

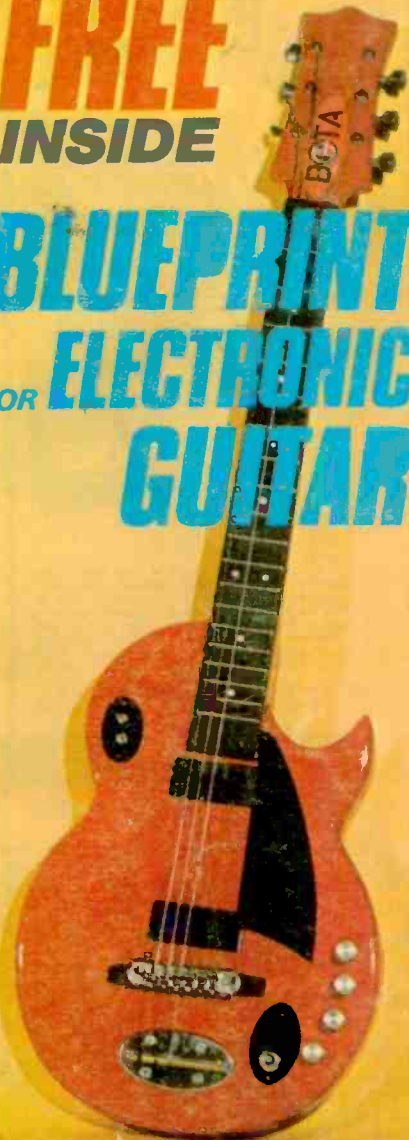
An exciting hobby.... for everyone

# everyday electronics

NOV 72  
15p

**FREE  
INSIDE**

**BLUEPRINT  
FOR ELECTRONIC  
GUITAR**



**AUTO ACCELEROMETER**

*New* **BEGINNERS SERIES**

**BASIC  
ELECTRICITY**



**TRANSISTOR TESTER**

# Build yourself a TRANSISTOR RADIO

## NEW! ROAMER 10 WITH VHF INCLUDING AIRCRAFT

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

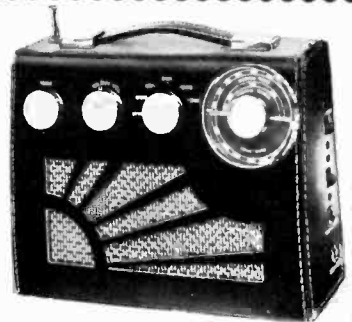
Built in Ferrite Rod Aerial for MW/LW. Retractable, chrome plated Telescopic Aerial, for peak short wave and VHF listening. Push Pull output using 600mw Transistors. Car Aerial and Tape Record Sockets. 10 Transistors plus 3 Diodes. Fine tone moving coil speaker. Air Spaced ganged Tuning Condenser with VHF section. Separate coil for Aircraft Band. Volume on/off, Wave Change and tone Control. Attractive Case in black with silver blocking. Size 9" x 7" x 4". Easy to follow instructions and diagrams. Parts price list and easy build plans 30p (FREE with parts). Earpiece with plug and switched socket for private listening 30p extra.

Total building cost

**£8-50**

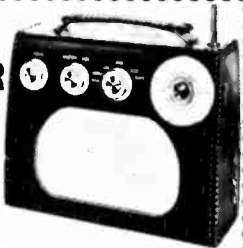
P. P. & Ins. 50p

(Overseas P. & P. £1)



## ROAMER EIGHT Mk I

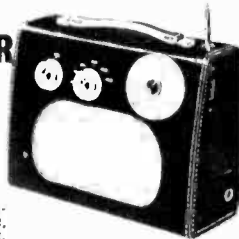
**NOW WITH VARIABLE TONE CONTROL**



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. Selectively switch. Switched earpiece socket complete with earpiece. 8 transistors plus 3 diodes. Fine tone moving coil 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 x 7 x 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. 45p. (Overseas P. & P. £1)

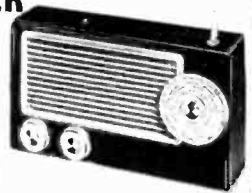
## ROAMER SEVEN MK IV



7 Tunable Wavebands: MW1, MW2, LW, SW1, SW2, SW3 and Trawler Band. Extra Medium waveband provides easier tuning of Radio Luxembourg, etc. Built in ferrite rod aerial for MW and LW. Retractable 4 section 24in. chrome plated telescopic aerial for SW. Socket for Car Aerial. Powerful push-pull output. 7 transistors and 2 diodes, fine tone moving coil speaker. Air spaced ganged tuning condenser. Volume/on/off, tuning and wave change controls. Attractive case with carrying handle. Size 9 x 7 x 4in. approx. Easy to follow instructions and diagrams. Parts price list and easy build plans 15p (FREE with parts).

Total building costs **£5-98** P. P. & Ins. 45p. (Overseas P. & P. £1)

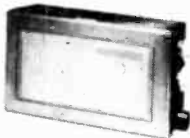
## ROAMER SIX



6 Tunable Wavebands: MW, LW, SW1, SW2, Trawler band plus an extra M.W. band for easier tuning of Luxembourg etc. Sensitive ferrite rod aerial and telescopic aerial for Short Waves. 3in. Speaker. 8 stages—6 transistors and 2 diodes. Attractive black case with red grille, dial and black knobs with polished metal inserts. Size 9 x 5½ x 2½in. approx. Easy build plans and parts price list 15p (FREE with parts).

Total building costs **£3-98** P. P. & Ins. 30p. (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 x 1½ x 3½in. Easy build plans and parts price list 10p (FREE with parts).

Total building costs **£2-29** P. P. & Ins. 21p. (Overseas P. & P. 63p)

## TRANSONA FIVE

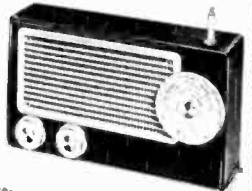


**5 TRANSISTORS AND 2 DIODES**

3 Tunable Wavebands: MW, LW and Trawler Band. 7 stage—6 transistors and 2 diodes, ferrite rod aerial, tuning condenser volume control, fine tone moving coil speaker. Attractive case with red speaker grille. Size 6½ x 4½ x 1½in. Easy build plans and parts price list 10p (FREE with parts).

Total building costs **£2-50** P. P. & Ins. 24p. (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 x 5½ x 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).

Total building costs **£4-48** P. P. & Ins. 32p. (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: 3 inch Speaker: Terminal Strip: Ferrite Rod Aerial: 3 Plugs and Sockets: Battery Clips: 4 Tag Boards: Balanced Armature Unit: 10 Transistors: 3 Diodes: Resistors: Capacitors: Three ½" 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. 32p. (Overseas P. & P. £1)



## RADIO EXCHANGE CO

61 HIGH STREET, BEDFORD. Tel. 0234 52367

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

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

Parts price list and plans for .....

Name .....

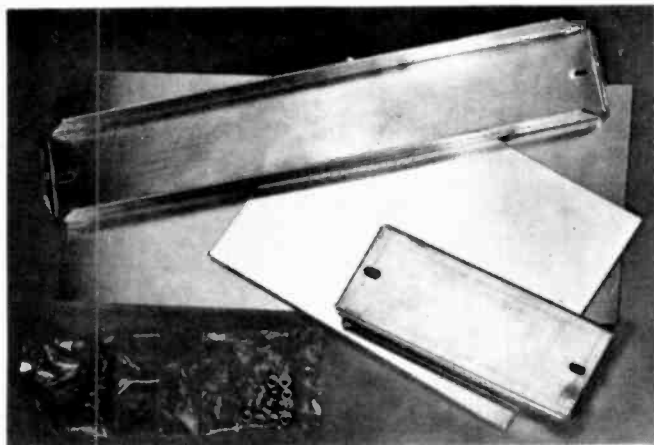
Address .....

(Dept. E.E.13.)

**FULL AFTER SALES SERVICE**

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

## From a recent copy of "Everyday Electronics" . . .



The advantages of this unique chassis are:

1. From stock, we can offer you a choice of 188 sizes, ranging from 3 x 3 x 1 ins. to 14 x 14 x 4 ins.
2. All parts are sold separately, so that a spoiled plate can be quickly and cheaply replaced. This is invaluable to the experimenter, who can use the same sides over and over again.
3. By fitting a plate to the bottom a whole range of small metal cabinets, complete with handles if required, can be assembled.

**This unique UNIVERSAL CHASSIS  
is obtainable ONLY from  
Home Radio (Components) Ltd.**

A full list of plate sizes, together with reference numbers for ordering, is given in our Components Catalogue. This famous "Constructor's Bible" lists over 8,000 components, over 1,500 of them illustrated. It provides the quick, simple means of ordering all your component needs. Every catalogue contains 10 vouchers, each worth 5p when used as instructed. The catalogue costs 70p, including postage and packing: drop us a line or use the coupon.

Ring 01-648 8422

Ask for details of our  
Credit Account  
Service

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

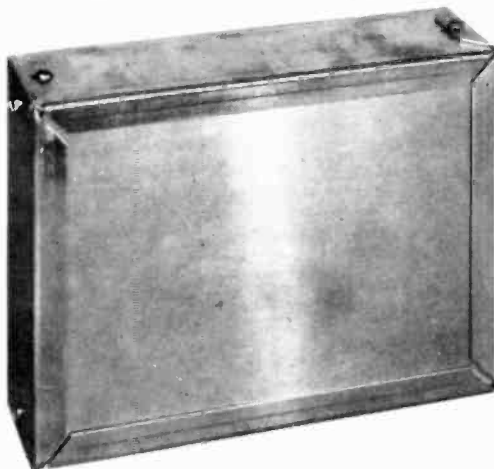


### Problems

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

Editorial extract  
reproduced by kind  
permission of the  
Editor of "Everyday Electronics"

Our famous Universal Chassis, which for many years has formed the basis of thousands of radio and electronic projects, consists of a top and four separate sides. The five parts, which are made of 18 S.W.G. aluminium, can be quickly assembled with the screws provided to form a chassis even more rigid than the standard type.



**POST THIS COUPON with your cheque  
or postal order for 70 pence**



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

This is my first H.R. Components Catalogue

Name .....

Address .....

Home Radio (Components) Ltd.

Dept. EE, 234-240 London Road, Mitcham CR4 3HD





now YOU can **CATCH SHOALS OF BIG FISH**  
with new electronic miracle  
special introductory offer **£2.50**

First time marketed in England, this exciting electronic instrument the "Decoytron" is the one responsible for starting the electronic fish-rage in the U.S.A. Just recently, Uses ingenious double-action method of attracting all kinds of fish from hundreds and hundreds of feet away... saltwater or freshwater. Why this device is so fantastically successful is because it actually imitates the sound of wet insects falling on the surface. These sound waves spread out hundreds of feet in all directions. Although this peculiar sonic frequency won't sound like much to you... to all the fish in the area it's their dinner bell! But that's not all... **electro-illuminescence neon tubes cunningly flicker intermittently**, penetrating the area for hundreds of feet around, at a frequency fish are unable to resist. The fish mistake this flickering glimmer for the soft phosphorescence glow given off by Plankton... a favourite delicacy of most fish!!! All you do is switch on, lower into the water (it's completely water resistant) allow around 6 minutes—then start reeling 'em in. We'll bet you won't be able to reel 'em in fast enough. Self-contained batteries last ages—cost pennies. Kit of all parts including special easy as a.b.c. directions only £2.50 + 25p. P. & P. (Parts available separately).

**BUILD 5 RADIO AND ELECTRONIC PROJECTS**

ONLY **£2.45**



Amazing Radio Construction set! Become a radio expert for £2.45. A complete Home Radio Course. No experience needed. Parts including simple instructions for each design. Illustrated step-by-step plans, all transistors, loudspeaker, personal phone, knobs, screws, etc. All you need. Presentation box 45p extra as illus. (If required, parts available separately, no soldering necessary. Send £2.45 + 25p p. & p.

**SOOTHE YOUR NERVES RELAX WITH THIS AMAZING RELAXATRON**

**CUTS OUT NOISE POLLUTION—SOOTHS YOUR NERVES!**—The RELAXATRON is basically a pink noise generator. Besides being able to mask out extraneous unwanted sounds, it has other very interesting properties. IF YOU WORK IN NOISY OR DISTRACTING SURROUNDINGS, IF YOU HAVE TROUBLE CONCENTRATING, IF YOU FEEL TENSED, UNABLE TO RELAX—then build this fantastic Relaxatron. Once used you will never want to be without it—TAKE IT ANYWHERE. Uses standard PP3 batteries (current used so small that battery life is almost shelf-life) CAN BE EASILY BUILT BY ANYONE OVER 12 YEARS OF AGE using our unique, step-by-step, fully illustrated plans. No soldering necessary. All parts including case, a pair of crystal phones. Components, nuts, screws, wire, etc. no soldering. £2.75 + 25p p. & p. Parts available separately.



ONLY **£2.75**

... (text continues from previous block)

**UNIQUE RADIO FOR BEDROOM OR OFFICE** No batteries, no electricity. ONLY **£1.70** never wears out

Tune in your favourite programmes or the news, or sports in the Office or in your bedroom. Uses sensitive, germanium diode originally evolved from wartime radar. Never buy a battery. Never use electricity. Never replace. Covers all medium waves. Clear beautiful tone. Size 4 1/2" x 2 1/2" x 1 1/2" in beautiful case. ONLY 7 CONNECTIONS AND IT'S WORKING. No soldering necessary. CAN BE BUILT ALMOST BLINDFOLD IN UNDER 15 MINUTES! Ideal for absolute beginner from 8 years of age upwards. SPECIAL PRICE TO CLEAR STOCKS OF COMPONENTS, ONLY £1.70 + 20p. P. & P. for all parts including beautiful case. Germanium semiconductor, tuning condenser, personal phone, wire, nuts, screws. SIMPLE AS A.B.C. INSTRUCTIONS (Parts available separately).

**"READ PEOPLE'S MINDS"—TEST THEIR NERVES—BEAT THEM AT CARDS, ETC. WITH THIS ASTONISHING ELECTRONIC BRAIN BOX** only **£2.87**

With this "Brain-box" you will be able to perform mind-boggling feats. THE MIND READING DEVICE will make people swear you have "telepathic" powers. THE AMAZING CARD TRICK UNIT completely mystifies and baffles from one to six people. You correctly "guess" the two cards each person has selected at random from a pack they themselves shuffled. THE ELECTRONIC NERVES TESTER puts your friends to a very lively test. It gives out fall and finish signals (the winner is the person with lowest number of full signals). Can be adjusted from the weakest to strongest person. THE ELECTRONIC MAZE tests the mental ability of the player because it uses psychology with an electronic twist to it. You can change the pathways in seconds to prevent the maze becoming too stale after lots of use. Completely safe and foolproof. Size 18" x 12" x 4" (Max.). You can play all these games and more beside after building the "Brain box". No soldering, you get pictorial, easy as a.b.c. step-by-step simple instructions. ONLY £2.87 + 35p. p. & p. for all parts including chassis, switches, stylus, signalling lights, wire, nuts, screws, etc. Uses standard battery. Presentation Box 35p. extra as illus. If reqd. (PARTS AVAILABLE SEPARATELY) FULL OPERATING DIRECTIONS WITH EACH OF THE PROJECTS.



the amazing "Phototron" **SOUND OPERATED FLASH**

Take flash pictures at the exact instant of the bursting of a balloon. A champagne cork leaving the bottle. The split second a hammer strikes a light bulb. The mind boggles at the possibilities of the "Phototron" ... the only limit is your imagination. Now that inexpensive flash guns are on the market in quantity, it has made possible, with the help of electronics the production of a wide variety of exciting photography strictly limited to the professionals. The duration of an electronically produced flash is extremely brief and normally measured in Millionths. Now, providing the camera shutter is left open in a dark or subdued light, it is the timing of the flash that determines what is imprinted on the film—not necessarily anything done by the camera. As electronic flash guns are fired by making a switched connection then it becomes obvious that one of (with variable sensitivity control) some real "way out" photography effects can be captured forever on film. Easily built in a complete hour or so, the "Phototron" is fully solid state, uses self contained PP3 battery. No soldering necessary using our special printed circuit terminal board (pat. Applied for). All parts including special pictorial step-by-step plans, transistors, microphone, S.C.R., potentiometers, switches, test lamp, case, nuts, screws, etc. etc. ONLY £4.50 + 25. P. & P. Made up must be worth at least 10. (parts available separately).

Eavesdrop on the exciting world of Aircraft Communications—**V.H.F. AIRCRAFT BAND CONVERTER** ONLY **£2.85**

Listen in to AIRLINES, PRIVATE PLANES, SET-PLANES. Eavesdrop on exciting cross talk between pilots, ground approach control, airport tower, Hear for yourself the disciplined voices aiding tenseness of talk downers. Be with them when they have to take nerve ripping decisions in emergencies—Tune into the international distress frequency. Covers the aircraft frequency band including HEATHROW, GATWICK, LUTON, KINGWY, PRESTWICK, ETC. CLEAR AS A BELL. This fantastic fully transistorised instrument can be built by anyone over nine in under two hours. No soldering necessary. Fully illustrated simple instructions take you step-by-step. Uses standard PP3 battery. All you do is extend rod aerial, place close to any ordinary medium wave radio (even tiny portables). NO CONNECTIONS WRETEWRECKED! SEND ONLY £2.85 + 20p. p. & p. for kit including case, nuts, screws, wire, etc. etc. (parts available separately).

**INGENIOUS ELECTRONIC SLEEP INDUCER**

ONLY **£3.25**

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 uses tones by itself so you don't have to worry about it being on all night! The loudspeaker produces soothing audio-frequency sounds, continuously repeated—but as time goes on the sound gradually becomes less and less—until they eventually cease altogether, the effect is has on people is amazingly very similar to hypnosis. All transistor. No knowledge of electronics or radio needed. Step-by-step instructions included. No soldering necessary. Kit includes case, nuts, wire, screws, etc. SEND £3.25 + 25p p. & p. (parts available separately).



**FIND BURIED TREASURE!** Transistorised Treasure Locator

This fully portable transistorised metal locator detects and tracks down buried metal objects—it signals exact location with loud audible sound (no phones needed)—uses any transistor radio which fits inside—no connections needed. FINDS GOLD, SILVER, COINS, JEWELLERY, ARCHAEOLOGICAL PIECES ETC. ETC. Extremely sensitive will signal presence of certain objects buried several feet below ground. No knowledge of radio or electronics required. Can be built with ease in one shot receiving by anybody from nine years of age upwards, with the clear, easy to follow, step-by-step, fully illustrated instructions—Uses standard PP3 battery. No soldering necessary. Kit includes nuts screws, wire, etc. ONLY £2.85 + 25p. p. & p. (Sectional handle as illustrated 95p. extra). Parts available separately. Made up looks worth 15.



ONLY **£2.85**

**SHORTWAVE TRANSISTOR RADIO**



Anyone from 9 years of age can follow the step by step, easy as ABC fully illustrated instructions. No soldering necessary. 76 stations logged on radio aerial in 30 mins.—RUSSIA, AFRICA, U.S.A., SWITZERLAND, etc. Experience the thrill of the world news sport music, etc. Eavesdrop on unusual broadcasts. Uses PP3 battery. Size only 3" x 4 1/2" x 1 1/2" ONLY £2.75 + 20p. p. & p. Kit includes cabinet, screws, instructions, etc. (Parts available separately).

ONLY **£2.75**

**AMAZING MAGIC MUSIC BOX**

make electronic music waving your hands about only **£2.75** Everyone's heard the weird, wonderful, but beautiful music used in Science Fiction Films, Horror Films etc., also on Radio and Television. This unearthly, eerie music is almost always produced by a little known electronic device measuring only a few inches—called Theremin. All you have to do is switch on your radio (almost any type will do) and place the Theremin close by. Switch on the Theremin and proceed to wave your hands mysteriously in the air like a magician. The most fantastic musical sounds are then produced, and with a little practice people can learn to play all the well known tunes. Apart from it's musical value, it's small size allows it to be used to best advantage at parties, gatherings of friends etc. It attracts all kinds of attention and never gets bored! Relax, as the sweetest nerve-soothing birlsong takes you to leafy woods and glades. Provides countless hours of joy to young and old alike. Standard self-contained battery lasts ages. Easily built in an hour or so with special pictorial step-by-step plans. No soldering necessary. All parts including special printed circuit terminal board (Pat. Applied For). All parts including nuts, bolts, case etc. ONLY £2.75 + 25p. P. & P. (Parts available separately).



**INGENIOUS ELECTRONIC SINGING & WARBLING CANARY** only **£4.50**

Actually whistles & warbles like a real live Canary! Amazing circuitry faithfully reproduces the Canary's magnificent song. Just switch on and leave it—whistling down scale for some seconds, suddenly breaking into a delightful warble, then several seconds later shutting off for a second or two—only to start automatically again in a few seconds. People listen to the delightful song all day and never get bored! Relax, as the sweetest nerve-soothing birlsong takes you to leafy woods and glades. Provides countless hours of joy to young and old alike. Standard self-contained battery lasts ages. Easily built in an hour or so with special pictorial step-by-step plans. No soldering necessary. All parts including special printed circuit terminal board (pat. applied for) transformers, loud-speaker, transistors, nuts, screws, wire, etc. + case (which fits under cage—cage and toy bird not supplied) ONLY £4.50 + 25p. P. & P. (parts available separately).

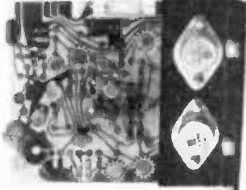


# SAXON ENTERTAINMENTS.

STANDARD & CUSTOM-BUILT AUDIO & ELECTRONIC EQUIPMENT  
NEW & SECONDHAND MUSICAL INSTRUMENTS. MAIN  
DISTRIBUTORS FOR A.K.G. HIGH QUALITY MICROPHONES.

## SA25-SA35-SA100

LOW-PRICED AUDIO MODULES  
FOR DOMESTIC & COMMERCIAL USE



THESE THREE MODULES HAVE ENJOYED UNPARALLELED SUCCESS DURING THE FIRST FEW MONTHS OF THEIR BEING MADE AVAILABLE TO THE GENERAL PUBLIC. WE ARE PLEASED TO ANNOUNCE THAT WE CAN NOW OFFER FAST DISPATCH ON MOST OF OUR ADVERTISED ITEMS, INCLUDING THESE THREE MODULES.

**SA25 £2.95** carr. free

25 WATTS RMS. 7 transistors 7 diodes

**SA35 £4.45** carr. free

35 WATTS RMS. 7 transistors 7 diodes

**SA100 £10.90** carr. free

100 WATTS RMS. 11 transistors 6 diodes

ALL THREE MODULES HAVE OPEN & SHORT CIRCUIT PROTECTION, AND THE SA100 IS PROOF AGAINST OVER-DISSIPATION & FAULTY INDUCTIVE LOADS. ONLY ADVANCED DESIGN TECHNIQUES MAKE THESE EXTRA-ORDINARILY LOW PRICES POSSIBLE.

### BRIEF SPEC. FOR ALL THREE MODULES

Freq. response	15-40,000 Hz $\pm$ 1dB
Distortion	0.2% at 1 kHz
Loads	4 to 16 ohms
Quiescent current	15 mA
Noise	Better than -75 dB
Supply voltage	25-45 volts SA25/35 40-70 volts SA100
Size	4 1/2" x 4" x 1" (SA100) 4" x 3" x 1" (SA25/SA35)

Circuits, connecting instruction and application data are supplied free with all modules.

### POWER SUPPLIES FOR THE SA25/35 & SA100 AUDIO MODULES

Stab PS45	Stabilized module for 2 SA25's or two SA35's	£3.50 carr. free
MT45	Transformer for above, heavy duty	£2.85 carr. 20p
MT30	Transformer for unstabilized supply complete with rectifier diodes mounted	£3.50 carr. 20p
PU70	Unstabilized supply for one or two SA100	£6.75 carr. 40p
PS70	Stabilized supply module for one or two SA100's	£4.90 carr. free
MT70	Transformer for PS70	£4.90 carr. 40p

ALL MODULES ARE BUILT ON  
GLASS FIBRE P.C. BOARD

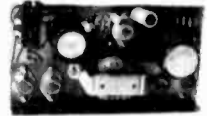
## OTHER SAXON PRODUCTS...

120 WATT HEAVY DUTY MODULE £13.90 + 20p carr. or with supply  
£18.95 + 40p carr.

Featuring a rugged class A driver stage, this module will run from all our mixers, etc., and most other makes of mixer. It delivers 120 watts into an eight ohm load and employs 4 T03 can (118 watt) output transistors.

### SPECIFICATION

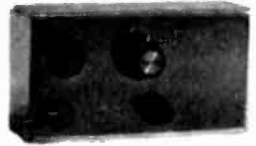
Power output	120 watts into 8 ohms
Freq. response	30-30,000 Hz $\pm$ 2dB
Input sensitivity	200 mV into 10K
Construction	Fibreglass board
Size	8" x 4" x 4" (8" with supply)
Low distortion parallel push-pull output stage.	



### SINGLE CHANNEL SOUND/LIGHT CONVERTER

This compact and reliable unit operates from amplifiers with outputs from 5-100 watts. Does not impose a heavy load on the amplifier, or, if connected in the wrong polarity, cause any damage, as with some units.

Operation is simplicity itself and the unit is fully fused. The unit is supplied to function from bass notes but may easily be converted to respond only to treble or mid-range notes by the addition of components costing less than 5p.



£8.90 carr. free

### THREE CHANNEL SOUND TO LIGHT UNIT

Handling the total of 3000 watt (3kw) this unit is unique for its price in that not only bass, middle and treble but also master controls are provided. Two amplifier sockets eliminate the need for split leads, etc. Supplied in tough white steel case with a blue stielvette hooded cover. Fully guaranteed.

£19.75 carr. 30p

### SAXON STEREO CONTROL UNIT



Two decks, and full headphone monitoring. The unit is mains operated and measures 17 1/2" x 3" x 4" deep and is finished with a smart white on black fascia. The controls are: Left/Right deck fader, volume, bass, treble, Headphone Selector and volume, Microphone volume, bass, treble, mains on/off. THIS IS A MUST FOR THE HOME BUILT HIGH QUALITY DISCO THEQUE AND IS COMPARABLE TO UNITS AT OVER TWICE THE PRICE.

£15.80 carr. 30p

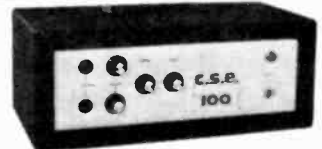
MONO VERSION  
£6.50 carr. 20p

(As illustrated left S.A.E. details 9 volt operation)  
Outputs up to 1 volt RMS

### COMPLETE AMPLIFIERS

The CSE 100. £34.90 carr. free

This versatile unit is now available in a black vinyl case and so represents even better value than ever delivering speech and music powers of up to 100 watts RMS and continuous sine wave outputs of 70 watts. Two individually controlled inputs with wide range bass and treble controls. Ideal for small groups D.J.S., etc.



The SAXON 100 £48.50 carr. free



With an RMS output of 120 watts speech and music, 100 watts continuous power, four individually controlled FET input stages and wide range bass and treble controls, this amplifier has established itself as a unit offering quality and reliability at low cost.

### LOUDSPEAKERS British made bargains!!!

12" 25 watt 8/15 ohms £4.95 carr. 30p. 15" 50W.8/15 ohm £14.50 carr. 50p.  
12" 40 watt 15,000 gauss magnet system 8/15 ohm £11.50 carr. 40p.  
A.K.G. microphones suitable for disco, group or general P.A. use.  
D11DHL rrp £11.00 our price £9.45 post free  
D190C High Z rrp £21.50 our price £17.45 post free  
D1000C 24 ct gold plate rrp £37.00 our price £32.00 post free

SEND SAE FOR OUR AKG PRICE LIST. DISCOUNTS ON ALL MICS.

### CALLERS & MAIL ORDER:

327-331 Whitehorse Rd.,  
West Croydon, Surrey.  
CRO 2HS 01-644 4385

### CALLERS ONLY:

8a Dalce Rd., Rochester,  
Kent. Medway 404199

### BUSINESS HOURS:

9.30 a.m.  
to 5.30 p.m.

### TERMS OF BUSINESS:

C.W.O. or C.O.D. (35p extra)  
All cash in regd. envelopes please!  
Telephone orders to our CROYDON BRANCH.  
TRADE & EXPORT enquiries invited.

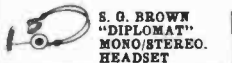
# CRESCENT RADIO LTD

11 & 40 MAYES ROAD, LONDON N22 6TL 888 3206

MAIL ORDER DEPT.  
No. 11  
MAYES RD.  
LONDON  
N22  
6TL

## COMPONENTS AND HI FI FOR THE HOME CONSTRUCTOR

OUR SHOPS ARE OPEN ALL DAY FROM 9 A.M. TO 6 P.M. ON FRIDAY (WE CLOSE ALL DAY THURSDAY)  
13 SOUTH MALL, EDMONTON, N-9 803 1685



**S. G. BROWN "DIPLOMAT" MONO/STEREO HEADSET**  
Finest quality British made Lightweight Headphones.  
Incorporate ceramic piezo electric transducers.  
Specification:—  
Frequency—20-17,500 CPS.  
Impedance—Predominantly capacitive, at -001MFD per earpiece can be regarded as 150K at 1Kcs.  
Weight—3.5oz. (98 grams)  
A Bargain at **£2-50p** each set  
Please include 10p per set P.P.



**"CRESCENT" DIGITAL CLOCK KIT**  
24 Hour Nixie Digital Clock Kit We Supply:  
★ A complete set of components  
★ A complete set of easy to follow instructions  
★ Printed circuits made to make construction as simple as possible  
★ A cabinet and front panel to give a professional finish.  
All for the price of the components. £22-50. 4-6p. P. & P. Please send S.A.E. for more information.



**TRI-VOLT BATTERY ELIMINATOR**  
Enables you to work your transistor radio, amplifier, or cassette, etc. from A.C. mains through this compact eliminator. Just by moving a plug you can select the voltage you require—6v, 7½v or 9 volts. This means all your transistor power pack applications can be handled by this one unit.  
Approx. size: 2½" x 2½" x 3½". OUR PRICE—£2.75 + 10p. P. & P. Same model suitably wired for the Philips Cassette—£3-00 + 10p. P. & P.



**TRI-VOLT CAR CONVERTER**  
Enables you to work your Transistor Radio, Amplifier or Cassette etc. from the 12 volt car supply positive or neg. earth.  
This converter supplies 6, 7½ or 9 volts and is transistor regulated. Approx. size 2½" x 3½" x 2". Very easy to fit and a real money saving device for £2-50 + 10p. P. & P.



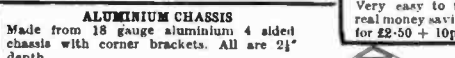
**WAPER SWITCHES**  
1 pole 12 way  
2 pole 2 way  
2 pole 3 way  
2 pole 4 way  
2 pole 6 way  
3 pole 4 way  
4 pole 2 way  
18p each. Please inc. 5p P. & P. Up to 3 switches.



**BRIDGE RECTIFIER**  
Plastic encapsulated.  
Texas Type No 1B40  
K05 50v at 4 amp  
Our Price 55p  
+ 5p P. & P.



**MINIATURE RELAY**  
6 volt 70 ohm.  
Single Pole Changeover.  
Approx. size = 1½" x 1" x 1".  
**40p** plus 5p P. & P.



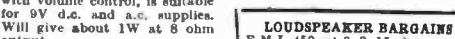
**ALUMINUM CHASSIS**  
Made from 18 gauge aluminium 4 sided chassis with corner brackets. All are 2½" depth.  
6 x 3—41p 12 x 3—53p 14 x 9—84p  
6 x 4—45p 12 x 8—81p 16 x 6—86p  
8 x 6—83p 12 x 8—83p 16 x 10—108p  
10 x 7—83p 14 x 3—80p  
Please send 10p per chassis P. & P.



**POTENTIOMETERS**  
All types 1" and less diameter.  
SINGLES DUAL  
5K Log or 5K  
10K Lin Less 10K  
25K Switch 25K Less  
50K 50K Switch  
100K 100K  
250K Double 250K 40p  
500K Pot 500K each  
1M Switch 1M  
2M 2M 24p ea.  
Up to 3 Pots. Please add 5p. P. & P.



**S.G. BROWN HEADPHONES**  
Used! But in good working condition. These Type "P" headphones are 4,000 Ohm imp. and a bargain at  
**50p** Plus 10p. P. & P. per pair



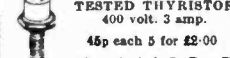
**LOW VOLTAGE AMPLIFIER** Few only at **£1-75**  
5 transistor amplifier complete with volume control, is suitable for 9V d.c. and a.c. supplies. Will give about 1W at 8 ohm output. With high IMP input this amplifier will work as a record player, baby alarm, etc., amplifier.  
plus 13p P. & P.



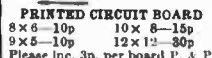
**POPULAR POWER TRANSFORMER**  
Now at our Low Price  
50p each  
Please include 5p P. & P.



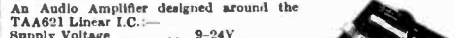
**PRINTED CIRCUIT KIT**  
Everything for producing your own printed circuits.  
£1-40p plus 10p. P. & P.



**BARGAIN S.C.R. TESTED THYRISTOR**  
400 volt. 3 amp.  
45p each 5 for £2-00  
Please include 5p P. & P.



**PRINTED CIRCUIT BOARD**  
8 x 6—10p 10 x 8—15p  
9 x 5—10p 12 x 12—30p  
Please inc. 3p. per board P. & P.



**EA1000 3 WATT AUDIO AMPLIFIER MODULE**  
An Audio Amplifier designed around the TAA621 Linear I.C.—  
Supply Voltage . . . . . 9-24V  
Speaker Imp. . . . . 8-16 ohm  
Frequency . . . . . 50Hz-25KHz  
Overall Size . . . . . 2½ x 3½ x 1½ in  
Ideal Amplifier for radios, record players, stereo units, etc.  
Full technical data and diagrams with each module. All guaranteed and a bargain at **£2-63** + 5p P. & P.



**LOUDSPEAKER BARGAINS**  
E.M.I. 450 set 3. 8. 15 ohm  
£3-50 plus 38p. P. & P.  
E.M.I. 350 set 8 ohm.  
£7-00 plus 38p. P. & P.  
**MINI LOUSPEAKERS**  
2½" (57mm) 8ohm — 50p each  
2½" (57mm) 40ohm — 50p each  
2½" (57mm) 80ohm — 50p each  
Please include 5p. P. & P. up to 3 Mini-Loudspeakers

# C. HADLEY

24, WOODHILL, HARLOW, ESSEX

## MINITRON DIGITAL INDICATOR TYPE 3015F

Reads 0-9 and decimals (Data Sheet on request)

**ONLY £1-50**

for one month only

All our stocks are brand new with money back guarantee

<b>TRANSISTORS</b>	BD116 79p	OC14 13p	TIP33A 85p	2N3711 10p
AC107 15p	AL102 59p	OC45 13p	TIP34A £1-80	40251 49p
AC126 11p	AL103 49p	OC71 12p	2N3857 15p	40636 55p
AC127 11p	AU103 85p	BF194 59p	OC81 13p	2N1304 25p
AC128 11p	AU111 95p	BFY50 15p	OC83 13p	2N1305 25p
AC176 25p	BC107 8p	BFY51 12p	OC91 20p	2N2646 47p
AC141K 20p	BC108 8p	B8Y95A 15p	OC170 24p	2N2926 10p
AC142K 20p	BC109 8p	ME0402 18p	OC200 25p	2N3053 20p
AD14 40p	BC154 20p	ME0404 14p	OC201 25p	2N3055 49p
AD180 44p	BC168 10p	ME4401 10p	OC25 25p	2N3702 12p
AD161 8p	BC169 11p	ME4102 12p	OC28 30p	2N3703 12p
AD162 M/P 55p	BC182L 8p	ME6002 14p	OC29 36p	2N3704 12p
AF114 15p	BC183L 8p	ME8101 14p	OC35 25p	2N3705 12p
AF115 15p	BC184L 8p	ME9102 15p	OC36 36p	2N3706 10p
AF116 15p	BC212L 8p	MP8111 32p	TIP29A 48p	2N3707 10p
AF117 15p	BC214L 8p	MP8511 34p	TIP30A 55p	1844 10p
		MP8513 45p	TIP31A 58p	2N3709 10p
		OC41 13p	TIP32A 69p	1N4149 4p
				W02 32p

**MULLARD POLYESTER CAPACITORS C180 SERIES**  
250V P.C. mounting: 0.01µF, 0.015µF, 0.022µF, 5p, 0.033µF, 0.047µF, 0.068µF, 31p, 0.1µF, 4p, 0.15µF, 0.22µF, 5p, 0.33µF, 6p, 0.47µF, 81p, 0.68µF, 11p, 1.0µF, 13p, 1.5µF, 20p, 2.2µF, 24p.

**MULLARD POLYESTER CAPACITORS C196 SERIES**  
400V: 0.001µF, 0.0015µF, 0.0022µF, 0.0033µF, 0.0047µF, 21p, 0.0068µF, 0.01µF, 0.015µF, 0.022µF, 0.033µF, 3p, 0.047µF, 0.068µF, 0.1µF, 4p, 0.15µF, 6p, 0.22µF, 7p, 0.33µF, 11p, 0.47µF, 13p.  
160V: 0.01µF, 0.015µF, 0.022µF, 0.033µF, 0.047µF, 0.068µF, 3p, 0.1µF, 31p, 0.15µF, 41p, 0.22µF, 5p, 0.33µF, 6p, 0.47µF, 71p, 0.68µF, 11p, 1.0µF, 13p.

**ELECTROLYTIC CAPACITORS—MULLARD C426 SERIES** 6p each  
(µF/V) 10/2.5, 20/2.5, 80/2.5, 160/2.5, 320/2.5, 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.

**MULLARD C437 SERIES**  
100/40, 160/25, 250/16, 400/10, 640/6.4, 800/4, 1000/2.5, 8p, 100/64, 160/40, 250/25, 400/16, 640/10, 1250/4, 1000/6.4, 1600/2.5, 12p, 160/64, 250/40, 400/2.5, 640/16, 2000/4, 4000/16, 16000/4, 2500/2.5, 15p, 250/64, 400/40, 640/25, 3200/4, 1000/16, 1600/16, 4000/2.5, 18p.

Miniature Fitted Ceramic Plate, 3p each.  
Preferred values from 1.8p to 10,000pf.

**VEROBOARD**

2½ x 3½ in	0.15 Matrix 17p	0.1 Matrix 23p
2½ x 5 in	25p	25p
3½ x 5 in	25p	25p
3½ x 5 in	30p	25p
5 x 17 in (Plain)	83p	—

Vero Pins (Bag of 36) 20p.  
Vero Cutter 45p.  
Pin Insertion Tools (1 and .15 matrix) at 55p.

**SUPER LOW PRICED LINEAR I.C.'S**

301A	T099	49p
301A	D1L	48p
709C	T099	28p
709C	D1L	30p
723C	T099	87p
723C	D1L	80p
741C	T099	35p
741C	D1L	34p
741C	8p in D1L	34p
747C	D1L	40p
748C	T099	48p

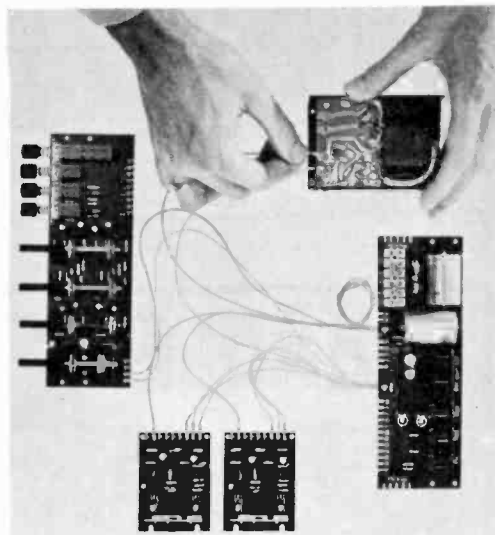
**ZENER DIODES**  
400mW 5% 3-3V to 30V, 15p.

**LOW COST DUAL INLINE I.C. SOCKETS**  
14 pin type at 15p each.  
16 pin type at 16p each.

**TRANSISTOR EQUIVALENTS BOOK** 40p

Pack of 20 1N4148	80p	Mix Pack of 20 1N4000 Series Diodes	50p
AC127 & AC128	13p	AD161, AD162	M/P
10 plus	11p	1-9	62p
100 plus	9p	10 plus	48p
2N3055	49p	BC107-BC108	8p
1-9	48p	BC109	8p
10 plus	48p	10-99	7p
Pack of 10 2N3930	50p	100 plus	6p
unbranded but tested		Pack of 10 Plastic BC109	80p
Unmarked but fully tested		Unmarked but fully tested	
2N3055	30p	TBA800	5 watt AF power Amp. £1-40 each
1-9	25p		

# 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  $\Omega$ )

Inputs - Mag. P.U. - 3mV correct to R.I.A.A. curve 20-25,000 Hz  $\pm$  1dB. Ceramic pick-up - 50mV. Radio - 50 to 150mV. [Aux. adjustable between 3mV. and 3V.]

Signal to noise ratio - Better than 70dB

Distortion - better than 0.2% under all conditions.

Controls - Press buttons for on-off, P.U., radio and aux. Treble +15 to -15 dB at 10 kHz. Bass +15 to -15 dB at 100 Hz. Volume. Stereo Balance.

Channel matching within 1dB.

Front panel - brushed aluminium with black knobs.

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

**£29.95**

To SINCLAIR RADIONICS LTD., ST. IVES, HUNTINGDONSHIRE PE17 4HJ

Please send Project 605 post free  Details and list of stockists

Name .....

Address .....

for which I enclose £29.95 cheque/money order/cash. **E.E.98.**



# DISCOUNTS UP TO

# 60%

## Global's GOLDEN Guarantee

WE GUARANTEE THAT WITHIN 7 DAYS OF PURCHASE IF ANY ITEM OF GOODS IS FOUND TO BE GENUINELY DEFECTIVE WE WILL REPLACE THE SAID GOODS WITHOUT QUESTION, AFTER 7 DAYS GOODS ARE COVERED BY MANUFACTURERS 12 MONTHS GUARANTEE.

**GARRARD SP25 Mk. III SPECIAL OFFER £17.45**

Garrard SP25 Mk. III  
Goldring G800  
Teak plinth and tinted cover. All leads supplied.  
Please add £1.25 for P. & P.

### TURNTABLE

Please add 75p for P. & P.

Garrard SP25 Mk. III	£9.95
Garrard AP76	£17.45
Garrard 5L65B	£13.95
Garrard 401	£26.50
Garrard Zero 100 (Auto)	£38.75
Garrard Zero 100 (Single)	£36.55
Garrard 3000	£10.00
Garrard 2025TC with Sonotone 9TAHC	£8.75
BSR MP60	£9.95
Goldring GL72	£21.75
Goldring GL72/P	£28.75
Goldring GL75	£26.95
Goldring GL75/P	£33.95
Goldring 101 PC	£20.00
Wharfedale Linton & cart.	£27.25
New Products TD125 AB Mk. II	£91.75
Thorns TD150 Mk. II	£26.95
Thorns TD150A Mk. II	£32.95

### AMPLIFIERS

Please add 75p P. & P.

Amstrad 8000 Mk. II	£14.95
Amstrad IC2000	£27.50
Amstrad Integra 4000	£21.95
Armstrong 521 (teak cased)	£43.85
Alpha Highgate 212	£24.95
Alpha Highgate FA300	£30.95
Alpha Highgate FA400	£34.50
Keleton 700 new prod.	£19.50
Leak Delta 30	£45.90
Leak Delta 70	£55.75
Metrosound ST20E	£24.20
Metrosound ST60	£45.30
Pioneer SA600	£57.00
Pioneer SA500A	£34.25
Pioneer SA900	£85.00
Pioneer SA1000	£93.00
Rogers R/brook (Chassis)	£35.80
Rogers R/brook (Cased)	£38.95
Rogers R/bourne (Chassis)	£45.50
Rogers R/bourne (Cased)	£49.50
Sinclair PRO60 2 x Z30/PZ5	£14.70
Sinclair PRO60 2 x Z30/PZ6	£16.70
Sinclair PR060 2 x Z50/PZ8/Trans	£21.25
Sinclair AFU (Filter Unit)	£4.40
Sinclair 605	£17.95
Sinclair 2000 Mk. II	£21.50
Sinclair 3000 Mk. II	£28.50
Wharfedale Linton	£44.25
Teleton SAQ206B	£20.50
Teleton SAQ307	£22.50
Rotel RA 310	£33.75
Rotel RA 610	£50.75

### TUNERS

Please add 75p P. & P.

Amstrad Multiplex 3000	£28.75
Armstrong 523	£39.00
Armstrong 524	£30.50
Rogers Ravensbrook FET4 (Chassis)	£31.00
Rogers Ravensbrook FET4 (Cased)	£35.00
Rogers Ravensbourne FET4 (Chassis)	£43.00
Rogers Ravensbourne FET4 (Cased)	£47.50
Sinclair PR060 (Module)	£15.75
Sinclair 2000/3000 Tuner	£31.00
Philips RH690	£33.00
Leak Delta FM (Cased)	£53.75
Leak Delta AM/FM (Cased)	£64.00
Alpha Highgate FT 150	£34.95

### TUNER/AMPLIFIERS

Please add 75p for P. & P.

Alpha Highgate 150	£44.25
Armstrong 525 (Teak cased)	£67.50
Armstrong 526 AM/FM (Cased)	£77.25
Leak Delta 75	£124.00
Philips RH781	£150.00
Philips RH702	£82.50
Teleton 2100	£29.45
Goodmans One Ten	£99.50
Rogers R/brook (Teak)	£78.50
Rogers R/brook (Chassis)	£72.75
Alpha FR 3000 New prod.	£66.00

### SPEAKERS

Please add £1.25 P. & P. per pair

Amstrad 138	£14.70
Wharfedale Denton 2	£28.75
Wharfedale Linton 2	£35.75
Wharfedale Melton 2	£47.45
Wharfedale Dove Dale 3	£59.75
Celestion Ditton 120	£38.50
Celestion Ditton 15	£52.75
Celestion Ditton 25	£87.00
Celestion County New Prod	£35.95
Goodmans Double Maxim	£48.00
Goodmans Mezzo 3	£46.95
Goodmans Magister	£77.45

£3.20\*



Plus 35p p. & p. Finished in teak veneer with tinted dust cover fully assembled. For Garrard SP25, 2025TC, 3000, AT60, 2000, 2500, 3500, 5100, 1025, 5L65B. Also for BSR McDonald MP60 and others. For AP76; AP75; SL72B; SL75; SL95B; £4.20 plus 35p P. & P. Also finished in walnut to match Japanese equipment—at no extra.

### CARTRIDGES

Please add 10p for P. & P.

Goldring G850	£3.25
Goldring G800	£5.75
Goldring G800E	£7.45
Goldring G800 Super E	£14.35
Shure M3D	£3.85
Shure M447	£4.95
Shure M55E	£5.60
Shure M75E Type 2	£10.00
Sonotone 9TAHC	£1.75



All prices correct at time of press E. & O.E. and are subject to alterations

## GLOBAL AUDIO DISCOUNT WAREHOUSES

Dept.(EE12) 174 Pentonville Road, London, N1. Telephone 01-278 1769

Or: 4 High View Parade, Redbridge Lane East, Woodford Avenue, Ilford, Essex. Tel: 01-550 1086.

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

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

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



## for fast, easy reliable soldering

Ersin Multicore Solder contains 5 cores of non-corrosive flux, instantly cleaning heavily oxidised surfaces. No extra flux is required.

### IDEAL FOR HOME CONSTRUCTORS



Size 1 cartons all at 25p each in 40/60, 60/40, or Savbit alloys in 7 gauges.

### EASY-TO-USE DISPENSERS



Size 5 (Savbit) 18swg, 18p (illustrated)

Size 19A (60/40 alloy) 18swg, 18p

Size 15 (60/40 alloy) 22swg, 22p

### BIB WIRE STRIPPER AND CUTTER



**NEW!**

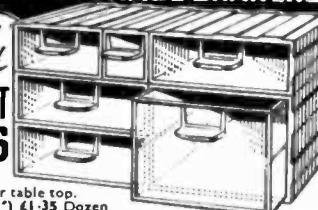
Model 3A. Strips insulation from cable or flex without nicking wire. 4 different settings, 4 & 6 BA spanner ends, ground cutting edges. Price 32p. Also available, de luxe Model 8. Price 58p.

From Electrical and Hardware Shops. If unobtainable, write to Multicore Solders Ltd., Hemel Hempstead, Herts.

### INTER-LOCKING PLASTIC STORAGE DRAWERS

Newest, neatest system ever devised for storing small parts and components: Resistors, capacitors, transistors, etc. Rigid plastic units, interlock together in vertical and horizontal combinations. Transparent plastic drawers have label slots / removable space dividers. Build up any size cabinet for wall, bench or table top.

**NEAT! HANDY! TIDY!**  
**DISCOUNT PRICES**



**5 SIZES ALL INTERLOCK**

**SINGLE UNITS** (5" x 2 1/2" x 2 1/2") £1.35 Dozen  
**DOUBLE UNITS** £2.25 Dozen  
**TREBLE (3D)** £3.35 for 8  
**DOUBLE TREBLE 2** draws in one outer case (6D2) £3.65 for 8 extra large size (6D1) £3.30 for 8.  
**PLUS QUANTITY DISCOUNTS!** Order £5 and over Deduct 5% in the £. Order £10 and over Deduct 7 1/2% in the £. Order £20 and over Deduct 10% in the £. Pack./Post./Carr.: Add 35p to all orders under £5. Orders over £5 P/P/C free. (Dept. EE11) 124 CRICKLEWOOD BROADWAY, LONDON N.W.2

**IVORYET LIMITED**

## The most accurate pocket size CALCULATOR in the world

The 66 inch OTIS KING scales give you extra accuracy. Write today for free booklet, or send £4.65 for this invaluable spiral slide rule on approval with money back guarantee if not satisfied.

**CARBIC LTD.** (Dept. EE4) 54 Dundonald Road, London, SW19 3PH.



**FREE BOOKLET ON REQUEST**





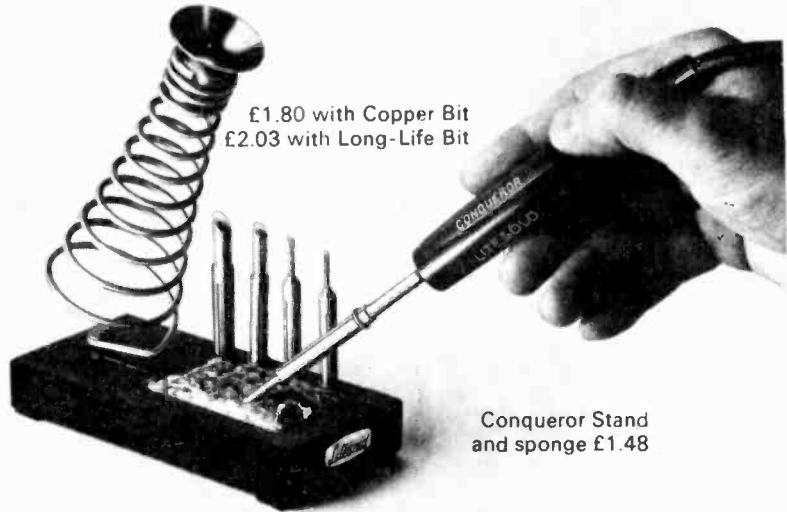
# The *Litesold* CONQUEROR

An outstandingly simple and efficient new soldering tool, featuring a fully enclosed element and slip-on bits which can't seize. Five tip sizes available,  $\frac{1}{16}$ in to  $\frac{1}{4}$ in, covering most work with one iron only. Lighter and slimmer than comparable irons, and with better performance. A pleasure to use and excellent value. Mains or low voltages. Conqueror spring stand gives complete safety and convenience, and holds spare bits.

Note that we are now supplying a range of small pliers, cutters, soldering aids and other small tools for use in Electronics.

Please ask for leaflet.

Please ask for leaflet 54/1016.



£1.80 with Copper Bit  
£2.03 with Long-Life Bit

Conqueror Stand  
and sponge £1.48

**LIGHT SOLDERING DEVELOPMENTS LTD.**

28 Sydenham Road . Croydon CR9 2LL

01-688 8589/4559

## Have fun with electronics...



**Radionic  
Construction  
Kits**

### NO SOLDERING BATTERY OPERATED

Build your own radio receiver and many exciting experiments with the unique printed circuit board and mounted components. Easy to build, no soldering, battery operated, plus a fully illustrated instruction manual giving precise directions for each experiment. Ideally suitable for both the experimenter and beginner.

### Radionic Products Limited

St. Lawrence House, Broad Street, Bristol BS1 2HF.  
Tel: 0272 25351

Member of the ESL BRISTOL Group of Companies.



## PREMIER 800 STEREO AMPLIFIER



(As used in  
SYSTEM '800')

A truly high quality stereo amplifier—compare the specification, compare the price. Output: 5 watts per channel. Frequency response: 30-20,000 Hz = 2 db. Distortion: 1%. Output Impedance 8 ohms nom. Inputs equalised to R.I.A.A. Magnetic 4mV. Ceramic 100mV. Tuner 100mV. Tape 100mV. Tape out 150mV. Din sockets for inputs and outputs. Controls: Bass, Treble, Volume, Balance, Selector. Mono/Stereo switch. Stereo headphone socket. Attractive slim line design. Black leatherette cabinet with aluminium front panel. Size 12 1/2" x 6 1/2" x 2 1/2".

ONLY £15.00 Carr. 50p.

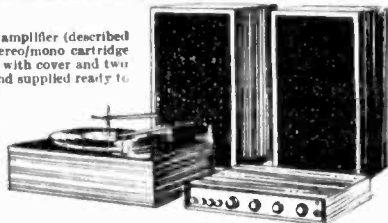
Mk. 11 Version available with Teak Finish Cabinet. £16.25. Carr. 50p.

## PREMIER HI-FI STEREO SYSTEMS

### SYSTEM "800"

Consists of the Premier 800 Mk II all transistor stereo amplifier (described left) Garrard auto/manual record player unit fitted stereo/mono cartridge with diamond stylus and mounted in teak finish plinth with cover and two cloth front loudspeaker systems. Absolutely complete and supplied ready to plug in and play. The 800 Mk II amplifier has an output of 5 watts per channel with inputs for ceramic and magnetic pick-up, tape and tuner also tape output socket and headphone socket. Controls: Bass, Treble, Volume, Balance, Selector. Mono/Stereo switch. Headphone socket. Power on/off. Teak finish cabinet with aluminium front panel. Size: 12 1/2" x 6 1/2" x 2 1/2".

£35.00  
Carr. £1.75



### SYSTEM "TWO"

as above but with slotted front teak finish loudspeakers. Garrard SP25 Mk. III and magnetic cartridge.

£45.00  
Carr. £1.75

### SYSTEM "THREE"

This consists of KLINGER KC903 stereo amplifier giving 6 watts rms per channel with Bass, Treble, Volume and Balance Controls. Inputs for Magnetic and Ceramic pick-up, tuner, tape in and out. Stereo headphone socket. Garrard SP25 Mk. III in teak finish plinth with cover and fitted Sonotone 9TACCD diamond stereo cartridge. A pair of HMF Speakers size 16 1/2" x 10 1/2" x 9" fitted EMI units complete the matching system.

£57.75 Carr. £1.75

**FREE**

LEADS  
AND PLUGS  
SUPPLIED  
WITH ALL  
SYSTEMS

## PREMIER PARAGON STEREO HI-FI AMPLIFIER



Gives the best possible reproduction of records, radio and tape at a reasonable price.

Fitted with all the controls and facilities you're ever likely to want, the Paragon gives you a degree of

sophistication that is usually only found with amplifiers costing twice its price. It has bass and treble side controls, volume and balance knobs, and eight push-buttons. There's also a standard stereo jack socket on the front panel, plus a ceramic/magnetic cartridge switch and a mains outlet socket on the back panel. Specifications 10 + 10 watts into 8 ohms. Power/frequency response: 9dB 10 watts into 8 ohms - 3dB 20Hz - 25KHz. Distortion typically less than 0.25%. Inputs for Magnetic phono (4mV) Crystal phono (66mV) Radio/Tape (100mV). High and low filters. Teak finish cabinet. Size: 12 1/2" x 5 1/2" x 10 1/2".

£32.50 P. & P. 50p.



**WELLER "EXPERT" SOLDER GUN.** Saves time and simplifies soldering in the home and service dept. Two position trigger gives instant dual heat. 100/140 watt. 240 volt A.C. £3.95 P. & P. 50p



"Litesold" Soldering Iron. Lightweight 3/4" pencil bit. Ideal for regular bench use and around the home. 25 watts. 240 volt A.C. £1.50 P. & P. 10p



**E.M.I. 13x8in. HI-FI SPEAKERS**

Fitted two 2 1/2in tweeters and crossover network. Impedance 8 or 15 ohm. Handling capacity 10W. Brand new.

£3.47 P. & P. 50p

## PREMIER HI-FI OFFERS

Rogers Ravensbrook II Stereo Amplifier teak

£38.50

Rogers Ravensbourne Stereo Amplifier teak

£49.00

Metrosound ST20E Stereo Amplifier teak

£25.50

Goldring GL72 less cartridge

£22.00

Garrard SP25 III with Goldring G800 cartridge

£15.00

P. & P. 60p extra any of above.



Garrard AP76 with G800, ready wired to 5 pin Din in plinth with cover

£29.50

P. & P. £1

Garrard AP76 less cartridge

£18.80

P. & P. 60p.

Garrard 401 Transcription Unit

£27.40

P. & P. 60p

Garrard 2025 T/C with Stereo Ceramic Cartridge

£8.50

P. & P. 60p

Garrard 2025 T/C with Stereo Ceramic Cartridge ready wired in teak plinth with cover

£12.45

P. & P. £1

**CARTRIDGE BARGAINS!**  
Goldring G800H £5.00; G800 £5.50; G800E £9.50; P. & P. 10p



### METER BARGAIN

MODEL GT-800 MULTIMETER

A precision made pocket sized test meter, ideally suited for testing electronic circuits or electronic appliances. Supplied complete with test lead and batteries. RANGE—DC Voltage: 10, 50, 250, 1,000V (1,000 opV). AC Voltage: 10, 50, 250, 1,000V (1,000 opV). DC Current: 1mA, 100mA. Resistance: 0-150K ohms. Decibel: -10 to +22db (at AC 10V range) £2.47. P. & P. 26p.



### HI-FI STEREO HEADPHONES

Designed to the highest possible standard. Fitted 2 1/2in. speaker units with soft padded ear muffs. Adjustable headband. 8 ohms impedance. Complete with 6ft lead and stereo jack plug.

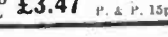
£2.47 P. & P. 26p.

### VERITAS V-149 MIXER

Battery operated 4-channel audio mixer providing four separate inputs. Size 6 x 3 x 2 1/2in. suitable for crystal microphone, low impedance microphone, with transformer, radio, tape, etc. Max. input 1.5v. Max. output 2.0v. Gain 6 dB. Standard jack plug socket inputs, phonograph output. Attractive teak wood grain finish case.

MONO MODEL £3

STEREO MODEL £3.47 P. & P. 15p



**GENUINE EMI—TAPE COMPACT CASSETTES LOW NOISE BRAND NEW IN LIBRARY CASES**

C60 (List 71p) 45p  
C90 (List 98p) 65p  
C120 (List £1.48) 85p  
P. & P. 10p



### LOW-NOISE COMPACT CASSETTES

Screw fixing—fully guaranteed. In Library cases.

C60—29p 3 for 81p

C90—40p 3 for £1.11

C120—52p 3 for £1.40

P. & P. 10p each (3 and over 10p)

### "VERITONE" RECORDING TAPE

SPECIALLY MANUFACTURED IN U.S.A. FROM EXTRA STRONG PRE-STRETCHED MATERIAL. THE QUALITY IS UNEQUALLED. TENSILLED to ensure the most permanent base. Highly resistant to breakage, moisture, heat, cold or humidity. High polished splice free finish. Smooth output throughout the entire audio range. Double wrapped—attractively boxed.

TT3 3' 450'	POLYESTER 37p	DT8 51' 1800'	POLYESTER £1.12
DT3 3 1/2' 600'	POLYESTER 57p	TT8 51' 2400'	POLYESTER £1.87
SP5 5' 800'	P.V.C. 42p	SP7 7' 1200'	P.V.C. 62p
LP5 5' 900'	ACETATE 50p	LP7 7' 1800'	ACETATE 75p
DT5 5' 1200'	POLYESTER 75p	DT7 7' 2400'	POLYESTER £1.25
LP6 6' 1200'	ACETATE 75p	TT7 7' 3600'	POLYESTER £2.50

TAPE SPOOLS 3" 5p, 5", 5 1/2", 7" 7p.  
Post and Packing 3" 5p, 5", 5 1/2", 7" 10p (3 reels and over Post Free).



**PREMIER RADIO**  
23, TOTTENHAM COURT ROAD, LONDON, W.1 Tel: 01-636 3451

OXFORD ST

TOTTENHAM COURT RD.

DOMINION




# SEW PANEL METERS

USED EXTENSIVELY BY INDUSTRY, GOVERNMENT DEPARTMENTS, EDUCATIONAL AUTHORITIES, ETC.  
 ● LOW COST ● QUICK DELIVERY ● OVER 200 RANGES IN STOCK ● OTHER RANGES TO ORDER


## NEW "SEW" DESIGNS! CLEAR PLASTIC METERS      BAKELITE PANEL METERS

**CLEAR PLASTIC METERS**  
**TYPESW.100**  
 100 x 80 mm.



50μA	.....	\$3-80
500-500μA	.....	\$3-80
100μA	.....	\$3-80
100-0-100μA	.....	\$3-70
800μA	.....	\$3-80
1mA	.....	\$3-80
20V. D.C.	.....	\$2-40
50V. D.C.	.....	\$3-40
500V. D.C.	.....	\$3-40
5 amp. D.C.	.....	\$3-40
300V. A.C.	.....	\$3-40
5 amp. A.C.	.....	\$3-40
300V. A.C.	.....	\$3-40
VU Meter	.....	\$4-18


**BAKELITE PANEL METERS**  
**TYPES S-80**  
 80 mm. square fronts



50μA	.....	\$3-50
50-0-50μA	.....	\$3-40
100μA	.....	\$3-40
100-0-100μA	.....	\$3-20
500μA	.....	\$3-08
1mA	.....	\$3-85
20V. D.C.	.....	\$2-85
50V. D.C.	.....	\$2-85
300V. D.C.	.....	\$2-85
1 amp. D.C.	.....	\$2-85
5 amp. D.C.	.....	\$2-85
300V. A.C.	.....	\$2-85
VU Meter	.....	\$3-70


### "SEW" CLEAR PLASTIC METERS

**Type MR.85P. 4 1/2 in. x 4 1/2 in. fronts.**



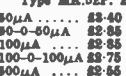
50mA	.....	\$2-10
100mA	.....	\$2-10
500mA	.....	\$2-10
1 amp.	.....	\$2-10
5 amp.	.....	\$2-10
15 amp.	.....	\$2-10
80 amp.	.....	\$2-20
20V. D.C.	.....	\$2-10
50V. D.C.	.....	\$2-10
300V. D.C.	.....	\$2-10
15V. A.C.	.....	\$2-10
300V. A.C.	.....	\$2-10
8 Meter 1mA	.....	\$2-10
300V. A.C.	.....	\$2-10
3 Meter 1mA	.....	\$2-10
VU Meter	.....	\$2-95
1 amp. A.C.	.....	\$2-10
5 amp. A.C.	.....	\$2-10
10 amp. A.C.	.....	\$2-10
20 amp. A.C.	.....	\$2-10
30 amp. A.C.	.....	\$2-10

**Type MR.85P. 1 1/2 in. square fronts.**



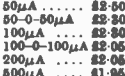
200mA	.....	\$1-75
300mA	.....	\$1-75
500mA	.....	\$1-75
750mA	.....	\$1-75
1 amp.	.....	\$1-75
2 amp.	.....	\$1-75
5 amp.	.....	\$1-75
10 amp.	.....	\$1-75
3V. D.C.	.....	\$1-75
10V. D.C.	.....	\$1-75
15V. D.C.	.....	\$1-75
20V. D.C.	.....	\$1-75
50V. D.C.	.....	\$1-75
100V. D.C.	.....	\$1-75
150V. D.C.	.....	\$1-75
300V. D.C.	.....	\$1-75
500V. D.C.	.....	\$1-75
750V. D.C.	.....	\$1-75
15V. A.C.	.....	\$1-85
50V. A.C.	.....	\$1-85
150V. A.C.	.....	\$1-85
300V. A.C.	.....	\$1-85
500V. A.C.	.....	\$1-85
8 Meter 1mA	.....	\$1-85
300V. A.C.	.....	\$1-85
8 Meter 1mA	.....	\$1-85
VU Meter	.....	\$2-30

**Type MR.85P. 2 1/2 in. square fronts.**



50μA	.....	\$2-40
50-0-50μA	.....	\$2-40
100μA	.....	\$2-40
100-0-100μA	.....	\$2-75
800μA	.....	\$2-85
1mA	.....	\$2-90
2mA	.....	\$2-90
8mA	.....	\$2-90
100mA	.....	\$2-90
800mA	.....	\$2-90
1 amp.	.....	\$2-90
5 amp.	.....	\$2-90
10V. D.C.	.....	\$2-90
20V. D.C.	.....	\$2-90
50V. D.C.	.....	\$2-90
300V. D.C.	.....	\$2-90
15V. A.C.	.....	\$2-90
300V. A.C.	.....	\$2-90
8 Meter 1mA	.....	\$2-90
VU Meter	.....	\$2-95
5 amp. A.C.	.....	\$2-90
10 amp. A.C.	.....	\$2-90
20 amp. A.C.	.....	\$2-90
30 amp. A.C.	.....	\$2-90


**Type MR.85P. 2 1/2 in. square fronts.**



50μA	.....	\$2-85
50-0-50μA	.....	\$2-85
100μA	.....	\$2-85
100-0-100μA	.....	\$2-85
200μA	.....	\$2-06
800μA	.....	\$1-95
500-0-500μA	.....	\$1-95
1mA	.....	\$1-85
5mA	.....	\$1-85
10mA	.....	\$1-85
60mA	.....	\$1-85
100mA	.....	\$1-85
500mA	.....	\$1-85
1 amp.	.....	\$1-85
10V. D.C.	.....	\$1-85
20V. D.C.	.....	\$1-85
50V. D.C.	.....	\$1-85
300V. D.C.	.....	\$1-85
15V. A.C.	.....	\$2-00
300V. A.C.	.....	\$2-00
8 Meter 1mA	.....	\$2-00
VU Meter	.....	\$2-50
1 amp. A.C.	.....	\$1-85
5 amp. A.C.	.....	\$1-85
10 amp. A.C.	.....	\$1-85
20 amp. A.C.	.....	\$1-85
30 amp. A.C.	.....	\$1-85

### "SEW" BAKELITE PANEL METERS


**Type MR.85. 3 1/2 in. square fronts.**



1 amp.	.....	\$2-15
5 amp.	.....	\$2-15
15 amp.	.....	\$2-15
30 amp.	.....	\$2-15
60 amp.	.....	\$2-15
5V. D.C.	.....	\$2-15
10V. D.C.	.....	\$2-15
20V. D.C.	.....	\$2-15
50V. D.C.	.....	\$2-15
150V. D.C.	.....	\$2-15
300V. D.C.	.....	\$2-15
50mV D.C.	.....	\$2-40
100mV D.C.	.....	\$2-40
300V. A.C.	.....	\$2-90
80V. A.C.	.....	\$2-90
150V. A.C.	.....	\$2-90
300V. A.C.	.....	\$2-90
500mA A.C.	.....	\$2-15
1 amp. A.C.	.....	\$2-15
5 amp. A.C.	.....	\$2-15
10 amp. A.C.	.....	\$2-15
20 amp. A.C.	.....	\$2-15
30 amp. A.C.	.....	\$2-15
50 amp. A.C.	.....	\$2-15
VU Meter	.....	\$3-40

**\*MOVING IRON—ALLOthers MOVING COIL**  
 Please add postage

### SEW EDUCATIONAL METERS

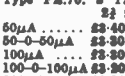


**Type ED.107.** Size overall 100mm x 90mm x 108mm. A new range of high quality moving coil instruments ideal for school experiments and other bench applications. 3" mirror scale. The meter movement is easily accessible to demonstrate internal working. Available in the following ranges:

50μA	.....	\$5-50
100μA	.....	\$5-10
1mA	.....	\$4-85
50-0-50μA	.....	\$5-10
1-0-1mA	.....	\$4-85
1A d.c.	.....	\$4-85
5A d.s.	.....	\$4-85
10V. d.	.....	\$4-85
20V. d.c.	.....	\$4-85
50V. d.c.	.....	\$4-85
300V. d.c.	.....	\$4-85
Dual range	.....	\$5-50
500mA/5A d.c.	.....	\$5-10
5V/50V d.c.	.....	\$5-10

### EDGWISE METERS

**Type PE.70. S 17/22in. x 1 15/22in. x 2 1/2 in. deep.**




50μA	.....	\$3-40
50-0-50μA	.....	\$3-40
100μA	.....	\$3-30
100-0-100μA	.....	\$3-30
500μA	.....	\$3-30
500-0-500μA	.....	\$2-15
1mA	.....	\$2-15
1-0-1mA	.....	\$2-15
8mA	.....	\$2-15
10mA	.....	\$2-15
60mA	.....	\$2-15
100mA	.....	\$2-15
500mA	.....	\$2-15
500μA	.....	\$3-05
1mA	.....	\$2-70
300V. A.C.	.....	\$2-70
VU Meter	.....	\$3-75

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


# MULTIMETERS for EVERY purpose!

### ROUND SCALE TYPE PENCIL TESTER MODEL TS.68

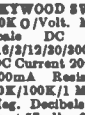


Completely portable, simple to use pocket sized tester. Ranges 0/3/30/300V AC and DC at 2,000 ohm p.v. Resistance 0-20K ohms. ONLY \$1-97 P. & P. 15p


**HIOKI MODEL 790Z**  
 20,000 O.P.V.  
 Overload protection.  
 5/25/100/500/1000 VDC.  
 10/50/250/1000 VAC.  
 50 uA/250 mA. 20K/2 meg ohm. -5 to +92db.  
 \$4-97. P. & P. 15p.




**SKYWOOD SW-500**  
 50K O/Volt. Mirror scale. DC Volts 0.5/2/12/50/300/600. DC Current 20mA/6/600mA. Resistance 10K/100K/1 Meg/10 Meg. Decibels -20 to +87 db. \$7-50. P & P. 15p.




**Model S-100TR MULTI-METER TRANSISTOR METER** 100,000 o.p.v. MIRROR SCALE OVERLOAD PROTECTION  
 0/12- -5/3/12/30/120/600 V DC.  
 0/6/30/120/600 V. A.C.  
 0/12/600uA/12/300MA/13 AMP. DC.  
 0/10K/1 MEG/100 MEG.  
 -20 to +80 db.  
 0.01 - 2 mfu.  
 Transistor tester measures Alpha, beta and Ico. Complete with batteries, instructions and leads. \$18-50, P.P. 25p.




**MODEL 5025 57 Ranges**  
 Giant 8 1/2 in. Meter, Polarity Reverser Switch.  
 Sensitivity: 50K/Volt D.C. 5K/Volt A.C. D.C. Volts: -125, -25, 1.25, 5, 10, 25, 50, 125, 250, 500, 1,000V. A.C. Volts: 1-5, 2, 5, 10, 25, 50, 125, 250, 500, 1,000V. D.C. Current: 25, 50mA, 2-5, 5, 25, 50, 250, 500mA, 5, 10 amp. Resistance: 2K, 10K, 100K, 1MEG, 10MEG. Decibels: -20 to +85 db. \$18-50. P. & P. 17p



**MODEL 500 20,000 O.P.V.** with overload protection mirror scale 0/5/5/10/20/100/250/500/1,000 V. D.C. 0/2/5/10/25/100/250/500/1,000V. A.C. 0/50uA/5/50/500mA. 13 amp. D.C. 0/60K/3 Meg/60 Meg Ω.  
 \$3-97. Post paid.




**TE-20RF SIGNAL GENERATOR**  
 Accurate wide range signal generator covering 150 Kc/s-250 Mc/s on 6 bands. Directly calibrated variable R.F. attenuator. Operation 230/240V. A.C. Brand new with instructions. \$18. P. & P. 37p. S.A.E. for details.



**TNK LAB TESTER.** 100,000 O.P.V. 8 1/2 in. Scale Buzzer Short Circuit Check. Sensitivity: 100,000 O.P.V. D.C. 5K 1000uA. A.C. D.C. Volt: 5, 2, 5, 10, 50, 250, 1,000 V. A.C. Volt: 3, 10, 50, 50, 250, 500, 1,000V. D.C. Current: 10, 100μA, 10, 100, 500mA, 2-5, 10, 100, 500mA, 100K, 10MEG, 100 MEG Ω. Decibels: -10 to +49 db. Plastic Case with Carrying Handle. Size 7 1/2 in. x 6 1/2 in. \$18-90. P. & P. 25p.



**TE-20D RF SIGNAL GENERATOR**  
 Accurate wide range signal generator covering 120 Kc/s-800 Mc/s on 6 bands. Directly calibrated Variable R.F. attenuator, audio output. Xial socket for calibration. 230/240V. A.C. Brand new with instructions \$18. Carr. 37p. Size 140 x 215 x 170 mm.




**RUSSIAN 22 RANGE MULTIMETER**  
 Model U437 10,000 o.p.v. A first class versatile instrument manufactured in U.S.S.R. to the highest standards. Ranges: 2-5/10/50/250/500/1000V D.C. 2-5/10/50/250/500/1000V A.C. DC Current 100 uA/1/10/100mA. Resistance 300 ohms/30/300/3K Ω. Complete with batteries, test leads, instructions and sturdy steel carrying case. OUR PRICE \$5-97 P. & P. 25p.




**BELCO DA-20 SOLID STATE DECADE AUDIO OSCILLATOR**  
 New high quality portable instrument. Size 1 Hz to 100 KHz. Square 20 Hz to 20 KHz. Output max +10 dB (10 K ohm). Operation 230/240V. A.C. Size 215mm x 150mm x 120mm. Price \$27-50. Carr. 25p.



**TO-3 PORTABLE OSCILLOSCOPE**  
 3in. tube. Y amp. Sensitivity 0.1v p-p/CM. Bandwidth 1-5 cps-1.5 MHz. Input imp. 2 meg Ω 25pF X amp. sensitivity 0.9v p-p/CM. Bandwidth 1.5 cps-500KHz. Input imp. 3 meg Ω 20pF. Time Base 5 ranges 10 cps-300 KHz. Synchronization. Internal/external. Illuminated scale 140 x 215 x 230 mm. Weight 15 1/2 lb. 230/240V. A.C. Supplied brand new with handbook. \$40-00. Carr. 50p



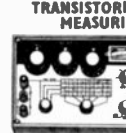
**240° Wide Angle 1mA Meters**  
 MW1-6 60mm square \$2-97  
 MW1-8 80mm square \$4-97  
 P. & P. extra



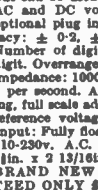
**HONEYWELL DIGITAL VOLTMETER VT.100**  
 Can be panel or bench mounted. Basic meter measures 1 volt D.C. but can be used to measure a wide range of AC and DC volt, current and ohms with optional plug in cards. Specification: Accuracy: ± 0.2 ± 1 digit. Resolution: 1mV. Number of digits: 3 plus fourth overrange digit. Overrange: 100% (up to 1.999). Input impedance: 1000 Meg ohm. Measuring cycle: 1 per second. Adjustment: Automatic zeroing, full scale adjustment against an internal reference voltage. Overload: to 100V. D.C. Input: Fully coating (3 poles). Input power: 110-230V. A.C. 50/60 cycles. Overall size: 5 1/2 in. x 2 1/2 in. x 8 3/16 in. AVAILABLE BRAND NEW AND FULLY GUARANTEED ONLY \$35-00. Carr. 50p.



**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 μ H. C 1 pF - 111 pF. HENRY'S 6 Ranges 2 - % C. 10pF ± 110mPd. 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 7 1/2 x 6 x 2in. \$20. P. & P. 25p



**230V/240V SMITHS SYNCHRONOUS GEARED MOTORS**  
 Built in gearbox. All brand new and boxed 60 RPM CW: 30 RPM CW; 2R/HR CW; 2R/HR CW; 2R/HR CW; 10 RPM CW; 50p each. Post 15p.



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

# HI-FI EQUIPMENT

SAVE UP TO  
**33 1/3% OR MORE**  
SEND S.A.E. FOR  
DISCOUNT PRICE LISTS  
AND PACKAGE OFFERS!

## RECORD DECKS

BBR	401	£28.60
UA50+	ZERO 100A	£39.95
C129+	ZERO 100B	£37.50
MP60		£10.40
610		£14.07
510		£11.50
310		£9.40
810		£33.48
MP80/		
G800*		£12.90
MP60 TPD1		£17.12
MP60/TPD1/		
G800*		£19.50
MP60 TPD2		£18.40
610 TPD1		£20.35
610 TPD1		£18.20
210 Package*		£9.58
HT 70		£14.99
HT70/		
G800*		£17.25
HT 70 Pack		£21.60
HT70/Pack/		
G800*		£23.95

GARRARD		
2025 T/C*	£8.50	
408*	£9.25	
EP25 III	£10.25	
RL55B	£13.45	
AP76	£18.85	
RL72B	£22.95	
SL95B	£32.50	

↑ Mono • Stereo Cartridge  
All other models less Cartridge  
Carriage 50p extra any model.

## RECORD DECK PACKAGES

Garrard 2025TC/9TAHCD	£12.95
Garrard 8P25 III/9TAHCD	£18.95
Garrard 8P25 III/G800	£19.50
Garrard 8P25 III/M76-E	£19.50
Garrard 8P25 III/M44-E	£17.75
Garrard 8P25 III/M44-E	£20.95
Garrard 8P25 III/M56-E	£22.40
8P25 III/G800 (Play on P&C)	£19.75
Garrard AP76/M76-E	£23.75
Garrard AP76/M56-E	£32.25
Garrard AP76/M75EJ	£34.25
Garrard AP76/G800E	£30.75
Garrard AP76/M44-E	£31.15
Garrard AP76/M75EJ	£35.95
BBR McDonald MP60/G800	£19.95
BBR McDonald MP60/M44-E	£20.95
BBR McDonald MP60/M44-E	£21.50
Golding GL72/G800	£24.80
Golding GL75/G800	£41.95
Golding GL75/G800E	£44.95

U4812 MULTIMETER	
Extremely sturdy instrument for general electrical use. 500 s.p.v.	
0/3/15/7.5/30/60/150/300/600/900 VDC and 75mV.	
0/3/1.5/7.5/30/60/150/300 600/900VAC.	
0/300uA/1.5/8/50/60/150/600MA/1.5/8 AMP. D.C.	
0/1.5/8/15/60/150/600MA/1.5/8 AMP. A.C.	
0/200 Ω/3K/30K Ω.	
Accuracy DC 1%, AC 1.5%.	
Knife, edge pointer, mirror scale. Complete with sturdy metal carrying case, leads and instructions. £9.50 plus P. & P. 25p.	

## LATEST CATALOGUE

Our 7th edition gives full details of a comprehensive range of HI-FI EQUIPMENT, COMPONENTS, TEST EQUIPMENT AND COMMUNICATIONS EQUIPMENT. FREE DISCOUNT COUPONS VALUE £60p.

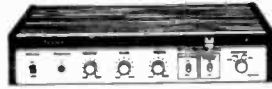
320 pages, fully illustrated and detailing thousands of bargains.

SEND NOW

ONLY  
**40p**  
P & P  
10p



## TELETON SAQ-206B STEREO AMPLIFIER



Latest exciting release. Brand new model. 6 + 6 watts rms. Inputs for max. r.t.a., aux tape. Volume, bass, treble, sliding balance, scratch filter and loudness controls.  
**OUR PRICE £22.95 Carr. 37p.**

## SKYWOOD CX203 COMMUNICATION RECEIVER



Solid state. Coverage on 5 bands 200-420 KHz and -85 to 30 MHz. Illuminated slide rule dial. Bandspread. Aerial tuning. R.F.O. AVC. ANL. 9' meter. AM/CW/SS B. Integrated speaker and phone socket. Operation 220/240V AC or 12v D.C. Size 325 x 266 x 150 mm. Complete with instructions and circuit.  
**£28.50, Carr. 50p**

## LAFAYETTE LA. 324 STEREO AMPLIFIER



Top quality Hi Fi Low Noise in Philips Library cases.  
C60 3 for 75p 10 for £2.35 P. & P.  
C90 3 for £1.05 10 for £2.30 10p  
C120 3 for £1.35 10 for £4.20 extra  
Tape Head Cleaner 30p each

## ★ TRANSISTORISED FM TUNER



5 TRANSISTOR HIGH QUALITY TUNER. SIZE ONLY 6x4x2 1/2 in. 3 I.F. stages. Double tuned discriminator. Ample output to feed most amplifiers. Operates on 9 V battery. Coverage 88-108Mc/a. Ready built ready for use. Fantastic value for money. £6.37p. P. & P. 12p. Stereo multiplex adaptors 34.97p.

## TMK MODEL 117 F.E.T. ELECTRONIC VOLTMETER



Resistance up to 2000Ω ohm. Decibels -20 to +51 db Complete with leads/instructions. £17.50. P. & P. 20p.

## MCA. 120 AUTOMATIC VOLTAGE STABILISER

Input 88-125 VAC or 176-250VAC. Output 120VAC or 240VAC. 200VA rating. £11.97. Carr. 50p.

## SINCLAIR IC-12



## HOMER INTERCOMS

Ideal for home, office, stores, factories, etc. Supplied complete with batteries, cable and free instructions.

2 Station £2.37, P. & P. 15p.  
3 Station £5.25, P. & P. 15p.  
4 Station £6.82, P. & P. 17p.

## EMI LOUDSPEAKERS

Model 350. 13" x 8" with single tweeter/crossover. 20-20,000 Hz. 15 watt RMS. Available 8 or 15 ohms. £7.50 each. P. & P. 37p.  
Model 450. 13" x 8" with twin tweeters/crossover. 55-13,000 Hz. 8 watt RMS. Available 8 or 15 ohms. £3.50 each. P. & P. 25p.

## TE 1018 DE-LUXE MONO HIGH IMPEDANCE HEADSET

Sensitive, soft earpads, adjustable headband. Magnetic, impedance 2,600 ohms.  
**£1.97, P. & P. 15p.**

## MP7 MIXER PREAMPLIFIER

5 microphone inputs each with individual gain controls enabling complete mixing facilities. Battery operated. 9 1/2" x 5" x 3". Inputs Mics: 3 x 3mV 50K; 2 x 3mV 600 ohm. Phono meg. 4mV 50K. Phono ceramic 100mV 1 meg. Output 250mV 100K.  
**£8.97, P. & P. 20p.**

## 1021 STEREO LISTENING STATION

For balancing and gain selection of loudspeakers with additional facility for stereo headphone switching. 2 gain controls, speaker on-off slide switch, stereo headphone sockets. 6" x 4" x 2 1/2". £2.85, P. & P. 15p.

## PRS-2 PHOTO ELECTRIC RELAY SYSTEM

Inexpensive warning or counting system consisting of an exciter and relay unit. Relay unit has variable sensitivity control and switch for intermittent alarm operation. Exciter unit has removable infra red filter and A.C. outlet socket to operate bells, counters, etc. 240V A.C. Complete with cables and instructions. £9.97 P. & P. 25p

## 230 VOLT A.C. 50 CYCLES RELAYS

Brand new. 3 sets of changeover contacts at 5 amp rating. 50p each. P. & P. 10p (100 lots £40) Quantities available.

## POWER RHEOSTATS

High quality ceramic construction. Windings embedded in vitreous enamel. Heavy duty brush wiper. Continuous rating. Wide range. Single hole fixing. 1/4 in. dia. snafits. Bulk quantities available.  
25 WATT. 10/25/50/100/250/500/1000/1500/2500 or 5000 ohms, 80p. P. & P. 7p.  
50 WATT. 10/25/50/100/250/500/1000/2500 or 5000 ohms, £1.15 P. & P. 7p.  
100 WATT. 10/25/50/100/250/500/1000 or 2500 ohms, £1.85 P. & P. 7p.

## "YAMABISHI" VARIABLE VOLTAGE TRANSFORMERS

Excellent quality. Low price. Immediate delivery

8-280 General Purpose Bench Mounting	5-280B Panel Mounting
1 Amp	1 Amp
2.5 Amp	2.5 Amp
5 Amp	5 Amp
8 Amp	8 Amp
10 Amp	10 Amp
12 Amp	12 Amp
20 Amp	20 Amp

Please add postage ALL MODELS INPUT 230 VOLTS, 50/60 CYCLES, OUTPUT VARIABLE 0-250 VOLTS. Special discounts for quantity

## SPECIAL OFFER! SINCLAIR PROJECT 60 STEREO FM TUNER



The first tuner in the world to use the phase lock loop principle—as used for receiving signals from space craft because of its vastly improved signal to noise ratio. Provides fantastic results even in difficult areas. Tuning range 87.5 to 108MHz. Automatic stereo indicator. Sensitivity: 2uV. AFC range ± 200KHz. Signal to noise ratio: 65dB. Output voltage 2 x 100mV. Operating voltage 25-30V. D.C. Size: 93 x 40 x 207 mm. REC. LIST PRICE £25.  
**OUR PRICE £15.75 P. & P. 25p**  
Unrepeatable offer—buy now and save over £9

## SINCLAIR EQUIPMENT

Project 60. Package offers.  
2 x X30 amplifier, stereo 60 pre-amp. P25 power supply. £15.95 Carr. 37p. Or with P26 power supply £18.00 Carr. 37p. 2 x Z50 amplifier, stereo 60 pre-amp. P28 power supply. £20.25 Carr. 37p.  
Transformer for P28. £2.97 extra.  
Add to any of the above £4.45 for active filter unit and £13.90 for pair of Q16 speakers. Project 60 FM Tuner £15.75. Carr. 37p. All other Sinclair products in stock. 2000 Amp £21.95 Carr. 37p.; 3000 Amp £28.50 Carr. 37p.; Stereo Amp £43.95 Carr. 37p. 1012 £1.80 Post 10p  
PROJECT 605 — £20.97, Carr. 37p.

## WHARFEDALE MID-RANGE HI-FI UNITS

As used in world famous system. 6" dia. Impedance 478 ohms. High fidelity ceramic mic magnet. 20 watts rms. Brand new £1.50. Carr. 37p.

## UNR-30 RECEIVER

4 Bands covering 550kc/a-30 mc/a. B.F.O. Built-in speaker 220/240v. A.C. Brand new with instructions. £15.75. Carr. 37p.

## LAFAYETTE HA-600 SOLID STATE RECEIVER

General coverage 150-400kc/a, 550 kc/a-30mc/a. PET front end. 2 mech. filters, product detector, variable B.F.O., noise limiter. 8. Meter. Bandspread R.F. Gain. 18" x 9 1/2" x 9 1/2". 18 lbs. 220/240v. A.C. or 12v. D.C. Brand new with instructions. £50. Carr. 50p.

## TE-65 VALVE VOLTMETER

High quality instrument with 28 ranges. D.C. volts 1.5-1,500v. A.C. volts 1.5-1,500v. Resistance up to 1,000 megohms. 200/240v. A.C. operation. Complete with probe and instructions. £17.50. P. & P. 30p. Additional probes available: R.F. £2.12; H.V. £2.50.



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

10 TOTTENHAM CT. RD. LONDON, W.1 Tel: 01-837 2232  
27 TOTTENHAM CT. RD. LONDON, W.1 Tel: 01-838 3715  
257/258 TOTTENHAM CT. RD. LONDON, W.1 Tel: 01-580 0870  
3 LISLE STREET, LONDON, W.C.2 Tel: 01-437 8204  
34 LISLE STREET, LONDON, W.C.2 Tel: 01-437 9154  
311 EDGWARE ROAD, LONDON, W.2 Tel: 01-262 0387

CALLERS WELCOME MONDAY TO SATURDAY 9AM-6PM

All Mail Orders to— 11-12, Paddington Green, London, W62 Tel: 01-262 6562

# ENGINEERS!

WRITE FOR THE BOOK  
THAT CAN CHANGE  
YOUR WHOLE FUTURE

The BIET Guide to Success should be read by every ambitious engineer. Do you want promotion, a better job, higher pay? "New Opportunities" shows you how to get them through a low-cost BIET Home Study Course. There are no books to buy and you can pay-as-you-learn. Send for this helpful 76 page FREE book now. No obligation and nobody will call on you. It could be the best thing you ever did.

**CHOOSE A NEW FUTURE NOW!**

**MECHANICAL**  
A.M.S.E. (Mech)  
C & G Eng. Crafts  
C & G Fabrication  
Diesel Eng.  
Inst. Eng. & Tech.  
Inst. Motor Ind.  
Maintenance Eng.  
Mechanical Eng.  
Sheet Metal Work  
Welding

**ELECTRICAL & ELECTRONIC**  
A.M.S.E. (Elec.)  
C & G Elec. Eng.  
C & G Elec. Inst.  
C & G Elec. Tech.  
Computer Elec.  
Electronic Eng.  
Electrical Eng.  
Install. & Wiring

**MANAGEMENT & PRODUCTION**  
Computer Prog.  
Electronic Data Processing  
Estimating  
Foremanship  
Inst. Cost & Works  
Accountants  
Inst. Marketing

Management  
Motor Trade Man.  
Network Planning  
Personnel Man.  
Production Eng.  
Quality Control  
Salesmanship  
Storekeeping  
Work Study  
Works  
Management

**DRAUGHTSMANSHIP**  
A.M.I.E.D.  
Electrical  
Draughtsmanship  
Gen.  
Draughtsmanship  
Jig & Tool Design  
Technical Drawing

**RADIO & TELECOMMUNICATIONS**  
C & G Radio/TV  
Electronics  
C & G Telecomm.  
Technicians  
Prac. Radio & Elec. (with kit)  
Radio Amateurs  
Exam.

Radio Servicing & Repairs  
Transistor Course  
TV Main. & Serv.

**AUTO & AERO**  
Aero Eng.  
A.M.I.M.I.  
A.R.B. Cert.  
Auto Engineering  
Auto Repair  
C & G Auto Eng.  
Garage  
Management  
MAA/IMI Diploma  
Motor Vehicle  
Mechanics

**CONSTRUCTIONAL**  
A.M.S.E. (Civil)  
Architecture  
Building  
Carpentry & Joinery  
Civil & Municipal Eng.  
Constructional Eng.  
Construction Surveyors  
Institute

Clerk of Works  
Council Eng.  
Health Eng.  
Heat & Vent.  
Hydraulics  
Inst. of Builders  
Inst. Clerk of Works  
Inst. Works & Highway  
Supers.  
Painting & Decorating  
Structural Eng.  
Surveying

**GENERAL**  
Agricultural Eng.  
Council of Eng. Inst.  
General Education  
Pract. Slide Rule  
Pure & Applied Maths  
Refrigeration  
Rubber Technology  
Sales Engineers  
University Ent.

**G.C.E. 58 'O' & 'A'**  
**LEVEL SUBJECTS**  
Over 10,000  
Group Passes

**SEND FOR YOUR FREE BOOK NOW!**  
**BRITISH INSTITUTE OF ENGINEERING TECHNOLOGY** B129

To B.I.E.T. Dept. XXX  
Aldermaston Court  
Reading RG7 4PF

Please send me book and  
details of your courses in:



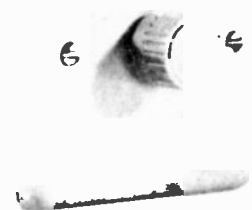
NAME \_\_\_\_\_  
BLOCK CAPITALS PLEASE  
ADDRESS \_\_\_\_\_

SUBJECT OF INTEREST \_\_\_\_\_ AGE \_\_\_\_\_

Accredited by the Council for the Accreditation of Correspondence Colleges.

B129

## Vary the strength of your lighting with a DIMMASWITCH

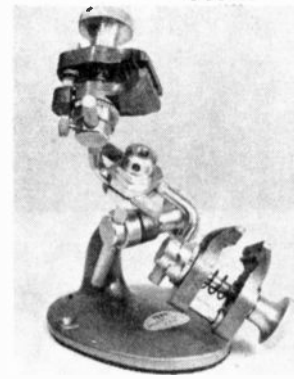


The DIMMASWITCH is an attractive and efficient dimmer unit which fits in place of the normal light switch and is connected up in exactly the same way. The white mounting plate of the DIMMASWITCH matches modern electric fittings. Two models are available, with the bright chrome knob controlling up to 300 w or 600 w of all lights except fluorescents at mains voltages from 200-250 v, 50Hz. The DIMMASWITCH has built-in radio interference suppression:  
600 Watt—£3.20. Kit Form £2.70  
300 Watt—£2.70. Kit Form £2.20

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

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

### The New Styled "MULTI-MINI" TWIN-VICES



An extra "Pair of hands" for  
those tricky jobs

**ASSEMBLY—SOLDERING—  
GLUING—WIRING—DRILLING  
ETC.**

- INDEPENDENT ADJUSTMENT OF THE TWO VICE HEADS TO ANY ANGLE WITH POSITIVE LOCKING.
- JAWS WILL FIRMLY GRIP, ROUND, FLAT, SQUARE, OR HEXAGONAL PARTS.

**TWIN VICE: £8.95 (25p P. & P.)**

Also available

**SINGLE VICE: £5.45 (21p P. & P.)**

**CANLEY ENGINEERING (SALES)  
LTD. DEPT. C/EI  
OSBORNE ROAD, COVENTRY CV5 6EA  
TEL: (0203)-77163/4.**



# BI-PRE-PAK

## COMPLETE TELEPHONES



EX. 'G.P.O. NORMAL HOUSEHOLD TYPE

**ONLY 95p**

POST & PACKING 35p EACH

## TELEPHONE DIALS

Standard Post Office type. Guaranteed in working order.

**ONLY 50p**

POST & PACKING 15p



## TESTED AND GUARANTEED PAKS

B2	4	Photo Cells, Sun Batteries. 0.3 to 0.5V. 0.5 to 2mA.	50p
B79	4	IN4007 Sil. Rec. diodes. 1,000 PIV lamp plastic	50p
B81	10	Reed Switches, mixed types large and small	50p
B99	200	Mixed Capacitors. Approx. quantity, counted by weight	50p
H4	250	Mixed Resistors. Approx. quantity counted by weight	50p
H7	40	Wirewound Resistors. Mixed types and values.	50p
H40	20	BFY502, 2N696, 2N1613 NPN Silicon uncodded TO5 can	50p
H9	2	OC71 Light Sensitive Photo Transistor	50p
H39	10	Integrated Circuits. 6 Gates BMC 962, 4 Flip Flops BMC 945	50p
H28	20	OC2001/12/3 PNP Silicon uncodded TO-5 can	50p
H30	20	1-Watt Zener Diodes. Mixed Voltages 6.8 - 43V.	50p
H35	100	Mixed Diodes, Germ. Gold bonded, etc. Marked and Unmarked.	50p
H38	30	Short lead Transistors, NPN Silicon Planar types.	50p

## UNMARKED UNTESTED PAKS

B64	150	Germanium Diodes Min. glass type	50p
B83	200	Trans. manufacturers' rejects all types NPN, PNP, Sil. and Germ.	50p
B84	100	Silicon Diodes DO-7 glass equiv. to OA200, OA202	50p
B86	50	Sil. Diodes sub. min. IN914 and IN916 types	50p
B88	50	Sil. Trans. NPN, PNP equiv. to OC200/1 2N706A, BSY95A, etc.	50p
B1	50	Germanium Transistors PNP, AF and RF	50p
H16	40	250mW. Zener Diodes DO-7 Min. Glass Type	50p
H17	20	3 amp. Silicon Stud Rectifiers, mixed volts	50p
H15	30	Top Hat Silicon Rectifiers, 750mA. Mixed volts	50p
H16	15	Experimenters' Pak of Integrated Circuits. Data supplied	50p
H20	20	BY126/7 Type Silicon Rectifiers 1 amp plastic. Mixed volts.	50p
H34	15	Power Transistors, PNP, Germ. NPN Silicon TO-3 Can.	50p

## MAKE A REY COUNTER FOR YOUR CAR

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

**£1 each**



## OUR VERY POPULAR 3p TRANSISTORS

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

## FULLY TESTED AND MARKED SEMICONDUCTORS

4p		6p	
AC107	0-15	OC139	0-13
AC126	0-15	OC140	0-15
AC127	0-17	OC170	0-23
AC128	0-15	OC171	0-23
AC176	0-20	OC200	0-25
ACY17	0-20	OC201	0-25
AF239	0-30	2N1302-3	0-15
AF186	0-20	2N1304-5	0-15
AF139	0-30	2N1306-7	0-20
BC154	0-20	2N1308-9	0-22
BC107	0-10	2N3819FET	0-40
BC108	0-10	2N4416FET	0-35
BC109	0-10	Power Transistors	
BC148	0-10	OC20	0-40
BC169	0-12	OC25	0-25
BF194	0-15	OC23	0-25
BF274	0-20	OC36	0-25
BFY50	0-15	OC28	0-30
BSY25	0-13	OC35	0-25
BSY26	0-13	OC36	0-37
BSY27	0-13	AD149	0-35
BSY28	0-13	AUY10	0-75
BSY29	0-13	25034	0-25
BSY95A	0-15	2N3055	0-40
OC41	0-13	Diodes	
OC44	0-13	OC35	0-10
OC45	0-10	AA742	0-07
OC71	0-10	CA95	0-07
OC72	0-10	OA79	0-07
OC81	0-13	OA81	0-07
OC81D	0-13	OA95	0-07
OC83	0-18	IN914	0-04

## POWER TRANSISTOR PRICE BREAKTHROUGH!

Plastic cased Silicon Power Transistors of latest design. 40watts and 90watts. PNP & NPN types. All types available at the most shatteringly low prices of all time. All are fully tested, marked and guaranteed!

	1-12	13-25	26-50
40W NPN	20p	18p	16p
40W PNP	21p	19p	17p
90W NPN	24p	22p	20p
90W PNP	25p	23p	21p

PAK PAKS of matched pairs  
MP40  
40W + 40W 50p 48p 26p  
MP90  
90W + 90W 60p 58p 54p



## A CROSS HATCH GENERATOR FOR £3.50 !!!

YES, a complete kit of parts including Printed Circuit Board. A four position switch gives X-hatch, Dots, Vertical or Horizontal lines. Integrated Circuit design for easy construction and reliability. This is a project in the September edition of Practical Television.

**This complete kit of parts costs £3.50, post paid.**

A MUST for Colour T.V. Alignment.

## Our famous PI Pak is still leading in value for money.

Full of Short Lead Semiconductors & Electronic Components, approx. 170. We guarantee at least 30 really high quality factory marked Transistors PNP & NPN, and a host of Diodes & Rectifiers mounted on Printed Circuit Panels. Identification Chart supplied to give some information on the Transistors.

Please ask for Pak P.I. Only 50p. 10p P & P on this Pak.

## FREE CATALOGUE FOR



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

## 8 RELAYS FOR VARIOUS TYPES P & P 25p £1

## INTEGRATED CIRCUITS

	1-12	13-25	26-50
Clocked Flip Flop	BMC931	20p	18p 16p
Ex. 2M-input Buffer	BMC932	12p	11p 10p
2/4-input Expander	BMC933	12p	11p 10p
Hex. inverter	BMC934	12p	11p 10p
Hex. inverter	BMC935	12p	11p 10p
Hex. inverter	BMC936	12p	11p 10p
Hex. inverter	BMC937	12p	11p 10p
Decade Counter	BMC938	25p	23p 21p
Div. by 16 Counter	BMC939	25p	23p 21p
Hex. inverter	BMC940	12p	11p 10p
Hex. inverter	BMC941	12p	11p 10p
Type D Flip Flop	BMC942	20p	18p 16p
Ex. 2M-input Power	BMC944	12p	11p 10p
Clocked Flip Flop	BMC945	20p	18p 16p
Quad Inverter	BMC946	11p	10p 9p
Clocked Flip Flop	BMC948	20p	18p 16p
Quad Inverter	BMC949	12p	11p 10p
Pulsed Trlg. Binary Monostable Multivib.	BMC950	20p	18p 16p
Dual /K Flip Flop	BMC951	25p	23p 21p
Dual /K Flip Flop	BMC952	20p	18p 16p
Dual /K Flip Flop	BMC955	20p	18p 16p
Dual /K Flip Flop	BMC956	20p	18p 16p
Quad 2-input Power	BMC958	12p	11p 10p
2/4-input Gate	BMC961	12p	11p 10p
3/3-input NAND Gate	BMC962	11p	10p 9p
3/3-input NAND Gate	BMC963	12p	11p 10p
Audic. Amp. 3w. SL403D	£1.50	£1.40	£1.36
Linea. Op. Amp 709C	25p	20p	15p
Decade Counter SN7490	65p	60p	55p

## LOW COST DUAL IN LINE I.C. SOCKETS

14 pin type at 15p each } Now new low profile  
16 pin type at 16p each } type

## BOOKS

We have a large selection of Reference and Technical Books in stock. These are just two of our popular lines:

**B.P.I. Transistor Equivalents and Substitutes;** 40p  
This includes many thousands of British U.S.A., European and C.V. equivalents. Postage and Packing 21p.

**The Iliffe Radio Valve & Transistor Data Book 9th Edition;** 75p  
Characteristics of 3,000 valves and tubes, 4,500 Transistors, Diodes, Rectifiers and Integrated Circuits. Send for lists of these English publications.

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

NAME.....

ADDRESS.....

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

# BI-PRE-PAK LTD

DEPT. D, 222-224 WEST ROAD, WESTCLIFF-ON-SEA, ESSEX SSO 9DF  
TELEPHONE: SOUTHEND (0702) 46344

# everyday electronics

PROJECTS...  
THEORY.....

## A GOOD QUESTION

But what, actually, is the difference between *electronic* and *electrical*? Almost certainly every reader has either posed this very question or has had to supply the answer, sometime or another.

Seeing that electric current is the energy involved in both electronic and electrical devices and systems, the puzzlement and confusion existing in many minds is quite understandable. Yet there is a clearly definable difference between these two branches of science and engineering, closely related as undeniably they are.

## THE DIFFERENCE

Electrical apparatus and systems depend upon electric current produced by the drift of electrons within metallic conductors—"conventional" electricity, in other words.

The whole science and technology of *electronics* is based upon the special properties of certain devices such as the valve and, more importantly today, the semiconductor. In such devices the conduction of electric current takes place either through a vacuum or gas—as in the case of the valve, or by a somewhat abstruse process involving the movement of both negative and positive "current carriers" within the confines of a semiconductor material. The special properties and characteristics of these "electronic" devices make all of electronics possible.

Historically, electronics owes its original development as a separate branch of technology,

quite distinct from electrical engineering, to the exceptional capabilities of the valve. This device has largely fallen into disuse since the arrival of the modern semiconductor. The latter has "taken over" and greatly enhanced the possibilities and, thereby the prestige, of electronics.

## GROUND WORK

Any study of electronics clearly involves examining how these vital electronic devices work and the manner in which they can be applied to produce various useful functions through different circuit arrangements. However, a prerequisite to such study is a good general knowledge of the related subject, electricity. With this knowledge one can confidently tackle the more intricate (and more exciting) matters that are part and parcel of electronics.

From enquiries we receive it is evident that a straightforward explanation of electrical theory would be welcomed by many beginners, as a prelude to their immersion in genuine electronics. We are therefore commencing this month a new six-part series entitled *Basic Electricity*. Although aimed primarily at those starting from scratch, this series could provide a useful "recap" of the subject for many others.



Our December issue will be published on Friday, November 17

EDITOR F. E. BENNETT • ASSISTANT EDITOR M. KENWARD • B. W. TERRELL B.Sc.

ART EDITOR J. D. POUNTNEY • P. A. LOATES • S. W. R. LLOYD

ADVERTISEMENT MANAGER D. W. B. TILLEARD

© IPC Magazines Limited 1972. Copyright in all drawings, photographs, and articles published in EVERYDAY ELECTRONICS is fully protected, and reproduction or imitations in whole or part are expressly forbidden.

All reasonable precautions are taken by EVERYDAY ELECTRONICS to ensure that the advice and data given to readers are reliable. We cannot, however, guarantee it, and we cannot accept legal responsibility for it. Prices quoted are those current as we go to press.

Subscription Rates including postage for one year, to any part of the world, £2.35.

Everyday Electronics, Fleetway House, Farringdon Street, London, E.C.4. Phone: Editorial 01-634-4452; Advertisements 01-634-4202.



# ..EASY TO CONSTRUCT ..SIMPLY EXPLAINED

VOL. 1 NO. 13

NOVEMBER 1972

## CONSTRUCTIONAL PROJECTS

- AUTO ACCELEROMETER** Check the performance of your car by Brice Ward 696  
**ELECTRONIC GUITAR** Beta construction, for use in conjunction with the blueprint by B. W. Terrell 710  
**TRANSISTOR TESTER** Provides a quick check of most transistors by P. A. Graves 718

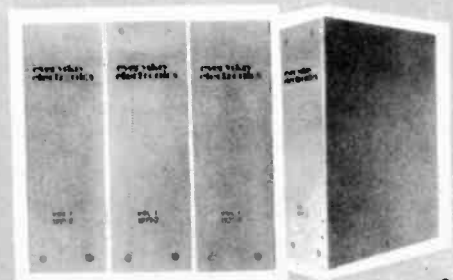
## GENERAL FEATURES

- EDITORIAL** 694  
**SHOP TALK** Components and new products by Mike Kenward 701  
**RADIO CONTROL OF MODELS** The state of the art 702  
**ACTION!** A look at an electronics evening class 707  
**GUIDE TO CIRCUIT SYMBOLS** Part 5—Transducers, Semiconductors 708  
**PLEASE TAKE NOTE** 714  
**BASIC ELECTRICITY** Part 1—Batteries by Maureen Birch 715  
**RUMINATIONS** by Sensor 717  
**THEY MADE THEIR MARK** No. 6 Faraday (Part 2) by J. E. Gregory 722  
**TEACH-IN END OF TERM ANSWERS** Answers to last month's test 725  
**READERS LETTERS** Comment and criticism from you 726  
★ **FREE BLUEPRINT** for **ELECTRONIC GUITAR**

## EE binders...

Both volume 1 and volume 2 (Jan. to Dec. 73) Easi-Binders are now available—handsomely finished in orange de luxe Balacron with black lettering on the spine.

Order your binder from Binding Dept., IPC Magazines Ltd., Carlton House, 68, Great Queen Street, London W.C.2.  
The price is 88p, including postage and packing.





## An instrument to test overall car performance.

**E**VERY driver interested in his automobile performance would probably like to have a Dynamometer available for testing performance but this would cost more than it would be worth.

There are low cost instruments for checking timing, contact breaker point dwell time and similar items but generally, these do not measure the overall performance of an automobile.

But utter simplicity quite frequently offers an answer which was unsuspected and that is the case with the Auto Accelerometer! Without measuring horsepower it does succeed in giving an indication of overall performance by measuring both acceleration and deceleration.

Increased acceleration obtained by adjusting carburation or timing indicates an increase in horsepower delivered to the rear wheels and a measurement of deceleration can be a good indicator of brake condition, road holding and brake fade.

In one small, simple instrument, we have the capability of measuring a wide range of performance parameters for the automobile.

For the avid enthusiast, it offers a means of checking the total effect of various changes in timing, carburetors, ignition systems and the like while for the not so avid, it furnishes a means of correcting bad driving habits and generally monitoring performance.

### PRINCIPLES OF OPERATION

Acceleration is normally measured in "g's." Speed is a measure of distance travelled per unit of time while acceleration is a measure of the change in speed per unit of time. The first is expressed as feet per second or miles per hour and the second in feet per second per second or miles per hour per second so that what is actually being measured is the number of miles per hour increase in speed per second.

The g, taken from the word gravity, is an international unit defined as the acceleration produced on a dropped object by the earth's gravitational field. In actual figures an acceleration of 1g is equal to 32.2 feet per second per second or 22 miles per hour per second.

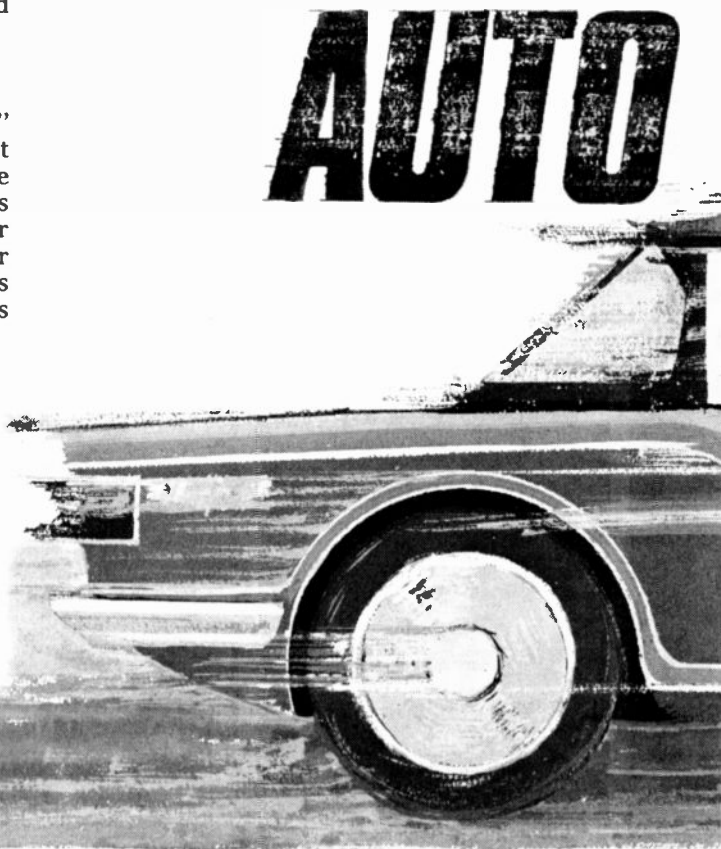
A pendulum responds in a very precise way to the effects of acceleration at right angles to the surface of the earth. That precise relationship says that the tangent of the angle from the vertical assumed by the pendulum equals the acceleration!

If the pendulum assumes a 45 degree angle from the vertical, the tangent of 45 degrees equals 1 and the acceleration is thus 1g. Deceleration is determined in the same general way.

The actual sensing device in the accelerometer is a simple potentiometer (VR3) with turning friction reduced to a minimum. There are any number of more complex ways to make a sensing device but this is by far the most straight forward. To this potentiometer is added a pendulous weight that will turn the potentiometer under acceleration and return to a known resting point with minimum hysteresis.

### CIRCUIT DESCRIPTION

The circuit (Fig. 1) is a simple bridge that is



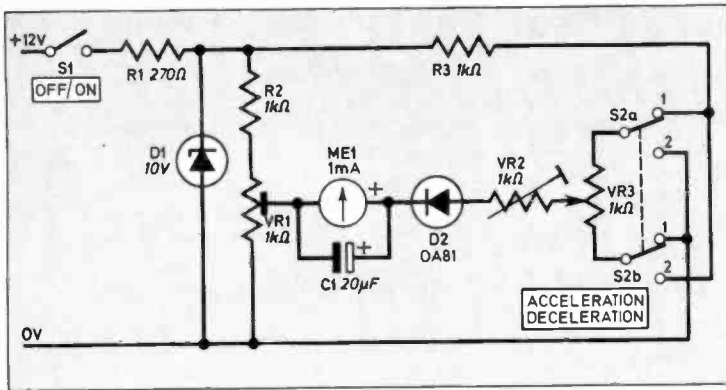


Fig. 1. Complete circuit diagram of the Auto Accelerometer. The pendulum which senses acceleration or deceleration is affixed to the shaft of potentiometer VR3.

balanced to give a zero reading on ME1 with preset VR1. The pendulum is attached to the shaft of potentiometer VR3 and as it pivots the circuit is unbalanced. Potentiometer VR2 is used to set the meter for full scale deflection with the pendulum at 45 degrees from the vertical (simulating 1g).

Diode D2 prevents reverse current through the meter and could be eliminated with very little chance of damaging the meter; it does prevent reverse deflection. Capacitor C1 eliminates any very fast fluctuations in the needle reading.

Power is obtained from the automobile battery

and is regulated by R1 and D1 to approximately 10 volts.

### THE PENDULOUS WEIGHT

A simple weight can be made of solder or plumbing lead. A chipboard box will smoke when the weight is cast but can be used as a one time mould for this job. A brass bush that will fit on the spindle of the potentiometer used, should be obtained. Clean this bush with sandpaper and flux it with some liquid flux. Insert it in the corner of the mould made as illustrated in Fig. 2.

Melt the solder or lead in a suitable container and pour it into the mould. Allow a few minutes

# ACCELEROMETER

By Brice Ward



# AUTO ACCELEROMETER

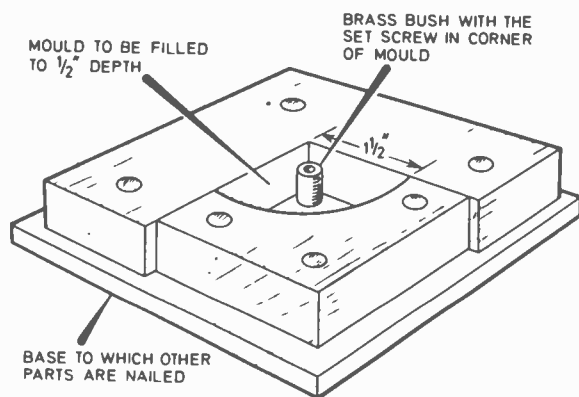


Fig. 2. The mould used to form the pendulous weight.

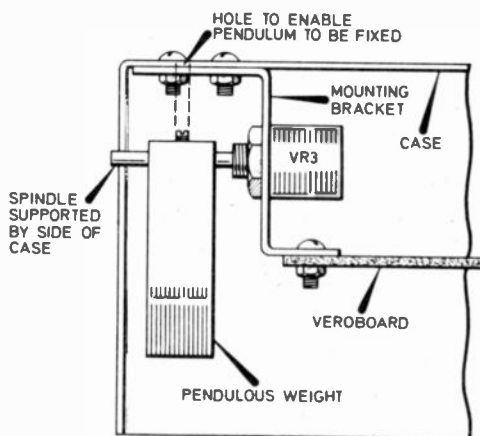


Fig. 3. Mounting of VR3, the pendulum and the Veroboard.

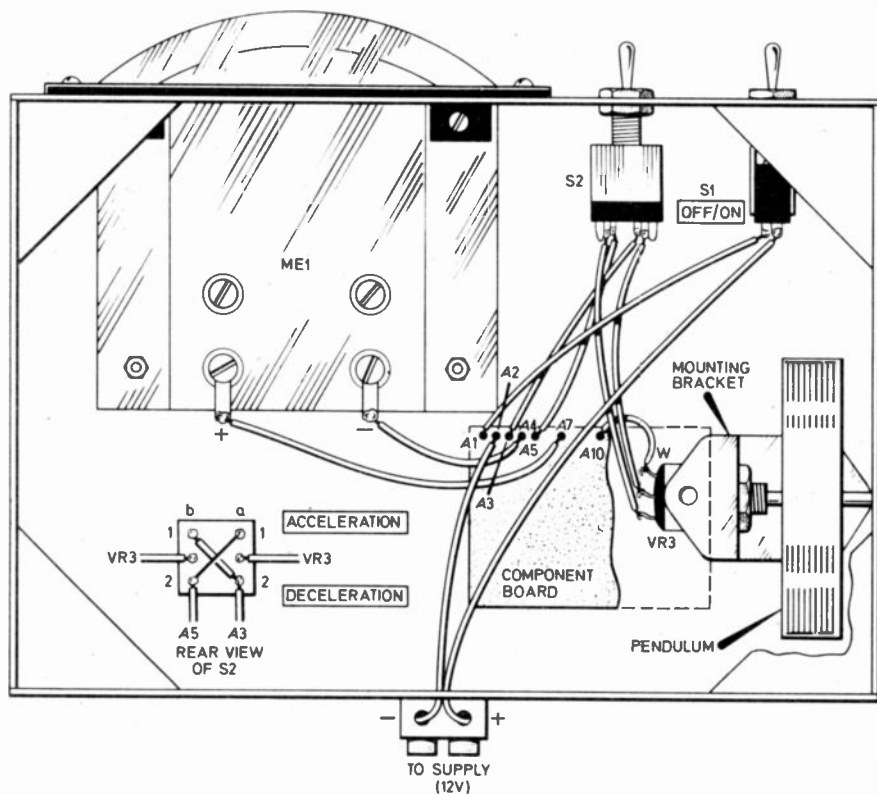


Fig. 5. Layout and wiring of the complete unit.



for the mass to cool and then, if you are satisfied with the results, quench it under cool water.

The potentiometer used for VR3 should be one of the types having a nylon spindle and should rotate freely with very little friction. Install a bracket on the potentiometer bush that is long enough to allow the pendulum clearance to turn (see Fig. 3).

The pendulum can now be attached to the shaft with the setscrew in the bush and the bracket fixed inside the case. A hole in the top of the case will allow adjustment of the pendulum after assembly.

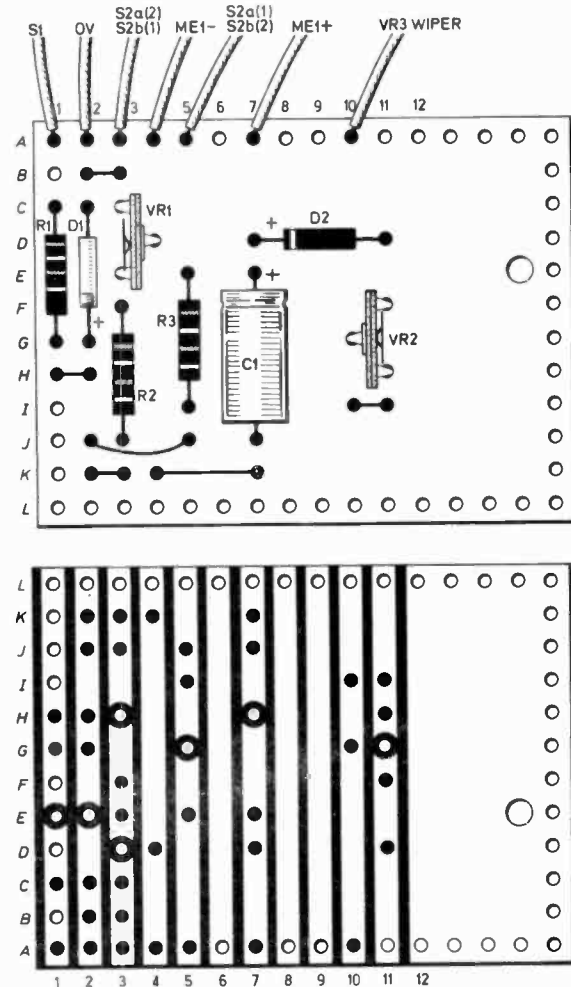


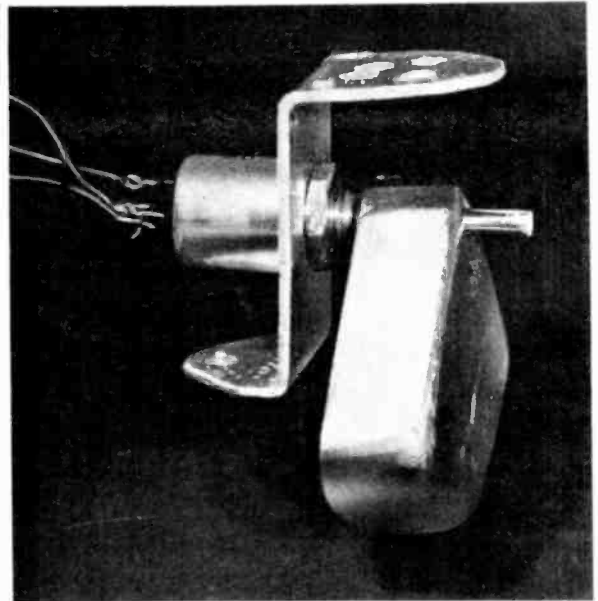
Fig. 4. Layout and wiring of the Veroboard. Copper strips to the right of strip 11 are not used and have not been indicated.

### FINAL CONSTRUCTION

The layout and wiring of the Veroboard is shown in Fig. 4. After cutting the Veroboard to size and cutting the conductors as illustrated, install and solder the components and wires required.

Final assembly is illustrated in Fig 5. An edge-

wise type meter is used, mounted in one side of the case. The electronics can be installed anywhere in the case. Make sure that the diodes and capacitor are placed the right way around and take care not to overheat the diodes when soldering.



The pendulum mounted on VR3 together with the bracket.

## Components....

### Resistors

- R1 270 $\Omega$
- R2 1k $\Omega$
- R3 1k $\Omega$
- All  $\pm 10\%$   $\frac{1}{4}$ W carbon

SEE

**SHOP  
TALK**

### Capacitor

- C1 20 $\mu$ F elect. 12V

### Potentiometers

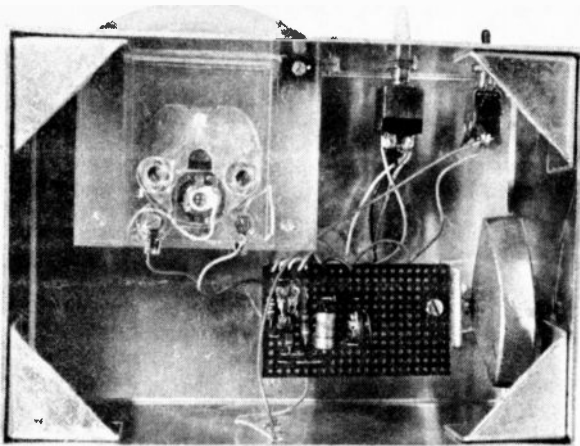
- VR1 1k $\Omega$  skeleton preset (or normal carbon —see text)
- VR2 1k $\Omega$  skeleton preset
- VR3 1k $\Omega$  linear carbon (see text)

### Diodes

- D1 10V 400mW Zener
- D2 OA81

### Miscellaneous

- ME1 1mA moving coil meter (any shape)
- S1 S.p.s.t. toggle switch
- S2 D.p.d.t. toggle switch
- Veroboard 1.7 x 1.3 x 0.1 in. matrix, plumbers lead or bar type solder for pendulum, 6in. x 4in. x 2 $\frac{1}{2}$ in. aluminium chassis for case
- VR3 mounting bracket, two way connector, 4BA fixings, connecting wire, brass bush  $\frac{1}{2}$  in. long to fit on VR3 spindle with a set screw.



Internal view of the prototype unit showing the positions of components and the pendulum.

## TESTING

Connect a source of 12 volts d.c. to the system observing lead polarity. If not done previously, adjust preset VR1 so that it is about half way around its range. Now adjust the pendulum on the shaft of VR3 so that it is hanging straight down with the meter reading zero.

Using a 45 degree set square or a protractor, incline either the base of the case or the pendulum to 45 degrees and adjust VR2 for full scale deflection on the meter.

Since the diode (D2) introduces some non-linearity, it would be a good idea to make a calibration chart by inclining the pendulum to the angles illustrated in Table 1 and noting the meter reading at these angles. It is worth noting that a germanium diode, as specified, will introduce less error than a silicon diode, due to the forward voltage drop being less in a germanium device.

## INSTALLATION

Finally, install the unit, ensure that the shaft of the potentiometer is at right angles to the direction of travel of the automobile, that the unit is level and the meter is installed where it

Table 1: Calibration Chart

Acceleration in g	Angle in degrees	Meter Reading
0	0	0
0.1	6	
0.2	11	
0.3	17	
0.4	22	
0.5	26.5	
0.6	31	
0.7	35	
0.8	38.5	
0.9	42	
1.0	45	1.0

can be seen. Connect the unit to the car supply observing polarity and switch on. The unit is now ready for road testing but before starting these tests, be certain that they can be performed with complete safety.

## ROAD TESTING

A navigator should be called on to read the meter. With the accelerometer set for acceleration, have the navigator note the reading at regular intervals (say every 5 m.p.h.) as you accelerate in first gear. Then do the same for the rest of the gears. It is best to make these tests on a flat road and running in both directions

The plotted results should be a curve something like the one in Fig. 6. The crossover points indicate the best gear change point in miles per hour for each gear. For example, the shift from first to second gear should be at about 32-33 miles per hour for this curve. If the car is fitted with a rev counter these points could be noted in revs per minute.

Testing the brakes can be done in the deceleration position of switch S2. It may be necessary to readjust VR1 which might also be mounted as a potentiometer on the front panel to allow for quick readjustment if required.

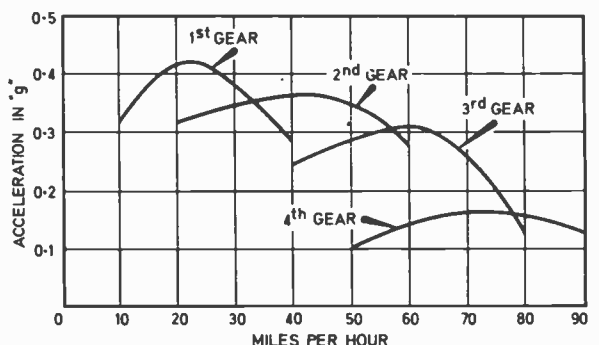
Drum brakes should indicate at least 0.5g and disc brakes from 0.7 to as high as 0.9g.

Brake fade can be tested by making a repetitive series of hard stops from 40 miles per hour and comparing all the results. The results may surprise you.

The unit can also be used to correct bad driving habits. On a level motorway, for example, at a set speed, the meter needle should sit rock steady at zero. If it does not, you are in all probability operating the accelerator pedal without realising it.

The effects of motor oil can be checked. Oil can, if viscous enough, cause a considerable amount of drag and changing to another oil can help. Tyre pressure, open windows and many other things can contribute to drag and the effects can be assessed with the accelerometer. ▣

Fig. 6. The graph resulting from the road tests mentioned in the text. The best gear change points occur where the graphs cross.





HOPEFULLY we will be addressing a few new readers this month. With the commencement of the *Basic Electricity* series we hope to gradually introduce some new readers into the ways of constructional electronics. Although this page may not be of great interest to the very new beginners who may not be buying many "electronic" components just yet, they will no doubt be keen to find out about general supply problems and of course some of the new products mentioned are sure to warrant attention.

Having said that, we must point out that we do not supply components, only the written word! If you have a component supply shop near you they should be able to supply most of the components we use. For the special components, or if there are no supply shops near where you live, you will have to send for the parts to one of the many mail order firms who advertise in our pages.

### Basic Electricity

All the components needed for the first part of *Basic Electricity* are obtainable from Woolworths or most good electrical shops (excepting the pencil). Just one word of warning, if you want to cut up some old batteries to see just what is inside, make sure you do it on plenty of newspaper because it can be a very messy process.

Everyday Electronics, November 1972

### Beta Electronic Guitar

As you will see from the article about *Beta* most of the requirements this month are for the wooden parts, generally available from timber yards—cut to size and shape if you are lucky (see text).

Other parts needed for the construction detailed this month are the six single machine heads, a six-string adjustable bridge, about four feet six inches of standard fret wire, two strap fasteners and a strap. When buying the machine heads make sure you get three left hand and three right hand ones, all these parts should be available from a good guitar shop.

We never cease to surprise ourselves at what can be used in building various projects, in the past we have specified egg cups and denture cleaning tablet tubes, now we use two knitting needles—or better still, as you only have to buy one at a time, two crochet needles. These needles are used to form the finger position markers on the *Beta* fretboard, the sizes required are No 5 and No 7. Make sure you get plastic ones of the colour you require.

### Auto Accelerometer

Most of the parts for the *Auto Accelerometer* are readily available. The meter does not have to be of the edgewise type shown but this type does provide a compact, neat-looking finished unit. The prototype case is a standard aluminium chassis, available from some of our advertisers.

One point to watch is the type of potentiometer obtained for VR3. We recommend the plastic spindle type for this job as they are usually reasonably frictionless.

Solder to make the pendulum can be bought in rods—a garage or hardware shop will sell you this. Do not attempt to use multi-core solder as you will find it very expensive.

### Transistor Tester

An extremely useful, simple project that will probably be put to good use by many readers, the *Transistor Tester* therefore deserves a sturdy case and we recommend the diecast type as used in the prototype. With a coat of paint this case is quite presentable and very strong. No real problems concerning com-

ponents for this project, the Terry clip used to hold B1 should be available at most hardware stores.

### New Products

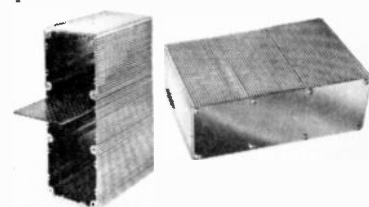
Once again some interesting new products have found their way into our offices, one of which is of particular interest to us since a similar product ceased to be made some time ago. This product is called Norman Q-Strip and is what we have previously termed stick down wiring.

Q-Strip is a  $\frac{1}{8}$  inch wide strip of copper with a thermo-setting adhesive on one side. After a protective backing is peeled off the copper is glued to a piece of component mounting board and used to form a circuit, in a similar way to a printed circuit board.

Having tested some Q-Strip in our workshop we have found the adhesive to be good even after two or three "re-heats". The strip can also be stuck down if it is accidentally lifted during desoldering. At 18p for 40 inches this circuit strip should be popular. Available from most large component suppliers in the near future.

We are always receiving enquiries about cases and various mounting and component housing problems for many of our projects. One new type of case which should go a long way to help with many of these problems has recently been announced by Vero Electronics Ltd. (the Veroboard people). The case—called Verobox—is made in various sizes from extruded aluminium sections, each incorporating two circuit board or chassis mounting strips. The extruded sections interlock and are held together by plain end plates and self-tapping screws. Altogether 80 different size cases are available ranging from 58 × 58 × 25 mm to 208 × 208 × 200 mm.

The finish of the extruded sections is exceptional and the prices range from approximately 40p to over £4. The Veroboxes should be available from most large suppliers.



# Radio



By A.J. Dunn

**I**N amateur electronics there are very few truly redundant components; the odd transformer, capacitor or even a piece of wire is harboured against the day when it can be employed profitably, lest the mere act of throwing it away will evoke a well known law and a replacement will have to be purchased. It is not unusual therefore to find the radio control enthusiast still employing parts of equipment that has long been out-moded.

This article is intended to familiarise the beginner with components and published information against the historical background of radio control and to outline the scope of the hobby.

## HISTORY

Radio control is almost as old as radio itself but it had little practical meaning until the late 1940's; there were of course, controlled models before the war and in America a radio controlled model aircraft contest, but in general it was a field in which only the intrepid and stalwart could succeed. There were three reasons for this—the high relative cost, the uncertainty of operation and what may be described as a psychological barrier.

The type of mind necessary for the painstaking construction of a delicate model was not often coupled with the brash inquisitiveness necessary



# Control of Models

for the development of the electronics—indeed it was often found that a good modeller joined forces with the local radio enthusiast to ensure success.

It was necessary to use an expensive special gas filled valve called "miniature". The valve had a very limited life and it called for great skill to adjust the circuit to maintain the maximum sensitivity without the valve taking excess current, leading to early demise.

Ferrite was a thing of the future so all coils were on hand-made formers, capacitors were often part-fabricated to save weight and high voltage batteries produced from copper and zinc sheet similar to Zamboni Piles. The electronics finished at the point where the (hand-made) relay closed in sympathy with the on-off switch on the transmitter, but then the electricians started.

In order to control various functions of the model, electro-mechanical sequential systems were devised—peculiar, delicate and often fiendishly ingenious assemblies of bent tin and tiny coils using twisted rubber bands as "motors". There was no weight restriction on the transmitter design so these tended to be large; the power source being an accumulator and 120 volt batteries. There was no question of the transmitter being hand-held!

## TRANSISTORS

Post war modellers with a developed knowledge of electronics soon set higher standards of performance and the advent of the early transistors enabled them to develop systems superior to, and thereby displace, some of the commercially available equipment.

Instead of simply interrupting the transmitter output (interrupted carrier wave) the r.f. output was modulated (Fig. 1) with low frequency audio tones (modulated carrier wave) either sequentially or simultaneously. Either method was easy to apply to the transmitter but the difficulty lay in separating out the tone information in the receiver. Two methods were used, each "tone" had an associated filter assembly and subsequent amplifier and relay or alternatively a "reed bank" or "reed relay" was used.

The reed bank is the equivalent of a number of relays each with a mechanically tuned attraction plate in the form of a long, thin, springy strip which vibrates as in a tuning fork. Each reed of the composite device is fitted with a miniature adjustable contact and when the appropriate frequency is applied the reed vibrates in resonance and makes repeated momentary contact.

The problem of momentary contact is easily overcome but the current rating of the miniature contacts necessitates a further "slave" relay (or transistor switch) for each reed or tone channel, capable in turn of carrying the current required by the actuator coils.

The device works very well indeed but needs great precision in manufacture and is consequently expensive, accounting for approximately half the cost of an installation, and is relatively heavy.

## CONTROL SYSTEMS

The experienced modeller can make a model perform quite complex evolutions even with a system that can only give instructions such as

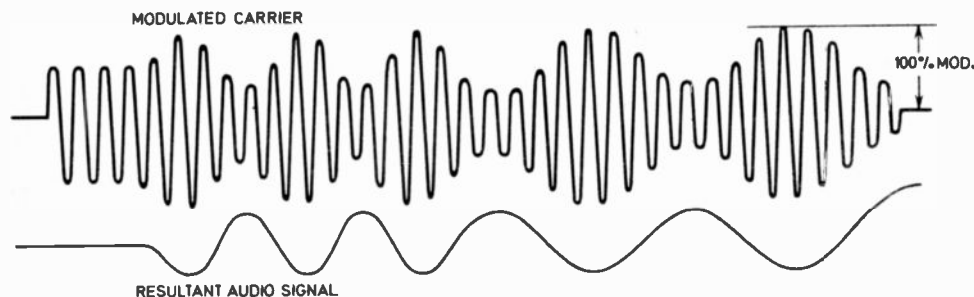


Fig. 1. Showing low frequency modulation of the r.f. carrier wave.

turn left—turn right: in a sense he achieves a degree of proportional control by varying the time ratio of the two instructions so that the mean effect produces a result approximately correct; an aeroplane, for example, can be flown in a multi-cornered circle. Possibly the best example of this practice, still in vogue, is the "galloping ghost".

Despite the proven reliability of the reed bank its weight and cost led experimenters to use compact ferrite-cored filter units from which a d.c. output can be derived as a function of a parameter change of the transmitter tone. This "controlled" d.c. is applied to a servo amplifier driving a small electric motor geared down to provide the necessary torque output. In this way single channel proportional control is employed to adjust, for example, the rudder of a model boat to the correct angle for the model to move in a true circle.

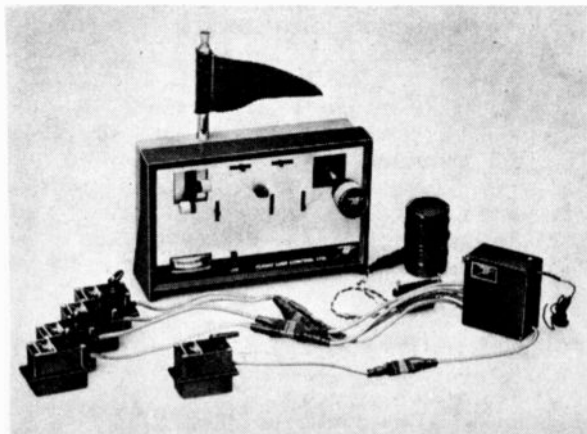
This is more than just a simple refinement. Radio controlled aircraft models are structurally different, in particular the dihedral, from the free flight types, the proportional class being capable of greater ease of operation to the extent that an inexperienced modeller can be his own test pilot rather than have the club expert fly it first.

## FREQUENCY BANDS

Multiple or simultaneous channels with proportional control on some, have become practicable to the extent that several models are used at the same meeting necessitating the use of superhet receivers and different band frequencies in order to prevent interaction. Each transmitter and receiver combination has a pair of matched crystals on one of the frequency bands shown in Table 1 with an appropriately coloured pennant fitted to the transmitter antenna.

An enthusiast can have several sets of crystals enabling him to take part on any vacant band or spot frequency and his transmitter is now fully

**The single stick five function proportional "Series Four" system manufactured by Flight Link Controls Ltd.**



transistorized making a compact hand held unit—usually fitted with joystick type controls. The highest tone frequency in common use is approximately 6 kHz and the band width occupied by a transmitter modulated by this tone is 12kHz or nearly half the separation between adjacent secondary channels, e.g. red to red/orange (Table 1) of 25 kHz. This is adequate for all practical purposes but if a higher tone frequency is used or the matched crystals are not exactly on the band frequency then interaction is possible to an adjacent secondary channel.

**Table 1. Frequency Bands**

Band Colour		Frequency
Principal	Secondary	MHz
Brown	Black	26·970
	Brown/Red	26·995
Red	Red/Orange	27·020
	Orange/Yellow	27·045
Orange	Yellow/Green	27·070
	Green/Blue	27·095
Yellow	Blue/White	27·120
		27·145
Green		27·170
		27·195
Blue		27·220
		27·245
		27·270

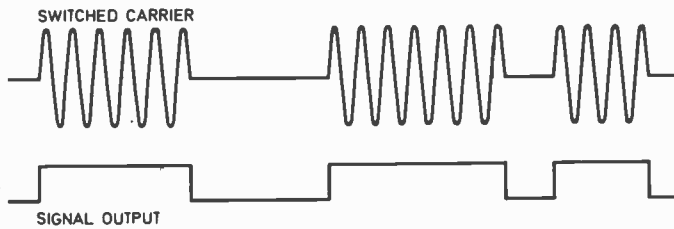
The band frequency on which radio control modellers operate. The matched crystals of the receiver and transmitter being colour coded and a pennant of the same colour used on the transmitter antenna.

Highly reliable commercial proportional equipment is available both ready for use and in kit form at prices from £40 to £350 dependent upon the facilities offered. The superhet receivers, often of foreign make, are produced at a figure the amateur can hardly improve on, component for component, and a saving of the labour content can only be made if a number of units are produced, as for a club, since much time must be spent in layout design alone. Similarly, the servo units incorporating a miniature motor, plastic gears etc., in a very compact and reliable form are difficult to copy.

The amateur constructor has a free field with respect to the transmitter, filter units etc., and it is common practice for a mixture of commercial and "home brew" equipment to be used, the system being basically designed for five or six channels but only one or two channels being used until the cost of a further servo unit kit is saved.

## DIGITAL CONTROL

The complications of multiple filter units and the advent of more specialized semiconductors such as the thyristor, paved the way for digital control; instead of varying the modulating tone frequency of one channel to effect a control, the



**Fig. 2.** The basis of the modern digital control system. The carrier wave is switched and transmitted in variable length bursts.

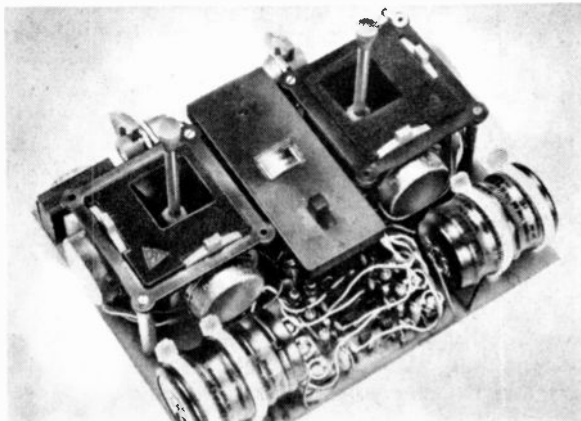
tone frequency is constant but is sent in variable length bursts (Fig. 2). The length of the burst or pulse being measured and converted to a d.c. output.

The attraction of the system is its basic simplicity and the avoidance of the difficulty of winding and accurately setting up filter coils. The disadvantage, is the necessity for synchronizing and sequence circuitry to ensure that the control on the transmitter always operates the corresponding model function. Present day technique is coupled with the availability of cheap integrated circuits.

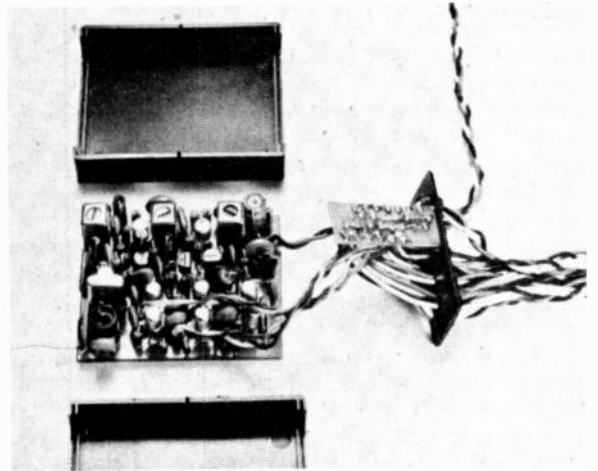
The number of channels that can be used with modern integrated circuit techniques is limited by fundamentals rather than cost: the rate at which a control output can be changed is proportional to the rate of measurement and hence to the number of pulses per second. If a slow rate of control is satisfactory about 12 channels may be used but if a faster rate of control is desired fewer channels must be used—6 is normal or the mean pulse length is reduced which means that the bandwidth of the system is increased to the limit of the commercial receiver. The immediate future is likely to provide more complex integrated circuits at reasonable prices.

Two transmitter frequency ranges are available 26.96—27.28 MHz and 458.5—459.5 MHz; the higher frequency range being long regarded as the domain of radio enthusiasts but is now a practical proposition with modern transistors: the future therefore may bring both frequency ranges into general use, the h.f. one being for the enthusiast with all proportional 10 channel equipment.

**The Quantum Six uncased transmitter available in kit form from Remcon Electronics.**



*Everyday Electronics, November 1972*



**An exploded view of the Quantum Six receiver.**

## LICENCE

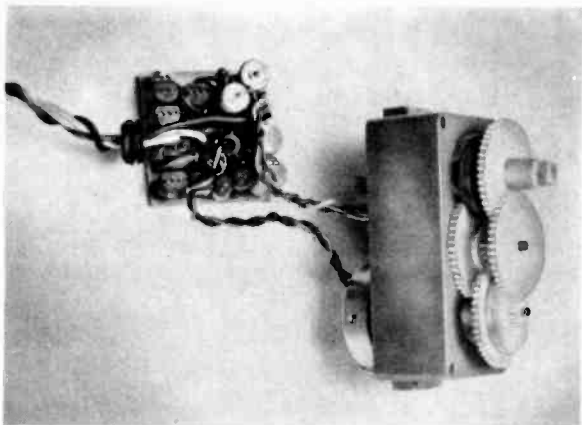
In order to operate a radio control transmitter a licence must be obtained from the Ministry of Posts and Telecommunications. This costs only £1.50 for a five year period and is well worth it considering that in the absence of a licence the authorities can fine and also confiscate all the equipment.

A form should be obtained from the Ministry of Posts and Telecommunications, Radio Regulatory Division (Amateur and Special Licencing Branch), Waterloo Bridge House, Waterloo Road, S.E.1.

In completing the form note that the equipment is licensed for an area defined by a 5 mile radius from a specified point; this can be varied by notifying the Post Office Telephone Manager for the Telephone Area of the alternative site: several sites may be in regular use simply by making standing notifications.

The regulations specify a "satisfactory method of frequency stabilization . . . measurement . . ."; in practical terms this means that the oscillator should be crystal controlled using a frequency marked miniature 3rd overtone crystal with matching tuning networks for 26.29—27.28 MHz. The emissions allowed are class A1, A2, F1 and F2, the meaning being:—

- A1 Telegraphy by on-off keying: the r.f. carrier not being modulated but just interrupted.
- A2 Telegraphy by on-off keying of either the modulating audio frequencies or the modulated carrier.



**Components incorporated in a typical modern servo unit.** (Remcon Electronics)

F1 Telegraphy by (unmodulated) frequency shift keying.

F2 Telegraphy by on-off keying of either the modulation or carrier frequency shift.

The power output is restricted to 1.5 watt (26.96—27.28 MHz) maximum (mean) effective radiated power; if an antenna other than the usual loaded Marconi type is used this figure must be derated by the gain of the antenna. If 100 per cent amplitude modulation is applied to a carrier the peak power is increased four times, the r.m.s. or mean power being  $\sqrt{2} \times 4$  times the unmodulated carrier.

In the case of a valve type transmitter the unmodulated r.f. power can be taken as the d.c. anode volts multiplied by the d.c. anode current. In transistor transmitters, unless specialised transistors and circuitry are employed, the maximum obtainable unmodulated power is of the order of 0.5 watt for 12—15V supplies. In general a simple output stage is capable of approximately 250 mW r.f.

## RANGE

The maximum range of a transmitter can only be properly quoted in relation to a given receiver of adequate sensitivity, and this presupposes that all factors, including the disposition of the antennas, are favourable.

For indoor (very short range) applications a transmitter with an output stage capable of 200 mW feeding a simple 30 inch rod antenna is adequate. If the same transmitter and antenna is used to control an aircraft it will be found that the range varies markedly with the disposition of the receiver antenna, and other factors and may be as low as 200 yards. In order to provide an adequate range with a factor of safety to provide for contingencies such as changing battery volts, detuning due to vibration, etc., the power output should be increased and a matched and efficient, loaded antenna used.

The super-regenerative receiver is easily made and has high sensitivity, its great disadvantage

being that in regions of high signal strength it can be "pulled" easily, responding to any signal close in frequency to the one it was tuned to. In practice this means that a more complicated and expensive superhet receiver should be used whenever two models are operated in close proximity, e.g. boats on a lake.

The novice could well be advised to start by controlling a model boat where there is little weight restriction and control failures are not disastrous. Simple equipment is all that is necessary with one or two channels only, for controlling the rudder and engine speed.

If starting completely from scratch a digital system could well be considered since the system could be extended at a later date. It may be thought that a digital system even with only two channels and servoamps is basically too expensive, in which case a simple single channel system could be considered.

## SUPPLIES

Initially dry batteries may be used for a venture into model control but for serious modelling and with regard to the safety factor and economics Deacs or rechargeable cells must be used. These have the advantages of lower internal resistance, a good power to weight ratio and, after the initial outlay, insignificant running cost.

Deacs may be charged with care from a "trickle charger" but it is usual to construct a special light duty unit for the purpose which makes use of the Deac characteristic to prevent over-charging. □

**The complete six channel proportional system from Remcon Electronics Ltd. The system is available in kit form.**







# ACTION!

*Another look at an electronics evening class.*

**T**EN weekly lectures in basic electronics was the course started by development engineer John Matthews at Hilderstone Adult Education Centre at Broadstairs, Kent, in September 1971. On completion of this first course entitled "Transistors and Semiconductor Devices" many of the students suggested a follow-up course and, because of this, further courses are planned for this year.

The course held was one of theory and practice and John explained fully the function of most common components from the diode up to an integrated circuit. Visits to local electronics firms were also arranged whereby the students

could get some insight into "industrial" electronics; these helped to stimulate interest and provide background knowledge.

For practical projects some of the EVERYDAY ELECTRONICS circuits have been used together with other designs. The students who took the first course come from jobs as varied as the projects they have constructed—from electricians to hovercraft pilots, and from chemists to draughtsmen.

Many of these students will be taking further courses, and any reader interested in taking part should write to John Matthews, care of Hilderstone House, Broadstairs, Kent.

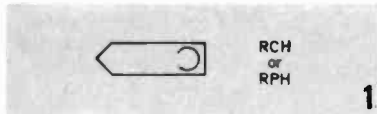
Some of the students who took part in the "Transistors and Semiconductor Devices" course being given constructional advice and instruction from John Matthews (standing). The students are, from left to right back row first: M. Fenney, I. Stockdale, V. Lane, R. Collins, M. Kennedy, and J. Wood.



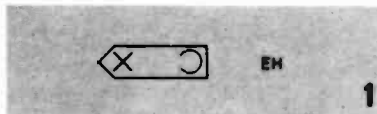


# guide to circuit

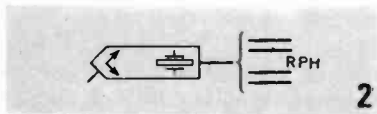
## Transducers



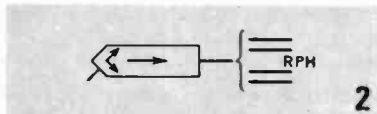
Head for magnetic tape or drum (monaural record or replay)



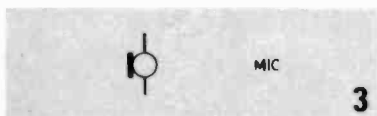
Erase head for magnetic tape or drum



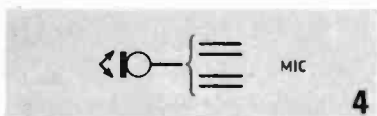
Stylus operated piezo - electric stereo pick-up for reproducing



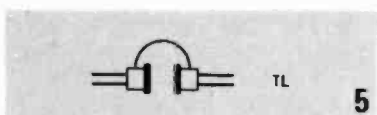
Stylus operated stereo pick-up for reproducing



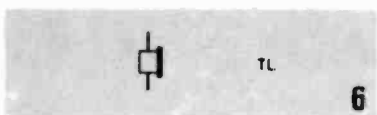
Microphone (mono)



Microphone (stereo)



Headphone, stereo (one wire from each side for mono)



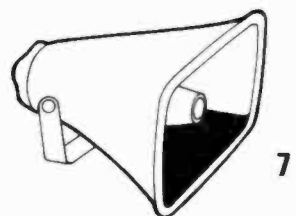
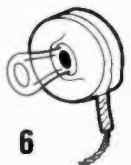
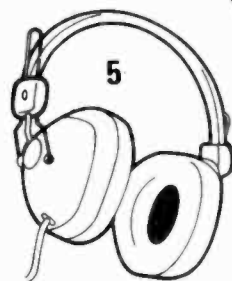
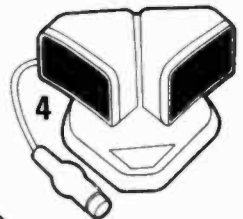
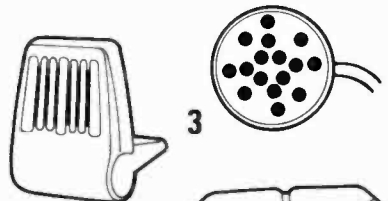
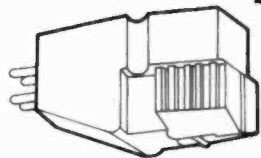
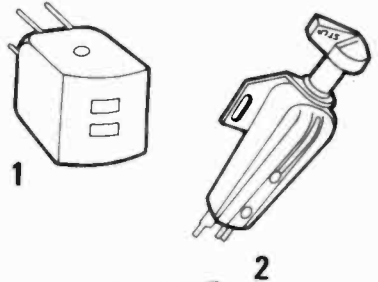
Earphone, mono only



Loudspeaker

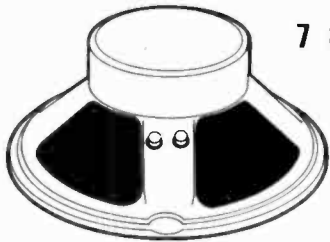


Loudspeaker, microphone

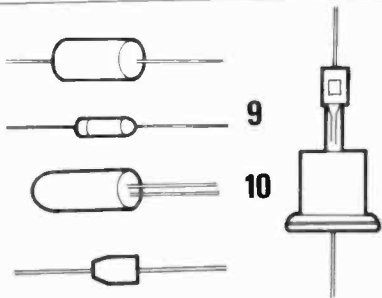


# symbols . . . part 5

## Semiconductors

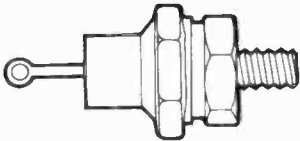


7 8



9

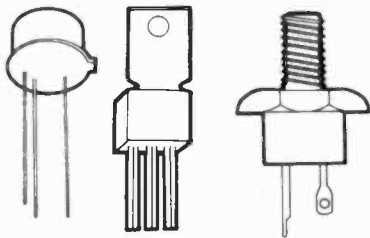
10



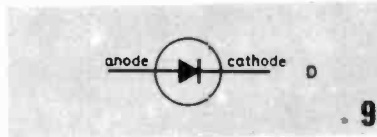
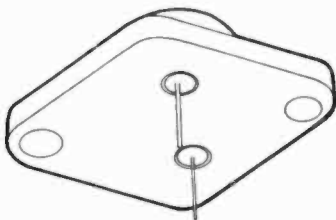
9



11

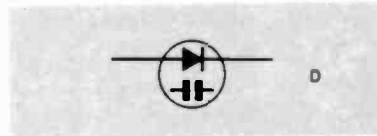


12 13 14 15



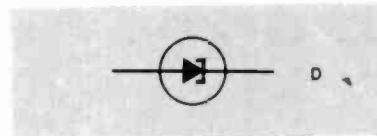
Semiconductor *pn* diode (Note: the cathode end of most diodes is usually marked with a plus sign or a red spot or band)

9



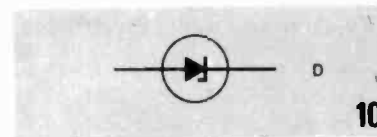
Diode used as a capacitive device, for example varactor

D



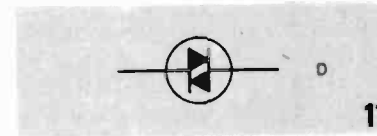
Tunnel diode

D



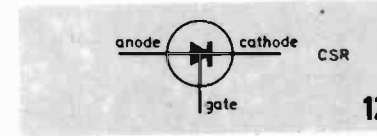
Unidirectional breakdown diode, voltage reference diode, for example Zener

10



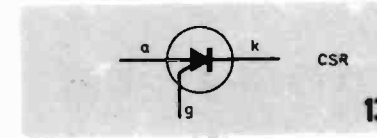
Bidirectional diode, diac

11



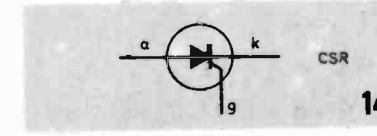
Controlled semiconductor rectifier, thyristor general symbol

12



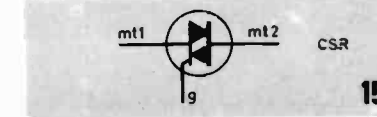
Reverse blocking triode thyristor, n gate

13



Reverse blocking triode thyristor, p gate

14




Bidirectional triode thyristor with two main terminals and trigger gate, triac

15

The Beta guitar incorporating two electronics effects.

# ELECTRONIC GUITAR

by Brian W. Terrell B.Sc.



**W**ITHOUT doubt, one of the most popular instruments of recent years and still today, is the electric guitar. Its popularity is easily seen by looking at and listening to the records in one of the national record sales charts to find that almost every record features a guitar, mostly electric, in one form or another in conjunction with an accessory such as fuzz, tremolo, vibrato, waa-waa, treble boost etc., which are either built into the amplifier or self-contained in a box situated on the floor and foot-operated.

## WHY DO-IT-YOURSELF?

Guitars and effects boxes are so readily available in so many shapes, sizes and forms that one may ask "why build your own?"

Perhaps the short answer to this is cost. Guitars to begin with can be very costly, prices ranging up to £300 or more for ones commercially available and even more in some cases for "custom built jobs".

An average price to pay for a reasonable instrument is about £40.

Effects boxes seem to cost a lot of money for what they actually consist of—electronically speaking—but are probably worth the enjoyment and satisfaction they give to their owners (and

see **FREE**  
**BLUEPRINT**  
WITH THIS MONTH'S  
ISSUE



Approximate  
cost of  
materials  
£7.50

fans). Typical prices for the common effects boxes vary between £7 and £15.

Other factors, leaving cost aside, stem from the fact that musicians like to be individualists, and own equipment (providing its good) that others don't. This is what you can do by building your own guitar, and add your personal "touches" such as pick-ups and positioning, controls and location, colour and other refinements.

## ELECTRONIC

The guitar to be described here, and known as Beta, is a guitar with a difference. It differs from most other solid electric guitars in so far that it has electronics effects built into its body. These effects can be brought into operation by the flick of a switch whilst playing. Both units—fuzz and treble boost—are powered by a single PP3 battery located in the control recess—but this will be fully described later.

It is therefore quite in order to call the Beta an electronic guitar—it is different already.

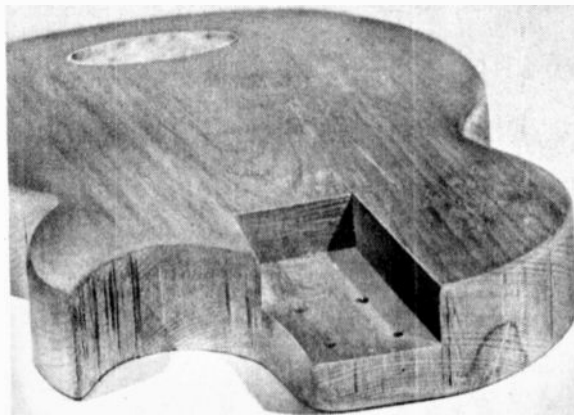
## WOOD

The wood content of the guitar, as can be seen in Figs. 1 and 2 on the blueprint enclosed in this issue, is essentially three pieces of wood, the body, the neck and head (made in one) and the fretboard. The choice of material is important but not critical.

In all cases the wood should be of the hard variety such as oak, teak, beech, etc., the important properties of these woods being that they have a close grain, are strong, do not distort or split easily under strain and can be engineered more accurately than softer woods.

Bearing in mind the cost and availability of these materials, beech was chosen for use in the prototype for the body, and neck and head combination, and teak as that for the fretboard since

**The guitar body in early stage of construction showing stem recess cut out.**



the latter is slightly softer in some respects as is required for fixing the fret wire in position.

For the body you will require a piece of beech about 13in. by 17in. by 2in. thick. For the neck and head combination a piece of beech 30in. by 3in. by 2in. with grain along the length, and a piece of teak board approx. 20in. by 2½in. by ¼in. for the fretboard.

## BODY OUTLINE

Begin construction with the body of the guitar. Transfer the outline shape of the guitar from the blueprint, Fig. 1, to the piece of beech wood (do not cut the blueprint).

This can be done in two ways by (i) tracing the outline and sticking the tracing on the face of the wood, or (ii) place a piece of carbon paper on the wood face, place the blueprint on top and follow the outline on the blueprint to give a direct transfer onto the wood. These methods can also be used with all the other full-size drawings of the guitar parts.

Whichever method is used for the body, ensure that the centre line is clearly scribed. The centre line is marked in Fig. 1.

When the prototype was being constructed a very useful tool was a G-clamp. It is recommended that one of these be used to make the work easier.

## CUT-OUTS

With the outline and centre line clearly marked, clamp the body wood down tightly on a bench top, top side up, and mark out the positions of the stem recess as detailed in Fig. 1. Cut out this recess and drill the six holes in this recess labelled "C".

Mark out the positions of the two pick-up recesses, the tailplate recess and cut out as detailed, using mallet and chisel.

The two switch slots on the face of the body should now be marked and made. These are best done by drilling at the ends of the slots and chiselling out the remainder. Note that the slot nearest the tailplate position is to be right through the body whilst the other is only halfway through from the front face.

Now mark and cut out the channel to accommodate the cables from the switches and pick-ups. This channel terminates near the rear pick-up in a ¾in. diameter hole drilled right through the body.

In the channel section linking the upper switch recess to the upper pick-up recess, lay in a length of ¼in. plastic tubing such as that used for petrol pipe. Fill in around this tube with a filler such as plastic wood. This tube is to allow the cable for the effects switches to reach the control section.

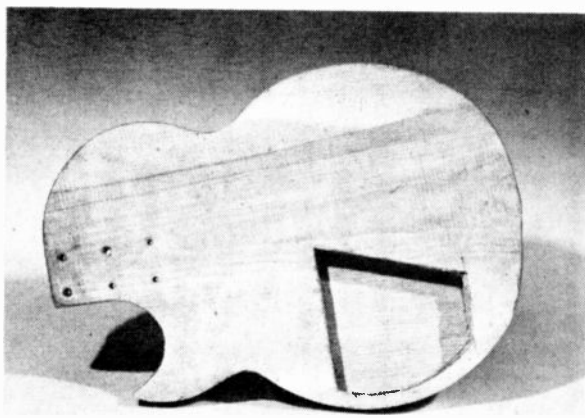
When all these cut-outs have been made, the body can then be cut to shape, slightly oversize to allow for cleaning up.



With the prototype, the body was cut using ordinary hand saws, chisels and files but took considerable time and effort—but this was justified by the end result. If you can get the timber yard or shop where you purchased the wood to cut it for you on their bandsaw, this is recommended.

Whether hand or machine cut, the edges will be rough and will have to be shaved down and smoothed. It is recommended that the smoothing is left till later. Shaving can be done with plane, Surform, rasp or rough file. You will probably end up using all of these tools for different parts of the body.

There are two further cut-outs to make, one on the edge and one to the rear face of the body for the jack socket and control section respectively. These should now be marked, cut and drilled as indicated in Fig. 1.



The rear face of the body showing the cut out to accommodate the electronics and controls.

The control recess, which is 1½in. deep into the rear face of the body is to be made first and is easily done with chisel and mallet, but care should be taken where the recess comes close to the body edge. The shape and position of this recess is shown dotted in Fig. 1—do not forget the ¼in. deep lip for holding on the backplate.

The 7/8in. diameter hole for the jack socket should be drilled from the edge through to the control section recess as detailed in Fig. 1.

Mark the positions of the four 'D' holes and drill through to the control section. Leave the body to one side for the moment.

### NECK AND HEAD

Referring to Figs. 2a and 2b on the reverse side of the blueprint, the neck and head are shown in front and side view (left and right respectively). The neck and head are to be made

in one. For this use the piece of beech size 30in. by 3in. by 2in.

Begin by marking out the side view of Fig. 2a along the 30in. by 2in. side of the length, aligning the face where the fretboard is to be attached and the end opposite the head with the corner of the length of wood.

Now use Fig. 2b side view (head profile) to transfer this shape to the top of the neck so it is now in one piece. You should now have the profile of the complete neck/head assembly.

Saw the slope on the front face of the head and smooth with plane and sandpaper.

Draw a line right down the centre of the 30in. by 3in. face, including the sloping head. Next mark out the front view of the neck and head about this centre line making sure that both views line up on the wood length.

The next job is to cut out the neck/head—leave the nut slot for one moment. Once again, if a bandsaw is available it is recommended that this be used, otherwise handsaws, chisels and rasps will be needed.

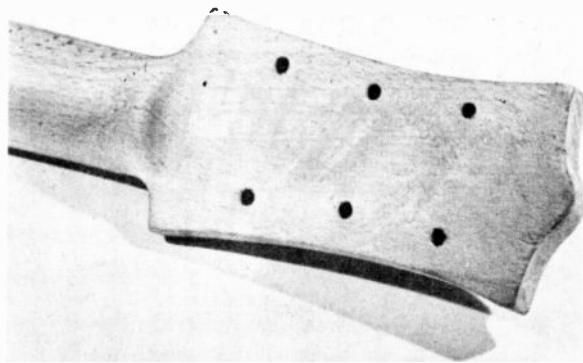
The method of cutting is left to the constructor to suit his own skills. Whichever method is used cut slightly oversize, it can be planed and filed to final shape later.

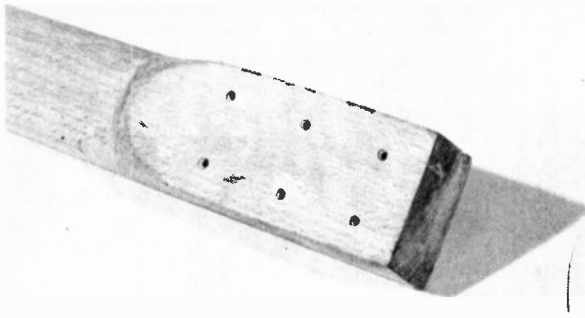
### JOINT

Plane or chisel the end of the neck that is to fit into the guitar body to give a tight fit—but not too tight. Ensure that the centre line through the body lines up with that along the neck/head.

When satisfied with the joint, mark through from the back the positions of the six 'C' holes and then drill these 1in. deep into the neck with a 1/8in. diameter bit. Replace the neck and secure to the body with six 2in. long No. 10 screws. Screw in fully. Now that the screw threads have been established remove the neck and commence rounding off the back side of the neck as indicated in the cross-section of Fig. 2b.

Photograph of the sloping head of the guitar with holes drilled to position machine heads.





Photograph of the neck section that fits into the guitar body.

This is best done with a heavy duty half-round file or rasp.

The regions where the head joins the neck, and the neck joins the body, should be shaped as indicated in Figs. 2a and 2b, and the photographs of the neck/head assembly. Shave the neck and head right down to the markings. The hard work is now over.

### FRETBOARD

The fretboard is made from a piece of teak although mahogany would be just as good. Cut the board to the correct length but leave over-size as far as the width is concerned.

Place the blueprint, Fig. 2a (left hand side) over the teak board and hold flat in position with drawing pins at each of the "E" and "F" holes. Using a large pin, prick through the blueprint along the centre line and either side of it at the 19 fret positions. The line to prick through for the fret saw line positions is the thin dotted one between the two close thick ones which represent the frets themselves.

Remove the drawing pins and blueprint from the fretboard and using the pin pricks draw in the centre line and the fret position lines. The eight holes at "E and F" will have been marked with drawing pins. Drill these holes as detailed.

With the neck screwed into the body, place

the fretboard on the neck, line up the centre lines and secure in this position with two small round-headed screws through two of the drilled holes in the fretboard. These screw holes are essential for locating the fretboard in the correct position when glueing in place later. Shape the fretboard to that of the neck.

Now, using a fine sawblade, cut the slots along the fret position lines (19). Make these slots about  $\frac{1}{16}$ in. deep. Remove the fretboard from the neck and lay on a flat surface.

## Materials . . . .

### Wood

Beech 18 x 13 x 2in. (body)

Beech 30 x 2 x 3in (neck/head)

Teak 20 x 2 $\frac{1}{2}$  x  $\frac{1}{2}$ in. (fretboard)

### Fretwire

4 $\frac{1}{2}$ ft. standard

### Perspex

12 x 12 x  $\frac{1}{8}$ in. (scratch plate and switch covers)

### Aluminium

3 $\frac{1}{2}$  x 2 x  $\frac{1}{8}$ in. (tailplate)

$\frac{1}{2}$ in. dia. tube 3 $\frac{1}{2}$ in. long

1 $\frac{1}{8}$  x 1 x  $\frac{1}{16}$ in. (jack socket cover)

### Steel plate

4 $\frac{1}{2}$  x 2 $\frac{1}{2}$  x  $\frac{1}{16}$ in. (stem support plate)

### Plastic tubing

2 x  $\frac{1}{8}$ in. internal diameter

### Plastic rod

1 $\frac{1}{2}$  x  $\frac{1}{8}$ in. diameter

1 $\frac{1}{2}$  x  $\frac{3}{16}$ in. diameter (No. 5 & 7 crotchet needles) (finger position markers)

### Screws and Bolts

2in. long countersunk (6 off)

1in. long countersunk (4 off)

$\frac{1}{2}$ in. long round headed (2 off)

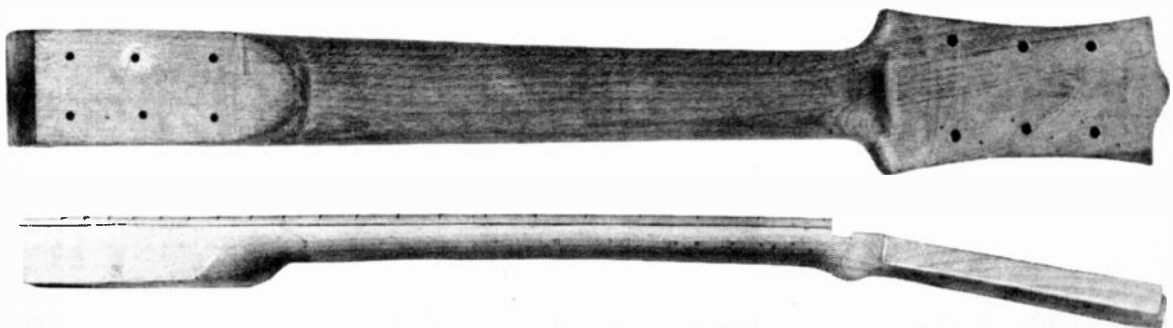
$\frac{1}{4}$ - $\frac{3}{8}$ in. long, thin chromium plated for fitment attachment (24 off) 1in. long, copper or brass plated (4 off); 1in. long 4BA (2 off)

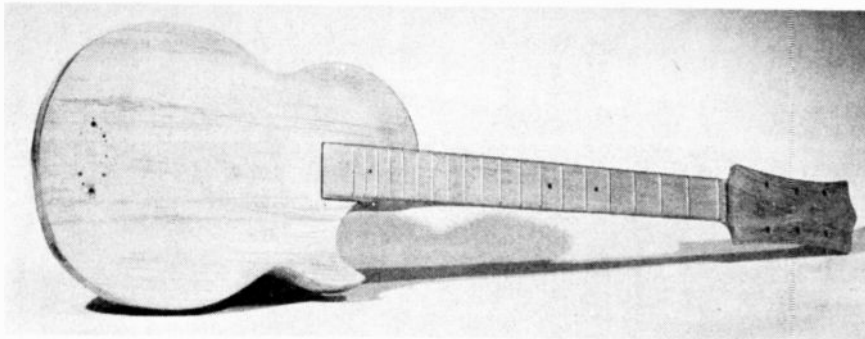
### Miscellaneous

Adjustable bridge; strap; strap fasteners (2 off); individual machine heads (6 off); set of steel strings (6); adhesive, filler and sandpaper.

SEE  
**SHOP  
TALK**

The complete neck/head assembly with completed fretboard glued in position. Shows the "shaping" at the neck/head and neck/stem regions.





The Beta nearing completion of the "raw" state.

Cut the fretwire in lengths to suit each fret position and push the wire in position from above. It must be a tight fit, and it should be necessary to have to tap them in with a small hammer or press them in with the aid of a metal vice. They must be pressed in as far as possible.

When all the frets are in position and fully sunk in, apply some adhesive to the fretboard (rearside), Evo Stik is ideal, and with the help of the two screw threads in the neck, locate in the correct position and allow to set with the screws tightened.

### FRET ALIGNMENT

When set firm remove the locating screws and file the ends of the fret wire flush with the edge of the fretboard/neck, and then chamfer each end of the fretwire (including the fretboard) so that you cannot feel the presence of the fret as you run your finger down the edge of the fretboard.

When you are satisfied with all the frets, file the tops off them so that there is about  $\frac{1}{16}$  to  $\frac{1}{32}$  in. flat. Finish off with coarse and then fine emery cloth so that the frets are free from file marks.

Place a flat edge along the top of the frets, spanning all of them, and determine if any are

high; if there are, file to correct. Further filing may be necessary after fitting the strings.

The "E" and "F" holes at various positions along the fretboard are for finger positioning. In the prototype these were filled with short lengths of white plastic knitting needle, and glued in.

Now cut out the slot to accommodate the nut (Fig. 2a).

Examine the machine heads you have obtained and see if the locating holes shown in the head, Fig. 2b, are satisfactory. If so, drill these positions to suit diameter of machine head spindle, if not, re-position and drill to suit. Secure the machine heads in position.

With reference to Fig. 4 make the nut. This should be made from a plastic material such as Perspex. The width of each slot should be made to suit the diameter of the strings to be used. The depth of the slots should be cut so that the strings, when fitted, will just clear the first fret when taut. This may have to be done by trial and error later so this fitment should not be glued in position at the moment.

**Next month:** details of guitar fitments and pick-ups.



## PLEASE TAKE NOTE

Cassette Tape Power Supplies—page 641  
**Fig. 3. (October issue). The wrong circuit symbol was shown for the Zener diode D 1. See Guide To Circuit Symbols in this issue.**

Reactomatic—page 651. In the text reference is made to VR4, this should be VR1.

# BASIC Electricity

## 1

### The Battery

By Maureen Birch

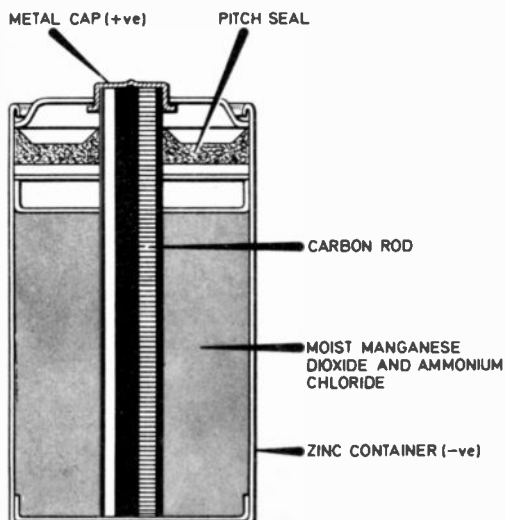
How many appliances have you at home at this moment which need batteries to operate them—torch, radio, shaver, model car etc? You must sometimes have asked yourself how these batteries work and how a current is produced by them.

#### DRY CELL

If you can unearth a small dud 1.5 volt battery—or dry cell as it is called—carefully dissect the outer steel case, cardboard sleeve and zinc container. Having done this you should be able to identify all the parts shown in Fig. 1.1a.

Notice that the inner container is grey zinc metal and the metal cap terminal at the top is connected to a carbon rod which runs the length of the inside. Around this rod is a moist, black mixture of manganese dioxide powder and ammonium chloride crystals. Although this is

Fig. 1.1a. Shows the internal construction and composition of a "dry" cell.



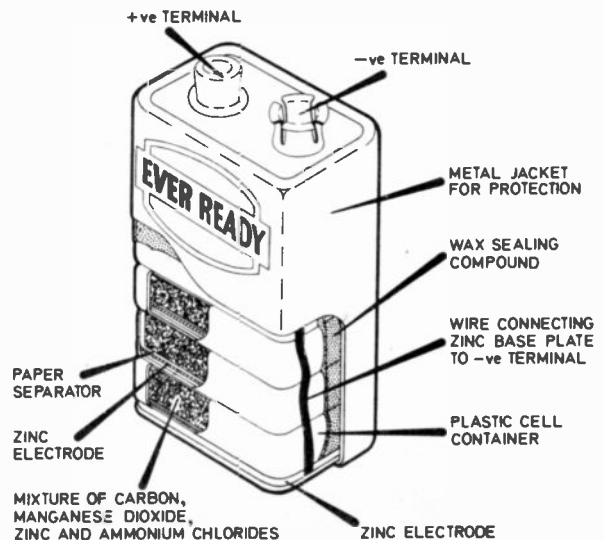
called a dry cell the chemicals inside it must be damp for it to work properly.

You will know from experience that dry cells come in all shapes and sizes. It is obvious that a large cell must contain more chemicals and therefore it lasts longer, but increasing the size will not increase its voltage. The output from a single dry cell is 1.5 volts and if more is needed many cells are joined together. Thus the 9 volt battery of the type used in transistor radios etc. is six layer type cells stacked inside one case and connected in series so that the carbon of one is in contact with the zinc plate of another Fig. 1.1b.

#### CHEMICAL REACTION

Now we come to the crux of the matter—how does the cell produce an electric current? The battery contains a supply of chemicals which react together to create a cloud of small particles

Fig. 1.1b. Stacking of six layered cells to make a 9V battery.



called electrons around the zinc case and at the same time the carbon rod has a shortage of electrons. Electrons are small negatively charged particles. Therefore we say that the zinc case is the negative terminal and conversely the carbon rod is positive.

When the cell is connected to a bulb the electrons flow away from the zinc case through the bulb and back to the carbon rod in an attempt to even things up. This is a continuous process because the zinc case immediately provides more electrons to replace those that have just left. This is a very simple explanation but it leads us to one important and basic fact—that an electric current is a flow of tiny negatively charged particles. Later, when we are talking about the magnitude of current we shall use units called **amperes** to describe it.

When the chemical energy which produces the electrical energy is used up, the battery is said to be flat and the current fails. It is possible to "refill" a used cell but this is not easy and is not worth the trouble. The zinc case is used up in the chemical reaction and in modern cells the thickness of this case is not very great—thus ultimately it may become completely eroded away—this leads to the cell leaking.

## ELECTRONS

Before we go any further we must consider in more detail the electrons which we have only mentioned briefly so far. All matter surrounding us whether it is solid, liquid, or gas is made up of atoms and an electron is a small part of an atom. Most atoms contain many electrons travelling at great speeds in orbits around the centre, or nucleus as it is called—rather like planets travelling around the Sun. Each electron has a negative charge and the nucleus contains enough positively charged particles—called protons—to balance the electron charges; thus the atom as a whole is neutral.

If we now return to our dry cell producing a current and running a light bulb, it is clear that as the electrons leave the zinc plate on their journey to the bulb and then back to the carbon rod they must travel in a substance which will allow the flow to continue easily. Such substances are called conductors and gold, silver, and copper are particularly good. Gold and silver are obviously too expensive to use for wiring and so copper is extensively used.

Insulators are substances which do not conduct electricity and these are used to cover conducting wires—rubber and plastics are examples of these.

Now what, you may be asking, is the difference between copper and rubber that makes one a conductor and the other an insulator?

## CONDUCTORS AND INSULATORS

To understand this problem we must think about the atoms which make up these sub-

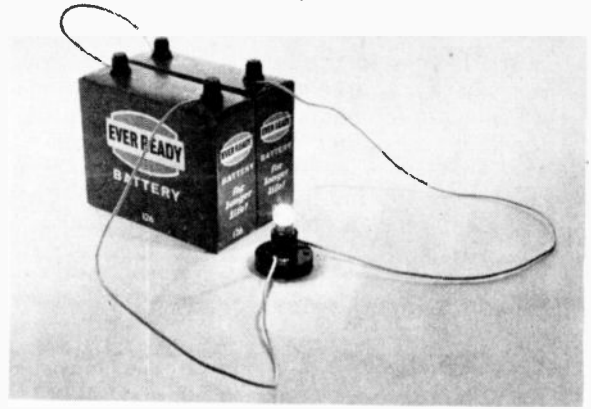


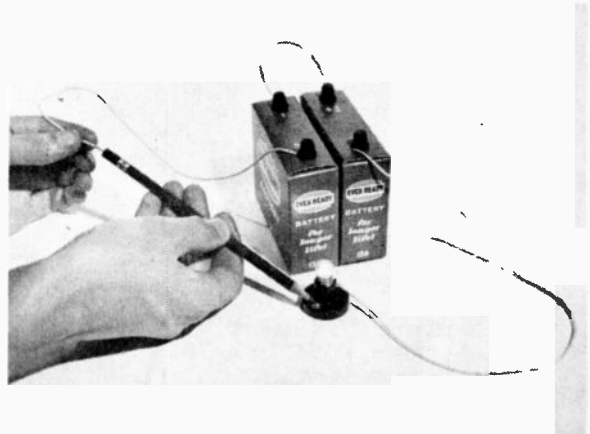
Fig. 1.2. Simple experiment to illustrate the principle of "current flow" in a "circuit".

stances. Some of the electrons in a conductor, such as copper, are very loosely held in their orbits and can be made to drift along if they are pushed by the electrons coming from a battery. These loosely bound electrons will be pushed from atom to atom until they find one with a shortage, or an electron may secure a place in an atom by pushing out another electron which will in turn move on to find itself a home. It is important to understand that the electrons which set out from one end are not the same ones which reach the other.

Insulators, on the other hand, do not have loosely coupled electrons, and thus are not able to carry a current.

One confusing fact about electricity is that, by convention, current is said to flow from the positive to the negative terminal of the battery although, as we have seen, it is a flow of electrons in the opposite direction.

Fig. 1.3. Introducing a resistance into the circuit of Fig. 1.2, by means of the graphite through a lead pencil, dims the glow from the bulb.





## THE CIRCUIT

We have said that for a current to flow, we must have a source of current e.g. a battery and wires made of conducting material (copper), but there is one other important condition which must be fulfilled, and this is that the current must have an unbroken path, or circuit as we call it, in which to travel. We call this unbroken path a closed circuit and in our homes most of the electrical apparatus is fitted with a switch which will open or close the circuit as required.

## EXPERIMENTS

At this point you can do some simple experiments. Obtain two 4.5 volt batteries with screw terminals—this makes the attachment of wires much easier—a 6V 0.12A torch bulb, a holder for the bulb and some insulated flexible wire—one of the cores from ordinary lighting flex will do.

Connect the batteries to the bulb as shown in Fig 1.2—they will provide us with 9 volts. Notice that the bulb glows brightly as the current is flowing in copper wire. Now introduce a lead pencil into the circuit (Fig 1.3)—lead pencils have a core of graphite. Hold the wires at either end of the core of the pencil (not on the wood) and notice that the lamp still lights but not as brightly as before. This is because graphite is not as good a conductor as copper. It is providing a certain amount of resistance to the flow of electrons.

We can show this even more dramatically by

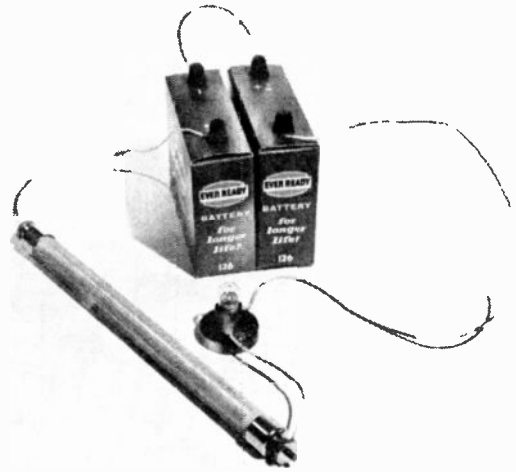


Fig. 1.4. Using an old electric fire element as a resistor.

substituting the element from an old 1 kilowatt electric fire for the pencil graphite, Fig. 1.4. If you use the whole length of the element you will be introducing a lot of resistance and the bulb will glow dimly. Use less of the element wire and the bulb will glow brighter thus showing that the circuit resistance is less. Later on we shall give numerical values to resistance and we shall use units called **ohms**.

**Next month:** Current flow through liquids.

## Ruminations By Sensor

### Away from it all

I think that most of us feel the need to withdraw ourselves occasionally from our surroundings, mentally at least, and retire into our own private world. One can soon become oblivious to everything going on around if deeply involved in some absorbing pursuit. Electronics can be a most satisfying hobby because it embraces so many arts and sciences.

The amateur woodworker can express himself in the construction of cabinets for his electronic gear while the would be metalworker can indulge himself in the creation of chassis and cases. Those who prefer to experiment with circuits can do so with

simple "breadboard" construction "just to see if it works". One may become interested in circuit design, or merely build from published designs. The hobby can be enjoyed at any level, just as one wishes.

### A place of one's own

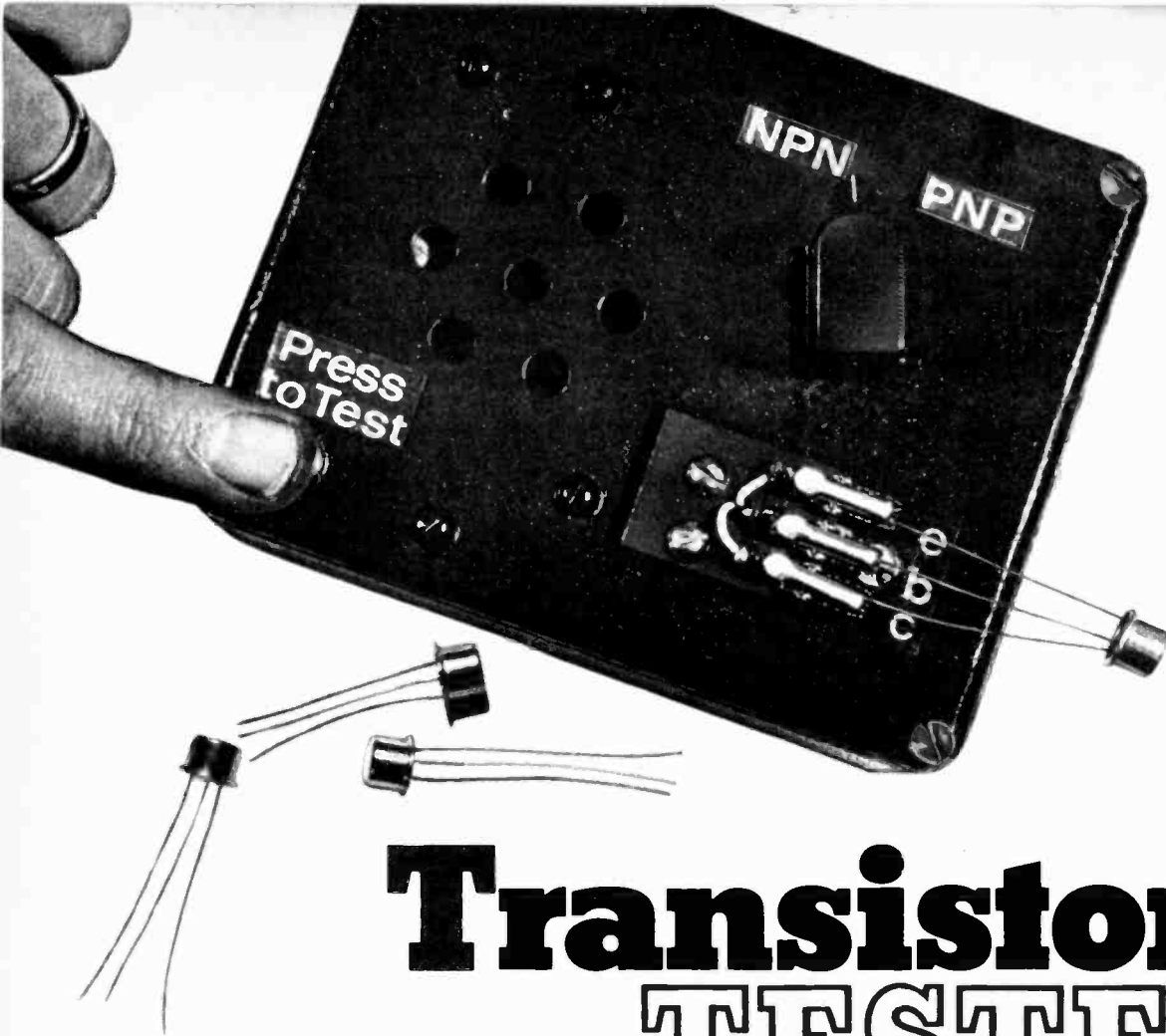
As a boy, most of my electronic projects were built upon the dining room table. This meant that I was required to clear the table for each meal and therefore could not easily embark upon a large project. When I started to build my first large project I first bought a cheap card table and this became my bench. It stood in a corner of the room and work could be started or stopped just whenever I wished—a great improvement over the dining room table.

If space permits, a room of one's own for a workshop, has definite advantages; I once saw a tiny workshop created in a cupboard under the stairs. There

was just room for one person and a small seat and a bench, like a shelf, but it served the purpose admirably.

When visiting a friend who had just moved into a new house I was invited conspiratorially to "follow me". He produced a pair of stepladders and led the way to the left space, there, around the central chimney stack, he had built a bench and storage cupboards for tools and components. "I can get away up here," he said.

From his air of secrecy, I concluded that his wife was not aware of the existence of his little sanctum! I wondered what she thought when he disappeared for long periods. Did she see that tell-tale ladder on the landing or did he pull it up behind him? Was she disturbed by strange noises from somewhere up aloft? I didn't like to ask these questions, he had shown me a glimpse of his private world and I felt that his confidence must be respected. Wouldn't you?



# Transistor TESTER

**A rapid tester for checking most transistors.**

By P. A. Graves

**A** CONTINUAL problem to the experimenter is the need to test transistors to check if they are functioning. Experience shows that transistors rarely fail slowly like valves, they usually go open or short circuit on one or more junctions. This means that they can be tested with an ohm meter.

The testing technique seems to have been invented by a three handed service engineer! It requires six separate measurements to completely test the transistor, assuming you do not forget where you have got to, while holding the transistor in one hand and trying to manipulate the ohm meter probes with the other.

The alternative is to build a proper transistor tester. This is where the trouble begins again! Some types of tester seem to have so many controls that they would not be out of place on an aircraft flight deck, and others require sensitive, and expensive, meters. Operation of the simpler types requires adjusting backing off voltages, several readings from meters and a calculation afterwards.

The Transistor Tester described in this article checks transistors by operating them in a simple oscillator circuit, which gives a very good indication of their functioning.

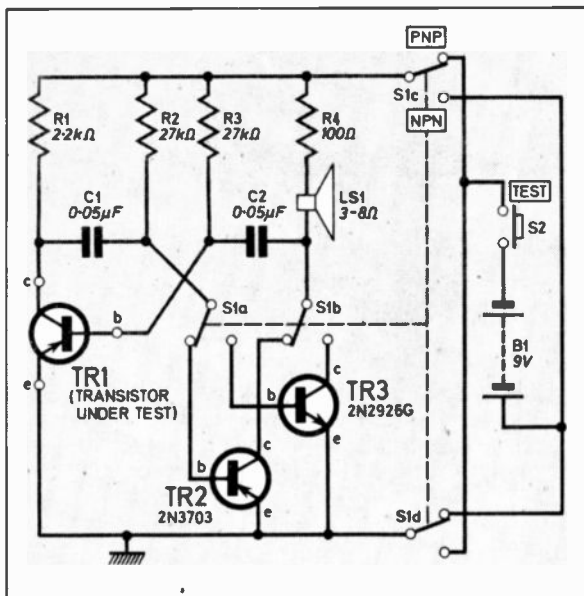
## CIRCUIT

The circuit (Fig. 1) at first sight seems a little fearsome due to the switching arrangements which are needed to cater for both *npn* and *pnp* type transistors. The circuit is basically a simple multivibrator.



**Approximate  
cost of  
components  
£1.85 plus case**

Everyday Electronics, November 1972



**Fig. 1. Complete circuit diagram of the Transistor Tester.**

The multivibrator acts as an "electronic see-saw." TR1 (the transistor being tested) and TR2 (or TR3) switching on and off alternately, at a frequency determined by C1, C2, R2 and R3; these are chosen to provide oscillation in the audible frequency range. Pulsating current flowing in TR2 (or TR3) collector, as the transistor switches on and off, causes an audible tone to be heard in the loudspeaker LS1. Resistor R4 limits the current flowing in TR2 or TR3 but allows enough to provide a reasonable output from LS1.

Provision for checking *pn*p and *np*n transistors is made by switching in a similar type in the TR2 position (TR3) and switching the battery polarity to suit, this is done by S1.

Only if TR1 is working will the tester oscillate giving an audible tone when S2 is pushed.

## COMPONENTS

None of the components are critical, almost any general purpose transistors that can pass a collector current of about 100mA will be suitable for TR2 and TR3. The loudspeaker can be any small 3 to 15 ohm type. Switch S1 is a four pole two way rotary type wired up as will be shown later.

## CONSTRUCTION

The prototype unit was constructed in a small diecast case that provides a very tough and business like finished unit. Commence construction by drilling the removable panel as shown in Fig. 2.; all the components will be mounted on this panel.

Next affix the loudspeaker, S1, S2 and the clip to hold B1. Having done this wire up the tag board as shown in Fig. 3, soldering in the two

## Components....

### Resistors

- R1 2.2kΩ
- R2 27kΩ
- R3 27kΩ
- R4 100Ω
- All ± 10% ¼W carbon

SEE  
**SHOP  
TALK**

### Capacitors

- C1 0.05μF
- C2 0.05μF

### Transistors

- TR1 Transistor under test
- TR2 2N3703 silicon *pn*p
- TR3 2N2926 (G) silicon *np*n

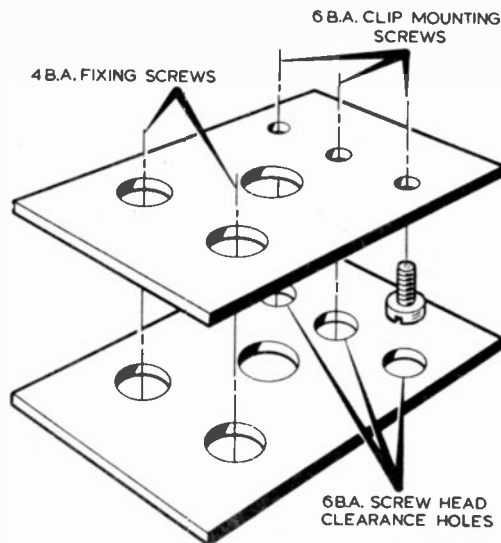
### Miscellaneous

- LS1 3 to 15Ω miniature loudspeaker (approx. 2 in. diameter)
- S1 4-pole 2-way wafer switch
- S2 Single-pole push to make push button.
- B1 9V PP3 battery
- Three miniature crocodile clips, 11 way tag strip, Terry clip to hold B1, small pieces of paxolin to mount connection clips, die cast box, approx. 4¼ x 3¼ x 2¼ in., pointer knob, 4BA fixings, connecting wire.

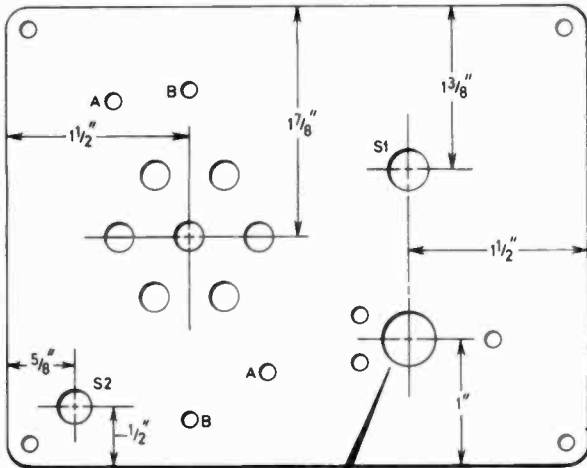
transistors last, using a heat shunt on each lead as it is soldered.

Before wiring up the unit the three small crocodile clips must be mounted on a piece of paxolin by their connecting screws and then mounted on the panel as shown in Fig. 4, using another piece of paxolin to insulate them from the case.

**Fig. 4. The two pieces of Paxolin used to mount the clips for TR1. Each piece measures 1in x ½in.**



# Transistor TESTER

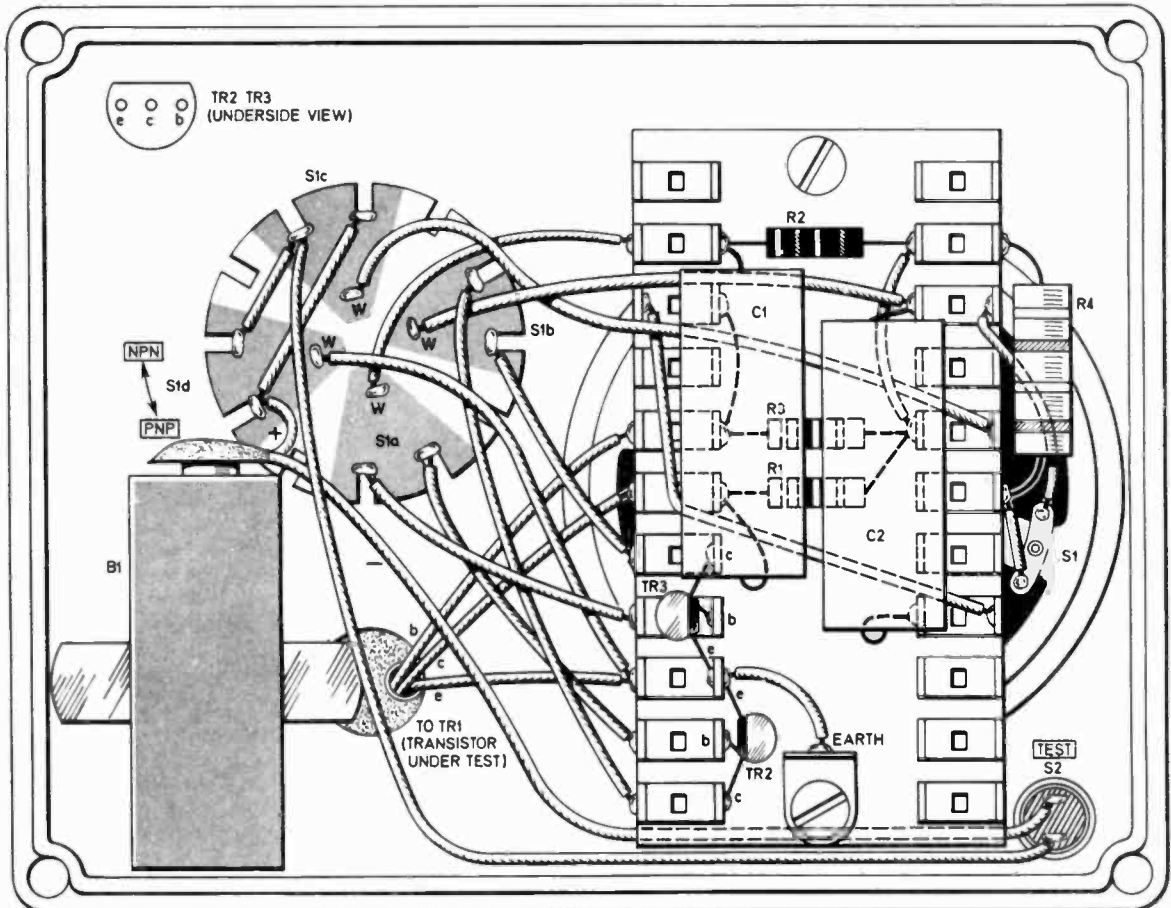


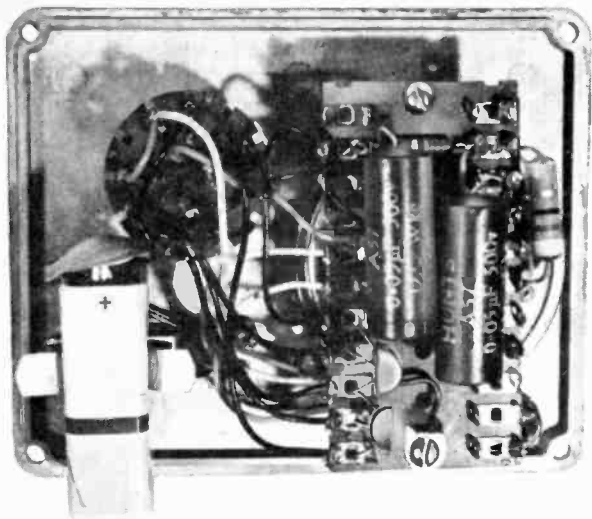
A= LS1 MOUNTING  
B= TAGBOARD MOUNTING

MOUNTING FOR TRANSISTOR  
UNDER TEST (TR1)  
CONNECTING CLIPS

Fig. 2. Front panel drilling details dimensions of some of the holes will depend on the components used.

Fig. 3. Internal view of the complete unit showing component layout and wiring.





Internal view of the prototype.

Finally, mount the circuit board, on two long bolts, over the speaker and connect up the unit.

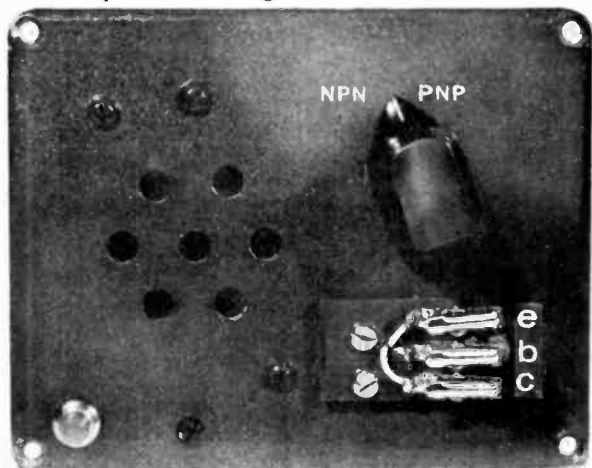
### TESTING

After checking all the connections, connect the battery observing polarity, insert a good transistor in the clips—again observing lead connections—select *npn* or *npn* on S1 and press S2. If all is well a bleep will be heard signifying that the oscillator is functioning. Now test the other position of S1 by inserting a different good transistor in the clips (i.e. if *npn* was used first use an *npn* type or vice versa).

Remember that this unit provides a quick check on most types of transistor—it cannot be used for f.e.t's or unijunctions and it will not test all the parameters of the device.

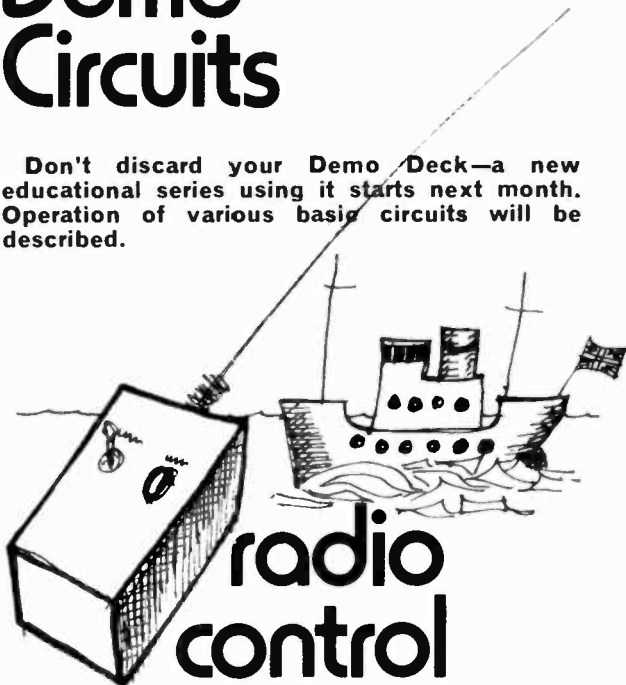
To complete the unit designate the panel as shown in the photographs and either paint it or at least coat the lettering with clear varnish to protect it. □

Front panel markings of the completed unit.



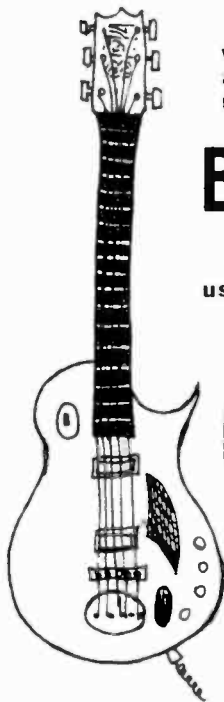
# NEXT MONTH Demo Circuits

Don't discard your Demo Deck—a new educational series using it starts next month. Operation of various basic circuits will be described.



## radio control transmitter

A single channel transmitter will be described next month and a receiver the following month.



## BETA

The pick-ups and fittings used in the Beta guitar.

All in the  
**December**



On sale Friday, November 17



# THEY MADE THEIR MARK

## NO 6 Faraday

(Part 2)

By J. E. Gregory

Faraday never relied on his memory, which was always bad, and wrote everything down, ideas, lecture notes and experiments. His diaries were later edited and published in 1932 in seven volumes.

Faraday's experimental work ended in 1855 when he retired. He shunned publicity preferring to live a simple Christian life. Since childhood he had belonged to a small religious sect, the Sandemanians and always found time to attend their meetings. At the age of thirty he had made a public confession of his faith.

Faraday delivered with some difficulty what was to be his last lecture at the Royal Institution in June 1862. He realised he was gradually becoming paralysed.

In 1858 Queen Victoria had placed at his disposal a Grace and Favour apartment in the precincts of Hampton Court and it was here that he died on August 25th, 1867, sitting quietly in his chair.

A grateful nation wanted to honour him with a national funeral at Westminster Abbey, but in accordance with his own wishes he was buried in perfect silence at Highgate Cemetery, London.

**Diorama showing Faraday, in his laboratory.**

*Photograph: Science Museum, London.*



*Everyday Electronics, November 1972*



*Photograph: Science Museum, London.*

LAST month we left Michael Faraday demonstrating the first dynamo to the Royal Society, but he did not stop to put his discoveries to practical use. When he was made Director of the Royal Institute laboratories he said "I must continue to discover new facts".

### ELECTROLYSIS

His earlier European journeys with Sir Humphrey Davy had attracted him to the work of Ampère and Volta.

His very first experiment recorded as early as 1812 had been to make a voltaic pile with seven halfpennies, seven discs of sheet zinc and six pieces of paper moistened with salt water. With this pile he decomposed magnesium sulphate. This was the start of his work on electrolysis and his electro-chemical experiments, which later led him to introduce the apt terms "electrolyte", "electrode", "anode" and "cathode", which are still in use today.

Faraday also carried out numerous electrostatic experiments, and he found that the electric charge induced between one conductor and another depended on the material or "dielectric" between them. In recognition of this discovery, the name Farad was given to the unit of electrical capacitance (see Table 1 last month).

Overwork was starting to take its toll and in 1841 Faraday was ordered to take a complete rest in Switzerland. Then in August 1845 he started to examine the

relationship between light and electricity. For this he conducted a magnificent experiment with a horseshoe magnet and a Nicol crystal prism. He passed a beam of polarized light through the crystal along the direction of the magnetic field. He found that the plane of polarization of the light was rotated as it passed through the crystal.

In the same year he also discovered that all substances have magnetic properties to some degree. Some bodies tend to move in a magnetic field towards the stronger parts of the field; this effect he called "paramagnetism". Other bodies tend to move into the weak parts of the field; this he called diamagnetism.

His three volumes "Experimental Researches in Electricity" covering his discoveries from 1831-1855 are accepted as classics and have been described as "One of the richest treasuries of knowledge which has ever been presented to the world by a single intellect".

### HONOURS

By now Faraday was a world famous figure and honours were showered upon him, but he declined a knighthood and the Presidency of the Royal Society for fear they would interfere with his experiments, and lecturing. His lectures to children at Christmas had become almost a national institution, two regular patrons being the Prince Consort and the young Prince of Wales. Commemorative Faraday lectures are still given at Christmas time today. They were introduced by the Institute of Electrical Engineers in 1924 with the object of informing the general public about recent advances in the applications of electricity.

**ALMOST UNBELIEVABLE!** Think of the year 1984 and what might be produced then—now get the fantastic **ASTRAD 17** and **SEE** for yourself that the incredible Russians have done it all **NOW!** It's the radio perfectionist's dream come true! **THIS ONE SUPERSEDES ALL EARLIER MODELS!** It will probably make your present radio seem like a "crystal set"! Complete with optional battery eliminator for both battery and mains use! We're almost giving them away at only **£20-75**—a mere fraction of even today's Russian miracle price! We challenge you to compare performance and value with that of £80 radios! \*Test 7 days—we'll refund instantly if you are not astounded after 7 days. Elegant black and chrome finish fascia, set in fabulous Cabinet built case—constructed of fine Russian hardwood in beautiful Teak Veneer finish—prevents vibration, ensures purer and sweeter tone than ever! Volume controlled from a whisper to a roar that would fill a hall! Much wider band spread, for absolute "pin-point" station selection! Plus "MAGIC EYE" tuning level indicator for ultra perfect tuning sensitivity! Yes, the Russians have surpassed themselves, proving again their fantastic ability in the field of electronics and brilliantly reflecting their advanced micro-circuitry techniques in the field of spaceship and satellite communications. **Yes, EVERY WAVEBAND** instantly at your fingertips including Standard Long, Medium, Short and Ultra Short Wave to cover the four corners of the earth 24 hours a day, including all normal transmissions—V.H.F., AM, FM, MW, LW, USW, plus local and new stations not yet operational and, messages from all over the world! Expensive TURRET TUNER side control waveband selection unit (as used on expensive T.V.'s!). Every waveband clicks into position giving incredible ease of station tuning! Genuine push-pull output! ON/OFF volume and separate Treble and Bass tone controls for utter perfection of reproduction and tone! Press-button dial illumination! Take it anywhere—runs economically on standard batteries (obtainable everywhere) or direct through battery eliminator from 220/240v AC mains supply. Internal ferrite rod aerial plus built-in "rotatable" telescopic aerial extending to 39ins approx. It's also a fabulous **CAR RADIO**. Can also be used through extension amplifier, tape recorder or public address system. Size 14ins x 10ins x 4ins overall approx. Magnificently designed, made to give years of perfect service. (U.K. service facilities and spares available for years and years to come, if ever necessary!). With WRITTEN GUARANTEE manual with simple operating instructions and circuit diagram. **ONLY £20-75** (with mains/battery eliminator £1-48 extra). **BOX, POST, ETC. 50p.** **BUT WAIT**, for only 55p extra you get the sensational "COMPUTERISED" **WORLD TUNING GUIDE** (it enables you to time, pinpoint and get transmissions the whole world over—even a child can do it in a flash—it even lets you know when to tune into the U.K. when abroad. **NO GUESSING! NO MESSING!**) PLUS Standard 'longlife' batteries PLUS ultra sensitive earphone for personal listening. (Sorry—We cannot change these new radios for any earlier model purchased). **HURRY!** Send today or call at either store. It's a chance of a lifetime that nobody can afford to miss. **SHOPERTUNITIES FOR BARGAINS!**

**JUST ARRIVED! THIS YEAR'S NEW \* COMPUTERISED? RUSSIAN MIRACLE! ASTRAD 17**

**BRAND NEW SPACE AGE model SO FAR AHEAD OF ITS TIME IT WILL STILL BE MAKING MANY LOOK OUT OF DATE IN 1984!**

**THE FABULOUS ASTRAD 17 PORTABLE RADIO & COMMUNICATIONS RECEIVER**

**WORLD WIDE RECEPTION** THOUSANDS OF TRANSMISSIONS & STATIONS POUR IN FROM THE FOUR CORNERS OF THE EARTH!



**28 TRANSISTORS AND DIODES! WAVEBANDS: STANDARD LONG and MEDIUM Plus 5 SHORT WAVEBANDS Plus ULTRA SHORT WAVES (V.H.F. AM, FM, MW, LW, USW.)**

**\* COMPARE ITS PERFORMANCE with £80 RADIOS!**

**BATTERY MODEL: £20-75 BOX POST ETC. 50p MAINS/BATTERY ELIMINATOR £1-48 extra**

**FIRST TIME EVER! \* NOW AVAILABLE WITH fabulous "COMPUTERISED" WORLD TUNING GUIDE! NO MORE GUESSWORK— INSTANT DATA at your fingertips— enables you to TUNE IN A FLASH to transmissions the world over!**

**ANOTHER EAST EUROPEAN MIRACLE!**

**FANTASTIC 2-in-1 PERSONAL PORTABLE and CAR RADIO**

**NOW WORLD WIDE RECEPTION**

**IN YOUR CAR TOO! (RUNS OFF 12V CAR BATTERY)**

Position it for **CAR RADIO**, results will justify! OR detach & use carry handle for **PORTABLE** with its own batteries!

**4 WAVEBAND V.H.F. AM/FM/ LONG & SHORT WAVEBANDS**

**FANTASTIC PRICE £9-95**

**TRY AND MATCH FOR UNDER £35!**

**Box, Post ETC. 45p**

**FANTASTIC!** Brand spanking new—Another East European Miracle! This incredible 2-in-1 Radio: First class makers—because of our crazy price, contract stipulates we must NOT mention name! Beautifully made, 9 x 5 x 2 1/2 inches overall approx. Every up-to-date technological improvement. **15 SEMI-CONDUCTORS**! 9 Transistors, 5 Diodes and Stabiliser! **FOUR WAVEBANDS!** Yes, V.H.F. model with AM/FM Long and Short wavebands! Will get stations around the world, including Standard Long, Medium and Short Wave, also local and new stations not yet operational! Built-in internal ferrite aerial plus 5 section 26in. swivel telescopic aerial. On/OFF volume and tone controls. Clear Station Selector Dial. Waveband selector! Equally wonderful in CAR or HOME: **TWO Tuning Dials** for flat or upright use as illustrated. **RUNS OFF 12 VOLT BATTERY**: (AS A PORTABLE it runs on standard batteries.) **PLUG IN 12 VOLT ADAPTOR JACK PROVIDED** and automatically cut out internal batteries, using car battery only! Don't you think it's miraculous? Span the Oceans and pull in hundreds of transmissions day and night, including short wave—even in car! **BUT WAIT**—shiny remove Radio from car, "snap on" optional carry handle and **YOU HAVE A DE-LUXE PORTABLE**, with additional upright tuning dial. **WRITTEN GUARANTEE**. Only **£9-95** box, post 45p. \*Sprung all metal matching detachable carry handle (see illus.) AND set of batteries only 25p extra if required. Match with sets costing £35 or more. Test 7 days, refund if not absolutely delighted.

Send quickly to our Uxbridge Road address or call at either store. (COMMERCIAL TRAVELLERS PLEASE NOTE: Merchandising Office at Holborn stores.)

**THIS FANTASTIC OFFER ONLY FROM US! SAVE £20-25 NOW! fabulous BRAND NEW SOLID STATE**

**BATTERY/ MAINS AC Combined V.H.F. AM/FM RADIO and CASSETTE TAPE RECORDER & PLAYER**

**WITH REMOTE CONTROL MICROPHONE**

**OUR PRICE £23-75** CARR. ETC. 35p

**RECOMMENDED RETAIL PRICE £44**

This equipment's got EVERYTHING!

Shopertunities 'thunder' ahead with an offer that's FANTASTIC (even by our standards!) We've snapped up 500 magnificent machines. Latest sensation in the world of sound! First-class makers! Fabulous V.H.F. AM/FM Radio AND Cassette Tape Recorder & Player combined and it also runs off standard batteries or mains. (Simply plug in the 220/240v. AC line cord. Record and play back anything. anywhere! Even tape directions from the Radio as you listen! **RECOMMENDED RETAIL PRICE GENUINELY £44!** **WE OFFER AT ALMOST HALF PRICE!** Wonderful features: \* Press-button Keyboard Control Panel or latest MASTER SWITCH CONTROL! \* "MAGIC EYE" Visual Battery check/recording level indicator or built-in automatic Leveller! \* Separate ON/OFF and HI-LO volume controls! \* Heavy duty built-in speaker! \* Earphone (for personal listening or "mossy"ing!) and extension speaker sockets! \* Remote control microphone! \* Built-in swivel telescopic extension aerial (24in. approx!). Magnificently made case with carry handle. (DESIGNS VARY SLIGHTLY.) Takes standard 30, 60, 90 or 120-minute Cassette Tape that are obtainable everywhere. The amazing built-in full circuit V.H.F. AM/FM Radio gives you superb clarity of tone, incredible station selection. Unique rotating Station Selector Dial—get all local city and regional stations in every part of the country plus B.B.C. National, V.H.F. Picks up dozens of foreign stations. Fabulous in your car! You could pay £££ more for a Car Radio or Car Cassette player ALONE! £23 75, CARR. ETC. 35p. Complete with simple instructions, remote control microphone with on/off switch and microphone stand. **WITH WRITTEN GUARANTEE**. Send today or call at either store. **BONUS OFFER:** Batteries and Cassette Tape 25p extra if required.

**SHOPERTUNITIES LTD.**

Dept. EE/13, 164 UXBURIDGE RD., LONDON, W12 8AQ (Thurs. 1, Fri. 7) (facing Shepherd's Bush Green). Also 37 High Holborn, London W.C.1 (Thursday 7 p.m.). Both Mon. to Sat. 9 a.m.—6 p.m.

# TECHNICAL TRAINING

## in radio television and electronics

Whether you are a newcomer to radio and electronics, or are engaged in the industry and wish to prepare for a recognized examination, ICS can further your technical knowledge and provide the specialized training so essential to success. ICS have helped thousands of ambitious men to move up into higher paid jobs—they can help you too! Why not fill in the coupon below and find out how?

Many diploma and examination courses available, including expert coaching for:

- C. & G. Telecommunication Techns. Certs.
- Radio Amateurs' Examination
- General Radiocommunications Certificate.
- C. & G. Radio Servicing Theory.
- General Certificate of Education, etc.

Now available, Colour T.V. Servicing

Examination Students coached until successful

## NEW SELF-BUILD RADIO COURSES

Learn as you build. You can learn both the theory and practice of valve and transistor circuits, and servicing work while building your own 5-valve receiver, transistor portable, and high-grade test instruments, all under expert tuition. Transistor Portable available as separate course.

### POST THIS COUPON TODAY

for full details of ICS courses in Radio, T.V. and Electronics

## ICS INTERNATIONAL CORRESPONDENCE SCHOOLS

Dept. No. RA26, Intertext House, Stewarts Road, London, SW8 4UJ

Please send me the ICS prospectus—free and without obligation.

(state Subject or Exam.).....

NAME..... AGE.....  
(Block Capitals Please)

ADDRESS .....

2/72

Member of the ABCC

Accredited by the CACC

**INTERNATIONAL CORRESPONDENCE SCHOOLS**

# gspk (sales)

quite simply-the best

### RESISTORS

#### FULL RANGE OF CARBON FILM

1/5 W (range 4.7 ohms to 470K) 1p each  
 1/2 W and 1 W (range 4.7 ohms to 10 Megs) ..... 1p each  
 1 W (range 4.7 ohms to 10 Meg) 2p each  
 2 W (range 4.7 ohms to 10 Meg) 3p each

#### RESISTORS

These Miniature High Stability carbon Film Resistors have negligible noise factor. All Resistors  $\pm 5\%$  (except values over 4.7 Meg). These Resistors are even lower in price than most 10% and older carbon composition types.

### PRE-SET POTENTIOMETERS

Standard values of pre-sets from 100 ohms to 5 Meg. Standard/miniature ..... 7p each Sub-miniature ..... 5p each

### SIEMENS PROFESSIONAL CAPACITORS

#### POLYCARBONATE AND POLYESTER

Voltage	Capacitance	Price
100v	0.1 $\mu$ F	6p
100v	0.15 $\mu$ F	6p
100v	0.22 $\mu$ F	6p
100v	0.33 $\mu$ F	6p
100v	0.47 $\mu$ F	10p
100v	0.68 $\mu$ F	18p
250v	0.01 $\mu$ F	8p
250v	0.015 $\mu$ F	8p
250v	0.022 $\mu$ F	8p
250v	0.033 $\mu$ F	8p
250v	0.047 $\mu$ F	8p
250v	0.068 $\mu$ F	8p
250v	0.1 $\mu$ F	8p

#### ELECTROLYTIC

Voltage	Capitance	Price
10v	22 $\mu$ F	7p
10v	47 $\mu$ F	11p
16v	47 $\mu$ F	7p
25v	10 $\mu$ F	7p
25v	100 $\mu$ F	8p
25v	220 $\mu$ F	11p
25v	470 $\mu$ F	14p
25v	1000 $\mu$ F	22p
25v	2200 $\mu$ F	42p
35v	4.7 $\mu$ F	7p
35v	220 $\mu$ F	14p
100v	10 $\mu$ F	8p
100v	22 $\mu$ F	8p
100v	47 $\mu$ F	14p

### SPECIAL OFFER

Bumper Bundle of power transistors capacitors and diodes.

Retail value £5 Yours for only

£1.50

Offer valid for limited period only.

### SEMICONDUCTORS

Here are just a few examples of our LOW Semiconductor prices. . . . . Many more semicons available all at equally sensational prices. . . . . NOW.

1+	25+	1+	25+	1+	25+
AC127	24p	28p	BZY88C		
AC128	19p	16p	Series E12		
AC176	18p	18p	(2.7v-30.0v)	10p	8p
AC118	18p	18p	NK1210	24p	19p
AD161	27p	25p	NK1211	24p	19p
AD162	27p	25p	NK1212	24p	19p
AF139	28p	26p	NK1213	24p	19p
BC107	9p	8p	NK1214	19p	17p
BC108	8p	7p	NK1218	24p	19p
BC109	9p	8p	NK1219	24p	19p
BC147	8p	7p	NK1223	26p	20p
BC148	8p	7p	NK1224	21p	18p
BC149	8p	7p	NK1242	14p	12p
BCY70	14p	13p	NK1243	61p	44p
BCY71	20p	19p	NK1401	70p	56p
BCY72	14p	13p	NK1402	70p	56p
BD130	81p	78p	NK1403	64p	50p
BF129	24p	22p	NK1453	41p	35p
BFY30	24p	22p	OA47	6p	5p
BFY50	19p	18p	OA79	6p	5p
BFY51	18p	17p	OAP0	5p	4p
BFY52	19p	18p	OC70	18p	12p
			OC76	22p	21p
			OC170	24p	21p
			1N4001	6p	5p
			1N4002	6p	5p
			1N4003	7p	6p
			1N4004	8p	7p
			1N4005	10p	8p
			1N4006	12p	11p
			1N4007	13p	10p
			1N4145	4p	3p
			2N1302	18p	16p
			2N1304	21p	20p
			2N1613	14p	13p
			2N1711	18p	16p
			2N2904	29p	28p
			2N2905	24p	22p
			2N2906	18p	16p
			2N2907	22p	21p
			2N3053	17p	16p
			2N3054	49p	47p
			2N3055	67p	63p
			(BD130)		

### NUMEROUS OTHER ITEMS AVAILABLE INCLUDE:

Switches Comprehensive range of N.S.F. Toggle switches and Rotary Wafer switch kits (to enable you to make your own switch to your own specification).  
 Copper laminates and all materials available to make your own printed circuit boards.  
 Lamps and lampholders for every requirement. Ready Built Circuits and Modules.  
 Freezer and Cleaner aerosol sprays.  
 Jack Plugs and sockets.  
 Variety of speciality products.  
 Recording Tape

All orders value £2 or over post free. Other orders please add 10p p & p. We only sell new products—do not confuse with 'seconds' or surplus stock. Because of our keen prices we regret the prices apply to U.K. and E.F.P.O. addresses only. Please fill in the coupon and send with 10p (refundable on ordering) for catalogue.

ALL CALLERS WELCOME  
 To GSPK (SALES) LIMITED, Dept. E.E.  
 Head Office, Hookstone Park, Harrogate, Yorkshire,  
 HG2 7BU.

MON. TO FRI. 9-5.00

Name .....

Address .....

E.E.



# TEACH-IN

## End of Term Answers

Here are the answers to the test we set last month:

- (1) To make an *npn* silicon transistor conduct, its base must be made 600mV positive with respect to its emitter.
- (2) Generally speaking, you can reverse the types of transistors in a circuit and reverse the power supply polarity to compensate, provided you reverse all transistors and all other parameters are identical. You cannot substitute silicon for germanium or vice-versa.
- (3) The power dissipation in TR1 is the potential difference between emitter and collector multiplied by the quiescent current flowing through the transistor.  
 First calculate  $I_b = \frac{9-0.6}{33,600} = \frac{8.4}{33,600} = 0.25\text{mA}$   
 We now find  $I_c = I_b \times h_{FE} = 0.25 \times 200 = 50\text{mA}$   
 Voltage drop across R2 =  $I_c \times R2 = 0.05 \times 100 = 5\text{V}$   
 Therefore drop across TR1 =  $9 - 5 = 4\text{V}$   
 The power dissipation in TR1 is  $V \times I = 4 \times 0.05 = 0.2\text{W}$  or 200mW
- (4) (a) When the switch is opened, C1 tries to charge over the range of 9V. We want the time it takes to reach 4V. That is 5V from the fully charged state.  
 $t = \log_e \frac{V_{\text{total}}}{V_a} \times C \times R$  (See *Teach-In* Part 8)  
 so in our case  $t = \log_e \frac{9}{5} \times 0.000001 \times 1,000,000$   
 $= \log_e 1.8 = 0.59$  seconds
- (b) It will take a longer time because as fast as the capacitor is being charged some of the charge will be leaking away.
- (c) The charging time will be less if you increase the total driving voltage range.  
 $t = \log_e \frac{18}{14} = \log_e 1.29 = 0.25$  seconds
- (5) The diode is sometimes needed to protect a transistor with low emitter/base reverse breakdown voltage. Its need is determined by this and supply voltage.
- (6) If the "mark" is 50mS the "space" will be  $\frac{50 \times 1}{10} = 5\text{mS}$   
 so the total period is 55mS. Hence the frequency  
 $(f = \frac{1}{t})$  is  $\frac{1}{0.055} = 18.2\text{Hz}$ .
- (7) 4V r.m.s. gives  $4 \times \sqrt{2}$  volts peak which is 5.65V either positive or negative going about the +2V level. Therefore peak maximum positive is  $(2 + 5.65) = +7.65\text{V}$  and peak negative is  $(2 - 5.65) = -3.65\text{V}$ .
- (8) It would be better to use a germanium diode in a low voltage range meter. The 600mV forward drop of a silicon diode would be too significant in a range of 5V. For higher ranges greater than 30V, a silicon diode could be used without introducing significant error.
- (9) The answer is transformer (c). Note that you do not have to have separate windings to get transformer action. A centre tapped coil can behave just like a transformer.
- (10) Buy the 6.3V r.m.s. type. It will have a peak output of

$6.3 \times 1.414 = 8.8\text{V}$ . After rectification and smoothing the output will fall by about 600mV on medium loads. Sometimes you can compensate for this drop by using alternative mains tapings on the primary. Set for 210V if you want a high output, or 250V if you want a lower output.

- (11) First calculate the reactance of the coil and total circuit impedance at each frequency, then use these values in a potential divide operation. We show the calculation at 50Hz and the straight answers at 100Hz and 200Hz.

$$\text{At } 50\text{Hz } X_L = 2\pi fL = 2 \times 3.142 \times 50 \times 1.5 = 472 \text{ ohm}$$

$$Z = \sqrt{R^2 + X_L^2} = \sqrt{(1,000,000 + 222,000)} = 1,100 \text{ ohms}$$

$$\text{Therefore } V_{\text{out}} = \frac{10 \times 472}{1,100} = 4.3\text{V r.m.s. at } 50\text{Hz}$$

At 100Hz  $V_{\text{out}} = 6.85\text{V r.m.s.}$  and at 200Hz  $8.8\text{V r.m.s.}$

- (12) One would use the class B stage because the quiescent current drawn is very low and hence very little power is wasted. If the volume is set low, battery power is conserved.
- (13) Class A output does not suffer from cross over distortion and hence, intrinsically, provides a better quality output but at the expense of a high quiescent power dissipation. In practice modern class B outputs give quite comparable quality outputs.
- (14) You would lose low frequency response (hence lose bass frequencies) because the low capacitance of the microphone presents very high impedance to current flow at low frequencies. There is a greater potential divide effect at low frequency when connected to a low impedance amplifier input.  
 If a high input impedance is used the proportionate reduction in signal level so caused is less significant. Ideally the input impedance of an amplifier for use with a crystal microphone should be about 10 times the impedance of the microphone.
- (15) Use the 15 ohm loudspeaker. You will not get maximum power coupling into it, but you will ensure that you do not exceed the current rating of the output transistors. As a general guide you can always use a loudspeaker having a higher impedance than that specified, but never use one that is lower.

- (16) The errors were:
  - (i) D1 was the wrong way round.
  - (ii) TR2 emitter and collector were connected the wrong way round.
  - (iii) The flying lead should have come from the positive rail.
  - (iv) TR3 should be an *npn* and not *pnp* transistor.
  - (v) C3 was shown the wrong way round.
 Typical values are R1, R2: 5.6 kilohm; R3: 100 kilohm; R4: 330 ohm; C1, C2: 15,000pF; C3: 50μF; TR1, TR2, TR3: BC108; D1, D2: OA91, LS1: 35 ohm; B1: 9V.  
 For unity mark/space ratio at 500Hz, Rf should be 100 kilohms but it can be varied between 22 kilohms and 470 kilohms to produce different frequency notes.

REMEMBER  
TO USE THE  
POSTCODE



# Readers Letters

## Temperature Measurement

In the August 1972 Editorial of E.E., reference is made of using the old British symbol for the resistor. I agree with the comment that the zigzag is superior to the oblong box, also for my own use I shall still think of c/s, Kc/s, Mc/s etc, rather than Hz, as I think c/s describes the frequency of alternating current far better than Hz.

Referring to the thermistor used in the Weather Station project, as I understand, it will give the temperature of the sunshine if placed in the sun, which will be higher than conventional thermometers in a proper ventilated screen four feet above bare earth and at least four feet away from any building or tree. This should be borne in mind if comparing such a temperature reading with those published in local evening papers as these are usually taken from thermometers in proper ventilated screens.

If placed in the shade of a tree so that the sun did not shine on it at all during the day the reading would then be nearer to that of a thermometer in a proper screen, although if used in the complete station, the unit (whole) would have to lie in an open space to record wind direction and speed.

C. W. Hockney  
Yorkshire.

K. Haley  
Newcastle.

## Wavelength

In your radio tuner article, you stated that Radio 2, on long wave is on 200 metres. In fact 200 metres is the h.f. end of the medium wave band, Radio 2 being on 1500 metres, 200 kHz.

Are there any plans for valve equipment which I notice your magazine has not published.

At present we do not intend to publish articles describing equipment using valves.

## Soldering

Your beginners series *Teach-In* suggests that in soldering, the soldering iron is applied to the work, and when the joint is sufficiently heated the solder applied to the joint i.e. the heated metal melting the solder. I have made reference to a book called "Soldering Handbook" which is (or was) published in association with Multicore solders. The book describes a similar technique to that which is printed on Multicore solder packets. This is as follows:

"Applying the iron directly to the work to heat it is very inefficient, and merely oxidises the workpiece surfaces making them more difficult to solder. It is much better to apply cored solder to the work, and then melt the solder with the iron; this is the most efficient way of heating the work, by letting the solder and flux carry the heat from the soldering bit to the workpiece surface".

Multicore solders have this information in their packets so I am sure you will agree with me in saying that they must know what they are talking about!

There is a tremendous amount of confusion concerning soldering and its application, and in the case of beginners starting off on this hobby, it is surely very important that they learn in the correct manner. But which is the correct manner? I myself have

been very confused and doubtful to whether my joints are of an acceptable quality, and I have been involved in electronic work for several years. So when it comes to beginners, a simple direct method should be employed where they definitely know what they are doing and given an assurance of good results.

Please comment on the two methods given, I feel the latter is the better but you may differ in opinion. Soldering being such an important part of electronics it is surely very important that beginners are taught correctly.

Paul Carvill  
Wimbledon.

*In our article on soldering (November 1971 issue—now unavailable) we said "A good soldered joint is made by first 'tinning' both surfaces . . . Unfortunately, copper oxidises very easily when heated . . . To prevent this oxidation we have to use a flux and this is contained in cores running through the length of the solder."*

*We went on to say, "The soldering iron, carrying a small amount of solder to help thermal contact, is then touched on the area to re-melt the solder on the surface and at the same time a small extra amount of cored solder is applied which runs into the joint."*

*As you have pointed out we did say that you should tin the wires by heating them with the iron and touching the solder on the wire. Provided the iron is carrying a small amount of solder to help thermal contact we believe this is better than melting the solder with the iron.*

*It is very easy for a beginner to melt the solder, without heating the job enough to ensure that the solder dissolves some of the copper wire and makes a good joint. If however the wire is heated until it melts the solder (using the solder on the iron to aid heat transfer) then the joint will be properly made.*

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

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

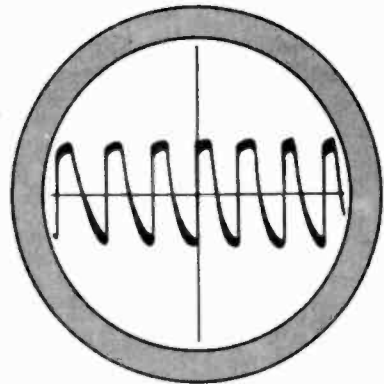
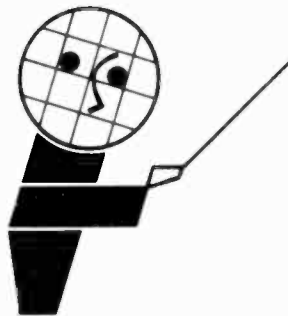
For all enquiries concerning advertisements or advertisers write to: The Advertisement Manager, Everyday Electronics, at the above address. Phone 01-634 4202.



# look! electronics really mastered

... practical  
... visual  
... exciting!

no previous knowledge  
no unnecessary theory  
no "maths"



RAPY

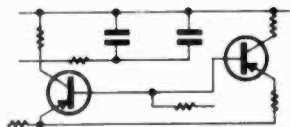
## BUILD, SEE AND LEARN

step by step, we take you through all the fundamentals of electronics and show how easily the subject can be mastered. Write for the free brochure now which explains our system.

### 1/ BUILD AN OSCILLOSCOPE

You learn how to build an oscilloscope which remains your property. With it, you will become familiar with all the components used in electronics.

### 2/ READ, DRAW AND UNDERSTAND CIRCUIT DIAGRAMS



as used currently in the various fields of electronics.

### 3/ CARRY OUT OVER 40 EXPERIMENTS ON BASIC ELECTRONIC CIRCUITS & SEE HOW THEY WORK, including:

valve experiments, transistor experiments, amplifiers, oscillators, signal tracer, photo electric circuit, computer circuit, basic radio receiver, electronic switch, simple transmitter, a.c. experiments, d.c. experiments, simple counter, time delay circuit, servicing procedures.

This new style course will enable anyone to really understand electronics by a modern, practical and visual method—no maths, and a minimum of theory—no previous knowledge required. It will also enable anyone to understand how to test, service and maintain all types of electronic equipment, radio and TV receivers, etc.

**FREE** POST NOW for BROCHURE

or write if you prefer not to cut page

TO: BRITISH NATIONAL RADIO & ELECTRONICS SCHOOL, P.O. Box 156, JERSEY. Please send your free brochure, without obligation, to:

NAME **STUART PEARCE CROPPWELL** we do not employ representatives  
**HOUSE SELSTON LANE ANNE ARK**

ADDRESS **WoodHouse, NOTTS NG17 9hb** PLEASE EEL112

**special free gift also to all our students**

## Eliminators



9 volt @ 20mA (PP3)	£1.25
6 volt @ 50mA	£1.50
9 volt @ 50mA	£1.50
6 + 6 volt, 50mA	£2.50
9 + 9 volt, 50mA	£2.50
7½ volt for cassette recorders	£2.00
6, 7½ or 9 volt	£3.00
3, 4½, 6, 7½, 9, 12 @ 500mA	£3.99
Car Battery Converter fully stabilised to provide 6, 7½ or 9 volts (illustrated)	£4.99

(p. & p. 15p. on all types)

## DIL Sockets



14 and 16 pin  
**16p**  
(including ZIG-ZAG)

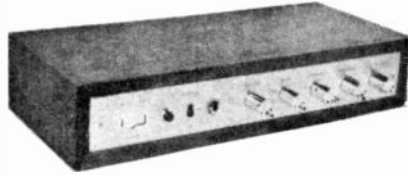
## Resistors

½ watt 5% Carbon Film — low noise Hi-Stabs  
All E24 values 1p. each plus p. & p. 7p. for up to 50 Resistors and a further 2p for each additional 50. Deduct 33 1/3% for 100 of one type or 25% for mixed orders over £1 in value.

1 watt 10% Carbon Composition	3p. each
2 watt 10% Carbon Composition	6p. each
2½ W 5% Wire wound	9p. each
5 W Wire wound	9p. each
10 W Wire wound	10p. each

plus p. & p. 7p. for up to 25 resistors plus 1p. for each additional 25.

# THE TEXAN



Complete Kit (inc. Teak Case) **£28.50** DEP 45p

20 Watts per channel integrated stereo amplifier developed by engineers of 'Texan Instruments Ltd.' This designer approved kit, has a state-of-the-art specification, including distortion of only 0.09% at 20 Watts into 8 ohms and a bandwidth of 5 — 35,000 at — 3db. The semiconductor complement of this superb kit includes no less than 6 integrated circuits, 10 Silicon transistors, 4 rectifiers and 2 zeners. Controls include bass, treble, volume, balance, on/off, 'on' indicator, headphone sockets, scratch filter, rumble filter; inputs for magnetic; phono; tuner, aux or tape; tape head etc; input selector, mono/stereo switch. The construction of this kit was featured in 'Practical Wireless' May - Aug. 1972.

## Veroboard

	Copperclad	Plain
	0.1"	0.15"
2½" x 1"	6p	6p
2½" x 3½"	20p	16p (9)
2½" x 5"	24p	21p (7)
3½" x 3½"	24p	21p (8)
3½" x 5"	27p	27p (10)
17" x 2½"	67p	50p
17" x 3½"	90p	70p
17" x 5"	—	75p

Spot-face Cutter 36p  
Pin Insertion Tool 47p  
Terminal Pins 18p per pack of 36

## Aluminium Boxes

Including baseplate and screws

No.	L.	W.	D.	Price	p. & p.
(7)	2½"	5½"	1½"	35p	8p
(8)	4"	4"	1½"	35p	8p
(9)	4"	2½"	1½"	35p	8p
(10)	4"	5½"	1½"	40p	8p
	11"	4"	2½"	35p	8p
	13"	3"	2"	32p	9p
	13"	6"	4"	50p	10p
	14"	7"	5"	58p	12p
	15"	8"	6"	75p	18p
	16"	10"	7"	85p	20p

## Semiconductors

AC107	25p	AF239	30p	BF197	15p	2N1304	22p	AA120	9p
AC126	17p	BC107	10p	BU105	£2	2N1893	30p	AA129	9p
AC127	15p	BC108	10p	MPF102	40p	2N2926	10p	BA100	15p
AC128	15p	BC109	10p	MPF103	37p	2N3053	23p	BA154	13p
AC176	20p	BC147	10p	MPF104	37p	2N3055	49p	BA155	14p
AC187	25p	BC148	10p	MPF105	40p	2N3702	12p	BA156	15p
AC187K	25p	BC149	10p	MPF106	45p	2N3704	17p	DA47	10p
AC188	25p	BC157	12p	OC26	40p	2N3819	35p	OA79	9p
AC188K	25p	BC158	10p	OC35	40p	IN914	—	DA81	7p
AD140	40p	BC159	12p	OC44	15p	IN4148	—	OA90	7p
AD149	40p	BC169	15p	OC45	15p	IN4001	—	OA91	7p
AD161	160p	BF180	25p	OC71	11p	IN4002	7p	OA200	10p
AD162	—	BF181	30p	OC72	17p	IN4003	8p	OA202	10p
AF114	18p	BF184	25p	OC170	23p	IN4004	8p	SL403D	£1.50
AF115	18p	BF185	25p	OC171	30p	IN4005	10p	µA709C	45p
AF116	18p	BF194	15p	2N697	18p	IN4006	12p	µA710	45p
AF117	18p	BF195	15p	2N706	12p	IN4007	15p	µA741C	50p
AF139	28p	BF196	15p	2N708	15p	AA119	9p	µA723C	£1.05

## Thermistors



R53	£1.32
VA1005	15p
VA1026	13p
VA1033	13p
CZ1	13p
CZ4	13p
CZ13A	13p
GL16	£1.00
GL23	£1.00
A15B	75p

## Heat Sinks



TO5	14p
TO18	15p
TO6	15p
Power Tab	13p



TO18	5p
10D	50p
DIP10/2 for SL403D	15p

# CHROMASONIC electronics

## Capacitors

### Mylar

- 100V

1000pf	2p	0.04µF	3p
2000pf	2p	0.05µF	3p
5000pf	2p	0.068µF	4p
0.01µF	3p	0.1µF	4p
0.02µF	3p	0.2µF	5p

### Polystyrene - 160V

10pf to 10,000pf all 3p. each in multiples of 10, 15, 22, 33, 47 & 68.

### Mullard C280 - 250V

0.01µF	3p	0.22µF	5p
0.015µF	3p	0.33µF	6p
0.022µF	3p	0.47µF	8p
0.033µF	3p	0.68µF	11p
0.047µF	3p	1µF	13p
0.068µF	3p	1.5µF	20p
0.1µF	4p	2.2µF	24p
0.15µF	4p	—	—

### Mullard C281 - 400V

0.01µF	4p	0.1µF	7p
0.015µF	4p	0.15µF	8p
0.022µF	4p	0.22µF	10p
0.033µF	5p	0.33µF	14p
0.047µF	6p	0.47µF	15p
0.068µF	6p	—	—

## Mullard C426, 015 & 016

all 6p each

Voltage:	10	16	25	40	63		
2.5	4	6.4	10	16	25	40	64

Capacity µF	22	15	10	6.8	1
	47	68	22	47	2.2
	100	150	47	100	4.7
	220	—	100	10	—
	150	—	—	—	—

10	8	6.4	4	2.5	1.6	1	0.64
40	32	25	16	10	6.4	4	2.5
80	64	50	32	20	12.5	8	5
160	125	100	64	40	25	16	10
320	250	200	125	80	50	32	20
500	400	320	200	125	80	50	32

### Mullard C437 & 017

2.5	4	6.4	10	16	25	40	64
1000	800	640	400	250	160	100	64
1600	1250	1000	640	400	250	160	100
2500	2000	1600	1000	640	400	250	160
4000	3200	2500	1600	1000	640	400	250
			470	220	100	—	—
			470	470	—	—	—
			1500	1000	680	470	18p



We also hold Mullard C333 ceramics 1.8pf 330pf 63V. 5p  
Silvered Mica 1%: 500V, 2.2pf - 820pf 7p  
Feedthrough ceramic 1000pf: 350V 5p  
Disc ceramics, monolithic ceramic, high voltage types, tantalums etc.

## Mullard C431

10	16	25	40	64	
2000	1250	800	500	320	33p
3200	2000	1250	800	500	40p
5000	3200	2000	1250	800	50p
10000	6400	4000	2500	1600	74p
16000	10000	6400	4000	2500	93p

## HT Electrolytics

1; 2; 4; 8µF	450V	14p
16µF	450V	15p
32µF	450V	20p
50µF	350V	20p

## TV & Radio Types

8 + 8µF; 450 V.W	18p	32 + 32µF; 350 V.W	25p
8 + 16µF; 450 V.W	20p	32 + 32µF; 450 V.W	43p
16 + 16µF; 450 V.W	25p	50 + 50µF; 350 V.W	35p
16 + 100 + 100 + 300µF; 275 V.W.	—	—	£1.23
32 + 100 + 125 + 200µF; 275 V.W.	—	—	£1.23
32 + 100 + 200 + 200µF; 300 V.W.	—	—	£1.23
100 + 100 + 100 + 150 + 150µF; 320 V.W.	—	—	£1.66
100 + 100 + 200 + 300µF; 275 V.W.	—	—	£1.23
60 + 100 + 200µF; 300 V.W	93p	—	—
100 + 200 + 200µF; 300 V.W	£1	—	—
100 + 200µF; 275 V.W	75p	—	—
100 + 400µF; 275 V.W	£1.15	—	—
200µF; 275 V.W.	50p	300 + 300µF; 300 V.W	£1.90

## Potentiometers



5K Ω	50K Ω	500K Ω
10K Ω	100K Ω	1M Ω
25K Ω	250K Ω	2M Ω

log or lin less switch 12p  
log or lin with switch 24p  
dual less switch 40p  
dual with switch 10K, 100K & 1M log only 52p  
10K log + 10K antilog less switch 40p

## Slider Pots

Single	Dual	
10K	10 + 10K	
25K	25 + 25K	log
50K	50 + 50K	or
100K	100 + 100K	lin
30p	50p	

Knobs 10p.

## Presets

Vertical or Horizontal	
0.1 watt 5p	0.25 watt 7p
100 1K	100K 1M
250 2.5K	25K 250K 2.5M
500 5K	50K 500K 5M

MAIL ORDERS: Where no p. & p. charge is shown, a minimum of 7p. applies. P. & P. on overseas orders is charged at cost  
ADDRESS TO: Mail Order Dept., 56, Fortis Green Road, London, N10 3HN.  
TELEPHONE: 01-883 3705

# Why take the risk?

of damage to expensive transistors and integrated circuits, when soldering?

## Use Antex low-leakage soldering irons



220-240 Volts or  
100-120 Volts

### Model X25

The leakage current of the NEW X25 is only a few microamps and cannot harm the most delicate equipment even when soldered "live". Tested at 1500v. A.C. This 25 watt iron with its truly remarkable heat-capacity will easily "out-solder" any conventionally made 40 and 60 watt soldering irons, due to its unique construction advantages.

Fitted long-life iron-coated bit 1/8".  
2 other bits available 3/32" and 3/16".

Totally enclosed element in ceramic and steel shaft Bits do not "freeze" and can easily be removed

PRICE: £1.75 (rec. retail)  
Suitable for production work and as a general purpose iron

### Model CCN

220 volts or 240 volts

The 15 watt miniature model CCN, also has negligible leakage.

Test voltage 4000v. A.C.

Totally enclosed element in ceramic shaft. Fitted long-life iron-coated bit 3/32"

4 other bits available  
1/8", 3/16" 1/4" and 1/16"

PRICE: £1.80 (rec. retail)

OR Fitted with triple-coated, (iron, nickel and Chromium) bit 1/8"

PRICE: £1.95 (rec. retail)

## A SELECTION OF OTHER SOLDERING EQUIPMENT.



### MODEL CN

Miniature 15 watt soldering iron fitted 3/32" iron-coated bit. Many other bits available from 3/64" to 3/16". Voltages 240, 220, 110, 50 or 24  
PRICE: £1.70 (rec. retail)

### MODEL CN2

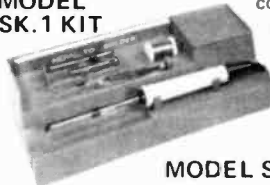
Miniature 15 watt soldering iron fitted with nickel plated bit 3/32". Voltages 240 or 220.  
PRICE: £1.70 (rec. retail)



### MODEL G

18 Watt miniature iron, fitted with long life iron-coated bit 3/32". Voltages 240, 220 or 110.  
PRICE: £1.83 (rec. retail)

### MODEL SK.1 KIT



contains 15 Watt miniature iron fitted with 3/16" bit, 2 spare bits 5/32" and 3/32", heat sink, solder, stand and "How to Solder" booklet.

PRICE £2.75  
(Rec. retail)

### MODEL SK.2 KIT

contains 15 Watt miniature iron fitted with 3/16" bit, 2 spare bits 5/32" and 3/32" heat sink, solder and booklet "How to Solder"



PRICE £2.40  
(Rec. retail)



### MODEL MES.KIT

Battery-operated 12v. 25 watt iron fitted with 15' lead and 2 heavy clips for connection to car battery. Packed in strong plastic wallet with booklet "How to Solder."

PRICE £1.95  
(Rec. retail)



From radio or electrical dealers, car accessory shops or, in case of difficulty direct from:—  
**ANTEX LTD. FREEPOST**  
(no stamp required) **Plymouth**  
**PL1 1BR Tel: 0752 67377**

- Please send the ANTEX colour catalogue.
- Please send the following:

I enclose cheque/P.O./Cash  
(Giro No. 2581000)

NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

EE11

### BODINE TYPE N.C.I. GEARED MOTOR

(Type 1) 11 r.p.m. 10lb. 10 1/2 inch. Reversible. 1/70th h.p. 50 cycle, 0.38 amp (Type 2) 28 r.p.m. Torque 20lb inch. Reversible. 1/80th h.p., 50 cycle, 0.28 amp. "As new" condition. Input voltage of motor 115V a.c. Limited complete with transformer for 230/240V a.c. input. Price, either type £3.50 plus 35p P. & P. or less transformer £2.25 plus 27p P. & P.

**CONSTANT SPEED, PRECISION MADE 6 VOLT D.C. GOVERNOR MOTOR**  
Seven pole armature, ballrace bearing. 2,750 r.p.m. Length 2 1/2. Dia 1/2. Shaft length 1/2. Shaft dia. 5/64. No load 40 mA. Normal load 350 mA. Price £1.25 P. & P. 10p.

### 230V/240V COMPACT SYNCHRONOUS GEARED MOTORS

Manufactured by either Sangamo, Haydon or Smith, Built-in gearbox.  
5 R.P.M. A/cw 1 R.P.H. A/cw 9 R.P.H. cw  
2 R.P.H. cw 12 R.P.H. cw  
3 R.P.H. A/cw 20 R.P.H. cw  
cw=Clockwise. A/cw=Anti-clockwise.  
Fraction of makers' price. All at 75p incl. P. & P.

### PARVALUX TYPE SD2. 200/250 VOLT A.C. D.C. HIGH SPEED MOTOR

Speed 9,000 r.p.m. approx. or 3,200 r.p.m. if used with built in governor, or variable speed over a wide range if used in conjunction with our Dimmer Switch, illustrated below. PRICE: £1.75 P. & P. 25p Other models available on request.

**600 WATT DIMMER SWITCH**  
Easily fitted. Fully guaranteed by makers. Will control up to 600W of all lights except fluorescent as mains voltage. Complete with simple instructions. £3 incl. P. & P.

### PROGRAMME TIMERS

240v A.C. 5 r.p.m. motor. 2 models available with either 10 cams or 15 cams. Each cam operating a 10 amp c/o micro switch. Cams are individually variable, allowing innumerable combinations. Ideally suited for machinery control, automation, etc. Price in the field of entertainment, for chaser lights, animated displays, etc. NEW 10 cam £4.75 p. & p. 25p. 15 cam £5.75 p. & p. 25p.

### ELECTRONIC ORGAN KIT

Easy to build. Solid State. Two full octave (less sharps and flats). Fitted hardwood case. Powered by two penlite 1 1/2 batteries. Complete set of parts including speaker, etc. together with full instructions and 10 tunes. Price £3.00. P. & P. 22p.

### 50 in 1 ELECTRONIC PROJECT KIT

50 easy to build Projects. No soldering, no special tools required. The kit includes Speaker, Meter, Relay, Transformer, plus a host of other components and a 56-page instruction leaflet. Some examples of the 50 possible Projects are: Sound Level Meter, 2 Transistor Radio, Amplifier, etc. Price £7.75. P. & P. 30p.

**CRYSTAL RADIO KIT**  
Complete set of parts, including: Crystal Diode, Ferrite Aerial, Drilled Chassis, and Personal Ear Piece. No soldering, easy to build, full step by step instruction. £1.75 incl. post.

**YENNER Electric Time Switch**  
200/250V Ex. G.P.O. Tested. Manually set 2 on, 2 off every 24h. Override switch: 10A £2.75, 15A £3.25, 20A £3.75, 30A £3.95. P. & P. 20p. Also available with solar dial ON dusk, OFF dawn. Price as above.

### VARIABLE VOLTAGE TRANSFORMERS

INPUT 230/140V a.c. 50/60 OUTPUT VARIABLE 0.260V from 1 to 50 amp stock. **SHROUDED TYPE**  
1 amp, £7.00 2.5 amp, £8.05  
5 amp, £11.75  
10 amp, £22.50 20 amp, £49.00  
15 amp, £25.00 25 amp, £38.00  
37.5 amp, £82.00 50 amp, £98.00  
**OPEN TYPE (Panel Mounting)** 1/2 amp, £4.75.  
1 amp, £7.00 2 1/2 amp, £8.05. All types carriage paid.

### Superior Quality Precision Made NEW POWER RHEOSTATS

100 WATT. 1 ohm, 10A; 5 ohm, 4.7A; 10 ohm, 3A; 25 ohm, 2A; 50 ohm, 1.4A; 100 ohm, 1A; 250 ohm, 0.7A; 500 ohm, 0.45A; 1 kΩ, 280 mA; 1.5 kΩ, 230mA; 2.5 kΩ, 165mA; 5 kΩ, 140mA. Diameter 3/16in Shaft length 1/2in. dia. 1/16in. All at £1.65 each. P. & P. 7p.  
50 WATT. 1/5/10/25/50/100/250/500/1k/1.5k/2.5k/5kΩ. All at £1.15 each. P. & P. 7p.  
25 WATT. 10/25/50/100/250/300/500/1k/1.5k/2.5k/3.5kΩ. All at 90p each. P. & P. 7p.

### STROBE! STROBE! STROBE!

Build a Strobe Unit, using the latest type Xenon white light flash tube. Solid state timing and triggering circuit. 230/250V a.c. operation. **EXPERIMENTERS' ECONOMY KIT**  
Speed adjustable 1 to 36 Flash per sec. All electronic components including Veroboard, S.C.B. Unijunction Xenon Tube and instructions £6.30, plus 25p P. & P. **NEW INDUSTRIAL KIT**  
Ideally suitable for schools, laboratories, etc. Roller tin printed circuit. New trigger coil, plastic thyristor. Speed adjustable 1-80 f.p.s. Price £10.50. P. & P. 50p. **HY-LIGHT STROBE MK 111**  
Designed and produced for use in large halls and utilises a silica tube printed circuit. Speed adjustable 0-30 f.p.s. Light output approx. 4 joules, £12.00. P. & P. 50p. **SPECIALLY DESIGNED. FULLY VENTILATED METAL CASE.** including reflector. £4.00 P. & P. 45p. Post paid with kit.

### THE 'SUPER' HY-LIGHT KIT

Approx. four times the light output of our well proven Hy-Light strobe. Incorporating:  
● Variable speed from 1-23 flash per sec.  
● Reactor control circuit producing an intense white light. Never before a Strobe Kit with so HIGH an output at so LOW a price. ONLY £20 plus 75p P. & P. **ATTRACTIVE, ROBUST, FULLY VENTILATED METAL CASE** specially designed for the Super Hy-Light Kit including reflector £7.00 P. & P. 45p. **7-inch POLISHED REFLECTOR**  
Ideally suited for above Strobe kits. Price 33p. P. & P. 13p or post paid with kits.  
**6 IN COLOUR WHEEL** as used for disco lighting effects etc. £5.75 incl. P. & P. can be operated from our 1/2 rpm synchronous motor 75p incl. P. & P.

### RELAYS New SIEMENS PLESSEY, etc. Miniature Relays at competitive prices.

1	2	3	4	1	2	3	4
52	3-6	2 c/o	63p*	700	15-35	2 c/o HD	73p*
280	9-12	2 c/o	73p*	700	16-24	6M	65p*
410	10-18	4 c/o	73p*	1,250	24-36	4 c/o	63p*
700	16-24	4 1/2 B	63p*	36-45	6M	63p*	63p*
700	16-24	4 c/o	78p*	2,400	30-48	4 c/o	50p*
700	12-24	2 c/o	63p*	9,000	40-70	2 c/o	50p*
700	6-12	1 c/o HD	50p*	15k	85-110	6M	50p*
700	22-30	6 c/o	73p				

(1) Coil ohms; (2) Working c.d. volts; (3) Contacts; (4) Price (HD) Heavy Duty. All Post Paid. \*Including Base.

**12 VOLT D.C. RELAY 140 OHM COIL**  
Three sets c/o contacts rated at 5 amps. 78p incl. P. & P. (Similar to illustration below.)

**'DIAMOND H' 230 VOLT A.C. RELAYS**  
Three sets c/o contacts rated at 5 amps. Price: 50p P. & P. 10p. (100 lots £40.00 incl. P. & P.) (UNUSED)

**'KEY SWITCH' 230 VOLT A.C. RELAYS**  
One set c/o contacts rated at 7.5 amps. BOXED. Price: 40p. P. & P. 5p. (100 lots £32.00 incl. P. & P.)

**MINIATURE LATCHING RELAY**  
Manufactured by Clare-Elliott Ltd. (Type F). 2 c/o permanent latching in either direction. Coil 1150 ohm, 15-30 Volt D.C. Size 1 1/2" high 1" wide, 1" thick. Complete with 3" leads. New 73p. incl. P. & P.

**MICRO SWITCH**—very special offer  
5 amp c/o contacts. Fitted with removable push button assembly. Ex. P.O. 20 for £1 incl. post. (Min. order 20).

**'HONEYWELL' LEVER OPERATED MICRO SWITCH**  
15 amps. 250 volt A.C. c/o contacts. NEW in maker's Carton. Price: 10 for £1.90 incl. P. & P.

### SINCLAIR PROJECT 60

Z30 £3.50  
Z50 £4.25  
PZ5 £3.97  
PZ6 £6.20  
PZ8 with trans £7.00  
AFU £4.50  
Stereo 60 £7.00  
Project 605 £19.00

### PROJECT 60 KIT £2.50

Our extremely popular kit contains the extra capacitors. DIN plugs and sockets, cable and fuse holder needed to complete Project 60.

### S-DECS AND T-DECS

S-DECS £1.40  
T-DECS £2.00  
M-DEC A £3.00  
Official credit orders from educational establishments welcome.

### SINCLAIR SUPER IC12

Complete with free printed circuit board and 44 page instruction book.

ONLY £1.80

**KITS OF PARTS FOR THE IC12**  
Includes all parts for the printed circuit and volume bass and treble controls needed to complete the mono version £1.30. Stereo version with balance control £3.00.

**POWER UNITS FOR THE IC12**  
A set of components to construct a 30V, 0.5 Amp power supply £2.87. Also suitable Sinclair PZ8 fully constructed £3.97.

### SWANLEY ELECTRONICS 32 Golds Road, Swanley, Kent

Mail order only. Postage 10p per item. Our HI-FI colour catalogue is 10p post free.

**EX COMPUTER PRINTED CIRCUIT PANELS**  
2in x 4in packed with semi-conductors and top quality resistors, capacitors, diodes, etc. Our price 10 boards 50p. P. & P. 7p. With a guaranteed minimum of 35 transistors. Data on transistors included.

**SPECIAL BARGAIN PACK.** 25 boards for £1. P. & P. 16p. With a guaranteed minimum of 86 transistors. Data on transistors included.

**PANELS with 2 power transistors similar to OC28 on each board—components 2 boards (4 x OC28) 50p. P. & P. 6p.**

9 OA5, 3 OA10, 3 Pot Cores, 26 Resistors, 14 Capacitors, 3 GET 872, 3 GET 872B, 1 GET 875. All long leads on panels 1 1/2in x 4in. 4 for £1. P. & P. 25p.

**700C OPERATIONAL AMPLIFIER T08**  
8 lead I.C. 1 of 50p. 50 of 35p. 100 of 80p.

**250 MIXED RESISTORS 62p**  
1/2 and 1 watt.

**150 MIXED HI STABS 62p**  
1/2, 1 and 1 watt 5% and better.

**QUARTZ HALOGEN BULBS**  
With long leads. 12V 85W for car spot lights, projectors, etc. 50p each. P. & P. 5p.

**GPO EXTENSION TELEPHONES**  
with dial but without bell. 86p each, P. & P. 90p. £1.75 for 3, P. & P. 50p.

**BARGAIN RELAY OFFER**  
Single pole change over silver contacts 25V to 50V. 2.5k Ω coil. 8 for 50p. P. & P. 5p.

**KEYTRONICS mail order only**

44 EARLS COURT ROAD  
LONDON, W.8 01-478 8499

# SERVICE TRADING CO

All Mail Orders—Also Callers—Ample Parking Space  
Dept. E.E. 57 Bridgman Road, Chiswick, London, W4 5BB  
Phone 01-995 1560 SHOWROOM NOW OPEN MON.-FRI.  
Personal callers only. Open Sat.  
9 LITTLE NEWPORT ST.  
LONDON WC2H 7JJ 01-437 0576

**FOR  
RAPID  
SERVICE**

# GARLAND BROS. LTD.

DEPTFORD BROADWAY, LONDON, SE8 4QN

## ELECTROLYTICS

**TRANSFORMERS**  
all with 0-250 Volt primaries  
Miniature  
MM6 6V, 500mA + 6V, 500mA  
MM12 12V, 250mA + 12V, 250mA  
MM20 20V, 150mA + 20V, 150mA  
£1.29 plus 13p p. & p.

**L.T.**  
LT1 6-3V, 1.5A—75p plus 18p p. & p.  
LT2 6-3V, 3A—80p plus 26p p. & p.  
LT3 12V, 1.5A—80p plus 26p p. & p.  
LT4 12V, 3A—£1.32 plus 30p p. & p.  
LT5 9-0-9V, 0.5A—75p plus 21p p. & p.  
LT6 12-0-12V, 1A—95p plus 26p p. & p.  
LT7 30-0-30V, 1A—£1.87 plus 30p p. & p.

**Multi-tapped**  
MT30/2 0-12-15-20-24-30V, 2A—  
£1.95 plus 30p p. & p.  
MT60/1 0-5-20-30-40-60V, 1A—  
£1.97 plus 30p p. & p.  
MT60/2 0-5-20-30-40-60V, 2A—  
£2.90 plus 34p p. & p.

**Charger**  
CT/01 1A—£1 plus 26p p. & p.  
CT/02 2A—£1.25 plus 30p p. & p.  
CT/03 4A—£1.50 plus 30p p. & p.  
Secondaries—0-5-11-17V.

## SEMICONDUCTORS, etc.

Zeners—400mW, 15p; 1.5W, 22p  
L.D.R.—ORP12, 56p  
S.C.R.—400 P.I.V., 3.0A, 57p  
Bridge rectifier—40 P.I.V., 1.5A,  
50p  
Bridge rectifier—200 P.I.V., 2.0A,  
50p  
Transistor sockets—6p  
D.I.L. I.C. sockets—14 pin, 20p  
16 pin, 20p  
IN4001—50 P.I.V., 1.0A, 6p  
IN4002—100 P.I.V., 1.0A, 7p  
IN4003—200 P.I.V., 1.0A, 8p  
IN4004—400 P.I.V., 1.0A, 9p  
IN4005—600 P.I.V., 1.0A, 12p

## ALUMINIUM BOXES

with lids and screws  
Type L. W. D. Price p. & p.  
GB7 \* 5 1/2in 2 1/2in 1 1/2in 38p 15p  
GB8 \* 4in 4in 1 1/2in 38p 15p  
GB9 \* 4in 2 1/2in 1 1/2in 38p 13p  
GB10 \* 5 1/2in 4in 1 1/2in 44p 18p  
GB11 4in 2 1/2in 2in 38p 13p  
GB12 3in 2in 1in 33p 13p  
GB13 6in 4in 2in 52p 18p  
GB14 7in 5in 2 1/2in 63p 19p  
GB15 8in 6in 3in 81p 26p  
GB16 10in 7in 3in 92p 26p  
\* These sizes fit standard veroboards



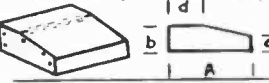
## EQUIPMENT CASES

with sloping front panel  
Type H. W. D. Price p. & p.  
SF1 2in 5 1/2in 2 1/2in 45p 12p  
SF2 2in 7 1/2in 3 1/2in 60p 16p  
SF3 2in 9 1/2in 4 1/2in 75p 19p  
Plain aluminium.  
Stove - enamelled silver-grey hammer finished, 20p extra.



## CONSOLE CASES

in plain aluminium, ideal for mixers, instruments, etc.  
Type W. A. B. C. D. Price p. & p.  
In in in in in  
GB20 8 9 3 1/2 3 £1.42 30p  
GB21 10 9 3 1/2 3 £1.58 30p  
GB22 12 9 3 1/2 3 £1.72 30p



## VEROBOARD

Size	0-1	0-15
	matrix	matrix
2 1/2in x 3 1/2in	22p	16p
2 1/2in x 5in	24p	25p
3 1/2in x 3 1/2in	24p	25p
3 1/2in x 5in	27p	29p
17in x 2 1/2in	75p	57p
17in x 3 1/2in	£1	75p

Pins—either size; packet of 36, 18p

## MINIATURE ELECTROLYTICS

1µF 450V	19p	1,000µF 25V	27p
2µF 450V	20p	1,000µF 50V	39p
4µF 350V	14p	2,000µF 25V	36p
8µF 450V	16p	2,000µF 50V	53p
16µF 450V	17p	2,500µF 25V	45p
25µF 25V	7p	2,500µF 50V	60p
25µF 50V	8p	3,000µF 25V	48p
32µF 450V	24p	3,000µF 25V	55p
50µF 50V	10p	5,000µF 50V	98p
100µF 25V	10p	8-8µF 450V	18p
100µF 50V	10p	8-16µF 450V	20p
250µF 25V	12p	16-16µF 450V	27p
250µF 50V	17p	16-32µF 450V	63p
500µF 25V	18p	32-32µF 450V	49p
500µF 50V	25p	50-50µF 350V	38p

## CASSETTE OWNERS!

For Philips and similar cassette recorders.  
PU12 Power unit for connection to 12V + or - E car electrical systems, giving 7 1/2V, stabilised output. **£3.25**  
PU14 As above but switched for 6V, 7 1/2V or 9V output. **£5.10**  
PP75 Mains power supply, output 7 1/2V d.c. **£1.95**  
All units are complete with cable and plug.

## VARIABLE POWER SUPPLY

Input: 240V, a.c.  
Output: Switched 3, 4.5, 6, 7.5, 9, 12 volts d.c. at 500mA **£4.20**

## BATTERY ELIMINATORS

suitable for transistor radios and similar light current equipment  
PP6 Input 240V a.c. Output 6V d.c.  
PP9 Input 240V a.c. Output 9V d.c.  
Price £1.50 plus 12p p. & p.

**NEW ILLUSTRATED 1972-73 CATALOGUE**  
Post Free 15p

## CONTROLS, Log. or Lin.

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

## SLIDER CONTROLS, 87mm.

complete with knobs.  
Single, 44p; Tandem, 55p. 10kΩ, 25kΩ, 50kΩ, 100kΩ, log. or lin.

## RESISTORS

Carbon  
All 5%, high-stability, E12 values. 1W, 1/2W, 1/4W, 1/8W, 1/16W, 4p; 2W, 6p  
Wire-wound  
5W, 10p; 10W, 12p

## LOUDSPEAKERS

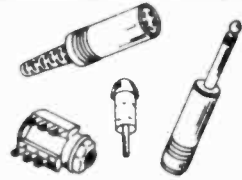
7in x 4in, 3Ω—£1.12, 8Ω—£1.12, 15Ω—£1.40.  
8in x 5in, 3Ω—£1.85, 8Ω—£1.77, 15Ω—£1.70.  
10in x 6in, 3Ω—£2.32, 8Ω—£2.32, 15Ω—£2.32.  
Bin-round, 3Ω—£2.10, 8Ω—£2.65, 15Ω—£2.10.  
Aadstra "Hi-Ten", 10in, 10W, 8 or 15Ω—£3.40.  
Please add 20p p. & p. to all speakers.

## BONDED ACRYLIC FIBRE

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

## PLUGS

Car aerial 14p  
Co-axial 9p  
D.I.N. 2 pin (speaker) 10p  
D.I.N. 3 pin 13p  
D.I.N. 4 pin 14p  
D.I.N. 5 pin, 180° 13p  
D.I.N. 5 pin, 240° 15p  
D.I.N. 6 pin 15p  
Jack, 2 1/2mm unscreened 9p  
Jack, 2 1/2mm screened 8p  
Jack, 3 1/2mm unscreened 10p  
Jack, 3 1/2mm screened 12p  
Jack, 4 1/2in unscreened 13p  
Jack, 4 1/2in screened 20p  
Jack, stereo, unscreened 20p  
Jack, stereo, screened 25p  
Phono, plastic top 12p  
Phono, plated metal 5p  
Phono, fitted 4 ft. lead 8p  
Wander, red or black 3p  
Banana 4mm, red or black 6p



## SOCKETS

Car aerial 8p  
Co-axial, surface 8p  
Co-axial, flush 9p  
D.I.N. 2 pin (speaker) 10p  
D.I.N. 3 pin 9p  
D.I.N. 5 pin, 180° 9p  
D.I.N. 5 pin, 240° 9p  
Jack, 2 1/2mm 10p  
Jack, 3 1/2mm 10p  
Jack, 4 1/2in unscreened 15p  
Jack, 4 1/2in switched 24p  
Jack, stereo, switched 24p  
Phono, single 7p  
Phono, 2 on a strip 5p  
Phono, 3 on a strip 9p  
Phono, 4 on a strip 10p  
Wander, single, red or black 5p  
Wander, twin strip 7p  
Banana 4mm red, or black 6p

## CAPACITORS

2.2pF 500V 5/M	71p	0.0027µF 500V 5/M	15p
3.3pF 500V 5/M	71p	0.0033µF 500V P.S.	5p
5pF 500V 5/M	71p	0.0033µF 500V Poly.	6p
10pF 125V P.S.	5p	0.0033µF 1,000V MDC	6p
10pF 500V 5/M	71p	0.0036µF 500V 5/M	15p
15pF 125V P.S.	5p	0.0047µF 125V P.S.	9p
15pF 500V Cer.	4p	0.0047µF 500V Poly.	6p
18pF 500V 5/M	71p	0.0047µF 500V 5/M	20p
22pF 125V P.S.	5p	0.0047µF 1,000V MDC	6p
22pF 500V 5/M	71p	0.005µF 100V Mylar	3p
25pF 500V 5/M	71p	0.005µF 500V Cer.	5p
27pF 500V Cer.	4p	0.0068µF 125V P.S.	10 1/2p
33pF 125V P.S.	5p	0.0068µF 500V 5/M	30p
33pF 500V 5/M	71p	0.0068µF 500V Poly.	6p
39pF 500V 5/M	71p	0.0082µF 125V P.S.	10 1/2p
47pF 125V P.S.	5p	0.0082µF 500V 5/M	30p
47pF 500V Cer.	4p	0.01µF 18V Disc	4p
50pF 500V 5/M	71p	0.01µF 125V P.S.	10 1/2p
56pF 500V 5/M	71p	0.01µF 160V Poly.	4p
68pF 125V P.S.	5p	0.01µF 250V M.F.	3p
68pF 500V 5/M	71p	0.01µF 400V Poly.	3p
75pF 500V 5/M	71p	0.01µF 500V Cer.	5p
82pF 500V 5/M	71p	0.01µF 500V 5/M	30p
100pF 125V P.S.	5p	0.01µF 600V MDC	7 1/2p
100pF 500V 5/M	71p	0.01µF 1,000V MDC	9p
100pF 500V Cer.	3p	0.015µF 160V Poly.	3p
120pF 500V 5/M	71p	0.015µF 400V Poly.	3p
150pF 125V P.S.	5p	0.02µF 100V Mylar	3p
150pF 500V 5/M	71p	0.02µF 125V P.S.	5p
150pF 500V Cer.	3p	0.02µF 250V M.F.	3p
180pF 500V 5/M	71p	0.02µF 400V Poly.	3p
200pF 500V 5/M	71p	0.02µF 600V MDC	7 1/2p
220pF 125V P.S.	5p	0.02µF 1,000V MDC	9p
220pF 500V Cer.	3p	0.033µF 250V M.F.	4p
250pF 500V 5/M	8p	0.033µF 400V Poly.	4p
270pF 500V Cer.	3p	0.047µF 12V Disc	6p
300pF 500V 5/M	8p	0.047µF 160V Poly.	3p
330pF 125V P.S.	5p	0.047µF 250V M.F.	3p
330pF 500V 5/M	8p	0.047µF 400V Poly.	4p
390pF 500V 5/M	8p	0.047µF 600V MDC	8p
470pF 125V P.S.	5p	0.047µF 1,000V MDC	10p
470pF 750V Disc	8p	0.1µF 30V Disc	6p
500pF 500V 5/M	8p	0.1µF 250V M.F.	4p
560pF 500V 5/M	8p	0.1µF 400V Poly.	5p
680pF 125V P.S.	6p	0.1µF 600V MDC	10p
680pF 500V 5/M	8p	0.1µF 1,000V MDC	13p
820pF 500V 5/M	8p	0.15µF 250V M.F.	5p
0.001µF 100V Mylar	3p	0.22µF 160V Poly.	6p
0.001µF 125V P.S.	6p	0.22µF 250V M.F.	6p
0.001µF 500V Poly.	8p	0.22µF 400V Foil	10p
0.001µF 500V 5/M	10p	0.22µF 1,000V MDC	15p
0.001µF 500V Cer.	3p	0.33µF 250V M.F.	8p
0.001µF 1,000V MDC	6p	0.47µF 250V M.F.	8p
0.0015µF 400V Poly.	3p	0.47µF 400V Foil	15p
0.0015µF 500V 5/M	10p	0.47µF 1,000V MDC	20p
0.0015µF 500V Cer.	3p	1.0µF 250V M.F.	15p
0.0018µF 500V 5/M	10p		
0.002µF 100V Mylar	3p		
0.002µF 500V Cer.	3p		
0.002µF 500V P.S.	6p		
0.0022µF 125V P.S.	6p		
0.0022µF 500V 5/M	10p		
0.0022µF 1,000V MDC	6p		

Note:  
S/M = silver mica 1% tol.  
P.S. = polystyrene 2 1/2% tol.  
MDC—a.c. rating = 300V.  
M.F. = Mullard min. foll.  
Cer. = ceramic.

**MAIL ORDERS:** Some items have a post and packing charge shown against them. Where p. & p. is not shown the charge is 12p for any selection. When both classes of goods are ordered the charge is 12p plus any p. & p. charges shown. (Overseas extra.) Telephone 01-692 4412



# If we can land moon modules we can certainly land you a good job

We are Control Data Corporation, a major American computer manufacturer, providing, among other things, computers that help control the landing of Apollo moon modules. Because computers have become the world's fastest expanding industry we want to meet men and women interested in training under us for really good jobs with our customers and with other computer users. By 1980, it is predicted, computers will form the world's largest industry and 90% of trainees are currently placed in jobs almost immediately. No specific qualifications are required for training - simply a clear, logical mind.

Telephone  
**01-637 2171**

between 9 a.m. and 9 p.m. from Monday to Friday  
and ask for Peter East

**CONTROL DATA INSTITUTE**

77-79 Wells Street, Oxford Street, London, W.1.

**CONTROL DATA**  
LIMITED



**MICROJET WELDER**  
A TINY FLAME UP TO 5000°F  
FOR ALL DOMESTIC APPLIANCES & POWER TOOLS  
INC 3 £11.50  
FLAME TIPS

A precision tool using a combination of butane and compressed oxygen. U.S.A. manufactured. Gives two sizes of flame of pencil lead thickness. Adjustable temperatures up to 5,000°F. Lights instantly, no priming. Cuts metals, welds, brazes and solters, etc., gold and silver. Ideal for electronics and electrical engineering, jewellers, clock-makers, silversmiths. Up to 40 minutes operation using fuel supplied. Replacement set of 2 oxygen and 1 butane cylinders £1.50 inc. post. Complete with instructions. Our price £11.50 + 31p P. & P. Bend £11.81.



**3 AMP DISTRIBUTION PANEL**

From Only  
**£2.40**

Safe and quick. FOUR 13 amp 3-pin shuttered Socket Outlets. Red neon warning indicator operates when in use. Only £2.40 + 35p P. & P. Total £2.75. Also De Luxe Model (illus.) PLUS On/Off switch PLUS Magnetic Contact Breaker - If you draw too much current it switches off automatically. PLUS 30ft (9 metres) approx. lead. £7.25 + 40p P. & P. Total £7.65. Bonus offer: if required, set of four fused 13 amp plugs 50p extra. Post free if ordered with above.

**JOHN DUDLEY & CO. LTD.**  
Childs Hill, London, N.W.2.



**TWIST FREE STORAGE**  
SAFE-WAY MANSARD EXTENSION LEAD  
SUITABLE FOR ALL DOMESTIC APPLIANCES & POWER TOOLS  
INTRODUCTORY PRICE ONLY  
**£1.69**

Store cable tidily. Heavy duty 3-core cable fitted unbreakable rubber standard 13 amp fused 3-pin plug and 3-pin socket. Saves trouble fitting your self. Ideal for Domestic Appliances, Garden Power Tools, Hedge Trimmers, Mowers, etc. 30ft. app cable and FREE storage reel £1.69 + 41p P. & P. Bend £2.10. 15ft. app. £1.20 + 35p P. & P. 50ft. app. £2.20 + 41p P. & P. 75ft. app. £3 + 50p P. & P. 100ft. app. £3.75 + 50p P. & P. 50ft. app. "Reverpoint" cable with winder reel, socket, plug, carry handle £3.99 + 35p P. & P.

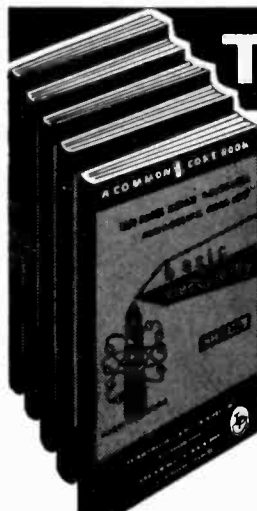


**BINOCULAR MAGNIFIER**

FOR PRECISION CLOSE-UP WORK - LEAVES BOTH HANDS FREE  
See close-up work with less eye strain and fatigue. Lightweight adjustable headband. Powerful optically ground lenses from Continental glassworks. Can be worn over normal glasses. An essential aid in modelling, industry, home and workshop. Stamp collecting Jewellers, watchmakers and any fine work. 2x magnification. £5.25 + 35p P. & P. Bend £5.60. 3x model 50p extra. State model.

**TWIN-BEAM SPEC-LAMP** - Worn just like a pair of spectacles. Two powerful spot lamps illuminate working area. Can be worn with Binocular Magnifier. Battery operated. Only £1.90 + 10p. P. & P. Bend £2.

Dept. EE2, 301 Cricklewood Lane, Tel. 01-458 5917 Callers welcome.



# The Pictorial Method

## BASIC ELECTRICITY (5 vols) ELECTRONICS (6 vols) TELEVISION (3 vols)

You'll find it easy to learn with this outstandingly successful PICTORIAL METHOD. The essential facts are explained in the simplest language, one at a time, and each is illustrated by an accurate cartoon-type drawing. These clear and concise illustrations make study a real pleasure. The books are based on the latest research into simplified learning techniques. This easy-approach-to-learning method has proved beyond doubt that acquiring knowledge can be an enjoyable experience.

### WHAT READERS SAY

You have my firmest recommendation in favour of this method of Self Teaching.  
*B.W. Blackburn.*

The best I have ever had: they are fantastic and everything your readers say.  
*P.L.W. Davenport.*

I have made great use of the Basic Manuals.  
*B.C. Hendon.*

I have found the Electronics volumes so interesting: please rush me Electricity.  
*C.A. Folkestone.*

The series will be of exceptional value in training mechanics and technicians in Electricity, Radio and Electronics.

**YOUR 100% GUARANTEE**

Should you be, in any way dissatisfied with the MANUALS your money will be refunded by return of post.

To The SELRAY BOOK CO., 60 HAYES HILL, HAYES, BROMLEY, KENT. BR2 7HP

Please find enclosed P.O./Cheque value £.....  
BASIC ELECTRICITY 5 parts £4.50   
BASIC ELECTRONICS 6 parts £5.40   
BASIC TELEVISION 3 parts £3.60

Tick Set(s) required. Prices include Postage and Packing.

**YOUR 100% GUARANTEE.** If after 10 days examination you decide to return the Manuals your money will be refunded in full.

NAME .....  
BLOCK LETTERS  
FULL POSTAL.....  
ADDRESS .....

**POST NOW FOR THIS OFFER!**

## BSR LATEST SUPERSLIM STEREO AND MONO

Plays 12", 10" or 7" records, Auto or Manual. A high quality unit backed by BSR reliability with 12 months' guarantee. AC 200/250v. Size 13 1/2 x 11 1/2 in.



£8.75 Post 25p.  
£7.75 Post 25p.

RCS DE-LUXE 3 WATT AMPLIFIER. Ready made tested. Printed circuit. 3 watts output. Tone and volume controls. Complete with two knobs, output valve and rectifier and high performance loudspeaker. Double wound fully isolated mains transformer. AC Mains 200/250v. Response 50-12,000 cps. Sensitivity 300mV. £4 Post 25p.

## GARRARD DISCO DECK

£10 POST FREE

4 speeds. Plays all sizes of records.

4 pole heavy duty motor. 9in. steel turntable. Flux in head complete with stereo/mono cartridge. Adjustable stylus pressure. Auto-stop. Brown and Cream Satin AC mains 110/240v. Base plate size 15in. x 8in. Operating area 14in. x 12in. Above motor board 3 1/2 in., below motor board 2 1/2 in. Ideal for Home Hi-Fi or Discotheque.



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

BSR JUNIOR SINGLE PLAYER £4.50

Turntable, 4-speed motor and separate pick-up

HI-FI PICK-UP CARTRIDGES. Diamond LP/Stereo Stereo Mono GTA £2.50; GP94 £2.50; GP93 £2.00; Sapphire Mono GP91 £1.50; Power-point LP/78. 60p.

## E.M.I. WOOFER AND TWEETER KIT £5.75 Post 25p

Comprising a fine example of a Woofer 10 1/2 x 6 1/2 in. with a massive Ceramic Magnet. 440g. Gauss 13,000 lines. Aluminium Cone centre to improve middle and top response. Also the E.M.I. Tweeter 3 1/2 in. square has a special light-weight paper cone and magnet flux 10,000 lines. Crossover condenser included. Impedance Standard 8 ohms Maximum Power 12 watts Useful Response 35 to 18,000 cps Base Resonance 45 cps

SUITE ENCLOSURE 20 x 13 x 9 in. £9 POST 25p MODERN TEAK DESIGN

WEYRAD P50—TRANSISTOR COILS

RAEW Ferrite Aerial. 72p	Spare Cores 3p
Osc. P50/1AC 33p	Driver Trans. LFD74. 58p
I.F. P50/2C 470 kc/s. 36p	Printed Circuit, PCA1 58p
3rd I.F. P50/3C 36p	J.B. Tuning Gang 65p
PS11 or PS1/2 36p	Wayrad Booklet 10p
P50/3V 36p	OPTI 58p

Mullard Ferrite Rod 8 x 1 in. 20p. 6 x 1 in. 20p.

VOLUME CONTROLS 80 Ohm Coax 4p. yd. BRITISH AERIALITE AERIAL-AXIAL AIR SPACED 4p. yd. £1.40; 60 yd. £2 FRINGE LOW LOSS Ideal 625 and colour. 10p yd.

## 8in x 10in ELAC HI-FI SPEAKERS

Dual cone plasticised roll surround. Large ceramic magnet. 50-18,000 cps. Bass resonance 55 cps. 8 ohm coil. 8in. 10 watt. 10in. 12 watt music power. £3.75



## E.M.I. 13 1/2 x 8in. SPEAKER SALE!

With twin tweeters and crossover, 10 watt. State 3 or 8 or 15 ohm. (As illustrated) Post 25p £4.25

With flared tweeter cone and ceramic magnet, 10 watt. 8in. 10 watt. Bass res. 45-80 cps. Flux 10,000 gauss. State 3 or 8 or 15 ohm. Post 25p £2.25

TEAK CABINET 18 x 10 x 9in. Fluted Front £5 Post 25p

BLANK ALUMINIUM CHASSIS 18 w.g. 2in. sides. 7 x 4in. 45p; 9 x 7in. 60p; 11 x 3in. 50p; 14 x 11in. 95p; 15 x 14in. 99p; 11 x 3in. 50p; 16 x 10in. £1. ALUMINIUM PANELS 18 w.g. 6 x 4in. 9p; 8 x 6in. 15p; 14 x 3in. 16p; 10 x 7in. 19p; 12 x 5in. 20p; 12 x 8in. 29p; 16 x 6in. 28p; 14 x 9in. 34p; 12 x 12in. 40p; 16 x 10in. 50p

## HI-FI STOCKISTS RETURN OF POST DESPATCH RADIO COMPONENT SPECIALISTS

Radio Books & Component Lists 5p. Written guarantee. (Export: Remit cash and extra postage.)

R.C.S. STABILISED POWER PACK KITS All parts and instructions with Zener Diode, Printed Circuit, Bridge Rectifiers and Double Wound Mains Transformer input 200/240v. AC. Output voltages available 6 or 9 or 12 or 15 or 18 or 20v. DC at 100mA or less. PLEASE STATE VOLTAGE REQUIRED. £2 POST DETAILS S.A.E. Size 3 1/2 x 1 1/2 x 1 1/2 in. FREE

## GENERAL PURPOSE TRANSISTOR PRE-AMPLIFIER BRITISH MADE

Ideal for Mike, Tape, P.U., Guitar. Can be used with Battery 9 12v. or H.T. Line 200-300v. D.C. operation. Size 1 1/2 x 1 1/2 x 1 1/2 in. Response 25 cps. to 25 Kc/s. 26db gain. For use with valve or transistor equipment. 90p Post Full instructions supplied. Details S.A.E. 10p

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

LOW VOLTAGE ELECTROLYTICS  
1. 2, 4, 5, 8, 16, 25, 30, 50, 100, 200mF. 15V. 10p  
500mF. 12V. 15p; 25V. 20p; 50V. 30p.  
1000mF. 12V. 17p; 25V. 35p; 50V. 47p; 100V. 70p.  
2000mF. 8V. 25p; 25V. 42p; 50V. 57p.  
2500mF. 50V. 82p; 3000mF. 25V. 47p; 50V. 65p.  
5000mF. 6V. 25p; 12V. 42p; 25V. 75p; 35V. 85p; 50V. 95p

CERAMIC 1pF to 0.01mF, 4p. Silver Mica 2 to 5000pF. 4p. PAPER 350V-0.1 4p. 0-5 13p; 1mF 15p; 2mF 150V 15p. 500V-0.001 to 0-05 4p; 0.1 5p; 0.25 8p; 0.47 25p. SILVER MICA. Close tolerance 1% 2.2-500pF 8p; 400-2-200 pF 10p; 2,700-5,600pF 20p; 8,800pF-0.01. mid 30p; each. TWIN GANG. 0-0.01 208pF +176pF. 65p; Slow motion drive 365+365 with 25+25pF, 50p; 500pF slow motion, standard 45p; small 3-gang 500pF £1-80.

SHORT WAVE, SINGLE. 10pF 30p; 25pF 55p; 50pF 65p. NEON PANEL INDICATORS 250V AC/DC Ambient 20p. RESISTORS. 1/2 w. 1 w. 20% 1p; 2 w. 5p 10 ohms to 10 meg HIGH STABILITY. 1 w. 2%, 10 ohms to 1 meg. 10p. Ditto 5% Preferred values 10 ohms to 10 meg. 4p. WIRE-WOUND RESISTORS 5 watt, 10 watt, 15 watt 10 ohms to 100K, 10p each; 2 1/2 watt, 1 ohm to 8.2 ohms 10p.

## GARRARD DECADEC SP25 MKII RECORD PLAYER

With Stereo/Mono Deram Cartridge transcription head and arm Four speeds. 10 1/2 in. turntable. Anti-rumble filter Bias compensation. Laboratory motor.



SPECIAL PRICE £18.50 Post 25p

## METAL PLINTH & PLASTIC COVER £4.50 POST 35p

Cut out for most Garrard or B.S.R. Will play with cover in position. Latest design. Covered in black leatherette. Antimagnetic. 12 1/2 x 14 1/2 x 7 1/2 in.

## MAINS TRANSFORMERS ALL POST 25p each

250-0-250 80 mA. 6.3v. 4 amp £1.50  
250-0-250 80 mA. 6.3v. 3.5a. 6.3v. 1a or 5v. 2a. £2.50  
350-0-350 80 mA. 6.3v. 3.5a. 6.3v. 1a or 5v. 2a. £3.00  
300-0-300 120mA. 6.3v. 4a. C.T. 6.3v. 2a. £3.25  
MINIATURE 200, 500mA. 6.3v. 1a. 2 1/2 x 2 1/2 in. 75p  
MIDGET 220v. 45 mA. 6.3v. 2a. 2 1/2 x 2 1/2 in. 60p  
MINI-MAINS 20v. 130mA. 1 1/2 x 1 1/2 in. 50p  
HEATER TRANS. 6.3v. 3 a. 60p  
Ditto tapped sec. 1.4 v., 2.3, 4.5, 6.3 v. 1 1/2 amp. 95p  
GENERAL PURPOSE LOW VOLTAGE. Tapped Outputs at 2 amp. 3, 4, 5, 6, 9, 10, 12, 15, 18, 24 and 30 v. £2.25  
1 amp. 6, 8, 10, 12, 15, 18, 20, 24, 30, 36, 40, 48, 60, £2.25  
2 amp. 6, 8, 10, 12, 15, 18, 20, 24, 30, 36, 40, 48, 60, £3.25  
5 amp. 6, 8, 10, 12, 15, 18, 20, 24, 30, 36, 40, 48, 60, £3.75  
AUTO TRANSFORMERS 115v. to 230v. or 230v. to 115v. 150w. £2-25; 500w. £6-25; 750w. £10; 100w. £14.  
CHARGER TRANSFORMERS. Input 200/250v. for 6 or 12v., 1 1/2 amp., £1-50; 2 amp. £1-80; 4 amp. £2-50.  
FULL WAVE BRIDGE CHARGER RECTIFIERS: 6 or 12v. outputs. 1 1/2 amp. 40p; 2 amp. 55p; 4 amp. 85p  
LUCAS 2D5500 Charger 70V 5 amp £1.

MAINS ISOLATING TRANSFORMER Primary 0 - 110 - 240V. Secondary 0 - 240V. 3 amps. 720 watts. Insulated terminals. Varnish impregnated. Fully enclosed in steel case with fixing feet. Famous make. BARGAIN OFFER £10. Carriage 50p.

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

"THE INSTANT" BULK TAPE ERASER & HEAD DEMAGNETISER 200/250v. A.C. £2.35 Post 15p  
Leaflet S.A.E.

MINIMUM POST AND PACKING 15p CUSTOMERS FREE CAR PARK CALLERS WELCOME

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

## BAKER 12in. MAJOR £9



30-14,500 c.p.s., 12in. double cone, woofer and tweeter cone together with a BAKER ceramic magnet assembly having a flux density of 14,000 gauss and a total flux of 145,000 Maxwells. Bass resonance 40 c.p.s. Rated 20 watts. Voice coils 3 or 8 or 15 ohms. Post Free  
Module kit, 30-17,000 c.p.s. with tweeter, crossover, baffle and instructions. £11-50

BAKER 'BIG SOUND' SPEAKERS  
'Group 25' 'Group 35' 'Group 50'  
12 inch £8 12 inch £9 15 inch £20  
25 watt 35 watt 50 watt  
3 or 8 or 15 ohm 3 or 8 or 15 ohm 8 or 15 ohm

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

## GOODMANS 6 1/2 in. HI-FI WOOFER

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



## ELAC CONE TWEETER

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

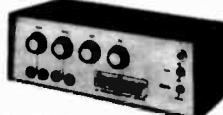
SPEAKER COVERING MATERIALS. Samples Large S.A.E. Horn Tweeters 2-16kc/s, 10W 8 ohm or 15 ohm £1-50. De Luxe Horn Tweeters 2-18 Kc/s, 15W, 15 ohm £3. TWO-WAY 3000cps CROSSOVERS 3 or 8 or 15 ohm 55p. SPECIAL OFFER! 80 ohm 2 1/2 in.; 2 1/2 in.; 35 ohm, 2 1/2 in.; 25 ohm, 2 1/2 in. dia.; 3in. dia.; 6 x 4in.; 8 x 5in. £1 EACH 15 ohm. 3 1/2 in. dia.; 6 x 4in.; 7 x 4in.; 3 ohm. 2 1/2 in., 3 in., 5 in.

LOUDSPEAKERS P.M. 3 OHMS. 7 x 4in. £1-25; 6 1/2 in. £1-50; 8 x 5in. £1-60; 8 x 2 1/2 in. 90p 8 in. £1-75; 10 x 6in. £1-90.

RICHARD ALLAN TWIN CONE LOUDESPEAKERS. 8in. dia. 4 watt; 10in. dia. 5 watt; 11in. dia. 6 watt 3 or 8 or 15 ohm models £2-20 each. Post 15p. VALVE OUTPUT TRANS. 25p; MIKE TRANS. 50p; 25p. 5 WATT MULTI-RATIO, 3, 8 and 15 ohms 80p.

## BAKER 100 WATT ALL PURPOSE TRANSISTOR AMPLIFIER

4 Inputs speech and music. Mixing facilities. Response 10-30,000 cps. Matches all loudspeakers. A.C. 200/250v. Separate Treble and Bass Controls. Guaranteed. Details S.A.E. £49 Post Free



BARGAIN AM TUNER. Medium Wave. Transistor Superhet. Ferrite aerial. 9 volt. £4.50

BARGAIN 4 CHANNEL TRANSISTOR MONO MIXER Add musical highlights and sound effects to recordings. Will mix Microphone, records, tape and tuner with separate controls into single output. 9 volt. STEREO VERSION OF ABOVE £4-50 £3.50

BARGAIN FM TUNER 88-108 Mc/s Six Transistor. 9 volt Printed Circuit. Calibrated slide dial tuning. Walnut Cabinet. Size 7 x 5 x 4inches £12.50

BARGAIN FM TUNER as above less cabinet £8.85

BARGAIN 3 WATT AMPLIFIER. 4 Transistor Push-Pull Ready built, with volume control. 9v. £3.50

COAXIAL PLUG 5p. PANEL SOCKETS 6p. LINE 18p OUTLET BOXES, SURFACE OR FLUSH 25p. BALANCED TWIN RIBBON FEDER 300 ohms, 5p yard. JACK SOCKET Std. open-circuit 14p, closed circuit 23p; Chrome Lead Socket. 4p. Phone Plugs 5p. Phone Socket 5p. JACK PLUGS 8cd. Chrome 15p; 3-5mm Chrome 14p. DIN SOCKETS Chassis 3-pin 10p; 5-pin 10p. DIN SOCKETS Lead 3-pin 18p; 5-pin 25p. DIN PLUGS 3-pin 18p; 5-pin 25p. VALVE HOLDERS, 8p; CERAMIC 3p; CANS 5p.

E.M.I. TAPE MOTORS Post 15p. 12v. or 240v. A.C. 1,200 r.p.m. 4 pole 138mA. Spindle 0.187 x 0.75in £1-25

E.M.I. GRAM MOTORS 120v. or 240v. A.C. 1,200 r.p.m. 2 pole 70mA. Spindle 1/4 x 1/4 in. Post 15p 75p

337 WHITEHORSE ROAD, CROYDON Open 9-6 p.m. (Wednesdays 9-1 p.m., Saturdays 9-5 p.m.) Buses 50, 68, 159 Rail Selhurst. Tel. 01-684-1665

# Everyday Electronics Classified Advertisements

RATES: 9p per word (minimum 12 words). Box No. 10p. extra. Semi-display—£6.00 per single column inch. Advertisements must be prepaid and addressed to Classified Advertisements Department, "EVERYDAY ELECTRONICS," I.P.C. Magazines Ltd., Fleetway House, Farringdon Street, London EC4A 4AD.

## RECEIVERS and COMPONENTS

**MINI MAINS PACK KIT.** Safe double wound mini transformer, silicon rects., 1,000 $\mu$ F smoothing. Delivers 9V d.c., 120 mA. Components with data sheet; pack buildable to size of PP6, etc., battery. £0.90 + U.K. post 5p. By mail only from **AMATRONIX LTD.**, 396 Selsdon Road, South Croydon, Surrey, CR2 0DE.

### SOUND SUPPLIES

(Electronics) Co. Ltd.  
P.A. EQUIPMENT. Marshall amps, instruments and guitars, etc. TOA and Eagle amps and accessories. Reslo mics, etc.  
COMPONENTS. Resistors, capacitors, plugs, sockets, cables, audio leads, semiconductors, valves, vero board, etc., for the constructor.  
Power packs and car droppers for the cassette recorder or radio.  
S.A.E. for list and enquiries. P.A. list 15p.  
12 Smarte Lane, Loughton, Essex  
Tel. 01-508 2715 Closed all day Thursday

**UNUSED COMPONENTS.** Excellent variety. £1 per hundred. Postal only. **Chaplin, 5** Brewery Hill, Wheat-hampstead, Herts.

### NEW MODEL V.H.F. KIT Mk 2

Our latest kit. Improved design and performance plus extra amplifier stage, receives aircraft, amateurs, mobile, radio 2, 3, 4, etc. This novel little set will give you endless hours of pleasure and can be built in one evening. Powered by 9 volt battery, complete with easy to follow instruction and built in jack socket for use with earphones or amplifier.

Only £3.50 + p. & p. 10p U.K. only.

Illustrated catalogue of selected kits and components. 15p P. & P. free.

Gallean Trading Co., Dept E.E.  
12 Burns Way,  
Coringham,  
Stanford-le-Hope, Essex.

**HEADPHONES:** Matching 9R59DS, EC10 and all low impedance receivers. Luxury lightweight adjustable, foam padded. Japanese. £2.60. **Partridge Electronics Ltd.**, Broadstairs, Kent.

## EXPRESS COMPONENTS

17 Albert Square, Stratford,  
London E15 1HJ

### ELECTRONIC KITS FOR E.E. PROJECTS

HAVE you waited weeks (or months) in the past for your electronic components to arrive??? Well you won't have to any more—not if you order from us!!! It is our intention to satisfy our customers—quickly and completely!!! This month's bargains are:—

**HORSES FOR COURSES £2.00**  
**WASH/WIPE CONTROLLER £2.10**  
**SIGNAL INJECTOR £0.75**  
**ELECTRONOME £1.65**  
**SHAVER INVERTER (20 watt) £3.75**  
**INFRARED BURGLAR ALARM £3.30**

These kits comprise all electronic components to complete the project.

**OTHER COMPONENTS** Transistors: AD142 (similar characteristics to OC26, OC28, OC29 OC35). .35p each; Relays: 185  $\Omega$  2-pole change over 5A contacts. £1.00 each; Wafer switches 1-pole 12-way, 4-pole 3-way, 3-pole 4-way. .20p each; Microswitch: S.P.C.O. .15p each; Potentiometers: 25k  $\Omega$  log. .12p each, 250k  $\Omega$  log with D.P.D.T. switch. .20p each; Mains neons (with resistor). .20p each.

Orders over 50p post free, others add 5p.

**MAIL ORDER ONLY**

**FOR ALL YOUR Electronic Component requirements.** Send for free list to **B.C. Electronic Supplies, 7** Regent Road, Huddersfield HD1 4NR.

COMPUTER PANELS 5BC106, diodes, 4-50p post 10p. PANELS WITH SILICON AND GERM/TRANS. at least 50. 6-£1.00 post 15p. UNIT WITH 4-LA2 POT CORES CAPS 50p post 15p. ICs 7400 SERIES ON PANEL(S) 10-75p post 10p. FALLOUTS 5-15p. ORP12 on panel ex equipt. 35p cp. WIRE ENDED NEONS 10-48p, 80-75p post 8p. SEND LARGE S.A.E. FOR LIST OF PANELS ETC.

7LB ASSORTED COMPONENTS £1.30 cp.

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

Versatile  
**10 in ONE**



### MINI-LAB

Comprising

- AC & DC Voltmeter ● Audio Generator
- Ohm Meter ● Resistance Substitution
- Capacitance Substitution ● DC Ammeter
- Battery Supply ● RF Signal Generator ● RF Field Strength Indicator

This new, unique instrument combines all you need for testing. Guaranteed, money back if not satisfied.

**£11.25**

+25p. p&p

Cash with order or write for illustrated data sheet to:

**RSL COMPONENTS (Dept. EE)**

Cricketfield Lane, Bishop's Stortford, Herts.

## MISCELLANEOUS

### MUSICAL MIRACLES

KITS to build quality accessories:—

WAA-WAA all parts, electronic & mech. £2.85

FUZZORAMA quality fuzz box £4.75 P&P 20p.

BASS PEDAL 18" and 8" tones £3.50

BUILD A SYNTHESISER OR AUTO RHYTHM from Dewtron professional modules

Cat. 15p from D.E.W. Ltd., 254 Ringwood Road, Ferndown, Dorset BH22 9AR

## NO NEED TO WORRY ABOUT A TRANSMITTING LICENCE

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

GET YOURS! SEND £5.50 NOW

S.A.E. for details

TO: BOFFIN PROJECTS,

DEPT. KEE.

4 CUNLIFFE ROAD,

STONELEIGH, EWELL, SURREY

## EDUCATIONAL

**MEN!** You can earn £50 p.w. Learn computer-operating. Send for FREE brochure—London Computer Operators Training Centre, G22 Oxford House, 9-15 Oxford Street, London, W.1.

**FREE**

TO ENGINEERS

Whatever your age or experience you must read New Opportunities. It describes the easiest way to pass A.M.S.E., A.M.I.M.I., City & Guilds (all branches), Gen. Cert., etc., and gives details of courses in all branches of engineering Mechanics, Electrical, Civil, Auto, Aero, Radin, TV, Building, etc. You must read this book.



Send for your copy today—FREE!

B.I.E.T. B32, Aldermaston Court,  
Reading, RG7 4PF

Accredited by the Council for the Accreditation of Correspondence Colleges

BRITISH INSTITUTE OF ENGINEERING TECHNOLOGY

## YOU CAN BE AN ELECTRONICS EXPERT

With I.C.S. home study. Pass exams in your spare time and join the highly paid specialists of the electronics industry. Electronics, Electrical Engineering, C & G Certificates and many specialised courses. Send for FREE details stating subject of interest.

**ICS School of Electronics and Electrical Engineering, Dept. 566N, Intertext House, Stewarts Road, London SW8 4UJ.**

### SANWA MULTI TESTERS

P2B	2,000 $\Omega$ /V	£4.85
JP-5D	2,000 $\Omega$ /V	£3.80
U50-DX	20,000 $\Omega$ /V	£8.35
J60 YTR	10,000 $\Omega$ /V	£7.95
A303 TRD	20,000 $\Omega$ /V	£10.35
N401	200,000 $\Omega$ /V	£32.85

### MAGNETIC CARTRIDGES

Goldring	Shure	
G800	M44-7	£6.95
G800H	M55-E	£8.85
G800E	M75-6 Slim	
G800 Super E		£8.85
	£18-25	M75-E(2)
G850	£4.95	£12.70
		M75-E(2) £13.75

### TRANSISTORS

AC107	28p	AD161	
AC126	27p	AD162	75p pr
AC127	23p	BC107	12p
AC132	19p	BC108	12p
AD149	47p	BC109	12p
BC147	20p	OC71	14p
BD117	44p	OC18D	19p
BFY51	23p	OCP71	45p
OC26	40p	2N2926	13p
OC28	52p	2N3055	65p

### RECORDING TAPE

S.P. 5in	600ft	50p	R.S. COMPO.
L.P. 5in	900ft	65p	NENTS.
D.P. 5in	1200ft	92p	TUNERS.
S.P. 5in	900ft	65p	AMPLIFIERS.
L.P. 5in	1200ft	83p	DISCO.
D.P. 5in	1800ft	£1.18	VERO
S.P. 5in	1200ft	78p	BOARD
L.P. 7in	1800ft	98p	S.A.E. for
D.P. 7in	2400ft	£1.44	FREE leaflets

CATALOGUE 25p POST FREE. All prices POST FREE. Minimum order 50p. MAIL ORDER ONLY FROM

P.O. BOX No. 1, LANTRWIT MAJOR, GLAMORGAN CF6 9YN

CELETRON-E

**FOR SALE**

**SURPLUS STOCK  
AT  
REDUCED PRICES**

Cs — Rs — Transistors — small  
3v Electric Motors — Relays —  
Transformers — Plugs —  
Sockets — Etc., Etc.

Send S.A.E. for list.

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

**TRANSISTORS**

**TRANSISTORS 2p EACH**

**SPECIAL BULK PURCHASE**

New unmarked, assorted gain transistors.  
NPN-PNP similar to: BFY 50-53, BCY 30-33,  
BFX.88, 2N3702-3, 2N.3704-11, 2N.706.  
In packs of 50 (units of 10) state types required.

**PRICE £1 PER PACK**

CWO—add 10p P. & P.

Send 3p for Stock and Price Lists

**DIODE IN914 (IN4148) at 3p each**

**BACON ELECTRONICS**

133 High St., HURSTPIERPOINT, Sussex  
TEL. 2554-5

**SERVICE SHEETS**

**SERVICE SHEETS** for Televisions,  
Radios, Transistors, Tape Recorders,  
Record Players, etc., from 5p with free  
Fault-Finding Guide, S.A.E. orders/  
enquiries. Catalogue 15p. Hamilton  
Radio, 47 Bohemia Road, St. Leonards,  
Sussex. Telephone Hastings 29066.

**BOOKS**

**"HOW TO LISTEN TO THE WORLD"**  
published October 1972, £1.90, post 10p  
direct from World Publications' Ware-  
house, order from: David McGarva,  
Box 114E, Edinburgh EH1 1HP.

**CASSETTES**

**TOP QUALITY**, low noise audio mag-  
netics cassettes with fitted screws, in  
library case, C60 30p, C90 40p, C120 50p.  
P&P 15p. Ingo Ltd., 72 West End Lane,  
London, NW6.

**WANTED**

**EVERYDAY ELECTRONICS**, parts 1,  
3, 4, 5, 7. State price required. Box 2.

**URGENTLY REQUIRED**, the first  
eight parts of Everyday Electronics  
complete, please reply immediately.  
Box No. 3.

**YATES ELECTRONICS  
(FLITWICK) LTD**

DEPT. E.E., ELSTOW STORAGE DEPT.  
KEMPSTON HARDWICK,  
BEDFORD.

**C.W.O. PLEASE. POST AND PACKING  
PLEASE ADD 16p TO ORDERS UNDER £2**

Catalogue which contains data sheets for most of the  
components listed will be sent free on request.  
10p stamp appreciated.

OPEN ALL DAY SATURDAYS

**RESISTORS**

1/4W Iskra high stability carbon film—very low noise—capless construction.  
1/4W Mullard CR25 carbon film—very small body size 7.5 x 2.5mm. 1/4W 2%  
Electrosil TRS.

Power watts	Tolerance	Range	Values available	Price
1/4	5%	4.7Ω-2.2MΩ	E24	1-99 100+
1/4	10%	3.3MΩ-10MΩ	E12	1-0p 0-8p
1/2	2%	10Ω-1M	E24	3-5p 3-0p
1/2	10%	1Ω-3.9Ω	E12	1-0p 0-8p
1	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 1/4W, lin 1/4W).  
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.

**TRANSISTORS**

AC107 15p	BC107 10p	BF195 15p	OC81 12p	2N3703 12p
AC126 12p	BC108 10p	BFY50 22p	OC82D 12p	2N3704 13p
AC127 12p	BC109 10p	BFY51 22p	OCF71 40p	2N3705 12p
AC128 12p	BC147 10p	BFY52 22p	ORP12 50p	2N3706 11p
AC131 12p	BC148 13p	BSY56 32p	2N2369 16p	2N3707 12p
AC132 12p	BC149 13p	OC26 45p	2N2646 60p	2N3708 10p
AD140 50p	BC157 13p	OC28 45p	2N2926R 9p	2N3709 11p
AD151 33p	BC158 13p	OC35 45p	2N2926O 9p	2N3710 11p
AD162 36p	BC159 13p	OC42 12p	2N2926Y 9p	2N3711 11p
AF114 20p	BD131 75p	OC44 12p	2N2926G 10p	2N4062 12p
AF115 20p	BD132 75p	OC45 12p	2N3054 58p	ZTX302 15p
AF116 20p	BF179 32p	OC70 12p	2N3055 60p	ZTX500 16p
AF117 20p	BF181 25p	OC71 12p	2N3442 140p	ZTX503 16p
AF118 38p	BF194 15p	OC72 12p	2N3702 13p	40362 58p

**ZENER DIODES**

400mW 5% 3-3V to 30V, 15p.

**LINEAR IC's (DIL)**

709 50p	741 50p
710 50p	748 50p

**DIL SOCKET**

14 and 16 pin  
16p

**DIODES**

RECTIFIER	VOLTS	IA	SIGNAL	PRICE
BY127	1250V	1A	OA85	7p
BZY10	800V	6A	OA90	5p
BZY13	200V	6A	OA91	5p
IN4001	50V	1A	OA202	7p
IN4004	400V	1A	IN4148	8p
IN4007	1000V	1A	BA114	5p

**BRUSHED ALUMINIUM PANELS**

12in x 6in—25p; 12in x 2 1/2in—10p; 9in x 2in—7p.

**SLIDER POTENTIOMETERS**

86mm x 9mm x 16mm, length of track 59mm.  
SINGLE 10K, 25K, 100K log. or lin. 40p.  
DUAL GANG, 10K + 10K etc. log. or lin. 60p.  
KNOB FOR ABOVE 12p.  
FRONT PANEL 65p

18 Gauge panel 12" x 4" with slots cut for use with slider pots. Grey or matt  
black finish complete with fixings for 4 pots.

**MULLARD POLYESTER CAPACITORS C295 SERIES**

400V: 0-001µF, 0-0015µF, 0-0022µF, 0-0033µF, 0-0047µF, 2 1/2p. 0-0068µF, 0-01µF,  
0-015µF, 0-022µF, 0-033µF, 3p. 0-047µF, 0-068µF, 0-1µF, 4p. 0-15µF, 6p. 0-22µF, 7 1/2p.  
0-33µF, 11p. 0-47µF, 13p.  
160V: 0-01µF, 0-015µF, 0-022µF, 0-033µF, 0-047µF, 0-068µF, 3p. 0-1µF 3 1/2p. 0-15µF,  
4 1/2p. 0-22µF, 5p. 0-33µF, 6p. 0-47µF, 7 1/2p. 0-68µF, 11p. 1-0µF, 13p.

**MULLARD POLYESTER CAPACITORS C280 SERIES**

250V P.C. mounting: 0-01µF, 0-015µF, 0-022µF, 3p. 0-033µF, 0-047µF, 0-068µF  
3 1/2p. 0-1µF, 4p. 0-15µF, 5p. 0-22µF, 6p. 0-33µF, 7 1/2p. 0-47µF, 8 1/2p. 0-68µF, 11p. 1-0µF, 13p  
1-5µF, 20p. 2-2µF, 24p.

**MYLAR FILM CAPACITORS 100V,**

0-001µF, 0-002µF, 0-005µF, 0-01µF, 0-02µF  
2 1/2p. 0-04µF, 0-05µF, 0-068µF, 0-1µF, 3 1/2p.

**CERAMIC DISC CAPACITORS**

100pF to 10,000pF, 2p each.

**ELECTROLYTIC CAPACITORS—MULLARD C426 SERIES**

(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.

**MULLARD C437 SERIES**

100/40, 160/25, 250/16, 400/10, 640/6-4, 800/4, 1000/2-5, 9p. 100/64, 160/40, 250/25,  
400/16, 640/10, 1250/4, 1000/6-4, 1600/2-5, 12p. 160/64, 250/40, 400/2-5, 640/16,  
2000/4, 1000/10, 1600/6-4, 2500/2-5, 15p. 250/64, 400/40, 640/25, 3200/4, 1000/16,  
1600/10, 2500/6-4, 4000/2-5, 18p.

**ELECTROLYTIC CAPACITORS Miniature P.C. mounting**

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

**VEROBOARD**

0-1	0-15
2 1/2 x 3 1/2	22p
2 1/2 x 5	17p
3 1/2 x 3 1/2	21p
3 1/2 x 5	24p
17 x 2 1/2	28p
17 x 3 1/2	75p
17 x 5 (plain)	100p
17 x 3 1/2 (plain)	82p
17 x 2 1/2 (plain)	60p
2 1/2 x 5 (plain)	42p
3 1/2 x 3 1/2 (plain)	11p
Pin insertion tool	52p
Spot face cutter	42p
Pkt. 50 pins	20p

**JACK PLUGS AND SOCKETS**

Standard screened	18p	2-5mm insulated	8p
Standard insulated	12p	3-5mm insulated	8p
Stereo screened	35p	3-5mm screened	13p
Standard socket	15p	2-5mm socket	8p
Stereo socket	18p	3-5mm socket	8p

**D.I.N. PLUGS AND SOCKETS**

2 pin, 3 pin, 5 pin 180°, 5 pin 240°, 6 pin  
Plug 12p. Socket 8p.  
4 way screened cable 15p/metre  
6 way screened cable 22p/metre

**BATTERY ELIMINATOR**

£1.50  
9V mains power supply. Same size as PP9 battery

**THERMISTORS**

VA10555 15p	VA10665 15p	VA1077 15p	R53	£1.35
-------------	-------------	------------	-----	-------

**COMPACT CASSETTES—IN PLASTIC LIBRARY BOX**

C90	65p	C120	85p
-----	-----	------	-----

**LARGE (CAN) ELECTROLYTICS**

1600µF	64V	74p	3200µF	16V	50p
2500µF	40V	74p	4500µF	16V	50p
2500µF	50V	58p	4500µF	25V	£1.68
2500µF	64V	80p	5000µF	50V	£1.10
2800µF	100V	£3.00			

**HIGH VOLTAGE TUBULAR CAPACITORS—1,000 VOLT**

0-01µF	10p	0-047µF	13p	0-22µF	20p
0-022µF	12p	0-1µF	16p	0-47µF	22p

**POLYSTYRENE CAPACITORS 160V 2 1/2%**

10pF to 1,000pF E12 Series values 4p each.

### TAPE HEADS

We are gradually obtaining more information about the Truvox tape heads we have, we are told that these have been ground in a very ingenious way so that winding may be coupled either in parallel or in series depending whether high or low impedance is required. We also have matching erase heads and now offer these in pairs. 1 reel and 1 erase head. Price of the 2 track 45p per pair. 4 track 75p per pair. Pair mounted on plate 45p extra.

### I.R.P.M. MOTOR

Made by the famous Smiths Company. 240v 50 cycle mains working. Ideal motor to drive clock mechanism. Price £1 each or 10 for £9.

### DRILL CONTROLLER

#### NEW IKW MODEL

Electrically changes speed from approximately 10 revs. to maximum. Full power at all speeds by finger-tip control. Kit includes all parts, case, everything and full instructions. £1.50 plus 13p post and insurance. Made up model also available. £2.25 plus 13p post & p.

**CONTROL DRILL SPEEDS**

### MAINS OPERATED CONTACTOR

250/240v. 50 cycle solenoid with laminated core so very silent in operation. Closes 4 circuits each rated at 10 amps. Extremely well made by a German Electrical Company. Overall size 2 1/2 x 2 x 2in. £1.50 each.

### HIGH ACCURACY THERMOSTAT

Uses differential comparator I.C. with thermostat as probe. Designer claims temperature control to within 1/10th 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. £5.75 plus 25p post and insurance.

### WATERPROOF HEATING ELEMENT

28 yards length 70W. Self-regulating temperature control. 50p post free.

### MULTI-SPEED MOTOR

Replacement in many well-known food mixers. Six speeds are available 500, 850 and 1,100 r.p.m. from either or both of the nylon sockets (where the heaters of the food mixer normally go) and 8,000, 12,000 and 15,000 r.p.m. (ideal polishing speeds) from the main drive shaft. This drive shaft is 1 in. diameter and approximately 1 in. long. A further point about this motor is that being 250/240v. A.C./D.C. series wound its speed may be further controlled with the use of our Thyristor controller. This is a very powerful and useful motor size approx. 2 in. dia. x 5 in. long, mains 250/240v. Price £8p plus 25p postage and insurance. 12 or more post free.

### ISA ELECTRICAL PROGRAMMER

Learn in your sleep: Have radio playing and kettle boiling as you awake—switch on lights to warn off intruders—have warm house to come home to. All these and many other things you can do if you invest in an electrical programmer. Clock by famous maker with 16 amp. on/off switch. Switch on time can be set anywhere to stay on up to 6 hours. Independent 60 minute memory jogger. A beautiful unit. Price £1.95 + 20p p & p or with glass front chrome bezel 75p extra.

### 0.8 AMMETER

2in square full vision for stub mounting. Moving iron instrument. Ideal for charger. Price 60p each. 10 for £5.40.

### NUMICATOR TUBES

For digital instruments, counters, timers, clocks, etc. Hi-vac XN. 3. Price £1.45 each. 10 for £13.

### 12 WAY SUB-MINIATURE MULTI-CORE CABLE

7-0076 copper cores each core P.V.C. insulated and of different colors. P.V.C. covered overall and approx. 3/16in. thick. Price 50p per yard.

### LIGHT CELL

Almost zero resistance in sun-light increases to 10 K Ohms in dark or dull light, epoxy resin sealed. Size approx. 1in. dia. by 1/2in. thick. Rated at 500 MW, wire ended. 45p with circuit. Also ORP 12 light cell 45p.

## MULLARD 4 + 4 STEREO AMPLIFIER

We demonstrate these daily and almost always a sale results; it really is a cracking amplifier. Only Mullard with their know how could have made it possible at this low price. B.P.C.C.: Mains operated; 4 watts music or speech per channel; Double wired power supply eliminates cross talk. Harmonic distortion less than 2%. Frequency response 50Hz-16KHz. Input suitable for pick up tuner or microphone. 6 month guarantee. Only £2.95 + 30p postage and insurance.



### THYRISTOR LIGHT DIMMER

For any lamp up to 200 watt. Mounted on switch plate to fit in place of standard switch. Virtually no radio interference. Price £2.50 plus 20p post and insurance.



### 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. Compress motor, Impeller, 2kW. element and 1kW. element allowing switching 1.2 and 2kW. and with thermal safety cut-out. Can be fitted into any metal line case or cabinet. Only need control switch. £2.50. 2kW. Model as above except 2 kilowatts £2.50. Don't miss this. Control Switch 35p. P. & P. 40p.



### DISTRIBUTION PANELS

Just what you need for work bench or lab. 4 x 13 amp sockets in metal box to take standard 13 amp fused plugs and on/off switch with neon warning light. Supplied complete with 6 feet of flex cable. Wired up ready to work. £2.25 plus 25p P. & I



### THIS MONTH'S SNIP

A bargain parcel of 7 motors for £1. Some not as large as a postage stamp and only 1/2" thick, largest is 1 1/4" x 1 1/2". Some work off 1 1/2" some as high as 1 1/2". These motors are used in racing cars, power toys etc. The largest is so powerful that it will drive a Mini drill, model lathe, or similar. This is a 4 pole motor, optimum working 15-5v but very powerful even as low as 4v. Don't miss this wonderful snip.

### REPEATING TIME SWITCH

1 or 2 on/off per 24 hours. Repeats until re-programmed. Switches up to 15 amp. Switching time completely adjustable through 24 hours. Precision made with 24 hour dial. Miniature—will fit into 2in cube. Mains operated clock but switch may be isolated for switching battery sets. Ideal for shop window lighting, anti-theft devices, central heating control and many other automatic processes. Price with instructions £2 each plus 20p post and insurance.

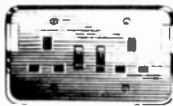
### STANDARD WAFER SWITCHES

Standard size 1 1/2" wafer—silver-plated 5-amp contact, standard 1/2" spindle 2" long—with locking washer and nut.

No. of Poles	2 way	3 way	4 way	5 way	6 way	8 way	9 way	10 way	12 way
1 pole	40p	40p	40p	40p	40p	40p	40p	40p	40p
2 poles	40p	40p	40p	40p	40p	40p	40p	40p	40p
3 poles	40p	40p	40p	40p	70p	70p	85p	85p	85p
4 poles	40p	40p	40p	70p	70p	70p	70p	£1.20	£1.20
6 poles	40p	40p	70p	70p	70p	85p	85p	£1.45	£1.45
8 poles	40p	70p	70p	70p	70p	85p	85p	£1.70	£1.70
9 poles	70p	70p	70p	85p	£1.20	£1.20	£1.20	£1.95	£1.95
10 poles	70p	70p	70p	85p	£1.20	£1.20	£1.20	£2.20	£2.20
11 poles	70p	70p	85p	85p	£1.45	£1.45	£1.45	£2.45	£2.45
12 poles	70p	85p	85p	85p	£1.20	£1.20	£1.70	£1.70	£2.95
					85p	£1.20	£1.70	£1.70	£2.20

### MULLARD AUDIO AMPLIFIER MODULE

Uses 4 transistors, and has an output of 500mW into 8 ohm speakers. Input suitable for crystal mic, or pick-up. 9 volt battery operated. Size 2" long x 1 1/2" wide x 1" high. SPECIAL SNIP PRICE 60p each. 20 for £5.40.



### 13 AMP TWIN GANG SOCKETS

Offered at less than wholesale price your opportunity to replace those dangerous adaptors—brown bakelite flush mounting—standard fitting. Unswitched 80p each, separately switched 85p each. Separately switched and with neon on/off indicators 45p each. Less 10% ten or more + 20p postage if order under £5.

### 50 MICRO AMMETER

Square, panel mounting type. £2

### 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 MPN 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.

### MULLARD I.F. MODULE

This is a fully screened intermediate frequency module for amplification and detection of i.f. signals at 10.7MHz and a.m. signals of 470kHz. The first stage is used as an i.f. amplifier for i.f.m. and a self-oscillating mixer for a.m. operation, in conjunction with an external oscillator coil. 75p each. 10 for £6.75. 100 for £63.50p. With connection dig.

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

### MINIATURE WAFER SWITCHES



2 pole, 2 way—4 pole, 2 way—3 pole, 3 way—4 pole, 3 way—2 pole, 4 way—3 pole, 4 way—2 pole 5 way—3 pole, 12 way. All at 20p each, £1.80 for ten, your assortment.

### TOGGLE SWITCH

3 amp. 250v. with fixing ring 7p each, 75p doz



### ROCKER SWITCHES

Three new types to offer this month all snap-in fitting into oblong holes. Type 1. S.P. on/off 10 amp. 250V. Size approx. 1 1/2" x 1". Made by Arrow Electric. (93 series). Price 15p each; 10 for £1.08.

Type 2. D.P. on/off 10 amp. 250V with neon indicator in the lever. Again Arrow 93 series. Price 25p each or 10 for £2.25.

### SLIDE SWITCH

2 pole change over panel mounting by two 6 BA screws. Size approx. 1" x 1/2" rated 250v lamp 6p each, 10 for 64p. 100 for £5.10. 500 for £24.



### MICRO SWITCH

5 amp changeover contact, 5p each, £1 doz. 15 amp Model 10p each or £1.05 doz.



### NEED A SPECIAL SWITCH?

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



### PRESSURE SWITCH

Containing a 15 amp. change over switch operated by a diaphragm which in turn is operated by air pressure through a small metal tube. The operating pressure is adjustable but is set to operate in approx. 10 in. of water. There are quite low pressure devices and can in fact be operated simply by blowing into the inlet tube. Original use was for washing machines to turn off water when tub has reached correct level but no doubt has many other applications. 75p each. 10 for £6.75.



### SWITCHES ???

We could fill this whole page with all the switches we have so if you can't see the one you want send for our switch list.

**TIMED "ON" SWITCHES.** Made by Smiths for washing machines, etc. Centre spindle closes double pole 15 amp switch directly it is turned. A full 360° turn only a part turn winds the clockwork mechanism and keeps the switch closed until the spindle returns to the "off" position. A dial therefore could be fitted to indicate hours and minutes and the switch on period could be set quite accurately. 3 models available—90 minutes, 120 minutes and 360 minutes. Price 95p each. Metal dial pointer knob 15p. Suitable reed to make the switch "on" instead of "off". 35p.

**LEVER SWITCH—Ref. H52/4.** Ideal for intercom or similar. Pressing the lever down operates 6 pairs of change-over contacts, pressing the lever up operates 4 pairs of change-over contacts. The switch is spring loaded and normal returns to the off or centre position. Size approximately 1 1/2" long x 2 1/2" deep x 1" thick. 40p each.

**5 PUSH BUTTON SWITCHES.** Mains, suitable for audio or R.F. Each switch rated at 250v. 15 amps. 1st (black push button) closes 2 circuits. 2nd (white push button) operates one change-over. 3rd (white push button) operates one change-over. 4th (white push button) opens one circuit. Note: all depressed buttons remain down until cleared by the 5th (red button). Further note: It is a relatively easy job to alter the position of the tags thus making the switches suit your circuit. Fitted with 3 white, 1 red and 1 black button. 30p each or 10 for £2.70.

**PUSH OPERATED MICROSWITCH.** Change-over contacts, spring return when plunger released. Also fitted with lamp holder to take Lilliput lamp in plunger; fixing is by locknut, through 1/8" hole. Price 25p each or 10 for £2.25.

**22-POSITION SOLENOID OPERATED STUD SWITCH.** Mains operated, each current pulse to switch solenoid moves switch arm through one position on to the next contact stud—current to release solenoid brings back switch arm to position one. These are re-experiment but in good working order. Any not so would be replaced. Price 50p each.

## J. BULL (ELECTRICAL) LTD.

(Dept. E.E.), 7 Park Street, Croydon CRO 1YD

Callers to: 102/3 Tamworth Road, Croydon.



# ADCOLA

meet the precision  
'INVADER' SOLDERING INSTRUMENTS

Precision instruments supplied with standard detachable copper chisel face bits. Standard temp. 360°C at 19/23/27 watts. Special temps. from 250°C/410°C.

For perfection  
in soldering

**L1076**  
BIT SIZE 1/4"  
6.34 mm Dia.  
27 watts.  
£2.18

**L646**  
BIT SIZE 3/16"  
4.75 mm Dia.  
23 watts.  
£2.12

**L706** →  
BIT SIZE 1/8"  
3.2 mm Dia.  
19 watts.  
£1.96



Don't take chances. We don't. All our ADCOLA Instruments are of impeccable quality. You can depend on ADCOLA day after day. That's why they're so popular. You get good service... reliability... from our famous thermally controlled ADCOLA Element and the tough steel construction of this production tool. ADCOLA day after day.

Send for NEW catalogue today

ADCOLA PRODUCTS LTD. ADCOLA HOUSE GAUDEN ROAD LONDON, SW4 6LH  
Postage, packing paid on orders over £2 under £2, add £0.10

Models required

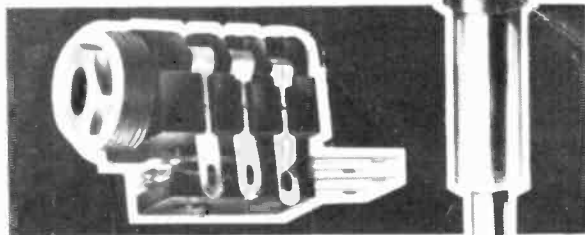
Enclosing P/O or cheque for

Name

Address

EES

# Are you alright for Jacks?



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

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

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

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



## RENDAR

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

## SOUND BARGAINS

**GIANT POWER MULTI-WAVEBAND COMMUNICATIONS RECEIVER**  
WITH 3 in 1 AC/DC POWER SUPPLY SYSTEM  
Mains/BATTERY plus BUILT-IN BATTERY BOOSTER

**BEST OF ALL WORLDS**

VHF, FM, AM, A.F.C., AIR BAND, PUBLIC SERVICE, AND WEATHER BANDS

**OUR PRICE £10.50**  
+40p P. & P.

THIS NEW 1972 RADIO. No less than 3 VHF BANDS. Picks up Aircraft Transmissions, Pop Pirates, Taxis, Ambulances, Local Radio, Continental and all BBC, VHF Stations plus fascinating Public Service Transmissions we are not allowed to mention! Even TV sound in certain areas. PLUS A SPECIAL WEATHER-BAND. Frequency ranges: MW540-1600 KUZ, FM88-108MHz, Airband 108-145 MHz, VHF 145-175MHz, 23 semi-conductors—12 transistors, 11 diodes and thermistors. Automatic frequency control. 31" telescopic aerial. Runs off mains AC 230/250 volts or off 4 U11 batteries, or use re-chargeable nickel alkali cell. Finished in strong leather grained case with carrying handle. Approx. size 10 1/2" x 6 1/2" x 3 1/2". Written guarantee. Special magnetic ear-piece for personal listening, dry batteries FREE. HURRY! Limited quantity only from Marktyme. Fully guaranteed.

**BATTERY CHECK INDICATOR**

**OUR PRICE £28.95**  
+50p P. & P.

Tune into the world with this amazing communications receiver. A truly exceptional unit in performance and looks—leatherette with stainless steel trim. Looks good anywhere. Use either as a portable with standard batteries or plug it directly into 220-240 volt domestic mains supply. 14 Transistors; 9 diodes; thermistor. Internal ferrite rod antenna plus telescopic aerial. Separate tone, volume and tuning controls with push-button selectors for the 8 WAVEBANDS. Complete with U-FI earphone for personal listening. Frequency ranges: Long wave 150-350Kcs. Medium 353-1605Kcs. Marine 1.6-4.5Mcs. Short Wave 12-24Mcs. FM/VHF 88-108Mcs. Aircraft 108-135 Mcs. PUBLIC SERVICE BANDS 135-174Mcs. Fully guaranteed.

**8 WAVEBANDS AND WORLD MAP & TIME ZONE DIAL**

**MARKTYME**

(Dept. ED6), 372 EDGWARE ROAD, LONDON, W.2. Tel. 01-723 0094.  
Caller welcome Monday to Saturday 9 a.m.-6 p.m.

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

**MARKTYME**

# U.K.'s LARGEST ELECTRONICS CENTRES! HENRY'S RADIO LTD. EDGWARE ROAD, LONDON, W.2.

**NOW OPEN!**

404-406 ELECTRONIC COMPONENTS & EQUIPMENT 01-402 8381  
354-356 HIGH FIDELITY & TAPE EQUIPMENT 01-402 5854/4736  
309 PA - DISCO - LIGHTING HIGH POWER SOUND 01-723 6963  
303 BARGAIN STORE SPECIAL OFFERS All Mail to: 303, Edgware Rd., London, W2 1BW

ALL YOUR ELECTRONIC REQUIREMENTS WITHIN 200 YARDS. CALL IN AND SEE FOR YOURSELF.

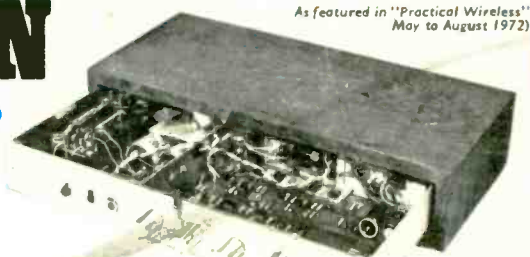


## BUILD THE TEXAN

**20 + 20 WATT INTEGRATED I.C. STEREO AMPLIFIER**

★ **FREE TEAK CABINET** with complete kits!

**FEATURES.** New slim design with 6 - IC's, IC sockets, 10 silicon transistors, 4 rectifiers, 2 zeners, special Gardener's low field slim line transformer. Fibre glass PC panel. Complete chassis work.  
**HIGH QUALITY & STABILITY ARE PREDOMINATE FEATURES** — DEVELOPED BY TEXAS ENGINEERS FOR PERFORMANCE, RELIABILITY AND EASE OF CONSTRUCTION.  
**FACILITIES.** On/off switch indicator, headphone socket, separate treble, bass, volume and balance controls, scratch and rumble filters, mono/stereo switch, input selector; Mag. P.U. Radio Tuner, Aux. Can be altered for Mic., Tape, Tape-head, etc (Parts list Ref. 20 on request).



As featured in "Practical Wireless" May to August 1972

**SPECIAL KIT PRICE**  
**£28.50 P & P**  
45p

★ **SLIM DESIGN WITH SILVER TRIM**  
Overall chassis size 14 1/2" x 6" x 2" high

**COMPLETE WITH FREE TEAK CABINET**  
Designer approved kits only available from Henry's

### RECORD DECKS

- CHASSIS (Post 50p)  
SP25/3£10.75 HT70 £15.00  
MP60 £10.40 MP610 £14.15  
AP76 £18.95 GL72 £22.25  
WITH PLINTH/COVER (Post 70p)  
MP60 £17.20 TD150AB  
HT70 £21.60 £41.45  
HL(GL75) PLI2AC  
£35.25 £35.25  
MP610£20.35 BD2 £32.25  
CART/PLINTH/COVER (Post 70p)  
(HL) AP76/G800/PC £29.95  
(HL) SP25-3/G800/PC £18.95  
HT20/G800/PC £27.00  
(HL) 2025TC/9TAHCD/PC £13.50  
MP60/SC5MD/PC £17.25  
(HL) GL75/G800/PC £44.15  
(HL) GL72/800/PC £35.50

### ULTRASONIC TRANSDUCERS

Operate at 40Kcs up to 100 yds. Ideal remote switching and signalling. Complete with data and circuits.  
£5.90 per pair. Post 10p

### MARRIOT TAPE HEADS

- 4 TRACK MONO or 2 TRACK STEREO  
'17' High Impedance £2.00  
'18' Med. Impedance £2.00  
'36' Med.-Low imp. £3.50  
Erase Heads for above 75p  
'63' 2 track mono- £1.75  
'43' Erase Head for above 75p

### POWER INTEGRATED CIRCUITS

Plessey SL403D—3 watt with 8 page data, layouts and circuits £1.50. P.C. Board 60p. Heat Sink 14p.  
Sinclair IC12—6 watt with data and circuits £1.80.  
TH9013P—20 watt Power Amp Module £4.57.  
TH9014P-IC Preamp £1.50. Data/Circuits for above No. 42 10p

### 7 SEG & NIXIE TUBES

(Post 15p per 1 to 6)  
XN3, XN13, GN6 0-9 side view with data, 85p.  
TH9014P-IC Preamp £1.50. Data/Circuits for above No. 42 10p

### Miniature Amplifier

5 transistor, 300mW o/p. Fitted volume and sensitivity control, 9 volt operated, £1.75 each P/P 15p.

### Quality Slider Controls

60mm stroke singles and ganged. Complete with knobs: 5K, 10K, 25K, 100K, 500K, 1 meg, Log and Lin, 40p each, 10K, 25K, 50K, 100K, Log and Lin ganged, 60p each.

### Hi-Fi & Tape Equipment

Acknowledged as U.K.'s Largest Stockists with Lowest Prices Plus 12 months Guarantee. Write or call for FREE 16 page lists (Ref. 16/17)

Transistors-IC's-SCR's-Rectifiers- Triacs, etc. NEW FREE LISTS Ref. No. 36 on request.

### LOW COST HI-FI SPEAKERS

- E.M.I. Size 1 1/4" x 8 1/4". Large Ceramic Magnet.  
TYPE 150 6 watt, 3, 8 or 15 ohms £2.20. Post 22p.  
TYPE 150 TC Twin cone version £2.75. Post 22p.  
TYPE 450 10 watt with twin tweeters and crossover, 3, 8 or 15 ohms. £3.85. Post 25p.  
TYPE 350 20 watt with tweeter and crossover, 8 and 15 ohms. £7.70. Post 28p.

POLISHED CABINETS 150, 150TC 450 £4.60. Post 30p.

### ML-3 MW/LW TUNER TO BUILD

Uses Mullard Module. Slow motion tuning. Built in battery. Ferrite aerial. Overall size 7" x 2 1/2" x 3 1/2". TOTAL COST TO BUILD £4.85, Post 15p. All parts sold separately. Leaflet No. 6

### "BANDSPREAD" PORTABLE TO BUILD

Printed circuit all transistor design using Mullard RF/IF Module. Medium and Long Wave bands plus Medium Wave Bandspread for extra selectivity. Also slow motion geared tuning, 600 mW push-pull output, fibre glass PVC covered cabinet, car aerial. Attractive appearance and performance. TOTAL COST TO BUILD £7.98, p.p. 32p. (Battery 22p). All parts sold separately—Leaflet No. 2

### TEST EQUIPMENT

- SE250B Pocket Pencil Signal Injector £1.90  
SE500 Pocket Pencil Signal Tracer £1.50  
TE15 Grid Dip Meter 440 KHz-280 mHz £13.45  
500 30 K/V Multimeter £9.25 With leather case £10.50  
200H 20K/V Multimeter £4.20. With case £4.95  
AF105 50K/V Multimeter £8.50. With case £9.50  
U4341 A/C/D/C Multimeter with transistor tester with steel case £10.50  
TE20D RF Generator 120KHz-500MHz £15.95. Carr. 35p  
TE22D Audio Generator 20Hz-200KHz £17.50. Carr. 35p  
TO3 3" Scope 1 1/2MHz £39.00. Carr. 50p  
CI-5 3" Pulse Scope 10Hz-10MHz £39.00. Carr. 50p  
TE65 Valve Voltmeter 28 ranges £17.50. Carr. 40p



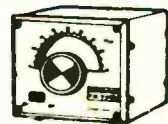
### PA-Disco-Lighting

U.K.'s Largest Range—Write phone or call in. Details and demonstrations on request.  
DJ30L 3 Channel sound to light unit, 3kw £28.50  
DJ40L 3 Channel Mic (Built in) to light, 3kw £37.50  
DJ70S 70 watt Disco amp/mixer £49.75  
DISCOAMP 100 watt Disco amp/mixer £67.50  
DJ105S 30 watt Disco amp/mixer £31.00  
Anti-Feedback Quality Mic. £11.50  
SDL 12" 50 watt 8 ohm Full range speaker £12.95  
DECKS. Use MP60 or SP25/3 see above  
Matching cartridge SC5M £2.62  
FIBRE OPTICS, LIGHTING EFFECTS, PROJECTORS, SPOTS, DIMMERS, MIXERS. Everything for PA—Disco—Lighting. FREE Stock List Ref. No. 18.



### BUILD THIS VHF FM TUNER

5 TRANSISTORS 300 kc/s BANDWIDTH, PRINTED CIRCUIT, HIGH FIDELITY REPRODUCTION, MONO AND STEREO  
A popular VHF FM Tuner for quality and reception of mono and stereo. There is no doubt about it—VHF FM gives the REAL sound. All parts sold separately. Free Leaflet No. 3 & 7.  
TOTAL £6.97, p.p. 20p. Decoder Kit £5.97.  
Tuning meter unit £1.75  
Mains unit (optional) Model PS900 £2.47. Post 20p  
Mains unit for Tuner and Decoder PS6/2 £3.25. Post 20p



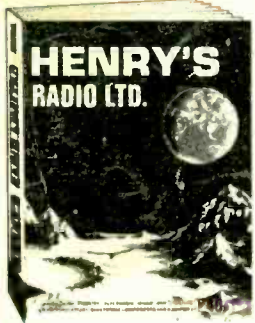
### SINCLAIR PROJECT 60 MODULES —SAVE POUNDS!

- Z30 £3.57; Z50 £4.37  
STEREO 60 PZ5 £3.97  
£7.97; PZ8 £4.77  
PZ6 £6.37;  
Transformer for PZ8 £2.95  
Active Filter Unit £4.45  
Stereo FM Tuner £16.95  
IC12 £1.80; Q16's £15 pr.  
Post etc. 20p per item



### PACKAGE DEALS

- Post 25p  
2xZ30, Stereo 60, PZ5 £15.95  
2xZ30, Stereo 60, PZ6 £18.00  
2xZ50, Stereo 60, PZ8 £20.25  
Transformer for PZ8 £2.95  
PROJECT 60S KIT £19.95



### CATALOGUE

Fully detailed and illustrated covering every aspect of Electronics—plus data, circuits and information. 10,000 Stock lines at Special Low Prices and Fully Guaranteed.  
PRICE 55p Post Paid (40p FOR CALLERS).  
PLUS! FIVE 10p VOUCHERS  
Send to this address—HENRY'S RADIO LTD. (Dept. EE) 3 ALBEMARLE WAY, LONDON, E.C.1.—for catalogue by post only. All other mail and callers to "303" see below.

**MORE OF EVERYTHING AT LOW PRICES ALWAYS AT HENRY'S**  
All the parts you need plus Data and Circuits — Get a Catalogue — It's all in there!

Prices subject to change without notice E. & O.E.

309-354-356-404-406-Open 6 days a week 9am -6pm (303 closed Thurs.) All Stores open all day Saturday.

**H MORE OF EVERYTHING AT THE RIGHT PRICE ALWAYS AT HENRY'S H**