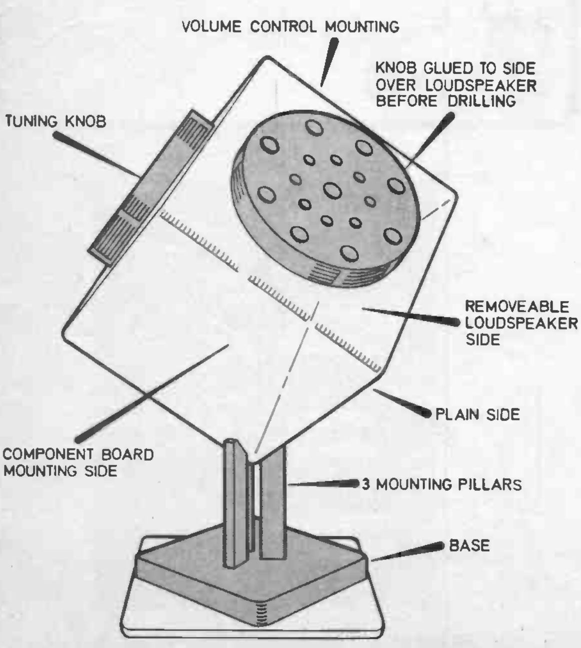


Fig. 6. The complete case.

STAND

The stand is made from a 4 inch square of $\frac{1}{8}$ inch Perspex, a 3 inch square of fluorescent $\frac{3}{8}$ inch Perspex and three 2 inch long fluorescent Perspex pillars, $\frac{3}{8}$ inches square. The three pillars are filed at an angle at one end so that each fits against one side of the cube which is "standing" on one corner Fig. 6. Filing this angle is rather difficult but with care and patience the resulting stand will be sturdy.

When glueing the sections it is best not to polish the edges to be glued. It was also found that the edges of the fluorescent Perspex give an orange hue if not polished, but this will disappear if they are polished. The three stand pillars were polished so that their four sides look the same, but the edges of the knobs and stand were not; the front cover illustration shows the effect of this.

Once the cabinet is finished all the parts can be mounted as shown in Fig. 4. and the connecting wires cut to the correct length and soldered up. Make sure that the loudspeaker will clear the aerial, if it will not, carefully file the ends of the aerial so that it fits deeper into the case. Foam rubber pads at the ends of the aerial will prevent it moving around in the case. Small coloured discs of sticky backed fabric placed over the spindle ends will finish the knobs neatly.

The Electro Laugh

by Gerry Brown

Although originally designed as a laughter simulator, this device can also be used as an electronic bell or in any other alarm system requiring an audible output.

As the title implies, this device produces a kind of electronic laughter. At the early paper stages of the design, the device represented only quite a small challenge but as the idea progressed it was not long before it became evident that even such an ostensible simple sound such as a laugh is fairly difficult to achieve.

BASIC DESIGN

Before the device can operate at all, it must obviously have some kind of a "voice." This is provided by a simple audio oscillator of frequency about 1kHz; but this must be modified in some way to make it resemble laughter. See Fig. 1.

Unfortunately, there isn't a "standard laugh" that we can model our electronic replica on, so the choice must be an average of many types.

On analysis, most laughter seems to begin at a given point in the audio spectrum, and fairly rapidly drop to a frequency about an octave or so below, rather like a football cheer in reverse. This kind of sound (musically known as a glissando) can easily be produced using the output voltage from a simple integrator driven from a low frequency square wave oscillator to vary the frequency of the voice generator. In our device this is referred to as the "reversed-cheer" generator.

Also, most laughter in addition to displaying the reversed-cheer, interrupts this characteristic in short bursts, each burst causing a sort of warbling effect on the already frequency diminishing signal. To achieve this an additional oscillator, the "giggle-generator" is employed. The "giggle-generator" constantly switches the frequency of the "voice-generator" from one fixed point in the voice spectrum to another.

Under operating conditions, the voltage from the integrator section of the "reversed-cheer" generator will be rising and falling, resulting in a corresponding rise and fall in the pitch of the voice, but if preferred, the rising portion

Approximate cost of components

£2·00

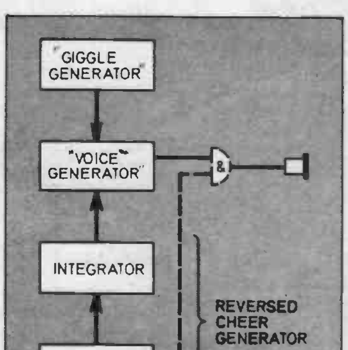


Fig. 1. Schematic diagram of the Electro Laugh. The "banking gate", shown dotted, may be connected to produce a different kind of laughter.

Components....

Resistors

R1 2·2kΩ
R2 22kΩ
R3 22kΩ
R4 2·2kΩ
R5 2·2kΩ
R6 10kΩ
R7 10kΩ
R8 2·2kΩ
R9 2·2kΩ
R10 4·7kΩ
R11 1kΩ
R12 1kΩ
R13 4·7kΩ
All $\frac{1}{4}$W ±10% carbon

Capacitors

C1 100μF elect. 12V
C2 100μF elect. 12V
C3 10μF elect. 12V
C4 39μF elect. 12V
C5 250μF elect. 12V
C6 0·33μF
C7 0·15μF

Transistors

TR1-TR6 2N2926 (orange) Silicon *npn* (6 off)

Miscellaneous

TL1 Earphone 100-250Ω impedance
S1 Single-pole push-to-make switch
B1 12V battery, 2 x PP1 (6V) or equivalent, plus suitable battery clip
Miniature plastic preserves container
Veroboard: 2$\frac{3}{8}$ x 2$\frac{3}{4}$ inch 0·1 matrix (23 x 37 holes)

of the tone can be inhibited by employing a blanking gate to control the voice-generator. The blanking gate is shown dotted in the schematic diagram, Fig. 1.

CIRCUIT OPERATION

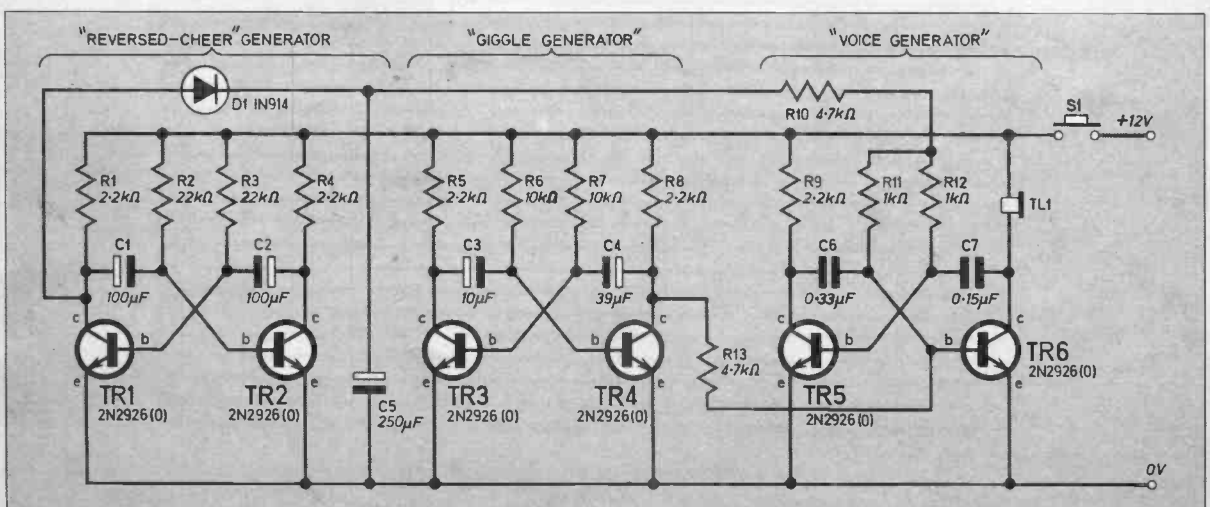
The Electro Laugh utilises three square wave oscillators, each employing an astable flip-flop. Apart from the circuit values which set the individual operating frequencies, circuit functions are virtually identical and only one flip-flop (multivibrator) need be described.

Consider the oscillator in the "reversed-cheer" generator circuit, Fig. 2. Upon initially switching on, we can assume that TR1 is conducting, and in this condition the collector side of C1 will be at almost ground potential. As a result C1, which will have already charged to nearly rail potential, will begin to discharge. At this time C2 will rapidly charge close to rail potential. When C1 has dicharged to approximately 0·6V (i.e., the V_{be} of TR2) TR2 will start to turn on, and due to the feedback between the two halves of the circuit, a rapid transition will occur resulting in TR2 turning hard on and TR1 turning off. The process then repeats as before with C2 discharging and C1 charging, until TR1 turns on again and TR2 turns off. This will continue indefinitely, or until the circuit is switched off.

The discharge rates of C1 and C2 are essentially set by the value of R2 and R3, while the overall time constant (1·4CR) determines the operating frequency. The charging times for C1 and C2 are reliant on the values of R1 and R4, which in general are small enough to be ignored.

During the time that TR1 is turned off, the positive potential at its collector is free to charge capacitor C5. The potential across C5

Fig. 2. The complete circuit diagram.



The Electro Laugh

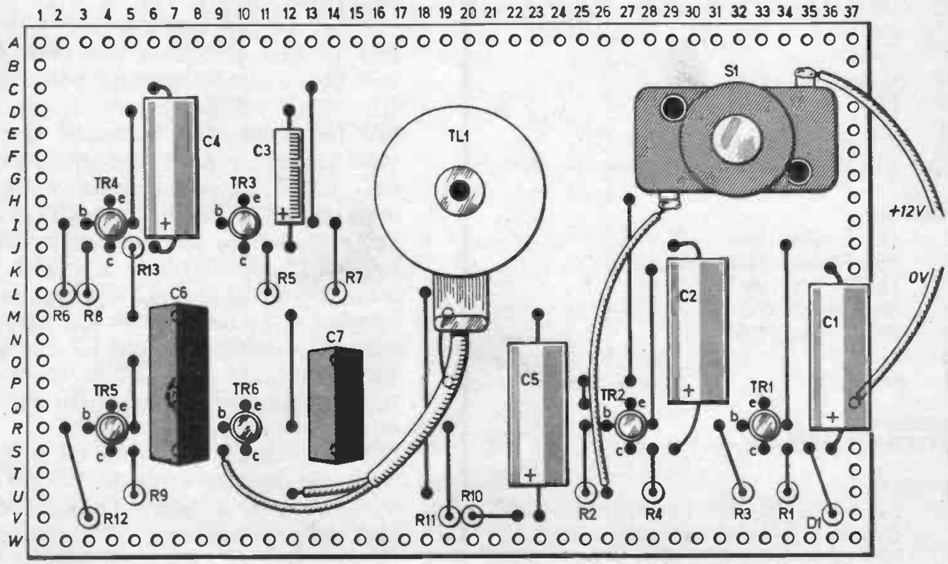


Fig. 3. The wiring of the components on the top side of the Veroboard.

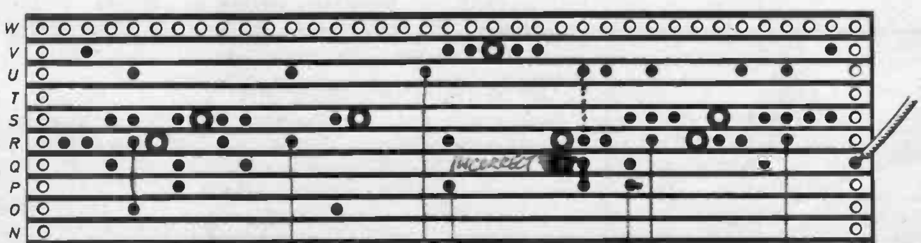


Fig. 4. The areas of copper strip to be removed.

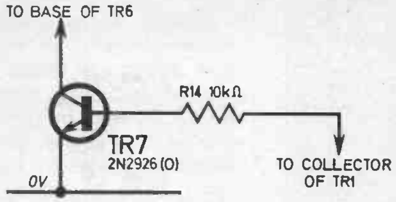


Fig. 5. The blanking gate.

thus rises towards rail potential while TR1 is in the non-conducting state. However, when it is the turn of TR1 to conduct, D1 is reverse-biased and C5 slowly discharges through R10, R11, R12, and the bases of TR5 and TR6. This process of charging and discharging C5, constantly alters the voltage points at which C6 and C7 (in the "voice-generator") begin their discharge. As a result the overall time-constant of this circuit is affected and, hence, the frequency of the output signal. Therefore, the rising (charging) potential across C5 does not result in a rising pitch.

The effect of the "giggle-generator" output is to momentarily swing the frequency of the "voice-generator" during the reversed-cheer characteristic. This is accomplished by coupling the collector of TR4, via R13, to the base of TR6.

CONSTRUCTION

The device is built on 0·1 inch matrix Veroboard which is shown in Fig. 3. During construction, all relevant breaks in the copper strips should be made prior to fitting components. It should be noted, too, that transistors and diodes are best mounted last in order to minimise damage from overheating while other components are in the course of being soldered into position.

The switch and earphone can be fixed in position by using an impact-adhesive such as Evo-Stik. The earphone used in the prototype sports a horn which makes it into a mini-loudspeaker. This is obtained as a ready-made item from a plastic preserves container. A hole should be drilled in the base of the container to accommodate the output nozzle of the earphone. The container should then be fixed in place with an impact-adhesive.

When the device has been constructed, all wiring etc., should be checked thoroughly before finally connecting it to the battery.

BLANKING GATE

If desired, a different laughter sound may be obtained by connecting in a blanking gate as shown in Fig. 5. With this in the circuit, the voice generator is prevented from functioning, by grounding the base of TR6, whenever TR7 is turned on. In other words, only the falling (discharging) action of the integrator on the "reversed-cheer" generator will be presented to the output.

CONCLUSION

At first sight this may seem a frivolous project, but it will give many hours of fun and enjoyment to all members of the family and can later, if desired, be used as an electronic "laughing" bell. ▣

MEMORY STORE

Retrieval By

John Watt

"NO laddie, an ohm is *not* the place where a volt lives!" my RAF sergeant instructor said to me—something I knew already, but he had to get his little jokes in.

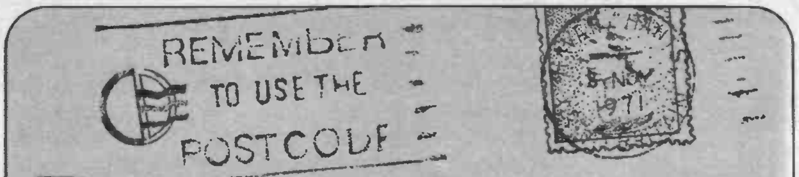
In point of fact, he wasn't a bad bloke (for a sergeant) and did teach me quite a lot of radio—or wireless as it seemed to be called then—and of course basic electronics and basic radio deal in much the same sort of techniques, and are just the sort of grounding that is so useful, no matter whether you are amateur or professional. With the evening classes to HNC standard that followed, I felt I had all the theoretical knowledge I needed and concentrated on practical construction thereafter.

Simultaneously, a number of friends expressed interest in audio—hi-fi *they* called it, but does anybody ever admit to lo-fi? (In any case, I always thought it was fidelity and infidelity). Anyway, I found myself testing and sometimes modifying what they had built. If you have such acquaintances this is a good way to start, for very often one can hear what is being done, in the absence of test equipment.

However, I can honestly say that I have never regretted spending money on test instruments and a small multirange meter, at least, should be in every constructor's kit.

Whatever you make though, should you wish to alter something, either in an attempt to improve the performance or just to get it working properly in the first place, do remember the Golden Rule—alter only *one* thing at a time, for t is then so much easier to determine what is happening and more important, why.

Do not imagine that everybody else has a large well equipped workshop for their constructional activities, like the professionals, while you, the poor struggling amateur, have to make do with one corner of the kitchen table. Put your foot down! Insist on *all* the kitchen table! Better still, even a small bench in a shed or garage (the car can stay outside if you get your priorities right), which can thus be left overnight with the latest "EE" project on it while building proceeds, will suffice; I use a corner of my house roof space, partitioned off with insulation board for winter warmth. If you can leave a particularly awkward piece of work for a few days undisturbed, it is surprising how easy it suddenly becomes on your return to it.



Readers Letters

Beginners Bits

Congratulations on your first issue! At last an electronics publication whose avowed philosophy is to interest and involve the beginner in this very important field of technology.

I don't know if it is your intention to start a correspondence column in your magazine, but perhaps you could advise me of the relative merits of different material and different shape soldering iron bits suitable for a beginners use. I have a soldering iron, but too large a bit for electronic purposes.

M. S. Peters
Thorne, Yorks.

Standard copper soldering iron bits are quite suitable for electronic work and most people prefer $\frac{1}{8}$ inch or $\frac{3}{16}$ inch chisel face types for general work. Iron coated, or various types of plated bits are available and these will last longer than the standard copper bit.

Rare Screwdriver

Not wishing to criticise your first issue, but I could not help noticing (on page 31) that a screwdriver with $\frac{3}{16}$ inch shaft and a 4 or 6 inch blade would be rather difficult to find. This I think should be the other way round.

However, I congratulate you on this excellent magazine which I feel caters for beginners, like myself and also people more advanced in the hobby.

Wishing you the very best of luck.

C. M. Thompson
Cheltenham, Gloucs.

Contents

Your new magazine is welcome indeed to fill the need of amateur constructors. I think I express a common feeling of hope, that its contents will not be too professional, its constructional projects not too big or complex, and its news not concerned with sophisticated radar systems supplied to Middle East Shieks. All this should be left to big brother, *Practical Electronics*.

Regular readers of any magazine like to hear of other readers experiences, and difficulties, so failing space for readers letters why not a chatty column commenting and answering extracts from readers letters?

Is it not possible to contrive some "big" breakthrough on the advert scene? Not only are they nearly the same every month, but the same as all the other monthlies as well! This greatly reduces any inclination to take both of your magazines. I feel sure there must be immense difficulties, however—probably insurmountable.

I wish EVERYDAY ELECTRONICS lots of success.

Vincent S. Evans
Parbold, Lanc.

We hope that this page will fulfill your first requirement. Advertisers please note the second!

Too Fast

I must start by apologising for criticising your first edition but as the magazine is supposed to cater for the beginner, perhaps you will bear with me, as I am just that, an absolute beginner in the field that your magazine is intended for.

I started, as suggested by the article *Component Buying and Supplying*, and ordered a catalogue for 70p, and ran into difficulty as soon as the catalogue arrived. I was unable to positively identify the components required for the *Demo Deck*.

The first snag was the perforated board as there is none listed as quoted under components required, and my local dealer could only find packets of strip in his catalogue with the matrix size quoted.

Secondly, the M.E.S panel mounting lamp holders are quoted in various sizes and require the lens colours to be stated when ordering, and this is not given in your magazine.

Finally there are no $3\frac{3}{8}$ inch speakers listed in the catalogue, and again my local dealer said this was an awkward size, and asked for alternatives. As I was unable to quote alternatives I asked him to order it for me. And apart from a gloomy forecast of a fortnight's delivery, he said the firm concerned were rather expensive to deal with.

Hoping this will be considered constructive.

D. Pratley
Innsworth, Gloucs.

First the bouquet: congratulations on producing a magazine filling an obvious gap. As a complete beginner I just did not know where to start. This first issue seems to fill the bill. Please keep up this high standard.

Now the brickbats: as already stated, I am a complete beginner. In your *Teach-in* you quote components for the *Demo Deck* as follows:

1 Veroboard 0·25 inch matrix (from reading advertisements are we to assume this should have been 0·15 in matrix?) Also no indication of board size (1 sq. inch or 10 sq. feet?).

2 Milliamp meter (SEW MR38P or similar). But what range? The SEW adverts quote ranges from 1mA to 10 amp.

Could you please put me right on these points and then I can order the components to construct the *Demo Deck*.

A. Bryan
Flintshire, N. Wales.

Firstly, the list published in our first issue was only a short advanced list—as you will now know, we published a comprehensive list in the Demo Deck *article last month. One point that has come to light is that R. S. Components Ltd. now quote the matrix size for the board as 6·33mm instead of 0·25 inches (the board is not Veroboard). Since this board is sold in standard size ($6\frac{3}{4}$in $\times$ $5\frac{1}{4}$in) we did not give dimensions. We quoted 1 one milliamp meter—that is a one-millamp range. You could use any small 35 ohm loudspeaker for the* Demo Deck.

A two week delivery date is by no means unusual for electronic components and this is one reason we published the advanced list, however two weeks is much longer than the normal delivery time from R. S. Components Ltd who operate a same day return

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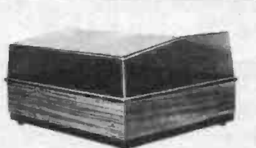

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Black Box

I am writing to congratulate you on your initiative in starting the new magazine EVERYDAY ELECTRONICS. I am particularly impressed by the way you give information which will be of interest and help to beginners in their future studies of electronics, as well as details regarding the construction of various projects.

If I may make a suggestion regarding the article on the record player by Mr. E. Pusey, I think that it would have been more helpful to beginners if the integrated circuit had not been treated as a mysterious black box.

Whilst it may not have been necessary to give the full circuit diagram, I think it would have been better if a block diagram of the amplifiers used in this integrated circuit had been given and shown connected to the pins. In this way, even if only input and output connections to individual amplifiers were shown, I am sure this would have been more helpful to the beginner, and by showing how basically simple they are, possibly encourage them to experiment further with integrated circuits.

However, I hope you will not take these suggestions amiss, as I think you have started a first class magazine which is ideal for beginners in electronics. I am sure that many people who thought this interesting hobby far beyond them will now realise that if approached systematically, it is just as simple as any other hobby —and more fun!

Cyril Bogod B.A.E.C.
Penarth, Glam.

Colour Sequence

I am writing to you about an article in EVERYDAY ELECTRONICS November, 1971.

The article is the *Snap Sequence Indicator*. It is shown that transistors 2N2926 are needed but when I looked up this component it was available in three different colours, green, yellow, and orange.

Could you possibly tell me which one I should use.

N. Sherwood
Scunthorpe, Lincs.

See Shop Talk.

Partial Control

I have just completed the construction of the *Windscreen Wiper Control* in accordance with the instructions contained in your first issue. Unfortunately the unit only works for half of the travel of the variable resistor.

The present variation in relay contact closing periods is from a minimum of seven seconds to a maximum of 20 seconds.

All the components used were as recommended with the exception of C4 for which the preferred value of 0·47μF was substituted.

I should be obliged for your suggestions as to the possible cause of the units malfunction.

R. Bacon
West Heath, Birmingham.

We have tried to simulate your fault on our prototype and we suspect that it is due to transistor leakage and RLA not being quite sensitive enough. Reduce R3 to 22 kilohms—this will slightly affect the timing range, mainly at the lower end, but should cure the fault.

Starting Again

I have recently purchased the first edition of EVERYDAY ELECTRONICS and on going through the pages I must admit the compilation is excellent — especially the enlarged diagrams.

It takes me back to the old catswhisker and crystal days but since the all-mains sets I have lost touch with components; electronics seems to have turned a complete cycle, back again to dry batteries.

Your *Beginners Brief* and *Teach-In* are very useful as it will keep me in touch with new parts and also help me pick up from where I left off.

Wishing you every success.

P. J. Brown
London, N.W.6.

Scottish Credit

Mr. A. Sproxton in his article on component buying mentions the bank credit gyroscheme. On inquiring at my own local bank I find that the issuing of forms and the writing of the order on the back of the said form is not known nor is countenanced. Perhaps the system as described by Mr. Sproxton applies only to England—or could Mr. Sproxton comment in his next article.

J. M. Neil
Lanarkshire.

I am sure you have been wrongly informed. We frequently receive orders written on the back of credit transfer forms issued by Scottish banks. In fact, Scottish banks are listed in a brochure "Bank Money Transfer Services" available from any bank.—Alan Sproxton.

Six Volt Cars

Whilst I must congratulate you on your first issue of EVERYDAY ELECTRONICS, I am disappointed that like many other practical journals, your projects for car owners are ignoring the many like myself who still have a 6 volt battery. May I beg therefore that you either give suitably modified circuits to operate from a 6 volt supply or alternatively a circuit for a 6 to 12 volt d.c. convertor.

This could perhaps have adequate output current to operate the *Windscreen Wiper Control* already featured plus a transistorised ignition system and tachometer which I hope you will also feature in due course.

One other item I personally would like to see covered, is a vacuum tube voltmeter, or its transistorised equivalent. This would be extremely useful for checking constructed items and general servicing.

R. T. Edwards
Herts.

Point taken; we will be looking at the needs of the 6V system, and some future projects may be aimed at the motorist whose car has a 6V supply.

Ruminations

continued from page 138

master. My attitude is quite illogical, I know; I accept, with gratitude, the thermostats and time switches that control the heating of my house and of my hot water, also the other automatic controls, of various kinds, in my home and car. Why should I resent the seat belt "watchdog"? Perhaps, because I believe that the human brain, combined with its encompassing body, forms the most wonderful, the most sophisticated, computer and control system that could ever be imagined. Electronic aids can be a great help to us, but must we surrender our responsibilities to them?

COMPONENT BUYING & SUPPLYING

No. 3 Contributors

Final article of a series
by Alan Sproxton, *Home Radio (Components) Ltd.*

. . . I trust the editor will forgive me if I just go back in time

I TRUST the editor will forgive me if I first go back in time, . . . since no writing on constructional articles would be complete without a reference to the one and only F. J. Camm. He was editor of innumerable publications, ranging from *Cycling* to *Movie Making* and including, of course, *Practical Wireless*. (I wonder by the way if readers know that F.J.'s brother Sir Sydney Camm designed the famous Hawker Hurricane, which shared honours with the Spitfire in the Battle of Britain!)

. . . he would find some valve or other at the bottom of his junk box

All the same, F.J's constructional articles used to drive us poor component suppliers crazy. He would find some valve or other at the bottom of his junk box and design a brilliant constructional article around it. The poor reader would build it carefully and then come to us to purchase the vital valve. We would listen to the customer with incredulity and say "*But Sir*—that valve was obsolete ten years ago!"

Another thing, F.J. would never use preferred values (probably there were none in his junk box) and it was quite useless for us to try and tell a customer that a 500 ohm resistor was unobtainable but that a 470 ohm resistor would do the job equally well.

Better Today

The situation is infinitely better today and writers of constructional articles are only too willing to check with us, the suppliers, that the items they wish to specify are available; and we for our part are only too pleased to assist them.

Even so projects sometimes go astray through no one's fault, and I call to mind two recent ones. One called for a "Maka Switch", and the other some Electroniques coils, and in each case the appearance of the articles coincided with the decision of the makers to cease making the required items. We have, as I mentioned in my previous article managed to resurrect the Maka Switch Kits and I'm even hopeful that we may eventually be able to put back the Electronique coils. I think one can say, in these two instances, that no one was to blame and when you consider the large number of such articles published in a year the record is a good one.

Alternatives, Tolerances

I think one way designers could help us and the customers is to indicate where alternatives can safely be used and to give a clear indication of maximum tolerances that can be allowed, because writers' statements are held in such reverance by the customers (and we don't quarrel with this, it is their right) that it is no use our suggesting that they could use a 5 per cent resistor instead of a 10 per cent—"Mr. X of EVERYDAY ELECTRONICS says 10 per cent and therefore 10 per cent it must be!" I think, for example, electrolytic capacitors represent a field where a wider choice could be offered, especially when you remember the tolerances are around minus 30 per cent to plus 70 per cent so instead of saying one must use 32 microfarad rated at 10 volts, say a capacitor of between 25 to 100 microfarads with a rating of 10-100 volts may be used provided the physical size will allow it to be fitted.

. . . provided the physical size will allow it to be fitted

Again, where speakers are specified (and here I exclude apparatus of either the high power or high fidelity class): is it really all that critical whether the unit employed is 3 ohm, 7½ ohm or 15 ohm? I personally doubt it, again provided the physical size is right, but how much easier for the customer and in turn for us if the recommended speaker is specified as 3½ inch diameter, impedance 3-15 ohm!

Advance Notice

I did suggest several years ago that the magazines might tell us in advance what articles were going to be published and give us a list of the parts required, but they pointed out (quite rightly) that they could not possibly circularise

every component supplier and it would be unfair to give such information to some advertisers and not to others.

On reflection, I confess we would still be caught out occasionally even if we had this advance list simply because it is always impossible to forecast how popular a given design will be.

Let us say we have a certain coil in stock, that ordinarily sells at two dozen a year. Unknown to us, one of the magazine contributors uses it in a constructional article and the sales rocket to 100 a week. The poor coil manufacturer who sold a few hundred a year finds the demand increased to hundreds of thousands and so his delivery which was 14 days becomes six months.

. . . it is always impossible to forecast how popular a given design may be

Sometimes there is no interest at all and with another one, we are inundated with requests for parts. We, of course, cannot lay out large sums of money without knowing whether there will be any sale for what we are buying!

Outlook Very Bright

I hope these three articles have been of some use to the general reader in enabling him to understand some of the problems involved. In conclusion I would like to hazard a guess at what the future holds in store for the electronics constructor. I think the outlook is very bright and the amateur constructor will be able to purchase more and more sophisticated parts to experiment with. We may go through a period where we seem in fact to be offering a decreased range. For example we stock 10 per cent and 5 per cent resistors at present, but if by buying large quantities we could offer you 5 per cent at nearly the same price as 10 per cent it would save us stocking a whole range, and you the consumer would be no worse off, in fact slightly better off.

This will happen because manufacturers are trying to sell larger and larger quantities! One can see their point of view, it costs them the same in administration costs to sell 10 as 10,000!

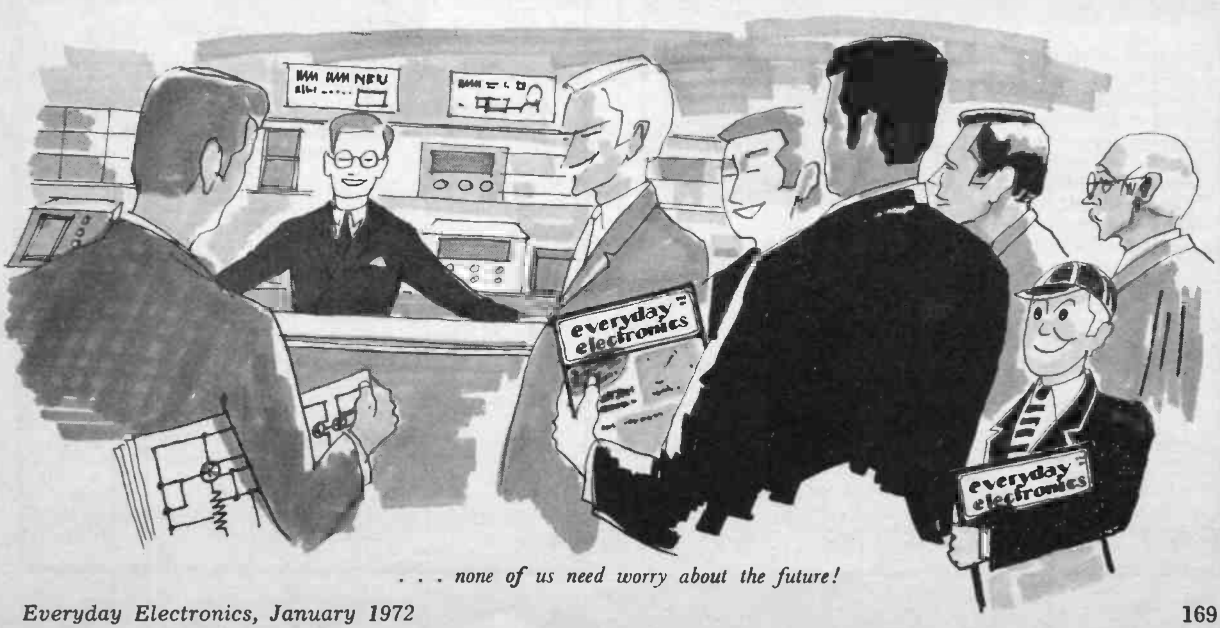
Another field where this same effect may occur is in toggle switches. We list four varieties: s.p.s.t., s.p.d.t., d.p.s.t., and d.p.d.t switches. It is not difficult to see that the function of all four types could be performed by just one of them, namely the d.p.d.t. The difference in cost between the various types is not very great, so that if we were able to persuade you to use the d.p.d.t. in every case, we could buy four times the quantity and so bring the price down!

You will see what I mean in an apparent restriction in range—the actual restriction is nil!

However, while we have magazines like EVERYDAY ELECTRONICS and their contributors giving us such challenging and interesting designs, suppliers who are anxious to please, and above all customers like yourselves with such boundless enthusiasm, none of us need worry too much about the future!

Post Script

Since these articles appeared I have been delighted to receive a number of interesting letters, some containing constructive ideas. I will mention one small happening that occurred about the time the first issue of EVERYDAY ELECTRONICS appeared. A customer who had not dealt with us before required some components urgently. He telephoned us at 10 a.m. and gave us the order. He then sent the money by telegram or telegraph and we received it at 11.30 a.m. We were able to despatch his order the same day. I mention this as it is a method of ordering that I had overlooked and one that could be a life saver in an emergency.



. . . none of us need worry about the future!

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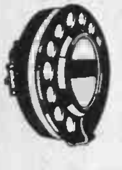

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OC71	0·13		
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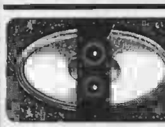

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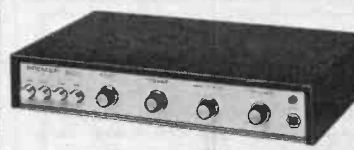

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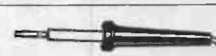

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COMPLETE PRINTED CIRCUIT AUDIO KITS

5 watt Power Amplifier £3·44. Postage and
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Full instructions and diagrams sent with all kits. Also available Printed Circuit kits, Component boards and a range of linear integrated circuits. LECTRON (Dept. EE), King Alfred Way, Cheltenham, Glos.
Mail orders only.

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APPROXIMATELY 10 silicon NPN general purpose transistors, also diodes, components, on 5 x 5in. panel, 17p. 5 panels 70p. 25 for £2·50. 100 for £8·10. SAE lists, data, free samples. Pawson, 114 South Street, Armadale, W. Lothian.

SERVICE SHEETS

SERVICE SHEETS (1925-1971) 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.

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TECHNICAL TRAINING in Radio, TV & Electronics through world-famous ICS. For details of proven home-study courses write: ICS (Dept. 566), Intertext House, London, SW8 4UJ. Accredited by the CACC.

HOLIDAYS

HOLIDAY FOR BOYS. 14/16 years, Summer 1972. Tuition and practical work in electronics (and tape recording), engineering (Karting), photography. 11 days in Norfolk—£16. Write for free brochure: Inter-School Christian Fellowship, c/o 1 Hubbard Road, London SE27 9PJ.

MISCELLANEOUS

RECORD TV SOUND using our loudspeaker isolating transformer. Provides safe connection to recorder. Instructions included. 70p + 10p P&P. CROWBOROUGH ELECTRONICS (E.E.), Eridge Road, Crowborough, Sussex.

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RING MODULATOR by Dewtron is professional, transformerless, 5-transistor, has adjustable F1/F2 rejection. Module £7. Unit £8·90. **WAA-WAA** Pedal kit of all parts, incl. all mechanics & instr. Only £2·95. **AUTO RHYTHM** from Dewtron modules. Simple unit for waltz, foxtrot etc. costs £18·00 in modules. **SYNTHESISER MODULES** and other miracles. Send 15p for illust. list.
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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.

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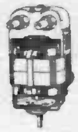
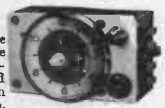
Just what you need for work bench or lab.
4 × 13 amp sockets in metal box to take standard 13 amp fused plugs and on/off switch with neon warning light. Supplied complete with 7 feet of heavy cable. Wired up ready to work, £2 less plug; £2·25 with fitted 13 amp plug; £2·40 with fitted 15 amp plug, plus 23p P. & I.

MULTI-SPEED MOTOR



Six speeds are available 500, 850 and 1,100 r.p.m. and 8,000; 12,000 & 15,500 r.p.m. shaft is ¼ in. diameter 230/240v Its speed may be further controlled with the use of our Thyrister controller. Very powerful and useful motor size approx. 2 in. dia. × 5 in. long, Price 88p plus 23p postage and insurance.

20 AMP ELECTRICAL PROGRAMMER

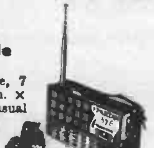


Learn in your sleep: Have Radio playing and kettle boiling as you awake—switch-on lights to ward off intruders—have warm house to come home to.
All these and many other things you can do if you invest in an Electrical Programmer. Made by the famous Smiths Instrument Company. This is essentially a 230/240 volt mains operated Clock and a 20 amp Switch, the switch-off time of which can be delayed up to 12 hours (continuously variable not stepped). Similarly the switch-on time can be delayed. This is a beautiful unit, size 5¼ × 3¼ × 2¼ in. deep. Metal encased, glass fronted with chrome surround. Offered at £2·40 plus 23p postage and insurance.

RESETTABLE FUSE

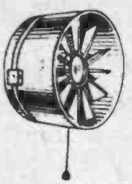
How long does it take you to renew a fuse? Time yourself when next one blows. Then reckoning your time at £1 per hour see how quickly our resettable fuse (auto circuit breaker) will pay for itself. Price only £1 each or £11 per dozen, specify 5, 10 or 15 amp—*simply fit in place of switch.*

SPARTAN Portable RADIO



Long and medium wave, 7 transistor, size 6in. × 4in. × 1¾in. with larger than usual speaker giving very good tone. Built-in ferrite aerial and telescopic aerial for distant stations.
A real bargain complete with leather case, carrying sling, earplug and case £3·75 plus 25p post and ins.

EXTRACTOR FAN



Cleans the air at the rate of 10,000 cubic ft. per hour. Suitable for kitchens, bathrooms, factories, changing rooms, etc., it's so quiet it can hardly be heard. Compact, 5¼" casing with 5¼" fan blades. Kit comprises motor, fan blades, sheet steel casing, pull switch, mains connector, and fixing brackets, £2 plus 36p post and ins.

MAINS MOTOR

Precision made—as used in record decks and tape recorders—ideal also for extractor fan, blower, heaters, etc. New and perfect. Snip at 50p. Postage 15p for first one then 5p for each one ordered.

KITS FOR PREVIOUS PROJECTS

Kits of parts available as follows:—

HOME SENTINEL INTRUDER ALARM
Electronic Components with case £3·75

SNAP INDICATOR
All components but not case or battery 75p.

WINDSCREEN WIPER CONTROL
All components including metal for chassis £1·50.

RECORD PLAYER
All components, but not case, loudspeaker, record deck or pick-up £5·50

DEMO DECK
Components as listed £6 POST PAID

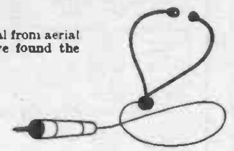
FUZZ BOX
All parts including box £1·85.

PHOTOGRAPHIC COLOUR TEMPERATURE METER
Electronic components less case £2·65

CAPACITOR DISCHARGE CAR IGNITION

This system which has proved to be amazingly efficient and reliable was first described in the Wireless World about a year ago. We can supply kit of parts for improved and even more efficient version (P.W. June), price £4·95. When ordering please state whether for positive or negative systems. Plus 30p post.

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

No. of Poles	2 way	3 way	4 way	5 way	6 way	8 way	9 way	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

TANGENTIAL HEATER UNITS

This heater unit is the very latest type, most efficient, and quiet running. Is as fitted in Hoover and blower heaters costing £15 and more. We have a few only. Comprises motor, impeller, 2kW element and 1kW element allowing switching 1, 2 and 3kW and with thermal safety cut-out. Can be fitted into any metal line case or cabinet. Only need control switch. £3·50. 2kW Model as above except 2 kilowatts £2·50. Don't miss this. Control Switch 35p. P. & P. 40p.

ASTRON RADIO
& TEMPERATURE COMPARATOR
FEATURED IN THIS ISSUE
To receive these kits quickly send quoted approx. price and any change due will be refunded.

HONEYWELL PROGRAMMER

This is a drum type timing device, the drum being calibrated in equal divisions for switch setting purposes with trips which are infinitely adjustable for position. They are also arranged to allow 2 operations per switch per rotation. There are 15 changeover micro switches each of 10 amp type operated by the trips thus 15 circuits may be changed per revolution. Drive motor is mains operated 5 revs per min. Some of the many uses of this timer are Machinery control, Boiler firing, Dispensing and Vending machines, Display lighting animated and signs, Signalling, etc. Price from makers probably over £10 each. Special snip price £5·75 plus 25p post and insurance. Don't miss this terrific bargain.

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 3¼" x 6¼" x 2" with leads and prods. Price £1·75 plus 20p postage.

100 THINGS YOU CAN MAKE

Send S.A.E. today for list of 100 constructor projects – instruments – alarms – counters – locks – radios, etc., etc.

THERMOSTATS

Type "A" 15 amp. for controlling room heaters, greenhouses, airing cupboard. Has spindle for pointer knobs. Quickly adjustable from 30–80°F. 40p. Calibrated dial 20p extra. Suitable box for wall mounting 25p.

Type "B" 15 amp. This is a 17in. long rod type made by the famous Sunvic Co. Spindle adjusts this from 50–550°F. Internal screw alters the setting to this could be adjustable over 30° to 1000°F. Suitable for controlling furnace, oven, kiln, immersion heater or to make flame-stat or fire alarm. 43p plus 12½p post and insurance.
Type "D" We call this the Ice-stat as it cuts in and out at around freezing point. 2/3 amps. Has many uses one of which would be to keep the loft pipes from freezing. If a length of our blanket wire (16 yd 50p) is wound round the pipes. 40p.
Type "E". This is standard refrigerator thermostat. Spindle adjustments cover normal refrigerator temperature. 50p
Type "F". Glass encased for controlling the temp. of liquid—particularly those in glass tanks, vats or sinks—thermostat is held (half submerged) by rubber sucker or wire clip—ideal for fish tanks—developers and chemical baths of all types. Adjustable over range 50° to 150° F. Price 80p

TREASURE TRACER

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

DRILL CONTROLLER

NEW 1KW 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 and p.

HIGH ACCURACY THERMOSTAT

Uses differential comparator I.C. with thermister as probe. Designer claims temperature control to within 1/7th of a degree. Complete kit with power pack £5·50.

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. £5·75p plus 25p post and ins.

AUTO-LITE

as circuit in this month's issue Practical Wireless. Kit of parts £1·20 post paid.

TOGGLE SWITCH

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

CAR ELECTRIC PLUG

Fits in place of cigarette lighter. Useful method for making a quick connection into the car electrical system. 38p each or 10 for £3·42.

ROCKER SWITCH

13 amp self-fixing into an oblong hole. size approximately 1" × ½" 6p each, 10 for 54p.

MAINS RELAY BARGAIN

Special this month are some single, double and treble pole changeover relays. Contacts rated at 15 amps. Operating coil wound for 240V A.C. Good British Make. Ex-unused equipment. Size approx. 1½" × 1". Open construction
Single pole 25p each 10 for £2·25
Treble pole 35p each 10 for £3·15

BALANCED ARMATURE UNIT

500 ohm, operates speaker or microphone, so useful in intercom or similar circuits, 33p each, £3·50 doz.

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.

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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 7 section Telescopic Aerial, can be angled and rotated 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. 7in × 4in 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. 7in. × 4in. 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)

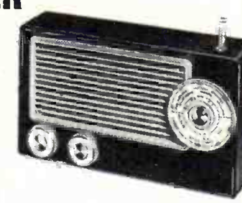
Exclusive to readers of "EVERYDAY ELECTRONICS"

"EVERYDAY SEVEN"

MEDIUM and LONG WAVE PORTABLE. Specially designed circuit for easy construction incorporating 7 transistors and 2 diodes, air spaced tuning capacitor, push pull output using 600 mw transistors, heavy duty loudspeaker for quality sound and room filling volume, internal Ferrite Rod aerial, Volume/on/off control, tuning control and wave change switch. Handsome, strongly made wooden case, size 11½″ × 7½″ × 3½″ with carrying handle and black knobs with spun silver inserts. The ideal radio for those who are comparatively inexperienced in electronic construction. Easy build plans are supplied free with parts or available separately for 25p.

Total building costs £4·98 P. P. & Ins. 41p
(Overseas Post £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 aerial and 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)

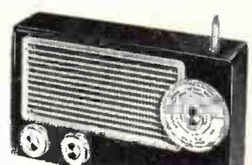
TRANSONA FIVE

NOW WITH 3in SPEAKER

3 Tunable Wavebands: MW, LW and Trawler Band. 7 stage—5 transistors and 2 diodes, ferrite rod aerial. tuning condenser volume control, fine tone 3in. moving coil speaker. Attractive case with red speaker grille. Size 6¾ × 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)

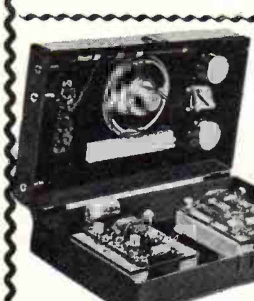
TRANS EIGHT



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: 4 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)

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

Parts price list and plans for ....

Name ....

Address ....

.... EE.3

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