

CONSTRUCTIVE

A short history of construction with thoughts on future developments.

The present-day electronics enthusiast needs a wide variety of skills and equipment to get the most from available technology. In the early days of experimental electronics all you needed was a selection of woodworking tools, wire cutters and a soldering iron. You could even, literally, knock together a circuit with square wire and nails on the kitchen table. Alas, the days of a single valve radio sets are long since past. . . . the boom in home construction started with the introduction of transistor technology, rapidly accelerated by IC technology. With the availability of more and more sophisticated devices came the need for more sophisticated constructional techniques, and deeper understanding of the actual device characteristics.

To help the enthusiast (and development work in industry) various constructional aids were developed. One of the earliest aids was pre-punched paxolin matrix board; with this, prototype circuitry could be assembled reasonably neatly and quickly, but all the actual wiring between components was still a major part of construction. Of course this was still not as neat as a specially designed printed circuit board, but in 1965 Veroboard was invented — with the copper in the stripes! This invention immediately made construction a lot neater, quicker and more flexible — leaving a lot more of the constructor's time available for the more creative aspects of electronics. Various other fixed and variable pattern circuit boards have been introduced since Veroboard revolutionised the home constructor's lot, the most recent being Blob-Board (similar to ETI's Utiliboard), which has the stripes but no holes!

Plug It And Print It

All of the above techniques are suitable for one-off prototype work. More flexible development aids include S-Dec or the newer Protoboard. Both of these devices enable you to plug in components, without soldering, with the benefit of no possibility of heat damage and easy re-use of components.

Of course for a neat professional finish to any project a printed circuit board is best. Here there have been several advances in technology — to make the home constructor's lot a happier one.

The first aid for the constructor was the appearance of photo-sensitive board — which enabled masters to be used for more than one board. A drawback to this method is the need for an ultra-violet exposure unit —

although cheap units are now becoming available — at a push the sun can be used (in the UK this can be hard to find!).

It's In The Bag

Next came the PCB pen, first marketed by Dalo, so that you could draw your circuit directly onto the board. By using dry transfer sheets for IC mounts, the tracks can be quickly drawn in for 1-off boards.

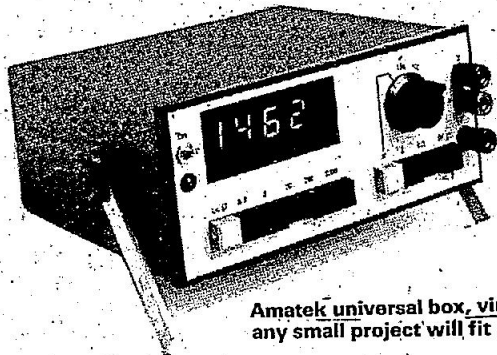
The Seno 'etch-in-a-bag' system removed the mess and danger of hot ferric chloride — a necessary evil of PCB production.

ETI PRINTS

All of these aids to PCB production are good, but the amateur is stuck with making up the master artwork, or drawing it each time. The latest innovation (brought to you by ETI) is PCB artwork complete, on etch resistant dry transfer sheets. ETI PRINTS cost 75p a sheet and can



THINKING



Amatek universal box, virtually any small project will fit inside.

be used as photomethod masters, or laid down direct onto the PCB — with six separate project designs per sheet.

Tooling Up

The mechanics of construction demand a reasonable selecting of hand tools. Side-cutters and screwdrivers haven't really changed in the last twenty years — they just get more expensive! A good idea is to spend as much as you can on good quality tools, they last longer and will not get any cheaper. A pair of sidecutters from Lindström cost about £4 in 1974 — the ETI pair still cut paper!

Good soldering irons seem to be the exception to the above rule, they are still amazingly cheap — considering how useful they are! Rechargeable irons are becoming cheaper and with higher capacities — the throwaway iron may be just over the horizon.

Temperature-controlled irons can be bought for between £10 and £20, the price is well worth it — all ETI projects are assembled with controlled irons.

A Pain In The . . .

Hand, finger — metal bashing can be painful; not to mention dangerous, high speed drills slipping off panels can work wonders on the kitchen table. The actual work of bending sheet metal into a vaguely rectangular shape is now done for you, but the various holes and slots are a time-consuming part of any project. In fact 90% of home-built gear falls down when it comes to the exterior finish. Even the most gifted electronics designer may cut slider slots crooked, and lettering usually ends up as stick-on labels.

Do not fear, ETI is here! Panel transfers of complete words add the professional touch to any project. This is still not much use if all your holes are like a dog's hind leg; pre-punched boxes are the answer. The latest in this line is from Amatek; they produce a really neat case with lots of holes, and rectangular cut-outs. The Amatek PDS

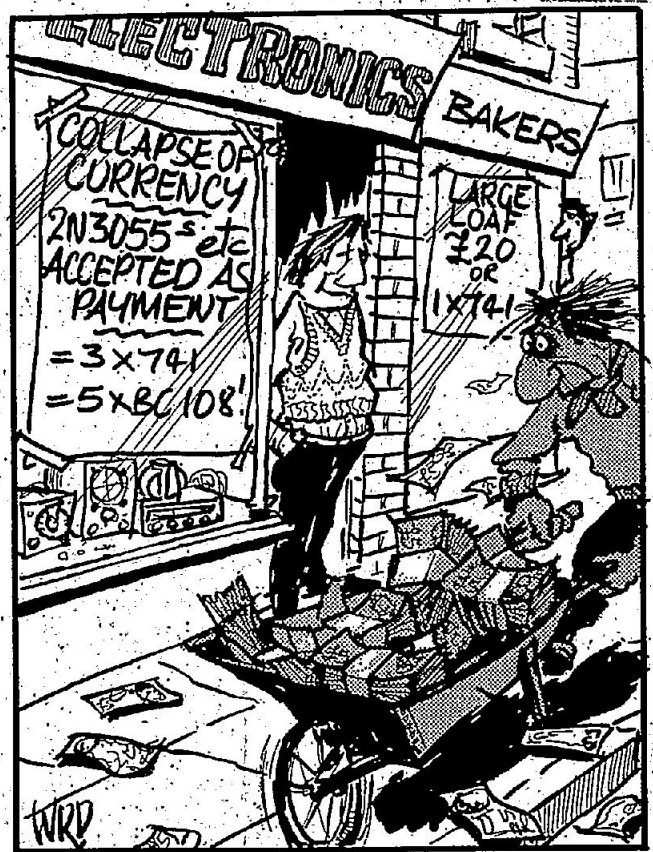
case comes complete with a front panel that can be used to mask unwanted holes. Expect more of this sort of Universal box in the near future.

What Next?

As the complexity of ICs increases the size seems to decrease. Finer and finer tools and techniques are needed for all constructional projects. One result is that a lot of people lose interest in actually building equipment, they find it much more interesting to just work the concepts out and possibly breadboard the design.

But lots of people actually enjoy the physical side of life, and are continually looking for new ideas to bring to mechanical and electronic life. Sometimes now, and probably more so in the future, the best combination is that of constructor and designer working as a team. This particularly applies in the MPU area — any competent constructor can put one together, but it needs a programmer to develop the software.

An interesting possibility is the establishment of an exchange/meeting centre, putting hardware constructors in touch with software ideas constructors — both doing what they enjoy most. □



WIRELESS TIMES

12:34

approx. $\frac{1}{2}$ full size digits shown here

National's MA1012 LED digital clock module is a complete clock & alarm unit, operating from 50 or 60 Hz mains, and offering all the features you would expect: Hours-minutes display in bright 0.5" leds with optional seconds, sleep and snooze alarms, fast and slow setting, AM/PM indicator, switched alarm outputs - but best of all no RFL. Thus the MA1012 is suitable for use in any radio/tuner applications, and requires just 1.75 x 3.75 x 0.7" total. (Ex. transformer). £9.45 per module, isolating mains transformer £1.50 each. (*8% vat) Two modules, and two transformers for £20.00 (+8% vat)

In the latest **Ambit** catalogue: more TOKO coils, chokes, filters etc., data on the short wave coil sets, a revised price list, micro-microphone inserts, special offer lines etc.

DETECKNOWLEDGEY

Metal locator principles and practise, including some of the facts and information manufacturers of £100+ detectors would rather you didn't know. £1.00 each.

The Bionic Ferret 4000 - a VCO metal locator-based on the PW seekit, including all parts, plasticwork, ready wound coil etc. Inc. free copy of detecknowledgedey. £34.26 in pp and VAT at 8%.

Special announcement: The Bionic Radiometer metal locator is at last to be released. A full VLF discriminator, with simultaneous display of ferrous, non-ferrous and foil objects. With a little practise, you can actually find objects obscured by junk. Outperforms uni's costing £150+. Digital control. Demo available at Brentwood, on sale soon for less than £75.SAE info:

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HA1137W	FM IF	2.20	BF224	6ghz RF	0.22	with matching trans'is.	9.95
TBA120	FM IF	0.75	BF274	7ghz RF	0.18	MFH series 4/5/7kHz band-	
TBA120S	FM IF	1.00	ZTX212	50v/3w	0.17	width @ 455kHz	1.95
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CA3123E	AM rad	1.40	ZTX451	60v/1w	0.18	EC3302 3cct v/cap fm	7.50
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tba810as	7w AF	1.08	BA121	vht varic	0.30	91197 mw/lw v/cap tun	11.35
LM301an	op amp	0.39	BB104	dual var.	0.45	7122 3 v/c mw (OR lw) tuner	
ua741	op amp	0.34	BB105	uhf varic	0.40	KIT 15v tuning	9.00
LM3900	op amp	0.68				810k 7w af kit comp.	£3
7805uc	5v/1amp	1.55	mvam2	dual AM	1.48	940k 10w af kit	3.95
tda1412	12v/1/2 A	0.95	mvam115	15v/AM	1.05	tda2020k pr. tda2020 ics,	
78M20	20v/1/2 A	1.20	mvam125	25v/AM	0.90	pcb, heatsinks for pa	9.35
78M24	24v/1/2 A	1.20				All mpx decoders feature	
ua723cn	variable	0.80				TOKO pilot tone filters.	
NE550a	as above	0.80				Tuners: complete	
taa550b	32v ref	0.50				Carsholt signalmaster Mk 8	
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NE566v	vco	2.50	YHCS11098AC2	0.30		Full instructions	86.95
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			LLC4828	7mm	0.33	min. foil trimmers (see pl)	
ZTX107	50v/3w	0.14	CFS10.7 ceramic	0.50		22t 100k pots for tuning.	45
ZTX108	30v/3w	0.14	BLR3107N	mpx	1.90	RFchokes: TuH to 120mH	
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ETI TYPES

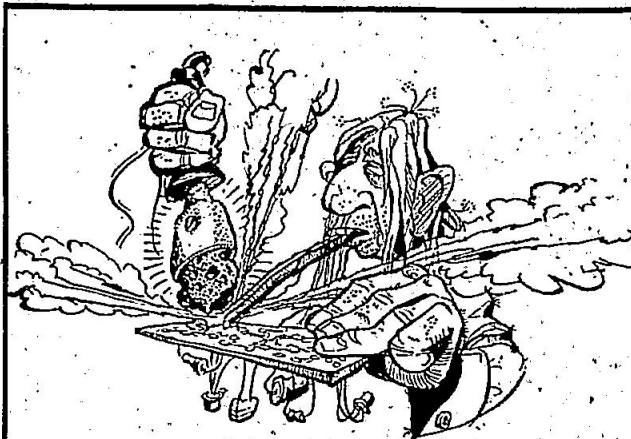
Which type are you? Our favourite cartoonist Roy Pullen puts pen to paper, and gives his impressions of ETI readers.

THE BEGINNER ~AND HIS ENVIRONMENT

Never before captured either by camera or pen, we see here the hesitant emergent moments of an individual **TECHNOLOGICAL COMMITMENT**; in fact the crucial turning point in what might be loosely described as Arnold Skulfington's formative years.

Fortified by the stability, identity and sense of purpose of this close knit family group, he receives enthusiastic guidance and encouragement from his Dad, here savouring the bottle of ETI **SPECIAL OFFER** scotch that first introduced ETI, and advanced technology to the household. Mum, after contemplating a tedious journey to the channel selector (mysteriously set to an unfamiliar channel), decides to settle to the **ECOLOGICAL QUESTION**. It may have something to do with young brother Mark, an aspiring marine biologist.

In the background are the relics of last months fleeting



Action replay of 3 handed technique. Get your leadpoisoning here! Arnold Favours plumbers, solder sticks and Boscoe's grudge (Fuming vitriol flux paste.)

interest — at least the sump oil spilt on the woven axminster has cleared the mould caused by fallout from the glue factory where the fumes signal the melting down of another batch of dead nags. Well, perhaps facilities are not ideal, but fortunately Grandad has donated his plumbing toolkit toward the enterprise. No doubt the Skulfington after-dinner drawing room conver-

sation will turn to the Crisis in Society and the contribution to be made by the rational technologists' disciplined mind — like Arnolds!

(After all a rabble never came up with anything, except possibly the French Revolution — and look at them!)



Ray Pullen

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6 GOWER ROAD

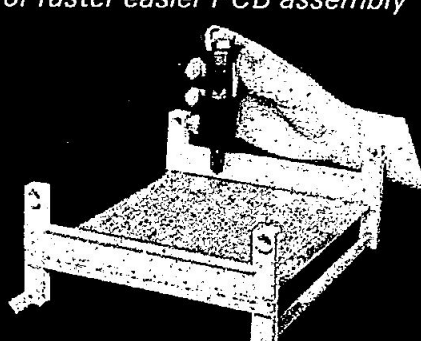
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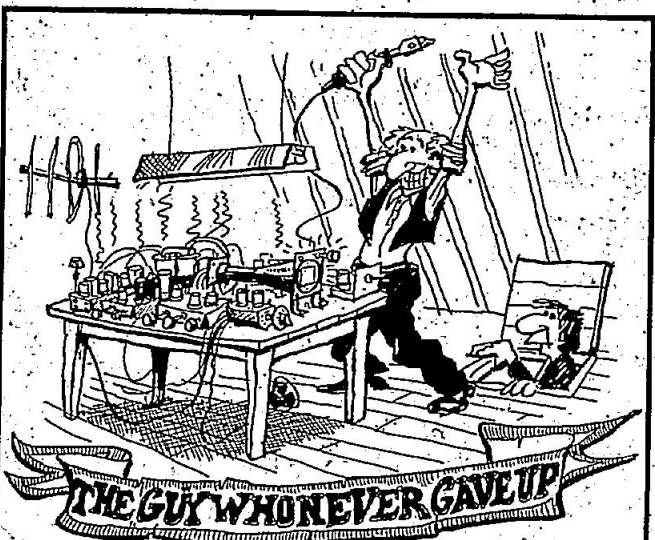
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- 5 All right! — We have ways of making YOU confess to it too!
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- 13 DUSTBINMEN approach detector. (Programmed to monitor CLANGS OF E.E.C. approved EUROBIN hitting deck range 2 1/2 miles).
- 14 Electronic Amoeba (ETI 639).
- 15 TTL Traffic Jam Synthesizer (MARSHALL'S OFFER).
- 16 EMT Source, High energy laxative, Senior Citizen Rejuvenator.
- 17 Dry Joint Simulator for testing dry joint testers (PW 975).
- 18 Electronic GRASS display (with variable differential growth and adjustable clipping) (Nominated by E.T.I. for the 1978 Wedgwood Benn Award for Innovation)
- 19 Farnyard Effects (EE 34).
- 20 Electronic Pterodactyl (WATFORD ELECTRONICS KIT).
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- 22 Infra-red SCORPION grill for toasty crunchy snacks. With timer.
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- 30 No-one knows what this does — let alone how it does it (MAPLIN KIT).
- 31 Sonic radar jammer to confuse bats.
- 32 STAR PROJECT . . . * Mini TOMOSCANNER and display. For dubious sausage rolls and ailing hamsters (ETISCANNER!)



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- 13 Tuner co-ax S.W.R. indicator.
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- 16 Barometer.
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- 19 Record turntable — on stack of paving slabs through to substrate!
- 20 Disc hygiene trolley. Handling, decontaminating, examining, ionizing.
- 21 Omnidirectional combined channels deep basshorn in chimney.
- 22 Cryogenic plant for low noise preamp.
- 23 Secret development model of Giant NABCASSETTE recorder on loan from R***.
- 24 Looney-box. All known Quadro systems decoder — and one or two unknown!
- 25 X-Y Stereo display.
- 26 Card and Memory store for programmable equipment.
- 27 Converted dentists chair for maximum comfort and minimum acoustic interference.
- 28 Emergency escape facility.
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- 30 IKON: Original 'Williamson' mummified in transparent potting resin (might be exhumed if transistors Lose Favour!).
- 31 Phial containing speck of dust found on stylus: to be sent for annihilation in CERN Synchotron, Geneva.
- 32 Continuity Announcer.

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31CS-10B* (ST) £59.95	31CS-10B (ST, TM) 6.5mm £59.95	
		
Ultra Slim	Five-way Alarm	Lady's Model £49.95

*Available November/December

Not illustrated: 31CBS-10B, ultra slim, heavy gold plated £99.95. 26CGL-11L ladies' gold plated watch on strap £49.95.
Available soon: Chronograph measuring to 1/100 second, two lap times. Round watch £59.95, square watch £64.95. Low cost lady's watch £3.95.

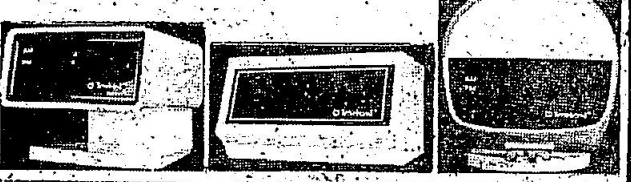


IBICO451ES (left) watch/chromograph. All stainless steel case, mineral glass face. Water resistant to 100ft. 1/100 second; to 1 hour, net and lap times £49.95.
NEW FROM IBICO. Model 407, superbly styled 6 digit LCD, displaying hours, minutes, seconds (or hrs., mins. date) and day of week. Backlight. Water resistant. Ultra slim case, fully adjustable metal strap £39.95. Lady's models from £39.95.
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- | | |
|--|---------------|
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| C6110 (centre). As C500 with more sophisticated controls. White only | £15.90 |
| C590 (right). With built-in high/low intensity elevating reading lamp. White only. | £23.35 |



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THE MPU MAN

The amateur computer man shares with the Hi-Fi fanatic the same highly developed mania for interconnected SEPARATES. There is no way that a one-box personalised high performance system could be tolerated. However, whereas audio equipment hovers on the strife-torn domestic borderline between FURNITURE AND MACHINERY, computer tackle is definitely machinery and as such (apart from the Skulfington household) is relegated to cellar, attic or shed.

Colleagues more familiar with the world of exotic signal processing, as found in audio, communications and television tend to scorn the pathetic ups and downs of the rustic digital signal, and insist that waveform processing is intrinsic to genuine electronics. They even scornfully question whether the computer man is concerned with ELECTRICITY!

Meanwhile the inscrutable practitioners of this new and bizarre branch of mathematical sorcery toil on — on a higher and rarified plane of intellectual existence to that of the dirty finger-nailed, scope battering radio rabble.

KEY

- 1 Teletype unit.
- 2 Punched paper tape reader.
- 3 Floppy disc 'player' unit.
- 4 Home-made floppy disc experimental unit.
- 5 Incompatible systems interface patch-board.
- 6 Skeleton keyboard for manual entry.
- 7 Modulator for feeding display material to domestic magic lantern.
- 8 Domestic magic lantern showing results of simulated World cup final.
- 9 Another advanced game in progress.



There are rumours of an Opto-Pneumatic Power Cue being evaluated by leading players. Integral Laser Theodolite system determines range and angles while Microprocessor backpack computes and controls shot dynamics.

- 10 Working microprocessor module.
- 11 Well ventilated reprogrammable read only memory.
- 12 Interesting teleprinter graphics — genuine system check — no kid!
- 13 Early home-made 8-bit processor.
- 14 Power supply with outboard cooling and attractive economy housing.
- 15 Another development module. Seems to have undergone pre-frontal lobotomy. . . . Last Night of the Proms?
- 16 Junked cassette player with sprinkling of cassette programmes. Alternative to papertape or manual entry.
- 17 Primitive one-shot switch input unit.
- 18 Aerosol spray for de-bugging.
- 19 Mighty de-bugged noughts and crosses programme listing being triumphantly brandished.
- 20 Attempt to fabricate home brew floppy disc.
- 21 Another teletype unit.
- 22 Personalised low density punched tape storage system.

