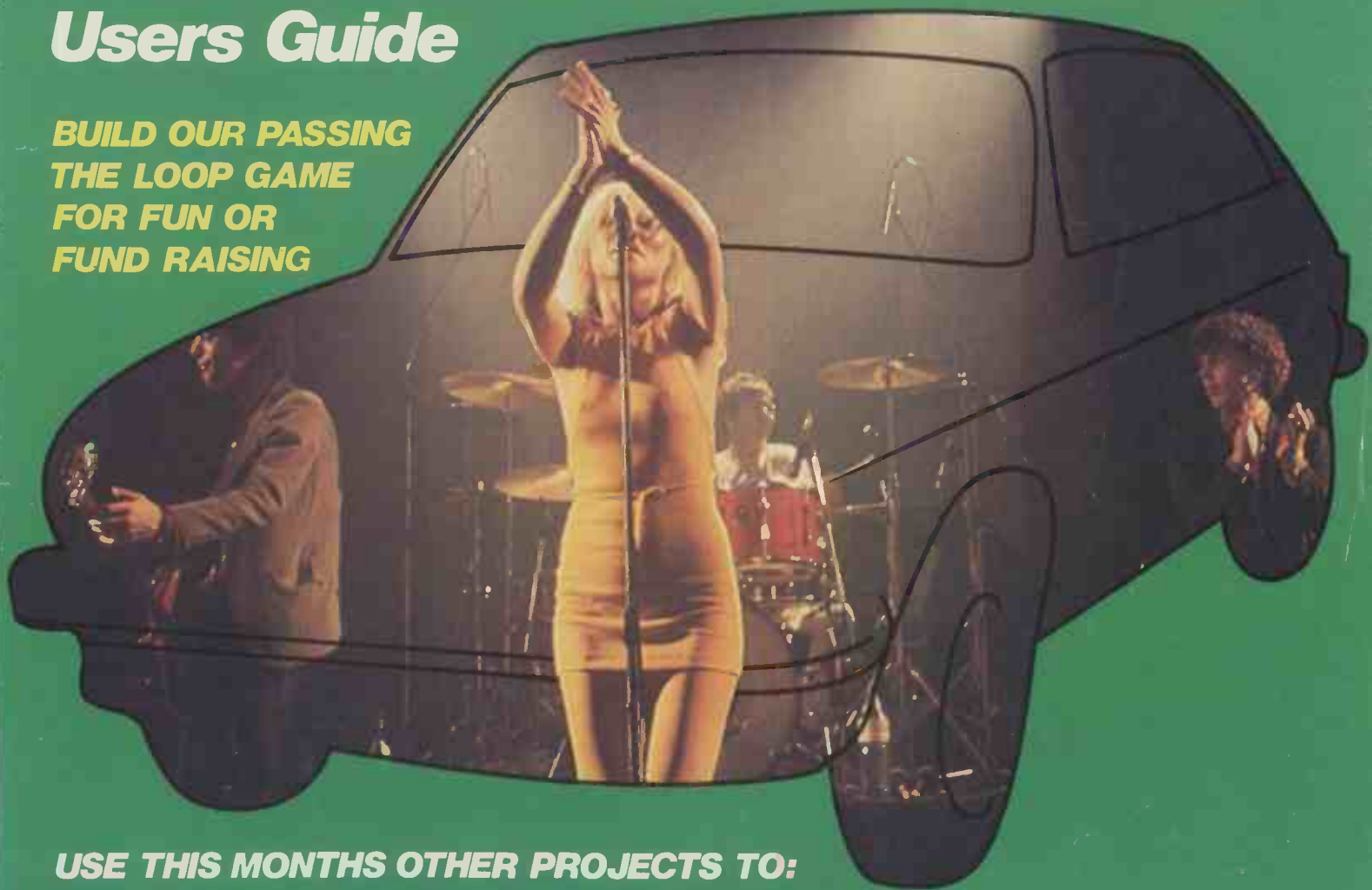


Hobby Electronics

August '80 55p

IN CAR ENTERTAINMENT *A Buyers And Users Guide*

**BUILD OUR PASSING
THE LOOP GAME
FOR FUN OR
FUND RAISING**



USE THIS MONTHS OTHER PROJECTS TO:

Tone Down Your Car Stereo System

Keep Your Valuables In Their Place

Turn Your Trannie InTo An Alarm Clock

Check Out Your OP-AMPS For Under A Fiver

Protect Your Caravan/Boat From Fire...Or Worse

Complete Audio/Tuner Kits



Mk III FM Tuner series

Carriage for Mk III tuner £3 inc

The Mark III series FM tuner has been updated, and now includes a centre zero tuning meter as standard. The instruction manual has been meticulously revised, enabling easy assembly by constructors of various levels of experience - a preview copy may be purchased for £1.00.

Mark III A series 'Reference series' tuner modules£171.35 inc.
Mark III B series 'Hyperfi' modules, with switched IF BW, pilot cancel decoder£198.95 inc.

A matching synthesiser unit will be made available later this year, and can be retrofitted to either version. All versions include digital frequency readout/clock, VU deviation meters, 6 preset stations, 10 turn pot manual tuning, toroidal PSU, output level adjustment, 110/240v AC input. Full alignment service available.

Power Amplifier

Style and performance - with a real 'belt and braces' PSU design.

After a couple of preview comments, it seems that many of you are waiting to hear about the matching HMOSET power amplifier for the Mk III tuner. Well, it's out at last - complete with twin toroidal PSUs for comfortable 80W RMS per channel, over 100W peak, but limited by thermal shutdown of the HMOs. 10W-100W log LED output peak indicator, DC offset protection and switch-on pause relay. AC or DC input coupling, direct or relay protected output terminals. The works. Only one version of this item: Complete kit£178.25 inc. Carr. £5.

Preamplifier

More features and facilities, thanks to DC switching and control design

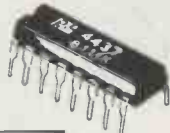
Previewing the most comprehensive audio preamplifier yet..... OC switching of 7 inputs, plus two tape in/out's. 2 low pass, 2 high pass active filters, genuine volume control, 1dB channel matching, with DC volume, balance, bass and treble controls. Suitable for bus/remote control, tape dubbing, switched monitor etc. 80dB S/N+, THD -75dB or better. Pluggable PU equalization boards, tone control override. Price for complete unit about £149 ex VAT.

Semiconductors

Radio/Communications ICs

FOR COMPLETE LISTINGS - SEE OUR NEW PRICELIST

CA3089E	2.11	HA1197	1.61	SD6000	4.31
CA3189E	2.53	CA3123E	1.61	TDA4420	2.59
HA1137W	1.95	TDA1072	3.09	MC1330P	1.38
HA11225	2.47	TBA651	2.53	MC1350P	1.38
HA12412	2.81	TDA1090	3.51	KB4412	2.24
KB4420	1.95	TDA1220	1.61	KB4413	2.24
TBA120S	1.15	TDA1083	2.24	KB4417	2.53
KB4406	0.80	TDA1062	2.24	MC3357P	3.16

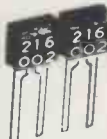


SL1610	1.84	SL1626	2.80
SL1611	1.84	SL1630	1.86
SL1612	1.84	SL1640	2.17
SL1613	2.17	SL1641	2.17
SL1620	2.50	SL6600	4.31
SL1623	2.80	SL6640	3.16
SL1624	3.77	SL6690	3.68
SL1625	2.50	MC1496	1.44

VARIACAP DIODES.....

A section from our PL:

BA102	0.35	16:1 ratio AM tuning
BB204	0.41	KV1215 9v triple 2.93
BB105	0.41	KV1211 9v dual 2.01
BB109	0.31	KV1225 25v triple 3.16
MVAM2	1.93	BB212 9v dual 2.25



POWER MOSFETS

100W PA's made simple

Since pioneering the 100W complementary MOSFET technique - Hitachi have developed a range of output devices and drivers that ought to revolutionise opinions and attitudes towards the design of all LF amplification systems. We have a new 48 page application note (£1.50 inc) and complete sets of parts, modules and now the new complete PA system (see above).

2SK133 120v N-ch 100W MOSFET £6.33 2SJ48 Pch complement £6.33
2SK135 160v N-ch 100W MOSFET £7.29 2SJ50 Pch complement £7.39
PA101B Kit for 100W MOSFET PA less Heatsink £16.10. (£23 inc heatsink/bkt)

ULTRA LOW NOISE PU PREAMPLIFIER

The HA12017 is the last word in PU preamps, and general low noise audio design. It is an SIL IC, with 86dB S/N in RIAA configuration, 10v RMS output capability, 0.002% typ THD at 10v RMS output (imagine the overload margin !!). It comfortably supercedes discrete circuit designs in terms of price/performance, and takes the art beyond the TDA1042's capabilities. (Replaces HA1457) £1.80 each - or an RIAA applications PCB with two ICs for £5.75. Complete with Rs&Cs £9.95.

Radio Control ICs

We have various RC ICs, including NE544 NE5044, and two new ones from OKI

KB4445 4 channel dig.prop. FM TX IC. 30mW out (amplifiable) -£2.30 inc
KB4446 4/5 ch. dig. prop FM RX IC. Suits KB4445 or RCME syst. £2.65.
KB4445/6 pair: £4.75. New 8 page data-sheet 35p + SAE. More RC ICs in list

CMOS, LPSNTTL, TTL, MPU:

Most CMOS is available in low volume - also LPSN. Standard lines: and TTL OK.

Things like ICM7216B, ICL8038, 8080A, 6800P, 2708, NE555, NE556, etc

Coming Soon..... Contain yourselves, RF fans! Not yet ready for a full launch until autumn, but previewed here:

SSB transceiver system : 10kHz to 1000MHz !!

A modular VLF to UHF SSB TX/RX system at last. With the correct first mixer, the basic PCB covers 10kHz to 1000MHz, using LO fed from ext. source (Our 2 IC Mullard synth for instance) and RF PA for TX. OP: 0.2uV basic sensitivity in HF. Typ cost for HF synth SSB RX will be less than £200. Add an RF PA for full TRX for another £50. See one in my foyer, and marvel.

CATALOGUES 60p ea. All those for £1.60
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Radio/Audio/Communications Modules

LW-MW-SW-SW DC tuned and switched

91072: All switching of bands by a single pin to gnd. Varicap tuned, with LO output for synth. MW/LW version or MW/LW plus 1 or 2 SW bands
MW/LW: £15.58 +1SW £16.73



VHF Tunerheads

Europe's largest stock range for broadcast and communications. Probably also the world's - details in the catalogues and PL. Specials are also supplied in the region 30-220MHz.

Pilot Cancel PLL Stereo decoders

Again, Europe's widest range of stereo decoders including pilot cancel PLL types. The pic shows the 944378 - pilot cancel including post decoder 26/38kHz filtering and muting preamp output



Switched bandwidth FM IF strips

Broadcast FM IF strips for all occasions, including the new 911225 - with diode switched narrow filter option, ultra linear phase ceramic filters, 84dB S/N, and 0.04% THD (40kHz deviation). Plus usual things like AGC, AFC, dev. mute, level meter drive. £23.95 (supplied in screen can with 0.1 edge connection system) Also the 7230 hyperfi series - as the 911225, but with slope controlled AFC that operates in conjunction with signal level - and an extra IF amp stage for DXing.

Various digital frequency displays

The World's largest range of receiver DFM's is now joined by the DFM7 (shown) - and L shaped version of the DFM3 with remote display mount connector possibility - 1kHz SW resolution with 455kHz or 10.7MHz offsets, 100Hz res up to 3.9999MHz, and VHF to 299.99 MHz in 10kHz steps : £41.75



Components

Crystal Filters

Most popular types are available - ex-stock, and in quantity.

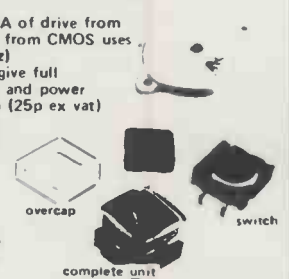
10.7MHz	25kHz Channel spacing 8pole	£16.67
	12kHz	£17.82
	2.4kHz SSB	£19.78
	Monolithic dual roofing filter	£2.30
34.5MHz	1.3dB loss, 80dB stopband HF first filter in synth. RX	£36.80
RC XTALS	FM pairs (no spits)	£3.74
	AM pairs	£3.57
USB/LSB	Xtals for 10.7SSB filter	£2.88 ea



Piezo Sounders

The most efficient warning sounders yet

The latest thing in electro-acoustic efficiency. 1mA of drive from CMOS will give an SPL of 83dB - 10v RMS drive from CMOS uses 3mA for 100dB SPL at 4.8kHz (88dB at 1.65kHz) The data sheets shows various drive circuits, and give full specifications with regard to broadband responses and power consumption etc. 1 off 44p inc. 100 off 28.75p (25p ex vat)



Keyboard switches and caps

From the world's most widely used switch manufacturers - ALPS - come the biggest and best range of keyswitches, and data entry keyboard switches. The SCM81101 is shown here, with the KT5 2-part cap (with clear top, to enable easy fitting of your chosen legend. Other types are available with built in LED, 90° mounting etc. SCM81101: 17p, KT5: 16p - or 29p/pair

LCD CLOCKS

Clocks use 1.5v at 15uA only. DVM 9v/1mA

LCD DVM

CM161: 7mm LCD 12/24hr, alarms etc £11.44 each
CM172: 13mm, 12hr, alarms, timer etc £14.32 each
CM174: 13mm, 12hr, min/sec stopwatch £14.32 ea
DVM 176: ICM7106 based LCD 3 1/2 digit £22.36 each



WHAT'S NEW at AMBIT

NEW PRICELIST/SHORTFORM:- 28 pages, FOC with A5 SAE pse

Bigger print than our recent one page list and vastly extended

If you still need convincing to invest £1.60 in the cats, be mean and get this first.

POWER MOSFET APPLICATIONS HANDBOOK by HITACHI :

£1.50 each or free with pairs of HMOs and the PA101B

Everything you should know about HMOSET devices theory and applications.

PLEASE Commercial MA terms on application. Goods are offered subject to availability, prices subject to change - so please phone and check if in doubt

Parts 1-3 AMBIT catalogues 60p ea, or £1.60 the lot.

AUGUST 1980
Vol. 2 No.10

Editor: Ron Harris B.Sc
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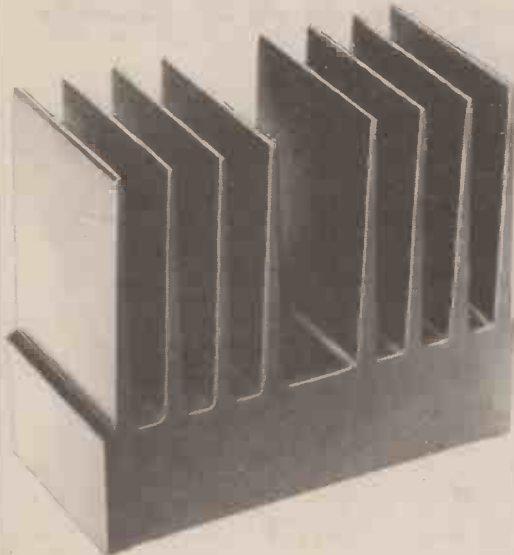
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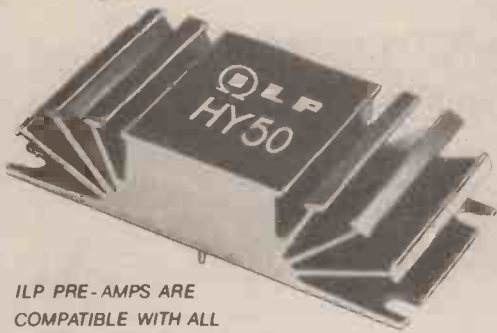
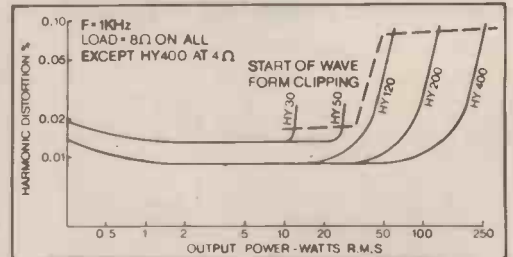


Simply ahead...



POWER AMPLIFIERS

ILP Power Amplifiers are encapsulated within heatsinks designed to meet total heat dissipation needs. They are rugged and made to last a lifetime. Advanced circuitry ensures their suitability for use with the finest loudspeakers, pickups, tuners, etc. using digital or analogue sound sources.



ILP PRE-AMPS ARE COMPATIBLE WITH ALL ILP POWER AMPS AND PSUs

Model	Output Power R.M.S.	Distortion Typical at 1KHz	Minimum Signal/Noise Ratio	Power Supply Voltage	Size in mm	Weight in gms	Price + V.A.T.
HY30	15 W into 8 Ω	0.02%	100 dB	-20 -0 +20	105x50x25	155	£6.34 + 95p
HY50	30 W into 8 Ω	0.02%	100 dB	-25 -0 +25	105x50x25	155	£7.24 + £1.09
HY120	60 W into 8 Ω	0.01%	100 dB	-35 -0 +35	114x50x85	575	£15.20 + £2.28
HY200	120 W into 8 Ω	0.01%	100 dB	-45 -0 +45	114x50x85	575	£18.44 + £2.77
HY400	240 W into 4 Ω	0.01%	100 dB	-45 -0 +45	114x100x85	1.15Kg	£27.68 + £4.15

Load impedance - all models 4Ω - ∞
Input sensitivity - all models 500 mV
Input impedance - all models 100K Ω
Frequency response - all models 10Hz - 45 KHz - 3dB

POWER SUPPLY UNITS



ILP Power Supply Units with transformers made in our own factory are designed specifically for use with ILP power amplifiers and are in two basic forms - one with circuit panel mounted on conventionally styled laminated transformer, for smaller PSU's - in the other, for larger PSU's, ILP toroidal transformers are used which are half the size and weight of laminated equivalents, are more efficient and have greatly reduced radiation.

PSU 30 ± 15V at 100mA to drive up to 12 x HY6 or 6 x HY66 £4.50 + £0.68 VAT

THE FOLLOWING WILL ALSO DRIVE ILP PRE-AMPS

PSU 36 for 1 or 2 HY30's £8.10 + £1.22 VAT

PSU 50 for 1 or 2 HY50's £8.10 + £1.22 VAT

PSU 60 with toroidal transformer for 1 HY 120 £9.75 + £1.46 VAT

PSU 70 with toroidal transformer for 1 or 2 HY120's £13.61 + £2.04 VAT

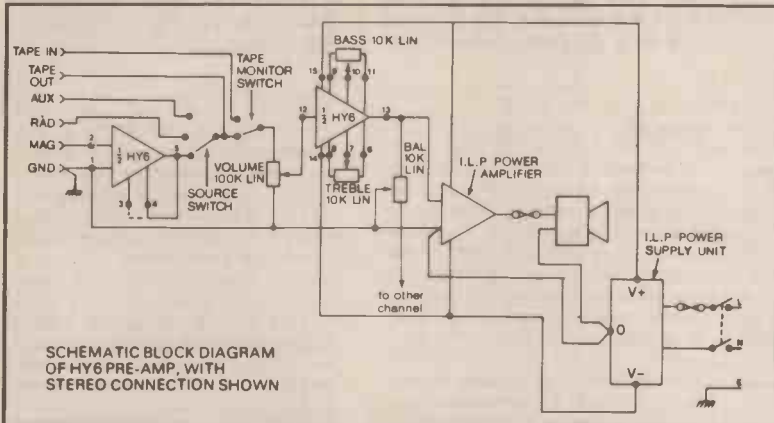
PSU 90 with toroidal transformer for 1 HY200 £13.61 + £2.04 VAT

PSU 180 with toroidal transformer for 1 HY400 or 2 x HY200 £23.02 + £3.45 VAT



AVAILABLE ALSO FROM WATFORD ELECTRONICS, MARSHALLS AND CERTAIN OTHER SELECTED STOCKISTS.

this time with two new pre-amps



HY6 mono HY66 stereo

When ILP add a new design to their audio-module range, there have to be very special reasons for doing so. You expect even better results. We have achieved this with two new pre-amplifiers - HY6 for mono operation, HY66 for stereo. We have simplified connections, and improved performance figures all round. Our new pre-amps are short-circuit and polarity protected; mounting boards are available to simplify construction.

Sizes - HY6 - 45 x 20 x 40mm | HY66 90 x 20 x 40mm Active Tone Control circuits provide ± 12 dB cut and boost. Inputs Sensitivity - Mag. P.U. - 3mV; Mic - selectable 1-12mV; All others 100mV Tape O/P - 100mV; Main O/P - 500mV; Frequency response - D.C. to 100KHz - 3dB

HY6 mono

£5.60
+ VAT 84p

HY66 stereo

£10.60
+ VAT £1.59

Connectors included

B6 Mounting Board
78p + 12p VAT

B66 Mounting Board
99p + 15p VAT

- LOW DISTORTION - Typically 0.005%
- S/N RATIO - Typically 90 dB (Mag. P.U. - 68 dB).
- HIGH OVERLOAD FACTOR - 38 dB on Mag. P.U.
- LATEST DESIGN HIGH QUALITY CONNECTORS.
- REQUIRE ONLY POTS, SWITCHES, PLUGS AND SOCKETS.
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- NEEDS ONLY UNREGULATED POWER SUPPLY $\pm 15V$ to $\pm 50V$.

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Monitor



Fast Frigate?

We thought that you would like to see this picture of the Royal Navy's first water-jet propelled hydrofoil, not because it is particularly amazing in itself but because of its name. Now wait for it, this vessel goes under the awe-inspiring title of HMS Speedy, can you believe it?

HMS Speedy, now don't laugh, has a top speed of 45

knots, it's just crammed full of the latest minicomputer gubbins (supplied by Perkins Elmer at a cost of £75,000) to evaluate the vessels performance during the sea trials. Ultimately it is hoped HMS Speedy will carry out fishery protection duties around our coastline. We can't get over the feeling that HMS Speedy sounds like one of those little pedal boats seen at resorts up and down the country.

Breadboard '80

Diaries at the ready, this years, bigger-and-better-than-ever Breadboard Exhibition is going to be held at the Royal Horticultural Hall, London SW1 between the 26th and 30th of

November. This year it will be stay open one late night (Thursday 27th) and for the first time ever it will be open on the Sunday. Look out for more news on Breadboard in the next couple of months.

Desert Island Tapes

Once in a while somebody has a good idea, you know the sort of thing, cat's eyes, TV games, suspender belts; we could go on but we would run out of space in which to tell you all about the Sony Stowaway. Unfortunately the way publishing works this review will be somewhat

old hat by the time you read it, nevertheless, what we're about to tell you should serve to emphasise that you cannot live a full and fruitful life without one of these machines.

For the uninitiated the Stowaway is a portable stereo cassette player. There are no speakers, just a pair of amazing MDR 3 stereo headphones. These use a mixture based on cobalt for the magnets, take it from us, we've had several pairs of MDR 3s in the office for the past six months, they are the best headphones this side of £100. (Actually they cost under £20 on their own). Sony have coupled them up to a miniature tape player, it looks something like those dictating machines, it certainly doesn't sound like one. It's impossible to describe the sensation when your favourite music is blasting through your head in genuine hi-fi quality from a little box about the size of a couple of packets of fags, our only advice is to get along to your nearest Sony dealer, try them for five minutes. We guarantee that if you've got £99 to spare you'll emerge with a Stowaway in your pocket. Beware, people tend to give you strange looks when you walk down the street singing to yourself.



Moon Madness

You've all heard how people are supposed to be affected by the full moon, madness, werewolves etc. It just so happens one of the more respectable American universities have just published a report that claims a significant number of

computer 'crashes' (failures or breakdowns) occur during the period of the full moon. It's a good thing the Apollo astronauts went to the moon during the day or all sorts of things could have gone wrong. Actually the ill-fated Apollo 13 mission set off at night, was it a full moon?

Energy Overheads

A company called Clyde Surveys has been flitting around the country, flying over large factories and making measurements to determine heat wastage. Aerial surveys like this rely on Infra-Red scanning techniques, variations as small as 0.2° C can be detected over the temperature range of -10° to 40° Clyde Surveys claim their equipment is so sensitive that they can measure dissipation from a one inch pipe buried underground at a height of 500 metres (the aircraft that is!). The

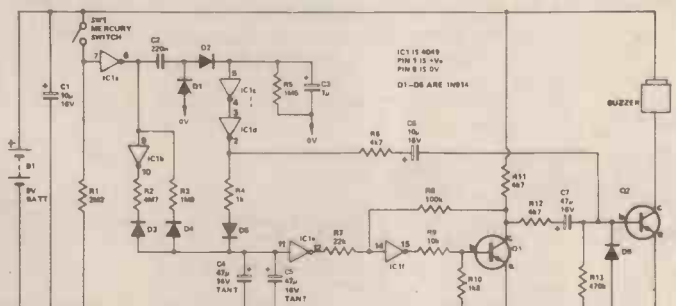
airborne electronics are centred around the EMI SE700 instrumentation recorder, outputs from the Infra-Red cameras are stored as analogue signals on five of the SE700s seven channels. Once all the information has been gathered it is taken back to their laboratory for analysis. Having your factory surveyed is not cheap, around £3,500 for a single site but then one large company can lose this much money in terms of energy loss in a single week. For further information on Clyde Surveys or the SE700 contact SE Labs (EMI) Ltd, Spur Road, Feltham, Middx.



Errata

Yes, we have got egg on our faces, the Egg Timer (June HE) had a little!!! problem with the circuit diagram. Somewhere down the line a couple of components got left off. If you built

the circuit from the PCB and Overlay diagrams there should be no problems so for those of you that are using your own layout we have the corrected diagram below.



MITRAD

MITRAD

QUARTZ L.C.D.s AT THEIR BEST

MITRAD

GENTS MEMORY CALENDAR ALARM CHRONO



A really successful watch incorporating all the latest technology.

Hours, mins, secs, weekday and snooze alarm indication on constant display.

A further two optional display modes are available, one being the calendar and month, which can be increased or decreased to give the appropriate month of the year.

A 1/106th second chronograph with split and lap mode facilities are built into the watch with a 12-hour capacity.

A 21-hour alarm with a 10-minute snooze function is also standard to this watch. A further feature is the backlight and fully adjustable stainless steel bracelet.



**STAR VALUE
£19.95**

GENT'S MULTI-MELODY CHIME ALARM CHRONOGRAPH

"Latest technology" constant display of hours, minutes and seconds; weekday date and month, with mode and chime indication display. A musical alarm is built in and can be set to any time within 24 hours; once activated playing the tune "Oh Suzanna". Two further alarm systems are incorporated in this outstanding watch: (i) 24-hour alarm; (ii) count down alarm. The watch can be set to chime on every full hour. A 1/100th second chronograph with split and lap mode facilities is standard, the watch function may also be switched off. An excellent feature is the mineral glass face. This watch also has a battery hatch, backlight and infinitely adjustable stainless steel strap.



Value at **£19.95**

This month's special offer on the above two watches — a **FREE credit card calculator** currently being retailed at **£7.95**. 8 digits, square root, full memory, per cent keys, plus auto.

shut-off coming in attractive **FREE wallet**. **REMEMBER — ABSOLUTELY FREE** with every one of the above watches ordered this particular month.

GENT'S CHRONOGRAPH SOLAR ALARM

The slimmest Chrono Solar Alarm in the World. Only 7mm thick.

This watch has a genuine solar panel. You can take the battery out and the watch will still function as normal. Battery hatch. Mineral glass.

Constant display of Hours, Mins. and Secs. with Date Flag. Optional display of Hours, Mins. and Date.

The alarm can be set to any time within a 24-hour period and is actuated for a full 60 seconds.

The chrono runs to a 1/10th Sec. with a maximum capacity of 24 hours. Lap Time and Freeze Facilities are available.

Dual timing facilities are readily available.

Back Light. Fully adjustable stainless-steel strap.

This watch is available in gold or silver.



OFFERED AT £19.95

LADIES' COCKTAIL

Elegance and style for the lady with the discerning taste. In gold or silver finish with matching bracelet. Constant display of hours and mins. with month, date, secs., auto. calendar and back-light.



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- (ii) Full instructions and 12 month manufacturers guarantee.
- (iii) Our own free back-up service.
- (iv) 10-day full money refund if not completely satisfied.
- (v) Free felt presentation case with each watch.

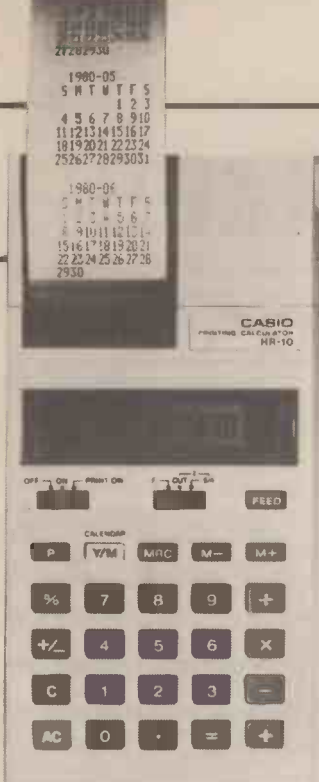
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Earn £££s selling watches to all your friends. P/P per item 85p which includes insurance. Cheques or P.O.s made payable to Mitrad and sent to (Dept. HE)), 68-70 High Street, Kettering, Northants NN16 8SY.

Telephone: (0536) 522024



Calendar Calc

You've all seen calculators with calendars before, now haven't you? Well, Casio, well known manufacturers of calculators have just announced the HR 10 10 digit, LCD display etc, etc printer calc with calendar facility. Should you wish to know the days of the week for any month between the years 1901 (January) to 2099 (December) then this is what you've been waiting for. This highly useful feature comes in a box only 88 x 168 x 40 millimeters. The battery life is as you expect something in excess of 200 years (well, 5000 hours, but who's counting) or 8800 lines of print should you wish.

Price for this box of tricks is a very reasonable £36 (or less), and should be reaching the shops about now. Just for the record Casio live at 28 Scrutton Street, London EC2A 4TY.

Kitted Out

In electronics shops up and down the country there will be appearing a selection of small plastic bags, each bearing the name Hobbikit. These little bags come in twenty varieties and contain all the parts necessary to build anything from a Smoke and Gas Detector to a Model train speed controller. If the name Hobbikit is unfamiliar then you'll be relieved to know that they come from Vero Electronics, suppliers of electronic

hardware for nearly twenty years.

Each kit comes complete with all the components, a glass fibre PCB, drilled, masked and printed with the component legend. At the time of going to press we're not sure of the price but informed sources reckon they'll start at around £5.00 for the simple kits. If you're local shop has yet to stock them then contact Vero, at Vero Electronics Ltd, Industrial Estate, Chandlers Ford, Eastleigh, Hants SO5 3ZR.



Video Variations

If you are still pondering as to whether your life is incomplete without a video tape recorder then here's another one to consider.

This one comes from Mitsubishi and uses the well tried VHS format. Firstly, the important bit, it will retail at around £698 (inc VAT), this places it squarely in the mid- to upper-price bracket, so what do you get for close on 700 quid? How about a full function infra-red remote control, picture search mode (seven times normal speed), slow motion (half-speed) and freeze frame. Still with us? Then how does this sound, a seven-day timer with options to record up to six pro-

grammes of varying length on any channel. If the HS300 (that's what to ask for when parting with the readies) is for you then you'll be glad to know

that a cabinet with tape storage can be yours for as little as £51. Mitsubishi are awaiting your call at: Mitsubishi Electric (UK) Ltd, Otterspool Way, Watford, Herts WD2 8LD.



Book Reviews

Three for your approval this month, the first two are from the Babani stable and come from the pens of two very well known gentlemen.

First away is called Electronic Household Projects. (R. A. Penfold, ISBN 0 900162 91 0, £1.75, BP71). This book is a veritable mine of information for anyone even vaguely interested in gadgetery. Everything from a doorbuzzer to a simple ultrasonic remote system, you're bound to find something of interest here. Our only criticism is the lack of constructional details, many of these circuits are ideal beginners projects but unless you are familiar with PCB design or stripboard layout it's all a bit tricky. Well worth looking at though, not for absolute beginners.

Our second Babani book is entitled A Microprocessor Primer. (E. A. Parr, ISBN 0 900162 92 0, £1.75, BP72). Confused by computers, mixed up over micros? Worry no more, of all the 'undersyand microprocessor in three easy lessons' books, this one comes closest to painlessly explaining these little devils to a complete layman.

Last, but definitely not least is an extremely attractive book entitled Test Ger Projects. (Terry Dixon, ISBN 0 333 26396 0, £3.95). This really is a delight to read, clearly written, beautifully illustrated and above all, full of really well designed projects. All the projects have accompanying stripboard layouts and could quite easily be put together by even the most inexperienced constructor. Virtually every piece of test gear you'll ever need, except of course an oscilloscope, is to be found here. Don't let the price put you off, it's well worth it.

Catalogue Corner

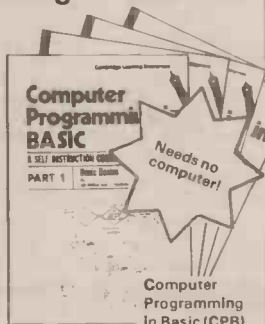
Two of the largest component retailers have just announced new catalogues, or to be fair, new versions of their previous offerings. Both Stevenson and Bi-Pak's new catalogues were just a touch too late to make it into our catalogue survey in the June issue, but you may rest assured that both are well up to standard. Prices are both very reasonable and both contain a useful amount of additional data on semiconductors. The addresses for both companies can be found elsewhere in this issue.

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Also **THE BASIC HANDBOOK (BHB) £11.50** An encyclopaedic guide to the major BASIC dialects. A must if you use other peoples' programs

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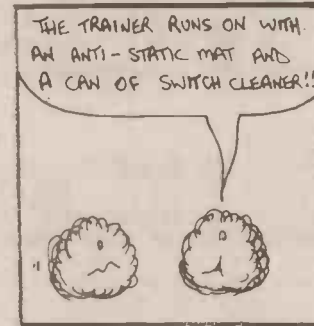
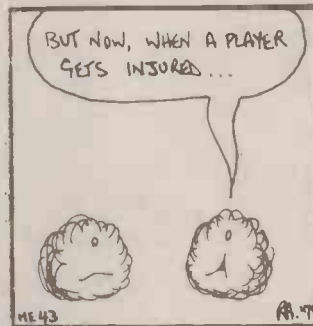
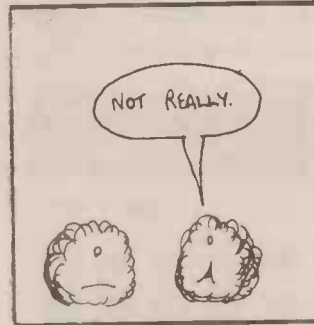
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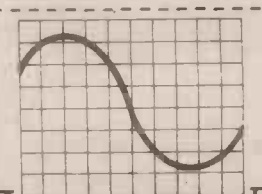


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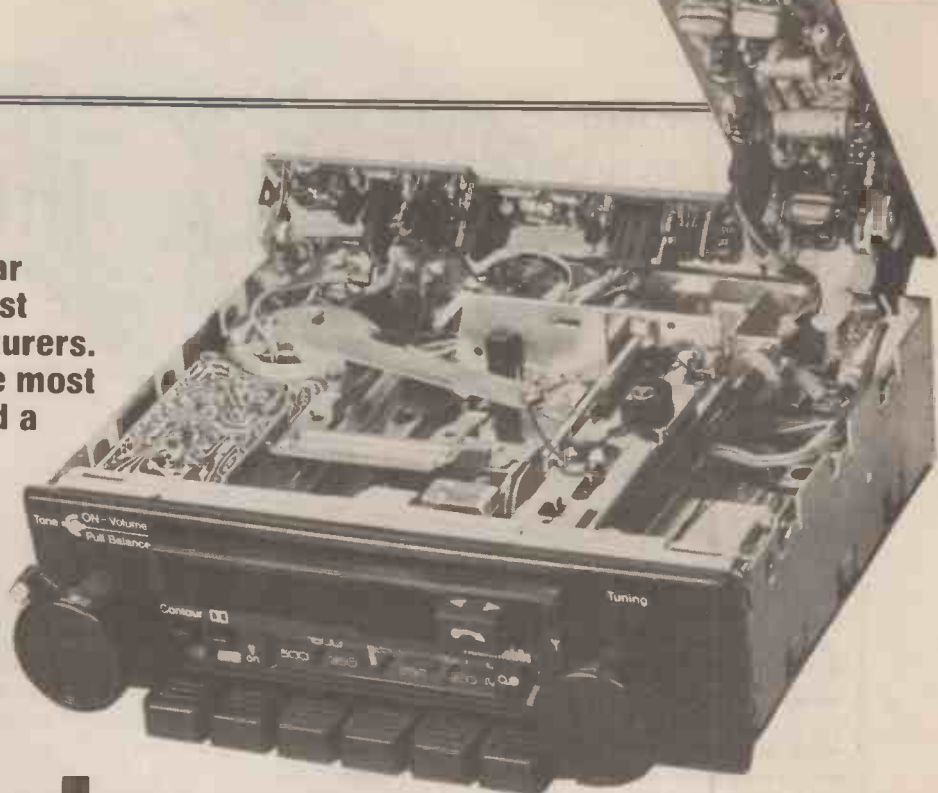
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ICE or to give it its full name, In Car Entertainment, is one of the biggest growth markets for hi-fi manufacturers. Terry Bentley looks at some of the most recent additions to the market and a glimpse of what's to come.



In Car Entertainment

'IN-CAR ENTERTAINMENT': not what goes on with seats reclined in secluded parking lots but the popular name, godawful as it is, for a sector of the audio market worth an estimated £38 million last year in the UK alone. Big business is what we're talking about, and a highly competitive one at that.

As in most areas of commerce, the challenge of competition has led to a constant struggle among manufacturers to get one technical jump ahead of rivals whilst pegging prices within acceptable limits. The result has been relatively rapid assimilation of new technology, particularly in the electronics field, but a degree of conservatism, varying between companies, mainly motivated by good old-fashioned market forces — i.e. how strong an influence the desire of the punters for the latest gadgetry has on their willingness to open their wallets.

UKICE

Right now the ICE field in this country is going through some traumas, as are just about all areas of industry falling largely into the 'luxury' bracket. World economic trends and domestic policies mean tough times ahead in Britain, and less money available for spending on non-essentials, including frivolities like car radios and tape players. Things are going to get a hell of a lot worse before they ever get any better,

and there are already strong signs of stagnation in sales.

Don't let's get too despondent, though; assuming you still have a little cash left in your pocket, there is a good side to the apparently gloomy state of affairs. Car audio equipment makers have actually been *reducing* prices of current models amid the raging inflation we all know and hate, in an attempt to shift stocks before the rot sets in for real. In terms of actual purchasing power, you can currently get extremely good value. You haven't been able to get such a good deal for your week's wages for a long while, and you probably never will again

In the longer term, there's every reason to expect general developments to carry on as before. Once the novelty of the recession wears off, those that have it will start spending money on luxuries again, and it's likely that recent trends give a good indication of the direction in which the ICE market will move once the ball is rolling once more.

Some figures as of last year, around 55% of the 14 million-odd cars in Britain were fitted with some sort of audio equipment. Combination radio/tape units accounted for maybe 6%, while 40% had radios. 12% had tape players; obviously there was a certain amount of overlap in those figures — i.e. some vehicles had separate radios and tape machines. In the separate radio sector, 90% of sets

were AM only, but 37% of combination units had both AM and FM radio capability. 80% of car audio equipment sold in Britain last year was imported.

Current Trends

Trends? Over the past few years there have been very strong moves towards combined radio/tape units FM radio. Technical improvements have brought these two together, as manufacturers have become capable of packing an increasing numbers of facilities into the standardised case dimensions. Progress has been startlingly fast. Initially it was difficult to cram all the possible features of separate units into one small package and . . . it was rare to find a pushbutton radio tuning along with a cassette deck and virtually unheard-of to find all the works together — i.e. auto-reverse cassette, pushbutton FM + 2AM radio with IAC, muting and decent output. Today, from the middle of the market upwards, the former is the rule rather than the exception, while the latter list of features is by no means unusual.

If increasingly sophisticated combinations made to fit DIN-sized dashboard apertures have been one side of the story, even more complex separate component systems have made up the other. Where space is not restricted, it's now possible to install systems of near domestic hi-fi standard, with all the associated



A cassette power booster, this one comes from Pioneer, you can expect up to 120 watts from this model!

refinements. Power amplifiers with upwards of 50 watts RMS per channel, tape decks with Dolby noise reduction and switchable equalisation for metal/CrO₂ tapes, five- or six-band graphic equalisers and multi-element speaker systems are all now available from a wide range of manufacturers. Performance levels are very high. Of course it's arguable that it's not worth going to such bother in as acoustically poor an environment as the inside of a motor vehicle anyway, but if you want it and can afford it, it's easy now to spend a thousand pounds on a car audio system.

There's a third trend, which forms a kind of bridge between the other two. This is to use 'booster' amplifier units, often in conjunction with graphic equalisers, to give 'ordinary' low-output units the power to drive better speakers at acceptable distortion levels. You still have the inherent disadvantages of the compact machinery — typically poorer frequency response and wow/flutter figures, along with the lack of Dolby and so on — but the advantages over the 'straight' 4 or 5W per channel of the basic unit are considerable, and at least you can improve and upgrade your system step by step instead of spending a fortune all at once.

Just recently, there's also been a tendency to raise power outputs of the best in-dash units to more sensible levels, 20 watts or so per channel. At the same time, these are being packed with more features (even Dolby), so perhaps the gaps between separates and combinations are closing up.

Digital Dashboards

The magic word 'digital' has recently crept into many current up-market combinations. Some of these have little to offer over long-established electro-mechanical designs, but a number exploit digital techniques effectively by offering more station preselections, light-action pushbuttons and precise electronic frequency displays, among other things. Phase-

locked loop frequency synthesis offers very accurate and stable radio tuning.

The higher output powers of the 'new generation' units and the better booster amplifiers come from using bridge amplifiers, which can double the voltage across the speaker and hence develop four times the usual power. Techniques like this have been known for some time, but only lately have they been put into integrated circuit form so that they can be crammed into the small space available in a car radio casing.

Future Developments

Going off at a tangent, an area of ICE due for more publicity soon is traffic information broadcasting. For some time now, the Bosch-developed ALI system has been under trial in West Germany and other areas on the Continent. Public testing in this country of the BBC's alternative CARFAX system will, it may be hoped, soon establish which is the more useful and lead to full-scale introduction of one or other of the rival concepts.

Briefly, CARFAX will utilise a network of medium wave transmitters broadcasting traffic messages over an 8 minute repetition sequence within given areas. Reception will be by means of an extra, fixed-tune receiver, either integrated with other audio equipment or in the form of a bolt-on addition, which can be switched into operation when the user wants to hear the messages.

Of course, whichever traffic information system is adopted, the success and popularity of the scheme will depend entirely on timing and content of the messages. It's not difficult to imagine a few bolt-on devices being torn off and hurled through car windows as irate motorists are given gems like 'you are now joining a ten mile queue.' The Transport and Road Research Laboratory is co-ordinating work on aspects such as this.

Station programme identification ('SPI') is another likely development. SPI systems are based on FM trans-

missions with a digitally encoded pilot sign, used in conjunction with receivers that can have decoders and displays of several different levels of complexity. Initially the receiver would identify the station, transmitter and programme type for any signal it was tuned in to — e.g. 'Radio 4, Wrotham, News.' Subsequent refinements could include automatic search functions, so that it would seek out a programme of the desired nature when the user keyed in a request for 'News,' 'Classical Music,' 'Rock,' 'Commercial Garbage' or whatever. At least one proposed system along such lines is undergoing broadcast compatibility trials by the BBC.

Further development could bring through a facility akin to Teletext, but for safety reasons this would probably be restricted for in-vehicle use. Similar systems will probably evolve around AM radio, though these are likely to be more limited in scope.

Several AM stereo radio transmission methods have recently been tested in America, and there is some scope for something along the same lines in Britain. For various reasons FM reception is still patchy in many parts of the country, and AM stereo would be a reasonable compromise method of improving facilities for listeners in poorly-served FM areas.

On the recorded sound side, several alternatives to the normal cassette tape have been propounded. The ludicrously bulky eight-track cartridge has been dead for some time (if, indeed, it was ever alive on this side of the Atlantic) but other, smaller than 'compact' cassette, tape systems cannot be ruled out although they present severe mechanical problems. A 4 inch audio disc has been proposed by one manufacturer, while digital storage of whole programmes in small, interchangeable solid state devices such as read-only memories is another strong possibility.

Conclusions

There are plenty of exciting ideas in the pipeline but most of these are necessarily vague at present. What is for sure is that in the immediate future car audio manufacturers will go on squeezing more functions and greater power outputs into existing case dimensions — both the in-dash sizes and the bigger component units. Pricewise, now is a good time to buy but constantly improving technology means that there's always a better product just around the corner. Buy now or wait — it's your choice.

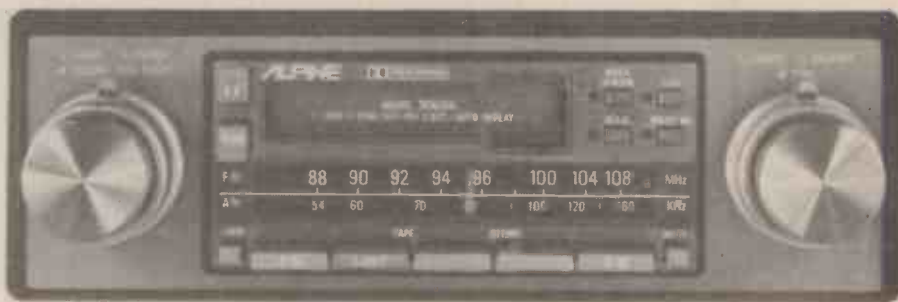
Car Audio — Who, What & Where

What follows is a listing of some of the makes available in this country and a brief description of whatever seems newest or most interesting in each of their ranges. Prices include VAT, rounded to the nearest pound.

Alpine

This Japanese make has built its reputation on a range of in-dash sets of high quality but conservative design. Latest of these is the CM923, a combination unit with a six pushbutton MW/LW/FM stereo radio and auto-stop tape section. It has IAC-type FM noise suppression, auto-muting, manual mono/stereo switching and costs around £168.

Alpine also produce a selection of much more sophisticated 'component' units, including the 7307 tape deck/tuner, 3000 and 3003 graphic equalisers and 3002 50 watts per channel power amplifier. Listed



along with the 'separates' range is the 7206 which is actually a very high-quality integrated combination unit. It has, among various other refinements, CrO₂/FeCr switching and Dolby on its tape deck, separate treble and bass controls, a good AM/FM MPX radio, plus a 20W per channel output with pretty good distortion cha-

racteristics. Price of this piece is £259. There are high-quality speakers to match the component range.

Alpine's distributors in the UK, Autocar Electrical, also handles the prestige Becker range from Germany, along with the American Jensen speakers, aerials from Hirschmann and Facet accessories.

Blaupunkt

This Bosch brand is well known as an up-market champion but also makes quite competitively priced sets for mere mortals.



For example, the Coburg and Paris combination units are both currently selling for £172; both have MW/LW/FM stereo radios but the former has a more sophisticated, six pushbutton radio section while

the latter has a superior tape deck with auto-reverse and a switchable 'db' noise-reduction circuit.

Blaupunkt continue to shoot for the moon, on the other hand, with sets like the Berlin 8000, which they don't mind calling 'the most expensive in the world' at £750. Among the features of this unit are a goose-neck mounted remote tuner control panel placing seven pre-selection touch-buttons, volume control, self-peek control and on/off switch close to the steering wheel and the driver's fingertips; Dolby, CrO₂ switching, auto-reverse and stereo recording facility on the tape deck; automatic volume level adjustment which reacts according to noise level inside the car; output of a claimed 18W into each of four channels.

Clarion

A top Japanese make that has only in the past year or so become well-known on the UK scene, this firm has an extensive range of DIN-sized dash-mounting tape and combination units, plus the 'G-Series' selection of high-quality separate components and various boosters, equalisers, speakers, etc. Clarion are among the front runners in application of advanced technology and their more up-range in-dash sets, in particular, have some very interesting features.

The recently introduced PE-957 is currently the top combination unit and it possesses a number of impressive attributes. It is a microprocessor-based device, which comes in two parts a DIN-fitting tape deck/tuner and a 'black box' containing the amplifier and much of the sophisticated electronic circuitry. The tape section is very compact, yet has auto-reverse and unusually good wow and flutter figures. The radio has pushbuttons for MW, LW and four FM preselections, with stereo reception on FM. It has auto-seeking a digital frequency display which will also tell you the time when required, and a 'loudness' button for emphasis of high and low frequencies at low volume settings. So far so good

Now for the really tricky bits. Instead of the phase-lock loop (PLL) synthesis in the electronic tuner that most leading manufacturers now employ, Clarion use a voltage synthesiser system which, they claim, gives the capability for finer and more accurate frequency selection.

There is inter-station muting and automatic frequency control on FM reception — but AFC is also, most unusually, available on MW AM. There is a good active noise reduction system along IAC lines (Clarion call theirs 'CZ1'), DX/local switching on AM, stereo/mono switchover and what Clarion term 'SASC' ('signal-actuated stereo control'). This last facility is a circuit that responds to changing quality of FM stereo reception by continuously variable attenuation of channel separation according to field strength; it also cuts out extraneous high-frequency noise. Only a couple of other manufacturers have comparable systems as yet but the improvement over straight on/off stereo switching has to be heard to be believed; it must be the way to go. Cost of all this clever stuff is listed at £366, but it's possible to find the set discounted down to around £260.

Talking of 'hearing to believe', I took the opportunity to try out a PE-957 during the

preparation of this article. The chance to check in practice the functioning of the various alluring facilities was too good to miss. I am happy to report that in virtually every respect the set lived up to its promise. Radio performance was altogether excellent, while the tape deck did everything that could be expected of it. Some tape hiss was audible but only Dolby-equipped competitors could be expected to do better (and there are hardly any of those outside the specialised 'separates' sphere — certainly none with such an array of other worthwhile features). Facilities found most effective and useful included the tape auto-reverse, and on radio the auto-search and SASC.

Speakers used for the test were Clarion's concentric twin element GS-509E model. These were rated very highly, with adequate, well-defined bass response, full mid-range and unusually sharp, clear treble. At a list price of about £50 a pair, they seem very good value.





Hitachi

Hitachi were first on the UK market with a 'digital' combination unit, the CSK 501, and this is still among the best available. With a microprocessor memory, its tuner stores six pre-selections on MW, LW and FM, will self-seek all or stereo only signals as well as be manually tuned, and has all the by-now usual attributes like IAC, inter-station muting, local/DX sensitivity switching on AM, and so on; it also matches automatically to any aerial. It has a straightforward but reliable tape section, and sells for £215.

Latest development from Hitachi is "ASLC" — automatic sound level control — which, like Bosch's system, governs radio or tape volume in relation to ambient noise level. It's currently available built-in to one combination unit, the CSK 303X, and as an add-on device in the form of the DU16, at around £40. It will also be offered in a booster amp package later this year.



Pioneer

Another make with a very high reputation for quality, Pioneer have a big range featuring some very sophisticated equipment, both combinations and separate components. Top combination unit is the KE-2300, which has the usual three bands but use of electronics for a synthesiser varactor tuner, 15-station pre-selection and a 32-element LED analogue tuning scale rather than a digital frequency display. It has their version of IAC ('PNS') and also features their equivalent of Philips continuous FM mode variation — Pioneer call it 'ARC' (automatic reception control), and it's switchable. The cassette deck has no frills, but its performance is second to none in its class. Current price of the 2300 is around £213.

On the separate component front, Pioneer have more units with more good points than there's room to describe here. In terms of performance and specifications, they are

Minikits

Minikits Electronics sell one model only, and it's a bit of an anomaly among the rest of the sets I've described. Called the 'Harvard Autosport De Luxe', it's a pretty basic Japanese unit with MW/FM stereo radio and auto-stop tape deck with lockable FF but no fast rewind. FM suppression is by ceramic filters — there's no active interference rejection — and the tuning scale is also the cassette door. Output is about 4-5w per channel RMS.

Why have I bothered to mention it? Well, it has one very big thing in its favour: price. It costs just £45 plus £1.40 p&p, and that includes speakers! What can you say? Minikits' address is 88 Hainault Road, Leytonstone, London, E11 1EH.



National Panasonic

Another good Japanese make with well-priced combinations and component units, National are in the process of introducing several new models. There's a digital unit, the CQ-863, with auto-seek, frequency synthesiser tuner and all the other good things a microprocessor or two can bring for £200; there's also a more ordinary-looking unit with a claimed 20w power output, the 673, which sells at £166. Real news, though, is the 973. This digital unit has all the works on the radio section (PLL FS tuner, 15 station pre-set, auto-seek, etc., etc.), plus a cassette deck with auto-reverse, Dolby, Cr₂ equalisation; LED signal level meter, loudness-compensation and four-way balance. It works with a choice of power amps, and no price is yet available as I write.

probably unsurpassed in the car audio world. Their speakers are also held to be among the best, and there's a huge range of them.



Motorola

One of the long-established 'big names', Motorola have a quality separate component range, including power amps, graphic equalisers and some very good speakers. They also produce sensibly priced combination units, which have recently been restyled and reduced in price. The best of them, the 708, has a three-band radio including FM stereo, six pushbuttons, each of which can be set to select a station on MW, LW or FM, and a good, straight-forward auto-eject tape deck. It now sells for £167.

Philips

Philips were the company that started the whole cassette thing off; they were also the first with IAC. Perhaps it's not too surprising, then, that their combination units are still among the best of the lot in terms of actual, as against theoretical, performance. The AC880 has LW/MW/FM stereo radio with 'tumolock' six-station button selection, plus a good tape deck with electronic speed control; the 890 is similar but has digital frequency display. Both have what Philips call SDS/SDR circuitry on radio as well as the more usual AFC and IAC. This means that as you move through areas of varying FM signal strength, stereo separation and high-frequency response are continuously and imperceptibly modified to give the optimum sound. In practice, both this and their FM noise rejection (IAC) work better than anybody else's alternatives.



There is no Philips separate component range at present, but there are some good speakers, and boosters, equalisers and so forth.

Radiomobile

An English make with a good reputation for quality and reliability, Radiomobile have a relatively conservative range of in-dash units. Their 409 model has a manually-tuned three-band radio with stereo FM, and an auto-reverse cassette deck, while their new 420 unit has Dolby on its tape side but only two AM bands on its six pushbutton radio.

Sanyo

Yet another Japanese brand with a selection of in-dash and component units, Sanyo are soon to launch a number of new models. At present their most interesting 'normal' sets include the FT4400M, a MW/FM digital display combination unit, and the FT4687ME, which has three wavebands and auto-reverse tape section.

Among the 'big guns' is the FT-DT10, which has a high-frequency filter switch. It has FM radio only. The matching power amp has a claimed power output of 20W per channel.



Sharp

Sharp are one-up on most of their competitors in that their prices always seem to be exceptionally keen. Their range is purely in-dash stuff — no fancy separate components — but the units perform well.

Most interesting new model is the RG6600E. This is a microprocessor-controlled set with five station memory for each of its three wavebands, PLL synthesised tuner, FM noise suppression and what Sharp call 'ASTS' (automatic stereo tuning system), which is another gradual stereo/mono FM signal regulator along Philips/Pioneer lines and a similarly great improvement over the conventional 'on-off' switching. The set also has DX/local switching on AM, built-in loudness circuit, FM muting, etc.

Boosters, speakers, etc. are available. HE

Voxson

Just for a change, an Italian make. All models are compact units, some designed to be 'extractable' for security when

leaving the vehicle. Top model is the Indianapolis combination, which has a 16 station (MW & FM) memory, thanks to a chip manufactured by Fairchild; there's one-upmanship for you. The tape section is relatively ordinary. Price is around £252.



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Hobby Electronics

Next
Month

THE SEPTEMBER ISSUE WILL BE ON SALE AUGUST 8th

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Teletext Textbook

At last! How many times in the past have you wondered *when* someone would finally take the mystery out of teletext once and for all with a clear, easily comprehended explanation of Ceefax, Oracle, Prestel and the rest?

Well, wonder no longer. Next month HE does exactly that. Who else would anyway? Had ye *no* faith? Read Hobby next month for this important screening!

Reaction Tester

Well, I suppose it had to come didn't it? After all those lines of pretty little lights, someone just *had* to go and produce a simple, inexpensive way of sending out reaction times accurate to 1/1000th of a second. And of course that someone *had* to be HE! Pick up a copy as fast as you can else you'll never know how quick on the draw you *really* are!

Power Supply, Touch Switch, Darkroom Timer and Audio Mixer

Says it all really, doesn't it? Except that all these are brilliantly realised as Hobby Electronics projects next month — which means they can all be built easily and quickly by anyone who can hold a soldering iron straight!

P198 CEEFAX 198 Wed 18 Jun 11 31 '80

BBC CEEFAX

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ENHANCED TELETEXT SYSTEMS

An Enhanced TELETEXT system will allow pages to include PICTURES with a quality limited only by the display device.



The items mentioned here are those planned but unforeseen circumstances may affect the actual contents.

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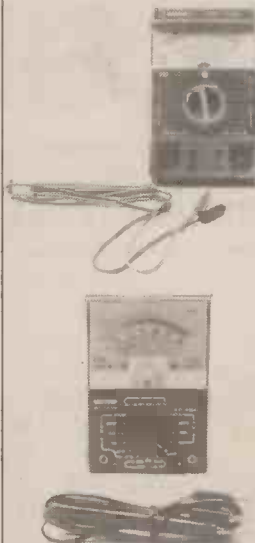
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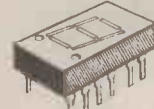
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Equitone

HE comes up with a project to enable you to equalize your car sound system, designed to match the HE CAR BOOSTER in last month's issue.




THE HE CAR BOOSTER is without doubt a very good project. 18 watts RMS per channel stereo music in a car gives a reasonably (?) acceptable level of sound. The basic unit does however suffer from one slight drawback, of necessity it relies on the existing tone control of the music source. Car radios and cassette players tend to feature a single treble-cut tone control, which hardly allows the listener to match his personal preference of tone in with the listening environment of his car cockpit.

The HE CAR EQUITONE CONTROL gives you this facility with the minimum of fuss, controlling the level of bass, middle and treble frequencies with three fully adjustable pots. Because it has three master controls rather than just the normal 2 channel (bass and treble) type, the unit does justify the term sound equalizer, hence the name EQUITONE. Matching the absolute simplicity of the BOOSTER, our design for the EQUITONE Control uses only 29

components *total* and fits onto a PCB only 85 x 50 millimetres. It connects in between the sound source ie car radio and cassette player, and the booster amplifier so coupling it up is no problem. Because of its passive nature it (magically) needs no power supply whatsoever, just two audio connections at the I/P and two at the O/P.

Construction

Due to the passive, rather than active tone control networks involved in the EQUITONE, there are absolutely no semiconductors in the circuit. This simplifies construction somewhat and enables a small neat PCB to be used. This holds all components including the pots. The pots obviously need to be of the PC mounting type and a suitable source is noted in BUYLINES.

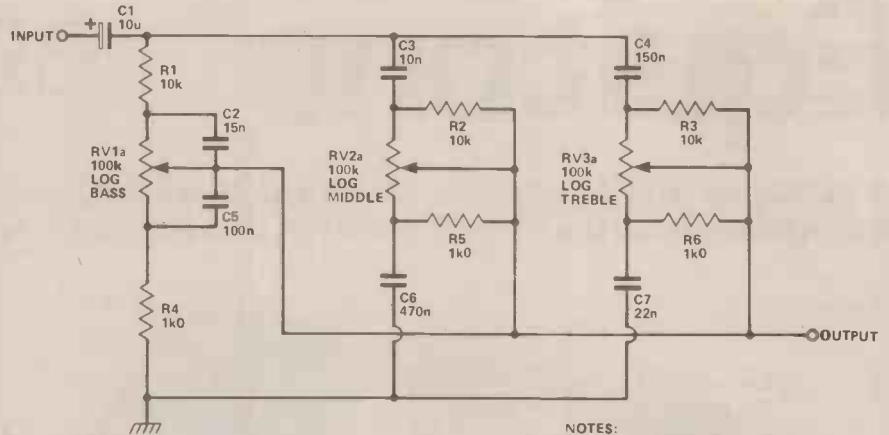
The potentiometers give an extra bonus in that when they are bolted to the front panel of whatever case you use, they automatically hold the circuit board perpendicular, eliminating the need to bolt it to the chassis of the case. The board is purpose-designed to fit easily into (yes, you've guessed it) a SINK BOX, to match last month's CAR BOOSTER in appearance. The same length ie 100mm is ideal, although the enterprising builder may wish to fit the two BOOSTER Amps and an EQUITONE Control board in the same case (length 150mm). If you find that the output volume of the booster has dropped slightly with the insertion of Equitone, don't worry. Reducing the value of R1 in the amplifier circuit from 2M7 to (say) 1M8 will give you any extra gain that is required, once again to perforate your eardrums. 

How It Works

The HE CAR EQUITONE Control basically consists of 6 similar tone control stages ie 3 per channel, 1 bass, 1 mid-range and 1 treble.

These days it's usual to make tone control stages 'active' (if you consult the schematics of most pre-amplifier circuits you will probably find that the tone controls are present in the feedback loop of an amplifying stage). The main advantage of 'active' control is that there is no insertion loss ie no "volume" is lost. This was the first method we considered.

It soon became apparent that there was no need for it to be active. After all, we have all the "volume" we need from the output of the car cassette player. The alternative — passive controls, need far fewer components and therefore a smaller, neater circuit evolved. They are much less complicated in construction and design, acting only as simple AC voltage dividers, cutting the signal at particular frequencies, hence the insertion loss.



NOTES:
DIAGRAM SHOWS ONE CHANNEL ONLY. OTHER CHANNEL COMPONENTS ARE PREFIXED 2

Figure 1. Circuit diagram of the Equitone, simplicity is the name of the game.

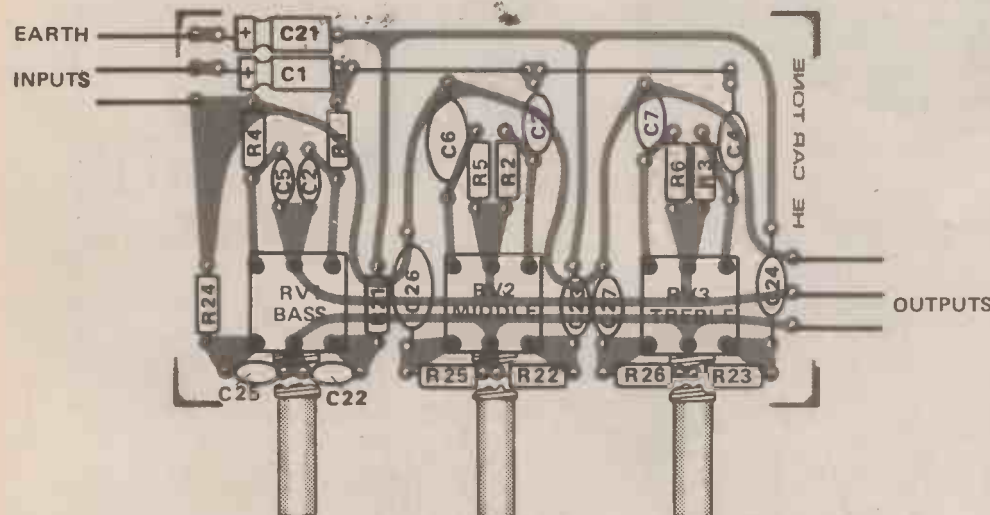
Parts List

RESISTORS (all 1/4W, 5%)
R1, 2, 3, 21, 21, 23 10k
R4, 5, 6, 24, 25, 26 1k

POTENTIOMETERS
RV1, 2, 3, 100k dual log printed circuit mounting

CAPACITORS
C1, 21 10u 16V electrolytic
C2, 22 15n polycarbonate
C3, 23 10n polyester
C4, 24 150n polyester
C5, 25 100n polycarbonate
C6, 26 470n polycarbonate
C7, 27 22n polyester

MISCELLANEOUS
1/4??MM Sink Box
4 x Phono Sockets
3 x Knobs



Above. Layout diagram for the Equitone, the neatness of this board is mainly due to the use of PCB mounting pots.

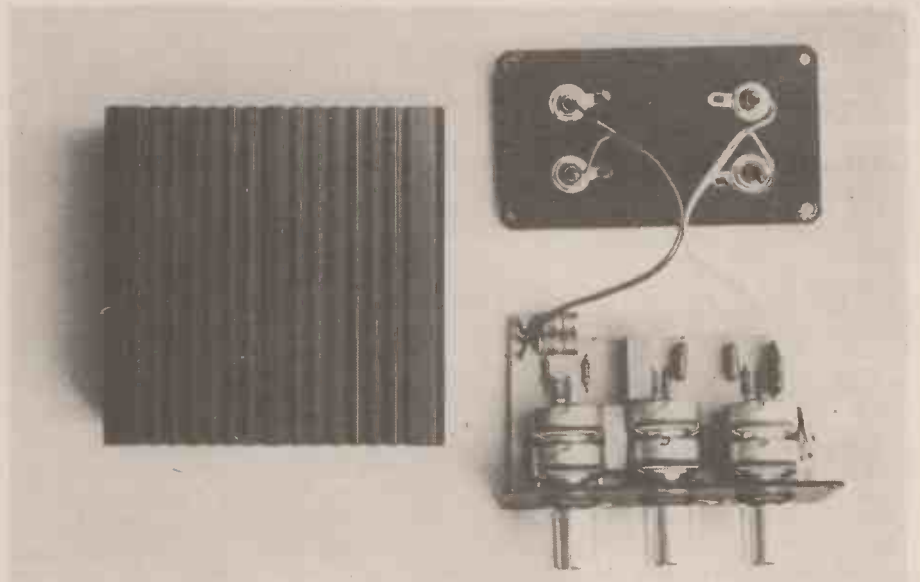
Right. Inside the 'Sink Box' cage the Equitone makes the ideal partner for last month's stereo booster.

Buylines

Once again we have used the SINK BOX from West Hyde Developments, to house this project. It makes for an exceptionally neat and tidy appearance which is just about destruction proof — ideal for the car.

The PC mounting pots, as far as we know, are available only from Electrovalue.

The estimated cost of all parts excluding the case and PCB is about the £8 mark.



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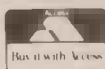
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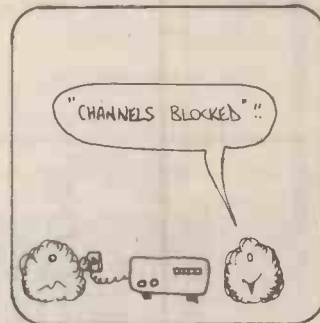
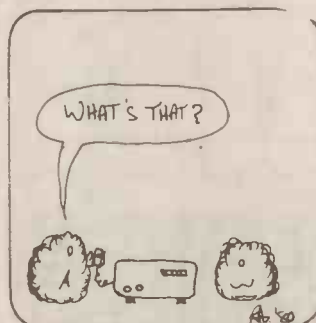
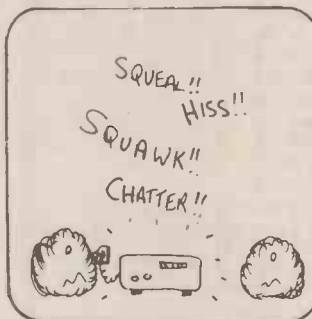


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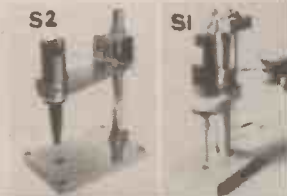
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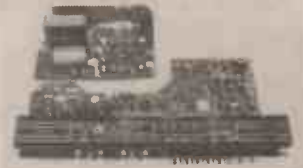
on all goods purchased or ordered during August.



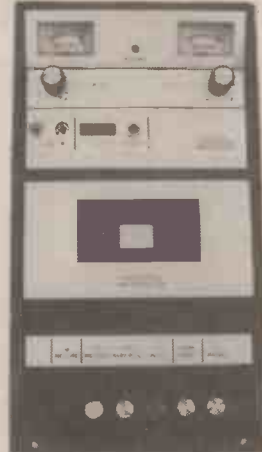
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This impressive watch is made from 100% stainless steel with a hard, mineral crystal lens and is water-resistant to 33ft of water. Yet, it is only 7mm thick.

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The alarm sound is an insistant and effective musical tone to get you up in the mornings, or to warn you your time has expired (count-down operation).

The stop-watch counts to 12 hours in second stops and has 1st and 2nd past the post split and lap timing modes.

The second time zone can be set to any part of the world.

There are 7 display indicators and 6 digits.

The day of the week can even be in English, French, or German, whichever you prefer, and the strap is fully adjustable for all wrists. There is of course a back-light and the battery lasts for approximately 1½ years.

GUARANTEE

Like all products sold by Metac this fine Buler watch is guaranteed for one year. And, we even offer a 10-day money back offer.

24-HOUR DESPATCH

This is another unique Metac service.

Unlike other companies we don't believe you really want to wait 28 days for your watch, so we have opened a special 24-hour despatch centre.

Simply complete and return the coupon and this sensational new watch will be safely and securely on its way to you within 24-hours of your order being received.

Customers may buy from our shops in:
LONDON: 327 Edgware Road, W.2.
DAVENTRY: 67 High Street.
NORTHAMPTON: 11 St. Giles Square.
Credit Card Holders may telephone 03272-5983/4/5 or 01-723 4755.

Metac

ELECTRONICS & TIME CENTRES
47 High Street, Daventry, Northants.

Hobby Electronics, August 1980



Buler dual time multi-function alarm chrono with count-down. Special Metac price. **£24.95**

Time 1 Hours mins, secs day and date	✓✓✓✓
Time 1 Automatic viewing of time day and date	✓
Time 1 12 24 hour AM PM display	✓
Time 1 24 hour alarm	✓
Time 1 Day of week in English	✓
Time 1 Day of week in French and German as well	✓✓
Hourly chimes	
Time 2 Hours mins, secs day and date	✓✓✓✓
Time 2 Automatic viewing of time, day and date	✓
Time 2 12 24 hour AM PM display	✓
Time 2 24 hour alarm	✓
Time 2 Day of week in English French and German	✓✓✓
Chronograph Measuring up to 12 hours hr / min / sec	✓
Chronograph Measuring up to 24 hours hr / min / sec	✓
Chronograph Split lap timing modes	✓
Count down timer up to 100 minutes	✓
Count down timer up to 23 hours 59 mins	✓
Number of digits	6
Number of symbols	8
Slimness	7mm
Battery life	1½ years
Battery availability	most battery retailers
Stainless steel construction	✓
Quartz mineral crystal lens	✓
Water resistant to a depth of	99ft

Seiko alarm chrono. Lowest retail shop price. **£42.95**

Time 1 Hours mins, secs day and date	✓✓✓✓
Time 1 Automatic viewing of time day and date	✓
Time 1 12 24 hour AM PM display	
Time 1 24 hour alarm	✓
Time 1 Day of week in English	
Time 1 Day of week in French and German as well	
Hourly chimes	
Time 2 Hours mins, secs day and date	
Time 2 Automatic viewing of time day and date	
Time 2 12 24 hour AM PM display	
Time 2 24 hour alarm	
Time 2 Day of week in English French and German	
Chronograph Measuring up to 12 hours hr / min / sec	✓
Chronograph Measuring up to 24 hours hr / min / sec	
Chronograph Split lap timing modes	✓
Count down timer up to 100 minutes	✓
Count down timer up to 23 hours 59 mins	
Number of digits	10
Number of symbols	7
Slimness	8mm
Battery life	2 years
Battery availability	Seiko dealer only
Stainless steel construction	✓
Quartz mineral crystal lens	✓
Water resistant to a depth of	Yes, but not specified

To: Metac 24-hour Despatch Centre,
47 High Street, Daventry, Northants.
Please send me Buler watches at £24.95 plus
75p&p. I enclose cheque/PO for £

Please Complete

Barclaycard/ Access No

Name

Name

Address

Address

HE 8

Building Site

Welcome to Building Site, the new feature where HE's Project Editor — Keith Brindley — takes a look at the month's projects with the accent on construction techniques.

WHEN I was asked to write a monthly feature in HE, I immediately jumped at the chance of discussing the practical problems and difficulties which might arise in the construction of the projects in the issue. Having built the projects myself I suppose I am in the best position to take a more detailed look at them and to pass on any relevant information not normally given in the project section but which may be of help to you.

Speaking of projects in this general way provides a useful introduction to those contained in this issue. There are six this month, three are constructed on Printed Circuit Board and three on veroboard. The veroboard projects are all constructed on standard sized, 10 x 24 holes 0.1" matrix veroboard. These boards, of course, are fairly cheap and readily available. There can't be many electronics enthusiasts who haven't used veroboard, but for those of you that have missed out, or are just a little rusty, I will quickly run over the basics.

Veroboard essentially consists of predrilled circuit board available with holes on either 0.1" or 0.15" matrix. Photograph 1 shows a sample of 0.1" matrix board with its copper tracks joining all the holes in lines, horizontally.

The Good, The Bad And

When building a project which is designed for veroboard, the first job to be done is the cutting of the track where indicated in the diagrams of the underside of the board, usually given in the project section. The places to "cut" are shown by large black circles in the track. There is a special tool for the job but you can use a drill, (about 1/8" — holding it in your hand). See photograph 4. Gently twist the drill or tool on to the hole where the break is shown, until a good clean hole in the copper track is formed. Check that no swarf or loose copper bridges across to nearby tracks. Photograph 2 shows

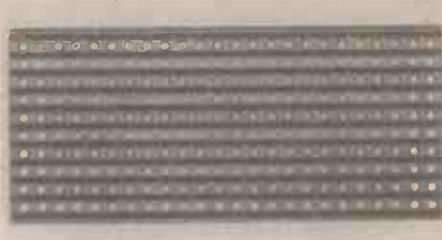


Photo 1. A piece of veroboard of the size and type used in many of our projects — 10x24 holes on a 0.1" matrix.

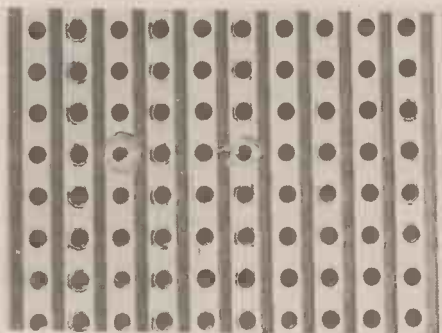


Photo 2. The track break on the left is a good one. However, that on the right is not — note how a loose piece of copper is bridging across to the adjacent track.

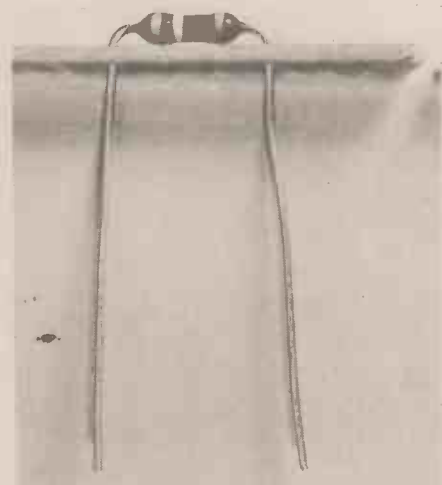


Photo 3. Mount the component, in this case a resistor, close to the board, preventing any future short circuits between it and other component leads which may be close by.

a good and a bad break — make sure you know the difference.

Neatly Does It

Next, the components are inserted. Generally speaking, the lowest height components should be put in first (both with veroboard and PCBs) e.g. resistors, wire links, etc. It is normally, advisable to leave all semiconductors till last as they tend to be easily damaged by excessive heat.

Insert one component at a time. Before soldering check that the components are mounted close to the board (photo 3), and that the end result is neat and tidy without any component leads shorting together.

Ready To Go

Underneath the board two other potential hazards can be avoided by trimming the protruding leads using side cutters (as in photo 5) as close to the solder joint as you can, preventing any future short circuits and checking that there are no solder bridges across adjacent tracks.

After all this, you should have a working veroboard project, undoubtedly something to be proud of. Perhaps, next time you will have the confidence to have a go at a project constructed on PCB — it may be one of the three featured in this issue. For instance, Gaztec, the gas detecting alarm, should pose no real constructional problems. However, do take care when handling CMOS integrated circuits — leave them until the very end before insertion and never hold them by the pins.

Sound Advice

The HE Equitone is of course the complementary tone control to the Car Booster featured in last month's issue. Neither the Booster nor the Equitone are too difficult to build, deliberately so. You will be rewarded with a cheap yet good quality sound system for the car cassette/radio which, believe me, is loud. There is nothing too critical in the construction of this project, except perhaps the use

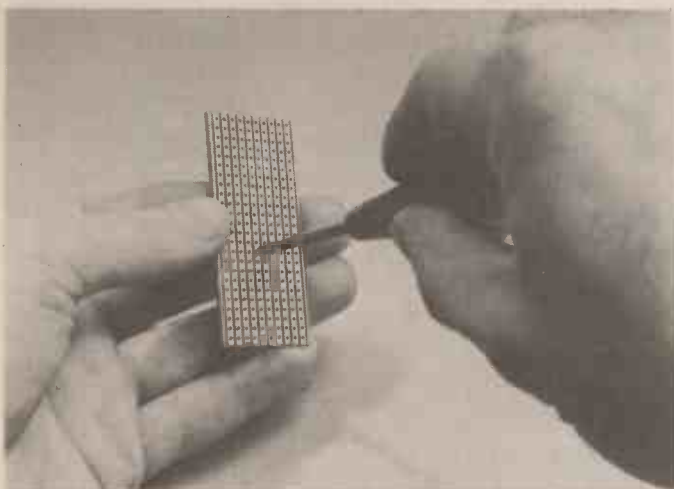


Photo 4. Using the cutting tool to break a track in the correct places. Alternatively a small drill bit held in the hand can be used.

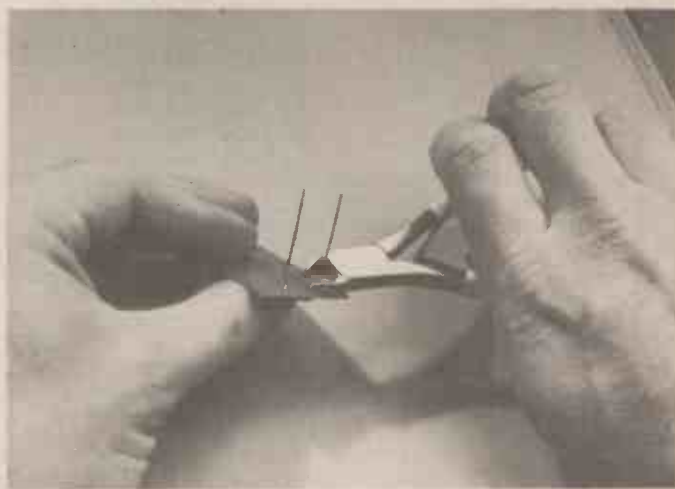


Photo 5. Use a good quality pair of side cutters to snip the component leads off as close to the solder joint as possible.

of the printed circuit mounting potentiometers. Ordinary pots could of course be used but those specified cut down the interwiring involved to nothing.

Last But Not Least

Our last project this month is 'Pass The Loop.' HE's updated version of the old game which used an alarm bell, battery and wire, although ours is much evolved from the original and

quite a bit more entertaining. This one is going to be a real winner at fêtes and fairs. We have used CMOS chips again so care will be needed at the IC insertion stage. Interwiring between the PCB and the various controls, leads, wires etc, is fairly complex and so we have tried to help you with clear connection diagrams. We fitted our complete unit into a case but you can, if required, put yours onto a larger baseboard to enable the shaped wire to be much longer and bigger.

The Resistor Code

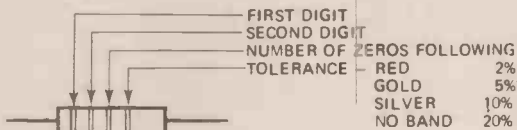
Finally, we have shown below the conventional resistor colour code scheme and a table of preferred values and corresponding tolerances. If you dabble in the hobby for any length of time you are almost certain to pick up the code — it is not too difficult to learn (being basically the colours of the rainbow) but we are including for the benefit of new entrants into the electronics world (or simply the lazy regulars!).

HE

The Resistor Colour Code

RESISTORS

- 0 - BLACK
- 1 - BROWN
- 2 - RED
- 3 - ORANGE
- 4 - YELLOW
- 5 - GREEN
- 6 - BLUE
- 7 - VIOLET
- 8 - GREY
- 9 - WHITE



Tolerance

	±5%	±10%	±20%
1.0		1.0	1.0
1.1			
1.2		1.2	
1.5		1.5	1.5
1.6			
1.8		1.8	
2.0			
2.2	2.2		2.2
2.4			
2.7		2.7	
3.0			
3.3		3.3	3.3
3.6			
3.9		3.9	
4.3			
4.7		4.7	4.7
5.1			
5.6		5.6	
6.2			
6.8		6.8	6.8
7.5			
8.2			
9.1			

READING THE RESISTOR CODE

Resistors are coded with coloured bands to ease the problem of marking such small components.

The numbers corresponding to the ten colours used and the values per position are shown above.

For example, 180 000 ohms is coded with the first digit brown, then grey and finally yellow. The fourth band indicates the tolerance that the value has with respect to the stated value. For example, silver indicates 10% tolerance meaning the 180 000 ohms could vary between 180 000 ± 18 000 i.e. 162 000 to 198 000.

These tolerance may seem to reflect poor manufacture but in most circuits they are, in fact, quite satisfactory.

Relaxing the tolerance enables the maker to sell them more cheaply.

PREFERRED VALUES

If the maker tried to produce and sell every value of resistance that exists there would be chaos and the costs would be greatly increased. The actual values made, therefore, are limited to a range called the preferred values. These are listed in the table at right.

The values may seem illogical at first sight, but this is not so. They stem from the fact that the tolerance extremes of a value reach the extremes of adjacent values, thereby covering the whole range without overlap. Values normally available stop in the megohm decade.

ALL PRICES IN PENCE EACH UNLESS OTHERWISE STATED

CAPACITORS				Miniature Low Value				Order Code				Polyester Radial Leads				Order Code				RESISTORS																											
Electrolytic Axial Leads -10% to +50% Tol.				Polystyrene, Axial, 1% Tol., >=30V DC Wkg. Ceramic Plate, Radial, Low K, 100V DC Wkg. Ceramic Plate, Radial, Med K, 100V DC Wkg. Ceramic Plate, Radial, High K, 63V DC Wkg.				Cap 424 Cap 632 Cap 630 Cap 629				Dipped Type, C280/352 Style Moisture Type, 10-2mm Pitch				Cap 352 Cap 360 + Value				Carbon Film, Fixed 0.25W, E24 Values 100-10M, 5% Tol. 2 each 100/100 (Mult 10/Value) Res RD1 0.5W, E12 Values 10K-4M, 10% Tol. 3 each 150/100 (Mult 10/Value) + Value Res RD4																											
µF	V.d.c.	16	25	40	63	100	150	220	330	470	680	1000	1500	2200	0.1	0.015	0.022	0.033	0.047	0.068	0.1	0.15	0.22	0.33	0.47	0.68	1.0	1.5	2.2	3.3	4.7	6.8	10	15	22	33	47	68	100	150	220	330	470	680	1000	1500	2200
P.C.B. Components				Dip Pen, Blue Ink, Slow Drying				Pan 33PC				Tantalum Bead 20% Tol.				Order Code Cap PR + µF + Volts				Metal Film, Fixed 0.5W, E24 Values, SR-1M, 2% Tol. 8 each 400/100 (Mult 10/Value) Res MR30 2.5W, E12 Values, 10R-27K, 5% Tol. 18 each 800/100 (Mult 10/Value) + Value																											
Metal Film, Fixed				Metal Glaze, Fixed				Skeleton Presets, Miniature				Skeleton Presets, Standard				Potentiometer, Rotary				Potentiometer, Slider																											

C-MOS (BUFFERED)				74LS				LINEAR				SEMICONDUCTORS									
HEF4005	22	HEF4044	105	HEF4512	138	74LS00	10	74LS03A	106	74LS174	141	74LS373	172	IN914	5	2N3705	10	BC182L	12	BFX85	29
HEF4001	22	HEF4046	133	HEF4514	313	74LS01	10	74LS05	104	74LS175	110	74LS374	172	IN4001	5	2N3773	297	BC184	11	BFY50	17
HEF4002	22	HEF4047	109	HEF4515	374	74LS02	19	74LS06	39	74LS181	106	CA3102E	99	IN4002	5	2N3819	22	BC184L	12	BFY51	17
HEF4006	119	HEF4049	57	HEF4516	127	74LS03	19	74LS09	59	74LS190	117	CA3140E	48	IN4004	7	2N3820	39	BC121	11	BFY52	20
HEF4007	22	HEF4050	57	HEF4517	426	74LS04	27	74LS10	76	74LS191	117	CA3195E	293	IN4007	9	2N3904	9	BCY10	12	BLX65	282
HEF4008	100	HEF4051	87	HEF4518	118	74LS05	27	74LS12	56	74LS192	119	LM309A	34	IN4148	4	2N3457	39	BC214	11	BRV39	50
HEF4011	22	HEF4052	90	HEF4519	69	74LS06	27	74LS13	59	74LS193	119	LM339N	78	IN4502	15	2N3459	39	BC214L	12	BSX20	21
HEF4012	22	HEF4053	90	HEF4520	118	74LS09	27	74LS14	126	74LS194	161	LM3801N	104	2N2218A	31	40E73	88	BC547	13	CLB960	2850
HEF4013	57	HEF4054	62	HEF4521	235	74LS10	19	74LS15	107	74LS195	119	LM3802N	104	AD161	42	BC548	11	BC549	12	MEF102	36
HEF4014	105	HEF4056	475	HEF4522	124	74LS11	26	74LS16	109	74LS196	126	LM3900N	75	AD162	42	BC549	12	OC91	8	OC91	8
HEF4015	100	HEF4058	22	HEF4523	150	74LS12	26	74LS17	112	74LS197	132	LM3900P	156	2N2926G	13	RC107	14	BC557	15	OC78	118
HEF4016	57	HEF4060	48	HEF4524	388	74LS13	48	74LS18	113	74LS198	132	SL440	331	NE531	131	2N3053	19	BC108	14	OC35	106
HEF4017	100	HEF4070	22	HEF4525	138	74LS14	74	74LS19	114	74LS199	132	SL445	182	NE532T	259	2N3054	18	BCY10	15	TP11A	48
HEF4018	100	HEF4071	22	HEF4526	194	74LS15	26	74LS20	53	74LS202	206	SL446	245	NE555N	28	BC109	14	BC558	15	TP12A	54
HEF4019	58	HEF4072	23	HEF4527	426	74LS16	19	74LS21	53	74LS203	206	SL447	245	NE555N	28	BC109	14	BC558	15	TP12A	54
HEF4020	112	HEF4073	23	HEF4528	96	74LS17	26	74LS22	59	74LS204	206	SL448	369	NE555N	28	BC109	14	BC558	15	TP12A	54
HEF4021	107	HEF4074	23	HEF4529	454	74LS18	26	74LS23	59	74LS205	206	SL449	369	NE555N	28	BC109	14	BC558	15	TP12A	54
HEF4022	103	HEF4075	130	HEF4530	122	74LS19	26	74LS24	59	74LS206	206	SL450	369	NE555N	28	BC109	14	BC558	15	TP12A	54
HEF4023	22	HEF4076	130	HEF4531	122	74LS20	26	74LS25	59	74LS207	206	SL451	369	NE555N	28	BC109	14	BC558	15	TP12A	54
HEF4024	78	HEF4077	22	HEF4532	214	74LS21	26	74LS26	59	74LS208	206	SL452	369	NE555N	28	BC109	14	BC558	15	TP12A	54
HEF4025	22	HEF4078	23	HEF4533	113	74LS22	27	74LS27	59	74LS209	206	SL453	369	NE555N	28	BC109	14	BC558	15	TP12A	54
HEF4026	22	HEF4079	23	HEF4534	92	74LS23	35	74LS28	136	74LS210	206	SL454	369	NE555N	28	BC109	14	BC558	15	TP12A	54
HEF4027	244	HEF4080	23	HEF4535	78	74LS24	35	74LS29	136	74LS211	206	SL455	369	NE555N	28	BC109	14	BC558	15	TP12A	54
HEF4028	89	HEF4081	80	HEF4536	149	74LS25	35	74LS30	93	74LS212	206	SL456	369	NE555N	28	BC109	14	BC558	15	TP12A	54
HEF4029	113	HEF4082	80	HEF4537	149	74LS26	35	74LS31	93	74LS213	206	SL457	369	NE555N	28	BC109	14	BC558	15	TP12A	54
HEF4030	58	HEF4083	80	HEF4538	149	74LS27	35	74LS32	93	74LS214	206	SL458	369	NE555N	28	BC109	14	BC558	15	TP12A	54
HEF4031	250	HEF4104	206	HEF4539	149	74LS28	35	74LS33	93	74LS215	206	SL459	369	NE555N	28	BC109	14	BC558	15	TP12A	54
HEF4032	136	HEF4502	114	HEF4540	149	74LS29	35	74LS34	93	74LS216	206	SL460	369	NE555N	28	BC109	14	BC558	15	TP12A	54
HEF4033	107	HEF4503	114	HEF4541	149	74LS30	35	74LS35	121	74LS217	206	SL461	369	NE555N	28	BC109	14	BC558	15	TP12A	54
HEF4034	94	HEF4504	230	HEF4542	149	74LS31	35	74LS36	121	74LS218	206	SL462	369	NE555N	28	BC109	14	BC558	15	TP12A	54
HEF4035	83	HEF4510	135	HEF4543	149	74LS32	35	74LS37	121	74LS219	206	SL463	369	NE555N	28	BC109	14	BC558	15	TP12A	54
HEF4036	100	HEF4511	157	HEF4544	149	74LS33	35	74LS38	121	74LS220	206	SL464	369	NE555N	28	BC109	14	BC558	15	TP12A	54

Plastic Boxes - Boss Industrial Mouldings				SWITCHES				MAINS TRANSFORMERS				VERO ELECTRONICS PRODUCTS			
Moulded Box and Close Fitting Flanged Lid ABS Box, C/W Brass Bushes, and Lid in Orange				Miniature Toggle - Honeywell				Secondary may be connected in series or parallel to give wide voltage range Primaries 0-220, 240V				2.5" x 5" - 1" pitch Veroboard 71 200-21069J			
L112 W82 D31	90	Case B1M2003 OR	Order Code	SPDT	C/OH	67	SW 8A1011	0.4-5V, 0.4-5V Secondaries	Trans 6VA	45	LM3909A(1K)	119	2.5" x 5" - 1" pitch Veroboard 79 200-21072D		
L150 W80 D50	131	Case B1M2005 OR	Order Code	SPDT	Double Bias To Centre	81	SW 8A1021	0.12V, 0.12V	60	UA723CN	42	2.5" x 5" - 1" pitch Veroboard (5) 85/Pack 200-21076C			
L180 W110 D80	223	Case B1M2008 OR	Order Code	SPDT	Single Bias To Centre	90	SW 8A1041	0.15V, 0.15V	120	UA741CN	20	3.75" x 5" - 1" pitch Plain Board 88 200-21078H			
Plastic Boxes with Metal Lids				Miniature Push - C & JK				Approx 18% Regulation F.C. 54, H36, W35				Spot Face Cutter 107 203-21013A			
Recessed Top Box				SP Push To Make, Momentary				20VA - Clamp Type Construction 360 each				Pin Insertion Tool for .040 Type pin 147 203-21015F			
ABS Box, C/W Brass Bushes, in Orange				SP Push To Break, Momentary				Approx. 16% Regulation F.C. 70, H48, W48				DS Pin .040 (100) 44/Pack 200-21087G			
Trim Aluminium Top Panel Finished Grey				SP Push To Bias, Momentary				0.4-5V, 0.4-5V Secondaries				Verovire Kit (1 on 2, wire, 25-comb) 454/Kit 200-21314D			
L85 W86 D29	112	Case B1M4003 OR	Order Code	D.I.L. Sockets				0.8V, 0.8V				Verovire Combs (25) 109/Pack 200-21338F			
L111 W71 D42	180	Case B1M4004 OR	Order Code	8 Pin Low Profile Socket Tin	12	D.I.L SKT B	12	0.12V, 0.12V	120	Verovire Wire (21)	109/Pack 200-21340G	Heatinks			
L181 W96 D53	208	Case B1M4005 OR	Order Code	14 Pin Low Profile Socket Tin	14	D.I.L SKT L	14	0.15V, 0.15V	150	Individual Type for 1 x T05 50°C/W 12 Sink 5F	Individual Type for 1 x T06 10.5°C/W 28 Sink TV2				
Diect Boxes				16 Pin Low Profile Socket Tin				0.20V, 0.20V				Individual Type for 1 x T03 7.2°C/W 26 Sink TV3			
Diect Box and Flanged Lid				16 Pin Low Profile Socket Tin				0.20V, 0.20V				Individual Type for 1 x T02 17°C/W 26 Sink TV4			
Aluminium Box and Lid in Natural Finish				16 Pin Low Profile Socket Tin				0.20V, 0.20V				Individual Type for 1 x T02 17°C/W 26 Sink TV5			
L113 W83 D31	124	Case B1M5003 NA	Order Code												
L152 W82 D50	215	Case B1M5005 NA	Order Code												
L192 W112 D81	334	Case B1M5008 NA	Order Code												

G.M.T. ELECTRONICS KITS.		PUBLIC ADDRESS EQUIPMENT		
FULL TELETEXT KIT (Free-standing unit-no internal connection to T.V.)	£199-90	A55	20W AC/12vDC MOBILE AMPLIFIER	£ 69-00
TELETEXT DECODER + REMOTE CONTROL KIT (For wiring into existing television)	£135-90	A56	50W AC/12vDC AMPLIFIER	£117-30
PAL ENCODER/MODULATOR KIT	£ 22-90	A70	175W AC/24vDC PROFESSIONAL AMPLIFIER	£275-00
DOPPLER RADAR ALARM KIT	£ 44-90	L78	20W WEATHERPROOF HORN SPEAKER, B OHM & LINE	£ 41-40
F.E.T. POWER AMPLIFIER OUTPUT MODULE KIT	£ 27-50	L83	16W MEGAPHONE (SEPARATE MICROPHONE)	£ 69-00
ONE AMP POWER SUPPLY MODULE KIT - FIVE VOLTS	£ 6-00	L110	40W CABINET SPEAKER B OR 16 OHMS (SPECIFY WHICH) (c/w black 'vynide' covering, metal corners and overall cover)	£ 89-70
ONE AMP POWER SUPPLY MODULE KIT - TWELVE VOLTS	£ 7-50	M21	UNI-DIRECTIONAL ELECTRET CONDENSER MIKE, 600 OHM	£ 19-32
MOWL INERTIA CONTROLLER MK I - SLOT RACER	£ 30-00	M30	BALL WINDSHIELD DYNAMIC CARBOID MIKE, 600/50K OHM	£ 28-98
MOWL INERTIA CONTROLLER MK II - TRAIN (HAND UNIT)	£ 25-00	M104	SIX CHANNEL STEREO MIXER AND PRE-AMPLIFIER (accepts high and low imp mikes, and has RIAA input)	£ 62-10
MOWL INERTIA CONTROLLER MK III - TRAIN (CONSOLE UNIT)	£ 25-00	M124	FLOOR TYPE MICROPHONE STAND, EXTENDS TO 60"	£ 14-49

Radio Timer

This inexpensive little project will turn your plain ordinary transistor radio into a bedside radio complete with 'sleep' facility.

THIS SIMPLE AND inexpensive little project is designed to make it possible for you to reach the land of dreams more easily, whatever the outside world may do to prevent you: It will convert your simple little "trannie" into a true bedside radio, which lulls you to sleep with music and then switches itself off to preserve those expensive batteries.

Six pre-set timing periods are provided on the unit, from five minutes to thirty, but if you need to extend this 'How It Works' will provide you with the information you need. Longer times are possible with this device, since the ICM 7555 IC (integrated circuit) we have used is a CMOS version of the ubiquitous 555 timer chip, having two advantages over the latter: —
 (i) it consumes far less current in operation
 (ii) it has the ability to work with larger values of resistance as a timing component.



How it Works

IC1 is used in the standard 555 monostable multivibrator configuration. C1 is the timing capacitor. It's essential that a high stability type should be chosen if the unit is to function properly. Ideally it should be a tantalum bead capacitor as these have closer tolerances and lower leakage currents than ordinary electrolytic capacitors. The timing resistance is formed by whichever of the resistors (R1 and R6) are switched into circuit using SW1. The output pulse length of IC1 is nominally 1.1CR, giving an output pulse duration of about 300 seconds (five minutes) with one resistor, 600 seconds (10 minutes) with two resistors, and so on. Of course, these times will not be exact due to the tolerances of the timing components and IC1 itself, but they will be close enough for this applica-

tion. IC1 is triggered by taking pin 2 low by momentarily operating SW3. The output at pin 3 then goes high for the time set using SW1, biasing Q1 into conduction via current limiting resistor R7. Power is then applied to the radio which forms the collector load for Q1. At the end of the timing period the output returns to the low state, switching off both Q1 and the radio. Power is still applied to the timer circuit at the end of the timing period, but as it has a current consumption of only about 70 uA under these conditions the life of the battery will not be much reduced even if the unit is left switched on almost continuously. SW2 enables the unit to be bypassed and the radio to be operated normally. SW4 is an ordinary on/off switch.

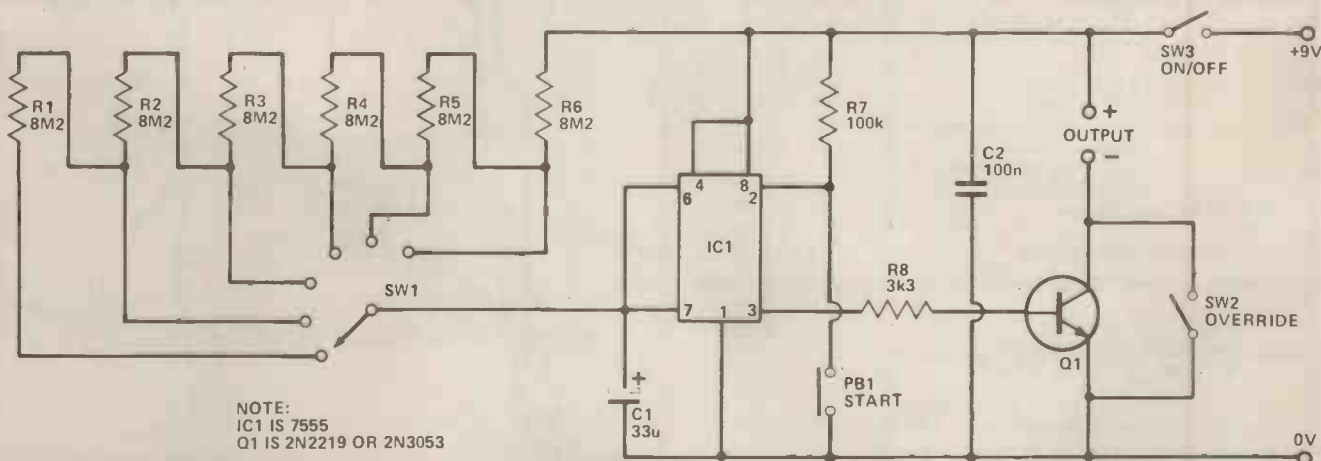
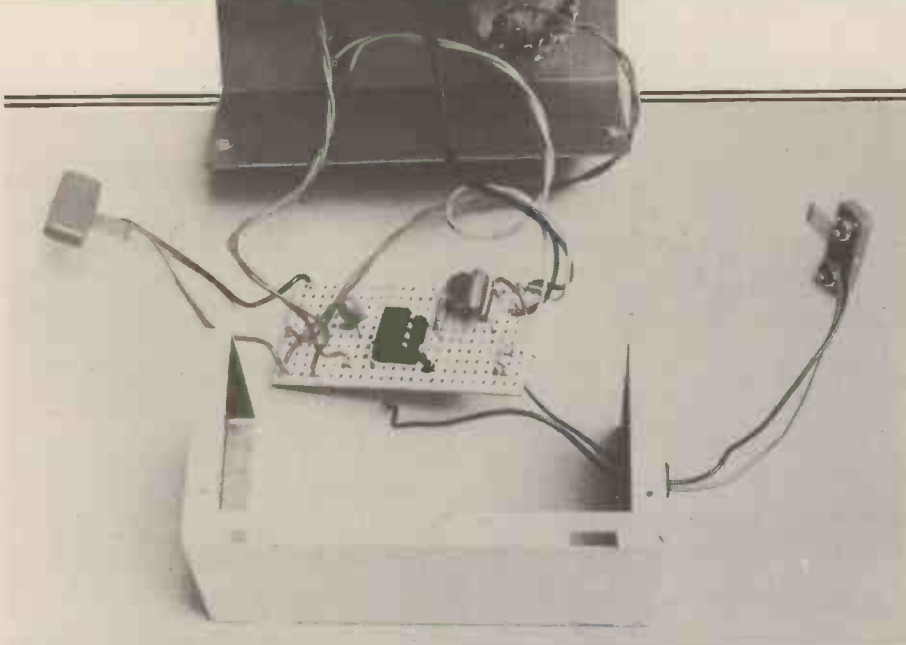


Figure 1. The circuit diagram of the Radio Timer. Note how the resistor chain R1-6 is connected in series with the switch SW1.



From this photograph you can see how we use a battery connector to power the radio.

Construction

We assembled our prototype on veroboard, but there is no reason why you could not use a PCB for the project. This might be a good place to try your first design, as actual board layout should not prove critical. If you use a PCB the timing resistors we fixed to the switch could easily be accommodated, with a resultant 'cleaning-up' of the case!

Before assembling on Veroboard, make sure you have cut the tracks at the locations shown in the diagram (Fig. 2). If you don't neither the timer

nor the 7555 will operate — probably ever again!

Solder in the links and wiring pins first, as these are least susceptible to heat damage, followed by the resistors and capacitors. Be careful too with the copper tracks themselves, if you overheat these they will lift from the board and probably snap in the process. Fit the transistor and IC last of all and preferably use a holder for the IC.

Check that you have the IC and tantalum capacitors oriented correctly before soldering in too, look for the indent or spot next to pin 1 and the lead markings respectively. If you follow the diagrams all will be well.

The resistors fitted to the switch should be aligned as neatly as possible, taking care that the leads from these components do not touch each other. Check that when you close up the case the resistors do not touch the metalwork thereby shorting them out completely. Sounds obvious but it's easily done we assure you — ask our technicians.

Choice of case is not all that critical, by the way, so if you can fit in the board, hardware and battery — it will do nicely.

Constructive Use

Connecting up the Timer is easy. Just fit the radio into the battery clip provided — noting that the Timers Clip is wired *in reverse* to normal practise so that it will fit the corresponding clip on the radio. You should choose this clip to fit the type of battery in the radio.

Switch on, set the time you want and press 'Start'. The unit will now turn the radio off after the selected period has elapsed. Sweet dreams.

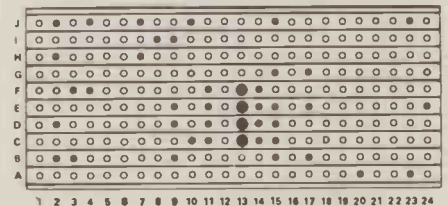


Fig. 2. Above. The underside of the board showing break points

Fig. 3. Below. Connection details and veroboard layout

Parts List

RESISTORS (All 1/4W 5%)

R1-6	8M2
R7	100k
R8	3k3

CAPACITORS

C1	33u 10V tantalum
C2	100n polyester

SEMICONDUCTORS

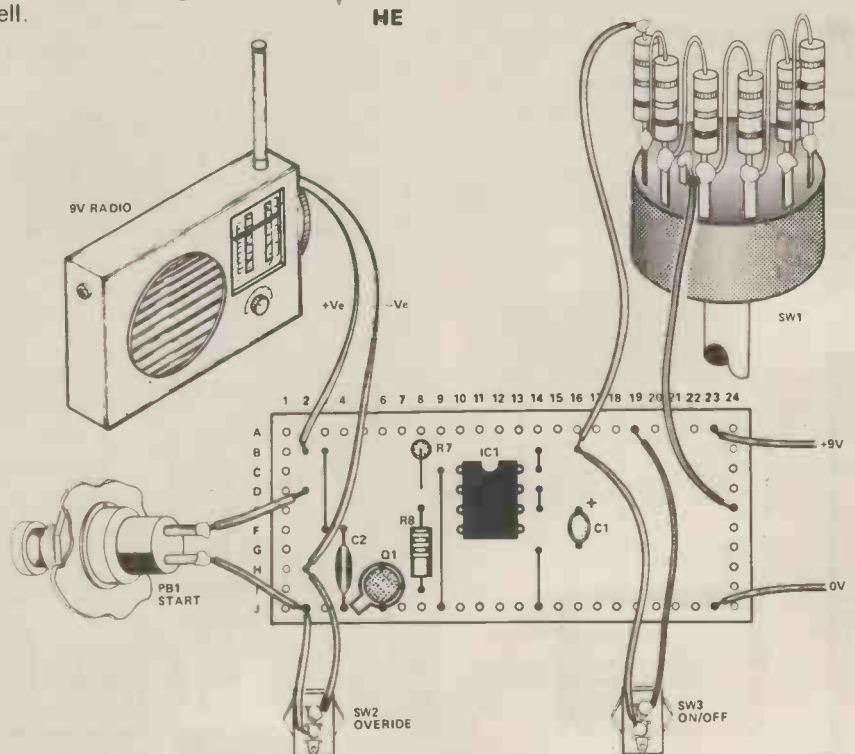
IC1	7555
Q1	2N2219 or 2N3053

MISCELLANEOUS

SW1	1 pole, 6-way rotary switch
SW2,3	single-pole, single-throw toggle switch
PB1	push-to-make, release-to break switch
10 x 24 hole, 0.1" veroboard	
Case to suit	
PP3 battery and 2 x connectors.	

Buylines

We cannot foresee any problems in obtaining the components for this project. The approximate cost for all components should not be any more than about £5.



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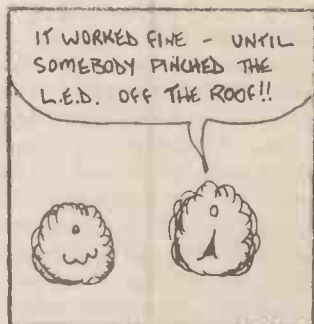
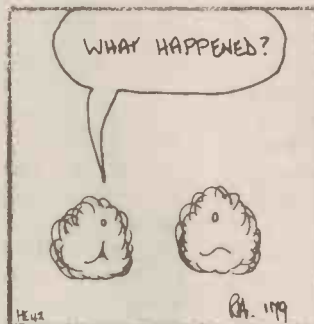
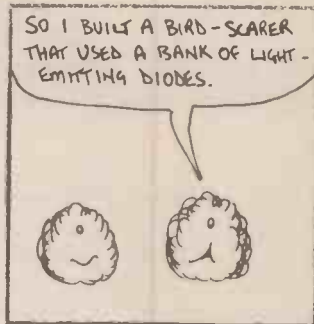
OHIO SCIENTIFIC Superboard 2. Assembled 50Hz model £159.95 + 15% vat post free. Colourboard 2 (the new colour version of Superboard 2) £205 + 15% vat.
 Special offer: If bought with super board or colourboard these items are at the reduced price shown first.
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COMPUTER GAMES chess champion 6 £49.95. Chess challenger 7 £75. New sensory chess challenger 8 £109.
 Atari videocomputer £129. Cartridges £14.85.
COMPONENTS 1N4148 0.9p. 1N4002 3.1p. 741 18p. bc182, bc184, bc212, bc214, bc548 5.5p. Resistors 1/4W 5% £12 10R to 10M 1p, 0.8p for 50+ of one value. 16V electrolytics 0.5, 1, 2, 5, 10, 22mf 6p, 100mf 7p, 1000mf 11p. 1 lb FeC1 £1.50. Dato pen 84p. 40 sq ins pcb 45p. Polystyrene capacitors £12 63V 10 to 1000pf 3p, 1n2 to 10n 4p. Ceramic capacitors 50V £6 22pf to 47n 2p. Zeners 400mW £24 2v7 to 33v 7p.

TV GAMES AY-38500 + kit £10.21. AY-38600 + kit £14.98. Stunt cycle chp + kit £14.09. Colour generator kit £9.05.
TRANSFORMERS 6-0-6V 100ma 80p. 1 1/2 £2.60. 9-0-9V 75ma 80p, 1a £2.40, 2a £3.94. 12-0-12V 100ma 99p, 1a £2.80.
IC AUDIO AMPS with pcb. JC12 6W £2.08. JC20 10W £3.54.
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Kit Review

The ultimate amplifier kit? We think this month's offering from Crimson will make you think twice about buying that flashy oriental box of tricks.

CRIMSON ELEKTRIK kits are now available over-the-counter and the company has just announced a new generation of power modules, so now is a good time to have a look at what they offer. Crimson sell a range of pre-assembled PCB modules for use in hi-fi and other quality sound systems. They sell 'Hardware Kits' so you can build up the modules you have selected into a preamp or power amp looking like those pictured above.

The modules in the Hobby Electronics system are CPR1S preamp board, two CE608 power amp boards (each 60W, 8 ohms), and the CPS1 and REG1 power supply boards. The 'S' suffix on the preamp board indicates that tantalum capacitors and metal-oxide resistors have been used where applicable.

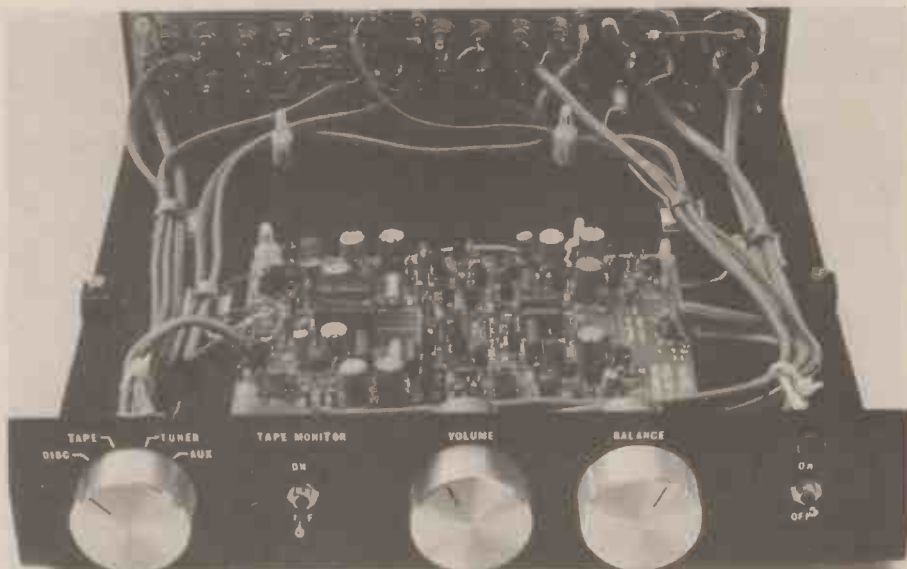
The Crimson Elektrik advertisement in Electronics Today International gives details of the other modules. Briefly, they offer 100W and 170W power amps (4 or 8 ohms) and a pre-amp for use with a moving-coil cartridge (this fits into the case on the four unused PCB pillars shown in Photo Two).

The Kit

We do not recommend our readers to build hi-fi amplifiers from scratch (unless they are experts at working with high-power transistors and audio circuitry). The Crimson amplifier, however is suitable because the kit comes with all the difficult bits pre-assembled. (Not that it's a piece of cake, though. You need to have had some project-building experience to put this kit together.) This is an expensive top-quality amplifier, so it should be built with care.

Features

The amplifier is low on front-panel features, but behind the simple exterior lies a sophisticated amplifier. The spec is superb. The preamp's disc input stage boasts a 40dB overload margin — at 30dB overload there's less than 0.005% distortion at



20kHz. Signal/noise ratio of the stage is 70dB. THD over the range 20Hz to 20kHz is less than 0.008% through the preamp. FET muting protects your loudspeakers when you switch the power on.

The power amplifier specs are: THD typically 0.01%, TID negligible, slew-rate limit 25V/us, signal/noise ratio 110dB, and frequency response 10Hz-35kHz -3dB. The distortion normally introduced by fuses in the speaker leads can be avoided — fuses are not needed with the series '5' amplifiers (except to protect low-power speakers from high power when the volume control is abused).

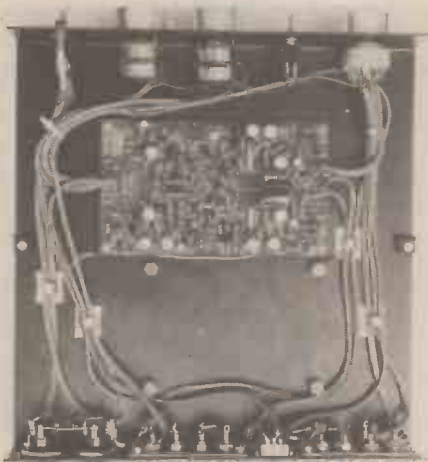
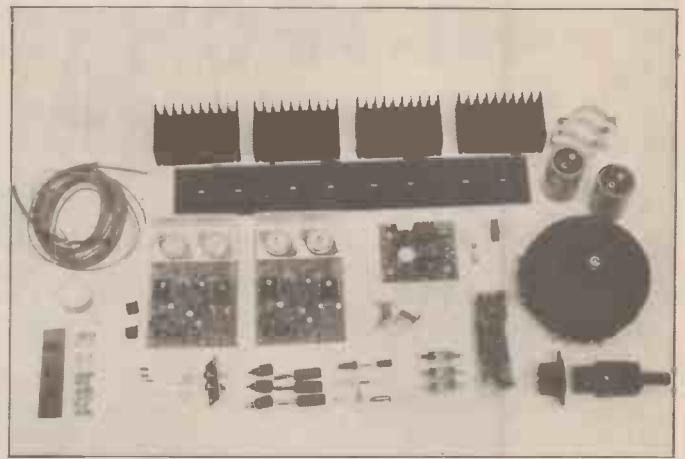
Crimson call their protection system an 'Intelligent Sensing Circuit'. The ISC does not trigger on transients (or clipping) — inferior protection circuits do and thereby distort the signal. The ISC monitors both voltage and current and, should a fault arise in the load circuit, virtually instantaneously (0.1s) the amplifier is put into standby mode with the load disconnected. Unless you fit a quick-reset switch (handy in discos) the amp will stay shut-down for about a minute. Using the ISC you can short out the speakers when the amp is turned up full without damage.

The high power and high specs identify Crimson equipment as audiophile material. The medium-fi enthusiast will be bewildered by what looks like an absence of tone controls. That's because there are no tone controls. If you don't understand why, join the club — I gave up trying to understand audiophiles years ago.

The Preamp Kit

The preamp kit consists of all the bits shown in Photo One, plus the matt black steel case and two leaflets. The Application Notes (12 pages of photocopied typescript) tell any buyer of the CPR1 how to make it work; the Assembly Instructions (6½ pages) tell you how to use the Hardware Kit.

The Hardware Kit isn't cheap (£38.07 — use your local shop for the pots, switches, sockets, and wire, and make your own case, and you'd save a few pounds) — but it is good. You are assured of a neat finish and no hassle, so for domestic Hi-Fi it's worth it. The components supplied are all top quality; most come in Radio Spares packing. Good components are fun to use — everything clicks into place and the thrill of watching gold turn to silver as you solder the mains



leads to the switch is an experience no amateur constructor will forget (why can't all components have gold-plated tags?).

Minor problems encountered were one threadless nut (identified as such only after five minutes of digital contortion with long-nosed pliers and screwdriver), a patch of bad photocopying (a marginal note explaining how the phono sockets supplied were different to those in the instructions, resulting in the application of a bit of creative thought to figure out what to do), and the omission of (more likely my misplacement of) insulated sleeving from the wire pack. The pettiness of these quibbles is my way of saying how easy it was to build. Only someone unfamiliar with the basic function and construction of simple components would have trouble. (For example, I doubt that a raw beginner could make the RS 6-way switch into a 4-way switch using these instructions and no further help.)

The Power Amplifier Kit

Photo Three shows all the components that fit into the power amp case. There is less wire than in Photo One: correspondingly this kit takes

less time to build (six hours if you're slow, three if you rush). The Assembly Instructions (8 pages) and large Wiring Diagram make the job easy.

I made notes when the components supplied didn't live up to the expectations of the instructions. There was no room for washers on some of the heatsink bolts, and I'm pretty sure the mains plug and socket supplied were different from the ones written about. Anyone who has ever built a Hobby Electronics project will realise that if that's all I can find wrong with the instructions then Crimson have done a good job. There's always room for improvement. Step 26 refers to a diagram (which you use to decide which rectifier you are using). This would be better located alongside Step 26 so you don't have to spend time deciding which diagram on which bit of paper you are supposed to be looking at.

Like the preamp, the power amplifier can be built by anyone familiar with components and soldering. I'm pleased that Crimson didn't pitch their instructions at the man in the street. I've built kits that said things like "Find socket S7. Take apart as shown in Fig. 32. Fix into hole HS7 as shown in Fig. 33, taking care to make sure that the conductor is insulated from the back panel." When building kits like that I have a tendency to ignore the instructions altogether and build directly from the wiring diagram. But there's always something important you miss, so you have to read the tedious instructions anyway!

Testing the amplifier is simple — all you need is a multimeter. The power supply is tested before power is wired to the amplifier boards. One nice touch is that Crimson give you a 560 ohm resistor which you use to discharge the power supply capacitors after testing. Testing the com-

plete unit is a matter of measuring the voltage at the speaker sockets. For me it identified one dodgy joint in the power supply — one of those multiple connections where a 25W soldering iron is really inadequate.

The Final Analysis

To be honest, I knew Crimson were good before I built this kit. I had heard the amplifier demonstrated at a hi-fi shop and I know people who use their modules in PA applications. My expectations — both of the kit and the amplifier-when-built — were pleasantly fulfilled. The only drawback is the price, you have to be prepared to invest in a hi-fi system costing over £500 if you are to do justice to the amp.

I haven't commented on the appearance of the equipment. Hopefully this will be apparent from the photographs. The use of a toroidal mains transformer (only 50mm high) means a low-profile design can be accommodated. All the controls are on the front panel of the preamp, so the power amp can be hidden away. I doubt, however, that anyone would want to — the black slab with heatsinks across the front would take pride of place in any HE reader's home.

Crimson kits and modules are retailed by Marshalls and can be bought across the counter in London, Glasgow and Bristol, and from Badger Sound Services in Lytham and Down Hifi in Bangor. The prices of the modules described here are: CPR1S £40.87, REG1 £6.90, CE608 £19.52 each, CPS1 £16.56, Preamp Hardware Kit £38.07, Power Amp Hardware Kit £35.03.

If you cannot get the kit to work properly Crimson will get it going for you for a small charge (typically £10, at worst around £25, including return postage). Crimson Elektrik are at 1A Stamford Street, Leicester, LE1 6NL.

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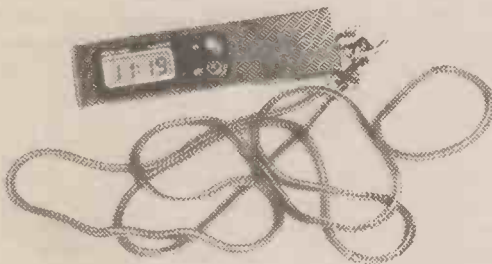
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What's In a Name

This month we start a new series. Rick Maybury tries to cut his way through the jungle of Jargon — we start with the differences between Electricity and Electronics.

FOR THE NEXT FEW months, as an ongoing situation, we are going to take a systemised, time-phased, functional investigation into the incredible world of jargonese, acronyms and abbreviations.

If you understood that paragraph then you are probably one of those people that persist in talking in what amounts to a foreign language — technical jargon. I suppose to a complete outsider even Hobby Electronics (HE to its friends) can appear daunting so, to everyone who has complained about our useage of such confusing terms as CMOS and LED Opto Isolator we dedicate this series.

Misleading Medics

Before we dive in at the deep end it's probably a good idea to look at some of the reasons why everyone from politicians to postmen surround themselves in incomprehensible (unless you happen to be one) jargon.

The first, and still one of the most prolific users of jargon must be the medical profession. The actual reasons for using such terms as 'acetyl-salicylic acid' (aspirin) or even a double convoluted femoral contusion (I made that one up) was to protect the profession from outside (usually amateurish) involvement. Of course this is a gross simplification but if you had just spent seven or more years studying all manner of human ailments you wouldn't want every Tom, Dick or Harry running around curing themselves — or worse! You'd be out of a job pretty quickly. Now before we

get hundreds of letters from members of the medical profession complaining, see if you can decipher a doctor's prescription.

The most recent addition to the jargon game is our old friend the computer. During the last 10 years, with the advent of cheap microprocessors, volumes of (mostly unnecessary) jargon have been written to protect those in the know, from letting the general public — you and me, in on all the 'fun'. After all knowledge can be a dangerous thing. Sadly it is far too late to change things, anyone seriously interested in computing has to learn the seemingly endless lists of terms and assorted nonsense before they can even look a PET (that's an acronym for Personal Electronic Transactor) squarely in the ASCII keyboard. (American Standard Code for Information Interchange, see what we mean?)

I suppose all this sounds rather like throwing stones in glasshouses, since electronics, because of the diversity of disciplines it encompasses, must come pretty high on the list of offenders. The only difference between us and the medical profession is that we are actively encouraging you to dabble.

Electronics vs Electricity

To start the series off we are going to look at the word Electronics and how it's different from its older brother, electricity.

Looking through the various dictionaries and knowledgeable tomes that litter the HE office it's easy to see that there is no clear cut definition of electronics. So, I have taken the best bits from the various definitions to produce the following. I think you'll agree it comes as close as possible.

First Electricity

The study of the low of large currents in metal conductors. By large we mean 'comparatively' large. Very few 'electrical' systems operate with currents less than 0.5 amps.

Now Electronics

The science and study dealing with the motion, emission and behaviour of electrons, especially in a vacuum, gas, specialised conductor or semiconductor and controlling the motion of electrons within these environments.

Down To Earth

Brought to its simplest form electricity looks at electrons flowing through conductors and the effects it has in those circuits. Electronics goes one stage further and attempts to control the electrons by passing them through substances or materials (not necessarily conductors in the true sense), as well as metal conductors.

So now you know, next month we will be looking at some of the terms we use to describe how electrons behave themselves. **HE**

JARGON GENERATOR

Here is the instant HE Jargon Generator, if you are at a loss at parties, confounded by computer nuts or simply out to impress the boss then take note of these words. To build up an impressive phrase all you have to do is select a word from each column and string it together. For instance you could say to someone: "I was involved on a Col 1, 5, Col 2, 1, Col 3, 7," there's not much one can say to you after that, try it some time.

Column 1

0. Integrated
1. Total
2. Systematized
3. Parallel
4. Functional
5. Responsive
6. Optical
7. Synchronized
8. Compatible
9. Balanced

Column 2

0. Management
1. Organizational
2. Monitored
3. Reciprocal
4. Digital
5. Logic
6. Transitional
7. Incremental
8. Third generation
9. Policy

Column 3

0. Options
1. Flexibility
2. Capability
3. Mobility
4. Programming
5. Concept
6. Time phase
7. Projection
8. Hardware
9. Contingency

ETI NEXT MONTH

Vocoder



Now you can make your own synthesiser or guitar or even your cat speak or sing to you. This design uses 14 channels and has all the goodies like LED PPM meters, slew rate control, voiced/unvoiced detector and very versatile internal excitation! What more could you ask for? The ETI Vocoder's got the lot.

TV Sound Amplifier

You've read the book and seen the film. Now hear the TV version AS IT REALLY IS! Yes folks true glorious hi-fi sound from your telly! Broadcast sound is of an incredibly high standard and TV sound circuits are of an incredibly LOW standard. What a waste.

Improve your viewing and give your ears a treat by playing Crossroads in high fidelity. No messy wiring into the set either, its all self contained — complete with monitor amp — and is easily constructed.

Survival

The time interval is getting shorter and the ladder higher. Your opponent has turned up the skill level to maximum — one tiny slip and you're gonna hit the bottom and hard. Can you make it to the top? Can you survive? Good game, Good game!

Very Low Level Circuit Design

An absorbing article on the obstacles to be overcome at signal levels of a few microvolts and less. How do you minimise noise problems, when the amplitude of the noise is comparable to the amplitude of the signal? How about obtaining a decent gain without increasing hum pickup? An unusual and intriguing subject well explained.

Digital Test Meter

If we told you that next month we are running what is probably the ultimate digital meter project would you believe us? Probably not — but try anyway, because its true! You name it, this box will measure it — accurately. Frequency, voltage, resistance, current etc etc. It has an LCD display and costs a lot less to build than you think.

Articles mentioned herein are in an advanced state of preparation. However, circumstances may dictate changes to the final contents.

HELP us to help You

Hobby Electronics needs your help. We are continually striving to bring you the most informative and most enjoyable electronics magazine around. We know that there are a large number of our readers out there, on the other side of this printer's ink, who never write in to us and who have never filled in a magazine survey — even ours!

The highest response we had to a survey such as this was around 10% of the total readership, which although staggeringly good in normal terms still means that only one in ten Hobby readers fed his/her opinions into our receptive ears. Nine out of ten, therefore, are seeing the magazine that number ten wants!

This time PLEASE pick up your pens, pencils, quills — anything you like, and let's hear from more of you. We want to produce the magazine that you want to read, and the best way to help us do that is to spare us five minutes and fill in the form overleaf. No bribes, no inducements — just a better HE!



HOBBY ELECTRONICS SURVEY

MODMAGS LTD

145 CHARING CROSS ROAD

LONDON WC2

READER SURVEY

1) Please rate this month's articles on a scale of 1 (rotten) to 9 (superb). If you didn't read the feature, please score 0. In addition please tick the best feature and write any comments in the space provided.

	SCORE	COMMENT
MONITOR		
ICE		
OP AMP CHECKER		
WHAT'S IN A NAME		
EQUITONE		
BUILDING SITE		
RADIO TIMER		
KIT REVIEW		
PASS THE LOOP		
CLEVER DICK		
MOVEMENT ALARM		
GAS DETECTOR		
BREAKER ONE FOUR		
BEASTIES		
MICROS ARE EASY		

2) Do you intend to build any projects from the issue? If so, which?

YES	NO

3) How do you think this issue compares with the last?

MUCH BETTER	SLIGHTLY BETTER	NO DIFFERENT	SLIGHTLY WORSE	MUCH WORSE	OH MY GOD!

Do you notice any differences between current issues of HE and those of, say, a year ago?

4) Do you construct projects using PCBs or Veroboard?

PCB	VERO

If PCB, do you make your own?

YES	NO

8) Please list below those projects that you have built, take a separate sheet.

9) Have you ever built up any of the Short Circuits from HE?

YES	NO

10) How did you become a reader of HE?

Impulse buy	Friend's copy	Through Advertisements	Other, please specify
	ETI	press	Radio

11) Is there a specific project you'd like to see published in HE? If so tell about it below or use a separate sheet if necessary.

ADVERTISING

12) Do you read advertisements in HE?

Frequently Occasionally Never

13) Do you find the advertisements in HE useful when purchasing goods?

Yes No Neither

14) Have you ever purchased goods from mail order advertisements in HE?

YES	NO

15) If so:—

(a) Approx. how many times in the last year have you ordered goods from a mail order company? £

(b) How many mail order companies have you used during that period? £

16) Approx. how much did you spend on electronics in the last year?

17) Approx. how much of this amount was spent as a direct result of seeing an advertisement in HE? £

18) Have you any comments on advertisements in HE?

AUDIO

19) Do you own a stereo system?

YES	NO

20) How much did your present system cost? £

21) Do you attend electronic exhibitions?

YES	NO

22) If so, which? £

HOME COMPUTING

23) Do you own a home computer or microprocessor system?

YES	NO

24) How much did it cost? £

25) Did you buy it through:—

(a) Recommendation by other/shop

(b) Article in HE/other magazine

READER PROFILE

These are personal questions which you may find objectionable. Please feel free to tell us to mind our own business in that case. Answering them would help us greatly, however, and your co-operation would be appreciated. All info treated strictly as statistics and in confidence.

- 26) How old are you?
- 27) Sex (Male)Female/(Undecided)
- 28) Total annual income £
- 29) Do you hold any of these credit cards? Access American Express Other
- 30) To what level were you in full time education?

C.S.E. 'O' Level 'A' Level
O.N.C. H.N.C. Degree

- 31) What do you like about HE?
- 32) and dislike?
- 33) Any suggestions for improvement?
- 34) Any comments to make? (Please include separate sheet if necessary!)

35) The competition. (Otherwise known as the Bad Guys!)

On an arbitrary scale of 100 with HE scoring 50, please rate the competition against us.

	READ			RATING
	REGULAR	OFTEN	USED TO NEVER	
RADIO CONTRACTOR				
WIRELESS WORLD				
TELEVISION				
VIDEO				
PRACTICAL COMPUTING				
PRACTICAL WIRELESS				
PRACTICAL ELECTRONICS				
PERSONAL COMPUTER WORLD				
BYTE				
ELEKTOR				
EVERYDAY ELECTRONICS				
COMPUTING TODAY				
HOBBY ELECTRONICS				
E.T.I.				

Thank you for your time and patience!

Name
Address

5) Which of the following best describes Hobby Electronics coverage of these subjects?

SUBJECT	OVERDONE	SLIGHTLY TOO MUCH	ABOUT RIGHT	COULD DO MORE	NEEDS A LOT MORE	NEW REGULAR FEATURE REQUIRED
CITIZENS BAND RADIO						
CONSTRUCTIONAL PROJECTS IN GENERAL						
INTRODUCTORY FEATURES (ie Into Electronics)						
HOME COMPUTING						
GENERAL SCIENCE						
AUDIO (ie Hi-Fi)						
EQUIPMENT REVIEWS						
OTHER (Please specify)						

6) More specifically, there are many types of project we can present in HE. Indicate your interest in these examples (0-9 (good)) and what sort of emphasis should we place upon each

	LESS NEEDED,	RIGHT NUMBER NOW	LET'S HAVE MORE	TOTALLY IGNORE
TEST GEAR				
SOUND EFFECTS				
GAMES				
MUSIC				
AUDIO				
BIOFEEDBACK				
MOTORING				
COMPUTING				
FOR THE HOME GADGETS				

7) How many projects have you built from HE within the last year?

0	1-5	6-10	11-15	16-20	OVER 20 (please specify)

DISPLAYS

OL304 Red 0.3" c.c. pin comp. £1.80
 DL307 Red 0.3" c.c. pin comp £1.80
 DL707 £1.80
 DL847 Red 0.8" (pin comp DL747) c.c. £1.80
 DL850 Red 0.8" c.c. (pin comp DL750) £1.80
 OL727 Dual 0.5" c.c. a Red £1.50

D.V.M. THERMOMETER KIT

Based on the ICL 7106. This kit contains a PCB, resistors, presets, capacitors, diodes, IC and 0.5" liquid crystal display. Components are also included to enable the basic DVM kit to be modified to a Digital Thermometer using a single diode as the sensor. Requires a 3mA 9V supply (PP3 battery). **£20.75**

MINI KITS

These kits form useful subsystems which may be incorporated into larger designs or used alone. Kits include PCB, short instructions and all components.

MK1 TEMPERATURE CONTROLLER / THERMOSTAT
 Uses LM3911 IC to sense temperature (80°C max) and triac to switch heater. **500W £3.20 1KW £3.50**

MK2 SOLID STATE RELAY
 Ideal for switching motors, lights, heaters, etc. from logic. Opto-isolated with zero voltage switching. Supplied without triac. Select the required triac from our range. **£2.60**

MK3 BAR/DOT DISPLAY
 Displays an analogue voltage on a linear 10-element LED display as a bar or single dot. Ideal for thermometers, level indicators, etc. May be stacked to obtain 20 to 100 element displays. Requires 5-20V supply. **£4.75**

MK4 PROPORTIONAL TEMPERATURE CONTROLLER
 Based on the TDA1024 Zero voltage switch, this kit may be wired to form a "burst fire" power controller or a "proportional temperature" controller enabling the temperature of an enclosure to be maintained to within 0.5°C. **1.5KW £5.25 3KW £5.55**

MK5 MAINS TIMER
 Based on the ZN1034E Timer IC this kit will switch a mains load on (or off) for a preset time from 20 minutes to 35 hours. Longer or shorter periods may be realised by minor component changes. Maximum load 1KW. **£4.50**

MINI TRANSFORMERS



Standard mains primaries 240V a.c. 100mA secondaries
 6.0-6V 80p
 9.0-9V 85p
 12.0-12V 90p

LEDS

LEDS
 0.1" Red 9p
 0.1" Green 12p
 0.1" Yellow 12p
 0.2" Red 9p
 0.2" Green 12p
 0.2" Yellow 12p
 0.2" clips 3p
 Rectangular Red 18p
 Rectangular Green 20p
 Rectangular Yellow 21p

TOUCH CONTROL LIGHTING KITS

These KITS replace light switches and control up to 300 Watts of lighting. No rewiring, fit plaster depth boxes, insulated touchplates. Easy to follow instructions.

TD300K TOUCHDIMMER. Single touchplate with alternate action. Brief touch switches lamp on and off, longer touch dims or brightens lamps. Neon lamp helps find the switch in the dark. **£8.50**

TDE/K Extension Kit for TD300K for 2-way switching, etc. £1.50

TSD300K TOUCHSWITCH & DIMMER
 Single touchplate, small knob controls brightness. **£5.50**

TS300K TIME DELAY TOUCHSWITCH
 Turns off after preset delay (2 secs to 3 1/2 mins.) **£4.30**

LD300K Conventional Lightdimmer £2.90

INTEGRATED CIRCUITS

555 Timer 21p
 741 Op. Amp. 19p
 AY-5-1224 Clock £2.60
 AY-5-1230/2 Clock/Timer £6.50
 AY-3-1270 Thermometer £8.20
 ICL7106 DVM (LCD drive) £7.00
 LM377 Dual 2 W Amp £1.45
 LM3795 Dual 6W Amp £3.50
 LM380 2W Audio Amp 80p
 LM382 Dual/low noise Preamp £1.00
 LM386 250mW low voltage Amp 75p
 LM1830 Fluid Level Detector £1.50
 LM2907 I-v Converter (8 pin) £1.40
 LM2917 I-v Converter (14 pin) £1.60
 LM3909 LED Fisher/Oscillator 85p
 LM3911 Thermometer £1.20
 LM3914 Dot/Bar Driver £2.10
 MM74C911 4 digit display controller £6.50
 MM74C915 7 segment-BCD converter 96p
 MM74C926 4 digit counter with 7 seg.o/p £4.50
 S566B Touchdimmer £2.50
 S9263 Touchswitch 16-way £4.85

DO MAGAZINE REMOTE CONTROL PROJECTS MAKE YOU SEE INFRA RED?



How many times have you considered building a remote control project but were put off by the dozens of ICs, special coils, lenses and other hard to get components, not to mention the need for a well equipped lab. to set the unit up? T.K. ELECTRONICS have changed all that. Three ICs can build a sophisticated system that requires only a capacitor and resistor to set the clock frequency (which can drift up to 20% without affecting performance). Control radios. Hi-fi (including bass, treble and volume), lighting, toys, garage doors, etc. Still not convinced? Then look at the prices!



LD271 IR Emitting Diode 36p
 SFH205 Photodiode Detector 95p
 SL480 IC Pulse Amplifier £1.40
 SL480 Keyboard Controlled Encoder/Transmitter £2.40

ML922 10-channel Receiver and 3 Analogue Outputs £4.20
 ML926 16-channel Receiver (4 Momentary binary outputs) £1.40
 ML928 16-channel Receiver (4 Latched binary outputs) £1.40
 Data sheets (per device) 5p
 These ICs can also be used with ultrasonic and radio links, depending on range, cost and speed of operation. For more details, why not give us a ring - we will be pleased to advise you.



If you do not require a sophisticated multi-channel remote control, we have developed a simple single-channel ON/OFF infra red transmitter and receiver. The transmitter unit comes complete with a hand held box and requires a PP3 (9V) battery. The receiver includes a triac capable of switching up to 500W at 240V a.c. and comprises a preamplifier, bistable latch and a mains power supply, making the unit completely self-contained. The small size of the receiver enables the unit to be "built into" all kinds of equipment from lamps to tape recorders. The minimum range is 20 feet.

INTEGRATED CIRCUITS

SN76477 Complex Sound Generator £2.52
 TBA900 5W Audio Amp 58p
 T8A10AS 7W Audio Amp 85p
 TDA1024 Zero Voltage Switch £1.20
 TDA2020 20W Audio Amp £2.85
 ZN1034E Timer £1.80
 All ICs supplied with data sheets
 Data Sheets only 5p each device.

TRIACS

400V Plastic Case (Texas)
 3A 49p 16A 90p
 8A 58p 20A 165p
 12A 85p 25A 190p
 6A with trigger 80p
 8A isolated tab 65p
 Diac 18p

SPECIAL OFFERS

orders must be received by 30.7.80

10x8pin sockets 85p	10x555 £1.80
10x14pin sockets £1.00	10x741 £1.60
10x16pin sockets £1.15	25xD.2" Red Leds £1.50
10x18pin sockets £1.40	ORP12 50p
100xSoldercon pins 40p	2N3055 40p

ALL COMPONENTS ARE BRAND NEW AND TO SPECIFICATION. ADD VAT AT CURRENT RATE TO ABOVE PRICES. 40p P&P MAIL ORDER - CALLERS WELCOME BY APPOINTMENT



TK Electronics
 (H.E.), 106 STUDLEY GRANGE ROAD
 LONDON W7 2LX. TEL. 01-579 9794



EX-STOCK FROM US J.V.C. BELT DRIVEN TURNTABLE WITH STEREO MAGNETIC AUDIO TECHNICA CARTRIDGE



LIST PRICE OVER £50
 J.V.C. Turntable supplied complete with Audio Technica AT10 stereo magnetic cartridge. Belt driven

'S' shaped tone arm. Modern design. Full size 12" platter. Calibrated counter balance weight (0.3 grms). Anti-skate (bias) device. Size - 12 3/4" x 15 3/4" (approx)

AT ONLY
LIMITED STOCKS £25.99
 PLUS VAT £3.89 Post £2 50

GEC HIGH QUALITY STEREO 10 + 10 watt AMPLIFIER WITH AM/FM STEREO TUNER IDEAL FOR THE HOME

A cancelled export order brings you this offer from the world-famous firm of G.E.C.

AM/FM stereo Tuner Amplifier
 Ready built. Comprising of a tuner/pre-amp. board and separate power supply/power amp. board with wiring diagram.

Rotary Controls: Tuning, on/off volume, balance, treble, bass, Stereo Beacon indicator.

Push-button Controls: Mono, Tape, Disc, A.F.C., F.M. (VHF), LW, MW, SW.

Power Output: 7 watts RMS per channel, at better than 2% THD into 8 ohms, 10 watts speech and music.

Frequency Response: 60Hz-20KHz within ± 3dB.

Tape Sensitivity: Output - typically 150 mv. Input - 300 mv for rated output.

Disc Sensitivity: 100 mv (ceramic cartridge)

Radio: FM (VHF) 87.5MHz-108MHz.
 Long Wave 145KHz-265KHz.
 Medium Wave 520KHz-1620KHz.
 Short Wave 5.8KHz-16MHz.

Size: Tuner - 2 1/4" x 1 1/2" x 7 1/2". Power Amp - 2 1/2" x 7 1/2" x 4 1/2".

LOW PRICE OFFER



Limited stocks
 Superb Value
 Don't delay
 order one today

ON/OFF BALANCE. TREBLE, BASS, MONO TAPE Phono AFC FM LW MW SW Tuning. Volume

Fully Guaranteed Ex-Stock

SUITABLE SPEAKERS IN CABINETS PAIR 10 WATTS £19.95 INC. VAT POST £2.50 Pair

ONLY £19.95 + VAT £2.99 CARRIAGE £2 50

CAR STEREO CASSETTE MECHANISM



★ Front loading 12 volt transistorised
 ★ Speed & Voltage control
 ★ Ex-equipment - Tested O.K.
 ★ Takes standard C60 cassette

ONLY £7.50
 INC VAT POST 80p

5 + 5 Watt Car Stereo Amplifier made for Motorola

★ WITH pre-amplifier and M. & Long wave assembly.
 ★ Supplied as two built and tested units.
 ★ R.F. and I.F. stereo preamplifier and radio 4 x 2 x 1"
 ★ 5+5 watt stereo amplifier 12/14 volt 4 x 2 x 1"
 ★ Complete with circuit, data and connection diagrams.
 ★ Limited quantity available, ex-stock.

BRAND NEW Only £5 + VAT + VAT Post 50p

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HENRY'S
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PRO M25 Professional capacitor boom-arm microphone by Eagle.
 A graceful 60 cm boom-arm capacitor studio microphone using a cardioid capsule. A high standard of finish for in-vision use and yet robust enough to withstand long periods between maintenance. Supplied complete with 1 red and 1 black windshield and 6 metres of twin screened cable terminating at the microphone end in an XLR connector.
 Impedance: 600 ohms (floating). Response: 20-18,000 Hz. Sensitivity: -70 dBV.
 Cable: 6 metres 2 conductor shielded. Connector: XLR 3-11C. Battery type: HP7.

LIST PRICE £37.40
OUR PRICE £19.95
 inc VAT POST £1 50

Pass The Loop

All the fun of the fair with this easy to construct, cheap to build project from HE. Amuse your friends and annoy your neighbours, or raise funds with the HE Pass the Loop.

CAN you remember the old game where the aim was to pass a loop of wire slowly along an intricate shape of stiff wire without the two touching? If they did touch, an alarm bell rang, indicating that the player had lost.

Well, that was too simple for us. We wanted something that was a bit more up to date and more demanding of the finer sensory motor skills. So our designers set to work and eventually hit upon this solution to the problem — an all solid state circuit which produces audible and visible warnings of game won, game lost, and loop contact conditions. If that isn't enough we have also included timer circuitry so that the player can compete against the clock, thereby increasing the fun quotient.

Four common CMOS ICs form the heart of the game, all fitting neatly onto our purpose-designed printed circuit board. These ICs generate all the functions of the device, such as timing visible warnings via LEDs, and audible tones. Three different tones are produced to indicate to the player whether he has won, lost or hit the wire.

Transistor Q1 amplifies the generated frequencies to power a small loudspeaker so that the PCB is self-contained and in most cases this is sufficient. But, if you want much more volume then the low level output can be used to drive another amplifier.

Construction

Use IC sockets to mount the ICs but as they are CMOS remember to leave the ICs until the very end before insertion. Follow the overlay carefully putting all other components and links in. Carefully check that electrolytic capacitors, diodes and the transistor are the correct way round.

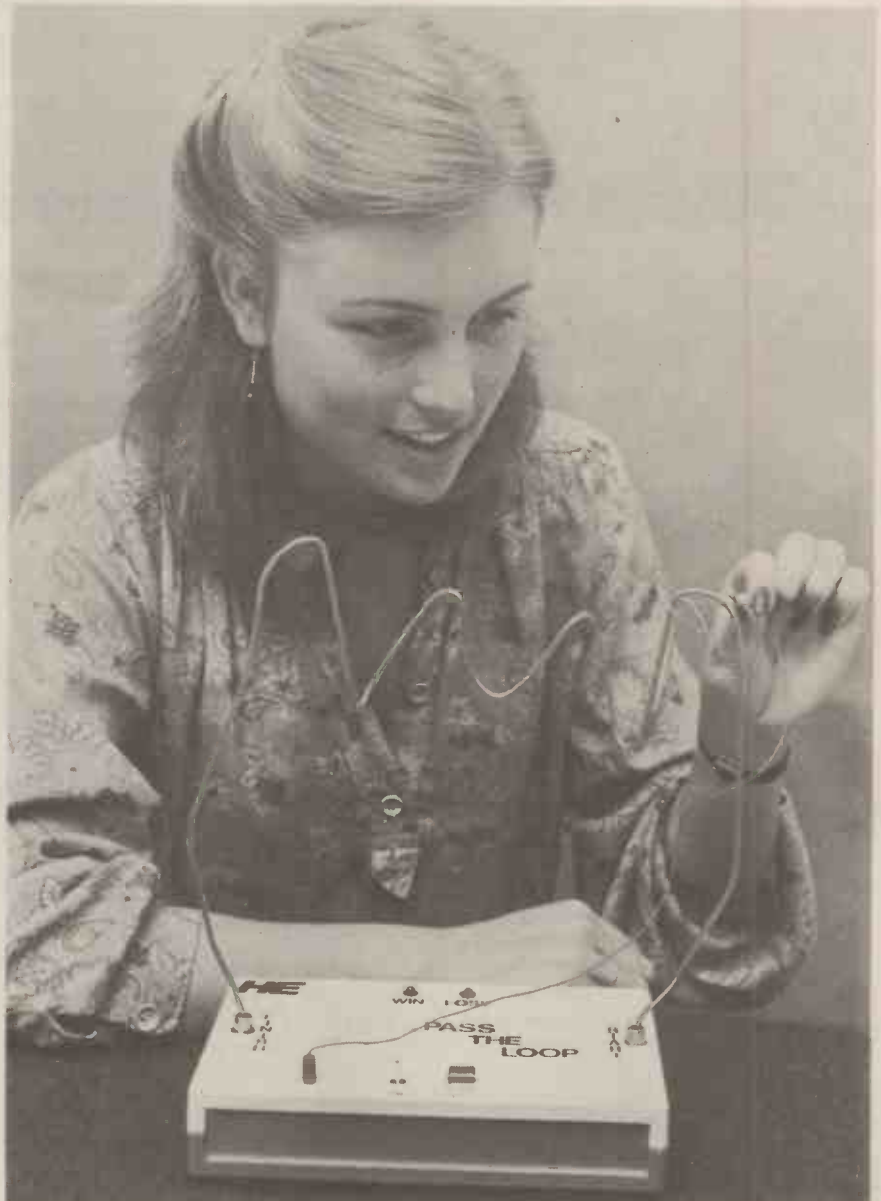
Next make all off-board connections to the loop, wire, phono sockets (see later) and loudspeaker etc., and then when you are sure that all is O.K. you can insert the ICs. If

you have never dealt with CMOS chips before then be careful! They will be supplied either in conductive foam or in a small plastic holder and it is advisable not to take the chips out of this until the very last minute.

Do not touch any of the pins! CMOS is susceptible to static electricity and can be easily damaged. Hold the ICs carefully by

the ends and fit them into their holders, without bending any pins underneath. This is quite a fiddly job so take your time and get it right.

The end pieces can be made using common or garden phono sockets without their cover cap, thus providing the necessary isolation between the centre and outside connections. Screw or glue the



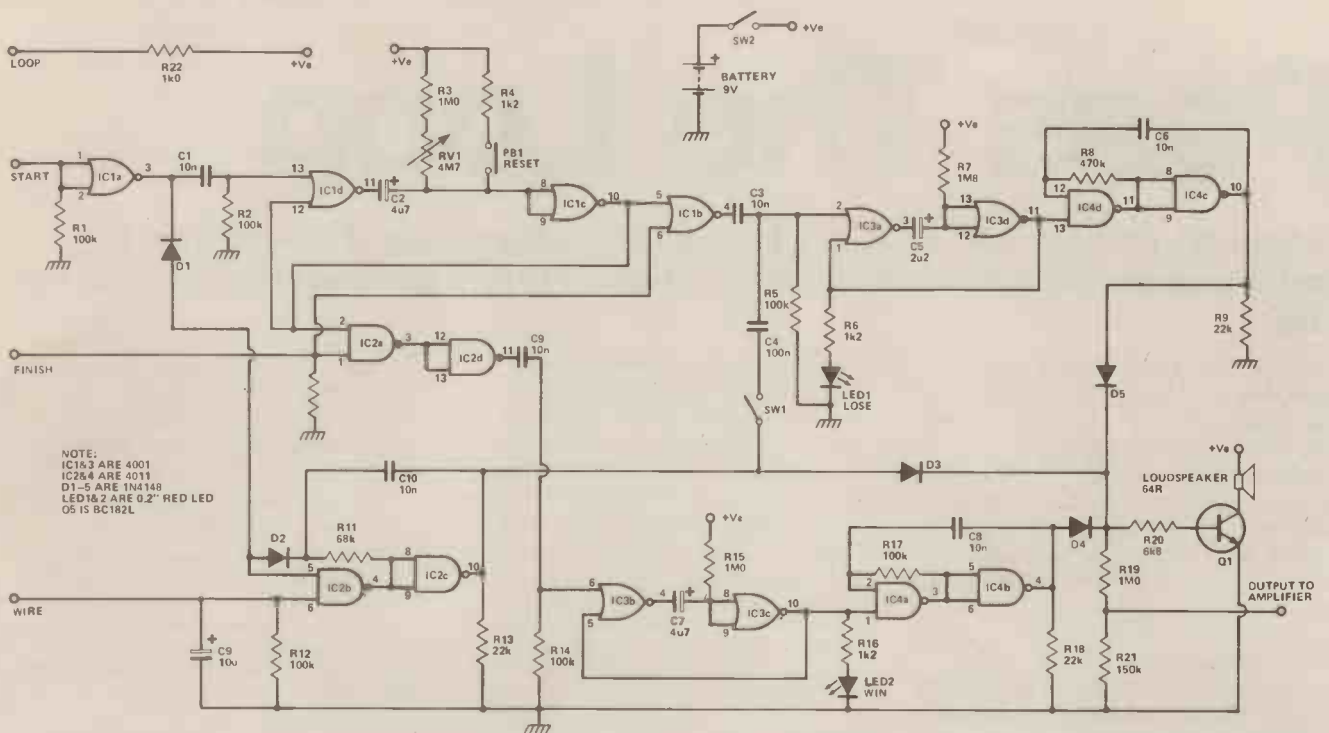


Figure 1. The circuit diagram of the Pass the Loop game.

Buylines

All components should be easily obtainable from your local stockists, however if you have problems most of the larger mail order companies advertising with us should be willing to help.

Although any case into which the circuit can be used the particular one in our prototype is noted in the Parts List.

As a rough guide to the cost of components (not including the case or PCB) we estimate the price to be around £10.

How it Works

IC1 forms a monostable multivibrator which is triggered into its timing period when the loop is disconnected from its starting position. RV1 presents the timing period during which the monostable is on i.e. the play-time.

If this timing period lapses without the loop reaching the finish position then IC3-IC3d, a second timer with a period of about 4 seconds, is triggered. The output from this enables the lose indicator LED1 and the astable multivibrator formed by IC4c and IC4d. This provides a visual and audible indication that the player has lost.

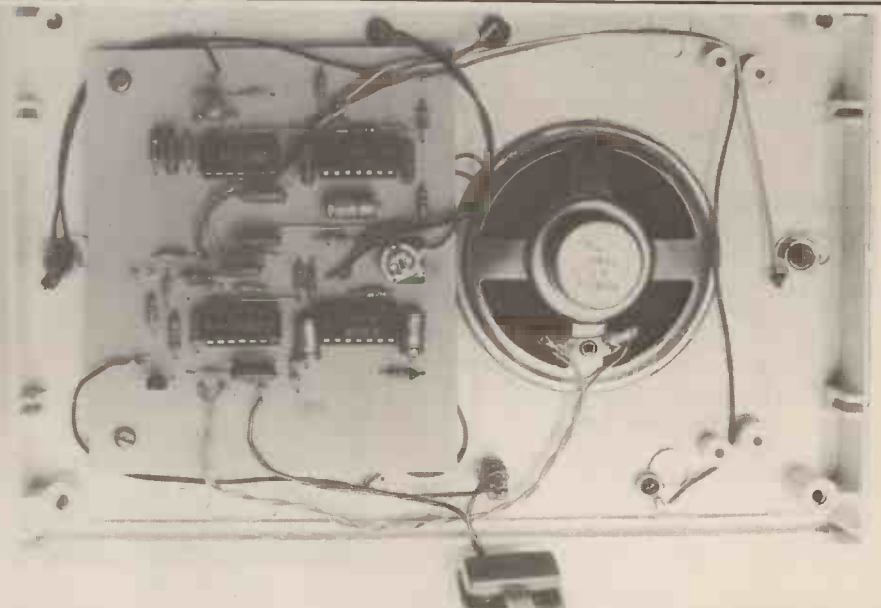
If, however, the loop reaches the finish position in time then the lose indicators are

disabled and a similar block of circuitry (IC3b-IC3c and IC4a-IC4b) indicates the "game won" condition by illuminating LED2 and producing a different tone.

Any time the loop touches the wire the astable formed by IC2B and IC2c is enabled and an audible signal indicates a hit. This can, by using SW1, automatically trigger the lose indication or not, depending on whether or not you want to simply add up the number of hits per go.

Q1 forms a simple amplifier to power a small speaker. Alternatively an external amplifier can be used to provide a much louder sound level by connecting it to the low level output.

phono sockets (one for each end, start and finish) into a baseboard thick enough to hold the plugs but still thin enough to make adequate electrical connections underneath (see Fig 3). The wire to be formed is pushed into the sockets' centres and joined from the underneath of one socket to the circuit board — we used an old wire coat hanger. The outsides of the sockets are also wired to the PCB. See the connection diagrams for details. The loop can literally be a simple loop of wire connected at one end to the board.





Above. The HE Pass the Loop game in use.

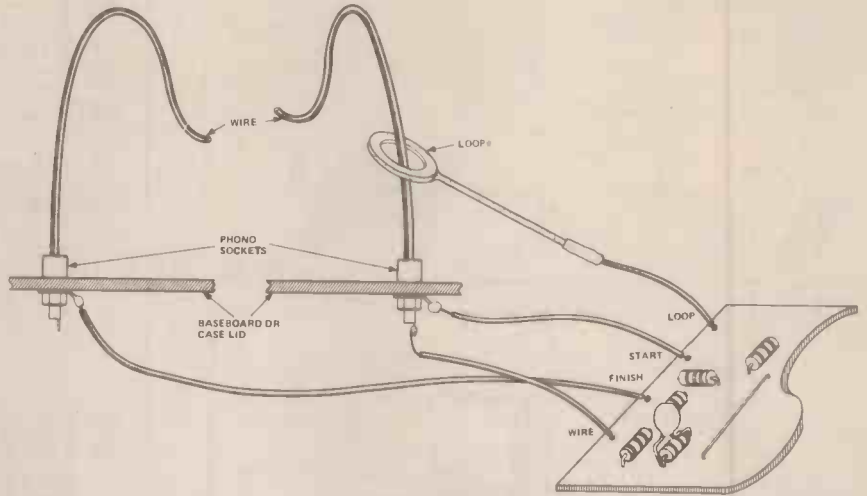
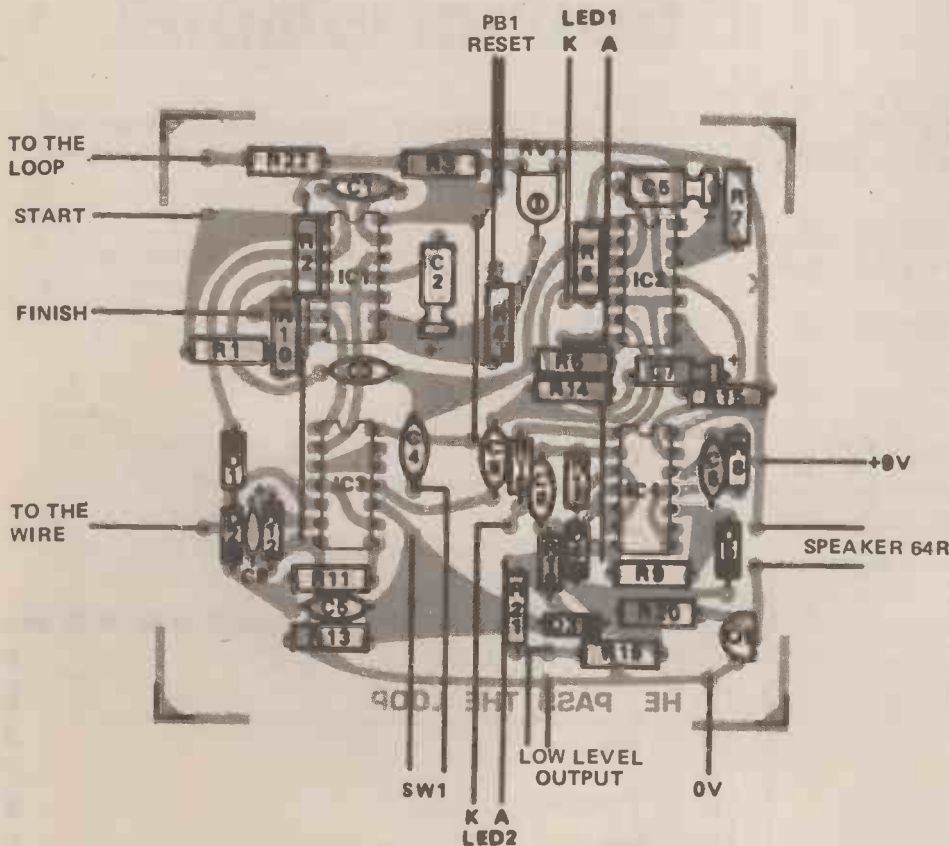


Figure 3. The connections between the printed circuit board, the loop and the bent wire, shown in greater detail to aid clarity. The edge of the circuit board shown corresponds to the left hand edge of the overlay shown in figure 2 below. A wire coat hanger can be used for the loop and the bent wire.

Figure 2. The overlay of the printed circuit board (the foil pattern is on page 73). All connections should be more or less self-explanatory.



Parts List

RESISTORS (all 1/4W, 5%)

R1, 2, 5, 10, 12, 14, 17	100k
R3, 15, 19	1M0
R4, 6, 16	1k2
R7	1M8
R8	470k
R9, 13, 18	22k
R11	68k
R20	6k8
R21	150k
R22	1k0

POTENTIOMETERS

RV1	4M7 Miniature Horizontal Preset
-----	---------------------------------

CAPACITORS

C1, 3, 6, 8, 10	10n polyester
C2, 7	4u7 10V electrolytic
C4	100n polyester
C5	282 10V electrolytic
C9	10u 10V tantalum

SEMICONDUCTORS

IC1, 3,	4001 (Quad 2-input NOR gates)
IC2, 4	4011 (Quad 2-input NAND gates)
D1-5	1N4148
LED1, 2	0.2 in LEDs (Red for "LOSE" Green for "WIN")
Q1	BC182L NPN Transistor

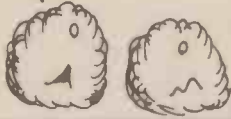
MISCELLANEOUS

PB1	Push button switch
SW1, 2	SPST Toggle switch
64 ohm	miniature loudspeaker
2 x phono sockets	
PP3 battery clip	
Verocase type — 202-21-34J	

Beasties

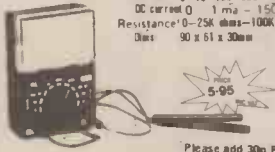
ER, I'D LIKE YOU TO MEET OUR NEW COMPUTER GAMES CORRESPONDENT!!

TROMP!
TROMP!
TROMP!
TROMP!



Multitester

1,000 opv
AC volts 0-15-150-500-1000
DC volts 0-15-150-500-1000
DC current 0-1 ma-150 ma
Resistance 0-25k ohms-100k ohms
Dims 90 x 61 x 30mm

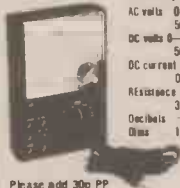


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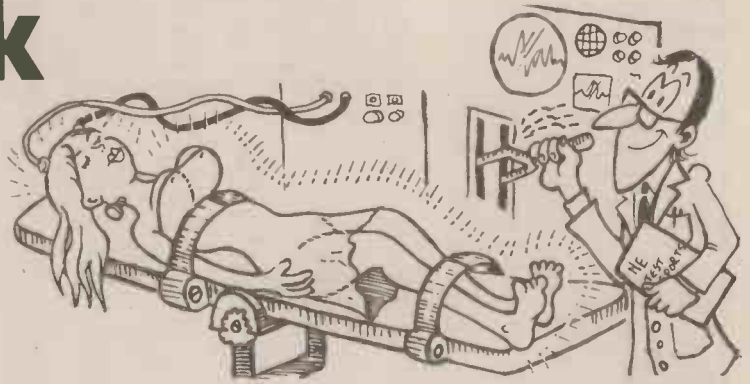
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Clever Dick

Have you ever heard of an Ultrasonic record player? How about an Iron and Constantan thermocouple? Budding inventors and creeping Worthingites, they're all here in this month's episode of Clever Dick.



YOU AT THE BACK THERE, sit up and pay attention. Clever Dick is about to wax lyrical on a subject that is never far from our wallets — Inflation.

Inflation is particularly nasty stuff, you can't smell it or hear it but by golly you can feel it. Being unable to predict prices from month to month was the main reason we dropped the "approximate cost" from our project 'Buylines'. But, as we have discovered from countless letters (like the one from Martin Ayub below) many of you would like to see its return.

Dear CD,

Recently, while wearily thumbing through an ex-friend's copy of a certain 'electronics mag' (not HE or ETI — that's why he's an ex-friend), I discovered that alongside each project was an estimated price. This struck me as a good idea, one which HE and I or ETI should take up(?). Perhaps you could include it with 'Buylines'.

Martin Ayub, Hants

PS I'm not scrounging for a Binder, but.....

OK, you win. From now on we'll include an approximate cost of each project in the Buylines but don't blame us if the ravages of inflation get to it first. One of the reasons we dropped it from the early issues of HE was the letters of complaint. Few of you seemed able to match our prices. We will base our approximate costs on the catalogue prices of the 'big three' mail order companies. If you buy your components from the radio shop 'round the corner' then expect to pay more.

We're always glad to hear suggestions on how to improve the mag, after all HE is meant for you. Here's a good one from John Pepper, de-

finitely not to be sneezed at. (Sorry about that John, couldn't resist it.)

Dear CD,

How about having a page or so reserved for our own circuits or even modifications to your circuits? I have a couple of circuits that I have designed and are ready for you to see.

John Pepper
Winchester

Actually John, we've never discouraged anyone from sending us ideas or suggestions (that's what this page is for). If you have a circuit, modification or any suggestion that you think is worth sharing then we would be only too happy to see it. If the response is big enough then maybe we'll hand over some space to you. Remember though, the ideas must be your own and not pinched from another book or magazine, look forward to hearing from you.

Gary Lowe must need patches for his knees, rarely have we read such a creeping letter.

Dear DC (Oops, I mean CD),

Is it possible to acquire a list of the numbers and functions of ICs. I have at least 50 that I have scrounged (being a creep) or de-soldered from old boards. I haven't the slightest idea what they do. The same applies to transistors, my local components shop (3½ miles away) does not have a list or a very good supply of transistors.

Changing the subject to CB, I was glad to see another petition in the June issue, I am busily getting it filled in (creep, creep). I would just like to and that even though I cannot really afford it, I never miss my monthly installment of that wonderful, sophis-

ticated, fantastic and even excellent electro mag HE (creep creep).

Gary Lowe
Worthing.

PS I think I deserve a Binder with all that creeping.

Yes, you do deserve a Binder but unfortunately we've dished out this months quota. Keep up the good work. Another letter like that and you may well get one. Now, to your main problem (apart from creeping), we published a two part Data Supplement in the November and December issues, sadly both those issues are either sold out or are about to do so. The only other source of data that is either free or cheap are mail-order catalogues. Two that we recommend come from Watford Electronics and of course Maplin. If you have a few quid to spare then invest in a copy of Towers International Transistor Selector, published by Foulsham for £9.50. ICs are a little tricky, we use an American book(s) called D.A.T.A., again, they're not cheap but just one look will tell you why. They are distributed in this country by Rowse Muir Ltd, their address is: Index House, Ascot, Berks SL5 7EU. Why don't you persuade your local components shop to invest in a set?

Do you remember Mr Wagstaff and the Thermocouple question in the June edition? Here's a reply from A. G. Lorimer.

Dear Clever Dick,

In the June edition of HE you made mention of a thermocouple in your reply to F. G. Wagstaff's letter. However, you suggest the use of Platinum and Rhodium as the metals for use in the thermocouple. Using sufficient of these metals to power a radio is'

unlikely to improve the bank balance and so might I suggest the use of iron and constantan (much more likely to cheer the bank manager). At 100°C an iron constantan thermocouple will produce an EMF of 5 millivolts or so. A number of these devices could easily be connected in series (not forgetting the need for a cold junction in between each hot one).

Although this arrangement will not provide enough current to power the average tranny, it should certainly be adequate to drive a ZN 414 AM radio.

A. G. Lorimer
Clydebank

We naturally assumed all HE readers were incredibly rich just like ourselves. Oh well, if you want to cheapen the whole affair, go ahead.

Here's a good question.

Dear Dick,

Could you please describe the principles of a tone control. How can it be connected between the amp and speaker? Finally, HE is a mag of superb quality, keep it up. Thanks.

L. Jones
Torquay.

In its most basic form a tone control is a filter that will permit only a selected band of frequencies to pass through an audio system. Your request for a circuit to fit between the output of the amplifier and the speaker is a little impractical. Although a crossover network is a kind of tone control it is designed to operate at high power levels. Almost without exception the tone control network is sited between the pre-amplifier and power amplifier, or alternatively, forms an integral part of the pre-amp. Have a look at the Equitone circuit this month for a good idea of a simple passive tone control network.

Although the Equitone seems to contradict the general rule it does in fact use the existing power amplifier as a pre-amp and feeds its output into a power amplifier. In any case the Equitone will operate quite happily after a conventional pre-amp.

If you're looking for something a little more advanced then you could do worse than consider the 5080 pre-amp/tone control published in the May issue.

Lastly, a letter from a budding inventor, take it away Adrian.

Dear Dick,

Please could you tell me whether the following device has ever been patented. My idea is basically to replace the stylus in a record player. Instead of the stylus there would be a small ultrasonic 'microscope' working rather like a TV camera. Instead of producing a picture there would be a processor unit converting the output into sound. I would like this information as I intend entering this idea in a competition.

Adrian Hallas
Midlothian

To our rather uncertain knowledge nobody has ever thought of using ultrasonics to replace gramophone needles (stylus if you're state-of-the-art!). This sounds like an excellent idea as it would completely eliminate record wear. If you are successful then drop us a line, we would be more than happy to publish it as a project. We are however a little dubious as to the practicality of such an invention but then they said man would never fly. Watch this space for comments. Some bright spark is bound to write in and tell us it was invented 50 years ago.

HE



Shown here are all of the back issues currently available. Each issue costs just £1, (that includes post and packing).

The latest addition to our stocks is the March issue. Features include: Automotive Electronics, PETting it Together and the second part of Ian Sinclair's new series Into Electronics Construction. The projects include: The 5080 modular amplifier system, PSU module for the 5080, Short Wave Radio and a novel Touch Switch. For details of other issues see our main Index in the January issue. HOBBYPRINTS for this and all back issues are still available. For order codes and information on how to use HOBBYPRINTS see the ad. in this issue.

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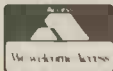
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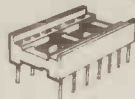
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LM377	170p
LM378	230p
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LM381	140p
LM382	120p
LM386	90p
LM387	120p
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The circuit really is quite simple and should pose no problems to the aspiring amateur. A thyristor's latching action is used to hold the alarm on until the whole circuit is turned off by disconnection from its battery supply. Thyristor operation means that the device can be interfaced directly to a low-voltage alarm, e.g. a piezoelectric buzzer (or similar), or if you really want to raise the roof, then a mains powered alarm can be used. In this case it is safest to use the thyristor to latch a relay on, which in turn switches the alarm. Although this may seem a somewhat lengthy process, it is preferable to directly operating the mains device via the thyristor — things can go badly wrong unless the builder is experienced. Dare we say, a shocking time could be had by all.



How it Works

The title 'Movement Alarm' is a slight misnomer really. The device doesn't actually pick up movement but sound. The sound of a drawer opening will tend to be of a fairly low frequency, so the main part of the device is a microphone followed by a low-pass pre-amplifier. Q1 and Q2 form the pre-amplifier which cuts off frequencies above about 2kHz. A low frequency sound picked up by the crystal insert is therefore amplified and triggers the thyristor THY1. RV1 adjusts for varied levels of gain to allow for a range of microphones and sound levels.

As the supply is DC the thyristor latches and holds the alarm or relay in its activated position until the supply is turned off.

Diodes D1 and D2 give an AND function at the gate of the thyristor, thus disabling it until both anodes are at positive potential. Transistor Q3 forms a simple time delay circuit holding the emitter of Q3 low for a period of about 10 seconds after switch on. During this time it doesn't matter what sound is picked up and amplified by the pre-amplifier, the thyristor cannot be turned on due to the D1 and D2 AND gate.

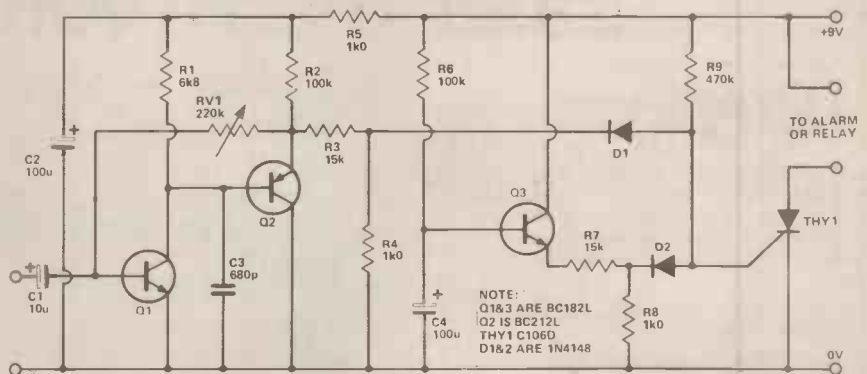


Figure 1. Circuit diagram of the HE Movement Alarm, ensure the thyristor THY1 is connected the right way round.

Now the smart ones amongst our readers (and you must be smart to be reading HE) will at this point be one step ahead of us and thinking to themselves — won't the alarm be triggered as the drawer is shut by the owner? Well, due to a disabling time delay of about 10 seconds — no! With typical HE efficiency we've

thought of everything, haven't we?

All joking apart, this Veroboard project really is quite a novelty being so simple, easy to build and yet so sensitive. A preset resistor caters for different sound levels, microphones and personal taste, while battery operation can mean absolute portability.

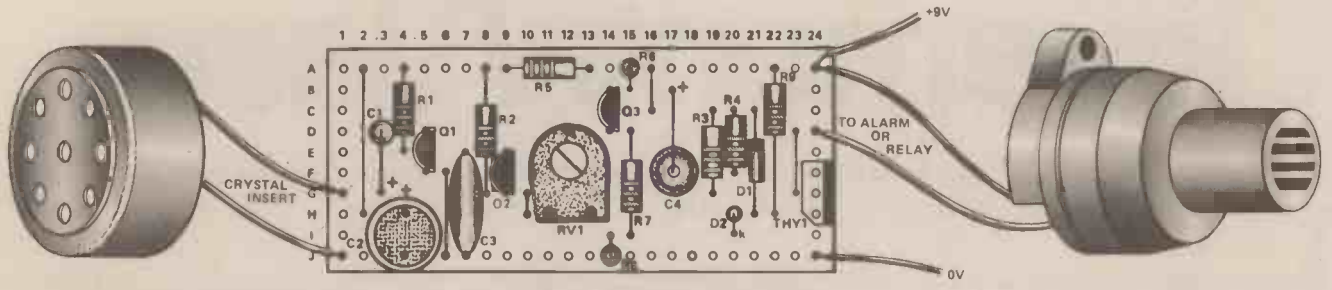


Figure 2. Connection details and verboard layout of the HE Movement Alarm. The crystal insert may be of any convenient type, refer to Building Site on page 26 to find out about verboard construction before you begin this project.

Parts List

RESISTORS (All 1/4W, 5%)

R1	6k8
R2, 6	100k
R3, 7	15k
R4, 5, 8	1k
R9	470k

POTENTIOMETERS

RV1	220k	Miniature horizontal preset
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CAPACITORS

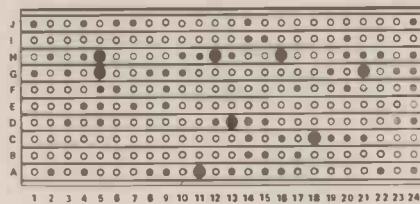
C1	10u	16V electrolytic
C2, 4	100u	16V printed circuit mounting electrolytic
C3	680p	polystyrene

SEMICONDUCTORS

Q1,3	BC182L	NPN transistor
Q2	BC212L	PNP transistor
THY 1	C106D	Thyristor
D1,2	IN4148	Diode

MISCELLANEOUS

- 10 x 24 hole Veroboard, 0.1 inch.
- Crystal microphone insert.
- 6 V Relay or solid state buzzer.
- PP3 battery clip.
- Case to suit



Above. Veroboard layout, the large black circles show breaks in the copper tracks. The smaller dots show the position of the components.

Below. The completed Movement Alarm shown with its case.

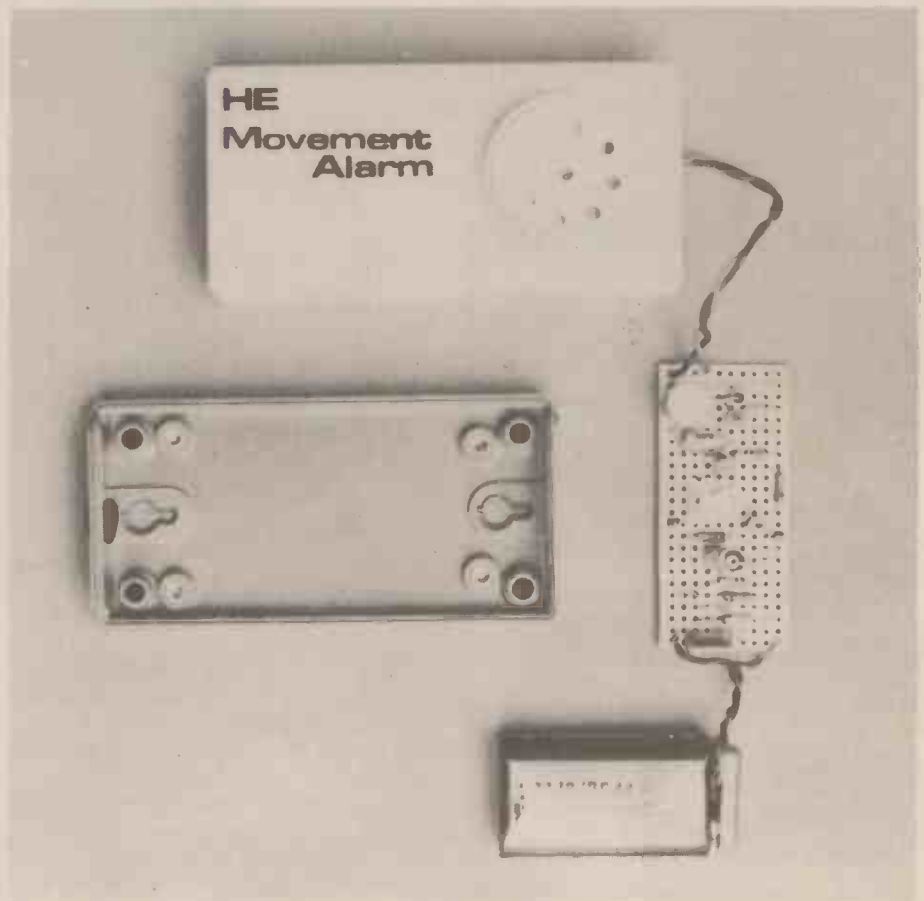
Construction

There's not a lot to be said really. Veroboard is an easy method of joining all the component leads together in the right places. That is as long as you insert the components in the right holes and that you solder them in carefully without joining adjacent copper strips. Also remember to cut the strips in the correct places.

Of course, neatness is the key, try to keep all components close to the board, in this way short circuits are minimised.

Finally, connect your battery and go. The circuit is quite simple and should work first time.

HE



Buylines

The crystal microphone insert and solid state buzzer can be obtained from most of the usual mail order companies should you have difficulties obtaining them locally.

None of the parts should be at all difficult to find.

All components excluding case should be available for around £7.

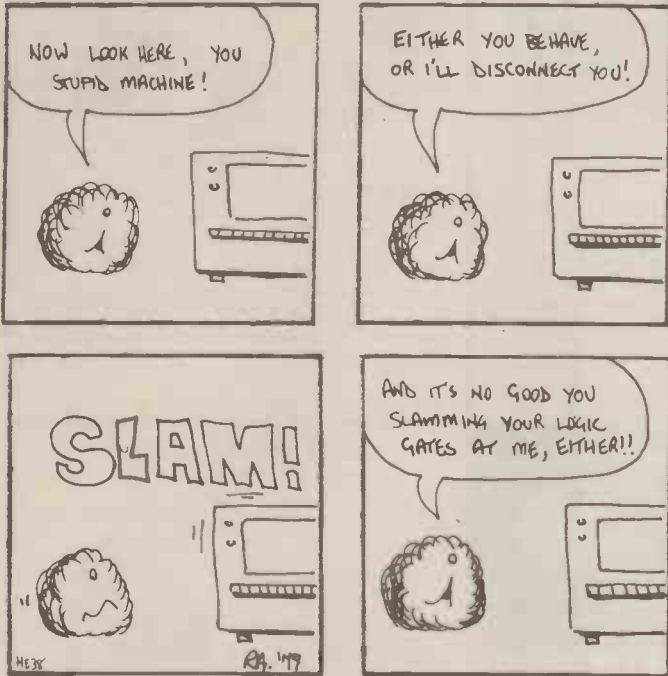
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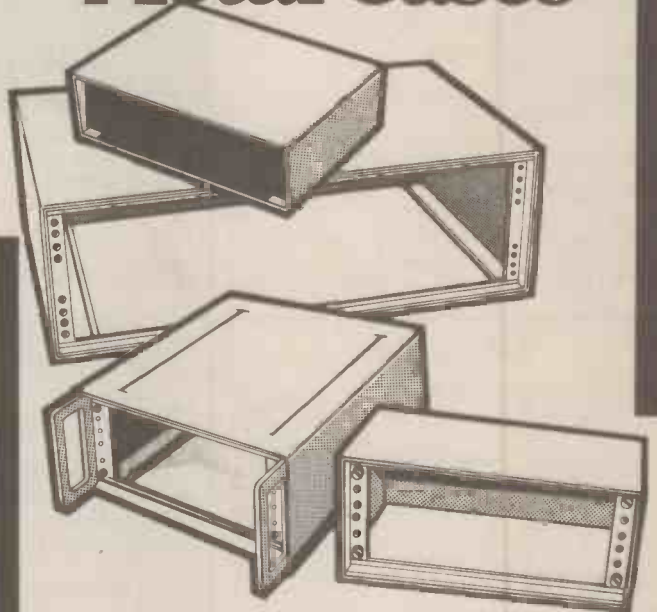
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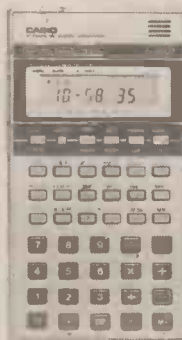
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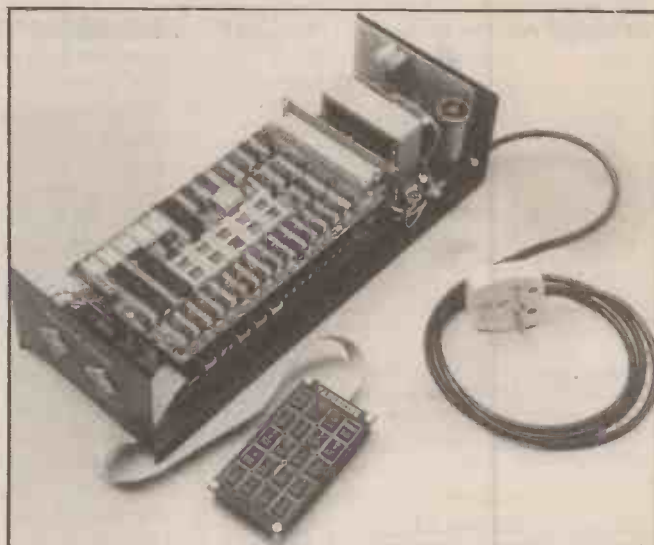
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Micros Are Easy!

In this month's Chit-Chat, Ron Harris pulls the shrouds of mystery away from MPUs to reveal just another component!



MICROPROCESSOR is a word you will find difficult to avoid these days. Home computing is a rapidly expanding hobby and any self-respecting office or school has to be equipped with a computer — of whatever size — or risk a trip to Coventry.

The aim of this article is to explain what a microprocessor — MPU for short — is, and how it fits into a microcomputer system. Next month Ian Sinclair will be weighing in with a major new beginners' series called

"Into Digital Electronics" which will be starting with basics and leading you simply and logically (ouch!) into the mystical world of the MPU.

The most difficult thing to comprehend in the field of computing is the jargon its disciples throw around so freely. Once you understand it, of course, it's as clear as day — but how do you get started?

Well, this is as good a place as any, so . . .

Logical Gateways

An MPU is nothing more than an adaptable integrated circuit which can 'impersonate' any one of a set of different types of logic circuit when told to do so. The instructions for what it is supposed to look like to the surrounding circuitry, at any given moment, comes from the program supplied by the user. This program is kept in the computer system's memory, without which the MPU is totally useless.

An instruction is passed to the MPU as a 'pattern' of voltages on its pins. These voltages are at one of two levels, HIGH or LOW.

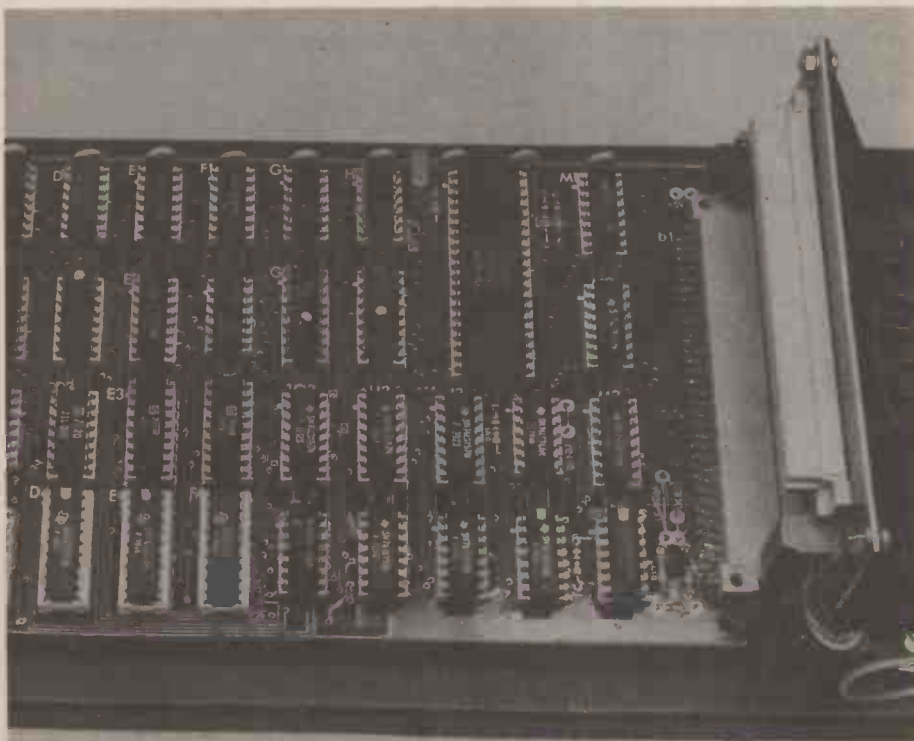
A typical MPU uses eight voltages to understand its instructions and any specific pattern will be called a "byte", or "instruction word". Manufacturers publish a list of these patterns, and what they mean to the MPU, calling it an "instruction set".

Exactly what the MPU can pretend to be is built in by the manufacturer and will vary a little from IC to IC, but we can look at some of the more common varieties.

What To Be Or Not To Be

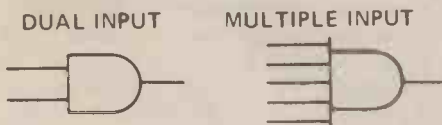
The first and most common function is an AND gate. When in this guise, an MPU monitors two voltages to see if they are both high, and produces an output only when they are.

This can be closely compared to, say, a person's decision to take a drink of water from a cup on a table. Two conditions exist — the first is whether the person is thirsty or not, and the



Above: a close up of the main PCB of the Tangerine Microtan 65 computer system. The MPU here is the largest of the ICs, to the right of the picture. Most of the other chips are memory. The full Tangerine system is seen in the heading photo.

Voltage A	Voltage B	Output?
Low	Low	No
Low	High	No
High	Low	No
High	High	Yes



Above: the symbol used for an AND gate in circuit diagrams. Two inputs are standard and four such gates would comprise one IC. Above that is the output, or truth, table for such a circuit.

second is whether the cup actually has water in it. Only if both conditions are satisfied will the drinking action occur.

For example, an MPU controlling a burglar alarm might have to decide whether a door was open or not, as well as whether or not the alarm had been set. If the answer to both is YES it can ring the alarm bell.

A second type of logic gate is the OR circuit. Again this does exactly what its name implies, and if we return to our two voltages, an output will be obtained if one OR the other of these is high, i.e.

Voltage A	Voltage B	Output?
Low	Low	No
Low	High	Yes
High	Low	Yes
High	High	Yes



Above: truth table and circuit symbol for an OR gate. As with the AND gate, ICs are readily available containing four dual-input circuits in one package.

If the program has told the MPU in our mythical burglar alarm to look at things as an OR gate now, if either a door OR a window is open, the bells will ring. It would be useful as a second inspection, perhaps after it has checked to see if the alarm is switched on.

With proper program control the MPU could first check out the circuit as an AND gate, then move on to an OR consideration if all is well — and go back again if it isn't! Repetitive but highly accurate.

Branching Out

This brings us to consider a third ability, that of being able to carry out a task, depending on certain conditions being met. Making the MPU run back around a set of actions until they are met, is called a "loop" and is a very useful program trick.

MPUs can only handle one job at a time and so they are by nature slower than a handful of ICs all dedicated to being AND or OR gates permanently. Slower, but infinitely more flexible.

If the job requirement changes, all the MPU needs is a new program. The dedicated ICs would all need rewiring, i.e. a complete circuit rebuild!

In order to carry out the program instructions the micro "(MPU)" needs some help. It needs a system to work in. The block diagram below shows one such (simplified) system.

The keyboard and VDU (Visual Display Unit) are there solely so that the user can give the MPU instructions and be sure that it has correctly understood them. If the program is already in the memory, they are not needed at all!

This 'memory' is for storing bits of information that the MPU will need to complete its tasks, i.e. data and program. It can be of two types — RAM (Random Access Memory), which generally loses the information when switched off, and ROM (Read Only Memory) which is not alterable by the user and contains things such as pro-

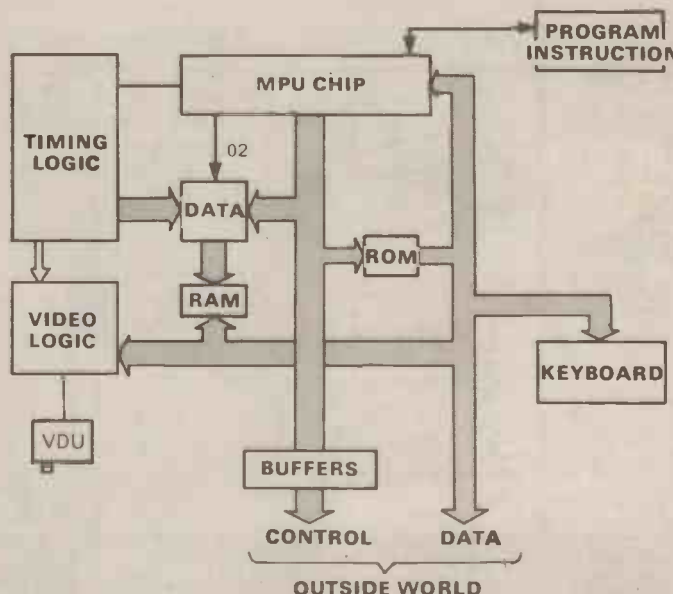
gram language and a monitor, which 'checks up' on the MPU in the course of its duties. The information in the ROM remains intact regardless of whether or not power is applied to the system.

Memory size is normally quoted in kilobytes i.e. 8K is eight kilobytes of information storage. This means that approximately eight thousand 'patterns' of voltages can be remembered by the machine. A very long program!

Clocking In And Out

All parts of the system have to work together at the same rate, not only to provide the MPU with information at the precise moment it is required, but also that the MPU can supply an output at the right time. Information — in the form of voltages — has to be shifted around the system with perfect timing, and this timing is set by the system clock. This must be highly accurate and very fast. A normal speed of operation would be around 2 MHz, or two million changes per second. The MPU might thus alter its mode of working this many times in a second.

The interface is simply to allow the voltage changes occurring at the MPU to affect the world outside the box and at its simplest could be a basic relay, switched by the MPU. In the burglar alarm, for example, this



Above: a typical computer system in simplified block diagram form. The ROM (Read Only Memory) and RAM (Random Access Memory) is there to allow the MPU to store information — either programs or data — for later use when it needs it. The program instructions can come from memory, or direct from the keyboard. Information is presented to the outside world as voltages, either data or control.



Above: the end result. This particular computer is a Zonith Z89, which uses two MPUs — one is there just to make the keyboard more efficient and easier to use. Printer interface is built-in too.

might power the bell when told to do so by the micro.

This output adaptor is needed because the voltage levels in the system are too small and change too rapidly to do much work outside. The MPU needs to be sheltered, or buffered, from the big bad world! About the most common adaptor would be used to enable the MPU to control a printer and the interface for this could be quite a complex circuit in itself.

Summary

Not much to it after all, is there? An MPU is simply a flexible work tool which can be adapted to do many different jobs by its controlling program. In order to work at all it needs a memory to store information and some sort of adaptor between it and the real world.

One final point I have to make, can we at HE at least, not refer to MPUs as 'the silicon chip' PLEASE? Of course they ARE produced on silicon but so are most other ICs. The equivalent would be to start calling all cars 'Fords'. **HE**

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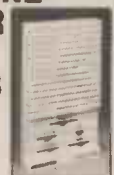


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THE INITIAL AIM of the project was for an alarm to operate when the amount of cooking gas in the atmosphere increases past a predetermined level. Obviously this makes the device suitable for use in boats or caravans to detect if the level of gas (due to leakage) is reaching combustion proportions. However, propane, butane, natural and town gas will all trigger the alarm before their danger levels are exceeded so the HE Gaztec is not restricted only to use in boats and caravans.

The power requirement of the device is minimal, 12VDC thus allowing its use in a boat or caravan (car battery). To ensure utmost safety the device emits a warning when the battery voltage drops below 11 volts, at which time the owner knows it's time to recharge the battery.

Use is made of a special gas sensing transducer. Inside the unit is a heated filament. The voltage across this filament varies with the level of combustible gas in the atmosphere. Modern instrumentation and transducer measuring techniques are utilised to detect when the level of gas increases towards danger proportion and to trigger a loud piercing alarm.

The HE Gaztec is a potential life-saver using four common ICs and one transistor in a simple yet ingenious circuit (mounted on one PCB) which fits neatly into a readily available plastic moulded case. Without doubt, the HE Gaztec is the best gas detecting project to appear on the hobbyist scene.

Construction

With our PCB design construction it's easy. Start by cutting out the part of the board which is to fit round your alarm device. The size of the cut-out depends on the actual size of the alarm which you use, but the semi-oval shape seen on the PCB layout defines the maximum area



This good looking piece of electronic wizardry could end up saving your life one day. The metallic "nose" at the top is the gas sensor and the round black object underneath it is the solid state alarm.

which can be cut out without possibly affecting the circuit itself.

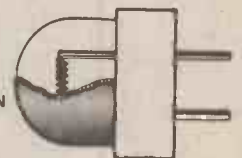
Next, all resistors, capacitors and IC sockets should be fitted followed by IC1, Q1 and the diodes. All connections to and from the board are best made at this stage. Make sure that the connections to the gas sensing transducer are correct — this is most important!

Finally, fit the remaining ICs into their sockets being careful not to damage IC3 and 4 by static discharge as you handle them.

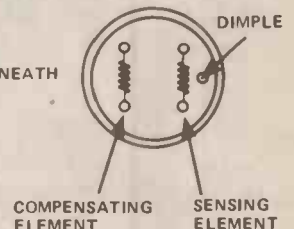
Setting up is not difficult. Turn the preset RV1 fully anticlockwise. Connect your HE Gaztec to the 12V battery. Slowly turn the preset clockwise until the alarm sounds. Push the "clear" pushbutton and the alarm should stop. Turn the preset just a fraction anticlockwise — the device is now set.

You can test the under-voltage warning by running the unit from a 9V battery. Approximately every 40 seconds the alarm should sound, only for an instant.

SIDE VIEW OF GAS SENSOR SHOWING SECTION



UNDERNEATH VIEW



The heart of Gaztec, the gas sensor itself, which is glued to the lid of the case with its leads protruding through.

A word of warning — do not test your detector, by holding the sensor in a continuous flow of gas such as that from a cigarette lighter. The heated element can easily burn out in these conditions.



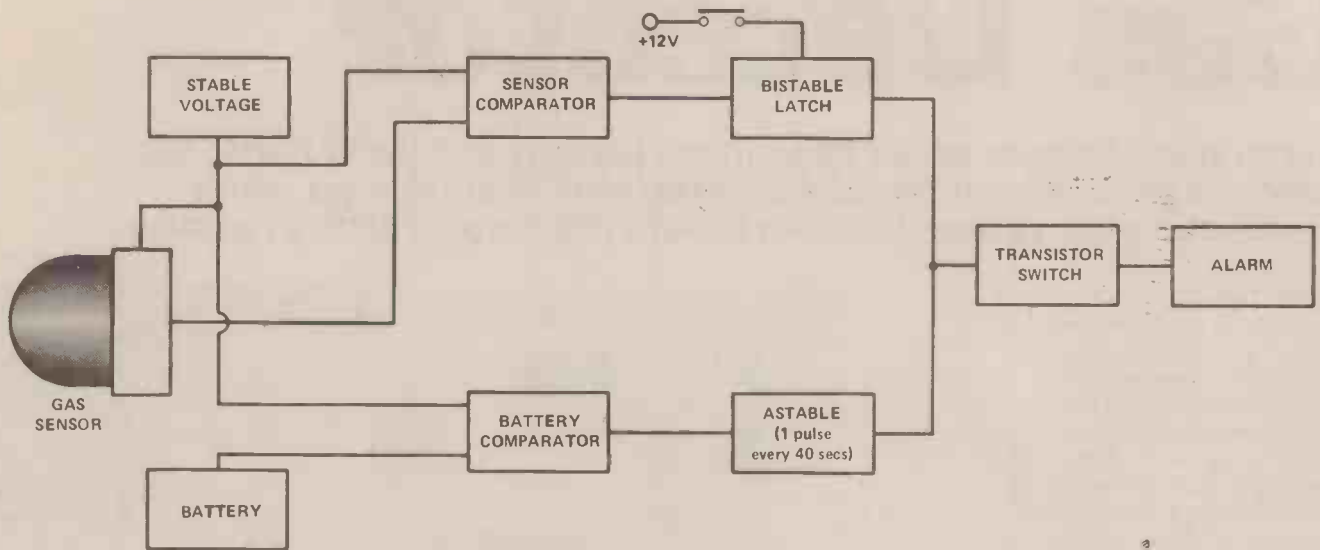
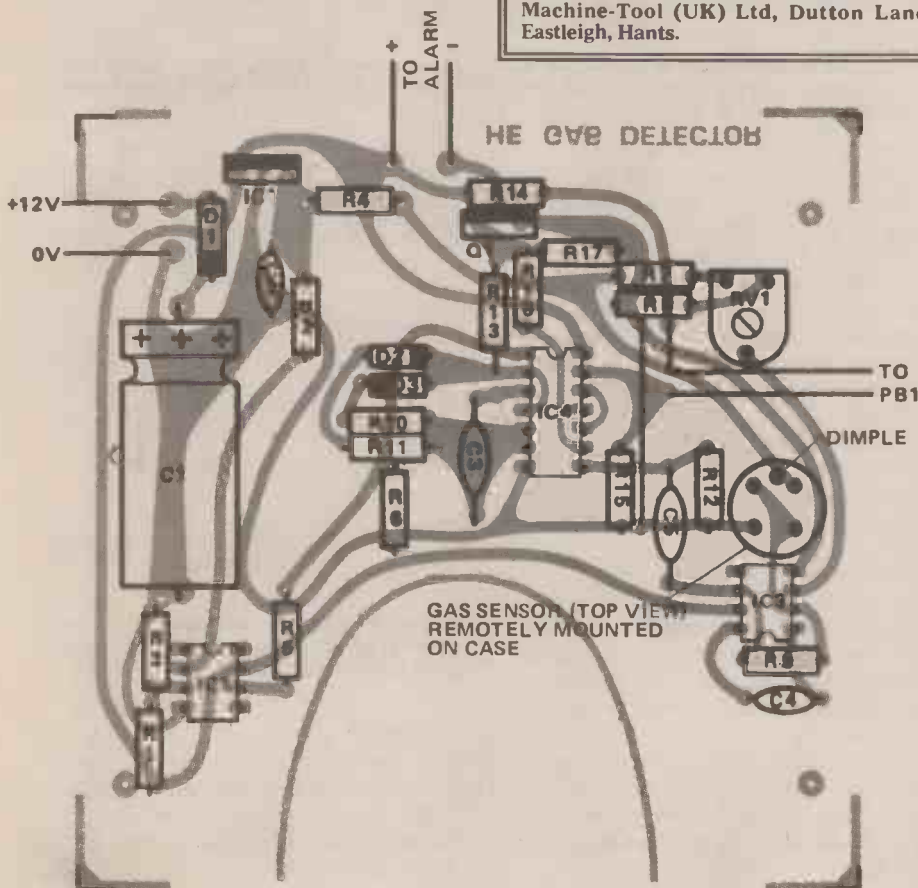


Fig. 1. A comprehensive system diagram of HE Gaytec, showing all important parts of the circuit as blocks. By referring to the How it Works section and the circuit diagram on page 59 along with this, the mode of operation should be easily understood.

Fig. 2. Below. The overlay of the printed circuit board whose foil pattern can be found on page 73. The oval shape at the bottom of the overlay should be cut out first, before any components are inserted. Make sure that all integrated circuits are inserted correctly.



Buylines

A complete list of all components, bar the case, is obtainable from Technomatic, who advertise with us, at the very reasonable price of £17.

The case is model CM5 125K from OK Machine-Tool (UK) Ltd, Dutton Lane, Eastleigh, Hants.

Parts List

RESISTORS(all 1/4W 5% except where stated)

R1,2	10k	
R3	8k2	
R4	12R	1/2 watt
R5,7,8	1k	
R6,11,12,		
15,17	100k	
R9	479k	
R10	33M	High ohmic thick film resistor
R13,16	4k7	
R14	3k3	

POTENTIOMETERS

RV1	10k	Miniature horizontal preset
-----	-----	-----------------------------

CAPACITORS

C1	220u	16V electrolytic
C2	100n	polyester
C3	2u2	polycarbonate
C4	220n	polyester

SEMICONDUCTORS

IC1	7805	5 V voltage regulator 1 Amp
IC2	741	Op Amp
IC3	3130	Mos-fet Op-Amp
IC4	4001	Quad, -2-input NOR gates
Q1	TIP121	Darlington transistor
D1	IN4001	1 Amp diode
D2,3	IN4148	Diode

MISCELLANEOUS

Gas Sensor	see Buylines
PB1	Push-to-make, momentary action

12 V Solid State alarm

Case to suit — see Buylines

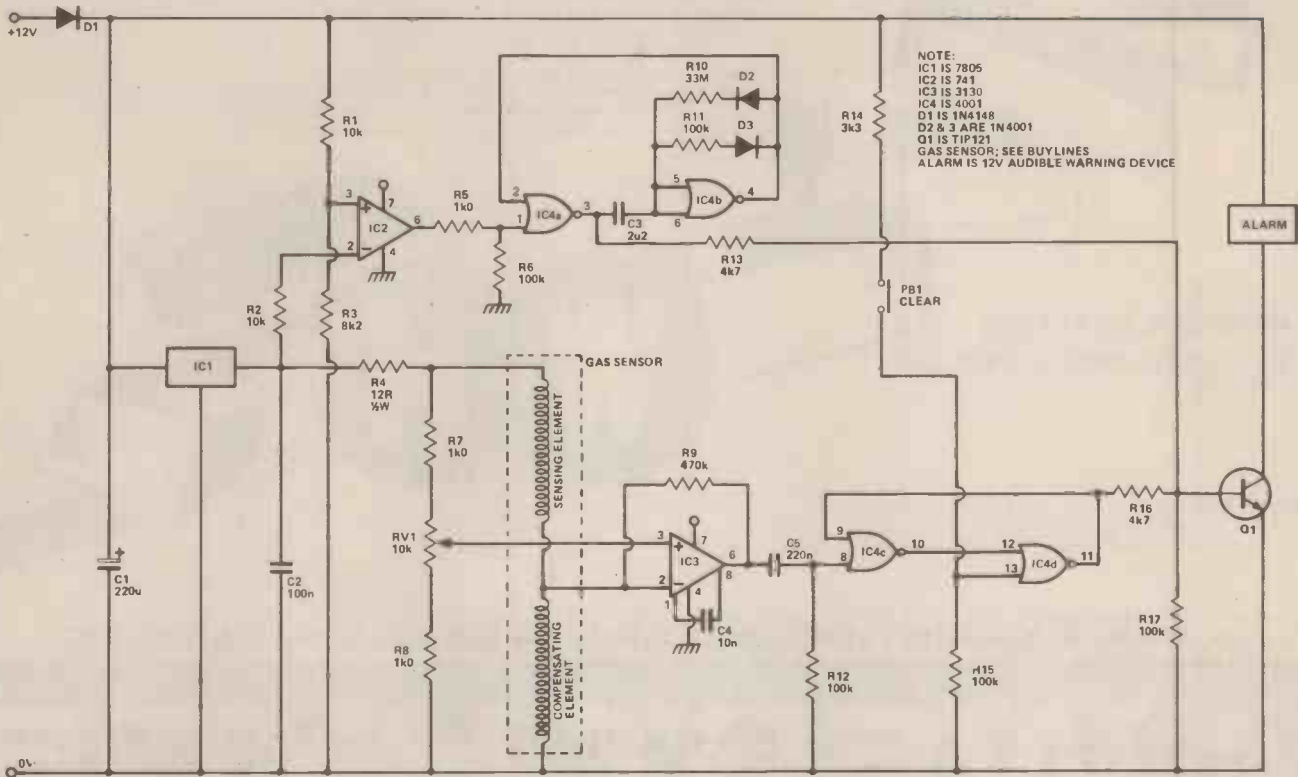


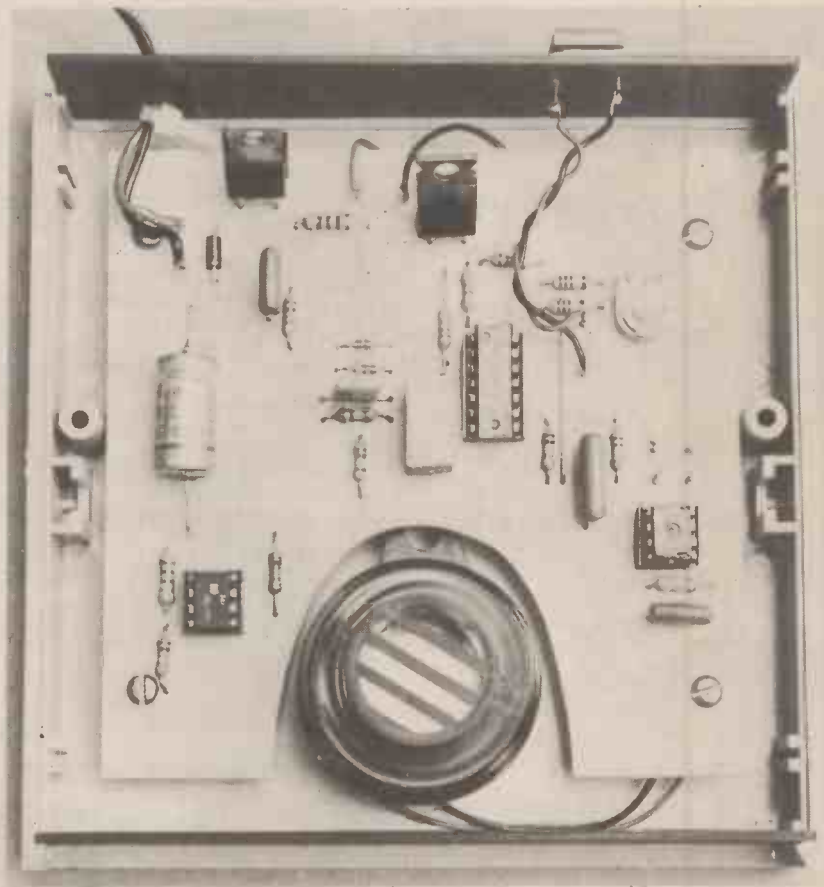
Fig. 3. The circuit diagram or schematic of the Graytec gas detector.

How it Works

Taking a look at the block diagram of Fig 1 the HE Gaztec assumes a somewhat friendlier appearance. By cross referring from the schematic to the block diagram the circuit should be easily understood. The gas sensing transducer has a stable voltage of exactly 3 volts applied across it derived from IC1, a voltage regulator and dropping resistor R4.

The voltage at the output of the sensor is compared with a portion of a stable voltage (from the preset RV1) by an op amp circuit called (remarkably) a comparator. When gas is in the surrounding atmosphere the voltage at the output of the sensor increases causing the output of the comparator to jump to a high position. This triggers a bistable latch formed by IC4 a and b, which in turn holds transistor switch Q1 on until the "clear" button is pressed.

Q1 can also be turned on by the astable formed around IC4c and d, so that it is on for approximately 200mS every 40 secs. This astable can be disabled or enabled, i.e. stopped or started, simply by the output of IC2, another comparator, which compares the junction of R1 and R3, a voltage divider, with the stable voltage from IC1. Whenever the voltage at the junction falls below 5 volts (the voltage of the regulator) then the astable is turned on. Therefore, a low voltage from the battery causes the alarm to be sounded but so as not to drain any more current from the battery than necessary, it is sounded regularly every so often. This also differentiates from a detection of gas.



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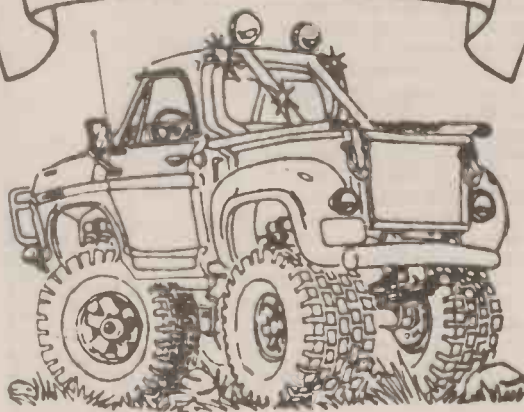
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The HE Op Amp Checker is a useful device designed to give easy and quick checking of IC operational amplifiers having the standard 8 pin DIL (Dual in line) package and pin connection layout (or TO-99 types with their leadouts formed into an 8 pin DIL configuration). The op amp is inserted into a DIL socket situated on the lid of the case and if it is working an LED indicator flashes on and off when a "push to test" switch is operated. However, if the op amp is faulty in any way the LED remains either on or off, giving an instant check on the op amp's state.

The device is simple to construct and use and is very cheap, as it relies totally on the operation of the IC under test rather than any active components of its own. A handful of resistors, capacitors and an LED form the circuit which is constructed on veroboards. However, you could try your hand at designing and making your own P.C.B. if you wish, as the circuit is quite a simple one.

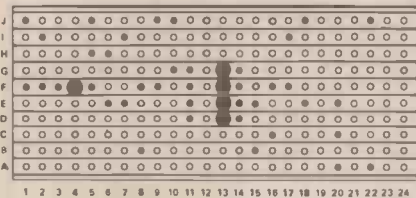
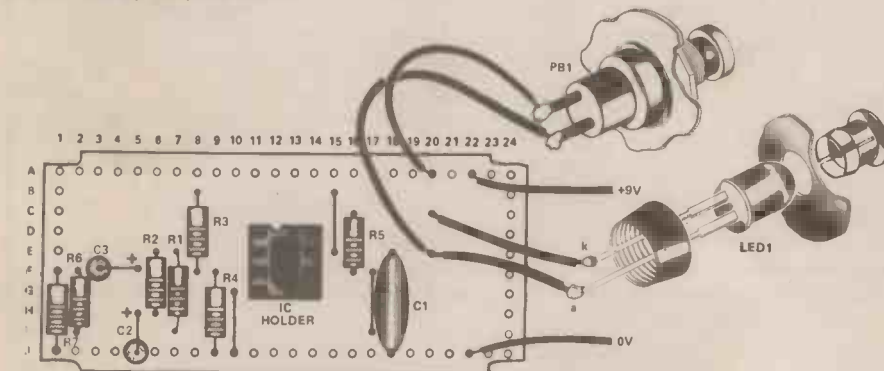


Figure 1. The underside of the board showing "break" points.

Figure 2. Board layout and wiring connections of the Op Amp Checker.



Construction

As far as construction of the circuit itself is concerned there is nothing unusual. The veroboard layout is uncluttered and neat, and builders should find no problems to hold them back. If you are not too sure about the use of veroboard then take a look at Building Site on page 26

However, our prototype has a rather novel method to interface with the outside world. We have used a wire-wrap socket to "piggy-back" with the IC socket mounted on the veroboard. The wire-wrapping socket is mounted on the top of the case — after 8 small holes have been drilled in the case to allow the eight wire wrap tags to go through! Pushing the veroboard up onto the wire-wrap tags conveniently mounts the board as well as making the necessary connections between the op amp under test and the rest of the circuit.

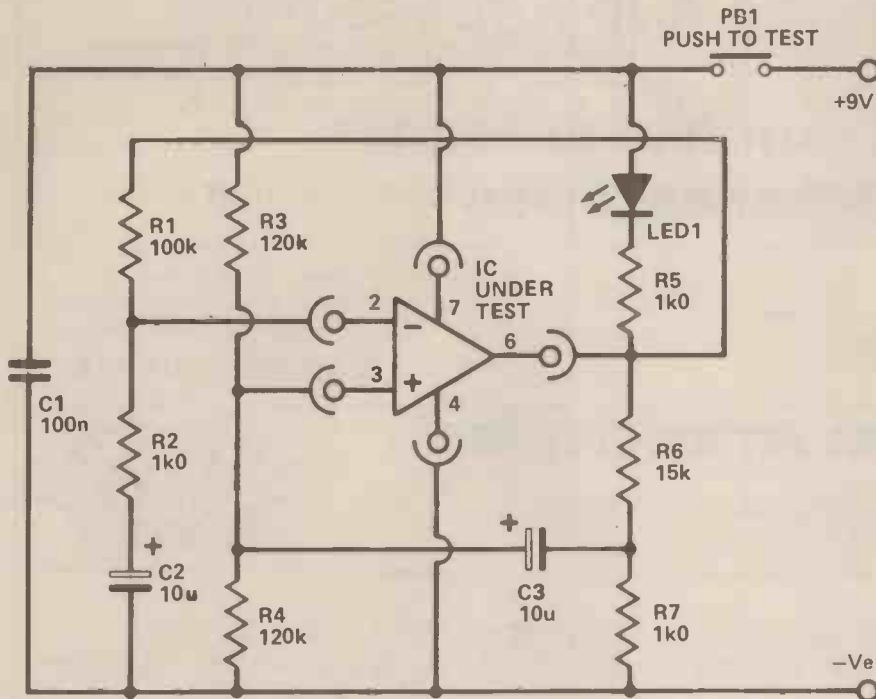


Figure 3. The circuit diagram of the Op Amp Checker.

Figure 4 shows the method of construction using a wire wrapping socket to provide connections between the IC under test and the board.

How it Works

The device being tested is connected up as a non-inverting amplifier, with the non-inverting (+) input biased by R3 and R4. R1 and R2 are a negative feedback network giving a closed loop voltage gain of 101 times (closed loop voltage gain equals $R1 + R2$ divided by $R2$). The open loop voltage gain of an op amp is the gain without any feedback applied — this is generally of the order of 100,000, a value much too high to be of any use. Applying negative feedback reduces this to a reasonable value — the closed loop voltage gain. LED 1 is the LED Indicator and is connected to the output of the op amp via current limiting resistor R5. The LED will switch on when the output of the test device is in the low state, and off when it is high.

R6 and R7 attenuate the output voltage of the amplifier, giving a nominal sixteenfold reduction in the output signal amplitude. C3 couples the output from the attenuator to the non-inverting input of the test device, providing some positive feedback. If the test device is functioning properly, the voltage gain it provides will considerably more than compensate for the losses through the attenuator, and the circuit will oscillate at a frequency of a few Hertz when SW1 is operated and power is supplied to the circuit. The repeated changes in the state of the output will cause LED 1 to flash on and off, indicating that the op amp is working correctly. Of course, a dud device would almost certainly fail to provide any significant voltage gain, and its output would then remain in a fixed state.

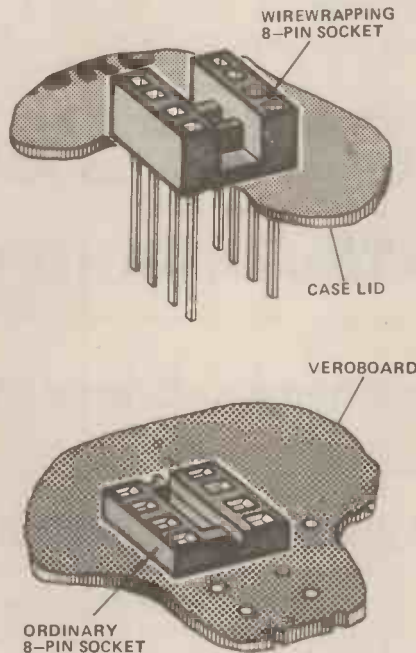


Figure 4 shows this in detail. Be careful that you get the veroboard the right way round i.e. pin 1 of the wire-wrap socket going to pin 1 of the normal IC socket. Mount PB1, the test push button and LED 1, the indicator LED into the front panel.

All that remains is to connect your battery and find an op amp that needs testing!

HE

Parts List

RESISTORS (all 1/4W, 5%)

R1	100k
R2, 5, 7	1kΩ
R3, 4	120k
R6	15k

CAPACITORS

C1	100n polyester
C2, 3	10u 10V electrolytic

SEMICONDUCTORS

LED 1	0.2" Red LED
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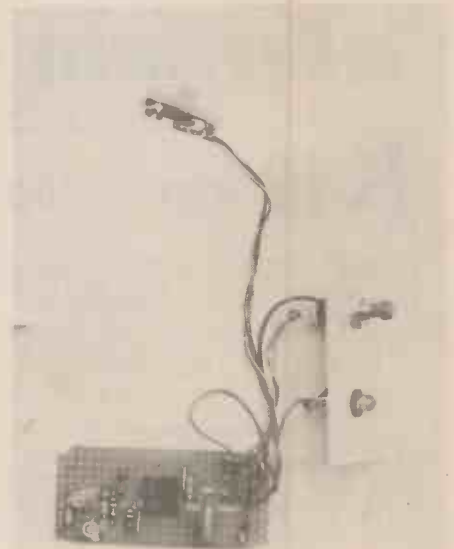
MISCELLANEOUS

10 strips × 24 hole 0.1" veroboard
 PB1 — push to make switch
 8 pin IC socket
 8 pin wire wrapping socket
 Case to suit
 PP3 battery and clip

Buylines

Your local stockist should have all parts which we specify, except possibly the wire-wrapping socket, but most of the mail-order companies who advertise with us may be able to help.

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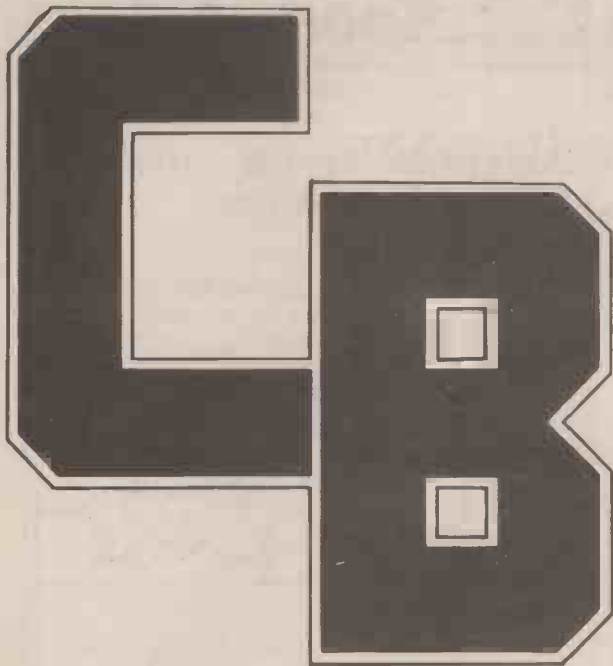
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All quiet on the CB front, no news is good news — or is it. Rick Maybury looks at the latest happenings on the CB and Open Channel scene

INCREDIBLE, that's the only work that adequately describes the response to our National Directory of Handles. Over twelve thousand of you have submitted your handle. Our problem is that it's absolutely impossible for us to include it as a free supplement. Before you go shouring 'foul' consider this, if we use the smallest practical type size we can get around 150 names per page, it doesn't take a degree in mathematics to work out that we'll need around 60 pages of HE to take them all. I don't think that would go down too well with our printers.

Our aim now is to produce the Directory as a 'Special' in its own right. To make it really worthwhile we're going to include a couple of features and general information on the CB scene in this country. Compiling the list has proved something of a headache so we're using one of our office computers to sort out the names alphabetically and allocate each handle a number. Obviously all this is going to take time, we anticipate publication around September, hopefully we'll be announcing the date and cover price next month.

Open Channel

Still no news on the arrival of Open Channel, various rumours are flying around for another announcement, January 1st, '81 is the most popular so far. The Green Paper discussion document has yet to appear, it may well be available by the time you read this. You can make sure of your copy by pestering your local HMSO (Her Majesty's Stationery Office) or by writing to the Rt Hon William Whitelaw (usual address, Houses of Parliament, Whitehall, London SW1), he should be able to tell you when. While you're at it you may like to tell Mr Whitelaw how distressed you are at having to wait for so long, you

could also impress upon him that the Government is losing an awful lot of money through not collecting license fees, VAT etc.

Trafalgar Demo

As luck would have it the Trafalgar Square Demonstration will have been and gone by the time you read this (a full picture report next month of course), at the time of writing it looks set to be the biggest so far. Doubtless there will be other demonstrations in the coming months. Time and again people have asked us why we do not give more warning of these events (the usual excuse for not turning up), all we can do is relay information, the constraints of a monthly publication demand that we know at least two months before the event if we're to give it a mention. So club organisers and campaign leaders please note, we're only too happy to give your event a mention but let us know in good time. The same goes for clubs, it's no good phoning us up and complaining that a club we mentioned in one of our directories no longer exists, if you don't tell us about it how are we supposed to know?

Breadboard 80

Most of our regular readers will know of the annual Breadboard Exhibition held in London in November, well this year it has fallen on Modmags (us) to organise the show. Last year our theme was the amazing Hebot robot, this year we hope to make CB the focal point of the proceedings. Already we have some of our regular CB advertisers booked for space, a couple of stands are still free so if you run a shop, club or any other CB organisa-

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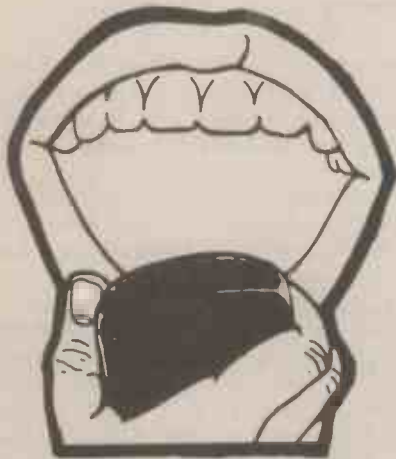
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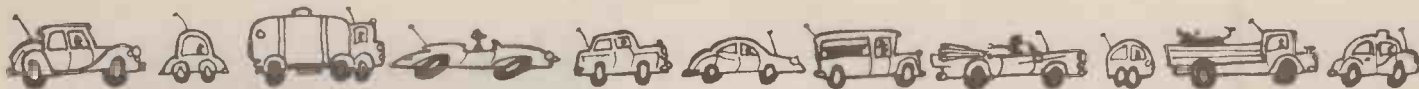
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tion and you want to get your name down for stand space then write to or phone Peter Freebey at our usual number for details. The show will be held at the Royal Horticultural Hall between the 26th and 30th of November. It will stay open late on the Thursday and open for the first time ever on the following Sunday.

Club Call

The club scene is livening up at last, the Ten-Four Club in particular has been undergoing some dramatic changes. After a number of internal disagreements the club has elected a new committee and a very good job they are doing too! At the beginning of June the club entered a float in the Waltham Forest Carnival (North East London) and as you can see from the photographs considerable imagination went into the design of the float. In fact they took third prize in their class and collected a tidy sum for local charities in their 'Big Rig' collection boxes. Events like these are superb publicity for the campaign, indeed the 10-4 Club attracted a number of new members and some favourable 'write-ups' in the local press. If any other clubs are organising similar events then we would be only too happy to send along some of our 'Legalise CB' Balloons to decorate your float or stand.



Above, the 10.4 Club's float, how about the rig above the drivers cab — big enough?
Below, the carnival underway, the collection boxes raised a few eyebrows.



Here's this month's selection of club addresses.

10-4 CLUB
Secretary Ian Leslie
BM/10.4
London WC1.

Meetings every other Tuesday (1st July, 15th July etc) at the 'Essex Arms' Forest Road, Walthamstow and last Wednesday each month at the 'Kings Oak', High Beech, Loughton (for formal club meetings), all are welcome.

EDINBURGH CB RADIO CLUB
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22 Ross Gardens,
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OPEN CHANNEL CB CLUB, PRESTON AND DISTRICT
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Chairman: F. W. McKeown
Secretary: S. J. Battersby (Address below)
17 Coronation Street,
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'HART OF ENGLAND CB CLUB
Secretary: Mrs S. K. Wilson
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Leicestershire.

Please note that the Weymouth CB Club has been dissolved. Anyone in the Weymouth area starting a club might like to drop us a line. The UBA ESSEX has been renamed the ESSEX CB CLUB, the address is still the same as the one given in the June issue.

Monitor

Bet you've seen the Monitor Offer on page 71, if you haven't sent your order in yet then why not? For the ridiculously low price of just £11.50 (including VAT and everything) you'll get a superb Short Wave converter and believe us, it's just about the best one you can buy under £50. Look no further, you can buy with confidence as this offer is being run in conjunction with genial Glyn Hall of Wintjoy Ltd, well, what are you waiting for?

Still on the subject of Glyn Hall, he's our CBVIP this month, don't miss it for a real rags-to-riches story. You may be interested to know that for the price of an SAE



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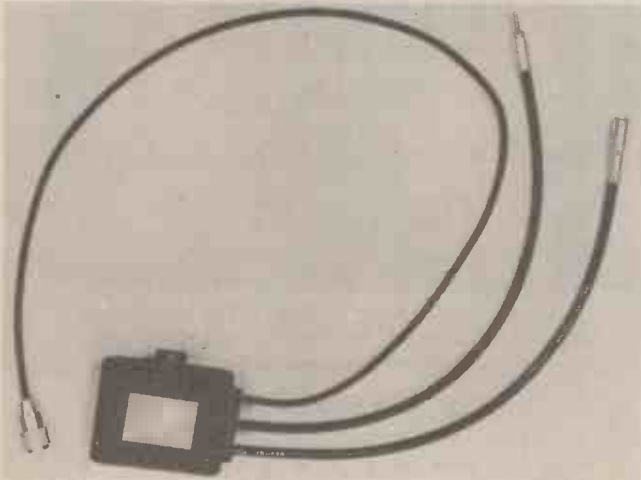
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he'll send you one of his excellent Shakespear or Antenna Specialists catalogues, they make very interesting reading. Before we leave Glyn altogether have a look at the picture of the 'un-Tenna', (below) this cunning little black box will convert your existing car aerial into a genuine Short Wave aerial, only one simple adjustment to make for a perfect SWR, what more can we say?



The 'Un-Tenna' car aerial converter

React UK

Our last item this month concerns the effort of Ivan Francis. He's a Canadian Gentleman over here for a few weeks. He represents REACT organisation, they are the people who voluntarily monitor channel 9 for emergencies in the States. Under the REACT Charter we couldn't start an official monitoring service until we have a legal system, however, Ivan has managed to start a club called REACT UK Supporters Club. If anyone is interested in finding out more about the benefits of REACT or a similar type of emergency monitoring system then you can either contact Ivan direct at:

28 The Coats,
Bristol, BS14 8LH.

or get in touch with any of the regional organisers listed below:

London — David Hughes

Midlands — Keith Townsend

North East — Les Carrol

Scotland — Keith Townsend

The REACT Club have already been in touch with the Red Cross and St John's Ambulance so as soon as we have a legal system there should be someone there 24 hours a day able to assist in emergencies. Now isn't that what CB is all about? See you next month.

Stay lucky

CB VIP

GLYN HALL



I was born 18 years ago; at the age of 17, in Salisbury, Rhodesia. I lived there until 1966 after doing a spell with Rhodesian Air Force during the Emergency Call-up just after U.D.I.

In July of that year whilst working for de Beers, in the diamond fields on the Skeleton Coast of South West Africa, I became interested in two way radio, which was my only contact with the outside world as my camp was 250 miles in the Namib Desert. My callsign was ZSR 72 and during this spell I was lucky (?) enough to get a blow

by blow account of the Six Day War which was relayed by Israeli Hams.

When I returned to Rhodesia in 1969 I seemed to spend most of my time in and out of the Air Force as the war in Rhodesia was starting to "hot up". In between fighting I was quality Control technician with a factory manufacturing motor vehicles.

April, 1971 saw me once again on the move, this time to Europe to seek my fortune. After dabbling around in the Motor Industry I decided to study Computer Technology and in November of '76 I graduated. I joined a small electronics manufacturer as Assistant R & D Engineer and worked my way up to Works Manager leaving them in July '79 to go it alone, although at this time I wasn't too sure whether to do CB accessories totally or diversify. I had a position as a consultant to a fairly large organisation available to me but after a few foray's on to the Continent found the CB market to be a growing industry.

On my return to the UK I contacted Bill Taylor to see if I could obtain backing for my idea. He had the foresight to realise the potential of the CB market and in November 1979, Wintjoy Limited was born. The aim of the company was to obtain goods direct from the factories in the USA, Europe and Asia rather than buying from middlemen and several franchises have been set up with top manufacturers. Though I believe that it is too late to stop 27MHz due to the sheer numbers already illegally operating, the manufacturers represented by Wintjoy have said they will manufacture for any frequency named.

May we at Wintjoy wish HE and BOF all the best and look forward to the day when BOF becomes a Magazine in it's own right, which it surely deserves.

Glyn Hall,
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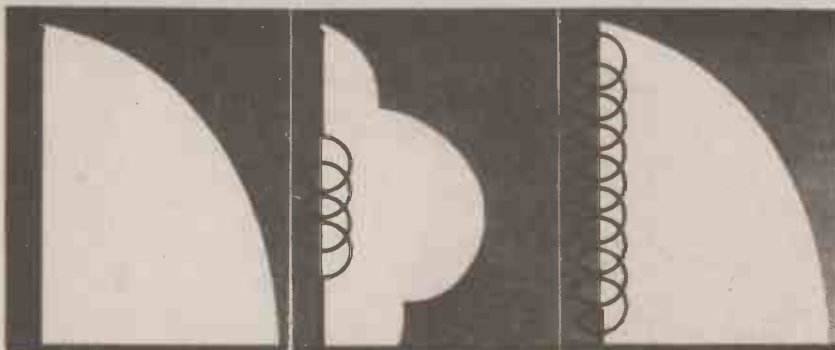
Rebel 500

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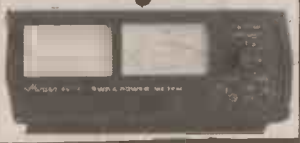
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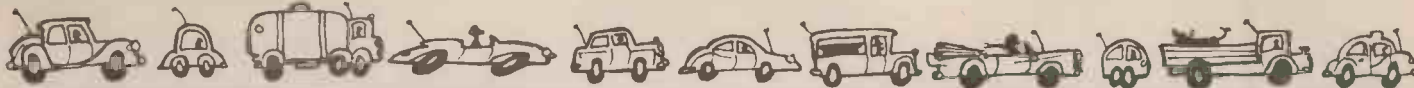
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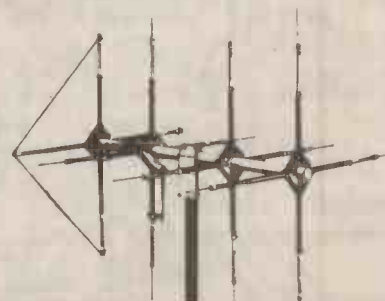
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PCB Foil Patterns

For the benefit of our confused readers who have been rushing around, frantically turning over pages, trying to find the foil patterns for the projects they are wanting to build — here they are!

We have collected all the track layouts or foil patterns (call them what you will) together on one page to make things easier.



Figure 1. The foil pattern for the HE Gaytec



Fig 2. The foil pattern for HE Pass the Loop

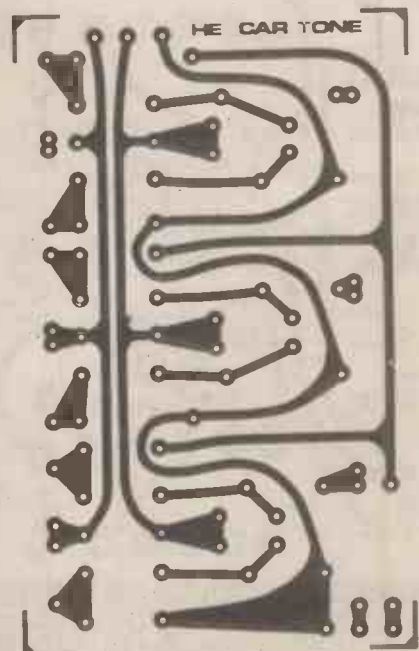


Fig 3. Equitance foil pattern.

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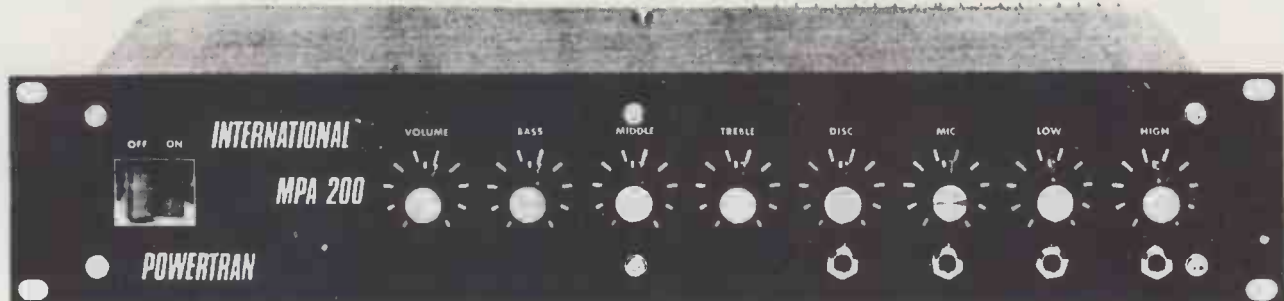


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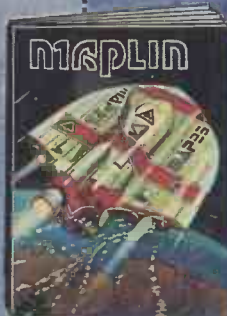


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