Registered by Australia Post — publication No. NBP0240.

AUSTRALIA'S NUMBER ONE ELECTRONICS MAGAZINE

ELECTRONICS AUSTRALIA

NOVEMBER 1983
AUST $2.10 NZ $2.60

We review Sony's PCM recorder

Televising the Bathurst 1000 –how it was done

Unique chance to build a 1920-style wireless set

Techniques for Rhythm Generators
Microbee IC computer reviewed
Low cost TV pattern generator

TANDY'S NEW TRS-80 MODEL 100
Small Computers Have Never Been This Big On Performance!

1099.00

26-3801

8K TRS-80 Model 100

A Workstation that Goes Where You Go! Our new TRS-80 Model 100 combines built-in, "instant-on" software and advanced communications capability with portability and expandability — making it the most revolutionary micro yet designed. Its ROM-based programs let you use Model 100 as a go-anywhere word processor, address book and phone directory, appointment calendar, general purpose ASCII terminal (via an acoustic coupler) and a true computer programmable in easy-to-learn BASIC!

All the Most Asked-For Features. Model 100 features a full-size keyboard with 8 programmable function keys and 4 cursor control keys, 8 lines by 40-character LCD display of upper and lower-case characters and 240 by 64 dot-matrix graphics, plus a real time clock with time/date/day display on the power-up main menu. All this, and battery-powered!

Complete Interface Capability. In the office, connect Model 100 directly to your computer, be it micro, mini or mainframe, using the RS-232C interface and transfer data at up to 19,200 baud. Connect Model 100 to your printer via the parallel interface for fast printouts. And there's even an interface to save or load programs/data/text at 1500 baud using standard cassette recorders!

Advanced BASIC Language. Extended Microsoft® BASIC offers full string handling, complete file operations, multi-dimension arrays, 14-digit double-precision accuracy and much more.

Seeing is Believing! Model 100 — expandable to 32K in 8K steps — is awaiting your hands-on inspection **now!**

Model 100 24K, 26-3802 ..... **1399.00**

Tandy ELECTRONICS

The biggest name in little computers®

A DIVISION OF TANDY AUSTRALIA LIMITED INC. IN N.S.W.

WE'RE NEAR YOU WITH NEARLY 350 LOCATIONS AUSTRALIA-WIDE!

See the New TRS-80 Model 100 at any Tandy Electronics store or participating dealer, or visit a Tandy Computer Centre and see why **TRS-80 is the Best Supported Computer in the World!**

Prices May Vary at Individual Dealer Stores

TAL11/83

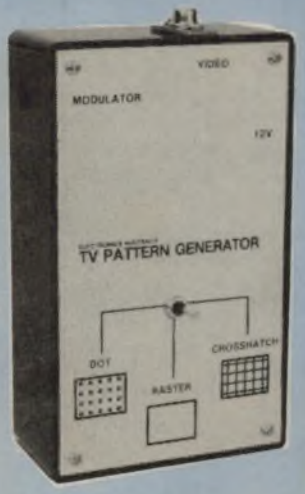
AUSTRALIA'S LARGEST SELLING ELECTRONICS MAGAZINE

ELECTRONICS AUSTRALIA

Volume 45, No. 11, November, 1983

Our cover this month highlights "Racecam", the in-car TV camera system that puts viewers right into the front passenger seat of a Bathurst 1000 racing car. Find out how "Racecam" works in our story on page 12.

Photo taken by Steve Brack on Canon F-1.



TV pattern generator

This low-cost TV pattern generator gives dot, crosshatch and raster patterns and uses just seven ICs. Use it to make adjustments for picture linearity, convergence, purity, width and height. Details page 56.

Parabolic microphone

Take a high-gain headphone amplifier and an easily-built parabolic sound reflector, put them together and you've got a powerful long range microphone. Use it to listen to birdsong or wild-life – or perhaps for more sinister activities. ASIO stand aside! Construction starts on page 64.

Features

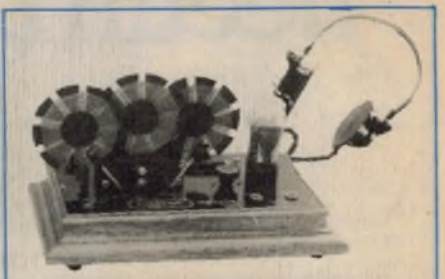
Hifi, Video and Reviews

Projects and Circuits

Personal Computers

Columns

Departments



1920s style vintage wireless set

This vintage style Unidyne wireless kit may be your last chance to bring an ancient circuit to life and at the same time gain a valuable momento of the "golden era" of valve radio. All parts are provided, including a spare valve, and the coils and wiring techniques faithfully duplicate the methods of the radio pioneers of the 1920s. Find out more by turning to page 46.

The change to excellence in sound...

needn't cost you a fortune.

Denon, the name associated worldwide with professional audio equipment has available in Australia their range of high quality integrated stereo amplifiers, tuners and cassette tape decks, incorporating the most advanced features at competitive prices.

High performance amplifiers, analog and digital tuners, and cassette tape decks featuring both Dolby "B" & "C", are the result of 30 years of research and technology, offering you the ultimate combinations of performance, reliability and cosmetic styling.

See the exciting range of amplifiers, tuners and cassette decks at your Denon dealer now, you'll find their prices rather exciting as well.

DENON

Professional Audio Brand.

AMALGAMATED WIRELESS (AUSTRALASIA) LIMITED

554 Parramatta Road, Ashfield, NSW 2131 Phone 797 5757

Canberra	Melbourne	Launceston	Adelaide	Brisbane	Townsville	Perth
80 5200	560 4533	44 5155	272 2366	44 1631	79 6155	271 0888

ELECTRONICS AUSTRALIA

EDITOR
Leo Simpson
B. Bus. (NSWIT)

ASSISTANT EDITOR
Greg Swain, B.Sc. (Hons. Sydney)

EDITORIAL CONSULTANT
Neville Williams
F.I.R.E.E. (Aust.) (VK2XV)

TECHNICAL PROJECTS
John Clarke, B.E. (Elect. NSWIT)
Peter Vernon, B.A. L.L.B. (NSW)
Jeff Skeen
Colin Dawson

PRODUCTION
Danny Hooper

GRAPHICS
Robert Flynn

SECRETARIAL
Christine Cleary

ADVERTISING MANAGER
Selwyn Sayers

CIRCULATION MANAGER
Alan Parker

Editorial and Advertising Office
57 Regent St, Chippendale 2008.
Phone (02) 699 3622 Telex 25027.
Postal Address: PO Box 163, Chippendale, 2008.
Advertising Sales Manager: Sel Sayers.
Melbourne — 392 Little Collins St, Melbourne 3000. Phone (03) 602 3033.
Representative: Mark Christian.
Adelaide — Charles F. Brown & Associates Ltd, 178 Fullarton Rd, Dulwich 5065
Representative: Sandy Shaw (08) 332 7711.
Perth — 454 Murray Street, Perth 6000.
Representative: Ashley Croft (09) 321 8217.

Circulation Office
Unit 3B, Sydneygate, Waterloo, 2018.
Phone (02) 699 2388.

Subscriptions
Subscription Dept, John Fairfax & Sons Ltd, GPO Box 506, Sydney 2001.
Enquiries: Phone (02) 699 2388.

Registered by Australia Post — publication No. NBP0240.
ISSN 0313-0150
*Recommended and maximum price only.

Editorial Viewpoint

Let's have more service and less smiles

Anyone who reads this magazine could not fail to notice the emphasis that many of our advertisers place on kits. For many readers the complete kit for a project is most desirable. They don't have to hunt around for odd bits and pieces, all the instructions are included and, in some cases, there is even the option of paying a fee to have a non-working kit fixed. All well and good. But sooner or later every hobbyist decides to strike out on his own.

The reasons are manifold. He may already have some of the major parts for a project described in this magazine; he may have designed a circuit for himself or, perish the thought, he may even wish to build a circuit described in an overseas magazine. Whatever the reason, he will be in the market for individual parts and not a complete kit. And this is where he may become very frustrated.

Some kitset suppliers will not supply individual parts from a kitset. They tend to take the attitude that they have invested time and money in compiling a kit and they are not going to risk jeopardising kit sales to sell a few parts. That may or may not be a realistic business policy but there is no doubt that it causes considerable customer irritation and, ultimately, loss of sales to the shop concerned.

More frustrating is the situation where the customer knows that the shop does stock the components he wants but the counter staff don't. Their response is that "we don't stock it". Sometimes the only way to buy parts is for the customer to quote the relevant catalogue number to the counter staff, because they are not familiar with the parts and don't even know that their own shop has them in stock.

The most recent example of this concerned the Soil Heater project. This project was a little unusual but did not use any special components apart from a thermistor. Even so, a number of readers rang to enquire where they could buy individual parts. We referred these people to a number of stores only to have some of them come back to us saying that they could not obtain the 4136 quad op amp, the MOC3021 opto-Triac driver and the 4030B. Further, the counter-jumpers at the store concerned had never even heard of these components.

The readers were finally able to get satisfaction but only because we gave them the relevant catalogue numbers for the particular store.

No-one expects counter staff to be familiar with the functions of every semiconductor on the market. But customers can reasonably expect store staff to know the product range stocked by the store.

In fact, these days when I enter an electronics store and one of the staff approaches me with a confident "Can I help you, Sir?" I mentally reply, "Probably not". I would rather have less of the cheery smile and more nous from counter staff.

I cannot accept the attitude of store managers who acknowledge that they have "idiots" on their staff but claim that they can't get good people. If staff cannot recognise a common op amp or CMOS chip they should not be employed. For their part, counter staff should take it upon themselves to be familiar with all current magazine projects and the full product range of the store concerned.

Those retailers with the better staff must win in the long run. In the meantime we can only advise customers to be able to quote those precious catalogue numbers. Otherwise you may be told, "There is no such device".

Leo Simpson

Printed by Magazine Printers Pty Ltd, Regent Street, Chippendale and Masterprint Pty Ltd, Dubbo, NSW for Magazine Promotions, Regent St, Chippendale.

Distribution: Distributed in NSW by Magazine Promotions, 57 Regent St, Chippendale, in Victoria by Magazine Promotions, 392 Little Collins Street, Melbourne; in South Australia by Magazine Promotions, 101-105 Waymouth St, Adelaide; in Western Australia by Magazine Promotions, 454 Murray Street, Perth; in Queensland by Gordon and Gotch (A'asia) Ltd; in Tasmania by Ingle Distributors, 93 Macquarie St, Hobart; in New Zealand by Gordon and Gotch (NZ) Ltd, Adelaide Rd, Wellington.

BANKCARD HOLDERS –
PHONE YOUR ORDERS
TOLL FREE!

AUSTWIDE

NEXT DAY DELIVERY

ALTRONICS 008-999-007

VIA JETSERVICE
(CAPITAL CITY & SUBURBAN AREAS)

ALTRONICS • BANKCARD JETSERVICE DELIVERY NEXT DAY • ALTRONICS • BANKCARD JETSERVICE DELIVERY NEXT DAY • ALTRONICS

MICRON SUPER 80

80 CPS : 80 COLS
BIT IMAGE GRAPHICS
FRICTION FEED AND
ADJUSTABLE SPROCKET FEED

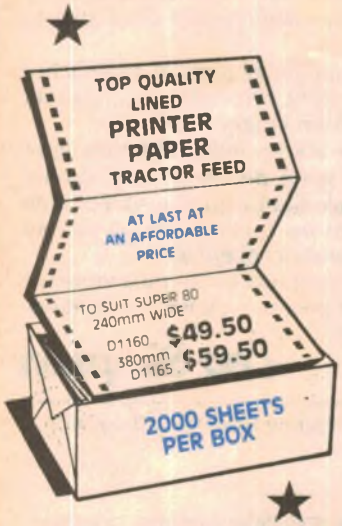
MADE IN JAPAN QUALITY

A FEATURE PACKED DOT MATRIX PRINTER FOR UNDER $500

Your "Super 80" printer will enable you to print **letters, reports, graphics generated pictures**, etc and importantly for the programmer. Hard Copy of **program listings**.
Operating under software control from any general purpose micro-computer the Super 80 features **13 different print types** including emphasizd (LETTER QUALITY). **Bidirectional print action** ensures **smooth, quiet operation.**

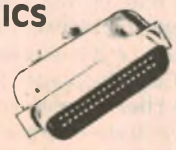
228 ASCII Characters, Handles **4" to 10" Paper**
STANDARD CENTRONICS INTERFACE

VALUE PACKED AT D1174..... **$499.50**
INTERFACE CABLE TO SUIT MICROBEE D1190..... **$45.00**
SPARE RIBBON D1175..... **$12.50**



CENTRONICS PLUG

36 WAY
D1192
$14.95



When you buy one of our printers you'll need a centronics plug. If you are **MICROBEE USER,** have a look at our **INTERFACE KITS** on the opposing page.

UK MADE, GOLD PLATED
D RANGE CONNECTORS
SAVE 25% ON BULK QUANTITIES!

	ea.	10 +	25 +
P.0880 DB9 Male 9 Pin	2.50	2.20	1.95
P.0881 DB9 Female 9 Pin	2.95	2.70	2.50
P.0885 DB9 Backshell	2.85	2.50	2.30
P.0890 DB15 Male 15 Pin	2.95	2.50	2.29
P.0891 DB15 Female 15 Pin	3.50	3.00	2.80
P.0895 DB15 Backshell	2.85	2.50	2.30
P.0900 DB25 Male 25 Pin	4.50	3.95	3.60
P.0901 DB25 Female 25 Pin	4.95	4.50	3.98
P.0905 DB25 Backshell	2.85	2.50	2.30

SOFTWARE

JUST PHONE OR WRITE & ASK
WE'LL SEND YOU OUR SOFTWARE CATALOGUE
HONEYSOFT • MYTEK • DREAMCARDS

SAVE LOAD AT 1200 BAUD EVERY TIME

WHY PAY OVER $80?

Adjustable Azimuth DATA CASSETTE

At last a Data Cassette Recorder/Player you can afford. The Micron D 1120 is fully **adjustable azimuth** (absolutely essential in our opinion) and incorporates tailored audio frequency response audio stage together with low distortion.
Now you can save and load software in your Micro with confidence.

D1140 ... C10 Data Cassette Tape **$1.10**
D1141 ... C20 Data Cassette Tape **$1.20**

D1120 Micron Data Cassette **$49.50**

HIGH RESOLUTION

GREEN PHOSHOR MONITOR

12" SCREEN ★ 10-20 MHz BANDWIDTH
SCREEN INVERT ★ 240VAC or 12vDC OPERATION
12vDC/1.1A Power your micor.

OVER 4,000 SOLD

One of the hassles of sitting there for countless hours operating your computer is eye strain (anyone who has just spent 10 hours solid will agree!!!) Well our fantastic new MICRON 12 High Resolution Green Phosphor Monitor has a 'reverse' or invert screen function where by simply rotating the contrast control anticlockwise the screen information and background are reversed. This is especially valuable in poor lighting conditions.

Incredible value.

D1112.. **$199.50** See Review June EA. p. 137

THE FANTASTIC MICROBEE IC HAS ARRIVED

NEW 3.375 mHz CLOCK SPEED

EDUCATION APPROVED DEPARTMENT

SCREEN FORMAT 64 x 16 OR 80 x 24 WHILE NETWORKING EG. USED AS A TERMINAL

The all new Microbee IC has got to be the most value packed ROM based personal computer available today. **New enhanced basic** enables 64 x 16 or 80 x 24 screen format while networking and the clock speed is now **a zippy 3.375 MHZ** and over **$110** worth of software integrated in ROM i.e. the absolutely delightful **Wordbee** word processor package or **Editor Assembler** plus all the other exciting features that have made the Microbee famous.

D1020..... 16K IC..... **$499.00**
D1035..... 32K IC..... **$599.00**

ARCADE GAMES, PERSONAL, BUSINESS AND EDUCATIONAL APPLICATIONS.

• FOR DESPATCH P&P CHARGES AND ADDRESS DETAILS PLEASE REFER TO OUR AD. ON **PAGE 107** •

A SINGLE BOARD CP/M COMPUTER

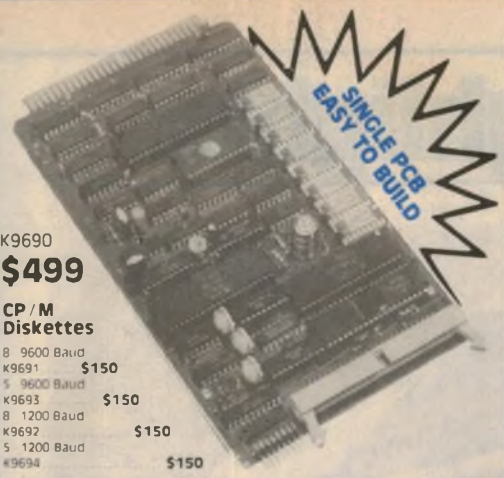
"THE LITTLE BIG BOARD"

64K on board RAM, Z80A based running at 4mHz (Top speed) Floppy disk controller, Real time clock.

That's right! A fully configured Z80 computer running at maximum capacity on a single **PCB**. **On board disk controller** drives up to four double sided, double density drives either 8" or 5". **2 by RS232 I/O Ports**, both may be software configured, use one for a terminal the other for a printer or modem etc. **Battery backed real time clock** software accessible for automatic dating of documents, timing during games. Fully **STD buss compatible** — choose from thousands of ready available plug in card options. **Bootstrap Monitor** on board — boots to **CP/M**. Choose from the world's **largest range of software**.

ALTRONIC KIT FEATURES

Two versions of the bootstrap monitor supplied. One set **for 1200 baud operation** enables connection to **MICROBEE 16 & 32K IC'S** utilizing their terminal emulation facilities. The other set for **9600 baud** operation.
Complete set of **IC** sockets.
Double sided plated through **PCB** — solder masked and pretinned.
56 Pin **STD** connector.
2 x DB25P's and ribbon cable for peripheral connections.
Quality components used throughout including solder and full documentation.



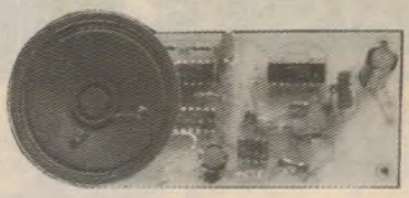
K9690 **$499**

CP/M Diskettes

8" 9600 Baud
K9691 **$150**
5" 9600 Baud
K9693 **$150**
8" 1200 Baud
K9692 **$150**
5" 1200 Baud
K9694 **$150**

COMPUMUSE

YOUR GAMES WILL NEVER BE THE SAME



A computer music synthesizer that is **easy to build** and **easy to use**, connects to any computer with a Centronics-style parallel port and provdes music over a five octave range and a wide variety of sound effects.

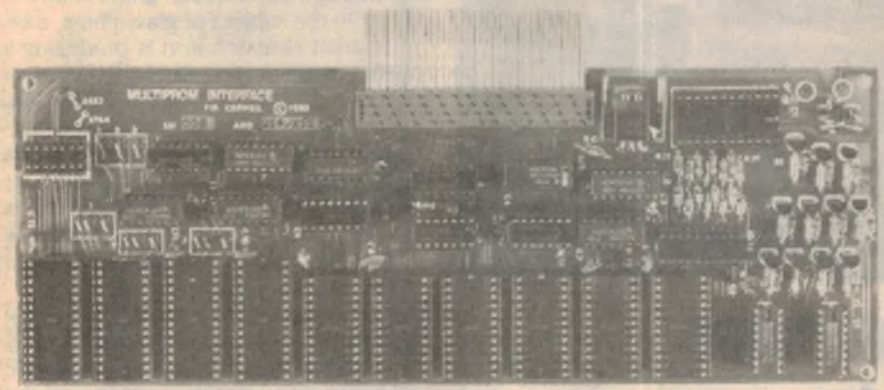
★ EXPERIMENTAL KIT - PCB, COMPONENTS & SOFTWARE

K9834..... **$26.50**

MULTIPROM INTERFACE FOR THE MICROBEE

(ETI NOV '83)

44K OF PROGRAM STORAGE ★ FULLY SOFTWARE SELECTABLE ★ SUITS BOTH IC AND PLUS MACHINES ★ 8 OUTPUTS FOR CONTROL APPLICATIONS ★



A sensational new kit for the MICROBEE, requires no modification to the computer except for the fitting of a 50 oin expansion socket. This project is easy to build and will allow you to store and software select up to 44K of eprom storage — acts like a mini disk drive system with the speed of RAM. Extra units may be added to further increase storage.

The Altronics Kit comes complete in every way
- ★ Full set of IC sockets.
- ★ Double sided, plated through board.
- ★ Assembled connection lead to Microbee.
- ★ Fully documented.
- ★ Cassette monitor included (plus sourcefile).

THE MICROBEE KIT OF 1983

K9673..... **$99.50**

PRICE BREAK-THROUGH

50 PIN EXPANSION SOCKETS

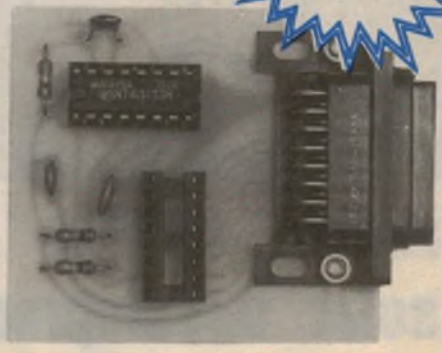
Right angle type to suit Microbee, floppy disk controllers etc
Mounts on PCB and mates with IDC sockets.

D1196.. **$8.50** EA...10 +... **$7.50**

PRINTER INTERFACE KITS FOR THE MICROBEE

PARALLEL TYPE

INCLUDES CENTRONICS PLUG AND CABLE



BUILD YOUR OWN INTERFACE AND SAVE $$$

A simple kit to build — takes about 20 minutes, save on the cost of a built interface and save the cost of a serial printer.

K9671..... **$29.95**

TTY TYPE

Teleprinters are cheap, so is this kit. If you've got an old Teleprinter this is for your.

K9672..... (Only)..... **$17.50**

★ KIT SUPPORT FOR THE MICROBEE ★

EPROM PROGRAMMER

(ETI JAN '83)

K9668..... **$55.00**

Versatile, low cost and easy to build. Plugs straight into the microbee I/O port. Suitable for 2716, 2732, 2532, 2732A and 2764 Eproms. Burn your games programmes and eliminate cassette loading time.

KIT FEATURES Sockets for all other IC's. 1 x 2716 supplied — get started straight away. Front Panel and Mains (SEC approved) transformer. 28 pin and 16 pin wire wrap sockets to flush mount personality plugs (2 included) and ZIF socket (included). DB15 Plug. Complete to last nut and bolt.

(See Review ETI AUGUST 1983)

RADIOTELETYPE DECODER

(ETI APRIL '83)

K9733..... **$19.50**

Display RTTY encoded messages on your video Monitor. Receive up to date weather information, international News before the Papers, all sorts of coded military info. Simple circuit uses PLL techniques. Single PCB Construction. Kit includes DB15 Plug and Backshell for connection to microbee. Shielded pretinned PCB.

NEW

MICROBEE LIGHT PEN

(ETI AUGUST '83)

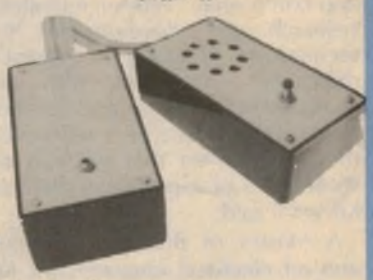
PROVIDES DIRECT PERSONAL CONTACT WITH YOUR BEE!

K9649..... **$19.95**

AT LAST — a light pen for the Bee. This pen works in the low resolution graphics mode and connects directly to the I/O port. ★ Complete kit including DB15 2m CORD. ★ Fully documented with software example.

FAX-DECODER

(ETI SEPT '85)



K9733..... **$24.50**

This project allows you to decode the signals of shortwave stations transmitting radio facsimile weather maps, satelite pictures etc. and then reproduce them on your dot matrix printer.
- ★ Complete kit of parts includes DB15 Ribbon Cable.
- ★ SOFTWARE LISTING.

FOR DESPATCH P&P CHARGES AND ADDRESS DETAILS PLEASE REFER TO OUR AD. ON PAGE 107

News Highlights

Amtex studies overseas solar developments

Mr Jim Kuswadi, general manager of Amtex Electronics, one of Australia's most successful solar power companies, has just returned from two of the world's most significant electronics fairs held in the United States.

He visited the Renewable Energy Technologies Symposium and International Exposition at Anaheim, California, early in September and also attended "MidCon '83" in Chicago, to review the latest high technology products in the industrial electronics field and assess their potential application to Australian manufacturing and commerce. "Although limited in our research and development of high technology products in Australia, we must be conversant with what is available in the world and our industries ready to embrace new technologies as they emerge so that we can develop some level of expertise in their use," Mr Kuswadi said.

A Master of Business Administration and an electrical engineer, Mr Kuswadi said the renewable energy industry was regarded as one of the major growth industries of the 80s.

"Remarkable breakthroughs in the uses and applications of natural energy resources such as solar power and wind power are emerging to meet the increasing energy demands of the marketplace," Mr Kuswadi said.

He said the demand for Amtex solar systems alone, in Australia, has doubled in the first seven months of 1983 compared with last year.

Speed breakthrough for optical fibres

Philips Industries marked a milestone in the development of optical fibre data transmission recently with a demonstration of data transmission at a speed of 140 million bits per second over a 36 kilometre link in Berlin, West Germany. Philips' Telecommuncatie Industrie (PTI) of Hilversum, Holland, made the glass fibre to the German Post Office's specifications.

The Philips' demonstration was significant as it is the highest data transmission speed yet achieved through commercial grade fibre.

On the subject of glass fibres, a US market research firm is predicting a tremendous growth in the use of optical fibre for data transmission, chiefly because of the encouragement from the American defence establishment. A major reason is that optical fibres are immune to the threat of the electromagnetic pulse effect, which follows a nuclear explosion.

As reported in EA, April 1983, the high voltage pulses induced in any metallic conductor by a nuclear explosion could cause major disruption of national communications networks, quite apart from the loss of life and damage to property caused by blast and radiation. Fibre optic communications links are not susceptible to EMP effects, an advantage in addition to their low size and weight, resistance to harsh environments and long service life.

Amateur radio, computers and satellite communications for NZ scout Jamborees

The 10th New Zealand Scout Jamboree will be held at Feilding (about 160 kilometres north of Wellington) from the 2nd to the 10th of January 1984. About 10,000 scouts and leaders including many from Australia, the Pacific Islands and other countries will attend and a wide range of radio, electronics and computer activities are planned.

Not only will there be the traditional amateur radio station (with, it is hoped, RTTY, SSTV, and OSCAR capability), but also a shortwave receiving station for SWLs, a kitset radio construction project, "fox hunting" (radio orienteering), and a computer system for the scouts to gain hands-on experience. A triple screen audio-visual presentation will show how radio and electronics activities can be incorporated into the scout program.

In case you are wondering, there will also be a wide range of other activities offered to the scouts for them to enjoy at this "Jamboree of Discovery". Listen on the "international" scout frequencies of: 3740, 3940, 7090, 7290, 14290, 21360, and 28990kHz for ZL2JAM.

Jim Parnell ZL2APE

'Last film search' turns up rare PNG film

An early Australian silent film which has never been screened publicly but which has been hailed by film experts and an anthropologist as "probably the most valuable pictorial record of New Guinea" is the latest to come to light in the National Library of Australia's "Last Film Search".

The film, "In New Guinea Wilds", is a two-hour, 10,000 ft documentary of life in the coastal regions and offshore islands of what was, in 1926 when the film was made, the Australian mandated territory of New Guinea.

It shows an active volcano, giant starfish, the graves of World War I servicemen at Samarai, structures near Rabaul believed to have been built during the German annexation of New Guinea, missionary establishments, Rabaul's Chinatown and many aspects of sea and village life.

Villagers are seen fishing, pearling, making pots, teaching their children to use bows and arrows, canoeing, wood carving, working on cocoa, copra and rubber plantations, making sago and enjoying themselves in such dances as one described by the filmmaker as "the black shuffle" of Manus Island.

Various sequences in the film are tinted. Jungle sequences, for example, are green; sea sequences, blue; and pottery-making sequences, orange.

The filmmaker was William J. Jackson, who came to Australia early in the 1920s as a Pathe Freres photographer. Described as "Australia's most travelled cameraman," he led an expedition over 11,000km in the course of the production.

Before he was allowed to make the film, Jackson had to give a guarantee that the New Guineans he photographed would "not be used in dramatic, faked or staged pictures of any kind."

The film is said to have "sent him broke". He was unable to find a distributor for it and when it passed into the hands of one of his creditors, Jackson became a photographer on the staff of a Sydney daily newspaper.

Members of the creditor's family recently found the 61 cans of film in four crates in a family warehouse in Melbourne and gave them to the Museum of Victoria. It is nitrate film, but despite its age has remained in excellent condition, only a small amount showing signs of disintegration. The photography is described as "first-rate professional".

The museum has now passed the film to the National Library to have it copied on to safety-base film for preservation in both the museum and the Library's National Film Archive.

Changes in Telecom radio phone patch policy

Telecom has widened the range of circumstances in which "Radio Phone-patch" connections may be made to the telephone network, although emphasising that phone patch services would be confined to specified user groups – mostly those with existing mobile radio services – and the phone connection service cannot be resold.

There is a rapidly growing need for radio patch services, particularly, according to Telecom, for emergency services, amateur radio operators, CB operators and other common interest groups operating mobile radio. Farmers, for example, who wish to make phone calls via a radio link back to their home, country taxi services which want to be able to contact, by phone, emergency services direct from their vehicles, and bushfire brigades which need to urgently contact members, can make good use of a system which patches a radio transceiver to the telephone network.

The phone patch equipment must be approved by Telecom prior to installation. Installation must also be performed by a Telecom technician to ensure that the wiring meets the Commission's standards.

Details of the new policy may be obtained from Telecom's Melbourne headquarters and applications for use of the new service will be accepted as from this month.

The Newest Dick Smith store

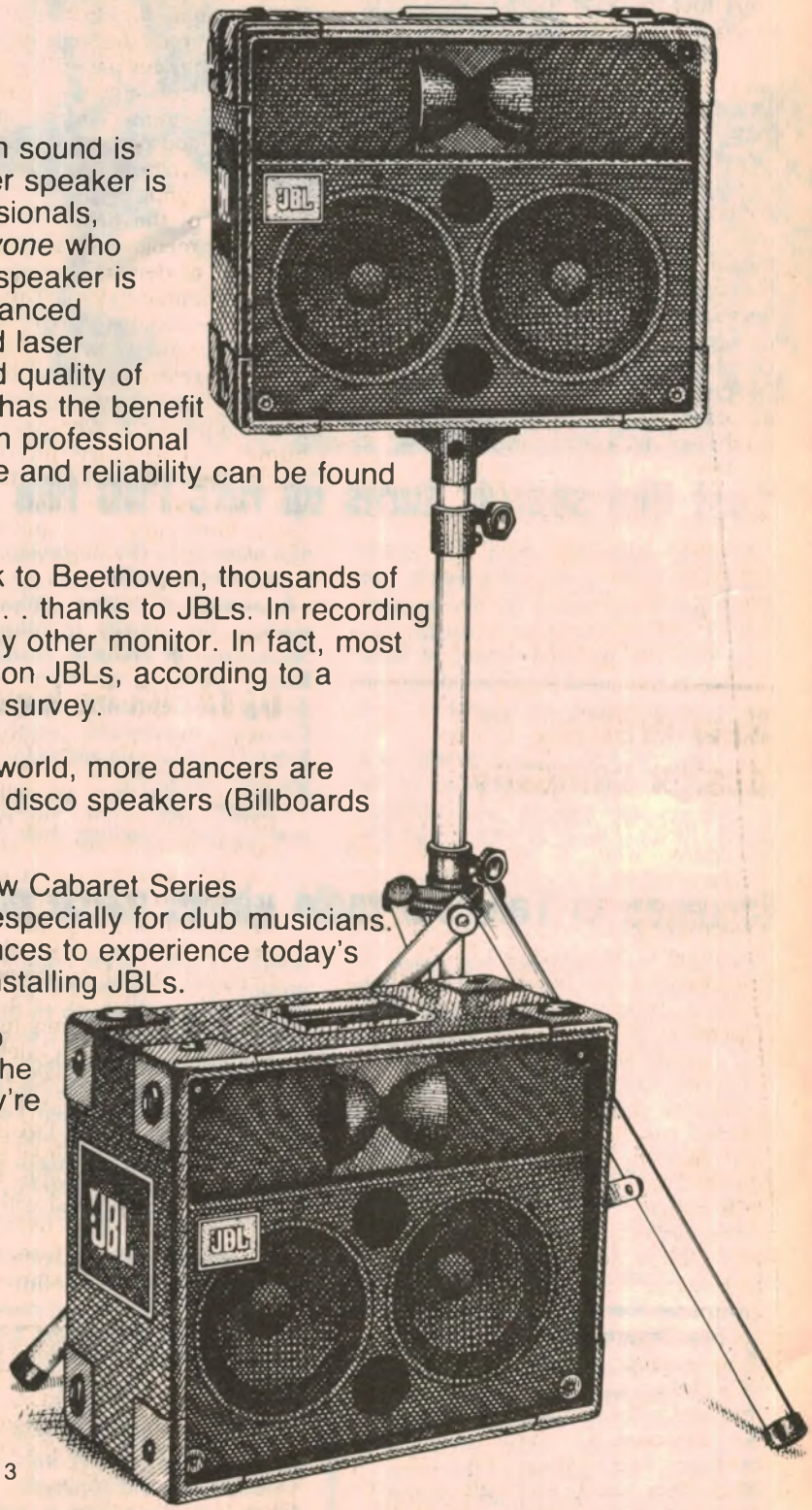
● The newest Dick Smith store has opened in Hornsby for the convenience of customers on the upper North Shore area of Sydney. The address of the store is 4 Florence St, Hornsby, phone (02) 477 6633.

Computer courses at Wollongong Institute

A Heathkit Hero 1 robot has joined the staff of the Wollongong Institute of Advanced Education. Imported from the United States, "Hero" joins a comprehensive range of microcomputer facilities used by the Institute in its computer education courses.

This year the Institute began a part-time postgraduate course for teachers and an associate diploma course in computer applications which has attracted businessmen, public servants and school leavers wishing to gain an understanding of the use of computers in their occupations. For further information contact the University of Wollongong, PO Box 1144, Wollongong. NSW, 2500. Phone (042) 29 7311.

JBL — WHERE THE MUSIC HAPPENS



Whenever and wherever excellence in sound is essential, JBLs are essential. No other speaker is good enough for top recording professionals, performing musicians on tour and *anyone* who listens for a living. Because no other speaker is created with JBLs combination of advanced design, high-technology computer and laser research, extensive listening tests and quality of craftsmanship. And no other speaker has the benefit of over three decades of experience in professional sound. The JBL heritage of excellence and reliability can be found in a wide variety of applications.

At outdoor concerts ranging from rock to Beethoven, thousands of listeners can hear the artists clearly . . . thanks to JBLs. In recording studios, you'll find more JBLs than any other monitor. In fact, most major albums are mixed or mastered on JBLs, according to a recent Recording Institute of America survey.

Under the lights at discos around the world, more dancers are moving to JBLs . . . by far the leading disco speakers (Billboards International Disco sourcebook).

Nightclub performers rely on JBL's new Cabaret Series loudspeakers — the first JBLs made especially for club musicians. Theatre owners who want their audiences to experience today's great new multiple sound tracks are installing JBLs.

And serious musician/songwriters who rely on home recording are following the lead of the big recording studios: They're turning to JBLs, too.
Wherever excellence belongs, you'll find JBL.

JBL

When JBL plays, everyone listens.

DISTRIBUTED BY
harman australia pty. ltd.

Unit A2, 6-8 Byfield Street, North Ryde,
Postal Address L.M.B. 12, North Ryde, N.S.W. 2113
Telephone: (02) 887-3233. Telex AA2487

News Highlights

Electronic media will not oust paper

Contrary to the expectations of many users the arrival of the new electronic media in the home will actually increase the consumption of certain types of paper products, according to a new report from US market research firm IRD Inc.

According to the report, in an age of increasing uniformity and depersonalisation, well represented by "electronic mail" and other new communications media, people long for the opposite, the unique and personal. One manifestation of this desire will be an upsurge in the use of personalised paper communication.

Paper has a deep symbolic significance according to the research report. It is a symbol of authority, it dispels doubt as to the reality of a transaction and represents an extension of the individual that is far more intimate than a piece of computer hardware. Even today the trend is evident in the practice of sending letters to confirm the subject of a telephone discussion.

"People don't need paper just for business reasons," says Ken Bosomworth, who headed the IRD research team for the study.

"A letter written on personalised stationery will be far more meaningful than the same words appearing on a CRT – and for that matter, more meaningful than the same words printed out on computer paper."

The dialectic argument proceeds by setting up a thesis and its opposite, an antithesis, and deriving a solution in the form of a synthesis, combining the best of both opposing arguments. The antithesis of the demand for the new electronic media, according to IRD, will thus be a demand for personalised written communications. Greeting cards and personalised stationery will be two paper products which will enjoy improved sales because of the backlash.

However the situation is not as rosy for all paper products. Where no deeply felt human needs are involved the efficiencies of electronic communication will win out every time says IRD. Directories, catalogues and newspaper classified adverts will be made obsolete by electronic information services, with a corresponding impact on the demand for paper used to create these products.

New drafting and design company

On Friday, September 16, 1983 a new company with a long established background in the electronics industry had its official opening. Ray Smith, Director of RCS Design Pty Ltd, formerly Raymond C. Smith Design Drafting, has established a new outlet for the contract drafting service his company offers. Operating as a bureau, RCS Design Pty Ltd specialises in the drafting and documentation of electronic and computer equipment, and in particular, printed circuit board design. Ray Smith and his staff have concentrated on the demanding skills required for efficient PCB layout.

The projects recently undertaken by RCS Design are diverse. They include automotive instrumentation, a colour computer, micro-controlled power supplies, interface and control circuitry.

An invitation to inspect the facilities at RCS Design is extended to any people involved in the industry, and all enquiries are welcome. For further information contact: RCS Design Pty Ltd, 728 Heidelberg Road, Alphington, Victoria, 3078 (03) 49 6404. (03) 850 3139 AH.

DATA '83 for Melbourne

DATA '83 will be held at the Victorian Expo Centre, Melbourne, Showground from the 8th to the 10th of this month. The combined exhibition and seminar series will concentrate on business applications of computers.

President Computer plans to have on display a new Australian designed portable computer, the Dulmont "Magnum", a battery-powered 16-bit computer system which can fit inside a briefcase.

Dick Smith Electronics is to unveil a new "semi-professional" machine but the company is not giving out details before the official launch.

A wide range of other exhibitors will also be on hand with displays including computer hardware and software, office furniture and communications equipment.

Dr Ian Parkin holds the IR data link next to some of the cables currently used for computer data communication.

Infrared data link developed at Sydney University

Researchers at Sydney University's Basser Department of Computer Science have developed a technique for communicating computer data using infrared light, which could cut the cost of installing computer terminals by eliminating the need for cables. The system converts digital information into infrared pulses which can be broadcast around any enclosed space by bouncing off walls and ceiling.

The "diffuse infrared broadcast" system was developed by Dr Ian Parkin, Senior Lecturer in Computer Science and Mr John Zic, who demonstrated their design at the Institution of Engineers, Australia conference on computers and engineering held in September.

The transmitters and receivers for the system are relativey inexpensive and the equipment is said to be superior to "satellite" infrared systems being studied in the United States and Japan. The scattered, broadcast nature of the Sydney University system does not require "line of sight" transmission, as do the highly directional satellite systems.

● Pat Daly, tormer marketing manager for Dick Smith Electronics, has formed a marketing services company. Over the past years Pat has been responsible for the launch and promotion of many consumer electronic products for Dick Smith Electronics and is now offering the benefit of his experience to his own clients. As he puts it: "If your business could benefit from creative advertising contact Pat Daly Marketing Services", 6 Chatswood Ave, Chatswood, NSW 2067. Phone (02) 411 7707.

CAN'T AFFORD IBM'S PERSONAL COMPUTER?

take Dick Smith more computer

We agree! The IBM PC is a superb computer. But look at the price – way over six thousand for a usable computer – then you have to start buying programs!
Now there's a brilliant alternative: the Dick Smith Challenger. For less than half the price of the IBM PC you get much, more computer. Just for starters, how about 128K RAM as standard – expandable to 256K (IBM give you 64K) and BOTH Centronics and RS232C ports as standard? (IBM charges you extra!)
And the quality is guaranteed!
Each Dick Smith Challenger is individually 100% computer tested and accompanied by it's own test certificate confirming it meets all specifications. Beat that, IBM PC.

Is it really IBM compatible?

We haven't found one IBM PC program that won't work in the Challenger (and we've checked hundreds!) Just pop in an IBM PC diskette – and away it goes! Not only that, but all plug-in IBM PC hardware is also compatible.

OUTSTANDING FEATURES:

- True 16-bit machine (uses full 16-bit 8086 processor, not the partly 8-bit 8088 processor used in the IBM).
- Comes in two versions – either the basic model or the fully expanded 128K, twin disk drive model . . . both of which are less than half the price of the IBM PC!
- And the expanded computer gives you BOTH Centronics AND RS232C ports. PLUS twin double density, double sided 'slimline' disk disk drives offering an incredible 640K of storage!
- Memory expandable up to an incredible 256K just by plugging in some extra chips.
- Offers virtually ALL of the hardware any computer user is likely to want. And if you DO want more, there are 6 expansion slots.

Basic 16 bit Computer

Cat X-8600 **Only $995**

Here it is: the new Dick Smith Challenger. It's the ideal computer for the business user, the professional or the serious hobbyist. Featuring a HUGE 128K memory – more than you're likely to need – with an equally large 40K ROM.

includes

- RF/ Video output
- Microsoft Extended BASIC , plus diagnostic in ROM.
- Four I/O ports: cassette, joystick, light pen & Centronics – type for printer.
- 84 key high tactile keyboard (detachable).
- Built-in speaker for sound programs

The IBM model with equivalent features would cost at least ~~$1700~~ if they'd sell you one!

YOU SAVE $700 OVER

DICK SMITH

Send for your FREE information pack!

See page 98 for

a look at the new

CHALLENGER

for half the price!

SPECIFICATIONS: (Expanded Computer)

CPU: 16 bit 8086 running at 4.77MHz
RAM: 128K (int expandable to 256K) plus 16K Video.
ROM: 40K (includes BASIC, cassette o/s, diagnostic)
KEYBOARD: Full 84 key tactile, detachable
CHARACTER SET: 256 expanded ASCII, in ROM.
RESOLUTION: 320 x 200 or 640 x 200
COLOUR/GRAPHICS: 16, with scroll & reverse image.

PLUS! All the software you really need – included in the low, low price!

Yes – over a thousand dollars' worth of famous Micropro software included – at no extra charge. Try and get that with your IBM PC! And not useless software, either! **WORDSTAR** – the most-used word processing system in the world! **CALCSTAR** – the electronic spreadsheet to beat them all! **MAILMERGE** – turn your WORDSTAR into an electronic mailing list!

WORDSTAR

Normally around $485.00 extra . . . yours FREE with the Dick Smith Challenger.

CALCSTAR & MAILMERGE

Normally around $475.00 extra . . . yours FREE with the Dick Smith Challenger.

Cat X-8610

All the expansion you're likely to need (hardware & software) for only $1995 EXTRA

Add the Challenger Expansion unit and you get unbelievable computing power – far more than the IBM PC gives you. Twin 320K disk drives included. Not one, but TWO disk operating systems (DOS) included. Both Centronics and RS-232 interfaces included. Plus (of course) everything the Challenger itself offers.
And full IBM PC compatibility – not just software, but the plug-in hardware devices too!

includes

- Twin slimline double sided, double density disk drives.
- RS-232C serial communications port
- 6 extra expansion slots (4 IBM PC compatible 2 true 16 bit).
- PLUS the following fantastic software:
  Genuine (licensed!) Microsoft MS-DOS & AT-DOS
  Genuine (licensed!) Micropro Wordstar, Calcstar & Mailmerge
- And compatibility with all known IBM PC software – and that's a heck of a lot to choose from!

IBM PC configured with similar features to Dick Smith Challenger would cost you well over $7000

CHALLENGER TOTAL SYSTEM ONLY **$2990**

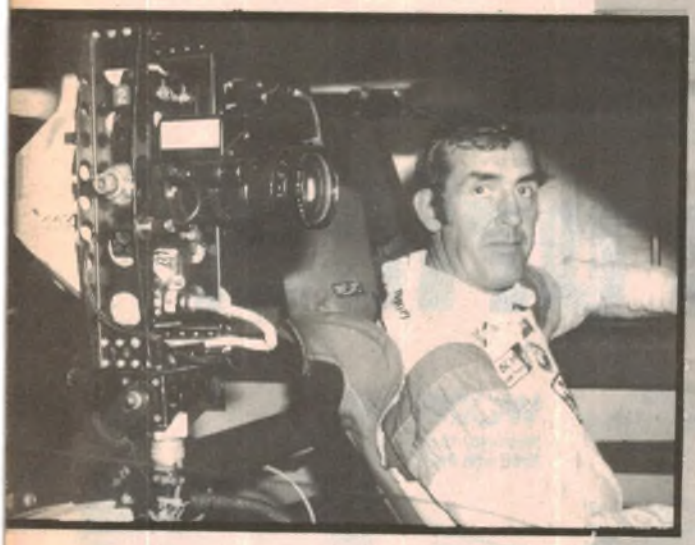
YOU SAVE $4000

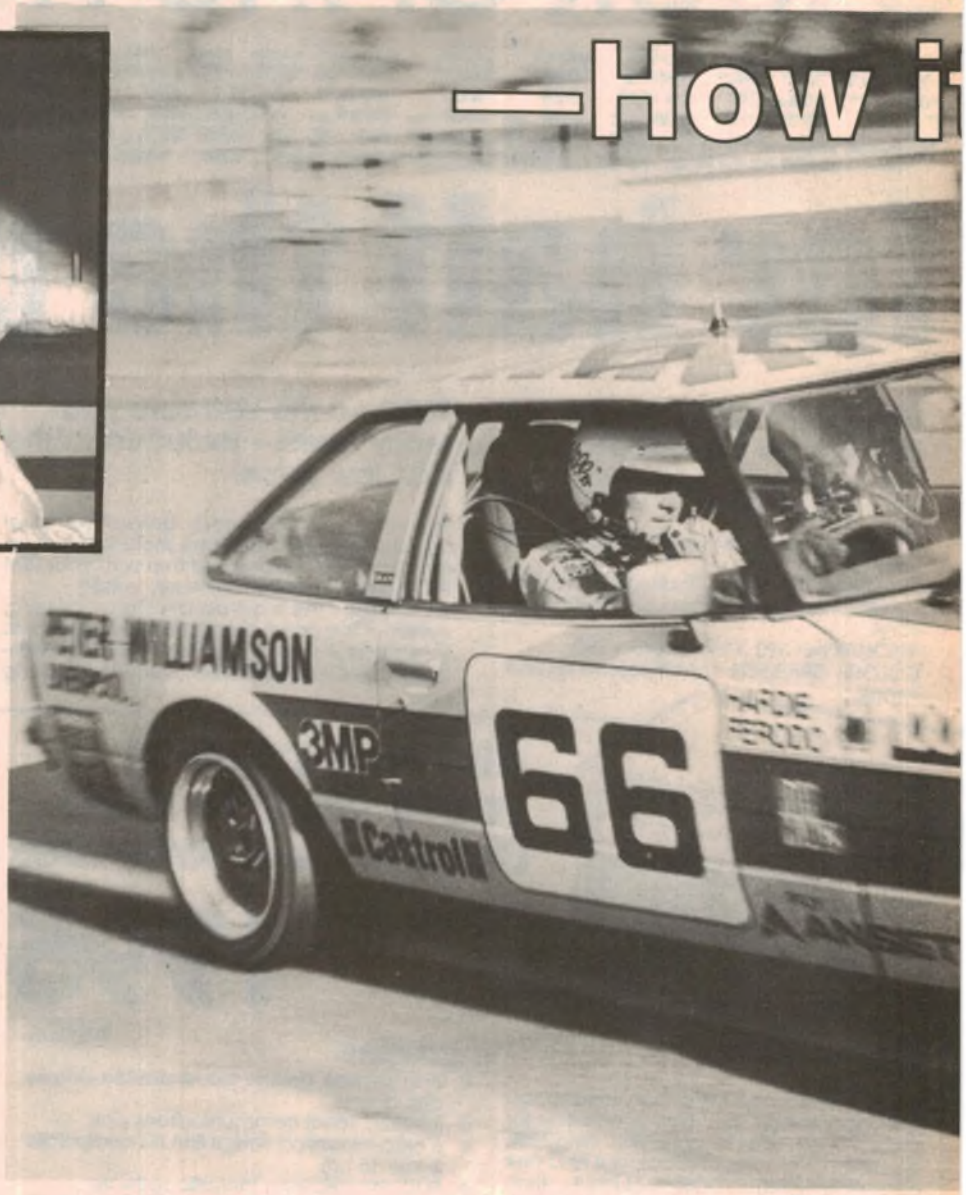
ELECTRONICS

full address details.

A621/LL

TELEVISING THE —How it





Few of us, given a long straight stretch, can resist "putting the foot down" and flogging the old bomb for all it is worth. And who hasn't imagined they were belting down con-rod straight, heading for the chequered flag? It's just a dream, but anyone who watched the Bathurst 1000 last month was assured of a seat beside the driver of at least one competing car.

The Bathurst 1000 production car race is one of the most prestigious motoring events in the southern hemisphere. Held on the Bathurst, NSW, Mt Panorama circuit in October each year it is, as its name suggests, a 1000km race. It is conducted over a roughly rectangular circuit of 6.24km, and lasts some six hours for the leading cars.

It is a punishing circuit, tough on both drivers and machines. It includes steep uphill grades, tricky downhill "S" bends, and a long straight downhill run of about 2km, where cars reach speeds of 260km/h. Because of the toll this has often taken of motors extended beyond their limit, it is known as "con-rod straight".

It is a spectacular event, and enthusiasts flock to the various vantage points to watch as much of it as they can first hand. The lazier types are content to watch it on TV and, by the very nature of things, see far more of the action than those on the spot.

Sydney's Channel 7 has televised the race for many years and, over that time, has steadily increased the coverage. Today the viewer is able to see the race from, almost literally, every angle. Apart from some 22 cameras located around the course, there is a helicopter-borne camera, introduced in 1977, which provides some spectacular views of the speeding cars – and the pile-ups when they happen.

But by far the most spectacular TV pictures are those produced by Racecam; a system of TV cameras fitted in the passenger-seat position of cars driven by leading racing drivers. It puts the viewer directly into the passenger seat.

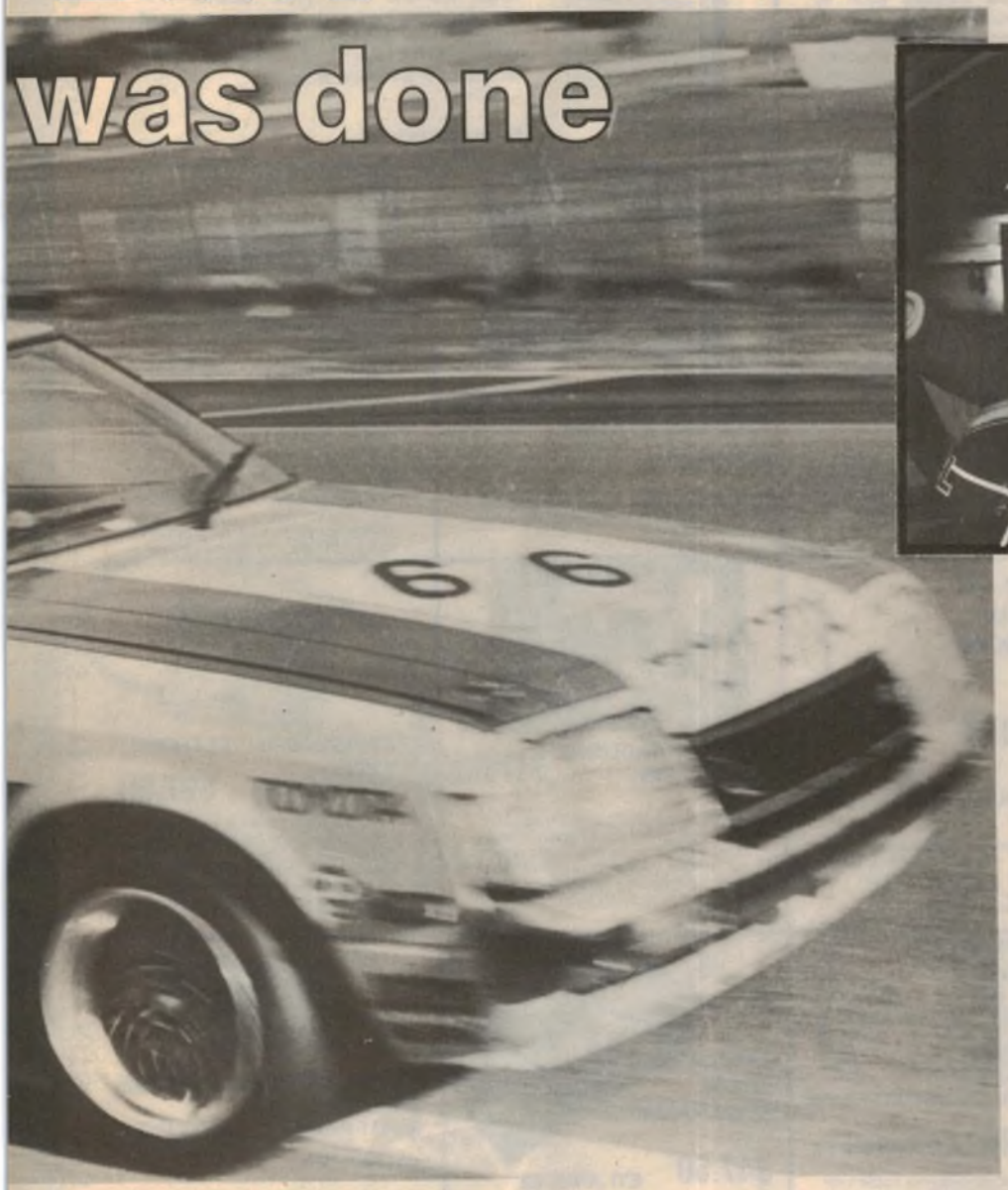
The result is extremely realistic: a trip down through the "esses" (S bends on a downhill run) is enough to, literally, produce a sinking feeling in the stomach. And the run down con-rod straight, often involving overtaking manoeuvres at high speed, is something else again.

And even in the less spectacular parts of the course, the ability to watch the driver's racing technique; when and how he changes gear, when he brakes, how

BATHURST 1000

by PHILIP WATSON

was done



he handles the wheel, how and when he overtakes, along with his own comments on the race, all add up to a sense of "being there" which would not be possible in any other way.

Just how did it come about, and what is involved? While the average viewer is inclined to take it all for granted, the fact remains that it represents a major technical achievement developed in Australia. American TV networks are now hiring the Racecam facilities from Channel 7 for their major events.

It all started back in 1977, only a few weeks before the "Bathurst 1000" for that year. There was talk of a similar system having been tried out on the Le Mans circuit in France, though with what success was not known. All that was known was that it used a rigid camera in the passenger position, with a fixed focus, fixed focal length lens, and automatic iris control.

The then Channel 7 operations manager, the late Don McPherson, first suggested something along these lines for the forthcoming event, and passed the idea on to John Porter, the company's special projects engineer.

Aided by chief engineer Daryl Drake, Peter Larsson (now projects engineer), and the technical staff, John Porter started things moving. In the event it was a project which he was to oversee right up to the present time, and which would grow beyond anyone's expectations.

The basic idea was simple enough. As well as the camera, the car would carry a small microwave transmitter to radiate the camera signals. And because of the difficulty of getting clean and reliable signals directly back to the OB van – particularly in the rugged terrain of the Mt Panorama circuit – the helicopter, already required as a camera platform, was to double as a relay station.

The camera set-up was to be as simple as possible; fixed position looking straight ahead, fixed focus, fixed focal length, and using an automatic iris. A voice circuit for the driver, allowing the commentator to talk to him, and for him to talk back, both on air, was also required.

With only a few weeks to set the whole thing up it became a race against time. Nor was the situation improved by an industrial dispute that pulled out the station technicians, leaving only a handful of executive technical staff to run the station and organise the entire race coverage.

It was touch and go. The team was still working on the car installation on the morning of the race while the car was being given its final inspection by the race officials. A major fault had developed in the camera's automatic iris control and, as time ran out, the engineer was forced to set it manually to what he estimated was a good compromise. Then, before some of the equipment covers could be replaced or further tests conducted, the car was whisked off to the starting grid.

Convinced that it had all been in vain the crew made their way back to the OB van as the race started, only to be

TELEVISING THE BATHURST 1000

greeted on entry by a monitor displaying a first class picture from the car as it made its way to the first corner.

And so the first attempt was a success, at least as far as the viewers were concerned, who were given something they had never seen before. As far as the engineers were concerned it had, on the one hand, whetted their appetite and, on the other, made them aware of many problems to be solved.

A major lesson was that the inside of a racing car is about the worst possible place for a TV camera, commentator's microphone, and the associated transmitters. The vibration can play havoc with the equipment, the noise level is so high as to make a legible commentary extremely difficult, and ignition interference and alternator whine can create a whole host of problems, particularly in regard to the incoming voice circuit for the driver.

There is also the problem of working with the car's mechanical crew. It is not unusual for these mechanics to work right through the night before a race, replacing, or even rebuilding, major sections of the car. In such an atmosphere a mere TV technician, fiddling with some new-fangled gadget, is likely to get short shrift indeed.

They also realised that a fixed camera image can become quite monotonous, after the initial novelty has worn off. What was needed was a camera which could turn its head and generally look around in much the same manner as would a passenger, if he were in the seat.

As a result, digital design engineer David Curtis was given the job of developing a radio control system which would provide full camera control; pan, tilt, focus, zoom, and iris. This was successfully achieved in time for the 1980 meeting, and the "passenger" could now look straight ahead, down at the floor to watch the gear changes, out the window at an overtaking car, or even out the rear window at a following car.

Another 1980 first was to fit Racecam into two cars, providing still more variety. On that occasion the wanted car was selected by remotely switching on its transmitter. More recently, both cars have been able to transmit continuously on separate uplinks to the helicopter.

Also by 1980, the channel had acquired a second helicopter and this solved another problem. The camera helicopter needs to operate at a relatively low altitude, for obvious reasons, whereas the relay function is best performed at a much higher altitude, to provide the best possible coverage. Having to alternate between the two altitudes severely restricted both functions.

Violent manoeuvres down through the "esses". Viewed from inside the car it can tense the stomach muscles.

As a result of these two advances, plus various minor improvements, the 1980 coverage was a considerable advance on the first effort. Nevertheless, those concerned realised that improvements were still needed.

Two major problems concerned the camera control. The control system itself was a simple "on-off" type; the motor driving the particular function was either on or off and ran at a constant speed. This made precise adjustment rather tricky.

The other problem concerned the camera cradle itself. It was a gimbal-like arrangement, driven by two motors; one providing pan (left/right) movement, the other tilt. The difficulty was to provide a drive system from the motors which was completely free from backlash. Otherwise the cradle, and the camera, was free to vibrate to the extent of the backlash, resulting in intolerably jittery pictures.

The cradle and drive mechanisms – in fact all the mechanical hardware, as well as the electronics – was produced in Channel 7's own workshops, and a number of schemes were suggested and tried, including the simple cord drive concept as inspired by old fashioned radio dial systems. In fact it worked well, but cord failure was a major problem.

Eventually the engineers developed a system of twin gears, spring loaded against each other; another idea common in early dial mechanisms. Carefully made and properly adjusted it is both effective and reliable.

At the same time, the limitations of the constant speed control system were assessed and it was decided to go for a fully proportional control system; a decision which really meant starting all over again. It was a big job, involving complex circuitry and the latest microprocessor techniques, but it was completed in time for the 1981 meeting, and has been used ever since.

The operator's control panel now features a small joystick which provides total camera attitude control, with the speed of movement controlled by the degree of joystick movement. Similarly, there are control knobs which provide fully proportional control for focus, zoom, and iris, allowing very precise setting.

Ironically, one of the trickiest problems the team has encountered – and one which is still occupying their attention – concerns the audio circuit from the racing driver. Acoustic noise in the car is the main problem; it is so high that it competes seriously with the driver's voice.

A number of approaches have been tried, including the fundamental ones of tailoring the frequency response to no more than is strictly necessary for voice communication. A wide range of microphones has been tried, mostly noise cancelling types, along with various helmet configurations. No one idea produced very dramatic improvement, but many contributed

TELEVISING THE BATHURST 1000

something and, collectively, the improvement has been well worthwhile.

Today's set-up is a far cry from those tentative beginnings in 1979. Some idea of how it is done can be gleaned from the accompanying diagram. The camera control operator has his own control room adjacent to the main OB van, fitted with monitor and control panel.

The audio control signals are taken by a simple landline to a transmitter at the helipad, well away from other communication and electronic equipment. A major problem in the past was the tendency for these signals to get into the public address system, creating an annoying background of bleeps and tones.

At the helipad the audio tones modulate a 5W UHF transmitter in the 470MHz band, which puts the signal directly into the car. (The direct circuit is quite good enough for simple audio signals.) At the same time, the race commentator has another 470MHz channel direct to the car, enabling him to talk to the driver.

From the car the video signals, together with the driver's voice circuit, go via a 2.5GHz link to the relay helicopter and thence via another (different frequency) 2.5GHz link to a ground relay station in a clear location a few kilometres away. From here the signals go back to the OB van via a 7GHz link.

This ground relay station also handles the signals from the camera helicopter and the 60cm dishes for both channels are manned continuously by operators whose sole job is to manually track the helicopters.

Both the 2.5GHz transmitter in the car and the receiver in the helicopter use broad pattern antennas which do not need to be orientated. On the other hand, the helicopter transmitter uses a directional antenna, mounted on an arm which protudes below the body and landing skids. It is extended after take-off and must be retracted before landing.

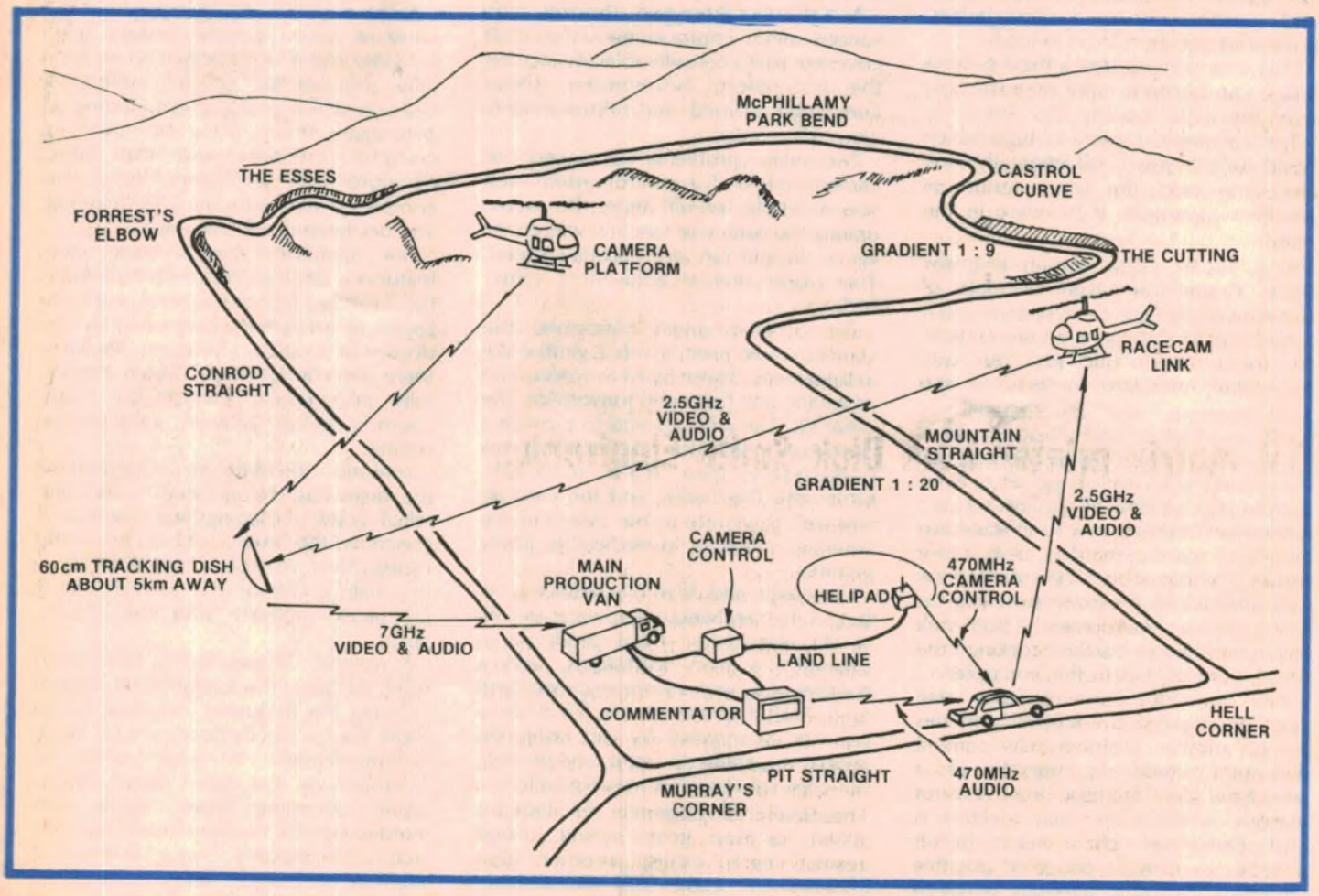
It is coupled to a complex automatic tracking system which ensures that it always points in the one, pre-selected, direction, regardless of which way the helicopter is facing.

On one occasion the antenna retraction mechanism failed and, with fuel running low, the helicopter was faced with the need to land and probably write off the expensive antenna. The situation was saved by a technician who, with his courage in both hands, and a spanner in one, stood underneath the hovering helicopter and unbolted the precious equipment.

These days Racecam is no longer used solely for the Bathurst 1000. It is hired to an American company, CBS Sports, who use it for three major stock car races; the Daytona 500 (miles), the Michigan 400, and the Talladeca 500. Each is an annual event.

In Australia a simplified, fixed camera, version is used for weekend races at the Amaroo Park racing circuit in Sydney's north western suburbs. And a manned camera version, using the helicopter relay system, is used for the start of the Sydney-Hobart Yacht Race, to put the viewer on the deck of one of the larger boats as it makes its way down the harbour and out the heads.

And so, once again, an Australian team, starting with little more than an idea, and a lot of enthusiasm, has developed a system which, by all accounts, leads the world. It is something about which the Channel 7 team has ever reason to be proud.



MITSUBISHI ELECTRIC

It's just common sense . . .

Mitsubishi are well known throughout the world as the manufacturers of top quality electronic apparatus, from disk drives to t.v.'s, from home hi-fi to industrial robots.

But Mitsubishi also manufacture the semi-conductors that make possible the efficient operation of all these, and many more, products.

So it makes sense that Mitsubishi have a very deep understanding of the requirements of semi-conductor users.

Mitsubishi manufacture a wide range of semi-conductors for almost every electronic application. Second to none, the range covers memories; micro-processor related LSI's; LS TTL's; discrete semi-conductors; C MOS and the M54000 series. For the very special application, GaAs FET's,R.F. power transistors and "Jumbo" high power transistors 625 (W); all manufactured with the quality you've come to expect from one of Japan's leading electronics manufacturers.

Mitsubishi semi-conductors, disk drives and video monitors are distributed in Australia by Nexus in Sydney, and Sycom in Melbourne; two companies dedicated to the pursuit of excellence. This philosophy ensures that adequate stocks of all Mitsubishi products are held at all times; and their technical support, particularly in areas of application, is second to none.

If you would like more information on any of our products, simply circle and return the Readers' Service card, and we'll get full information, including technical specs. to you straight away. It's all just part of the service, because at Nexus and Sycom, we do things just that much better!

Mitsubishi disk drives

Mitsubishi semiconductors

Mitsubishi display monitors

Just that much better

Available throughout Australia. For your nearest distributor contact:

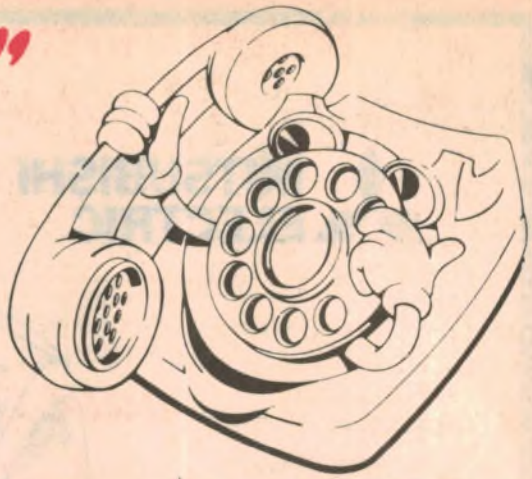
NEXUS

ELECTRONICS PTY LTD. (Inc. in NSW)
339 Pacific Highway,
Crows Nest, NSW Australia, 2065.
Telephone: (02) 922 1722

SYCOM

Systems and Components Division of
SYSTEMS RELIABILITY (AUST) PTY LTD.
49-53 Tope Street,
South Melbourne, 3205. Telephone: (03) 699 8433

"Phone Tap" Bargains!



Is your phone tapped? NO? Well if you don't rate, then tap ours! If you ring or write and say "Phone Tap!" in November, you can get the special prices shown below.

GO ON BUG US!

Piezo Horns

$9.95

PH 1005A
3½" Square Super Horn for PA's, Disco's etc. Very efficient. Around 50Wrms equivalent capacity
Cat. AS-3100 $9.95

$9.95

Jaycar has broken the price barrier for Piezo Horn Speakers!!
We now DIRECT IMPORT a range of piezo horns at prices that will stagger you. Similar units are used everywhere in P.A., Disco and Hi Fi applications. Only Jaycar, however, can bring you these products at low Jaycar prices!!
We now stock the most popular piezo models at new low prices.

PH 1038A
Hi Fi version of the PH 1005A. Slightly less sensitive but a smoother response.
Cat. AS-3102 $9.95

JAYCAR
125 YORK ST. HAS CLOSED – WE ARE NOW TRADING AT 117 YORK ST.
OUR TELEPHONE NUMBER REMAINS UNCHANGED
(02) 264 6688

TWIN SCREENED AUDIO CABLE

Twin screened round audio cable. (Two screened conductors NOT fig. '8')
This cable normally sells for $0.48/metre or $42.00/roll.

SAVE OVER 50%. . . $20.00 PER ROLL

Cat. WB-1504 $20.00/roll

BT151-650R

This is the 650 volt version (for extra safety) of the C122E SCR which we use in the popular 'Fluorescent Lamp Starter' Kit as described in October 1982 EA. Normally $1.50 each. This month only $0.95 each! (Minimum 5 pieces). Makes the Fluoro starter kit very cheap!
(PCB's for the kit) Cat. HP8747 ONLY $1.95

Cat. ZX7022
(8 amp 650V SCR)

1N914 DIODES – INCREDIBLE SAVINGS

The 1N914 (or 1N4148 if you like) is probably the most popular diode in the history of electronics. We probably use over 1M a year ourselves! Jaycar has made a bulk purchase of these diodes and we can pass on great savings!
We must sell these in minimum lots of 500.
Cat. ZR1100 1N914/1N4148
500 ONLY 3½ cents each
1,000 ONLY 2.8 cents each
10,000 ONLY 2 cents each and these prices include tax!!
The glass envelope is really too small to have markings, however some are branded. We reserve the right to supply units that are the same size as the 1N914/1N4148 but are electrically superior.

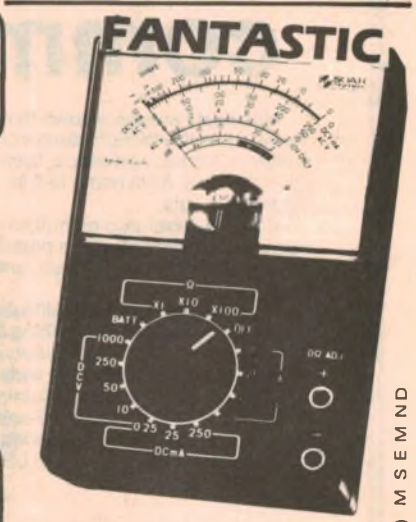
FROM 2 cents each!!!

BD677 DARLINGTON TRANSISTOR

BD677 Popular Philips Darlington Transistor
The BD677 is an NPN, TO-126, 60 volt 4 amp Darlington transistor. Its gain (hFE at 1.5A) is – would you believe 750!
We have a bulk buy of this snappy little transistor so you save!

ONLY 75 cents each 10 up 65 cents each

from 65¢



Multimeter

(clue) M S E M N D

- FUSE/DIODE PROTECTED!
- 4mm BANANA SOCKET PROBES!
- BIFURCATED SELECTOR SWITCH CONTACTS!
- ABS IMPACT-RESISTANT CASE!
- LARGE! MEASURES 90(w) x 135(h) x 45(d)mm

SPECIFICATIONS:

DC		AC	
0 – 0.25		0 – 10	
0 – 10		0 – 50	
0 – 50		0 – 250	
0 – 250		0 – 1000	
0 – 1000		AT 9,000 ohms/volt	
AT 20,000 ohms/volt			

RESISTANCE	DC CURRENT
0 – 5K	0 – 0.05
0 – 50K	0 – 25
0 – 500K	0 – 250mA

dB: -20 to +22dB
BATTERY CHECK FACILITY: AA, C & D CELLS
ACCURACY: DC +/–3% F.S. AC +/–4% F.S.
OHMS +/–3%
BANANA PLUG PROBES AND BATTERY INCLUDED
This is an unbelievable meter bargain. Normally this unit would sell for around $25. Japanese made quality.
Cat. QM-1005 $17.95

Wow! $17.95 $16.95

SENNHEISER MUFFS

$5.95 $4.95 PAIR

Genuine factory made spare foam earpads for the famous HD-414. We now have plenty of stock.
Cat. AA2011 $5.95 pair

MAGAZINE BINDER

LOW IMPORT PRICE

Keep your precious (and expensive) magazines in order for easy references. Smart blue colour with gold lettering. Heavy gauge and richly chromed metal fittings. Cat. BB7000

NORMALLY $4.95 ea
NOVEMBER ONLY
$3.95 each or
$3.50 each 4 up

1983/4 Australian Amateur Call Book
Cat. BE-1000 $7.95

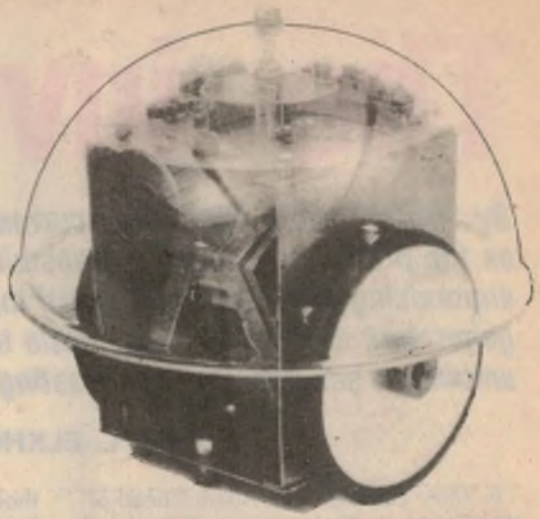
PIONEER 4" WIDERANGE

WIDERANGE 4"	
HANDLING	10W R.M.S.
RES. FREQ.	115 - 120Hz
SENSITIVITY	91 dB 1m/1w
FREQ. RESP.	18,000Hz
Cat. CE-2290	$9.95 ea

ONLY $9.95 ea

Robot Turtle Hebot II

Grab One NOW



The HEBOT 11 turtle is not just a fun device, it is a positive aid to education, it takes programming out into the real 3 dimensional world instead of the flat two dimensional world of the VDU. When connected to the I/O ports of your computer and given a DC supply of 9-15V the turtle runs around under computer control moving forwards, backwards, right and left with independent control of each wheel, it has blinking eyes, will bleep with a choice of two tones and when ordered by the computer, presses down a pen to chart its progress and provide hard copy of the results of the program. When set free to run around the turtle discovers its enviroment. When the turtles shell bumps into an unmovable obstacle touch sensors send back data to the computer for it to calculate evasive or exploratory action.
If the computer has no I/O ports it doubtless has an expansion bus and the turtle can be controlled and listened to using this bus together with the universal computer interface board. This board enables the turtle to be treated as a memory mapped I/O device.

COMPLETE "HEBOT II" KIT INCLUDING ALL HARDWARE, DOME, WHEELS etc. Cat. XR1020

$399 inc tax

UNIVERSAL INTERFACE CARD KIT Cat. XR1022 **$39.50**

save $100

ONLY **$299**

codemaster

Many of you know the clever parlour game that uses coloured tokens to stretch the brain to work out a hidden code in a minimum number of moves.
The people that came up with the game used a descriptive name which no-one else can use. It is a popular game and is well known under this name. Our game is similar to this game but - naturally - its electronic!! And, what's more, you can play against the machine - alone. Each XM7015 Codemaster measures 140(l)x85(w)x25(d) looks similar to a pocket calculator and runs off a standard 9V cell. Provision is made for a mains adaptor as well.
The Codemaster once sold for $29.50 but Jaycar has made a huge scoop purchase. You save a fortune!
Grab one now for only $4.98
* (For a further clue to the origin of this game read this page carefully)

WERE $9.95

ONLY $4.98

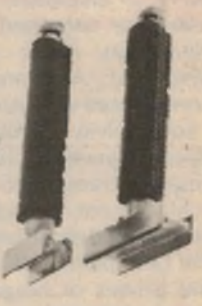
low cost IC inserters AND EXTRACTORS

Up until now these have cost a fortune!!
Features:
- **CMOS SAFE conductive plastic**
- **Exclusive bent pin alignment guides in handle . 8 to 40 pins.**
- **Ground strap can be connected.**
- **One hand operation.**

INSERTERS

Cat. No	Model	Description	Normally	NOW
TH1810	CIT820	8 – 20 pin	$5.95	$4.16
TH1812	CIT22	22 pin	$6.50	$4.55
TH1814	CIT2428	24 – 28 pin	$6.95	$4.86
TH1816	CIT3640	36 – 40 pin	$8.95	$6.26

LESS 30%



EXTRACTOR TH1818 ET480
Deceptively simple looking device. One piece metal construction. 8-40 pins
$2.95
NOW $2.06

NOVEMBER ONLY

115 VOLT COMPUTER FANS

GREAT VALUE!

$14.95

We have made a scoop purchase of computer grade Box Fans
They measure a standard 80 x 80 x 40mm. But there's a catch!
They are only available in 115V!
Great if you are making equipment for export to the USA — or use 2 in series! No problem!
Cat. YX-2508 ONLY $14.95

Peerless crossovers

TWO WAY CROSSOVER
50W R.M.S. HANDLING
FREQ. 2500Hz
Cat. CE-2612 $9.50 ea

$9.50

Quality

THREE WAY CROSSOVER
50W R.M.S. HANDLING
FREQ. 750Hz & 5000Hz
Cat. CE-2622 $22.50 ea

$22.50

WHAT'S — UP DOC?

Are the "rabbit ear" antennas on the back of your portable TV broken? You know those ones that are telescopic and have ball-swivel joints.
We have genuine 'HMV' factory spares that will fit other TV's Apparently they are almost industry-standard components.
Each unit comes with a short length of lug-terminated 300 ohm ribbon.
We have a small job lot available at only $7.95 each.
ONLY 220 SETS AVAILABLE.
Cat. AA2005

~~$7.95~~ **$6.95**

Peerless 12" WOOFER

THIS PRICE CAN NEVER BE REPEATED
80 WATT HANDLING – ABOUT 40W R.M.S.
EUROPEAN QUALITY – MADE IN DENMARK
FREQ. RESPONSE 35 – 4000Hz
RESONANCE FREQUENCY 35Hz
Cat. CE-2130 $29.75 ea

$29.75

Jaycar

Incorporating ELECTRONIC AGENCIES

SYDNEY SHOWROOMS
117 YORK STREET – PHONE: (02) 264 6688 and (02) 267 1614
TELEX: 72293
CARLINGFORD
Cnr. CARLINGFORD & PENNANT HILLS ROAD – PHONE: (02) 872 4444
CONCORD
115 – 117 PARRAMATTA ROAD – PHONE: (02) 745 3077
HURSTVILLE 121 FOREST ROAD – PHONE: (02) 570 7000

NUMBER 1 FOR KITS

POST AND PACKING CHARGES
$5 – $9.99 ($1.50) $10 – $24.99 ($3.20)
$25 – $49.99 ($4.50) $50 – $99.99 ($6.50)
$100 – $198 ($8.00) Over $199 ($10)
"Free INSURANCE for Road & Registered Post over $200"
All heavy or bulky items (over 20kg.) sent Comet Road Freight $12.00 anywhere in Australia
SHOP HOURS CARLINGFORD, CONCORD & HURSTVILLE
Mon – Fri 9am – 5.30pm Sat – 9am – 12pm Thurs night 8.30pm
SHOP HOURS SYDNEY
Mon – Fri 8.30am – 5.30pm Sat – 8.30am – 12pm Thurs night 8.30pm
MAIL ORDERS AND CORRESPONDENCE BOX K 39 HAYMARKET SYDNEY 2000

Mail Order By

BANKCARD Via Your Phone

The inventive genius

By 1983, Tesla's alternating current system was established as the preferred method of transmitting electrical power. After supervising the construction and installation of the first generators at Niagara Falls, Tesla turned his attention to an ambitious scheme for broadcasting power around the world.

by J. L. ELKHORNE

In 1886, Edward Dean Adams, head of the Cataract Construction Company, organised the International Niagara Commission. He asked Lord Kelvin to serve as chairman, to find a means of using the untapped power of the falls. Numerous ideas were studied and discarded: mechanical, hydraulic, and compressed air systems.

Lord Kelvin – William Thomson – had been engineer-in-charge of the first successful transatlantic cable. For this achievement, he was knighted. In 1890, his committee offered a $3000 prize for the best plan – of any kind – to utilise the power of Niagara. Some 20 plans were submitted, none by the large companies. Westinghouse demurred on the basis that the commission would get a hundred thousand dollars worth of value for a paltry prize.

By 1893, the commission had recognised that a businesslike approach was necessary and asked for bids from manufacturers. Also in that year, Westinghouse won the contract to light the Columbian Exposition. Originally planned as a celebration of the 400th anniversary of Columbus' discovery of the New World, the opening was delayed due to the extravagant plans made. The Building of Manufacturers and Liberal Arts spanned some 16 hectares, for example – the largest exposition building ever erected to that time. The Ferris wheel was invented for the occasion. The Exposition itself used more electricity than the city of Chicago – all produced by the Tesla system.

Tesla himself spent a week there, giving public demonstrations of his more unusual experiments. He had designed a graphic display of the rotating magnetic field, a modern-day parallel of the egg of Columbus. As Columbus was supposed to have stood an egg on end to challenge his critics, Tesla allowed a copper egg to stand on end and rotate around a platform, drawn by the invisible and revolving magnetic field created in the coils underneath.

He put on a veritable magic show of electrical technology, amazing thousands of onlookers with wireless lights, corona effects, high-frequency and high-potential wizardry – and culminated his performance by passing one million volts "through" his body. This feat, perhaps more than anything, convinced the doubting public that the horrors of alternating-current which Edison portrayed were greatly exaggerated.

Of course, Tesla had discovered early on that the nerves did not respond to frequencies above about 700Hz. He also became aware of skin effect – that a high-frequency current would pass across the body. And his megavolt had very little current behind it. Still, seeing a man grasp the high-tension terminal of a conical coil, reach out and vaporise a copper disc, was truly overwhelming.

Tesla's personal exhibit remained at the Exposition, as part of the Westinghouse Company display in Electricity Building. Untold numbers of people saw the marvels of Tesla's casual handling of greater voltages than any other man had ever produced.

His equipment represented 10 years' work. It included early polyphase motors, displays such as the "egg of Columbus," the 384-pole alternator, some of the "disruptive discharge" coils, fluorescent tubes, various forms of the "wireless" light, and the original oscillator.

By now, Edison's attempt at adverse influence having failed, an exchange of patent rights was arranged between the Westinghouse Electric Co and the General Electric Co. Lord Kelvin, having studied the proposals submitted for Niagara, reluctantly agreed that alternating current seemed to be the answer.

In October, the Westinghouse tender for two-phase generating equipment was accepted. Initially, three 5000 horsepower machines would be installed, and the first large-scale hydroelectric facility was born. The General Electric bid to build the transmission line found favour and the two bitter rivals collaborated on the largest electrical engineering project to that time.

Westinghouse completed Power House Number One in 1895, and the transmission system went on-line in 1896.

In 1885, three years after the opening of Edison's Pearl Street Station, several thousand power plants, supplying some 20 different direct current systems, operated throughout the United States. Most of them were steam plants, deriving their energy from coal-fired boilers.

Dr Charles F. Scott, of Yale University, commented that single powerhouses (now) supply more power than all of the thousands of central stations and isolated plants of 1890.

# of Nikola Tesla

Part 3

Power from the Niagara plant went to Buffalo, 22 miles away. The first industrial customer for Tesla electricity was the Pittsburgh Reduction Company. The aluminium plant, founded by Charles Hall in 1888, had been based on his discovery of a workable smelting process two years earlier. Cheap, long-distance power from Niagara turned the expensive novelty metal into commercial practicality.

The second industrial user connected to the Niagara system was Dr E. G. Acheson's carborundum plant. His artificial abrasive had been a commercial failure, until the advent of the Tesla polyphase electric system. Following these two modern industries came a whole host of other products that became commercially viable with cheap and efficient electricity: acetylene, nitric acid, explosives, fertiliser, artificial graphite, furnace electrodes, battery carbons, lubrication, ferrosilicon, ferrochromium, ferrotitanium chlorine, phosphorus, caustics and ammonia.

Tesla had fulfilled that boyhood dream. His electricity and his motors – driven by the power of Niagara and harnessed to men's will – turned the wheels of industry as never before. And, as is so often the case, a host of claimants immediately sprang forth to announce loudly to the world that *they* were responsible for the new system. Von Dobrowolsky was one such – he claimed the invention of the rotary field motor, as used in a pioneer electrical transmission scheme in Frankfurt, Germany. After argument erupted in scientific journals, he reduced his claim. Even then, the chief engineer of the project published a statement: "The three phase current as applied at Frankfurt is due to the labours of Mr Tesla and will be found clearly specified in his patents."

Opponents of Tesla turned to obscure academic curiosities to prove priority. But even the authorities they quoted supported the Tesla patents. Finally, a judgment was rendered by Judge Townsend of the United States Circuit Court of Connecticut, on May 1, 1900. Townsend studied the state-of-the-art as of 1888, the year of the Tesla patents. "Prior to Tesla invention," he wrote, "no alternating-current motors were in use.

He referred to concepts of Siemens, Baily, and Bradley, and to the principle of the Arago rotation; and concluded:

"It remained to the genius of Tesla to capture the unruly, unrestrained and hitherto opposing elements in the field of nature and art and to harness them to draw the machines of man. It was he who first showed how to transform the toy of Arago into a engine of power; the 'laboratory experiment' of Baily into a practically successful motor; the indicator into a driver; he first conceived the idea that the very impediments of reversal in direction, the contradictions of alternations might be transformed into power producing rotations, a whirling field of force.

"What others looked upon as only invincible barriers, impassable currents and contradictory forces, he seized, and by harmonising their directions utilised in practical motors in distant cities the power of Niagara."

Tesla, when he left Pittsburgh, had vowed to work only for himself. His landmark lectures in 1891, 1892 and 1893, led him ever further into virgin fields of exploration. His closely coupled coils had been superseded by air coils and tuned circuits. By 1893, during his lecture before the Franklin Institute, he could speak with some assurance of the goal of his researches as "(to) transmit intelligible signals and perhaps power."

In 1895, when he was seeing the fruits of earlier efforts culminated in the Niagara Falls Power Plant Number One, a fire in his laboratory completely wrecked his progress. Every bit of apparatus he had built over the past six years was destroyed. His World's Fair display, numerous awards and personal mementos, all went up in smoke.

That fire at 33-35 South Fifth Avenue destroyed a unique site for the elite of New York City. Tesla, always an accomplished gourmet, had fulfilled social obligations with lavish dinners at the best of New York hotels. These feasts were followed by demonstrations of his latest work at the laboratory for some of the most famous people of the day.

Now, all was ashes.

With the support of Edward Adams and others, Tesla equipped a laboratory at 46 East Houston Street, taking about a year to duplicate what had been lost. A series of patents on the new technology began in April, 1896. These included various means of producing and regulating high-frequency and high-potential currents; techniques of tuning and selective signalling; wireless transmission of signals and energy; and control of moving vessels or vehicles. Some 30 patents were issued over a 15-month period.

His successful experiments in wireless telegraphy – over a distance of 20 miles – were announced in "Scientific American" for June 19, 1897.

Tesla had constructed a gigantic tank in Madison Square Garden, which his friend Stanford White, the eminent society architect, had designed. In this tank, Tesla placed the model boat which is specified in US Patent 613,809.

The inventor wrote: "When first shown in the beginning of 1898, it created a sensation such as no other invention of mine has ever produced. In November, 1898, a basic patent on the novel art was granted to me, but only after the Examiner-in-Chief had come to New York and witnessed the performance, for what I claimed seemed unbelievable."

This was the first of what Tesla called "telautomatons" – machines capable of

The Inventive genius of Nikola Tesla

carrying out operations at a distance, under the control of the operator. He built a larger example of this boat, with loop antennas, which was capable of operating as a submarine. He foresaw a whole new race of robots; machines which "would perform a great variety of operations involving something akin to judgment."

The boat was battery powered and used a number of tuned circuits controlling relays and servos. It had rudder control, forward and reverse, and could flash a pair of lights in response to questions from the audience, the answers being supplied by Tesla at the controls.

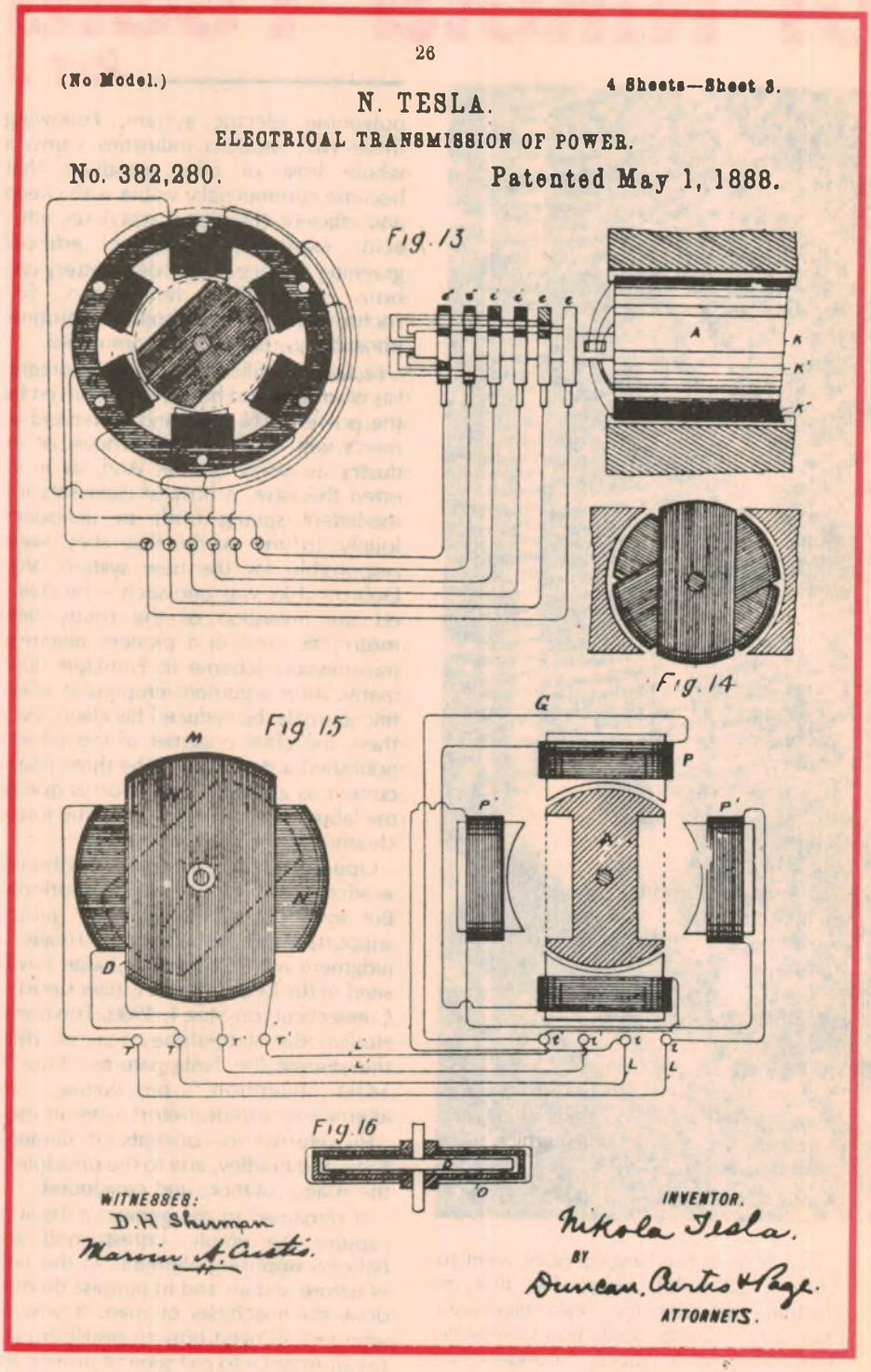
As a result of this exhibition, he was invited to organise a wireless reporting of an international yacht race, by Lloyds of London. Even though he could well have used the generous amount of money offered, he was too deeply engrossed in his researches to take the time and effort – or to allow anyone else to work with apparatus which he had, as yet, not wholly protected by patent. In any case, short distance signalling seemed insignificant to him.

His use of inductive coupling and multiple-tuned circuits to allay interference seems to predate work by Marconi, Lodge, and other fathers of wireless. Yet he did not pursue this area and put into solid engineering practice the discoveries he had made. If he had devoted himself or confined himself to this one area for even a year, he might well be known today as the father of radio.

One of the side issues he researched concurrent with high-frequency work was mechanical resonance. Some of this study had led to the "mechanical and electrical oscillator" first demonstrated in 1893. Another of the devices was an offshoot of air compression experiments. His goal in this area is not known.

One of the little toys he developed during this period was the scalp massager, often used by barbers in future years. Another item was a vibrating platform. Samuel Clemens, a good friend, used to regularly call on the inventor at the Houston Street laboratory, and is shown in one photograph holding one of the wireless lamps Tesla had developed.

The author – better known to the world as Mark Twain – once tried out the vibrating platform. He found the sensation quite soothing and refused to get off when advised to do so. After a couple more minutes of this gentle shaking, he leaped down and asked the way to the toilet. The laxative qualities of this machine were well known . . .



Tesla had a steel link delivered one day, and set up on sawhorses. It was two feet long and two inches thick. He attached a mechanical vibrator, powered by his special air compressor. This device was described later as "small enough to put in your pocket" and apparently had to be tuned by the operator. Once it achieved resonance, it reinforced the vibration until that steel link, capable of supporting tons of weight, snapped.

Next, Tesla found the 10-storey framework of a steel building going up on Wall Street. He attached his vibrator and set it going.

"In a few minutes," he wrote, "I could feel the beam trembling. Gradually, the trembling increased in intensity and extended through the whole great mass of steel. Finally, the structure began to creak and weave, and the steel-workers came to the ground panic-stricken,

believing that there had been an earthquake . . . if I had kept on 10 minutes more, I could have laid that building flat in the street. And, with the same vibrator, I could drop Brooklyn Bridge into the East River in less than an hour."

If this seems unlikely, study the newsreel film of the collapse of the Tacoma Narrows bridge. The third longest suspension bridge in the US in 1940, it achieved resonance during a gusting storm – with a wave motion of 10 metres along its length. The 200 metre central span dropped into the Narrows after about four hours, followed a short time later by the 300 metre end spans.

"It is a fortunate circumstance," Tesla had written in his 1893 lecture, "that pure resonance is not producible, for if it were, there is no telling what dangers might not lie in wait for the innocent experimenter."

The main thrust of his research, though, was still toward the wireless transmission of power. He had reached a safe limit, he felt, of four million volts in his Houston Street laboratory. He organised finance for the building of an experimental laboratory at Colorado Springs, Colorado, in 1899 and began developing the next phase of his work, which he called a "magnifying transmitter."

In a large, barn-like structure, he constructed an enormous Tesla coil. The primary was 17 metres in diameter, of only a few turns. This coil was beneath the floor of the building, and many researchers have been misled by examination of photographs from that period.

The secondary of the system, of the same diameter, was connected to a coil centrally mounted, six metres in diameter and some 10 metres high. This third coil was tuned, at least in one instance, to 100 kilohertz. Tesla achieved an output of 12 million volts, which was not duplicated until 1976.

From this latter coil, a cable led to a copper sphere on a mast almost 200 feet tall. At full power of about 300 kilowatts, Tesla noted sparks in excess of 30 metres, until the system stabilised. He recorded peak antenna currents of 1100 amperes in his diary of that period.

Although modern engineers claim that Tesla attempted the impossible, it appears that he did prove the transmission of 10 kilowatts to a circuit 35 kilometres away – at a fraction of full power. He also recorded detection of signals from the magnifying transmitter some 1000 kilometres distant.

In electromagnetic radiation, the inverse square law holds – when the distance is double, the energy received is quartered, as it were. Yet, Tesla himself wrote of the principle being "the diametrical opposite of ... electromagnetic radiation." He seemed to be pursuing the goal of altering the natural electrostatic equilibrium of the globe.

On July 3, he had established, using one of his unique devices for recording lightning strikes, which are plentiful in Colorado, that stationary waves occurred in the Earth.

He also commented: "I never saw fire balls, but as a compensation for my disappointment I succeeded later in determining the mode of their formation and producing them artificially."

This latter statement, almost an aside, prompted Robert K. Golka, of Brockton, Massachusetts, to duplicate the Tesla magnifying transmitter in 1976. Ball lightning is now accepted as a plasma phenomenon – and the creation of a stable plasma is one of the keys to fusion power. Golka rejects completely the Tesla theory of power transmission, believing that the abnormal ground conductivity in Colorado influenced Tesla's results.

Tesla, however, returned to New York City in 1900, published some articles and filed for a patent on his magnifying transmitter. This was finally granted in 1914. On the strength of his results thus far, he received some money from J. P. Morgan and other financiers. At Shoreham, on Long Island, a monster tower began to grow. W. D. Crow, an associate of Stanford White, designed this 200-foot tower which would have been topped by a 68-foot copper hemisphere.

This plant was designed to transmit 10,000hp, in the form of power, radio broadcasts, time and navigation signals, facsimile, and private messages to individual receivers. The grand plan was never finished, however, for the money ran out. Despite rumours that the US government destroyed the tower in World War I, the fact is that Tesla surrendered the property as payment of outstanding debts and a contractor dismantled the wooden tower for scrap. The laboratory building remains today as a sort of national trust site.

By 1911, Tesla was flogging a radical new turbine he had designed. Although Allis-Chalmers Co put some effort into it, Tesla's inability to work with other people doomed the project to failure. From then on, he declined into obscurity.

He died, alone and virtually forgotten, in the world he had helped create, in New York City. He was 86.

His legacy remains in the power system we use today, a host of patents – over 700, worldwide, credited to him – and diverse articles in magazines. And, perhaps, a hint toward the power generation system of the future.

Frequency modulation and sidebands

by John Kennewell, IPS & Kenneth Brown, USAF

**Learmonth Solar Observatory, Exmouth, WA.*

While most people are familiar with Amplitude Modulation and the relationship between carrier and sidebands, FM is something of a mystery. This article treats that subject.

Frequency modulation is a widely accepted form of transmitting intelligence via radio waves. The inherently higher signal to noise ratios possible with FM (as compared to AM) have led to its complete dominance in the field of high-fidelity broadcasting. In the area of point-to-point VHF communications, the simplicity and lower power requirements of FM transmitters have helped to make this the mode enjoyed by a majority of users. Certainly, in the VHF amateur bands, FM is the most popular form of modulation.

Only the wider bandwidth required by an FM signal has prevented it from being a serious contender to AM in the congested high frequency band. But what is the bandwidth required by an FM transmitter? By the use of photographic displays from a spectrum analyser we aim to graphically illustrate the answer to this question.

In amplitude modulation the frequency spectrum of the transmitter output is relatively simple. A central carrier is surrounded on each side by a single lower-intensity sideband. The modulation percentage changes only the level of the sideband components, but does not alter the general form of the spectrum. However, the situation is radically different for a frequency modulated signal. The appropriate parameter in FM is not percentage modulation but modulation index (m). As this index changes in value not only the amplitude of the sidebands change, but new sidebands appear and the whole shape of the frequency spectrum alters.

The modulation index is defined as the ratio of the maximum carrier frequency change (or deviation) f_d to the modulating audio frequency f_m producing this change. That is: $m = f_d / f_m$

Category	Frequency deviation	Modulation frequency	Modulation index	Signal Bandwidth
WBFM	75kHz	50Hz 15kHz	1500 5	200kHz
NBFM	5kHz	500Hz 3000Hz	10 1.5	15kHz

Table 1. Typical parameters for wideband (WBFM) and narrowband (NBFM) frequency modulation.

In AM, it is usually desirable to achieve a percentage modulation of 100%. There is, however, no single most desirable value for the modulation index, and several factors in any communications system influence the choice of m. These include system bandwidth restrictions and noise reduction considerations. The first requirement is that the signal level must exceed the system noise level. If, and only if this is the case, then FM displays a noise-voltage reduction factor (R) over AM of:

$$R = \sqrt{3}m = 1.73m.$$

This is shown graphically in Fig. 1. Three assumptions are made in deriving this equation. They are that the FM receiver has complete signal limiting, that the IF passbands are matched to the signal in each case, and that the FM and AM receiver audio passbands are the same.

Examination of Fig. 1 shows that the break-even point occurs at m = 0.6. That is, the modulation index must exceed 0.6 if any noise reduction benefit is to accrue from the use of FM. Above this, the amount of noise reduction increases as the value of m increases. When m = 10, FM displays a noise-voltage reduction over AM of 25dB.

It might thus seem advantageous to use as high a value of m as possible. However, as always, we never get something for nothing, and two

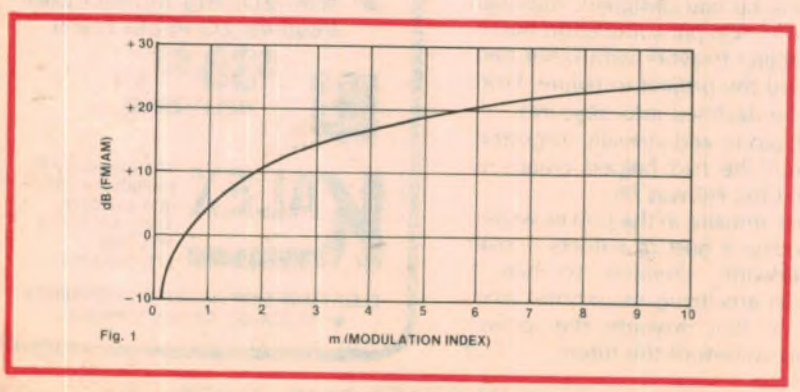


Fig. 1

Modulation Index (m)	Bandwidth (BW) (in multiples of f_m)
0.5	2
1	4
2	6
5	12
10	22

Table 2. Bandwidth versus modulation index. f_m is the (constant) modulating frequency.

problems arise. The first problem, as we shall see shortly, is the increased bandwidth that follows the increase of m. If transmissions have a certain limited frequency allocation, the bandwidth of each must necessarily be restricted.

The second problem relates to the dispersion of the total transmitter energy into more and more sidebands as the frequency deviation is increased. Eventually a point is reached where the amplitude of the sidebands (at the receiver) is below the system noise and the curve of Fig. 1 is no longer appropriate. In this case, an AM signal buried in the noise is more "copyable" than an FM signal similarly enmeshed.

In practice, FM transmissions tend to fall into two categories, designated wideband and narrowband FM (see Table 1). The first category, wideband FM, is normally used in high-quality broadcast situations (88-108MHz band and TV sound) and has a modulation index that varies between about five and 2000 depending upon the audio modulating frequency. Narrowband FM is used in VHF and UHF point-to-point systems and has a modulation index that typically varies from one to 10 for the narrower range of audio frequencies used for such communications.

Fig. 2 shows a number of FM spectra where the modulation index varies from 0.5 to 10.0. This was achieved by changing only the frequency deviation of the carrier – all other parameters were kept constant. The centre frequency used was 435.0MHz and the modulating frequency was 10kHz. The spectrum analyser was set to display amplitudes on a linear scale and thus any sideband with an amplitude significantly below one-tenth of the unmodulated carrier will not appear. This is also a good criterion to use in the computation of bandwidth.

A quick inspection of these spectra reveals that as the frequency deviation, and thus the modulation index, is increased, the number of sidebands and the frequency range they occupy increases. The separation between adjacent sidebands, however, remains constant at 10kHz, the modulating frequency.

A closer inspection of the individual spectra reveals a number of other interesting details. When the modulation index is 0.5, the FM spectrum looks remarkably like that of an AM signal with about 50% modulation. It is significant that around this value of m there is also no difference in signal-to-noise ratio between equivalent AM and FM signals (providing of course that the FM signal is above the system noise). However, this similarity is not as great as it first appears, a fact attested to by the inability of a centrally tuned AM receiver to demodulate this signal.

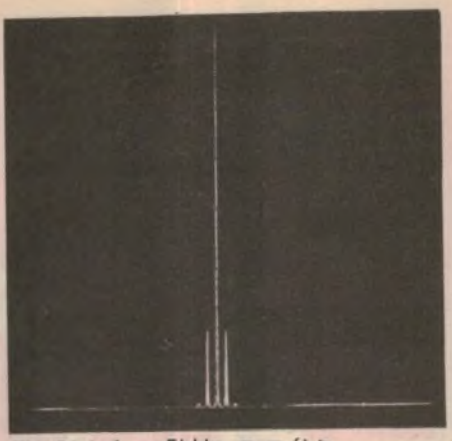


Fig.2(a): f_d = 5kHz, m = 0.5

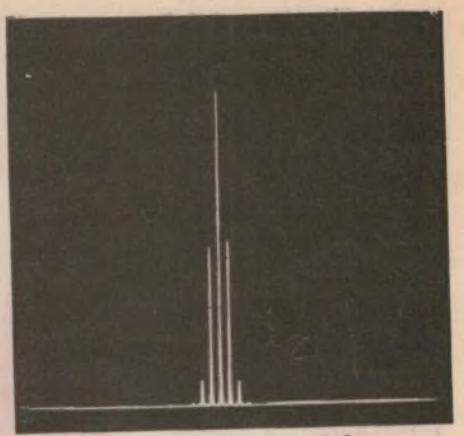


Fig.2(b): f_d = 10kHz, m = 1.0

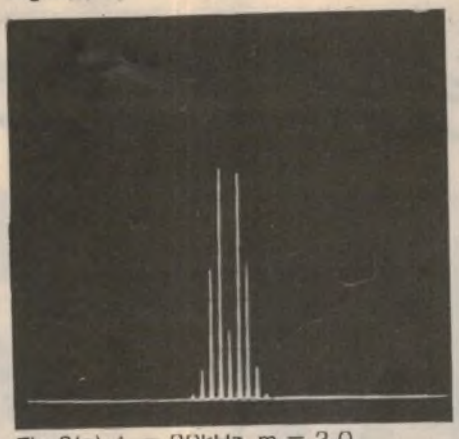


Fig.2(c): f_d = 20kHz, m = 2.0

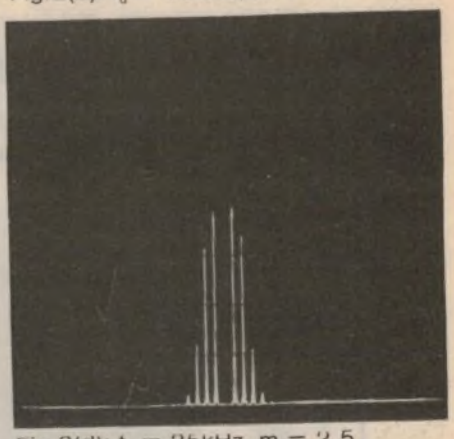


Fig.2(d): f_d = 25kHz, m = 2.5

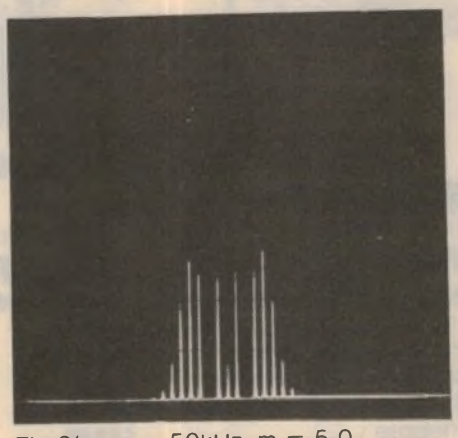


Fig.2(e): f_d = 50kHz, m = 5.0

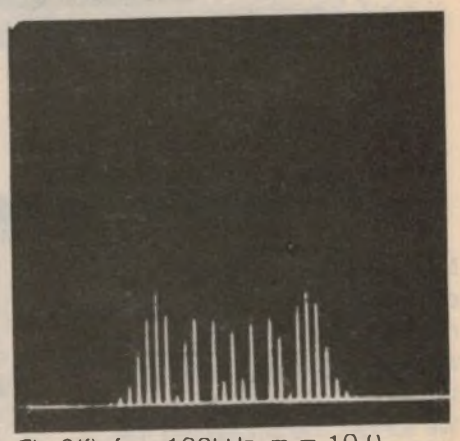


Fig.2(f): f_d = 100kHz, m = 10.0

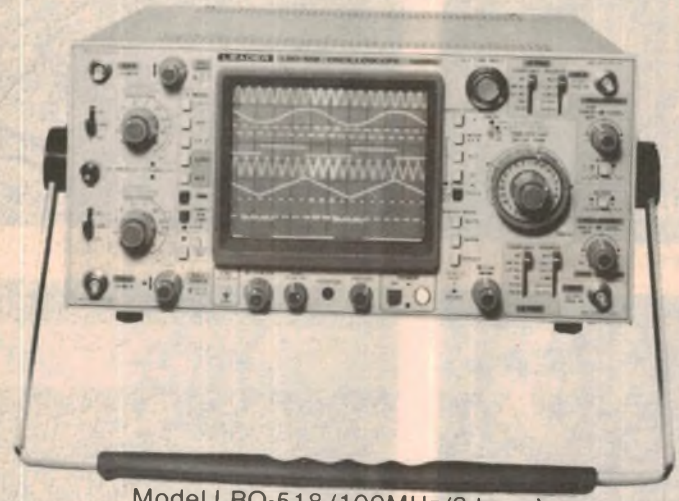
The discrepancy occurs because the spectrum analyser does not display all the information contained in the signal. While it does indicate the average power in each frequency component, it says nothing about their relative phase. If we had a phase indication we would see that the lower FM sideband was exactly 180° out of phase with its AM counterpart. (The moral of this is to try to get all the facts before jumping to any conclusion.)

As the modulation index is increased to 1.0, two things happen: a second pair of sidebands appear, displaced by twice the modulation frequency from the carrier, and the amplitude of the carrier is reduced. In an FM transmitter, the total power output is always constant, irrespective of what modulation is occurring. Thus, if more sidebands are produced, their energy can only come from the frequency components already present. In effect, frequency modulation removes energy from the carrier and puts it into the sidebands.

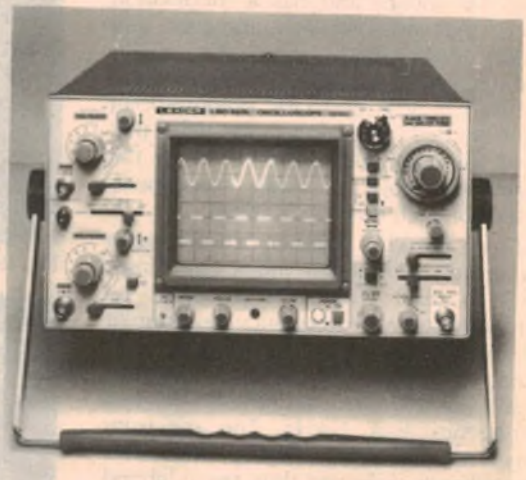
When the modulation index is increased to 2.0, three pairs of sidebands are present. The amplitude of the carrier is also dramatically diminished and the first sideband pair become the dominant frequency components. When m = 2.5 (or more exactly 2.4), the carrier component disappears entirely. This is not a permanent state of affairs as can be

AWA

latest release



Model LBO-518 (100MHz/8 trace)



Model LBO-525L (50MHz/2 channel)

Now there is a LEADER oscilloscope that is right for your measurement needs.
Whether you're an enthusiast, student or professional you get the range, the price and the facilities you need in a high performance instrument that will give you years of trouble free service – at a highly competitive price from **$562** for the 15MHz dual trace **LBO-514A** right up to the 100MHz/8 trace **LBO-518**.
All with the backing of the AWA organization.

Models

Model LBO-518 100MHz (20kV PDA) 4 Channel 8 Trace with signal delay, and dual timebase **$2195**

Model LBO-525L 50MHz (12kV PDA) 2 Channel, Signal delay, and dual timebase **$1345**

Model LBO-524L 35MHz, (7kV PDA) 2 channel, signal delay dual timebase **$1115**

Model LBO-524 35MHz, 2 channel, (7kV PDA) dual timebase. **$998**

Model LBO523 35MHz, (7kV) 2 channel. **$865**

Model LBO-522 20MHz, (2kV) 2 channel. **$619**

Features:

- 150mm rectangular CRT with internal graticule (8 x 10div: 1 div = 1cm), post deflection acceleration, flat face, metal back, dome mesh, % scale, scale illumination, beam rotation.
- Maximum sensitivity of 500μV (X10)
- Max sweep speed of 2nS/div (LBO-518)
- TV-V, TV-H, TV-Sync seperator.
- ALT Trigger
- Hold off variable
- X-Y Operation
- PRESET synchronization
- Linkage of frequency counter using CH-1 output.
- TTL Level Z MOD

Note:
All prices are exclusive of tax but include duty.
All oscilloscopes are supplied complete with probes.

For further details and latest prices please contact the AWA office nearest you.
Sydney: North Ryde Division, Instruments Department Cnr Talavera & Lane Cove Roads, Macquarie Park, North Ryde NSW 2113, Telephone (02) 887 7111. Melbourne (03) 529 4133. Brisbane (07) 369 1277. Adelaide (08) 223 6946. Perth (09) 325 5722. Launceston (003) 44 5155. Townsville (077) 79 6155.

AWA

Frequency modulation and sidebands

seen for the spectra where m equals 5 and 10.

As m increases above 2.4 the amplitude of the carrier begins to increase but it now has the opposite phase. Similar behaviour occurs with each of the sideband pairs. It can be seen that for m = 5, the second sideband pair is absent, and for m = 10 the third sideband pair is missing (the sixth sideband pair also has a very low amplitude). If we were to graph the amplitude of the carrier or any sideband pair as a function of m, we would find that they had the form of a damped sine wave (eg an oscillating mass on a spring with friction present).

If we count the number of sidebands present in each spectrum of Fig. 2 we can draw up a list similar to that of Table 2. From this we can develop an empirical equation giving the bandwidth (BW) required for each modulation index: This is:

$$BW = 2(m+1)f_m.$$

If we express m in terms of frequency deviation the relation becomes:

$$BW = 2(f_d+f_m).$$

That is, the bandwidth of an FM transmission is twice the sum of the frequency deviation and modulation frequency. This is quite a useful formula to remember.

Once we have decided on the frequency deviation to be used in a given situation, it is useful to examine how the frequency spectrum changes as the audio modulation frequency is varied over its specified range. The results are shown in Fig. 3. Here the modulation index varies from 2.5 to 100.0. Unlike Fig. 2, however, the frequency deviation has been kept constant at 50kHz. Only the modulation frequency has been varied. The centre frequency is still 435.0MHz.

These photographs show spectra with no qualitative differences from those of Fig. 2. It is difficult to count the individual sidebands for the higher values of m, but as m becomes large we might note that the envelope of the spectrum becomes U-shaped. There is a sharp boundary at the limits of the spectrum. In this situation, the modulation frequency is so much smaller than the frequency deviation that the bandwidth is effectively just twice the deviation.

Many texts will stress that frequency modulation produces an infinite number of sidebands. Although this may be theoretically true, in practice, as can be readily seen from the spectra shown here, the number of significant sidebands is quite limited, and the bandwidth occupied by these can be easily determined.

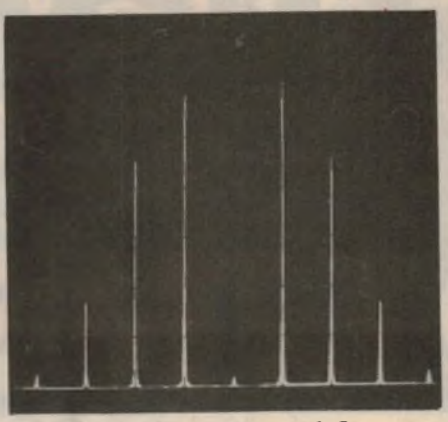


Fig.3(a): f_m = 20kHz, m = 2.5

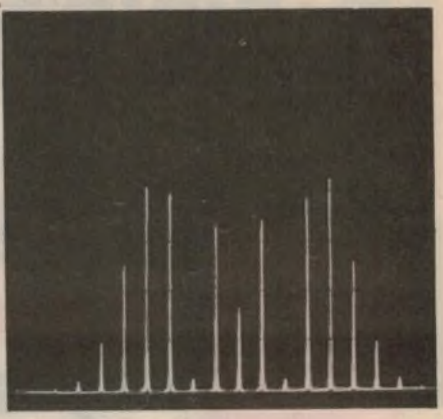


Fig.3(b): f_m = 10kHz, m = 5.0

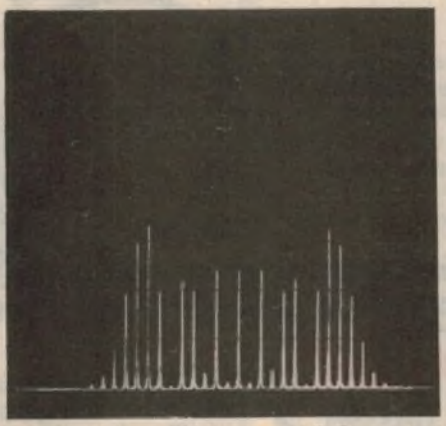


Fig.3(c): f_m = 5kHz, m = 10.0

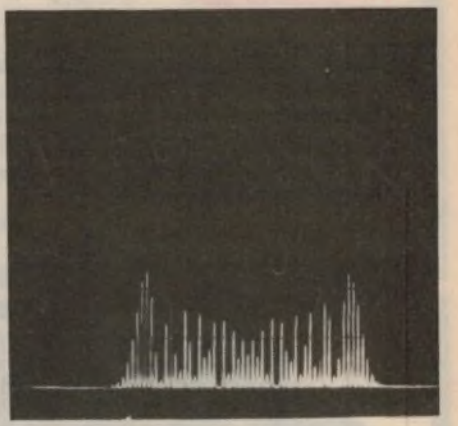


Fig.3(d): f_m = 2kHz, m = 25.0

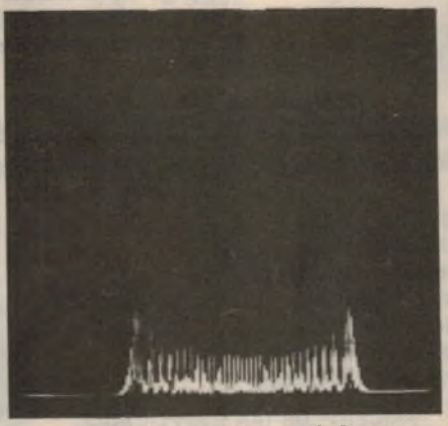


Fig.3(e): f_m = 1kHz, m = 50.0

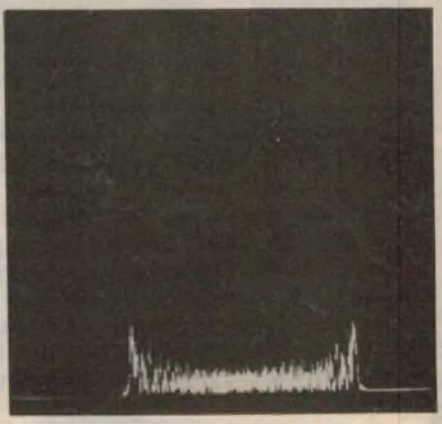


Fig.3(f): f_m = 500Hz, m = 100.0

ELLISTRONICS

PROPRIETARY LIMITED
797 SPRINGVALE RD. MULGRAVE 3170. PHONE: (03) 561 5844 TELEX AA37758 LSTRON
289 Latrobe Street, Melbourne 3000. Phone: (03) 602 3499 Telex AA37758 Lstron

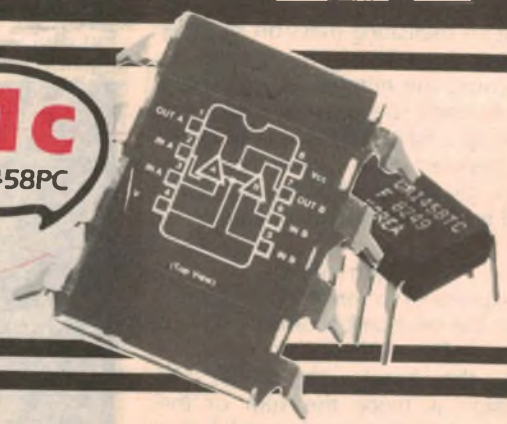
BOOK $12.50

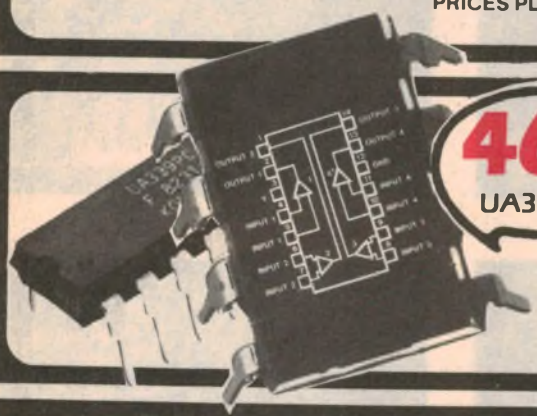
LINEAR

The UA1458 is a monolithic pair of internally Compensated High Performance Amplifiers constructed using the Fairchild Planar Epitaxial process. They are intended for a wide range of analog applications where board space or weight are important.

31c
UA1458PC

PRICES PLUS TAX IF APPLICABLE.





46c
UA339PC

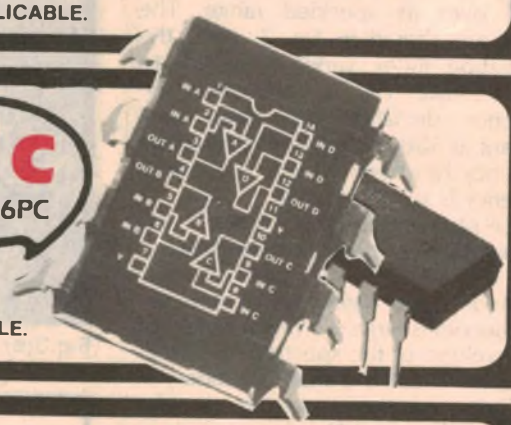
The UA339 consists of four independent precision voltage comparators designed specifically to operate from a single power supply. Operation from split power supply is also possible and the low power supply current drain is independent of the supply voltage range.

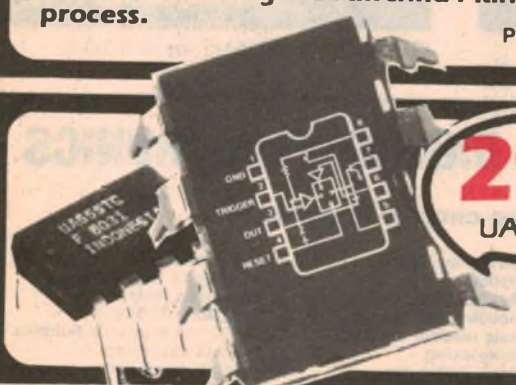
PRICES PLUS TAX IF APPLICABLE.

The UA 4136 Monolithic Quad Operational Amplifier consists of four independent high-gain, internal frequency-compensated op amps. They are specifically designed for low noise signal processing applications such as audio preamplifiers and signal conditioners. They are constructed using the Fairchild Planar Epitaxial process.

91c
UA4136PC

PRICES PLUS TAX IF APPLICABLE.





29c
UA555TC

The UA555 Timing Circuit is a very stable controller for producing accurate time delays or oscillations. In the time delay mode, the delay time is precisely controlled by an external resistor and one capacitor. In the oscillator mode, the frequency and duty cycle are both accurately controlled with two external resistors and one capacitor.

PRICES PLUS TAX IF APPLICABLE.

Bankcard Mail Orders Welcome

Please debit my Bankcard
Bankcard No. .....
Expiry Date .....
Name .....
Signature .....

Prices subject to change without notice. Phone or write for quantity discounts.
MAIL ORDERS: To ELLISTRONICS, 289 Latrobe Street, Melbourne, Vic 3000.
Minimum pack and post $2.00. Phone (03) 602 3499

ELLISTRONICS

PROPRIETARY LIMITED

797 SPRINGVALE RD. MULGRAVE 3170. PHONE: (03) 561 5844 TELEX AA37758 LSTRON

289 Latrobe Street, Melbourne 3000. Phone: (03) 602 3499 Telex AA37758 Lstron

LINEAR

OPERATIONAL AMPLIFIERS

UA1458HC	.84
UA1458TC	.31
UA201HC	.80
UA201TC	.36
UA224DV	1.20
UA2902PV	.80
UA301AHC	.95
UA301ATC	.63
UA308HC	.69
UA308TC	.36
UA318HC	2.17
UA324DC	1.26
UA324PC	.76
UA3403DC	1.08
UA3403PC	.91
UA348PC	.96
UA4136DC	1.37
UA4136PC	.92
UA709HC	1.02
UA709PC	.45
UA709TC	.45
UA714HC	2.17
UA715DC	2.28
UA715HC	2.28
UA725HC	2.74
UA725TC	2.29
UA739DC	2.05
UA739PC	1.26
UA741HC	.95
UA741TC	.29
UA747DC	.52
UA747HC	1.14
UA747PC	.69
UA748HC	1.05
UA748TC	.58

OPERATIONAL AMPLIFIERS

UA749DC	2.06
UA749PC	1.23
UA759HC	2.17
UA759UIC	1.26
UA776HC	1.26
UA776TC	.80
UA791KC	13.76
UA798TC	.44
UAF771ARC	2.08
UAF771ATC	2.13
UAF771BRC	1.33
UAF771BTC	.89
UAF771RC	.98
UAF771TC	.69
UAF772ARC	4.06
UAF772ATC	3.67
UAF772BRC	1.83
UAF772BTC	1.73
UAF772RC	1.30
UAF772TC	.91
UAF774DC	5.86
UAF774PC	3.43

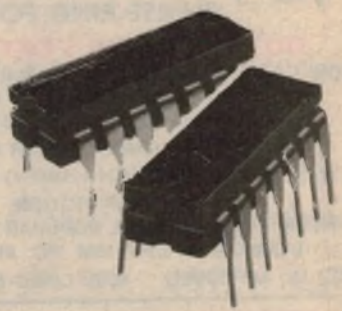
SPECIAL FUNCTIONS

UA2240DC	1.47
UA2240PC	1.03
UA3086PC	.35
UA555TC	.29
UA556PC	.95
UA726HC	12.49
UA727HC	20.52
UA733DC	.91
UA733HC	.52
UA733PC	.73
UA7392DC	2.28
UA7392PC	1.48
UA757DC	2.06

COMPARATORS

UA2901DC	.91
UA2901PC	.55
UA2908TC	
UA311HC	.91
UA311TC	.57
UA3302PC	.40
UA339DC	.77
UA339PC	.45
UA393TC	.45
UA710DC	.73
UA710HC	.73
UA711HC	.83
UA711PC	.54
UA760DC	8.60
UA760HC	10.84

PRICES PLUS TAX IF APPLICABLE.



PRODUCTS MANUFACTURED BY

FAIRCHILD

A Schlumberger Company

ONE OF THE WORLDS LEADING SEMICONDUCTOR MANUFACTURERS

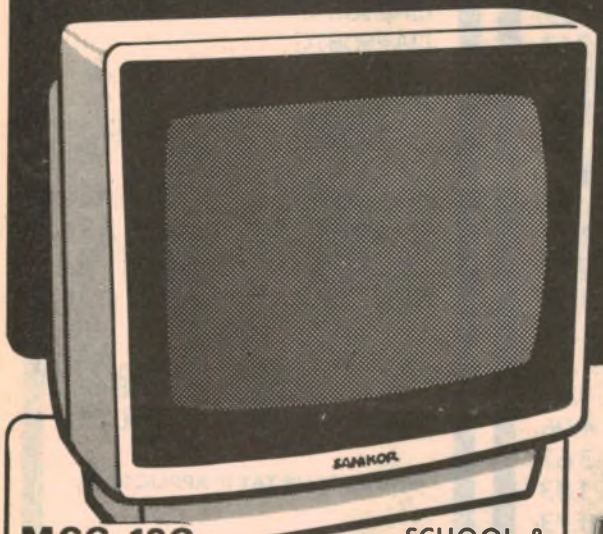
ELUSTRONICS

PROPRIETARY LIMITED

797 SPRINGVALE RD. MULGRAVE 3170. PHONE: (03) 561 5844 TELEX AA37758 LSTRON

289 Latrobe Street, Melbourne 3000. Phone: (03) 602 3499 Telex AA37758 Lstron

NEW VIDEO MONITOR



MCG-12G (12")

SCHOOL & CLUB BULK BUYERS PLEASE RING FOR PRICING.

OUTSTANDING FEATURES:

- LOW COST, HIGH QUALITY - SMART, RELIABLE
- COMPACT DESIGN & LIGHT WEIGHT
- LOW POWER CONSUMPTION
- NON-GLARE, GREEN/AMBER OPTION
- WIDE VIDEO BANDWITH (20MHz) FOR CLEAR & SHARP PICTURE
- INTERFACES WITH ALL POPULAR PERSONAL COMPUTERS LIKE IBM PC, APPLE
- FCC, UL APPROVED - 1000 LINES RESOLUTION

GREEN PHOSPHOR ...$154

ORANGE PHOSPHOR ...$175

RESELLER PRICES ON APPLICATION.

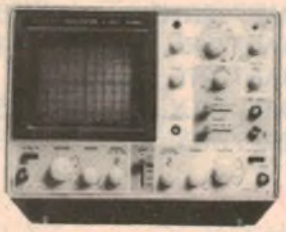
ALL PRICES PLUS 20% TAX IF APPLICABLE.

AMAZING NEW CP-80 PRINTER

QUALITY PRODUCT MADE IN JAPAN

$395

HITACHI V152F



- Features
- TV sync-separator circuit
- High-sensitivity 1 mV/div(15MHz)
- X-Y operation
- Sweep-time magnifier (10 times)
- Trace rotation
- Z-axis input (Intensity modulation)

$465

TRIO CS-1560 AII

PROBES 10 to 1 SWITCHING ONLY $22 ea.

• Simplified circuitry, improved performance and dependability have been successfully realized with the use of ICs throughout • A vertical amplifier provides as wide a bandwidth as DC to 15 MHz, as high a sensitivity as 10 mV/div. and a low input capacitance • A sweep rate extends from 0.5 μsec/div to 0.5 sec/div in 19 ranges. Further, TV vertical and horizontal syncs are available for measuring video signals and, its x5 magnified sweep, its range of application is extremely wide • Very easy X-Y operation of high input sensitivity for Lissajous measurements • Dimensions: 260(W) x 190(H) x 385(D) mm; Weight: 8.4kg.

$450

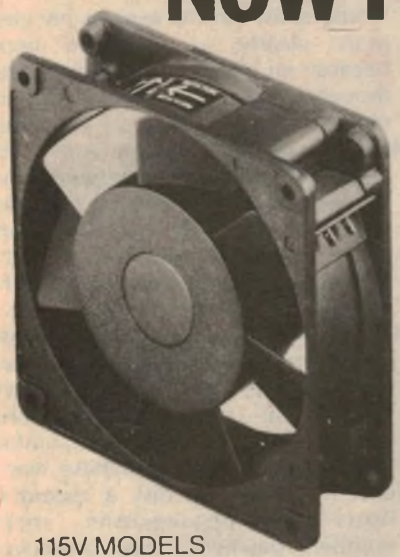
130mm DUAL-TRACE TRIGGERED SWEEP OSCILLOSCOPE

ELLISTRONICS

PROPRIETARY LIMITED

797 SPRINGVALE RD. MULGRAVE 3170. PHONE: (03) 561 5844 TELEX AA37758 LSTRON
289 Latrobe Street, Melbourne 3000. Phone: (03) 602 3499 Telex AA37758 Lstron

NOW FROM ok® INDUSTRIES



115V MODELS
ALSO AVAILABLE

A NEW RANGE OF COMPUTER FANS AT AN AFFORDABLE PRICE!

DESCRIPTION

OK Industries Inc., introduces a new line of Fans and Air movers to meet all applications. These dependable but surprisingly low cost fans are designed to meet any commercial or production application. All of OK's fans are of sturdy all-aluminium die-cast housings. This heavy-duty construction is built for high reliability in all environments.

The RF 180-/230 delivers up to 33 cubic feet of air per minute even with the compact size of 3⅛" (79.5mm) square x 1.63" (41.5mm) slim. This compact fan is ideal for all low profile cooling applications where small size but excellent performance is required. Surprisingly light-weight.

The RF 4120-230 is a long-life high performance fan for any general cooling purpose.

Features:

- 80-105 CFM air movement.
- 4.70" (119.5mm) square x 1.51" (38.5mm) thickness.

RF 180-230
$16 EACH

RF 4120-230
$16 EACH

Finger Guards
$1.50 EACH

PRICES PLUS 20% S/TAX

ok®

Wire for wire-wrapping, AWG-30 (0.25mm) KYNAR® wire, silver plated, solid conductor, easy stripping.

NEW LOW PRICES!

50' SPOOL	$2.20 ea
100' SPOOL	$3.20 ea
250' SPOOL	$5.95 ea
500' SPOOL	$10.50 ea
1000' SPOOL	$19.45 ea

8 colours available ex stock. Red, Black, Blue, Yellow, Green, Purple, White, Brown.

VERSA®
IC INSERTION TOOLS

CIT. 820
8 to 20 pin
$4.04

CIT. 2428
24 to 28 pin
$4.67

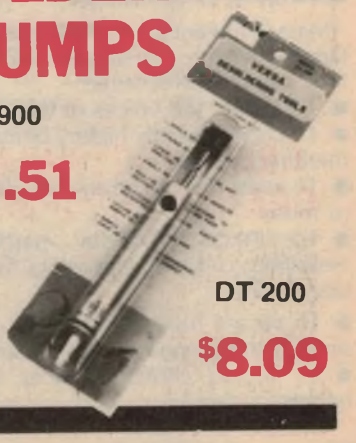
CIT. 22
22 pin
$4.35

CIT. 3640 pin
36 to 40 pin
$4.98

NOTE PRICES PLUS 7.5% S/TAX IF APPLICABLE.

DESOLDERING PUMPS

DT 900
$11.51



DT 200
$8.09

RESELLER AND QUANTITY DISCOUNTS ON APPLICATION.

Do microcomputers really have a

FORUM

Conducted by Neville Williams

For one who usually has so much to say, I have been doing an uncharacteristic amount of listening in recent weeks — taking stock of often unconvincing reasons that people put to themselves to justify the purchase of a personal computer. "I've decided to buy one," they say, "because . . ."

What follows is often about as logical as Blondie's time-honoured rejoinder to Dagwood: "Since when isn't 'because' a reason?"

One thing is certain: seldom do you hear the simple, unadorned admission: "Look, I just want a computer, and that's all there is to it!"

The situation is nothing short of a marketer's dream – even if it is likely to be somewhat short-lived. One advertising executive put it to me this way: "We love it when consumers are casting around for a reason to buy something; they make our job so much easier. All we have to do in our ads is to reinforce their thinking!"

It reminds me very much of the period following World War II, when domestic open-reel tape recorders first made their appearance on the market. As the latest example of gee whiz technology – the newest technical toy – tape recorders really grabbed the attention of consumers, young and old alike.

Up till then, to record anything was a major technical exercise – so much so that only those with money and a definite need even bothered to try. But, suddenly, anybody could own a tape deck and use it to record anything that took their fancy. What's more, with a little care, the sound quality compared favourably with that available at the time from records and radio.

Dubious justification

Many and varied were the reasons why families of the era simply had to have their own tape recorder:

- To record the voices of the children;
- To capture family history before older members passed on;
- To assist their children with elocution, or music;
- To record birthday parties, or weddings, or family gatherings for future enjoyment;
- To record business meetings and so simplify the preparation of minutes;
- To record church services for the benefit of shut-ins.

There were many others – reasons that sounded genuine enough but lent artificial weight by the fact that they were so often being dreamed up to reinforce a decision to buy that had already been made!

Within the audio industry, many of us felt that the novelty would soon wear off – and it certainly did. People bought the new toy, recorded everything within earshot for a month or two, and then began to lose interest. After a while, most tape recorders were left to languish in a cupboard: electronic "white elephants"!

I wouldn't be at all surprised if many of the personal computers that are currently being sold don't share the same fate. Why? Because the reasons which people are advancing to justify their purchase are often more dubious than those which applied to the initial flush of open-reel domestic tape recorders. Let me quote a few specific examples which came to my attention by doing what I referred to earlier: by just listening.

Mr A has a large collection of record albums featuring many hits by many artists. By investing in a computer, he decided, he need never again fossick through the collection looking for a particular track. The computer could tell him instantly who did what and where. It could and it did except that, in terms of time, money and the space it occupied in a bachelor flat, the computer proved more of a hassle than looking for record tracks! So he sold it again at a considerable loss.

Mr B convinced himself that a computer/word processor on his office table would facilitate the production of reports and letters. Mistakes could be corrected on the screen and word-perfect copies printed on the spot. But, in practice, the new technical toy so dominated his attention and his office space that he reverted to the traditional way of doing things.

Mr C is in a situation similar to Mr B but is toying with the idea of a word processor because he feels that it would assist him to express his ideas more clearly – a forlorn hope, because an inability to marshall one's thoughts goes much deeper than the medium by which they are expressed!

Mr D is a part-time feature writer who could logically use a computer/word processor. He is holding off, however, partly because of the overall cost and partly because of the demands that a present-day system would make on his rather limited domestic work space.

Mr and Mrs E are a young married couple, with strictly limited means and living space, who have recently invested in a complete personal computer system. Prominent among their reasons for the purchase was a desire to have on disk a record of household possessions, serial numbers, payments, insurance cover, etc. Listening to them, I was reminded of a computer supplier whose private comment in a similar situation was: "What's wrong with a notebook?"

Keeping pace

Mr F, a man with no technical background and no identifiable need for a computer, has bought one simply to find out "what makes them tick". What's more, he intends to buy one each for his grandchildren, as they grow up, "so that they won't be left behind by this new technology".

I am not trying to ridicule these people, because there are many less enterprising ways of spending money than on a computer. They are responding to a new technology and, even if there is a strong "technical toy" element in their motivation, they still stand to gain useful background in the new way of doing things.

As I remarked earlier, open-reel tape recorders also went through the "technical toy" stage and were discarded, in that form, by many of the people who rushed to buy them. Nowadays, they are used mainly by those who have a need for the facilities they offer – high quality, long playing time, multi-tracking, editing and so on.

place in your home?

What has taken their place, for most consumers, is the compact cassette recorder. It can still be used to record the occasional family or social event but its major role is as an in-house or in-car music source, using either pre-recorded or home-recorded cassettes.

The cassette deck never did pass through a "technical toy" stage. It was essentially a derivative of the open-reel recorder, a second generation product, guided into a perceived slot in the market. I cannot escape the conviction that personal computers have yet to go through a similar evolutionary process.

Basic plus options

To date, the key words in personal computer marketing appear to be price and versatility. You can buy a keyboard with basic computer electronics for a certain attractive figure, which can then be optioned up for a multitude of tasks by adding a monitor, cassette deck, disk drive, printer, extra memory, software and/or games cartridges, etc. It makes for interesting advertising copy and may even prompt good reviews but I doubt that it's the end of the story.

Certainly, for some purposes, the present price/option approach is fair enough:

A not-too-expensive keyboard and instruction manual, used in conjunction with the domestic TV set, can provide useful hands-on computing experience.

With the provision of suitable cartridges, the same set-up can offer an electronic games facility for family fun.

Depending on the available options and software, a system can readily be put together to meet educational and small business needs – something that is happening all the time.

The real problems concern the Mr A's, B's and C's of this world, when they aspire to set up their own in-home personal computer – a notion that often lies behind the initial purchase of a basic keyboard. Only then does it become apparent that many of the much-vaunted ideas and options are not very practical for a home situation.

I mentioned earlier the listing of music tracks in a private record collection – an intriguing notion until it became apparent that computer indexing demanded a fair amount of back-up organisation plus considerable outlay and shelf space.

In the matter of household accounting, I quoted that disturbingly perceptive remark:

"What's wrong with a notebook?"

Here's a couple of others quoted from people in the personal computing business – remarks that were made to me, strictly off the record:

"What housewife in her right mind would want to sit down and laboriously enter a whole swag of recipes from an illustrated cookery book, just for the privilege of reading them back from a TV screen?"

And, on an entirely different tack:

"How many people need to solve maths problems in the home that call for anything more than a simple calculator? Why would they possibly need a full-scale number-cruncher?"

My tip is that, beyond the tuitional phase, the most rewarding use of computer facilities in the home will be in the area of word processing – taking over from, and extending, the role of the ubiquitous typewriter. And just as there are large typewriters and small ones, I think we'll see an emerging range of computer/word processors, or "super intelligent" typewriters – call them what you will – large, small and small with options.

Right at the moment, any number of professional writers are using commercial microcomputers in word processing mode, for the most part with evident satisfaction. They have a QWERTY (typewriter) keyboard layout, upper and lower case letters, the usual display screen on which the operator can make instant corrections or alterations, disk storage from which they can recall copy for major editing, print-out facilities and so on.

"They cut writing time in half" is a commonly expressed verdict.

With the prices of this kind of equipment coming down steadily and the technology being tidied up progressively, this end of the market is looking good. The other end is where there is considerable room for development, as typified by the dilemma of Mr D, mentioned earlier.

Both cost and space are important in a home situation and a person who is accustomed to accommodating and using a compact typewriter is not likely to take kindly to a word processing system that permanently clutters the work space, price notwithstanding. Surely it should be possible to simplify and rationalise the hardware with one major role in view?

New approach

I couldn't agree more. So let's start by envisaging a computer type keyboard and circuitry, with an integral printer of one kind or another, styled externally like a typewriter.

Provision could be made to couple it into a TV receiver or monitor and to accommodate some software such that, in COMPUTER mode, the keyboard would offer limited tuitional computing facilities, and even a few games. So

The last word on electronic organs

That the way of the pioneer is not always an easy one is evident from an item in a news release, issued some time ago by the makers of Allen electronic organs.

When the instruments were first released, around 1939, a competitor noted that they used "Bushel baskets of tubes" — a scare tactic that didn't work too well because Allen found that tubes produced to wartime specs were notable for their reliability. But, nothing daunted, somebody started the curious rumour that all those tubes radiated mysterious rays which were a grave danger to organist and choir!

In 1948, Allen produced the Gryphonic Projector tone cabinet, a Doppler effect produced by loudspeakers rotating in slow motion — an idea that has since been widely adopted and adapted. But competitors saw only problems in the concept such as "motion fatigue" leading to "inducing nausea". It was suggested further that the system could interfere with heating and cooling of the church, with the result that "more than one choir had caught severe colds" from gyro-induced draughts.

The switch to solid state design in 1959 may have obviated most of those "suspect" tubes but it presented its own problems. One concerned competitor noted that transistors were important for moon shots but, since they were not "building organs for the moon", transistors were unnecessary. And why go to transistors, reasoned another; they were waiting for tunnel diodes!

But it is hard to cap the retort when Allen introduced "chiff" in 1963. A rival company professed not to be interested in "imitating the defects of a pipe organ!"

Make your music happen with Shure's new line of stereo cartridges

Models M99E and M92E. Excellent sound on a tight budget. Elliptical stylus, alloy shank. Suits both ½" and P-mount tone arms.

Models M105E and M104E. Outstanding performance on a limited budget. Suits both ½" and P-mount tone arms.

Model 111E and ML110HE. Unique stylus shank and hyperelliptical diamond tip. For both ½" and P-mount tone arms.

Model ML140HE. Hyperelliptical tip and Beryllium Microwall/Be™ Stylus Shank for ruler flat response and superlative tracking.

Model ML120HE. Hyperelliptical tip, Dynamic stabilizer and Stylus Guard Protector. Response is ruler flat 20-20,000Hz.

Your cartridge is the most critical device in your sound system. No other manufacturer in the world knows more about phono cartridge design than Shure. Whether your turntable has a tonearm with a standard ½" headshell or the new P-mount plug in connector, Shure's line of cartridges is especially designed to help you get the maximum enjoyment from your system.

SHURE

AUDIO ENGINEERS P/L
342 Kent Street
Sydney NSW 2000
(02)29 6731

NOMIS ELECTRONICS
689 South Road
BLACK FOREST S.A. 5035
(08)293 4896

AUDIO ENGINEERS (Qld)
Cnr. Jane & Buchanan Sts
WEST END QLD 4101
(07)448947

MARKETEC P/L
18 King William Street
Slh Fremantle WA 6162
(09)335 8275

versatility would not be completely sacrificed.

In the MANUAL mode, it might operate in the manner of an electric typewriter for anyone who doesn't need or doesn't understand the processor function.

In PROCESSOR mode, operation would be controlled by a word processing program in ROM – the kind of thing that is already available in some small computers. The text would be displayed, one or more lines at a time, in a liquid crystal display or in larger slabs on an external monitor. It would be stored in RAM (with battery back-up) sufficiently capacious to accommodate the contents of a typical letter or a useful segment of an article (16k or more). After appropriate revision, it could be printed out under computer control.

EXTRA STORAGE

What about bulk storage of text and the ability to recall for revision specific segments of a long article? It would be a nice facility to have but not essential for many smaller assignments. But then it may be practical to accommodate an optional single disk drive somewhere within the housing.

In short, I am envisaging a unit which is NOT a microcomputer optioned into a word processor. Nor am I thinking of a high technology typewriter which has become even more sophisticated – and costly. What I have in mind is a specific grouping of technology which already exists in the present generation of hobby computers, assembled in the physical form of a desk-top typewriter.

Earlier in the article, I described the cassette deck as an eminently successful derivative of the original, general-purpose open reel tape recorder. Unless I miss my guess, a not-too-pretentious purpose-built word-processing typewriter could be a no less successful derivative of the present generation of general-purpose personal computers.

What's more, when I put these general ideas to a friend, an executive active in the computer field, he assured me that I was not suffering from an overstressed imagination. In fact, I got the distinct impression that he would be delighted to have just such a unit in his product range right now, rather than having to wait until somebody gets around to producing it!

Perhaps, here, I might be permitted to change the subject completely.

If ever a retiree was to receive a reminder of the passing years, I had that experience last month, during a short trip to the central west of NSW.

Having gazed almost boggle-eyed at the intense green of the hills, in what must be the best season for decades, I took time off to look through the museum in Dubbo. It has a better than usual collection of memorabilia and I joined in the usual chorus of "I remember that, and that . . ." on the basis that they were things that had been owned and used by my parents and grandparents.

Then I came upon a section devoted to old phonographs and wireless sets – an interesting collection, indeed, of models seen more often these days in pictures than in tangible form.

Nearby, I spotted an old-time upright console radio that seemed strangely familiar, with its 180-degree Efco dial and its antique-finished escutcheon, branded "Reliance". When I peeped into the back, the reason for the familiarity was all too evident. There was a "Series 14" chassis, the faithful old Henderson power transformer, the squat, round Radiokes IF transformers and, down below, the once popular 8-inch Amplion electromagnetic loudspeaker.

As one of the two original wirers taken on by Reliance Radio in York (later Barrack) Street in the early '30s, there was a strong chance that I had been involved in the production of that set, wearing any of three hats: wirer, tester, inspector.

It's one thing to go into a museum and recognise things that were used by your parents or grandparents. It's quite another to confront a piece of ancient history that you probably helped to create!

OLD TIME READER

When I arrived back home from Dubbo and beyond, it was to find a letter waiting for me from Mr A. G. Murrell of Penola, South Australia, a reader whose name I know well from reader correspondence over a long period. He is now over 70 years of age, has been reading and filing the magazine since 1940 and has had a number of items published.

I would acknowledge and thank him for the kind remarks about the role I have been able to play over that same period of time. We in turn, owe our existence to the continuing support of readers like A.G.M.

While our correspondent has had a wide-ranging interest in the hobby, he refers to three pet projects which, by contrast, highlight the dramatically changing face of electronics.

The first was the construction of a pendulum type grandfather clock, at one time a popular project with readers of "Radio & Hobbies", as the magazine was then called. Seeking greater accuracy, A.G.M. used a light beam and electromagnet system to pulse the pendulum and trigger the clock, reducing the error to less than one minute per month.

He has since "transistorised" the drive system to increase reliability but any further improvement in accuracy would require critical experimenting with the pendulum to neutralise seasonal expansion and contraction.

While grandfather clocks still have a charm of their own, as you'll discover if you go to buy one, they have been rendered totally obsolete in terms of precision and economy, by the modern quartz controlled clock or watch. One might almost be pardoned for suggesting that such precision shouldn't come so cheaply!

Again, A.G.M. was involved in updating the electronics in a Kilner organ – an instrument which involved electrostatic pickup from the reeds of a traditional reed organ. The first time I heard an instrument of that kind, an Everett Orgatron in the '30s, I thought it was magnificent. But it was a very different story when I tried to apply the principle to a domestic harmonium. It sounded like a loud, out-of tune accordian and I didn't have the heart to persevere.

Since then, fully electronic organs and their derivatives have come a long way, giving us magnificent concert instruments like the Allen, through virtual one-man orchestras (Technics, Yamaha, etc) to fantastically compact and versatile single keyboards.

A.G.M.'s other interest was in sound transmission by light beam, an activity which, in the '60s normally involved flickering light globes, reflectors and photoelectric cells, with transmission paths measured in metres. They could never be more than a novelty.

Nowadays we have lasers, with beams of light so intense that they are now being conceived as weapons of destruction, on earth and in space. And, of course, there are the emerging optical cable systems with light beam "carriers" taking over from copper conductors.

A.G.M. has seen it all happen but his concluding remark has about it a familiar ring:

"I thought you may be interested in the attempts of an 'oldie' (I am over 70) to keep up with transistors and some ICs. I'm afraid that the present-day world of digital electronics and computers has left me well behind."

Perhaps so A.G.M. but, in the meantime, you've had a lot of fun – good, constructive fun!

UNBEATABLE KIT VALUE

Jaycar & Electronic Agencies

"Blueprint" 5000 preamp

FUNCTIONS
- MOVING COIL INPUT
- MOVING MAGNET (DYNAMIC CART)
- INPUTS (2 OFF)
- TUNER INPUT
- AUX INPUTS (2 OFF)
- TAPE INPUTS (2 OFF)
- INPUT LEVEL CONTROL
- TAPE OUTPUTS (2 OFF)
- 400Hz CALIBRATION OSCILLATOR
- LED AVERAGE (VU) & PEAK
- LEVEL METERS -48dB TO +9dB
- MODE SWITCH STEREO
- BALANCE CONTROL
- LINE OUT MONITOR OUT
- MONITOR VOLUME CONTROL

FEATURES
- EXTREMELY CLOSE TRACKING TO RIAA PHONO EQ.
- GOLD PLATED CONNECTORS ON ALL INPUTS
- ENGLISH 'LORLIN' LOW NOISE SELECTOR SWITCHES
- LOW NOISE 1% 50ppm METAL FILM RESISTORS USED
- TINNED FIBREGLASS PCB's
- LOW CAPACITANCE SCREENED CABLE USED THROUGHOUT
- QUALITY I.C. SOCKETS
- SPECIAL REAR PANEL
- MULTICOLOURED RECTANGULAR LEDs USED

$299

5000 POWER AMPLIFIER

REF: ETI JAN/MARCH 1981

Cat. KE4200

BLACK MONOLITH

unbeatable value

ONLY $319

5000 SERIES GRAPHIC EQUALISERS

ALL IC SOCKETS PROVIDED

SPECIFICATIONS
Signal-to-Noise: -102dB with respect to 1 Volt
Frequency Response: 12Hz - 105kHz to -1dB
Boost/Cut: 14dB (28dB total)
Distortion: 100Hz 0.02% 1kHz 0.007% 10kHz 0.006% (essentially irrespective of cut or boost)
Current consumption (DC): Approx 100mA @ 7.15V (requires 30V AC CT)
Output short-circuit proof.

AUSTRALIAN (NOT HONG KONG) MADE - SPECIAL BUILT RACK CABINET - QUALITY!!!

Cat. KE4204

$199 each

syntom

KJ-6502

Original design from the UK magazine "Electronics and Music Maker" April 1981. Self-contained unit produces a variety of fixed and falling pitch effects. Trigger by tapping the unit itself or by striking a drum to which the unit is attached. The Jaycar "SYNTOM" comes complete with high quality pre-drilled moulded all ABS box 152 x 80 x 47mm with professional silk-screened front panel.

FEATURES: Decay from less than 0.1 second to several seconds, pitch control, sweep control and volume on/off.

$36.50

0-30V 1amp power supply

Ref: ETI December 1982

ETI 162

Cat. KE4570

- Fully protected
- Output variable from 0-30V DC
- Selectable current limit
- Both voltage and current metering
- After a multimeter & soldering iron an absolute must for the enthusiast.

You will never own a more useful piece of gear.

$49.50

Digital Delay Line

The Digital Delay Line is designed to produce a huge variety of electronic effects. It works very well but the amazing thing is the low low price! The effects depend on the time delay selected and some of those included are: Phasing, Flanging, Chorous, ADT (Automatic Double Tracking), Echo, and Vibrato. The delay time can be varied from 0.32ms to 1.6 seconds! Because the signal is stored in digital form there is, unlike analog systems, no degeneration of the signal with time and unlimited repetition is provided by use of the freeze control.

All the controls mount directly upon PCB's to eliminate wiring and to further simplify construction the main board is 'plated through' i.e. there are no wire links or link through pins. The whole of the memory whether for the basic 400ms machine or the fully expanded 1.6 second model all fits on the main board. The cabinet which is free standing but also suitable for 19" rack mounting, is fully finished to a very high standard. The panel is deep blue whilst the cover is sprayed with a durable black enamel. The kit is available for only $449 - compare that with inferior uints that can cost over $2,000!!

Cat. KJ-6621

ONLY

$449

COMPLETE KIT

400ms VERSION

NOW IN STOCK!!

SAVE A FORTUNE!

LOW COST DIGITAL MULTIMETER KIT

ONLY $45

Ref: E.A. March 1983 (This month)
Almost everyday we are asked for a multimeter kit. Up until now we thought that it was just not worth it considering the fine low cost built up units available. The DP2010 changed all that.
This kit, fully imported from the UK, uses the famous DPM 05 custom LCD Voltmeter to achieve phenomenal accuracy at very modest cost!
All parts are included to complete the meter including an attractive and colourful front panel. (a 9V battery is required)

Set of test probes to suit $2.95
Probe to suit Cat. WT5312 ONLY $2.50
Eveready 216 (red) 9V Battery Cat. SB2370 ONLY $1.40

"LEARN ELECTRONICS AND END UP WITH A USEFUL PIECE OF TEST GEAR IN THE END"

DP2010 kit Cat. KJ7010 ONLY $45

SPECIFICATIONS

Function	f.s.d.	Resolution	Accuracy	Protection
Volts (d.c.)	2V	1mV	1%±1 digit	500V for
	20V	10mV	1%±1 digit	one minute
	200V	100mV	1%±1 digit	
	500V	1V	1%±1 digit	
Current (d.c.)	2mA	1uA	1%±1 digit	1A/250V
	20mA	10uA	1%±1 digit	
	200mA	100uA	3%±1 digit	
	2000mA	1mA	5%±1 digit	
Volts (a.c.)	2V	1mV	2%±5 digit	500V for
	20V	10mV	2%±5 digit	one minute
	200V	100mV	2%±5 digit	
	500V	1V	2%±5 digit	
Current (a.c.)	2mA	1uA	2%±5 digit	1A/250V
	20mA	10uA	2%±5 digit	
	200mA	100uA	4%±5 digit	
	2000mA	1mA	7%±5 digit	
Resistance	2K	1	1%±1 digit	260V
	20K	10	1%±1 digit	r.m.s.
	200K	100	1%±1 digit	
	2000K	1K	1%±1 digit	
Diode Test	2V	1mV	1%±1 digit	260V r.m.s

AC VOLTAGE AND CURRENT RANGES
When 33s select a.c. functions the output from either the voltage attenuator or current shunts is fed through C1 to remove any d.c. component.

AMAZING VALUE

$39.95

BBD EFFECTS BOX

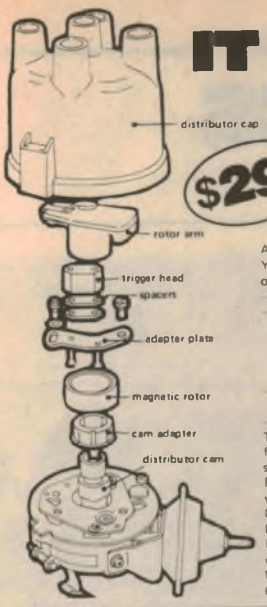
Fantastic low-cost instrument using the versatile MN3001 Bucket-Brigade Delay Line to achieve brilliant sonic effects. Now you can emulate the commercial rock groups with Phasing, Flanging' Reverb and Echo. The Jaycar kit includes all components INCLUDING IC sockets and the TU-04 box. (Not cut down but this is easily done). Jaycar has a specially built cabinet for this kit with all holes pre punched etc., at only $10 extra but only if you buy the original kit from us. Available as a separate item for $29.50 WHEN THE KIT IS PURCHASED WITH THE DE-LUXE CASE THE TU-04 CASE WILL NOT BE SUPPLIED

Special cabinet to suit $10.00
Cat. HB6445

COMPLETE KIT

Cat. KE1522
$79.00

IT HAD TO HAPPEN



$29.95

PLEASE NOTE
this system must be used in conjunction with an electronic ignition. The Hall Effect device will not switch enough current to replace the contact breaker points on their own!

JAYCAR
125 YORK ST. HAS CLOSED – WE ARE NOW TRADING AT 117 YORK ST.
OUR TELEPHONE NUMBER REMAINS UNCHANGED
(02) 264 6688

A professionally engineered electronic ("breakerless") contact breaker system
Yes, only Jaycar has a complete Hall effect triggerhead assembly designed to adapt to an extensive number of cars. Each kit contains the following:
- HALL EFFECT TRIGGER HEAD
- MAGNETIC ROTORS FOR BOTH 4 & 6 CYLINDER CARS
- OVER 6 CAM LOBE ADAPTORS
- OVER A DOZEN DIFFERENT ADAPTOR PLATES FOR YOUR PARTICULAR DISTRIBUTOR
- OTHER HARDWARE (i.e. SCREWS etc.)
- YOU CAN REMOVE THIS SYSTEM AND RE-EQUIP YOUR CAR WITH THE ORIGINAL BREAKER POINTS WHEN YOU SELL THE CAR!
- AS EASY TO INSTALL AS A SET OF POINTS!
- INSTRUCTIONS (SIMPLE TO FOLLOW) INCLUDED!

This set is designed to fit most European and Japanese cars. In fact it will also fit many Australian cars fitted with Lucas, Bosch, Motorcraft, AC Delco or Autolite electrics. If you wish to check first, please send SAE for car distributor list.
Because we have no way of knowing, you get the fitting set for ALL of the distributors available. Basically you end up with a jar full of parts that you don't need to use! (Perhaps for your next car?)
Quite frankly, we are amazed that we can supply such a comprehensive kit for this price. To produce a kit that will adapt to the dozens of different distributors around is amazing!
Remember, once you have installed a breakerless system it will never wear out and that part of your system will remain in tune FOR EVER.
We expect this kit to sell well. To ensure that you receive one, check with us early!
Cat. KJ6655

DIGITAL CAPACITANCE METER $74.50

Ref: EA March 1982
Accurately measure capacitance from 1pF to 19.99uF. A must for the serious enthusiast.
Cat. KA-1420

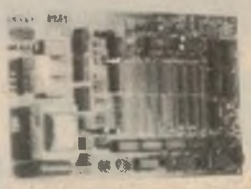
Digital Thermometer

Ref: EA Feb 1982
0 – 100 degrees with 0.1 degree resolution. Bright, easy to read display. Kit includes two sensors.
Cat. KA-1404

VALUE **$74.50**

ETI 644 direct connect modem

Ref: ETI October 1982



Two models (i) Short form which contains ALL PCB components as specified by ETI (BEWARE!!). The genuine ETI PCB with plated-thru holes, solder mask and component overlay is supplied. We also supply at NO EXTRA CHARGE a full set of quality IC sockets. A must with plated-thru PCB's. – Remember this when making comparisons (ii) Full kit. Includes: all of the above plus 12V plug-pack, case, front panel, switch and LED bezel and Cannon DB-25 RS-232 connector. Makes a complete stand alone modem.
*Capable of a range of Answer/Originate operating modes * Selectable Baud rate * Software controlled. * Uses new patented technique * More reliable and faster than most acoustic modems. Arlec transformer as used in this project only $22.00

"NEW UPGRADED MODEL FEATURING THE LATEST IMPROVEMENTS AND MODIFICATIONS"

SHORTFORM KIT Cat. KE-4600 **$169**

VIDEO ENHANCER *NEW*

Ref: EA Oct 1983
Get improved performance from your VCR
Cat. KE-7016 $35.00

ONLY $35

TV Crosshatch/Dot Hatch Generator

Ref: EA Nov. 1983
Great new version of this handy piece of test gear. Now you can generate Crosshatch, Dots and Blank (white) video signals. This is handy for TV/Video alignment.
Cat. KA-1530 Basic (short form) kit inc. Jiffy box ONLY $24.95
Cat. LT-3800 Video Modulator to suit $8.95
Power Supply to suit $9.95

ONLY $24.95

STEREO SYNTHESIZER

NEW ECONOMY SHORT FORM KIT

$11.95

All parts necessary to construct this project to PCB stage (Please note that plug pack and case are extra).
A great project for the Stereo Hi Fi lovers. Turns mono sound into realistic "stereo"
Cat. KA-1510

Function Generator

Ref: EA April 1982

$99

"Pigeon Pair" companion to the new 500MHz DFM. Low distortion generator of sine, square and triangular waveforms. From below 20Hz to over 160kHz. Inbuilt 4 digit frequency counter in de-luxe case.
JAYCAR EXCLUSIVE – 1% 50ppm metal film resistors used for stability
Cat. KA-1428

Cat. KA1428

500MHz Digital Frequency Period Meter

REF: EA Dec '81 – Feb '82

NOW BACK IN STOCK! The best version of this kit in Australia is now back in stock. Why settle for an inferior kit at the same price as ours? Cat. KA-1390

500MHz option only $26 extra
50MHz Version $119

ONLY $119

Tilting Bail to suit ONLY $4.95

Other people may appear to be selling this kit for less. But you GET less!!! Exclusive Jaycar features:
* Heavy gauge front panel. Pre-punched, and silkscreened. (NOT Scotchcal). * Low aging rate 10.000 MHz crystal * Quality IC sockets provided (A MUST) * All metal film resistors used (1% 50ppm) *Therm alloy heatsink for +5V regulator.
Beware of advertised units that do not conform to the original design. They may have inferior performance.

THE BEST QUALITY KIT VERSION OF THIS PROJECT IN AUSTRALIA

SUBWOOFER SYSTEM SPECIAL SAVE

NOVEMBER ONLY
BUY THE FANTASTIC EA DESIGNED SUBWOOFER ENCLOSURE AND SPEAKER AND SAVE A FORTUNE! (Ref: EA Aug '82)

NB. The photo shows the prototype which was finished in white. The production units are only available in black

SPEAKER (Cat. AS-3250) NORMALLY $79.00
CABINET (Cat. KA-1454) NORMALLY $79.00
TOTAL $158.00
SAVE $28 IN NOVEMBER PAY ONLY $130.00 (freight $12 extra)

Jaycar

Incorporating ELECTRONIC AGENCIES

SYDNEY SHOWROOMS
117 YORK STREET PHONE: (02) 264 6688 and (02) 267 1614 TELEX: 72293
CARLINGFORD
Cnr. CARLINGFORD & PENNANT HILLS ROAD PHONE: (02) 872 4444
CONCORD
115 – 117 PARRAMATTA ROAD PHONE: (02) 745 3077
HURSTVILLE 121 FOREST ROAD PHONE: (02) 570 7000

NUMBER 1 FOR KITS

POST AND PACKING CHARGES

$5 – $9.99 ($1.50)	$10 – $24.99 ($3.20)
$25 – $49.99 ($4.50)	$50 – $99.99 ($6.50)
$100 – $198 ($8.00)	Over $199 ($10)

"Free INSURANCE for Road & Registered Post over $200"
All heavy or bulky items (over 20kg) sent Comet Road Freight $12.00 anywhere in Australia
SHOP HOURS CARLINGFORD, CONCORD & HURSTVILLE
Mon – Fri 9am – 5.30pm. Sat – 9am – 12pm. Thurs night 8.30pm
SHOP HOURS SYDNEY
Mon – Fri 8.30am – 5.30pm. Sat – 8.30am – 12pm. Thurs night 8.30pm
MAIL ORDERS AND CORRESPONDENCE: BOX K 39 HAYMARKET, SYDNEY 2000

Mail Order By
BANKCARD
Via Your Phone

Telarc, Delos Audiophile albums available in CD

During a recent visit to the USA, Clive Purcell of P.C. Stereo Pty Ltd of Brisbane was able to secure from Telarc and Delos of an increased quota of compact discs for Australia, plus some interesting background information on CD production from Studer and Sanyo.

The Telarc and Delos labels are well known in the Australian audiophile record market, mainly because of the activities of P.C. Stereo, who have been handling their digitally sourced analog discs for several years. Indeed, a substantial proportion of their catalog releases have been reviewed in the Record columns of this magazine – for the most part very favourably.

Both companies have their roots firmly in the audiophile market. In a recently published interview, Jack Renner, recording engineer and part-owner of Telarc, said that he had been in the recording game for 20 years or more, for much of the time with a small independent company called Advent Records. There he had tended to specialise in recording chamber groups, organ recitals and church choirs, normally for local distribution.

Faced with a challenge to get into the audiophile record business at a serious level to "go really commercial", Jack Renner and his producer/partner Bob Woods realised that they needed a new company image and a new name that would be more distinctive than Advent.

At the time, Sheffield Labs were making a big impression upon audiophiles with their special-interest direct-cut recordings. To Renner and Woods, it seemed like a good idea to follow that course but to offer albums featuring traditional classics. So they settled for the name Telarc and launched into the new venture with what was probably the first modern direct-cut disc featuring a full symphony orchestra: "Direct from Cleveland" with the Cleveland orchestra under Lorin Maazel.

They followed it up with a classical organ recording: Telarc DD2 5036 – Michael Murray Playing the Great Organ in the Methuen Memorial Music Hall featuring works by Widor, Vierne, Dupre, Karg-Elert, Marcello. Neither album made anyone a fortune but they did draw attention to the new label.

For Renner and Wood, however, the two albums served mainly to emphasise the considerable problems of the direct-cut method, particularly with a large orchestra involved. Over and above the tensions of a once-only performance, there was no opportunity to edit their way around a problem or to re-cut a questionable lacquer. So they backed away from the Sheffield philosophy and settled for digital tape mastering which, they felt, would give them the flexibility they needed, hopefully without any perceptible loss of quality.

Along with the decision to go digital, Renner and Wood adopted two other conventions in their approach to audiophile recording sessions:

- Reliance on three top-quality Schoeps omni-directional microphones in preference to either American-style multi-miking or the crossed pair beloved by the British.
- The use of a Soundstream digital recorder which Renner maintains has better supersonic filtering than other makes. Repeated tests in monitoring situations, Renner says, have defied efforts by even keen observers to pick the difference between direct and off-the-tape signals.

Telarc claim that, as a result of these policies, they now have a reputation, a product and a library of digital master tapes that must give them a flying start into the era of compact disc. At present, demand far exceeds supply, which accounts for the strictly rationed shipments that have reached Australia.

But the situation is improving, as evidenced by the build-up of titles in the most recent literature from P.C. Stereo.

However, Telarc have no intention of pursuing compact discs to the exclusion of conventional audiophile pressings. They recognise the enormous commitment to present-day technology and are hopeful that further refinement may be possible. (An example would be the new Teldec process of producing master recordings by engraving directly into metal.)

According to Clive Purcell, both Telarc and Delos use a Studer Digital Frequency Converter to change the signal as recorded in the studio on a Soundstream (or other) system into a format to suit the compact disc. In particular, the sampling frequency of a Soundstream mastering system is given as 50,000 per second (50kHz) compared with 44.1kHz for compact disc. The signal obviously needs to be re-recorded.

It raises the whole question as to how it is possible to change the sampling frequency, when transferring from one digital format to another, without seriously compromising the integrity of the signal.

A seemingly obvious method would be to convert the Soundstream (or other) digital signal back into analog form by means of a normal D/A (digital/analog) converter, then to re-encode the analog signal at the new sampling rate with an A/D converter. Such a system would undoubtedly work but at the risk of reintroducing noise and distortion which the digital system is supposed to avoid.

A somewhat parallel problem arises with standards conversion for television pictures, as when American TV images are beamed to Australia (or vice versa) for local transmission. What starts out as 525-line 60-frame picture has to appear on our screens as a 625-line 50-frame image, with a different colour encoding system as an added complication!

At one stage, the only practical way of effecting television standards conversion was to display the incoming picture on a monitor and then re-shoot it with a local-standard video camera. The end result was usually quite poor.

Since then, electronic standards converters of one kind and another have been devised which obviate dependence on optical processes. Typically, the incoming signal is sampled and fed into a shift register. There it is progressively accessed and analysed to secure video information from which a new TV image can be reconstituted conforming to the local transmission standard. The end result can be eminently satisfactory.

The Studer PCM SFC 16 2-Channel Sampling Frequency Converter performs a similar function in the field of digital audio. A product of Studer International AG, it is claimed to be the first sampling frequency converter in the professional marketplace. According to the manufacturers:

"It is based on novel concepts in digital filtering, clock processing and digital control developed at Studer. It permits the free conversion between arbitrary digital audio formats and sampling frequencies.

"It can be used to increase or decrease the sampling frequency of a digital audio signal" . . . and . . . "covers the whole range of today's digital audio sampling frequencies, from 30 to 52kHz.

"The SFC 16 accepts ratios of sampling frequencies which can be: simple and constant, such as 32:48 (ie 2:3); complex and constant, such as 44.1:48 (ie 147:160); nominally simple but fluctuating slightly, as in the case of digital audio products which are not mutually synchronised.

"Since it adapts itself to the clock signals, the SFC 16 does not require any programming to a specific application or ratio of sampling frequencies. Its front panel accordingly displays a single 'Power' key."

Exactly how the SFC 16 works is not clear from the available literature. It would appear, however, that it examines

Continued on page 42

THAT CD PLAYERS can be used in the family car is evidenced by this unit recently demonstrated by Mitsubishi and scheduled for release on the Australian market during 1984. In practice, records with a high dynamic range may pose a problem because of the frequently high noise level in the average car.

DON'T BE CONNED!

before buying elsewhere you could save a fortune by using Dick's "DON'T BE CONNED" checklist!

9 band DUAL CONVERSION Receiver

Especially for the short wave listener!

Want a short wave receiver – but the budget doesn't quite stretch to a communications receiver? Try this for size. It's tiny – but boy does it pack a punch! AM, FM plus short wave bands for maximum short wave listening enjoyment.

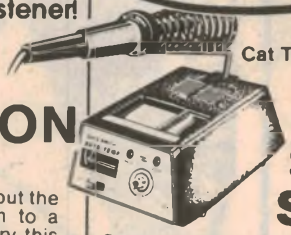
- All the international S/W bands: 13, 16, 19, 25, 31, 41 & 49 metres.
- Superb reproduction from its 70mm speaker with 500mW output.
- Dual conversion circuitry
- internal battery or external adaptor power.

Cat D-2837

All this for ONLY $119.00

Complete with cloth pouch and earphone

A PRO SOLDER STATION AT A HOBBYISTS' PRICE!



Cat T-2000

Dick Smith **SOLDER STATION**

Serious about soldering? Do it the right way—with a temperature controlled soldering iron! Dick Smith Auto Temp!

- **Fully variable temperature control (approx 200C to 500 C!)**
- **Lightweight iron**
- **Instruction manual**
- **Full Energy Authority approval!**

$69

FREE Tip of your choice—this month only! WORTH $3.20

Look at Dick's price for a CB 40 CH.

A full 40 channel set—yet it measures just 106mm (W) X 35mm (H) X 173mm (D). It's the smallest we've ever seen! So easy to use ....an ideal CB for anyone. **Cat D-1443**

- **Full legal power output**
- **huge LED digital channel readout**

ONLY $89.50

SCOOP PURCHASE

QUALITY **PHILIPS Car Speakers**

Twin cone for really thrilling sound! 4 ohms impedance and 20W rating. $40? No! $30? No! Thanks to a very special deal, our crazy price is just

$9.95 AMAZING! Cat A-6988

DICK SMITH PUBLICATIONS BOOK VALUE that can't be found elsewhere

Want Marine Radio facts?

Dick's Book tells it all!

The Australian Marine Radio Handbook...all the facts and figures for fitting and using a marine radio. Cat B-9604

ALL FOR ONLY **$12.95**

ALL THE DATA YOU'RE LIKELY TO NEED!

AUSTRALIAN SEMICONDUCTOR HANDBOOK

Murphy's law says you can never find the information you need. Murphy was wrong! This great book contains data, suggested circuits & new information on an enormous variety of commonly-used devices. Written just for Australia—written just for you!

AMAZING VALUE AT Cat B-4200 **$7.95**

LINEAR HANDBOOK

All you need to know about National Semiconductor 'uA' series linear ICs!

both $6.00 Vol. 1 Cat B-4019 Vol. 2 Cat B-4020

MOS MEMORY

Data book of Fairchild's MOS Memory LSI & VLSI devices! Cat B-4023

ONLY $5.95

DICK'S BOOKS ARE GOOD ENOUGH TO GO TO BED WITH—AND THE VALUE IS A DREAM COME TRUE!

Wow! Dick's quality-made DIE CAST Aluminium boxes

Precision die-cast boxes DON'T have to be expensive! Here's proof! Channelled walls make these boxes ideal for PCB work (RF circuits, too). Withstands heat of up to 600 C!

BUY NOW & SAVE!

SIZE			SAVE
190 x 60 x 110mm	Cat H-2201	$12.80	70c
150 x 50 x 80mm	Cat H-2206	$9.25	50c
120 x 40 x 65mm	Cat H-2211	$4.95	30c
100 x 25 x 50mm	Cat H-2221	$3.20	25c

STOCK UP NOW!

The New Callbook JUST $5.75

Cat B-2322

You receive an (almost) complete computer listing of VK/P29 callsigns issued plus SWL members of theWIA, together with many sections of data and reference material.

SAVE $329

Cat D- 2871

ON THE YAESU FT 107 DMS

Full HF/MF band coverage, of course—in all normal modes (includes FSK). A massive 240W PEP input, with features such as an RF speech processor, a variable bandwidth, super noise blanker, PLUS 12 channels of memory. Built-in 13.5V & 240V supplies.

NOW **$999**

A true masterpiece of solid state engineering! You only have to take off the cover and look inside to see the care and thought that has gone into it.

DICK SMITH Electronics

FOR A GREAT SAVING ON COMPARABLE SPEAKERS, JUST BUILD YOUR OWN!

THE DICK SMITH SERIES 200

'Just cause you haven't got as much space, why skimp on sound quality? Build these superb Dick Smith Series 200 hi-fi speakers – and you'll be amazed at the sound quality that could come from such a tiny package! And you'll be amazed at the savings make over built-up speakers! All you need is a tube of glue, some simple hand tools and a few hours – and you'll end up with speakers you'd be proud to have your friends listen to!

The Dick Smith Series 200 hi-fi speakers. They may be small – but this proves good things come in small packages

See ETI, September 1983

SPECIFICATIONS: 3-way speaker system
30 litres capacity, size 66 x 30 x 23cm
8 ohms nominal impedance
45Hz – 19KHz (-10dB)
40 watts nominal power handling

Includes:
Speaker Grill (Cat C-2608) $31.50
Enclosure Kit (Cat C-2636) $128.50
Speaker Kit (Cat C-2046) $89.50

Complete 200mm D.I.Y Speaker Kit
$249.50 per pair

Built-up speaker kits Cat A-2370 ONLY $299.00 per pair

COMPARE OUR PRICE!

VALUE!

DICK'S 15 W ECONOMY SOLDER IRON!

Mains powered! A fine tip ideal for PCB work, etc. Great soldering hints on pack! **Cat T-1310.**

VALUE! **$12.95**

LOW COST RECHARGE

GE Quality NiCad Charger!

Handles 4 AA NiCads! Great GE brand...full instructions provided!

Cat M-9520 **$8.95**

SAVE A FORTUNE ON AA Cells

Why throw those batteries away?

USE NICADS

Up to 200 re-charges! A great way to save $$! 1.2v AA size. **Cat S-3300**

$2.75 EA
10 or more **$2.45** EA

$200 OFF!

The amazingly powerful (64K RAM)

COMMODORE 64

Buy now and save a massive $200 (YES—that's nearly 30% off!). For personal or business use, it's ideal! High Res. Graphics, Music, Sound, great software options....and now, an enormous saving as well! **Cat X-6400**

~~$699~~
NOW **$499**

NEW 20MHz

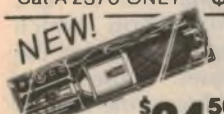
HITACHI Dual Trace CRO

Not just a good CRO....it's a great one! Top brand name with huge 20MHz bandwidth, dual traces, extra high sensitivity....it's got the lot! And all for our low, low price! (Even lower for tax-free purchasers.)

FEATURES:
- Extra high bandwidth
- Extra high sensitivity
- TV Sync separator circuit for stable TV signal observation.
- 5 display modes
- 1-touch wave form shifting

Cat Q-1243 **$699**

NEW!



THE DICK SMITH
MINI PC DRILL

It's tiny (34 x 188mm)—yet it outputs 6000RPM! Runs off 2 'C' cells...ideal for PC work, jewellery, crafts etc. 1.2mm drill inc.

$24.50
Batteries not included
Cat T-4751

RESISTORS BUY BULK & SAVE!

1/4W Metal film	1/2W Carbon film	1W Carbon film
7¢ each	6c each	9c each
100 or more	100 or more	100 or more
6¢ each	4c each	7c each

Phone/ Clock/ Radio!

All-in-one, space-saving brilliance! So convenient for bedside, kitchen, study...this fantastic unit is only the size of a conventional clock/radio! AM/FM reception; push-button phone; alarm function. Even pipe the radio into phone to entertain callers! Incredible! **Cat T-5101.**

AND JUST **$99**

DICK'S 'DON'T BE CONNED' CHECKLIST

1. Watch out for the sneaky little 'plus sales tax' message hidden somewhere in the advert. All Dick Smith's prices INCLUDE sales tax!
2. Watch out for guarantees—or lack of them! If there is one, can it be backed up? Dick Smith has a large, well equipped service centre—just in case you have any problems!
3. Watch out for fly-by-nighters. There's always someone out to make a quick buck and disappear! Dick Smith Electronics is now in its sixteenth year....you can trust Dick Smith!

See Page 98 for address details

Audio-video Electronics

The new front-loading CD300 CD player recently released by Philips. Supplied with instruction manual and demonstration disc, the CD300 is available for around $1199 from hifi suppliers.

the digital source signal and automatically sets up its input clock and filter system to increase substantially the effective sampling frequency. The extra sampling pulses so created would undoubtedly be quantised on the basis of digital signal logic rather than analog style integration.

This new, high-speed train of digital pulses is then presumably sampled by a second clock/filter system to produce output pulses of the required format.

It would appear from Studer literature, as quoted earlier, that no setting up is required by the operator. Given a certain input signal, and a certain output requirement, the SFC 16 determines the required orders of multiplication and division, sets up its own digital clocks and filters, and imposes its own logic-based decisions.

Methodology apart, Studer claim that the overall performance of the SFC 16 is commensurate with all present-day digital system requirements, with "signal degradation being significantly lower than that of a state-of-the-art A-to-D converter."

The phase response across the audio band is completely linear.

The amplitude response is level – with a maximum filter ripple of ±0.2dB – from zero to 6/7 of the sampling frequency. For example, at 44.1kHz, as for a compact disc system, the response is level to 19.3kHz, 2dB down at 20kHz and rolling off steeply thereafter.

The signal/noise ratio in either Up or Down conversion mode and referred to clipping level, is 96dB, measured at either 1kHz or 10kHz. Operated with an 18-bit output format, the figure is increased by a further 12dB.

Getting back to the actual discs, a couple of Telarc recordings submitted for review in EA carry the endorsement around the spindle area: "Technics. Made by Matsushita Electric Inc Co Ltd".

One of the Delos records is endorsed "Manufactured by CBS Sanyo." The source of the second one is not apparent but we understand that it would have been produced in Japan by Sanyo – hence the Sanyo brochure, mentioned earlier, which reached us via P.C. Stereo.

According to the brochure, Sanyo have been actively researching laser technology for audio discs since 1974. They unveiled their first experimental model in 1978; designated PCM-300, it used a 30cm diameter disc spinning at 1800rpm. This was followed by model VPD-800 in 1979 and in the following year by the DAP-800, which used a 12cm diameter disc and a constant linear velocity drive system. This paved the way for their DAD-8 CD player in 1982 and for Sanyo's further involvement in the production of CD software for the industry.

They pointed out that, in preparation for the production of a new compact disc, the original music master tape has to be re-recorded to include the variety of user-information which is unique to the format. Thanks to the digital format, this can be done without degrading the original music signal. It is this supplementary information which indicates the number of tracks on the disc, their playing times, elapsed time from the start of the disc or the start of the selection, providing the means to play tracks in any order, and to cue back to any point in the program.

Sanyo say that there is room in the existing track format to include a great deal more user information, if and when the need should arise.

As matters stand, something like 16 billion data pulses have to be etched into a track that spirals from the inside to the outside of the 12cm diameter disc – a measure of the data packing density involved.

Following preparation of the master recording tape, production of the master disc begins with the selection of a flat glass disc 20cm in diameter and 10mm thick. This is precision ground and "super polished" to obtain as flat a surface as possible. In the Sanyo factory, the surface is minutely checked with an interferometer measuring device capable of detecting undulations as small as 0.3 microns.

If it passes this test, the disc is then checked for any form of dust fouling, before being coated with a layer of photo-resist 0.1 microns thick. This, in

US court considers royalty claims

THE US SUPREME COURT has still apparently been unable to reach a decision in the so-called Betamax case, in which Hollywood interests are seeking to have a royalty surcharge added to the cost of blank video cassettes. The claim is being vigorously opposed by the electronics industry. The Court has called for more evidence from both sides but, even if it reaches a decision, the matter is unlikely to end there. Whichever side loses is expected to mount a major lobbying campaign to get its way through Congressional legislation.

EMI RECORDS IN ENGLAND has come up with what they claim to be the world's first computer game single. One side carries the pop music number "Camouflage" by Chris Sievey and the Freshies. The flip side contains the same music but is encoded with additional data: feed the signal into a Sinclair ZX81 personal computer and the lyrics appear on the screen. The side also carries a couple of video games originated by Sievey for good measure!

National get their act together

A focal point at the recent National Panasonic exhibition in Centrepoint, Sydney was this unitised home entertainment centre. All of the units which might otherwise be scattered around the living area are brought together, featuring a large rear-projection type video screen in the centre and flanked by top quality stereo loudspeakers on either side.

turn, is checked for possible unevenness using an automatic testing device known as an elipsometer, and capable of detecting differences in thickness as small as 10 A (angstrom).

Finally, the disc is positioned in what Sanyo describe as their own "original super-precision laser cutting machine which constitutes the core of the manufacture of CD software". They give no hint as to how the recording lathe achieves the required accuracy but it does have to lay down a spiral of pits so miniscule that there are 600 tracks to each millimetre of surface width or 20,000 tracks in the 33mm (approx) of signal area.

As the recording process proceeds, the photo-resist is acted upon by the laser beam which is, in turn, modulated by the signal pulses from the recording tape master. This done, the surface is photographically "developed", with the resist which has been exposed to laser light pulses being etched away. Precision plating is then used to produce a "mother" and "stampers" from which consumer pressings are made. (See our May, 1983 issue).

Cleanliness

For this whole process to be viable, Sanyo say, they have had to achieve clean room conditions in their compact disc production facility at least equal to those required for high density integrated circuit production. In fact, they claim to have achieved a standard far beyond the familiar Class 100 rating (a maximum of 100 dust particles exceeding 0.5 microns per cubic foot) "to boast an almost perfect one or two dust particles per cubic foot".

If cleanliness is an important key to successful compact disc production, Sanyo obviously have it!

YAMAHA FX-20 ORGAN

Put through its paces at the Sydney Music Show by organist Ray Thornley, this new Yamaha FX-20 electronic organ provides a bewildering array of music making facilities controlled by a no less bewildering array of push buttons. Amongst its many unusual features, the FX-20 offers touch sensitive keys, with the 200-step sensitivity gradation optimised for the voices being used. Another feature is key touch control over vibrato and a memory card system which permits instant recall of voicing. The FX-20 and the somewhat smaller FX-10 are distributed in Australia by Rose Music. In Melbourne (03) 699 2388. In Sydney (02) 750 8999.

BANKCARD HOLDERS – PHONE YOUR ORDERS TOLL FREE!

AUSTWIDE

NEXT DAY DELIVERY

ALTRONICS 008-999-007

VIA JETSERVICE
(CAPITAL CITY & SUBURBAN AREAS)

ALTRONICS • BANKCARD JETSERVICE DELIVERY NEXT DAY •

GO ANYWHERE 12-240V POWER

MASSIVE 300 WATTS

These great inverter kits enable you to power 240V appliances from a 12V DC power source. Tremendous for camping, fishing etc. Install into your Car, Boat or Caravan.

A fully regulated and overload protected design, featuring XTAL locked frequency. Use to power hi-fi, TV sets, even electric drills for short time periods.

MANY OF THESE KITS ARE NOW IN USE FOR EMERGENCY LIGHTING PURPOSES.

ALTRONICS KIT features ★ Gold plated edge connector and PCB buss ★ Low age rate XTAL ★ Sockets for all IC's ★ High Efficiency Transformer.

K6750..... (EA JUNE '82) ... **$199.50**

($10 DELIVERY AUSTRALIA WIDE)

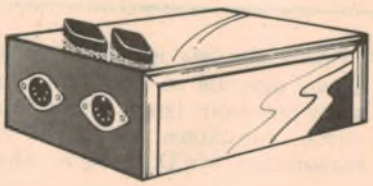
☆ TWO GREAT 40 WATT MODELS ☆

GENERAL PURPOSE

Suits small appliances, ie. Turntables, Tape Decks, Shavers etc. Variable frequency adjustment enables speed control of turntables. Works as a trickle charger when mains power is available.

EASY CONSTRUCTION ★ VALUE PLUS

K6700..... **$55.00**



FLUORESCENT LIGHTING

Operates above the audible frequency range and is capable of driving one 40 watt or two 20 watt fluorescent tubes to 150% of their normal 240V efficiency. Install permanently into caravans. **COMPLETE BOXED KIT, INCLUDING ALL WINDING WIRE.**

K6505..... **$37.50**

GENUINE FIGARO GAS SENSOR

ALCOHOL BREATH TESTER

K1583 ONLY **$29.95**

(SEE EA MAY 1983)

This Great new Kit from EA will be a smash hit with all the smashed people at your next party. Fun to build, Fun to calibrate and Fun to use. More seriously, this unit could save lives.

MICROWAVE OVEN LEAK DETECTOR

ETI PROJECT

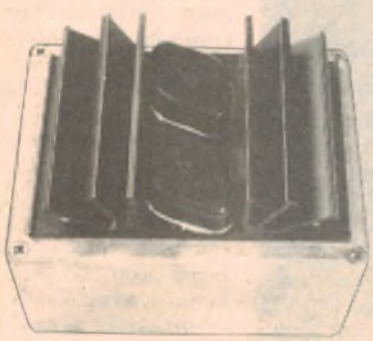
Completely passive project receives microwaves via an antenna which develops a voltage across a detector diode driving the meter.

Monitor your microwave oven with this easy to build kit. All components mount on single PCB, including the meter.

Genuine Hewlett Packard Hot Carrier Diode supplied.

K1724..... (still only) **$14.50**

TRANSISTOR ASSISTED IGNITION WITH DWELL EXTENSION



The Altronics Kit includes all components for the modifications, detailed by Electronics Australia Feb. 1983.

Yes, it's bad enough paying $2.00 a gallon for petrol without wasting a fortune on an out of tune engine. Fit this transistor assisted ignition kit in minutes and start saving money from the very next petrol stop. Easy to build!

K4010..... **$35.00**

POWER DOWN

MAINS APPLIANCE TIMER

(ETI JULY '82)

Clever new design from ETI, mains appliance is turned on at the press of a button and automatically turned off some preset time later.

Use for electric blankets, bathroom heaters, patio light. If your inclined to fall asleep while watching TV late at night — this is the kit for you.

SEC Approved Transformer ★ Screened Front Panel ★ Complete Kit as per ETI article, includes every last part.

K6265..... only **$32.50**

See EA November, 1982

POWER UP

A MUST FOR YOUR COMPUTER SYSTEM

This great new Project from EA is the answer to a Maidens Prayer.

What Does it Do?

A single 240v mains plug and lead feeds one unswitched master 240v outlet plus 4 switched 240v outlets. **With say a hi-fi system,** plug your main equipment item (e.g. Amp) into the master outlet and whenever you "switch on" your amp – presto – mains power is applied to the other 4 outlets i.e. simply "turning on" your amp turns on your tape cassette, tuner, turntable, graphic equaliser without mains spikes, plops etc.

Just the shot for your Computer System. The Altronics Kit includes case and all outlets.

K6000..... **$39.50**

• FOR DESPATCH P&P CHARGES AND ADDRESS DETAILS PLEASE REFER TO OUR AD. ON **PAGE 107** •

QUALITY VIDEO KITS

Video has been booming for quite a while, finally a range of video accessories in kit form.
Two **video amplifiers** for both VCR and Computer use, a brand new **Video Enhancer** and our popular **VCR Stereo Synthesizer.** All four represent outstanding value for money and all are assembled with **Altronic's Extra Care.**

VIDEO AMPLIFIERS

DISTRIBUTION TYPE
Simple, low-cost project will allow you to drive five video monitors from one source, such as a video cassette recorder or a computer. Great for piping video around the house, or for clubs meetings when screening lectures etd, or for computer demonstrations.

★ **THE ALTRONICS KIT** includes all components as specified by ETI **plus all** power supply components.

K5830..... Only..... **$45.00**

SINGLE OUTPUT

INVERSE AND NORMAL OUTPUT
Brilliant new kit from EA. **Super cheap** and **Super Effective.** Whilst our K5830 is suitable primarily for VCR use this video amplifier is best suited to use with computers. The EA documentation supplied is extremely well written and provides details for installation into television sets.

NO MORE SMEARY COLOURS, SIGNAL BEATS OR RF INTERFERENCE

NOTE ★ **NOT SUITABLE FOR USE WITH LIVE CHASSIS TV SETS.**

K5850..... **$14.95**

VIDEO ENHANCER

Here's a **simple** but **effective** Video Enhancer that is super **easy to build** at a fraction of the cost of commercial models.
Unit sharpens picture detail, and can actually improve the quality of a copy by amplifying the top end of the video signal.

AT LAST A VIDEO ENHANCER KIT

K5825..... **$35.00**

ENJOY THE PLEASURES OF STEREO SOUND
(See EA Sept '1982)

STEREO SYNTHESIZER FOR VCR'S AND TUNERS

Synthesize realistic stereo from virtually any monophonic source by simply connecting this unit between the source and your stereo amplifier.

★ Quality Phillips MN3001 (not second source dropout)
★ Provision for 2 different signal sources.
★ Selection of either source via front panel switch.
★ Normal or stereo sound selection.
★ Complete kit includes all hardwear, cables etc., even solar.

Important ★ beware of Kitset suppliers who sell this kit for **less** ★ you get **less!**

K5810..... **$55.00**

POWER SUPPLIES

If you're thinking of buying a power supply then buy from us, we are the experts on power supply kits and carry a supply to suit most enthusiast and professional requirements..... READ ON.

BENCH STANDARD
★ 3-30v Output @ 1 Amp.
★ Fully Regulated, Fully Protected from Thermal Overload and Short Circuits.
★ Based on EA Design.

K3200..... **$42.50**

★ All the features of above PLUS Current Limit.
★ ETI Design.

K3205..... (PICTURED)..... **$49.50**

DUAL TRACKING
★ ± 1.3 to ± 22v Output @ 2 Amps: + 5v @ 0.9 Amps.
★ Fully protected.
★ 10 turn pot enables voltage adj. to within 10mV.
★ EA Design (March '82).

K3220..... **$89.50**

HIGH CURRENT

MICROCOMPUTER PS
★ + 5 Volts @ 3 Amps. ★ + 12 Volts @ 2 Amps. − 12 Volts @ 200 milliamps.

This universal design has enough grunt to power most disk drives.

K3350..... **$59.50**

13.8 VOLTS @ 10 AMPS HAM'S & CBER'S
Save the expense of a Mains Powered Rig.

K3250..... **$89.50**

HIGH CURRENT — DUAL METERING

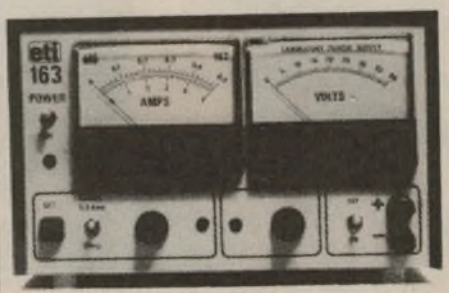
EA SWITCH MODE DESIGN
★ 2-50 Volts at massive 175 Watts.
★ CLEVER DESIGN — a fully mains isolated supply with a "Switchmode" low voltage circuit.
★ Easy to build.

K3300.. (EA MAY, JUNE '83).. **$139.00**
K3301... (10 TURN VOLTAGE CONTROL OPTION)... **$10.00**
K3302..... (± 12V OPTION) EA JULY '83..... **$12.50**

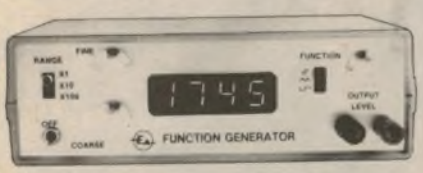
ETI SERIES REGULATOR DESIGN
★ 0-40 Volts @ 5 Amps — **thats 200 Watts.**
★ Current limiting 0-5 Amps variable.
★ Specifications Second to None.
★ Free from the hum and noise sometimes associated with other techniques.

A PROFESSIONAL SUPPLY

K3325.... (PICTURED).... **$175.00**



FUNCTION GENERATOR



The most essential piece of test gear (second only to a good multimeter) on any hobbyist's bench is some kind of audio signal generator. This design utilizes the latest circuit techniques to produce stable, low distortion waveforms.

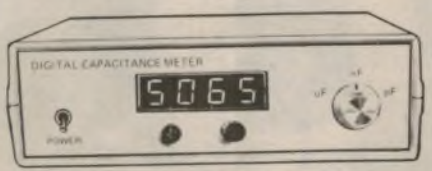
A truly versatile unit at a bargain price.

☆ 4 digit frequency readout (eliminates tiresome dial calibration) — typical accuracy ± 2% ☆ 3 overlapping ranges x1, x10, x100 ☆ 600 OHM Nominal Output — continuously variable 3MV — 2.5V P-P ☆ Distortion — sinewave : less than 0.7% @ 1KHz ☆ Linearity — triangle wave: better than 1% @ 1KHz ☆ Squarewave rise time — 6V/uz maximum output ☆ Amplitude stability — better than 0.1dB on all ranges.

With the exception of the display all components mount on a single PCB making this kit suitable for all constructors.

K2505..... **$85.00**

DIGITAL CAPACITANCE METER



NEW DELUXE FINISH
We are pleased to announce the release of the Digital Capacitance Kit housed in our Deluxe H0480 ABS Instrument Case.
This superb Test Instrument Kit now compliments our top selling Digital Frequency Counter and Function Generator Project Kit. Electronics Australia Project. Measures capacitance of both polarized and non-polarized capacitors from 1 picofarad to 99.99 microfarads in 3 ranges.
Check values of unmarked capacitors, especially those little trimmers that are never coded.
Select precise values for filters and timing networks within ease.

☆ EXCLUSIVE TO ALTRONICS ☆
Each kit includes precision measured capacitors for accurate calibration of each range.

K2521..... **$55.00**

All Altronics prices include Sales Tax.
Don't be conned by other advertisers whose seemingly low prices are plus Tax in fine print.
You could well pay up to 32½% more.

How to build a 1920's style

"Valves are dead but not forgotten" has been said of late (Sept. issue). This little gem may represent a last opportunity to bring an ancient circuit to life and at the same time gain a valuable memento of the "golden era" of the valve before it is also "forgotten".

by DAVID WHITBY

Availability

The full kit of parts for the Unidyne wireless set (not including the batteries) is available from Technicraft, 388 Katoomba Street, Katoomba, NSW 2780. Phone (047) 82 3418. Price is $79.50 plus $5 postage and packing. Spare valves and other parts are also available. Stictly limited numbers of this kit will be available.

Amid the ever increasing pace and advancement of electronics technology, there exists a growing interest in the history of radio, or "wireless" as it was then known.

The collecting and restoration of vintage receivers, components, and all manner of paraphernalia from the pioneering days has become an established hobby, with a growing number of clubs, societies, and publications being formed around the world to cater to the many enthusiasts of this relatively new area of antiquity.

The author was first bitten by the vintage radio bug whilst involved in designing up-to-the-minute and anything-but-vintage data-communications equipment in the mid 1970s.

Was it brought on by an overdose of plastic microchips, a touch of nostalgia for "the good old days", or simply a desire to find out where all "this" started? Probably all three, but it wasn't long before all sorts of strange and dusty haunts were being explored in search of crystal sets, valves, books, and innumerable other relics of the technological past.

The 1920s

The one-valve set described here came about as the result of a desire to build a set from scratch, using the circuits and techniques of the 1920s, and also as the

Wireless Set

outcome of the rescue of a fair quantity of early valves and other components from an old Melbourne warehouse before it was demolished to make way for a car park.

The wireless literature of the era shows the 1920s to have been a most active and interesting period with great technical improvements having been effected during and after the First World War and then the "coming of age" with the advent of broadcasting during the early 1920s.

There was phenomenal growth in the component and set manufacturing industry with large numbers of new firms springing up almost overnight, but with only a handful being destined to last out the decade.

The surge of public interest and intrigue at "wireless", the new wonder, has possibly not been equalled since – even by video or computers. This was truly the era of the "home brew" set, a large proportion of receivers being made at home from plans published in the numerous wireless magazines of the time. A study of the "Listener In" from 1926-27 shows that there were at least 50 separate firms (mainly in Sydney and Melbourne) supplying components, kits, and sets to a hungry radio public.

This set, whilst not intended to duplicate a particular design of the era, contains many early circuit and construction techniques and has the appearance and feel of the genuine article. It has been the UNIDYNE in keeping with the many other "DYNES" of the era (NEUTRODYNE, SOLIDYNE, INFRADYNE etc) – the name UNIDYNE was actually used on a British home constructor's set of around 1924.

As much use as possible has been made of original type materials such as a mahogany base, Bakelite panel, cotton-covered wire, spiderweb coils and early type valves.

For those who have an interest in the pioneering days, building this set will provide hands-on experience in such skills as the ancient art of spiderweb coil winding, variometer tuning, leaky grid detection, "A" and "B" batteries and swinging coil reaction control – all essential knowledge for the vintage radio buff.

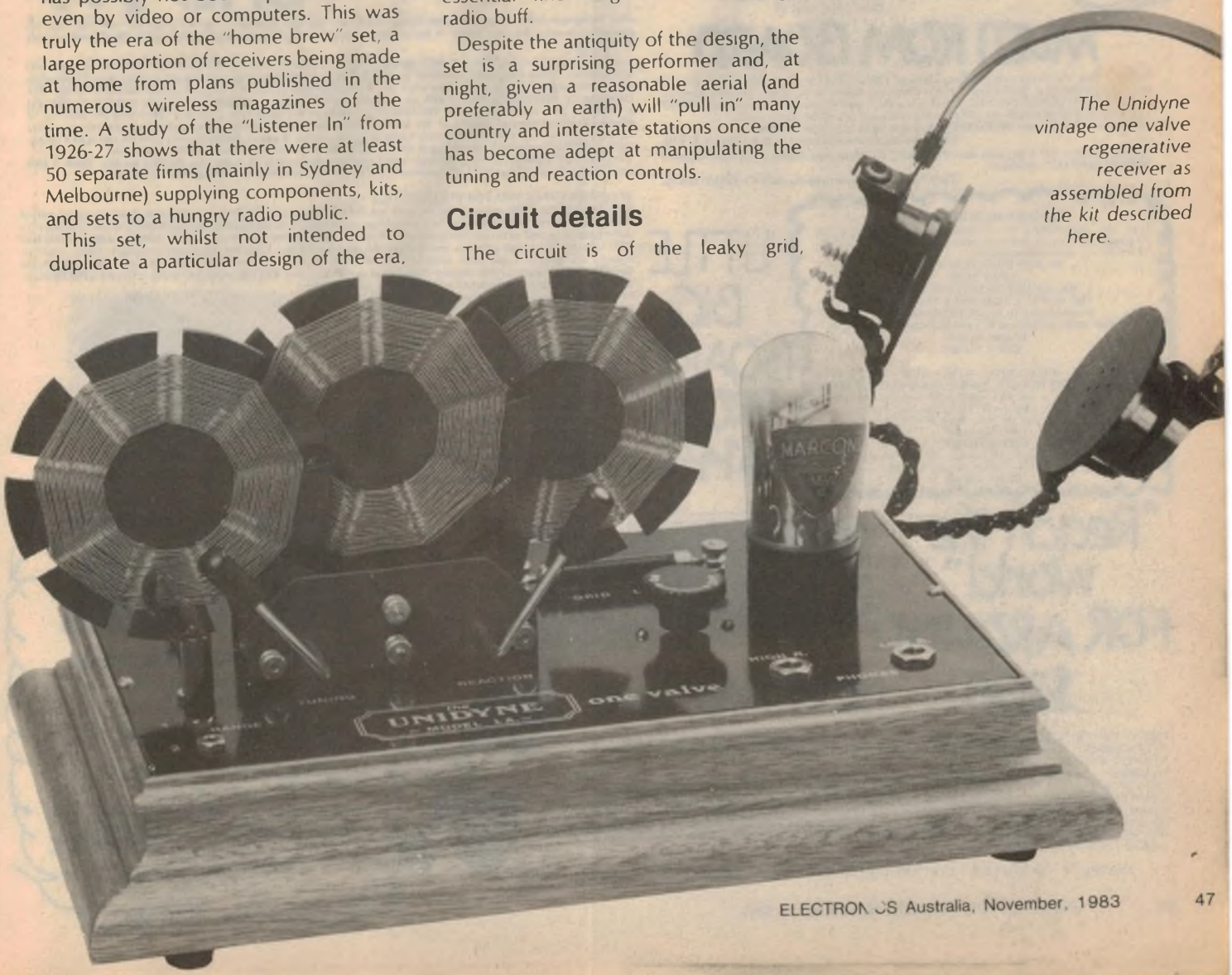
Despite the antiquity of the design, the set is a surprising performer and, at night, given a reasonable aerial (and preferably an earth) will "pull in" many country and interstate stations once one has become adept at manipulating the tuning and reaction controls.

Circuit details

The circuit is of the leaky grid, regenerative detector type, built around a single battery operated triode valve. Two valves are supplied with each kit. The one pictured is a Marconi type 210LF, which has a British 4-pin base and a 2V filament. The spare valve is a type VT50 (RAF number) which has the same base and filament but a smaller less bulbous envelope.

Filament current is supplied by two D-cells mounted in holders under the panel and the valve plate supply (B battery) is 45 volts made up of five No 216 (or P1) 9V batteries mounted in a specially made holder also under the panel. Output is into headphones, and an old type (pictured) is supplied with the kit. An output transformer is also provided so that either high impedance type (1-4kΩ) or low impedance type, such as modern stereo phones, may be used.

The regenerative one valve set was usually the next step up from the ultra simple and ever-popular crystal set and, although more expensive to build and operate, provided far greater reception range, selectivity, and volume, and all



The Unidyne vintage one valve regenerative receiver as assembled from the kit described here.

NEW STORE

172 LIVERPOOL ROAD, ENFIELD
Phone: (02) 745 2122

DON'T FORGET WE ARE PROBABLY THE LARGEST SELLER OF IC'S, COMPONENTS, IDC CONNECTORS, ALTRONICS KITS ETC. IN SYDNEY

AVTEK in the heart of "SILICON ALLEY"

bankcard

S-100 SOCKETS
High quality, gold plated
$6.95 ea or 10 for $65

NEW CPU SERIES	
6502	$11.95
6521	$9.95
6522	$10.95
6532	$16.95
6545-1	$19.95
6551	$17.50
6802	$9.50
6821	$4.75
6840	$10.95
6845	$16.95
6850	$4.95
Z80A CPU	$5.00 | $4.50
Z80A PIO	$5.00 | $4.50
Z80A CTC	$5.00 | $4.50
Z80A DMA	$19.95

A NEW KIT MICROBEE MULTIPROM INTERFACE BOARD ONLY $99

The Multiprom board is an extension of the Microbees memory in ROM. It simply plugs into the fifty way bus expansion port on the core board. It fits either neatly inside the Microbee or behind it, using the Microbee's own power supply.

The board takes the EDASM and NET eprom normally residing inside the Microbee, but allows several different sets to fit in: Editor-Assembler, Wordbee, Logo, MiniPascal, Networkrom, Bemon or your own program. It has room for 4 sets of eproms in the EDASM location and 3 sets of eproms in the NET location, a total of 44K of eprom. The board can be simply daisy chained with up to 6 slave boards (using an outside power supply in this case), allowing a maximum total of 308K in ROM. The EDASM locations accept either type 2532 or 2764 eproms and they can be mixed. Another powerful feature of the board is the input/output system. 11 outputs, open collector transistor driven. Each can turn ON or OFF a relay under program control. 8 inputs, buffered and protected can read 8 switch status – ideal for computer controlling of model trains, alarm systems, tape recorders, machinery etc.
The Avtek kit includes a plated through board plus all components to make this exciting project. There is also provision on the board to change the address of the ports used for eprom selection and input/output.

MULTI ROM BOARD

XM-1 – This is a totally new product developed EXCLUSIVELY for AVTEK – It takes two sets of EPROMs (e.g. WORDBEE and EDASM) and allows you to choose between them by simple KEYBOARD COMMANDS. It will take a short time to assemble and is simply installed inside the MICROBEE with one DIP plug (supplied) and two solder connections.
XM-1 – suits early model MICROBEE plus models using 2532 type EPROMs
These have serial numbers starting with 8 – ONLY $19.95
XM-2 – same as XM-1 but suits the 'MICROBEE IC' and is even simpler to fit. Also responds to PAK1 and PAK2 commands
These have serial number starting with 9 – ONLY $16.95

ATTENTION MICROBEE OWNERS
Have you ever wanted to do some experimenting with the Expansion Connector but have been unable to find a supplier of the 50 way transition connector.
WE NOW HAVE IT IN STOCK!
ONLY $8.95
IDC SOCKET TO SUIT ONLY $8.95
IDC 50 WAY CABLE ONLY $5.25 metre
We also have a 16 to 32K EXPANSION KIT available which includes all IC's and IC sockets. Takes about 30 minutes to fit
ONLY $85.00

KITS – KITS – KITS – KITS – KITS – KITS – KITS – KITS
MICROBEE LIGHT PEN KIT – see ETI Aug 1983 ONLY $19.50
RTTY DECODER – See ETI April 1983- includes connectors, case and front panel - display RTTY encoded messages on your Video Monitor. Plugs into the MicroBee's IN/OUT port
ONLY $19.50
MICROBEE EPROM PROGRAMMER – See ETI Jan 1983. Includes case, front panel, ZIF socket and one blank EPROM. Unit simply plugs into the I/O port on your MicroBee
ONLY $55.00

LITTLE BIG BOARD FROM $149

SEE ETI OCTOBER 1983 FOR FULL DETAILS
The Pulsar Series 6000 microcomputer card has been designed to provide a cost-effective general purpose central processor that will find application in a wide range of systems, from stand-alone and dedicated control processors to multi-processing and network configurations. While the 6000 Series is fully compatible with the industry standard STD bus, attention was given to partitioning the circuit so that a complete disc-based computer system could be constructed using just one card. Included on the board is: Z80A processor operating at a full 4MHz, 64Kbytes dynamic RAM, single/double density floppy disc controller, two RS232C serial I/O ports, 2Kbytes EPROM bootstrap monitor and battery-backed real-time clock and calendar.
Interfacing to the STD bus allows systems to include modules from a range of over 1800 cards available from some 80 manufacturers.
Card Includes
– Power-on automatic bootstrap to CP/M system in on-board EPROM
– Real time clock chip with battery backed supply
Bus Interface
– All signals meet STD Bus electrical specs
External Connections
– 50 way edge connector provided for 8" floppy disc connections
– 16 pin RS232C for terminal connection
– 16 pin RS232C for printer connection
FULL KIT – PHONE FOR FINAL PRICE
PCB – MANUAL & ROM ONLY $149.00

"Reach the World" FOR AROUND $200

NEW MODEM

THIS IS THE PRE-RELEASE INFORMATION ON A BRAND NEW MODEM KIT THAT IS DUE FOR RELEASE IN NOVEMBER – THIS KIT WILL 'KILL' ALL OTHER KITS AVAILABLE IN IT'S TOTAL COMMUNICATION WITH THE WORLD... READ ON
Modulation – Frequency shift keying. Digital Interface – RS 232C. Auto answer and disconnect. Data communication to basic Bell or CCITT specifications giving a world data communications capability. Operates with your normal phone. 300BPS or 1200 BPS with backward channel 75 BPS. Indicators and test switch. Auto answer or manual connect. Backward channel standard on 1200 BPS mode. Direct connection, inbuilt line isolation unit. Operates in the following modes: – Bell 103 originate 300 BPS. Bell 103 answer 300 BPS. Bell 202 equalised 1200 BPS. Bell 202 1200 BPS. CCITT V23 mode 2 equalised 1200 BPS. CCITT V23 mode 2 1200 BPS. CCITT V21 originate 300 BPS and CCITT V21 answer 300 BPS.
AND IT'S COMING SOON!
THE PRICE? AROUND $200 – THAT'S HUNDREDS LESS THAN THE NEAREST EQUIVALENT!

AVTEK

(ELECTRONICS) Pty. Ltd.

TWO GREAT LOCATIONS
119 YORK STREET, SYDNEY 2000
PHONE: (02) 267 8777
(Above Charlie Browns Place)
172 LIVERPOOL ROAD (HUME HIGHWAY), ENFIELD
PHONE: (02) 745 2122
All Correspondence to:
P.O. BOX Q302, QUEEN VICTORIA BUILDING, SYDNEY 2000

POST AND PACKING
Divide the value of your order by 20 (5%) to get post and packing value and then add $2.00 – it's that simple!
All Bankcard orders can only be sent to a normal address (NOT a P.O. Box). All Bankcard orders will be sent by registered mail (add $3 to P&P charges).
ENFIELD OPEN ON SUNDAY

How to build a 1920's style Wireless Set

without the gigantic aerial system necessary for the crystal set.

The circuit diagram is shown in Fig. 1. Signals picked up by the aerial are fed via C1 to the tuning circuit consisting of L1, L2 and C2, C3. Tuning is carried out by varying the inductance of the L1, L2 combination. Inductors L1 and L2 are identical flat radially wound "spiderweb coils" connected in opposition so that as their relative mechanical coupling is varied there is more (when close coupled) or less (when loosely coupled) cancellation of the equal and antiphase inductances.

Known as "variometer" tuning, this system was popular in various forms in the early days but soon gave way to the fixed inductance/variable capacitor system which is still used today. In order to cover the entire broadcast band two plug-selectable fixed capacitors (C2, C3) are provided.

The signal selected by the tuning circuit is detected by the grid of the valve, the detection system being known as "leaky grid" or "cumulative grid" detection.

In simple terms the grid/filament combination of the valve may be looked upon as a diode, with the triode concept of the valve ignored for the moment. On positive half cycles of the incoming signal the diode conducts, current flows through R1, a voltage is developed across R1, and C4 is charged to this voltage. The polarity of this charge is negative towards the grid and positive towards the filament.

On the following negative half cycle the diode does not conduct, but the grid is held negative by the charge on C4 which, however, commences to "leak" away through R1. If the next positive half cycle is weaker than the previous one, the voltage across C4 will continue to fall. If it is stronger the C4 voltage will rise. The time constant for R1/C4 is so chosen that it is just short enough to allow the charge on C4 to follow the highest modulation frequencies.

Thus the grid is made more or less negative, with respect to the filament, in accordance with the changes in RF signal which represent the audio modulation, ie, the grid is being varied at audio frequency. These grid variations are amplified by the valve's triode action, and appear as much stronger signals in the plate circuit.

Regeneration

At the same time, the RF signal applied to the grid is also amplified and appears as a stronger signal in the plate circuit. The secret of the high amplification of these simple sets lies in the use of regeneration or "reaction" as it was often called. This involves the coupling back of some of the amplified RF signal into the tuning circuit in such a way as to add to or assist the original signal (positive feedback). This increases the sensitivity and selectivity and makes long distance reception possible with simple circuitry.

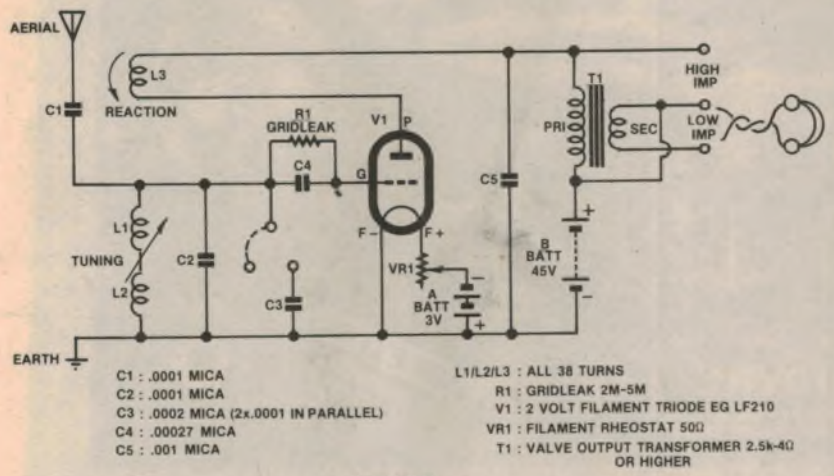


Fig. 1 UNIDYNE

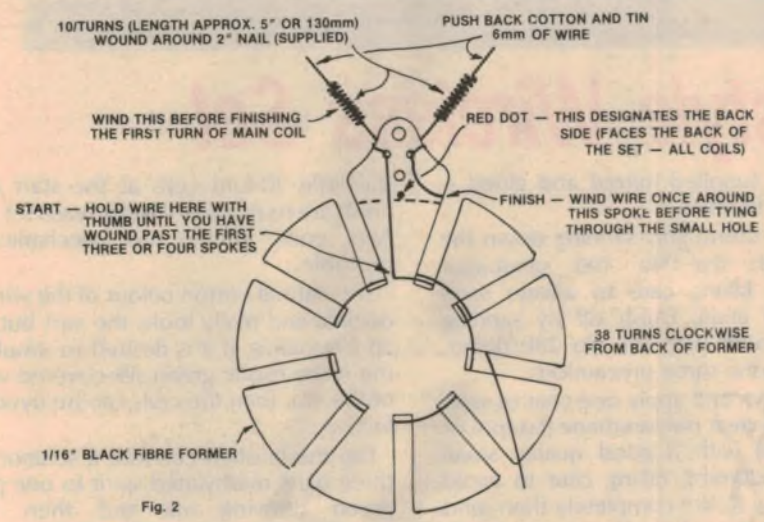


Fig. 2

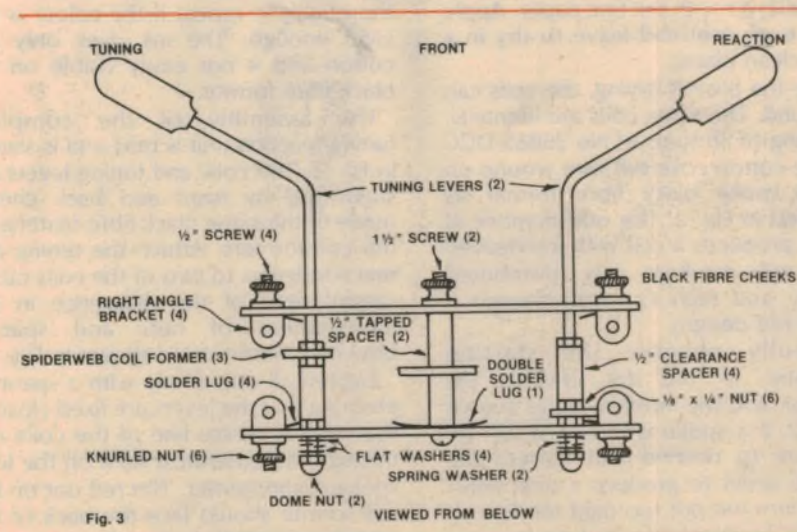


Fig. 3

How to build a 1920's style Wireless Set

Regeneration is accomplished in this case by a third spiderweb coil connected in the plate circuit and arranged with variable mechanical coupling to the other coils to enable the amount of regeneration to be precisely controlled. In use the reaction coupling is increased until the set is just short of the point of oscillation, or howling, and it is at this point that the receiver is in its most sensitive and selective condition.

Capacitor C5 serves to bypass the RF component which would otherwise tend to be blocked by the impedance of the headphone circuit. In severe cases this could prevent proper functioning of the regeneration circuit.

Transformer T1 is a 2500Ω–3.5Ω standard valve audio output transformer. On/Off control is provided by the filament rheostat RV1 which disconnects the filament supply in its anticlockwise position thus also cutting off the B battery current which flows due to filament emission.

Construction

Assembly and wiring is best carried out with the panel mounted into the wooden base. Therefore the first job to be done is to prepare and finish the base. This is made from a special Philippine mahogany moulding (similar to a picture frame moulding) which in the kit is supplied mitred and glued – ready for finishing.

Start by thoroughly sanding down the base with the No 100 sandpaper provided, taking care to always sand along the grain. Finish off by sanding super smooth with the No 280 paper, observing the same precautions.

Dust down and apply one coat of satin (not gloss) clear polyurethane (Estapol or equivalent) with a good quality small brush (12-20mm), taking care to avoid runs. Allow to dry completely then sand lightly all over with the fine paper. Apply a final even coat and leave to dry in a warm, clean place.

While the base is drying, the coils can be wound. The three coils are identical, consisting of 38 turns of No 26B&S DCC (double cotton covered) wire wound on a nine spoke black fibre former as illustrated in Fig. 2. The odd number of spokes produces a coil with interleaved turns and resultant low distributed capacity and high Q (even though a 70-year-old design).

Carefully observe the starting procedure, ie, red dot towards the operator, and the interleaving as shown in Fig. 2. If a spoke is missed it will be necessary to unwind and correct the error. In order to produce a neat finish keep a firm but not too tight tension on the wire. Terminate the coil as shown – the little 10-turn coils at the start and finish are to provide flexible leads for the two coils which are mechanically movable.

The natural cotton colour of the wire is original and really looks the part but, as an alternative, if it is desired to simulate the more exotic green silk-covered wire of the era, then the coils can be dyed as follows:

Dip the finished coil into a solution of three parts methylated spirit to one part green drawing ink and then dry thoroughly – repeat if the colour is not vivid enough. The ink dyes only the cotton and is not easily visible on the black fibre former.

The assembly of the complete tuning/reaction unit is next and is shown in Fig. 3. The coils and tuning levers are supported by front and back cheeks made of the same black fibre material as the coil formers. Attach the tuning and reaction levers to two of the coils taking careful note of the difference in the arrangement of nuts and spacers between these two as shown in Fig. 3.

Tighten all nuts firmly with a spanner, ensuring that the levers are fixed close to the vertical centre line of the coils and through the outermost hole on the long spoke of the former. The red dot on the coil former should face the back of the tuning unit on all three coils.

WE'RE No.1 FOR NEW PRODUCTS TOO!

NEW WELLER CONTROLLED TEMPERATURE DESOLDERING TOOL

FITS WTCP WELLER IRONS

Only $39.50

This unit allows you to use your Weller WTCP Soldering Iron to safely desolder temperature sensitive components. (Soldering iron NOT included)
Cat. TS-1510 $39.50

Horwood Instrument Cases

WE'VE GOT THE EDGE!

Quality Australian made cabinets. Aluminium and Marviplate construction with handles.

Cat. No.	Description	1–9
HE-1452	84/6V 203(D) x 102(H) x 153(W)	$18.50
HE-1454	84/8V 203(D) x 102(H) x 203(W)	$20.00
HE-1457	84/10V 203(D) x 102(H) x 254(W)	$21.50
HE-1458	84/12V 203(D) x 102(H) x 305(W)	$23.00
HE-1459	84/17V 203(D) x 102(H) x 432(W)	$28.00
HE-1461	93/8V 228(D) x 76(H) x 150(W)	$16.50
HE-1462	93/8V 228(D) x 76(H) x 203(W)	$18.00
HE-1463	93/10V 228(D) x 76(H) x 254(W)	$19.50
HE-1467	93/12V 228(D) x 76(H) x 305(W)	$22.00
HE-1469	93/17V 228(D) x 76(H) x 432(W)	$25.50

NEW MACHINED PIN GOLD CONTACT IC SOCKETS. . .

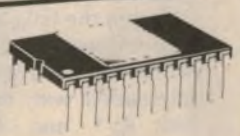
Expensive. But the best for professional work. Each pin is machined out of solid material (not punched out of a flimsy sheet). High quality heavily gold plated inserts form the socket end of the pin. The pins are then precision moulded into a high quality plastic housing. Ideal for use in equipment where high field service costs are a distinct possibility or where high reliability is essential.

Amazing

Cat. No.	Description	1–9	10+
PI-6452	8 WAY SOCKET	$0.90	$0.84
PI-6454	14 WAY SOCKET	$1.15	$1.10
PI-6456	16 WAY SOCKET	$1.25	$1.15
PI-6458	18 WAY SOCKET	$1.45	$1.35
PI-6460	20 WAY SOCKET	$1.60	$1.50
PI-6462	22 WAY SOCKET	$1.75	$1.60
PI-6464	24 WAY SOCKET	$1.95	$1.80
PI-6466	28 WAY SOCKET	$2.25	$2.10
PI-6468	40 WAY SOCKET	$2.95	$2.75

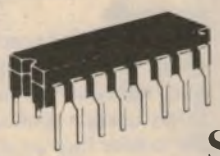
BACK IN STOCK! RIGHT ANGLE 'D' CONNECTORS

RIGHT ANGLE 'D' CONNECTORS
Now back in stock! P.C.B. mount 15 way.
Cannon DA15 R/A plug Cat. PP-2415 $8.95
Cannon DA15 R/A socket Cat. PS-4415 $8.95



$7.95 2708 EPROM

2708 EPROM FAIRCHILD PRIME SPEC – IN STOCK
What more can we say?
Cat. ZZ-8450 $7.95 each



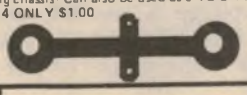
MN3001 BUCKET BRIGADE

This has been used in many projects lately and has been very hard to get. They are now available from us at a lower than normal price.
NORMALLY $22.50
NOVEMBER ONLY $19.50 each – Cat. ZK-8001

SLASHED $3

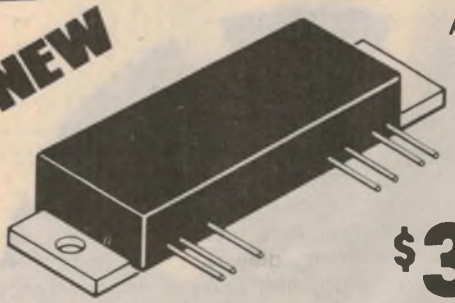
UNIQUE TO-3 BUSH ASSEMBLY NEW

TO-3 bush assembly. Why wasn't it thought of before? This moulded one piece plastic component replaces the loose TO-3 insulator bushes AND insulates the stout emitter and base feed thru connections from the surrounding chassis! Can also be used as a TO-3 marking template!
PACK OF 4 ONLY $1.00



Only $1 for 4

NEW



AMATEURS PLEASE NOTE

$39.95

UHF AMPLIFIER SENSATION

MASSIVE SCOOP PURCHASE! MANUFACTURERS DISTRESS STOCK!
Jaycar has purchased a quantity of genuine Brand New MOTOROLA Brand MHW-710-1 UHF Power Amplifier modules. These units are designed for industrial and commercial FM transmitters!
The unit (pictured) is a rugged, tuned train of RF Power Amplifier transistors featuring thin-film gold metallization, laser trimmed Nichrome resistors and MOS capacitors. The MHW-710-1 bolts to any flat metal surface to assist heat dissipation.
SPECIFICATIONS:
– RF POWER OUT @ 12.5V 13 WATTS – RF POWER OUT @ 15V 17 WATTS!!
(BOTH OF THE ABOVE RATINGS ARE LIKELY TO BE EXCEEDED AS MOTOROLA'S POWER RATING CLAIMS ARE CONSERVATIVE)
– 19.4 dB (Min) POWER GAIN. TYPICAL DRIVE LEVEL TO FULL POWER 90 – 150mW
– FREQUENCY BAND 400 – 440MHz. Will work to 450MHz and therefore covers the AUSTRALIAN UHF AMATEUR BAND!!
CIRCUIT DIAGRAM INCLUDED
Each MHW-710-1 comes individually packed with full manufacturers data. A manufacturers recommended circuit is included (only a few external components required!, as well as a PCB pattern for the circuit. This component makes an ideal base for a "Home Brew" UHF Linear Amplifier! GREAT for UHF Mobile!
SERVICEMEN
The MHW-710-1 has been used extensively in Australian Manufactured UHF Mobile 2-way radios. If you own or service a UHF radio that uses this part, now is your chance to grab a spare at an unrepeatable price! The MHW-710-1 sells for A$68 plus tax in the USA
QUANTITIES STRICTLY LIMITED
To be fair to all, we have limited this offer to 2 per person. Jaycar's Scoop offers are so successful that usually hundreds miss out. Even at 2 per customer we will probably run out quickly. Be early to avoid disappointment!!
STAGGERING VALUE! ONLY $39.95!! – Cat. ZK-8882

GOLD PLATED WIRE WRAP SOCKETS

24 and 40 pin quality. A must for high cost LSI
Cat. PI-6519 24 pin $4.95 – $4.50 10+
Cat. PI-6520 40 pin $6.95 – $6.25 10+

Incredible Value!

Jaycar Incorporating ELECTRONIC AGENCIES

SYDNEY SHOWROOMS
117 YORK STREET – PHONE: (02) 264 6688 and (02) 267 1614 TELEX 72293
CARLINGFORD
Cnr. CARLINGFORD & PENNANT HILLS ROAD – PHONE: (02) 872 4444
CONCORD
115 – 117 PARRAMATTA ROAD – PHONE: (02) 745 3077
HURSTVILLE 121 FOREST ROAD – PHONE: (02) 570 7000

NUMBER 1 FOR KITS

POST AND PACKING CHARGES
$5 – $9.99 ($1.50) $10 – $24.99 ($3.20)
$25 – $49.99 ($4.50) $50 – $99.99 ($6.50)
$100 – $198 ($8.00) Over $199 ($10)
Free INSURANCE for Road & Registered Post over $200
All heavy or bulky items (over 20kg) sent Comet Road Freight $12.00 anywhere in Australia
SHOP HOURS CARLINGFORD, CONCORD & HURSTVILLE
Mon – Fri 9am – 5.30pm Sat – 9am – 12pm Thurs night 8.30pm
SHOP HOURS SYDNEY
Mon – Fri 8.30am – 5.30pm Sat – 8.30am – 12pm Thurs night 8.30pm
MAIL ORDERS AND CORRESPONDENCE BOX K 39 HAYMARKET, SYDNEY 2000

Mail Order By
BANKCARD
Via Your Phone

How to build a 1920's style Wireless Set

Attach the fixed coil to the back cheek, noting the arrangement in Fig. 3, and tighten the 1½in screws into the ½in tapped spacers at the front of this coil as shown.

Fit the threaded shafts of the tuning and reaction coils into the back cheek, tuning coil to the left and reaction coil to the right and fasten loosely (do not tighten yet) with the flat washers, spring washer and dome nut as shown.

To fit the front cheek move the levers to the vertical position, insert the ends of the lever into the appropriate holes in the cheek, and push the cheek down the levers, around the bends, and over the two central screws. Thread two knurled nuts onto these screws and the assembly will now be mechanically stable.

Attach the right-angle brackets and solder lugs, using ½in x ⅛in screws and knurled nuts as shown, and solder the coil wires to the lugs as follows.

From the front of the upright tuning unit:

1. Tuning coil – Left wire to left rear lug. Right wire to central lug.
2. Fixed coil – Left wire to left front lug. Right wire to central lug.
3. Reaction coil – Left wire to right rear lug. Right wire to right front lug.

The dome nuts on the end of the lever shafts can now be tightened just enough to allow easy, smooth movement of the coil levers. In some cases it may be necessary to add one or two flat washers under the dome nuts to produce enough friction with the nuts fully tightened. The small knobs on the end of the tuning and reaction levers are pushed on with a twisting action and the tuning unit is now ready to be fitted to the panel.

Assuming the base is completely dry the three battery holders and T1 can be screwed to the inside of it before the panel is attached. These are fitted with the brass roundhead screws provided, into the pilot holes ready drilled in the wood, taking care to note the relative polarities of the battery holders and the orientation of T1 from Fig. 4.

The two D-cell holders are standard modern components and the B battery holder (supplied complete) is fabricated from a bakelite strip with five sets of battery clips rivetted to it and a clamp to hold the batteries in position.

Next fit the bakelite panel into the base with reference to Fig. 4 and fasten it with the two screws provided. The panel is pre-loaded with the valve socket pins, with RV1, and the aerial and earth terminals.

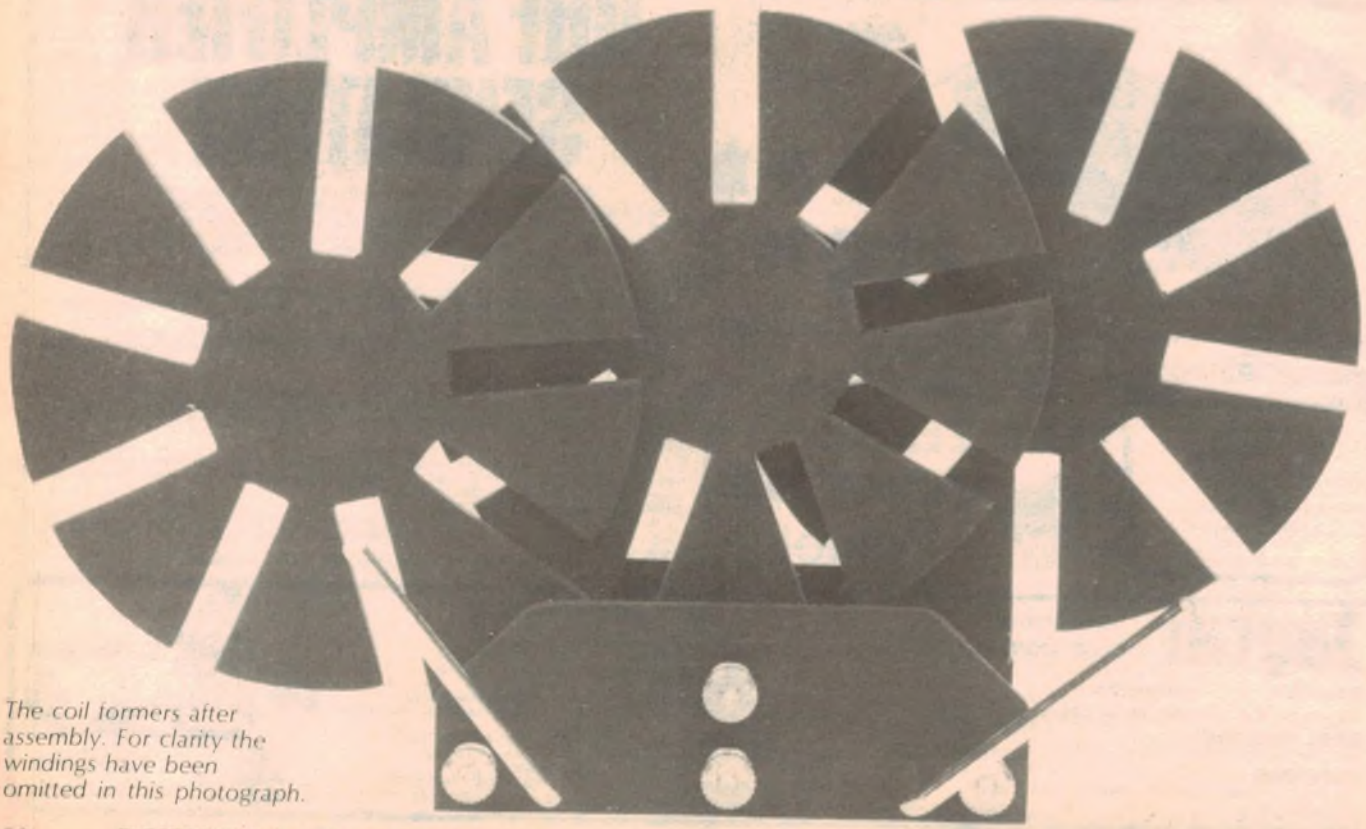
Fit the tuning reaction unit to the panel using the ⅝in long round head screws and tighten the nuts under the panel firmly using a spanner or nut driver. Fit all the solder lugs as shown in Fig. 4 using a flat washer under the nut in each case and then fit the phone jacks. The grid leak and C4 combination is mounted using ⅝in long screws with the nuts on top of the panel. The grid leak is held between these nuts and two knurled nuts, as seen in the photograph.

Wiring

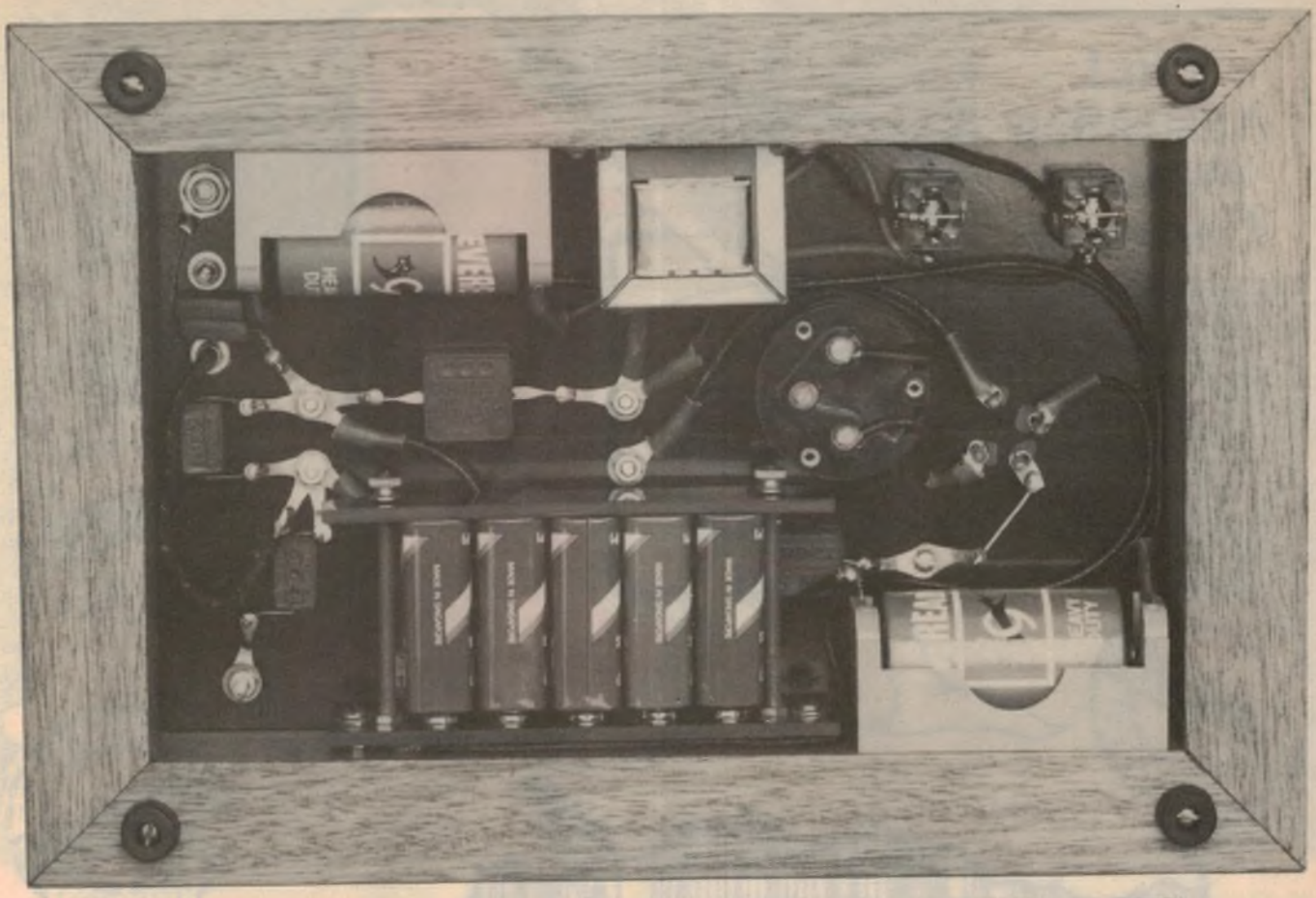
Arrange to support the set upside down (the kitset packing carton is ideal for this) and begin wiring by trimming and fitting the mica capacitors to the lugs as shown in Fig. 4. The main wiring is carried out with the black cloth or rubber covered wire supplied and a spaghetti sleeve is fitted over each lug after soldering. The wiring is fairly straightforward and should present no problems if Fig. 4 is followed carefully.

When finished double check the wiring to avoid the possibility of 45 volts appearing on the valve filament (a lot of vintage valves went that way in days of old) or of the B-battery being shorted (they give a very short life this way).

If all is well you can fit the batteries and the valve, connect an aerial, plug in the phones, and hear what 1983 programs sound like on a 1925 radio set. If the set does not operate, check with a multimeter that the filament voltage is reaching the filament and that the B battery voltage is reaching the plate. With the filament lit up (just visible) and RV1 full on there should be just under 2



The coil formers after assembly. For clarity the windings have been omitted in this photograph.



volts across the filament due to the residual resistance of RV1.

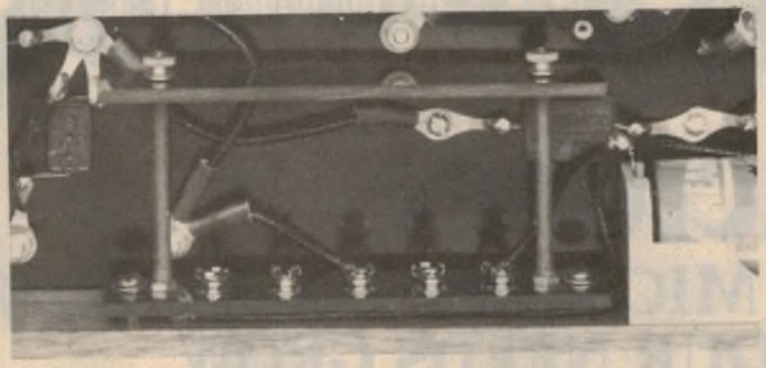
The filament current is 90-110mA with fresh batteries and the B battery current varies from 0.4mA to 1.5mA depending on the signal strength and the valve type. The B batteries will have a very long life (almost shelf life) and it should only be necessary to replace the two D cells from time to time if the set is used fairly frequently (these are not very expensive). Any problems in getting the set going should be covered by the information leaflet supplied with the kit.

The set works quite well in most locations with an indoor aerial of three to six metres but an outdoor aerial and an earth will boost reception remarkably, especially in country areas. An earth will also almost completely remove the effects of hand or body capacity on the tuning of the set.

The set attracts attention wherever it is seen and whilst the great enjoyment is in building and operating it there is also much pleasure in explaining and demonstrating it.

Overall the project will have served its purpose if it stimulates an interest in the origins of our particular branch of technology, with the knowledge that knowing where we have come from can often help us see more clearly where we are going.

Happy vintage listening!



Illustrations on this page show the arrangement of parts beneath the base of the receiver. Note that the wiring is in authentic 1920s style.

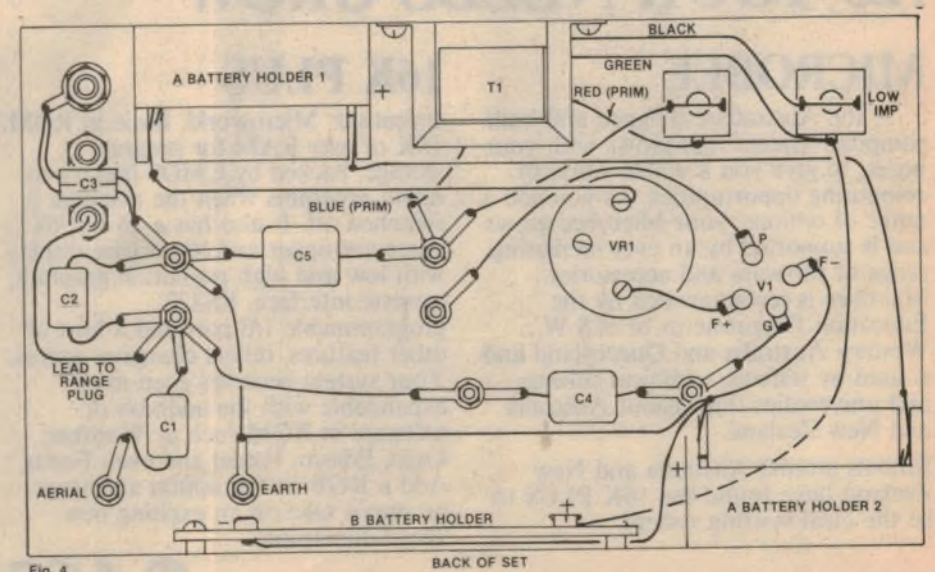
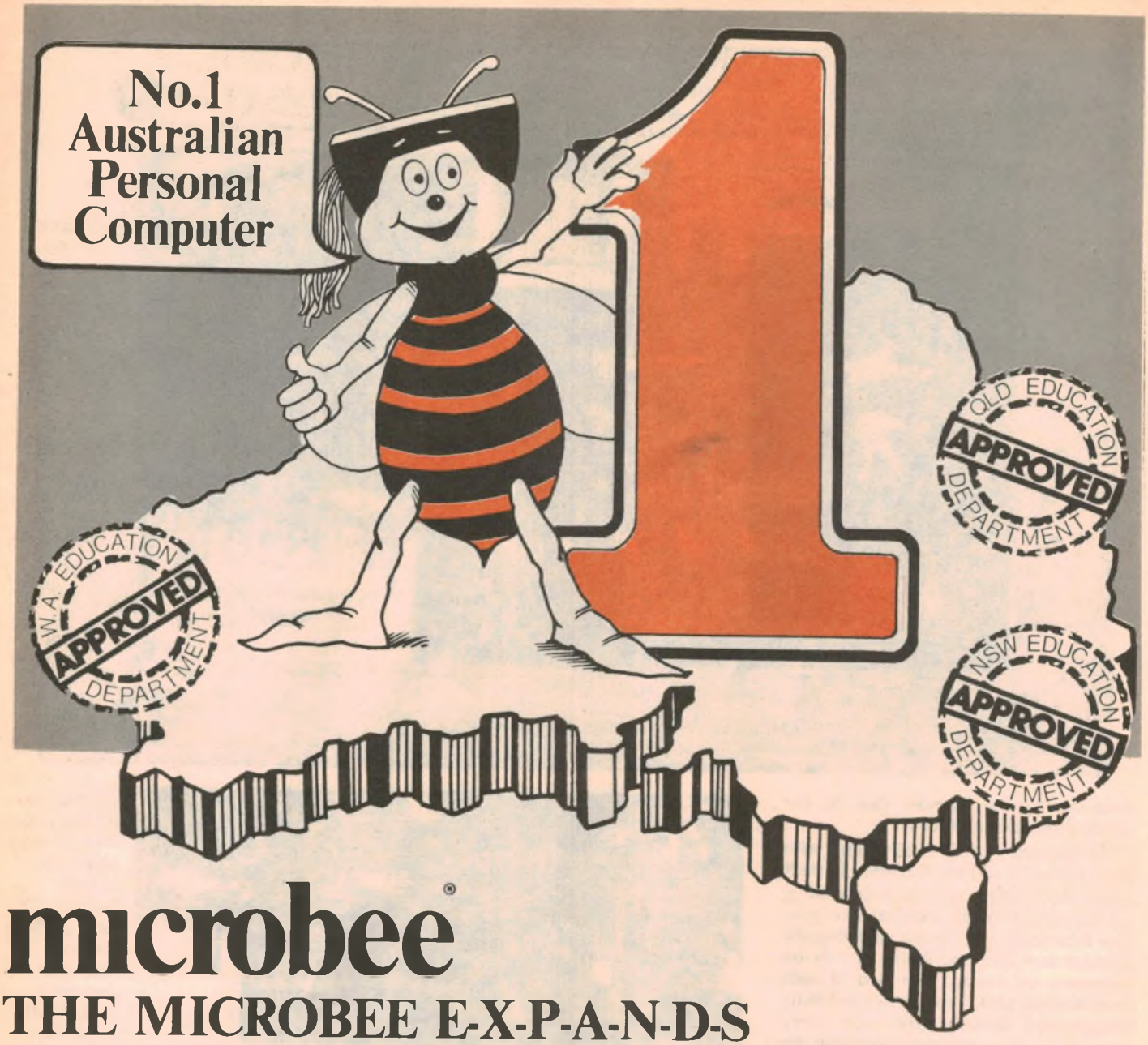


Fig. 4



microbee®

THE MICROBEE E-X-P-A-N-D-S AS YOUR NEEDS GROW

MICROBEE

. . . . the Australian designed and built computer system that grows with your needs, to give you a whole world of computing opportunities. As you add a range of options, your Microbee grows and is supported by an ever increasing range of software and accessories. Microbee is recommended by the Education Departments of N.S.W., Western Australia and Queensland and is used by schools, technical colleges and universities throughout Australia and New Zealand.

Schools around Australia and New Zealand have found the 16K PLUS to be the ideal starting system.

16K PLUS

It features Microworld, Basic in ROM, 16K of user RAM for program storage, backed by CMOS battery to retain programs when the machine is switched off. It also has a 16 line/64 character upper and lower case display with low and high resolution graphics, cassette interface, RS232, programmable 1/0 port and a host of other features, others charge as extras. Your system becomes even more expandable with the addition of software in ROM such as Wordbee, Logo, Edasm, Pascal and even Forth. Add a RGB colour option and your programs take on an exciting new visual dimension.

$469

32K IC

The Microbee 32K IC features 32K of CMOS RAM plus integrated software such as Wordbee, Communications, Machine Code Monitor and Self Test. It can be easily connected to a modem to 'talk' to other computers over telephone lines and is even capable of becoming a terminal for other systems. The battery-backed CMOS RAM enables you to write word processing files or run basic programs anywhere, then return to school/office to print them out. The remarkable capabilities of the Microbee 32K IC have won so much approval that it has become our best seller for serious home use.

$599

NOW! WITH WORLD CLASS SOFTWARE MICROBEE CP/M64 DISK SYSTEM

64K DISK SYSTEM

A new and exciting release! This system is probably the best value CP/M computer available on the Australian market. The package deal includes Microbee 64K keyboard unit, the new Microbee 400K disk drive system 'bundled' software including CP/M 2.2, Microsoft and Microworld Basic (disk and tape versions) Wordbee, Edasm, Busycalc and a host of utility programs to format. Also copy disks, compare files, communicative ability with other computers and demonstration programs that enable you to master this powerful computer with ease.

Your Microbee 16K or 32K can be adapted to a full disc system. (Ask your nearest Microbee shop for a quotation). Or for versatility, add a second disk drive to your 64K disk system and look for the hard disk drive early in 1984. All Microbee options can be added to expand your system to suit your needs. Your carefully selected library of programs is worth much more than the $500 price tag. The $995 keyboard and single drive must be today's best value on the Australian market.

Software worth much more than the $500 charged

64K/SINGLE 400K DRIVE/SOFTWARE $1495

64K/DUAL 400K DRIVE/SOFTWARE $1795

If you already own a 16K/32K Microbee contact your local Microbee shop for an exciting upgraded quotation that will save $$$ on your new disk system.

ACCESSORIES

MICROBEE DOT MATRIX PRINTER:
Ideal for graphics or letter writing. Can be connected by cable to the parallel port or with a serial option to the R232 port.

Parallel Printer $449
Parallel cable $49.50
Serial printer $549
Serial cable $49.50
Ribbons $12.50

MICROBEE JOYSTICK:
Brings your system to life and adds realism and excitement to your programs. $39.50

ROM BOARD:
Extends the internal memory so your Microbee can use a wide range of software packages without changing the ROM. $79.50

MICROBEE CARRY CASE:
Strong good looking protective case. $9.95

MICROBEE 'GREEN MONITOR':
Features 18MHz bandwidth for a clear display plus built-in power supply. $199

BOOKS

NEW RELEASES

MICROBEE TECHNICAL MANUAL 250.001
Contains full technical description of the Microbee operation service instructions, circuit diagrams and component list. Registration form is included for automatic up-date service for 12 months. $65

MICROSOFT BASIC MANUAL 250.005
For full use of your Microbee Disk System with MBASIC. This manual is all you'll need to master M/SOFT BASIC on your Microbee. $24.95

INTRODUCTION TO MICROBEE 250.009
— Your first 100 programs.
Walk into the world of Microbee computing with ease. This manual takes you from go to becoming a competant programmer in Microworld Basic. Prepared by two Australian school teachers, this practical course is an ideal companion for your Microbee. $14.95

microbee computer shops

1 Pattison Ave, Waitara 2077. Phone (02) 487 2711

729 Glenferrie Rd, Hawthorn 3122. Phone (03) 818 2244

141 Stirling Highway, Nedlands, Perth. Phone (09) 386 8250

Cooleman Court, Weston A.C.T. 2611. Phone (062) 88 6384

DIRECT ORDERS PHONE (02) 487 2711

DEALERS:

NSW: **Jaycar,** (inc. Electronic Agencies) 117 York Street, Sydney. 115 Parramatta Road, Concord. 121 Forest Road, Hurstville. Cnr Carlingford and Pennant Hills Road, Carlingford. **Compu-K,** 7 Casino Street, Lismore. **Comput/Ed,** 8 Park Arcade, Park Avenue, Coffs Harbour.

ACT: **Computech,** Belconnen Churches Centre, Benjamin Way, Belconnen.

VIC: **Computerland,** 37 Albert Road, South Melbourne.

S.A.: **Key Computers,** 1061 South Road, Edwardstown. 77 Grenfell Street, Adelaide.

W.A.: **Altronics,** 105 Stirling Street, Perth.

QLD: **Software 80,** 105 Milton Road, Milton. **Electrographic Office Systems,** 25 Grafton Street, Cairns. **Town and Country Computers,** CTL Centre, Anne Street, Aitkenvale, Townsville.

TAS: **Central Data,** 14A Goodwin Street, Launceston.

APPLIED TECHNOLOGY RETAIL PTY LTD

bankcard welcome here

microbee

CEAT3091

Low-cost unit gives dot, crosshatch and raster

Crystal-locked TV pattern generator

by JOHN CLARKE

Make sure your TV is up to the mark with this low cost pattern generator. It uses just seven ICs and gives three patterns: Dot, crosshatch and blank raster.

For TV servicemen, hobbyists, videophiles and those keen on computer graphics, a pattern generator is mandatory if the best picture is to be obtained from your screen. Adjustments with this generator can be made for picture linearity, convergence, purity, width and height.

Simple to build, the generator has no adjustments because of its crystal-controlled timing. Power is supplied by a 9V mains plugback.

Let us provide a brief description of each pattern and its purpose:

The crosshatch pattern consists of 14 vertical lines and 12 horizontal lines. This pattern can be used to check and adjust picture geometry (width, height, horizontal and vertical linearity) and dynamic convergence. Dynamic convergence is a measure of how well the three beams converge to a single line at any position on the screen.

The crosshatches will appear square when the height and width controls of the screen are adjusted correctly, while the vertical and horizontal lines will appear straight if linearity is correct.

The dot pattern provides a series of dots positioned at intersections of the white lines of the crosshatch pattern. The dot pattern is for adjustment of static convergence whereby the beams from the three guns converge on the same spot in a given part of the screen. This adjustment is made via magnets on the yoke assembly.

Finally, the pattern generator provides a white raster signal which can demonstrate picture purity. Any problems in this regard will show up as areas of colour tint on the screen. This could be the result of magnetisation of the tube metal surround which should not be the case if the automatic degaussing circuits are working correctly.

For further clarification of these adjustments, it will be necessary to refer to the service manual relevent to the particular TV set or monitor to be adjusted.

Two outputs are available from the pattern generator. Firstly, there is the direct video output which is a suitable signal for monitors and TV sets with a direct video input. Alternatively, a video modulated RF output can be connected to the TV antenna input. A simple three-postion switch provides pattern selection.

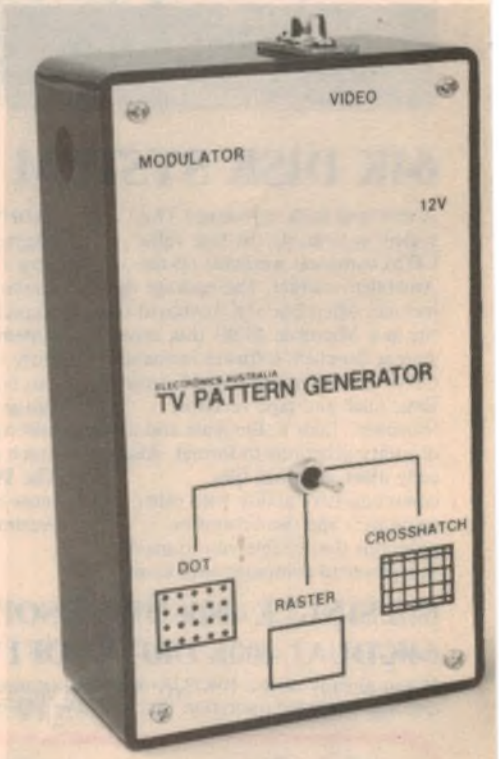
How it works

Fig. 1 shows a simplified block diagram of the generator and the various video and sync waveforms generated at different points in the circuit. The heart of the circuit is the 4MHz clock oscillator from which all the other signals are derived, including the video pulses for the vertical and horizontal lines in the crosshatch pattern and the horizontal and vertical sync and blanking pulses.

In the Australian TV system there are 625 lines in each complete picture or "frame" and 25 such frames are transmitted per second. To reduce flickering each frame is actually transmitted as two fields each of 312.5 lines with the second field interlaced with the first to give a total of 625 lines. To simplify the circuit of the pattern generator we have used random interlacing with 312 lines per field and 624 lines total in a frame. In practice, random interlace has no effect on the quality of the patterns and is nearly always used in pattern generators, video games and video terminals.

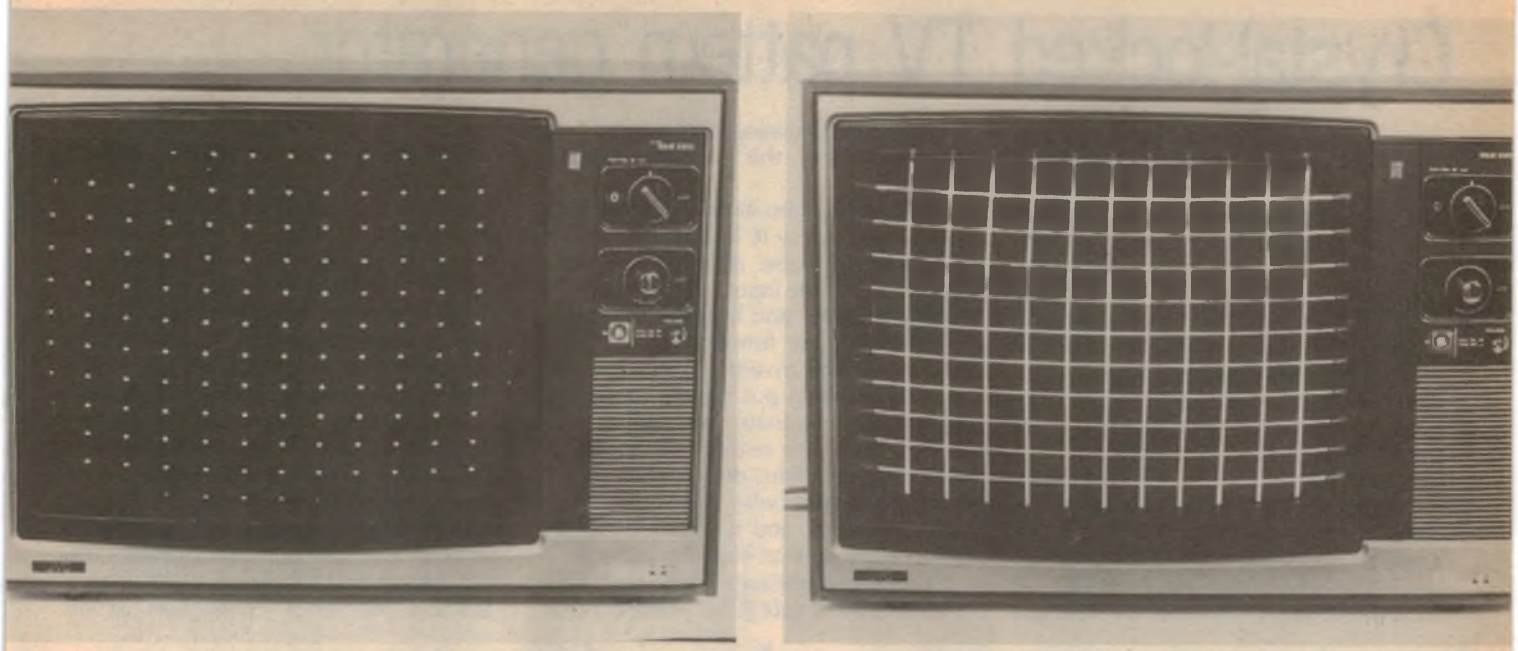
From the foregoing, it follows that the field (or the vertical deflection) frequency is 50Hz and the line (or horizontal deflection) frequency is 15,625Hz.

In this circuit, the horizontal sync pulses are 4ms long at the rate of 15,625Hz and the vertical sync pulses are 512μs long at the rate of 50Hz. The circuit also generates blanking pulses although these are not shown in Fig. 1.

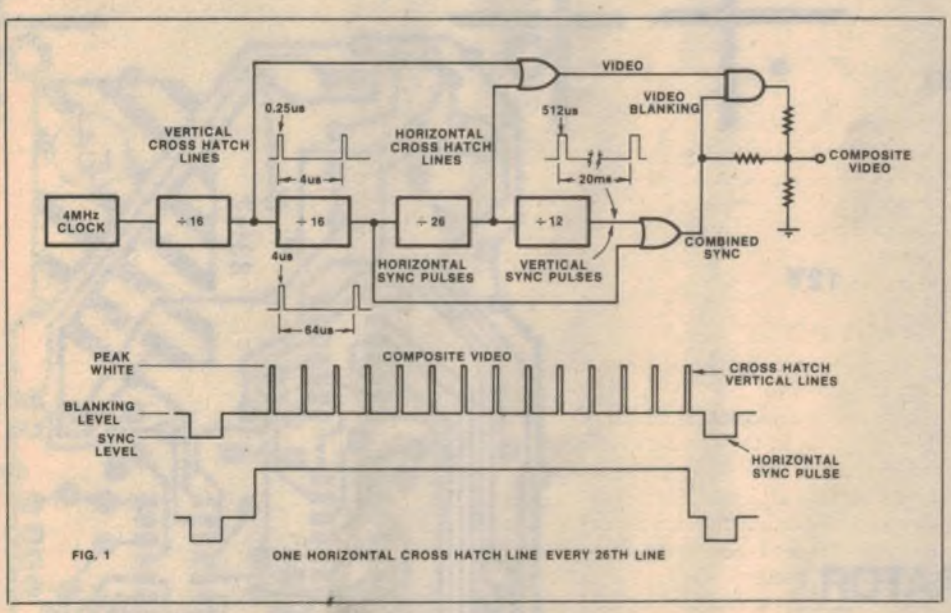


The unit provides three patterns: dot, crosshatch and blank raster.

Now getting back to how these signals are derived, the 4MHz clock is first divided by 16 to give a brief pulse 0.25μs long every 16 × 0.25 or 4μs. This provides vertical lines which are part of the crosshatch pattern. This signal is then further divided by 16 to give a horizontal sync pulse 4μs long every 16 × 4 or 64μs which, of course, is precisely the correct line frequency, since 1/64μs is 15,625Hz!



The dot pattern is used to check static convergence while crosshatch checks picture geometry and dynamic convergence.



The sync pulse is then further divided by 26 to give a signal which is high for one line (64μs) every 26 lines. These are in fact the horizontal lines which make up the crosshatch pattern and the reason we have chosen this apparently strange line spacing is so that the crosshatch has the correct aspect ratio of 4:3. That is, the crosshatches will appear square when the height and width controls of the TV set are properly adjusted.

Finally the signal is divided by 12 to generate the vertical sync pulses. As you have probably realised 12 × 26 is 312 which is precisely the number of lines per field required. One point that does emerge though, is that since we have 312 rather than 312.5 lines per field, the field frequency is 15,625/312 or 50.08Hz, not 50Hz. The difference is negligible.

Now refer to the circuit diagram. Seven readily available ICs have been used and these along with a few resistors, capacitors and a crystal comprise virtually all the circuitry necessary for the pattern generator.

A "PI network" oscillator using a 10MΩ biassing resistor is formed by the NOR gate IC4c which is connected as an inverter. Either a 4MHz crystal or a 4MHz ceramic resonator can be used here, although the ceramic resonator is possibly the better alternative since it is less costly. The poorer frequency tolerance from these devices is not important in this application.

Output from the oscillator goes to the clock input of IC1 which is a 12-stage CMOS binary divider. The binary outputs Q6, Q7 and Q8 of IC1 are decoded by IC2a, a 3-input NAND gate. This generates a pulse 8μs wide every 64μs which is the horizontal blanking pulse. This is further combined with Q5 of IC1 by the NOR gate IC4d to provide a horizontal sync pulse 4μs wide. Any glitches at the output of this gate, caused by propagation delays of IC1 and the gates, are removed by an RC delay before being applied to the input of IC5d, another NOR gate.

The Q9 output of IC1 is 7812.5Hz which is then further divided by 13 with IC3b to derive the horizontal crosshatch lines. So that IC3b, a binary counter, will divide by 13, the three gates IC2b, IC7b and IC7a are required. At the count of 13, all three inputs of IC2b will be high and the output will be low, setting the RS flipflop made up of the two NAND gates, IC7a and b. This resets the counter, IC3b, to zero.

Half a clock cycle later, the signal goes low and resets the RS flipflop, via pin 1 of IC7a. This removes the reset from IC3b which lasts for 64μs and occurs once every 26 lines. This signal is for the horizontal lines in the crosshatch pattern.

This horizontal crosshatch signal is mixed with the output of IC4a which provides the vertical crosshatch signal. These vertical crosshatch lines are derived in a similar manner to the horizontal sync previously described. The first four outputs of IC1, Q1 to Q4, are decoded by IC2a, a 3-input NAND gate, and IC4a, a NOR gate, providing vertical crosshatch lines 0.25μ long every 4μs.

The mixing of the vertical and horizontal crosshatch lines is performed by NAND gate IC7d and NOR gate IC5c. The output of the NOR gate is a combination of both vertical and horizontal crosshatch lines so this becomes the

Crystal-locked TV pattern generator

video signal for the crosshatch. The output of the NAND gate is low when the vertical and horizontal lines coincide and this is the dot pattern. Selection of these patterns is with switch S1. Note that with the switch in the centre-off position the signal is permanently low due to the 10kΩ resistor to ground and this is the blank raster signal, an all-white screen.

The horizontal crosshatch signal is further divided by 12 to obtain the vertical sync and blanking pulses. This is accomplished by IC3a. The count of 12 is detected with IC6b and the RS flipflop, consisting of NAND gates IC6c and IC6d, resets the counter, IC3a. Since the clock signal to IC3a is low for one line and high for 25 lines, the output of this divider will be a pulse which is low for 25 lines and high for the remaining 287 lines the field. This pulse is the vertical blanking interval.

Vertical and horizontal blanking intervals are mixed by IC7c and this combined blanking pulse disables the video signals fed to the input of NOR gate IC4d during the sync and blanking intervals.

The AND gate formed by the NAND gate IC6a and inverter IC5b mixes the vertical blanking pulses with the output of IC5a to generate the vertical sync pulses. Since the output of IC5a is high for only eight lines during each 26 line period the sync pulse will be eight lines long or 512μs, and it will occur at the start of the vertical blanking interval.

Vertical and horizontal sync pulses are mixed by NOR gate IC5d. These combined sync pulses, along with the video output from IC4b, are combined with resistive dividers. A 10kΩ resistor from IC5d and a 6.8kΩ resistor from IC4b, together with the 1.8kΩ resistor to ground, provide the correct relative levels for the sync, blanking level and peak white levels of the video signal. This signal is passed to the base of Q1, an emitter-follower stage. The tapping at the 100Ω resistor from the emitter of the transistor provides correct video voltage levels. The 470μF capacitor gives AC coupling to the video monitor or TV set.

This final composite video waveform is also fed to a UM1082 modulator which is a commercially built unit aligned to the TV channel 0. It has a 75Ω output, suitable for direct connection to the

Actual-size front panel artwork.

VIDEO

MODULATOR

12V

ELECTRONICS AUSTRALIA

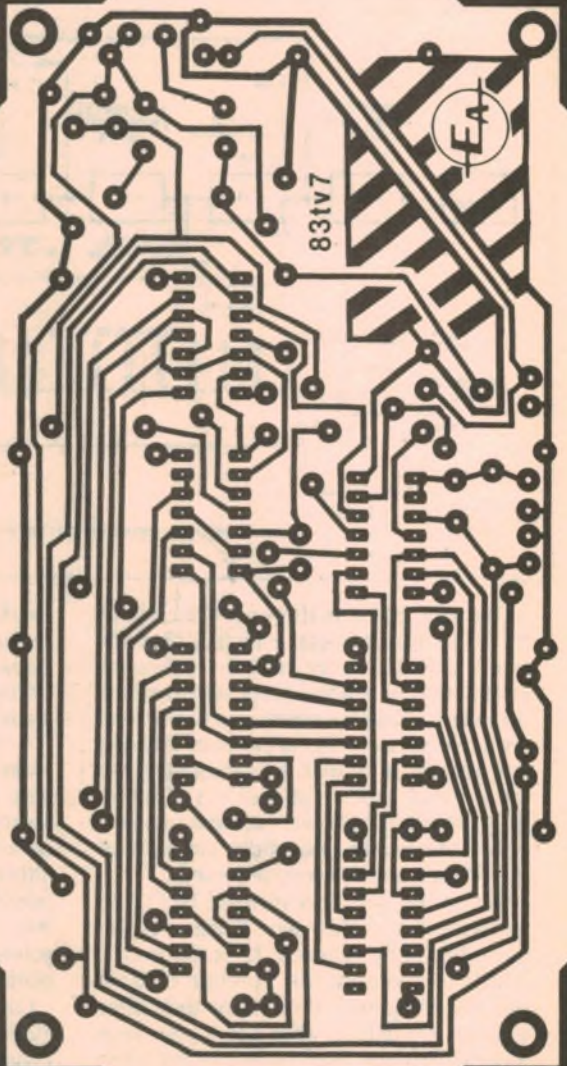
TV PATTERN GENERATOR

DOT

RASTER

CROSSHATCH

Actual-size PCB artwork.



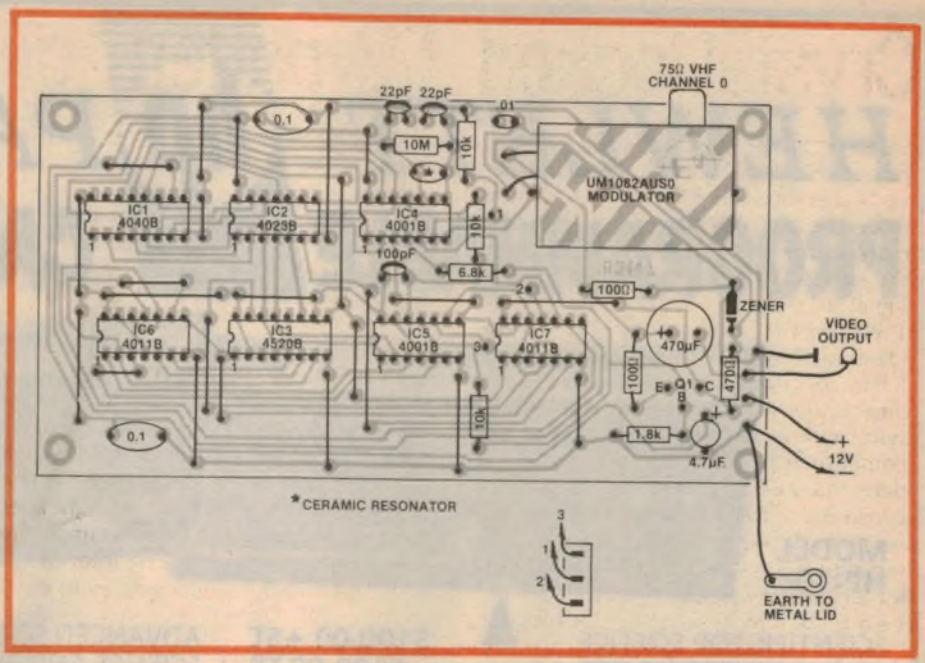
antenna input of the TV set. Power for the modulator is fed from a simple regulated supply comprising a 470Ω resistor, .01μF capacitor and 6.8V zener diode.

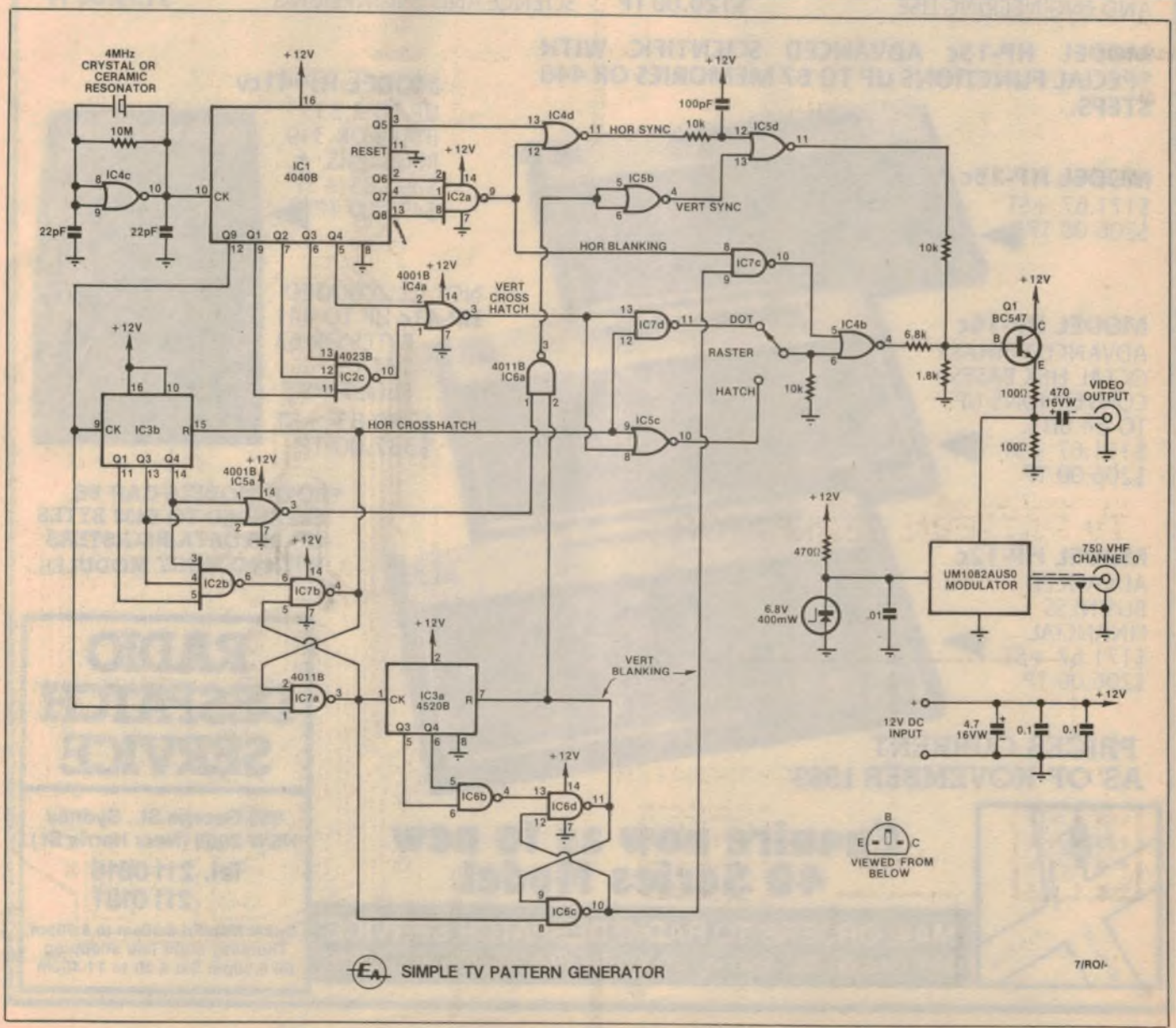
As mentioned before, power for the unit is supplied by a 9V mains plugback. The incoming supply is decoupled with a 4.7μF capacitor and two 0.1μF provide further bypassing directly at the ICs.

Construction

We constructed our prototype generator on a PC board measuring 142 × 74mm (coded 83tv7) and housed this in a plastic utility box measuring 50 × 90 × 154mm. A Scotchcal front panel 91 × 154mm gives the generator a professional appearance.

Start construction by ensuring that the PCB will fit into the case. We filed the corners of the PCB for a snug fit across the corner posts of the case. Construction of the PCB should begin by inserting





SIMPLE TV PATTERN GENERATOR

7/ROI-

HEWLETT hp PACKARD
PROGRAMMABLE CALCULATORS

MODEL HP-10c

SCIENTIFIC FOR SCIENCE AND ENGINEERING USE

$100.00 +ST
$120.00 TP

MODEL HP-11c

ADVANCED SCIENTIFIC FOR SCIENCE AND ENGINEERING

$129.17 +ST
$155.00 TP

MODEL HP-15c ADVANCED SCIENTIFIC WITH SPECIAL FUNCTIONS UP TO 67 MEMORIES OR 448 STEPS.

MODEL HP-15c
$171.67 +ST
$206.00 TP

MODEL HP-16c
ADVANCED BINARY OCTAL HEX BASES CONVERSIONS UP TO 64 BITS.
$171.67 +ST
$206.00 TP

MODEL HP-12c
ADVANCED BUSINESS FINANCIAL
$171.67 +ST
$206.00 TP

MODEL HP-41cv
UP TO 2,233 BYTES OR 319 REGISTERS. *
$395.83 +ST
$475.00 TP

NOT ILLUSTRATED
HP-41c UP TO 441 BYTES OR 63 DATA REGISTERS.*
$280.83 +ST
$337.00 TP

***BOTH MODELS CAN BE EXPANDED TO 6433 BYTES OR 919 DATA REGISTERS WITH MEMORY MODULES..**

PRICES CURRENT AS OF NOVEMBER 1983

Enquire now as to new 40 Series Model

MAIL ORDERS TO RADIO DESPATCH SERVICE
869 George St., Sydney 2000 Tel. (02) 211 0191 • 211 0816

RADIO DESPATCH SERVICE

869 George St., Sydney NSW 2000 (Near Harris St.)
Tel. 211 0816
211 0191

Open: Mon-Fri 8.30am to 5.30pm Thursday night late shopping till 6.30pm Sat 8.30 to 11.45am

Crystal-locked TV pattern generator

all the low profile components first, such as the links, resistors and ICs. Use the overlay diagram to aid you in the positioning of components. Ensure that the ICs are inserted in the correct orientation and solder the power supply pins first to allow the static protection diodes of the ICs to take effect.

Now the capacitors and modulator, if used, can be inserted along with the associated zener diode and transistor. We used PC stakes for the external connections on the PCB. Now the PCB can be put aside and the case drilled for the mounting holes of the PCB, external power inlet socket, video outlet RCA socket and the hole for accessing the 75Ω socket on the video modulator.

Place the Scotchcal label onto the aluminium panel and drill the hole for the switch. The two sockets can now be installed and the wiring completed. Follow the wiring diagram when completing these operations and make sure everything is correct before applying power. Note that the lid of the case is earthed back to the circuit via a wire and solder lug retained by one of the lid mounting screws.

As mentioned before, input to the TV set can be either from the modulator or direct video. The direct video input should connect to the set via a screened cable with an RCA plug on the pattern generator end and a suitable plug for the video input of the set. For the modulator output make sure that 75Ω cable is used. An RCA plug connects to the modulator while the TV antenna input will normally require a Belling Lee plug. If only 300Ω terminals are provided then a 75Ω to 300Ω balum transformer will be necessary. Now you are ready to adjust your screen for a first class picture.

One point to note when using the direct video output: depending on the DC voltage applied to the direct video input at the monitor or TV set, the 470μF capacitor may need to be reversed so that the capacitor is not reverse-biased. This can easily be checked with a meter, when connected to the TV set or monitor.

We estimate that the current cost of parts for this project is approximately

$25

This includes sales tax but not the cost of a modulator or 9V mains plugpack.

PARTS LIST

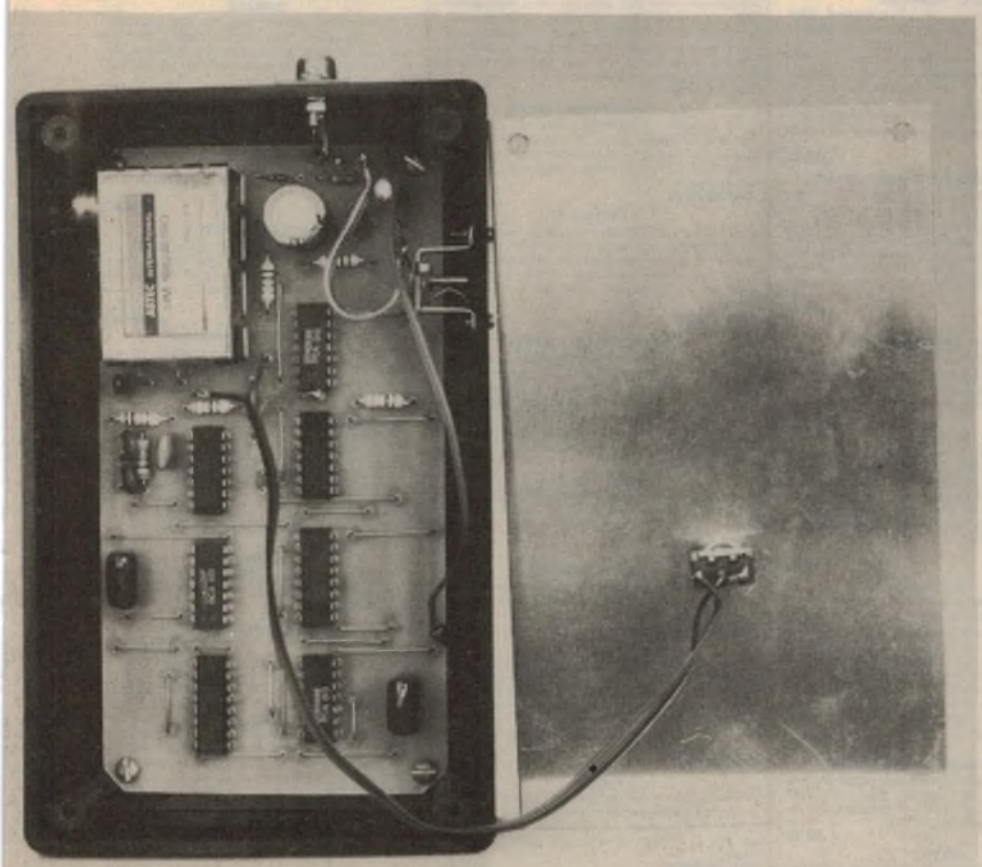
1 PCB, code 83tv7, 142 x 74mm
1 Scotchcal front panel, 91 x 154mm
1 plastic utility box, 50 x 90 x150mm
1 UM1082AUS0 modulator
1 SPDT centre-off switch
1 panel-mount RCA socket
1 2.5mm DC power socket
1 earth lug
1 4.0MHz parallel resonant crystal or 4.0MHz ceramic resonator (CSA4.00MT)
4 5mm tapped standoffs

SEMICONDUCTORS
2 4001 quad 2-input NOR gates
2 4011 quad 2-input NAND gates
1 4023 triple 3-input NAND gate
1 4040 12-stage ripple carry binary counter
1 4520 dual synchronous up counter
1 BC547 NPN transistor
1 6.8V 400mW zener diode

RESISTORS (¼W, 5%)
1 x 10MΩ, 3 x 10kΩ, 1 x 6.8kΩ, 1 x 1.8kΩ, 1 x 470Ω, 2 x 100Ω

CAPACITORS
1 470μF/16VW PC electrolytic
1 4.7μF/16VW PC electrolytic
2 0.1μF metallised polyester
1 .01μF metallised polyester
1 100pF ceramic
2 22pF ceramic

MISCELLANEOUS
PC stakes, solder, hook-up wire, machine screws and nuts etc.



View inside the prototype. Take care with component orientation.

JAYCAR & ELECTRONIC AGENCIES
NO.1 FOR MICROBEE SOFTWARE!

KEPLERS LAWS
A simulation of planetary orbits, producing data for analysis by students of the laws of Periods, Ellipses and Areas. Year 11/12 Physics.
Cat. XE-6900 **$14.95**

GRAPHIC LIFE
Life is "played" on a two dimesional grid of squares, so that every square has eight neighbouring squares or cells. Each cell is either alive or dead and each cell lives or dies depending on its neighbour cells. A dead cell with three live neighbours will be brought to life in the next generation. A very intrigueing experimenters tool kit.
Cat. XE-6905 **$14.95**

MILLIKAN'S EXPERIMENT
In 1910 Millikan deduced the charge of an electron. Side A is a simulation in HIRES graphics of the experiment. Side B contains a tutorial on Millikan and his experiment and students must answer questions as they work through. Year 11/12 Physics.
Cat. XE-6910 **$14.95**

DISASSEMBLER By Dreamcards
Some may say "Not another Disassembler". But this one has a difference. It allows you to set out where the data fields are so the computer is saving time, not rying to disassemble data. A program you shouldn't be without.
Cat. XE-6915 **$15.00**

CHEAPIE By Dreamcards
Two top quality programs for the price of one. The best Hangman we've seen yet on side A and a superb version of Battleship on side B. Both have excellent graphics.
Cat. XE-6920 **$15.00**

CANNIBALS AND MISSIONARIES
The old logic problem game of transferring 3 Cannibals and 3 Missionaries from one side of a river to the other in a boat that holds two. If there are more Cannibals than Missionaries on either side at any time the Cannibals revert to their favourite form of feeding.
Cat. XE-6925 **$14.95**

COMPOSER BEE
This is a very well written program for music. This program allows you to compose, play, edit, transpose as well as being able to load and save your music. A program that has been a long time in the writing and well worth buying.
Cat. XE-6930 **$22.50**

WORD ADVENTURE
A program with very good graphics using little characters to entice the user to think what word is either a synonym, antonym or homonym of the word they are showing. Everytime you get it wrong you are given more clues. After the clues run out you must face the Dragon when you must spell the word he is holding correctly before you.
Cat. XE-6935 **$14.95**

PONTOON
A quality fast moving card game where up to 6 players can play against the computer who is banker.
Cat. XE-6940 **$14.95**

WORD PROCESSOR – MYTEK
Mytek Wordprocessor comes with a quality ring binder and features most of the commands of the highly acclaimed SPELLBINDER. Mytek Wordprocessor is screen orientated and re formats the screen to 32 lines, allowing twice the amount of text to be displayed at once. Commands, which are all single keystrokes, included APPEND BACK, CLOSE, DELETE, EDIT, FORWARD, HOLD, INSERT, KILL, LINE LENGTH, MEMORY, OPEN, PRINT, READ, SEARCH/REPLACE TOP, UNHOLD, VERIFY, WRITE and EXIT.
Mytek Wordprocessor is not a plaything. Although simple to use, it is one of the most powerful cassette based wordprocessors currently available on any microcomputer.
Cat. XE-7010 **$50.00**

MUSIC – B – MYTEK
MusicB is a music Composer/Editor that lets you create and save music and sound effects with a flexibility that makes chopsticks of the Basic PLAY command. MusicB is a great way to learn and play music! Comprehensive instructions are included.
Cat. XE-7010 **$20.00**

TRSBEE – MYTEK
TRSBEE is a package of three programs that loads TRS-80 Model 1 and 3 program tapes into the MicroBee without any additional hardware. Although some program editing will still be required prior to their running, the majority of program typing time is saved by TRSBEE. The first program loads TRS-80 BASIC programs into MicroWorld BASIC. Most prgrams may then be edited and run. The second program in the package loads any TRS-80 machine code file into MicroBee memory. The third program loads TRS-80 assembler files into the MicroBee EDITOR/ASSEMBLER. Any TRS-80 Model 1 or 3 tape may be loaded. TRSBEE opens up a whole new world of possible software on your MicroBee!
Cat. XE-7005 **$30.00**

STOCK SUPERVISOR
This program is the means of creating a stock or product data base which provides an on-line information system. This system is then capable of being continuously and easily updated to reflect all the inventory and accounting aspects of stock on hand.
Cat. XE-6865 **$15.95**

HOUSEHOLD REGISTER
This program will simplify the task of determing the value of your home's contents for insurance purposes, as well as providing descriptions of all listed items in the event of their loss or destruction. Effects are catalogued by name, description and value. Nine separate rooms are provided, and up to 28 items may be listed in each.
Cat. XE-7000 **$15.96**

STAT PACK – STATISTICS
This program is a general purpose graph plotting, linear regression, line of best fit and correlation program. It features a t-test of significance for the correlation coefficient and, if no evidence of correlation is found, a determination of minimum sample size is performed.
Cat. XE-6999 **$14.95**

LOG – GENERAL PURPOSE INDEX
This program is designed to suit a wide range of records where indexing (and later searching) can be on one or two words, or on a string of up to 15 characters. Each record consists of its index heading, plus up to 12 lines of text. Each line can contain up to 41 characters.
Cat. XE-6890 **$15.96**

PROGRAMMING HINTS
Consists of a collection of modules which you may use to improve your own BASIC programs. They are all linked together under a menu driven display which allows you to RUN or LIST each module to see how they work.
Cat. XE-6895 **$14.95**

PROSPECTOR
Arcade game in which you are the prospector attempting to get gold and diamonds which are scattered around the field, and at the same time avoid two drunken bandits who are chasing you.
Cat. XE-6885 **$14.95**

BASIC TUTORIAL
Is a super teaching aid for any classroom. Basic Tutorial is a set of 9 interactive exercises designed for teaching Basic to the computer novice. No previous knowledge is assumed. Basic Tutorial uses a unique double screen technique to display both the normal computer output and the tutorial exercises at the one time. This allows the student to use the MicroBee in the normal way, while the tutorial instructions appear in the lower half of the screen.
Cat. XE-6860 **$20.00**

MACHINE CODE TUTORIAL – MYTEK
Consists of 8 interactive exercises designed for teaching machine code programming and related topics as they apply to the MicroBee computer. Only a general knowledge of the BASIC language is assumed. Machine Code Tutorial is designed to bridge the gap bewteen BASIC programming and being able to understand and use typical Z80 manuals.
Cat. XE-6855 **$25.00**

BUDGET – SPREADSHEET
This program is designed to speed up and simplify the task of framing a usable financial budget. Applications range from personal or household to small business finances. A quality program.
Cat. XE-6850 **$15.95**

SEADOG
Seadog a war game between two ships from the days of Nelson. You may play against a friend, or against the computer. The game features limited resolution graphics for the war battle sequences. As well as the enemy fleet, you must survive hazzards such as hurricanes, diseases, and your own gun aimers who do not always shoot straight!
Cat. XE-6845 **$14.95**

DECODE
Basic decoder and listing formatter
This programme will be an invaluable aid to any one taking first steps in understanding machine code or wants to expand their library of proven machine code routines. Decode will (a) print imbedded machine code routines fully and accurately (b) print all unprintable characters (c) provide a clearer, easier to read listing and send all output to a printer if so required. ED ASM is not required.
Cat. XE-6765 **$15.95**

CARDEX – CARD INDEX SYSTEM
This program simulates the card index systems of yesteryear in that it neatly files a series of records, and the user can leaf through the file inspecting each record one by one.
Cat. XE-6755 **$9.95**

FILEX
Filex is a larger version of Cardex, but handles larger amounts of data, and also is easier to find "the cards".
Cat. XE-6760 **$14.95**

FINANCIAL MANAGER
Provides an accurate and clearly formatted record of any financial account, and a cost analysis stated in money amounts and percentages. Personal Account Monitor and Business Account Analyst.

TEXTED
This program helps to produce a neatly formatted document of word processor appearance, with an absolute minimum of fuss on the user's part. It is the logical alternative when a high powered (and high priced) word processor is not warranted and/or not justified.
Cat. XE-6745 **$14.95**

DATABEE
This program is a well written data base management system that utilised the MicroBee to its fullest to provide a Data Management System similar to those found on larger and more expensive systems. This comes complete with large bound manual.
Cat. XE-6945 **$19.95**

TEACHERS MASTER TAPE
This tape allows the user to enter 20 words for a spelling list. These words are then at a later stage displayed back on the screen in clear graphics with four options of speed and display time. It makes a very useful program.
Cat. XE-6985 **$21.50**

FRACTIONS AND DECIMALS
Side one of the tape goes through a graphic tutorial of what fractions are and what they look like. Side two explains what equivalent fractions are and also introduces decimals to two decimal places. A well written tape which uses graphics to its fullest to teach the principles.
Cat. XE-6980 **$16.95**

NUMBER HANGMAN
A graphic game which helps improve times in solving mathematical questions. You must answer the question before the hangman has time to hang himself. Optional times and difficulty are available making it suitable for everyone.
Cat. XE-6990 **$13.50**

MEASUREMENT
This tape starts from scratch and defines the unit of measurement and what its other equivalents are. It gives exercises converting, measures small and large to the standard metre. It continues on to show perimeters, length and area and giving various exercises on the way. Another program that uses graphics to prove a point.
Cat. XE-6998 **$13.50**

MULTIPLICATION TABLES
This program is directed more at operation rather than age or grade. It uses graphics to enhance the display and optional time limits and difficulty to bring anyones multiplication tables up to scratch.
Cat. XE-6975 **$10.95**

ALGEBRA 1
This program introduces the uses of pronumerals as theoretical numbers with simple problems. Simple algebraic equations are treated showing collection of like terms, etc. It then gives exercises to try to further push the principles of algebra.
Cat. XE-6995 **$13.50**

ASTEROIDS PLUS – MYTEK
Asteroids Plus is one of the finest high resolution graphic arcade games available for the MicroBee computer. It features 3-D point by point resolution graphics, shields, sound effects, intelligent objects, guided missiles, black holes and a score board. If you enjoy playing computer games, you will be captivated by Asteroids Plus.
Cat. XE-6297 **~$22.50**

BEE2 80 – MYTEK
This secret code disassembler will disassemble any code sequence. Nothing is illegal. It will allow you to program with codes that no other disassembler can decipher!
Cat. XE-6298 **$20.00**

SPACE INVADERS
One of the most popular programmes ever released. This version was written especially for the MicroBee.
Cat. XE-6030 **$14.95**

SCREEN DUMP
This tape comes with two programmes and can be used on both parallel and serial printers such as Star, FX80, Epson and other compatible types.
Side A – Horizontal Dump – executed from net command.
Side B – Vertical Dump – executed from CTRL P command.
Cat. XE-6970 **$14.95**

FORTH
A new language for the MicroBee. Comes complete with interpreter on one side of the tape and supporting programs on the other side. As well as this it includes a very well written, bound manual.
Cat. XE-6965 **$45.00**

MINE DROP
You are a tank running around a maze gathering all the supplies you can. It sounds easy, but you have a guided missile hot on your trail. Your only defence is a remote controlled mine which you drop and explode at will. A very fast joystick or key controlled game.
Cat. XE-6960 **$14.95**

PENETRATOR
A low resolution graphic version of the popular game "Scrambler". You must defeat the rockets and bomb the radars in an effort to get to the next stage which is even harder. This game can be either controlled by a Joystick or by keys. Being in Lores graphics it is a very fast game. If you are bored with the same land pattern you can devise your own.
Cat. XE-6955 **$19.95**

SPACE PATROL
A lot like Penetrator but in high resolution graphics. You must battle your way through the various stages where at the last stage you have four chances of blowing up a neutron bomb shelter. If you are successful, the next round is a lot harder.
Cat. XE-6950 **$16.95**

METEOR RESCUE – MYTEK
Your mission is to rescue stranded astronauts. You are the commander of the Landing Module docked in space with the mother ship. It is your responsibility to guide the landing module through a meteor field, down to the surface of the planet, to land safely on a landing pad. An astronaut will then run to your landing module and you will blast off. You must use your lasers if necessary and dock with the mother ship again. A total of six astronauts must be shuffled to the mother ship.
Cat. XE-7020 **$17.50**

CORVILLE CASTLE
Corville Castle is an adventure which will take you to a far away place of mystic castles, fierce monsters and evil warlocks. You must enter the warlocks castle and find some dark secret which will help you to destroy the warlock. But remember, you only have until dusk.
Cat. XE-6285 **$16.95**

CARACE
A fast exciting graphic game for the MicroBee. You must weave your way through a field of cars and oil slicks to produce the highest score. If you're too good at one speed then try the next (10 speeds to choose from!)
Cat. XE-6700 **$11.95**

EYE OF MIN (32K)
An adventure game with a difference in that it gives you a picture of where you are. Once you enter the castle you are given a floor plan making it easier than moving in the dark. A very thrilling adventure game.
Cat. XE-7025 **$14.95**

MORSE CODE TUTOR
Perfect for all you budding young amateurs. Quality program which covers the full alphabet, random letters, and allows you to enter a sentence in English and plays it back in morse, plus more.
Cat. XE-6880 **$14.95**

PSYCHOTEC By Dreamcards
Psychotec provides a striking example of artificial intelligence, allowing a dialogue in English between computer and operator, the computer playing the role of psychatrist and the operator being a "patient" on the couch. Leaves other "similar" types for dead.
Cat. XE-6875 **$15.95**

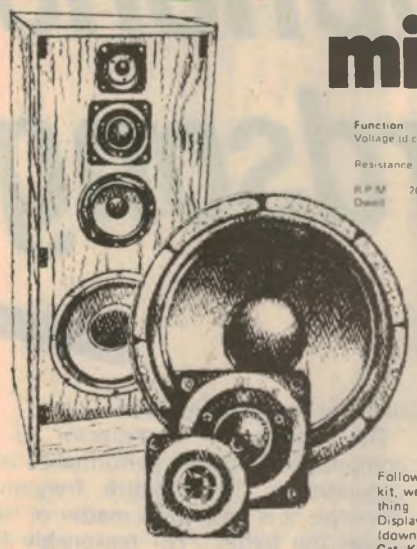
MERLIN By Dreamcards
Merlin is a 32K adventure set in England during the dark ages. Your task is to search through the dark forest inhabited by robbers, outlaws and creatures with awesome magic powers to find a legendary sword. An excellent adventure.
Cat. XE-6870 **$25.00**

YAHTZE
The famous old addictive dice game. Try to beat your own best score. Up to 3 players.
Cat. XE-6866 **$14.95**

UNDERWORLD OF KYN
Underworld of Kyn is an advanced adventure, average playing time to complete the game is about 10 to 12 hours for this reason it is recommended for experienced adventurers.
Cat. XE-6830 **$14.95**

BACUP
A program to assist you in making back-up copies. Allows you to load in a file loaded at 300 baud and save it again at 200 baud or 1200 baud.
Cat. XE-6780 **$11.95**

MORE OF THE BEST



minitune

Specification

Function	F.S.D.	Resolution	Accuracy
Voltage (d.c.)	20V	10mV	0.5% ± 1 digit
	200V	100mV	0.5% ± 1 digit
Resistance	2000Ω	100mΩ	0.5% ± 1 digit
	20kΩ	10Ω	0.5% ± 1 digit
R.P.M.	20,000 r.p.m.	10 r.p.m.	1% ± 3 digits
Dwell	90°	0.1°	2% ± 3 digits

FAR CHEAPER THAN DPM SEPARATELY

$42.95

Following the spectacular success of the DP2010 Digital Multimeter kit, we now have an ENGINE ANALYSER KIT! But the spectacular thing is the price! It is ACTUALLY CHEAPER than the DPM-05 Display and Case!! The Minitune will measure voltage, resistance (down to a very low range), RPM and Dwell Angle.
Cat. KJ-7012 $42.95

TEST LEADS TO SUIT ONLY $2.95

Ref: EA June 1983

GUITAR BOOSTER FOR STEREO AMPS

REF: EA JUNE 1982

Use your Electric Guitar on your home Hi-Fi. Saves you the expense of a practice amp.

Complete kit - ONLY $ 14.50

build your own speakers & SAVE!

4000/1 4-way System
Cat. CE-2430
Speakers only $525 (set of 8 spkrs with x/overs)
$525

4000/2 3-way System
Cat. CE-2440
Speakers only $397 (set of 6 spkrs with x/overs)
$397

'Power UP'

Ref: EA 11/82

$39.50 NO ROOM FOR DETAILS

Touch Sensitive Light Dimmer

Ref: EA April 1983

only **$19.95**

Cat. KA-1508

Complete kit including quality HPM wall plate with attractive brushed metal insert. The Jaycar kit is absolutely complete including a small dial spring which can be used to connect the PCB to the wall plate (Beware of other kits that do not include this). In addition to the above, we supply the High Voltage Resistors ALREADY SOLDERED in as a foolproof safety feature!

ETI15000 METAL DETECTOR

The Performance of a $500 metal detector for only $219! This is a fully discriminating V.L.F. T/R instrument (yes! the same principle as those expensive American ones) with ground balance. Control facilities are comprehensive — including an 'auto tune' button. This kit includes all parts including a fully built search head and handle assembly and special meter and case.
Cat. KE-1460 $219.00

SEE ETI DEC 1980 and JAN/FEB 1981

EQUIVALENT TO $500 units

$219

SUPER SIREN new low price

Ref: EA November 1982
The complete kit including Piezo siren
NORMALLY SELLS FOR $22.00
FOR NOVEMBER BUYERS
THE COMPLETE KIT — ONLY $14.95!!
Super Siren short form
Cat. KA-1484 — ONLY $5.00
PH1038 or PH1005 Piezo to suit $9.95

RIBBON tweeter

Unique regular phase design drives the entire diaphragm, uniformly and completely in phase over the full frequency range. The performance of an electrostatic speaker with the ruggedness and ease of use of a dynamic.
Cat. CE-2042 NORMALLY $36.50 ea

NOVEMBER ONLY
ONLY $19.95 — SAVE $16.95

- 91dB sensitivity
- 50W system power
- 5,000-40,000Hz
- No voice coil

SAVE

SAVE OVER $7.00

SPECIAL ANNOUCEMENT

JAYCAR IS PLEASED TO ANNOUNCE THAT WE NOW STOCK EVERY PC BOARD FOR EA AND ETI PROJECTS FOR THE LAST 5 YEARS IF YOU REQUIRE A BOARD FOR ANY PROJECT WITHIN THIS PERIOD SIMPLY CALL IN, WRITE OR PHONE — (02) 264 6688

Jaycar

Incorporating ELECTRONIC AGENCIES

SYDNEY SHOWROOMS
117 YORK STREET — PHONE: (02) 264 6688 and (02) 267 1614
TELEX 72293

CARLINGFORD
Cnr. CARLINGFORD & PENNANT HILLS ROAD — PHONE: (02) 872 4444

CONCORD
115 — 117 PARRAMATTA ROAD — PHONE: (02) 745 3077

HURSTVILLE 121 FOREST ROAD — PHONE: (02) 570 7000

NUMBER 1 FOR KITS

POST AND PACKING CHARGES
$5 — $9.99 ($1.50) $10 — $24.99 ($3.20)
$25 — $49.99 ($4.50) $50 — $99.99 ($6.50)
$100 — $198 ($8.00) Over $199 ($10)
"Free INSURANCE for Road & Registered Post over $200"
All heavy or bulky items (over 20kg) sent Comet Road Freight $12.00 anywhere in Australia

SHOP HOURS CARLINGFORD CONCORD & HURSTVILLE
Mon — Fri 9am — 5.30pm Sat — 9am — 12pm Thurs night 8.30pm
SHOP HOURS SYDNEY
Mon — Fri 8.30am — 5.30pm Sat — 8.30am — 12pm Thurs night 8.30pm
MAIL ORDERS AND CORRESPONDENCE: BOX K 39 HAYMARKET, SYDNEY 2000

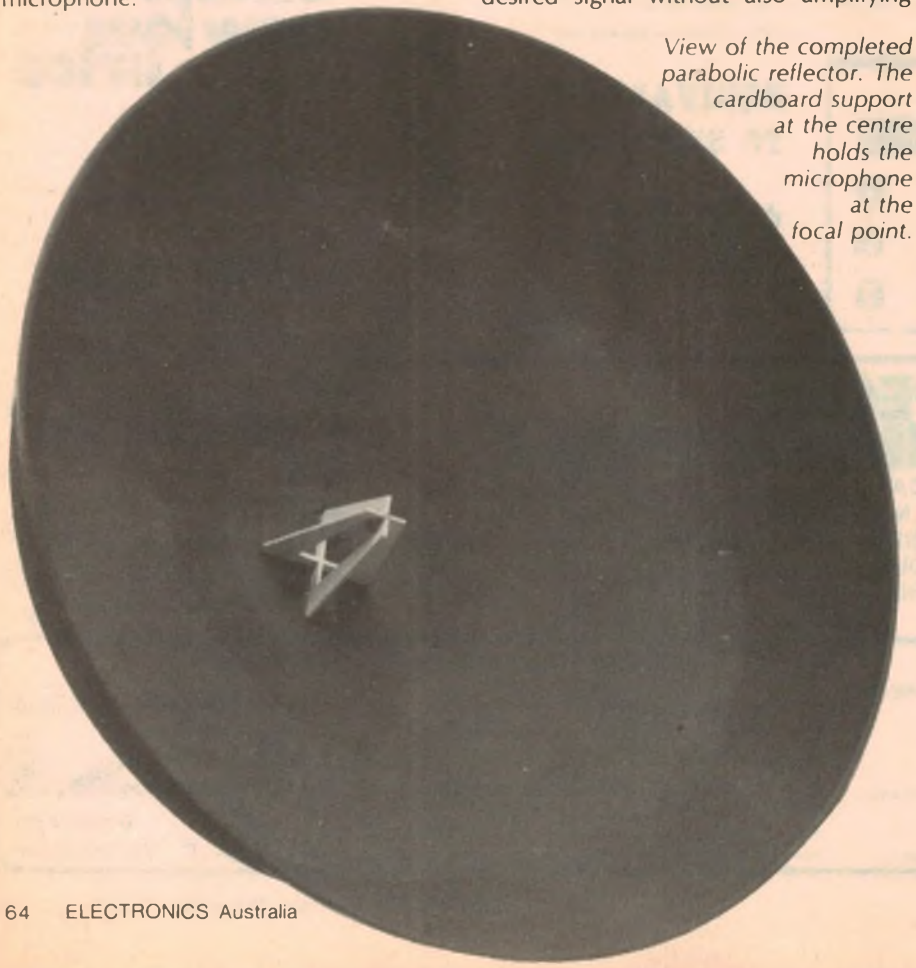
Mail Order By BANKCARD Via Your Phone

Parabolic Microphone for recording birdsong

We explain how to build a low cost parabola, along with a high gain headphone amplifier. Just the thing for listening to birds, or perhaps for other more sinister activities. (Move over ASIO!)

The text book definition of a parabola goes something like this: "the locus of a point which moves such that it is equidistant from both a point (the focus) and a line (the directrix)." So far as we are concerned, its main purpose in life is to be used as a reflector. The most common example of a parabola in this application is the reflector of headlamps, where rays of light emitted from the bulb are reflected in an almost parallel beam. In our case a reciprocal mechanism applies; incoming parallel sound waves are reflected onto a single point, ie, the microphone.

Parabolic reflectors provide gain (up to 20dB in this case) for any sound which is "on axis". This characteristic enables a microphone to respond to sounds which would otherwise be very mute or inaudible. Equally important is the fact that the reflection pattern is directional. This means that as the sound source is moved off-axis, the gain becomes progressively lower. For a sound source 90° off-axis, the gain will be around unity and for a sound behind the reflector, attenuation will occur. This is important because it allows us to amplify the desired signal without also amplifying much of the ambient noise.



View of the completed parabolic reflector. The cardboard support at the centre holds the microphone at the focal point.

The design of a reflector is a compromise between performance and convenience. To optimize frequency response, it is basically a matter of "the bigger the better". For reasonably flat response down to 100Hz, the reflector would have to be over 3m in diameter! Besides the difficulties involved in construction, attempting to use such a device could not be achieved in an inconspicuous manner.

We have settled for a reflector diameter of 60cm which results in a loss of efficiency for sounds below about 500Hz. This should present no problem with the majority of bird song, which is well above this frequency. Speech will not fare quite so well. Although still intelligible, it may sound thin and unnatural.

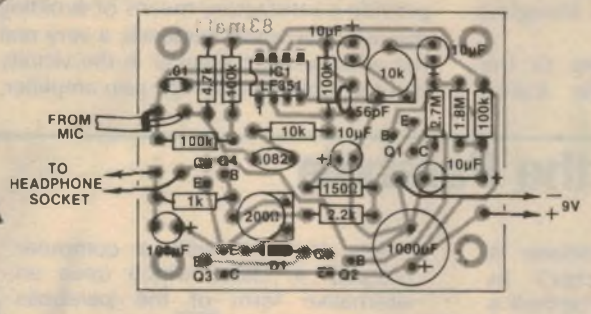
Even more important than the diameter of the reflector is the focal length, since the actual parabolic curve is built around this dimension. We chose a 10cm focal length, based on test results obtained by G. N. Patchett, PhD ("Tests on Parabolic Reflectors," EA Oct '73). Compared with several other focal lengths which Patchett had tried, this gave a much better low frequency response. Such a reflector is rather deep, but this has the advantage of shielding the microphone from the wind.

Because all of the sound waves striking the reflector are focussed onto a single point, it is possible to use a small microphone. In this respect, electret microphone inserts are ideal. They are readily available and quite cheap, and a light cardboard framework is all that is necessary to locate the microphone at the focus.

Making the reflector

Coming up with a workable process for building the parabola caused more than a little head scratching around our office. We had to find a process that was inexpensive, reasonably accurate, and above all something that could be easily duplicated by readers. As a temporary

Below: PCB parts overlay diagram. Use shielded cable for the microphone connections.



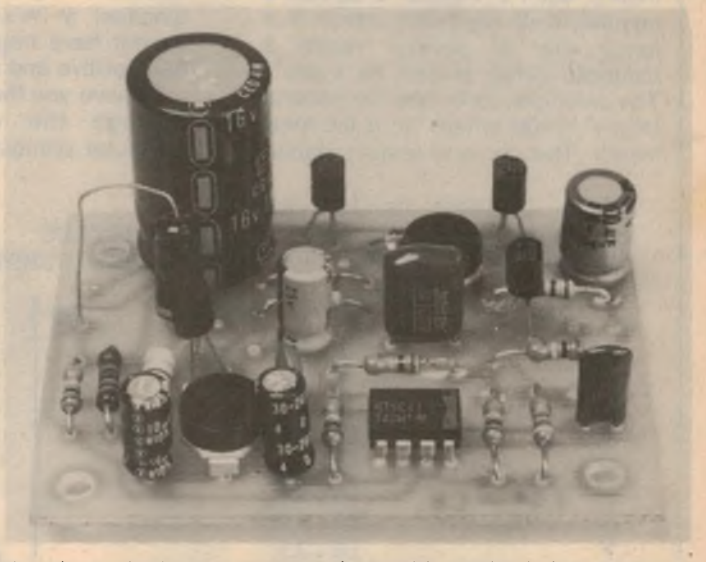
We estimate that the current cost of the components for the project is approximately

$15

This includes sales tax, but not the cost of batteries or headphones.

by COLIN DAWSON

Right: view of the assembled PCB. Take care with polarised parts.



measure, we decided to build a cardboard parabola using 12 segments.

After struggling with innumerable pieces of cardboard and sticky tape, a triumphant staff member proudly displayed his "pseudo-parabola". This ungainly-looking object tended to collapse unless supported by at least four hands at once. Perhaps surprisingly, it actually performed quite well. From G. N. Patchett's results, the greatest amount of gain we could expect was 20dB, and we achieved nearly 17. Certainly the design looked promising.

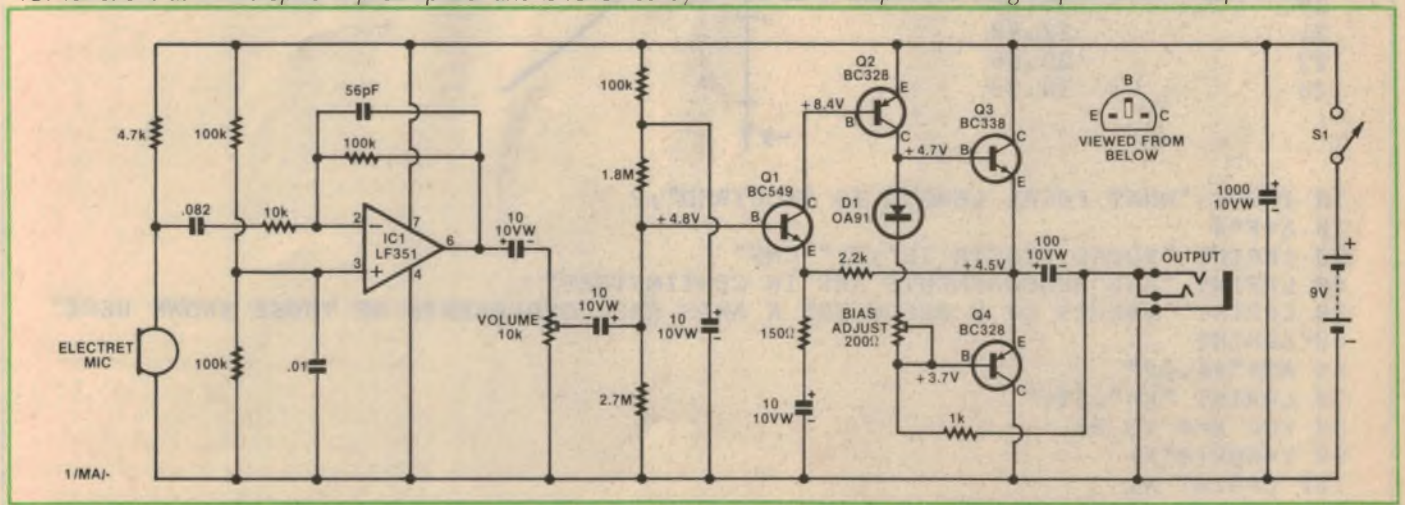
The most obvious improvement was to strengthen the parabola so that it became self supporting. This was achieved by pasting strips of paper over the cardboard, papier mache style. We made the mistake of making the first layer too wet so that the parabola became a nondescript gelatinous heap of paper. It had to be reshaped frequently whilst drying.

The final solution was to apply the strips to the inside of shell and we now suggest that they be applied to this side only. Since we had already applied one outside layer, we found that two inside layers were sufficient to provide the required stiffness, suggesting that three or four inside layers only should be about right.

Despite its shortcomings, we think this is still a feasible approach to building the parabola. If the constructor avoids our mistakes, the process should be reasonably straightforward. Alternatively, if you feel ambitious you could try a sand mould method for making a fibreglass reflector which was described in the RSGB publication, "VHF-UHF Manual" by Evans and Jessop.

The method involves shaping a mound of sand with a rotatable profile to produce the parabolic shape. The sand is then sprayed with a coat of paint to stabilise it and then mats of fibreglass impregnated with resin are laid over it to build up the required thickness and strength.

IC1 functions as a microphone preamplifier and is followed by a 4-transistor amplifier driving a speaker or headphones.



Parabolic Microphone

involve the use of an old umbrella to form the foundation of a fibreglass reflector.

When it comes to listening to the sound, headphones are the logical choice. Apart from anything else, they provide a satisfactory means of avoiding the risk of acoustic feedback; a very real risk when using a speaker in the vicinity of a microphone and high gain amplifier, directional characteristics of the reflector notwithstanding.

In addition, they provide a high level of sound with a modest power input, and block out most of the background noise. To drive them we have designed a low power utility amplifier – just the thing to use with headphones. The whole circuit

How to plot the Parabola

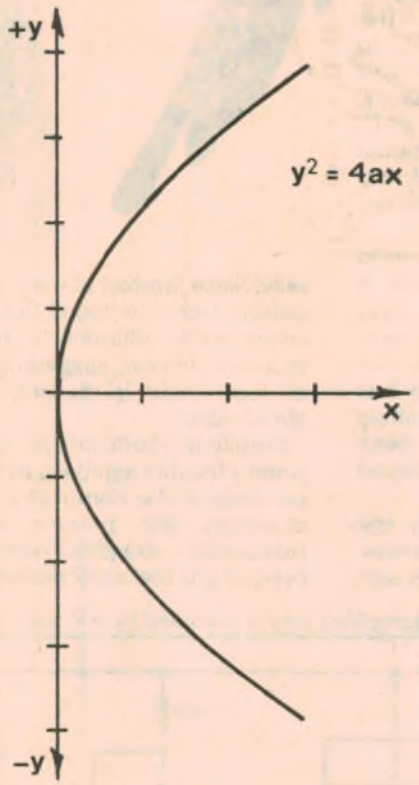
Just how do you produce a parabola-shaped reflector? In theory, such a reflector is termed a paraboloid of revolution which is a fancy way of saying "rotate a parabolic curve around its x-axis". The parabolic curve has the general form $y^2 = 4ax$ where "a" is the focal length. The curve is shown plotted below together with a computer program in Basic which uses an alternative form of the parabolic function: $y = \sqrt{4ax}$. Note that x cannot have negative values but y has positive and negative values.

To save you the trouble of running through the calculations the computer printout below shows the values of y for all values of x from 0 to 23 in 1cm steps. This is adequate to allow you to draw a full-size profile of the reflector.

Note that as far as the appearance of the parabola is concerned it is nice if it can be as smooth and as free of bumps as possible. For all practical purposes though, small bumps and undulations will not make a great difference to the performance.

```
FOCAL LENGTH IS 10  CMS
ALL MEASUREMENTS ARE IN CENTIMETRES
VALUES OF Y BELOW THE X AXIS ARE COMPLEMENTS OF THOSE SHOWN HERE

X=            Y=
 0             0.00
 1             6.32
 2             8.94
 3            10.95
 4            12.65
 5            14.14
 6            15.49
 7            16.73
 8            17.89
 9            18.97
 10           20.00
 11           20.98
 12           21.91
 13           22.80
 14           23.66
 15           24.49
 16           25.30
 17           26.08
 18           26.83
 19           27.57
 20           28.28
 21           28.98
 22           29.66
 23           30.33
```




```
10 INPUT "WHAT FOCAL LENGTH IS REQUIRED";F
20 A=F*4
30 LPRINT "FOCAL LENGTH IS";F;" CMS"
40 LPRINT "ALL MEASUREMENTS ARE IN CENTIMETRES"
50 LPRINT "VALUES OF Y BELOW THE X AXIS ARE COMPLEMENTS OF THOSE SHOWN HERE"
60 LPRINT
64 A$="##.##"
70 LPRINT "X=","Y="
80 FOR X=0 TO 23
90 Y=SQR(A*X)
100 LPRINT X,
110 LPRINT USING A$;Y
120 NEXT X
```

can easily be powered from a "six-pack" of penlight cells.

How it works

An op-amp microphone preamplifier is followed by a direct coupled transistor power amplifier. The output stage has two transistors in a fully complementary push-pull arrangement. This power amplifier is a design we have used a number of times in the past, with the earliest variants dating back to the days of germanium. We can't be accused of using an unproven circuit!

Refer now to the circuit. The electret microphone needs a bias current and this is supplied by the 4.7kΩ resistor connecting it to the positive supply rail. The signal appears at the junction of this resistor and the microphone and is coupled to the inverting input via the .082μF capacitor, which serves to isolate the inverting input from the bias voltage.

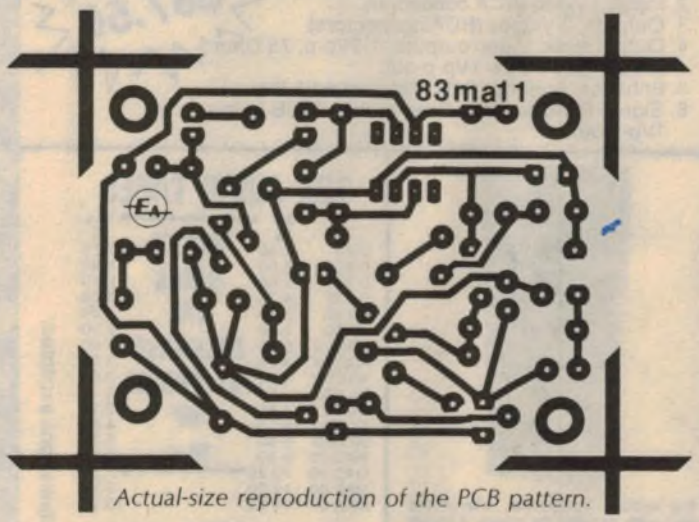
From the 0.082μF capacitor signal is fed via a 10kΩ resistor to the inverting input (pin 2) of the op-amp. The non-inverting input (pin 3) is connected to the mid-point of a voltage divider consisting of two 100kΩ resistors connected across the supply. This holds pin 3 at half the supply voltage.

Negative feedback for the op-amp is provided by the 100kΩ resistor connected between the output (pin 6) and pin 2. It is the ratio of the 10kΩ input resistor and this 100kΩ feedback resistor which determines the gain of the op-amp. A 56pF capacitor connected in parallel with the 100kΩ feedback resistor limits the bandwidth of the op-amp so that it will not respond to RF signals picked up by the input leads.

The output of the op-amp is capacitively coupled to the volume control, a 10kΩ potentiometer. This in turn is capacitively coupled to the base of Q1.

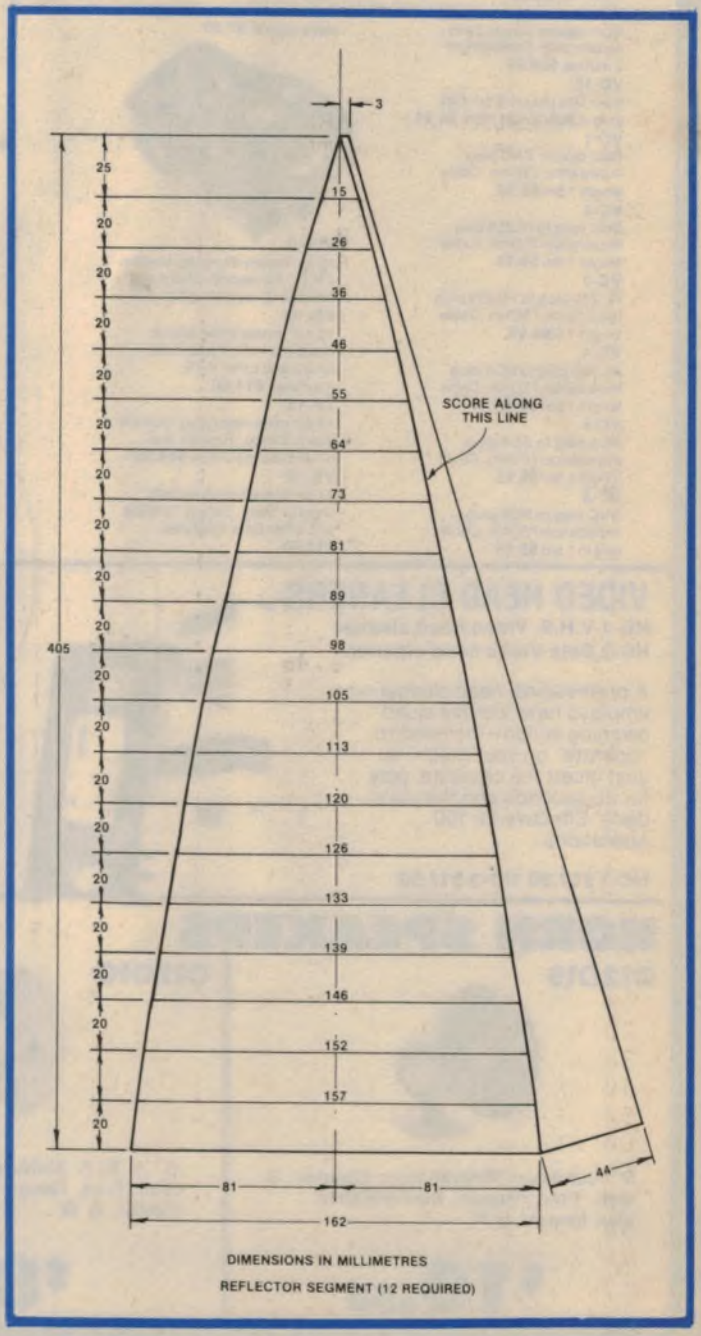
The base of Q1 is biased to approximately half the supply voltage by the divider consisting of the 1.8MΩ and 2.7MΩ resistors. There is also a 100kΩ resistor in series with the 1.8MΩ and this, in conjunction with the 10μF capacitor, forms a decoupling network which

Continued on page 129



Actual-size reproduction of the PCB pattern.

Below: this diagram gives the dimensions of the reflector segments. You will need 12 segments in all.



PARTS LIST

- 1 Printed circuit board 68 x 51 mm, code 83ma11
- 1 Electret microphone insert
- 1 Single pole single throw (SPST) switch
- 6 1.5V batteries (Eveready AA or equivalent)
- 1 Battery holder to suit
- 1 Battery snap
- 1 Metre of single core shielded cable
- 1 Stereo audio socket to suit (either 3.5 or 6.5mm

SEMICONDUCTORS

- 1 LF 351, TL071 FET input op-amp
- 2 BC328 PNP transistors
- 1 BC338 NPN transistor
- 1 BC549 NPN transistor
- 1 OA91 germanium diode

CAPACITORS

- 1 1000μF/10V electrolytic
- 1 100μF/10V electrolytic
- 3 10μF/10V electrolytic
- 1 10μF/10V axial electrolytic
- 1 .082μF metallised polyester (greencap)
- 1 .01μF metallised polyester (greencap)
- 1 56pF ceramic

RESISTORS (¼W, 10%)
1 x 2.7MΩ, 1 x 1.8MΩ, 4 x 100kΩ, 1 x 10kΩ, 1 x 4.7kΩ, 1 x 2.2kΩ, 1 x 1kΩ, 1 x 150Ω, 1 x 10kΩ small horizontal trimpot, 1 x 200Ω small horizontal trimpot

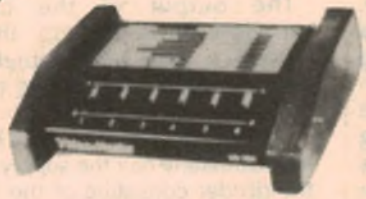
MISCELLANEOUS
Hook-up wire, cardboard, newspaper etc.

ROD IRVING ELECTRONICS

425 HIGH ST, NORTHCOTE 3070 VIC PHONE (03) 489 8131

Built and tested

Video Switching box



$47.50

Low loss R F. switching—allows inputs for:- VCR, video disc, antenna, cable TV, home computer and video games.

Built and tested

Video Enhancer

Detail Enhancer VP5030 is another important contribution to the world of video accessories. The lightweight Detail Enhancer has been particularly designed to rectify loss in detail derived from VCR tapes and picture impairments. With simple adjustments for more or moderate detailing, the detail enhancer can also overcome such picture impairments as loss of detail and disappearance of verticle lines.

Bargain Price $87.50

Specifications:

1. Power requirement: 12V DC 110mA
2. Input: 1 Video (RCA connector)
3. Outputs: 3 Videos (RCA connectors)
4. Output lever: Video outputs: 1.0Vp-p, 75 Ohm unbalanced below 1Vp-p out.
5. Enhance: Enhance 9dB (Referenced/1.0Vp-p)
6. Signal-to-noise ratio: Greater than 50dB below 1Vp-p out.

WE HAVE A GREAT RANGE OF VIDEO CONNECTORS AND CABLES FOR VIDEO TO VIDEO DUBBING.

Cables

PA-25
5 pin 180 degree dubbing adaptor—Reverse pins for video use **$6.95**

VC-14
8 pin square plug to 8 pin square plug. Cable length 2 metres **$29.95**

VC-15
6 pin DIN plug to 6 pin DIN plug. Cable length 1.5m **$4.95**

VC-1
BNC plug to BNC plug Impedance-75Ohm. Cable length 1.5m **$6.50**

VC-2
BNC plug to PL259 plug Impedance-75Ohm. Cable length 1.5m **$6.75**

VC-3
PL 259 plug to PL 259 plug Impedance-75Ohm. Cable length 1.5 **$4.95**

VC-4
PL 259 plug to RCA plug Impedance-75Ohm. Cable length 1.5m **$4.95**

VC-5
RCA plug to RCA plug. Impedance-75Ohm. Cable length 1.5m **$5.95**

VC-6
BNC plug to RCA plug Impedance-75Ohm. Cable length 1.5m **$5.95**

Video Connectors

VP-8
8 pin square video connector plug **$7.50**

VS-8
8 pin square video connector inline socket **$7.50**

VP-10
10 pin male video plug. Used in J.V.C., Panasonic, Sharp and other VHS machines **$11.50**

VS-10
10 pin female inline socket. Used in J.V.C., Panasonic, Sharp and other VHS machines **$11.50**

VP-14
14 pin male video plug. Used in Sony, Sanyo, Toshiba and other Beta machines **$16.50**

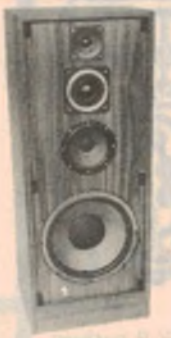
VS-14
14 pin female inline socket. Used in Sony, Sanyo, Toshiba and other Beta machines **$16.50**

VIDEO HEAD CLEANERS

HC-1 V.H.S. Video head cleaner
HC-2 Beta Video head cleaner

A professional head cleaner—employs new "double sided" cleaning action—no need to "operate" on your machine. Just insert the cassette, play for 30 seconds and the job's done. Effective for 100 operations.

HC-1 $17.50 HC-2 $17.50



The 4000/1 loudspeaker, without the front grille, showing the drivers. It stands about one metre tall.

SERIES 4000 PHILIPS SPEAKERS

Speakers + Crossovers	$479.00
Speaker boxes	$269.00
Crossover Kits	$199.00
Complete Kit	$749.00

TDK AUDIO TAPES

	1-9 $	10+ $
D 46	2.40	1.75
D 60	2.60	1.90
D 90	2.80	2.10
D 120	4.75	3.50
AD 60	3.15	2.60
AD 90	3.90	3.00
AD 120	5.90	4.90
ADX 60	4.05	3.00
ADX 90	4.80	3.80
SA 60	4.25	3.40
SA 90	4.80	3.90
SAX 60	5.25	4.80
SAX 90	5.80	5.20
MAC 60	9.50	8.50
MAC 90	10.25	7.95
MAR 60	12.20	9.95
MAR 90	15.72	13.95

DUE TO SALES TAX INCREASE ALL PRICES UP 10%

TDK VIDEO TAPES

E-60	12.50	11.00
E-120	14.00	13.00
E-180	15.00	14.50
E-240	25.00	23.50

Errors and omissions excepted.

T.V. and F.M. Splitters

300 OHM · 75 OHM

Model	F. Range (MHz)	Impedance (Ohms) IN	OUT	Output	Band	Splitting loss	Isolation	V.S.W.R
DDF 332 U-V	50-890	300	300	2	VHF	3.5	25	1.5
					UHF	4	20	1.7
DDF 772 U-V	50-890	75	75	2	VHF	3.5	25	1.5
					UHF	4	20	1.7
DDF 774 U-V	50-890	75	75	4	VHF	6.7	30	1.4
					UHF	7.8	22	1.8

DDF-332 **$3.95**, DDF-772 **$4.95**, DDF-774 **$6.95**

HORN SPEAKERS

C12015

5" Aluminium Material Horn Speaker. 8 ohm. Freq. Range: 600-5000Hz Max Power: 8 W

$10.50

C12010

5" A. B. S. Material Horn Speaker 8 ohm. Freq. Range: 600—5000Hz Max Power: 8 W

$8.95

5" Siren Horn (Aluminium) 8 ohm. Freq. Range: 600—5000Hz Max Power: 10 W Rated Voltage: 12 VDC

$18.95

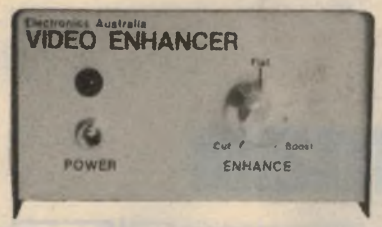
48-50 A'BECKETT ST, MELBOURNE 3000 VIC PHONE (03) 347 9251

Mail Order Delivery Instructions: Minimum Pack and Post $2.00 for Australia Post. Please allow extra for bigger orders and Certified, Airmail or Registered Post. Minimum order is $5.00. Please address orders to Mail Order Department, PO BOX 235, NORTHCOTE, 3070, VICTORIA. PHONE (03) 481 1436.

ROD IRVING ELECTRONICS

425 HIGH ST, NORTHCOTE 3070 VIC PHONE (03) 489 8131

VIDEO ENHANCER $35



Like tone controls in a hifi amplifier, touch up the signal with this Video Enhancer. EA OCTOBER 83

NAIL FINDER $10

Essential for the home handyman the Nail Finder will help locate timber studs behind Gyprock or plasterboard wall surfaces as well as locating pipes and wiring buried in walls.

EA OCTOBER 83

SPEED SENTRY $11

EA OCTOBER 83

Paying speeding fines can be a painful business. Build this Speed Sentry and avoid further pains in the wallet.

TRANSISTOR TESTER $15

Have you ever desoldered a suspect transistor, only to find that it checks OK? Troubleshooting exercises are often hindered by this type of false alarm, but many of them could be avoided with an "in-circuit" component tester such as the EA Handy Tester.

EA SEPTEMBER 83

SOIL HEATING UNIT $70

A little heat applied to the soil using this device may just do the trick. EA SEPT 83

WATTMETER $65

The unit described here will measure the power consumption of any mains appliance with a rating up to three kilowatts. It makes use of a special op amp called an "output transconductance amplifier" or OTA for short.

EA SEPTEMBER 83

CAR ALARM $29.00

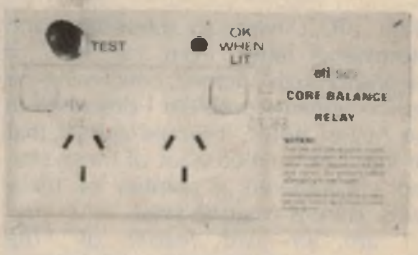
This Car Alarm uses the battery earth strap as a sensor to detect when a "courtesy" light or other electrical load occurs when a thief enters a vehicle. The circuitry is simple and immune from false triggering problems. ETI July 81

10-15V EXPANDED SCALE V-METER

ETI 159 December 81

$26.50

CORE BALANCE RELAY



$44.50

Mains-operated equipment that goes faulty is potentially lethal. Electro-mechanical "core-balance relays" which sense earth-fault currents and trip a circuit breaker have been available for house-mains installation for some years. Portable core-balance relay units have obvious advantages. Protect yourself — and your equipment — with this simple, inexpensive project.

VIDEO AMPLIFIER $15

EA AUG 83

Bothered by smeary colours, signal beats and RF interference on your computer display? Throw away that cheap and nasty RF modulator and use a direct video connection instead. It's much better.

The Video Amplifier features adjustable gain and provides both normal and inverted outputs. Power is derived from a 12V DC plugpack supply.

WHEATSTONE BRIDGE $45

±12V RAILS FOR LAB POWER SUPPLY

EA July 1983

An inexpensive addition to the 50V 5A Lab Power Supply which should prove its worth many times over. It provides additonal fixed ±12V outputs for lower power applications.

FRIDGE DOOR ALARM

When the refrigerator door has been left open for about 20 seconds — or, more correctly, when the light has been on for 20 seconds — this EA Fridge Alarm will emit a series of reminder beeps until the culprit closes the door.

$9

FOR PCB VERSION

EA July 1983

Portable 3½ Digit Heart Rate Monitor

$79.00

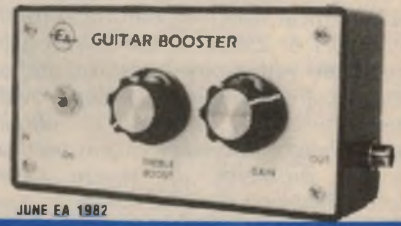
Here is a new heart rate monitor designed specifically for use by the dedicated fitness seeker. Small enough to carry when jogging or exercising, it features an optical sensor, no electrical connections to the body, an in-built calibration circuit, and direct readout on a large liquid crystal display (LCD).

Driveway Sentry

$32

Activated by your car's headlights, the "Driveway Sentry" will turn on a driveway or garage light so that you can make a safe exit from your car on the darkest of nights. At the end of five minutes, it will automatically turn the light off again.

EA GUITAR BOOSTER $17.50



JUNE EA 1982

48-50 A'BECKETT ST, MELBOURNE 3000 VIC **PHONE (03) 347 9251**

Mail Order Delivery Instructions: Minimum Pack and Post $2.00 for Australia Post. Please allow extra for bigger orders and Certified, Airmail or Registered Post. Minimum order is $5.00. Please address orders to Mail Order Department, PO BOX 235, NORTHCOTE, 3070, VICTORIA. PHONE (03) 481 1436.

The Serviceman

On linearity, tripler repairs — and earrings!

It's catch-up month this month; a time to catch up on a number of short items, contributions etc which, for a variety of reasons, seem to get pushed into the "too hard" basket at the time. So rather than a dramatic "who-done-it" style track 'em down story this month there are several interesting practical points worth filing for reference.

First off, I have an interesting and informative letter from Mr R.R. of Greensborough, Victoria, concerning the vertical linearity problem I described in the August notes. It would appear that Mr R.R. has handled a lot of these sets, and encountered a number of tricky faults. Here is what he says:

"I am an avid reader of "The Serviceman" each month and there have been many problems, encountered and solved by other readers and yourself, that have helped me. Now, maybe I can help you with the problem encountered with the Toshiba C812 (Precedent GC181) and described in your August 1983 article.

"I agree with your remarks that these sets can have numerous problems associated with dry and intermittent joints between the two sides of the double sided board. These can be overcome as suggested, by re-soldering likely problem areas. There can also be problems involving the sockets and pins which hold the vertically mounted boards, and these can be overcome by careful cleaning. These faults can range from intermittent colour, intermittent R-Y (green faces), to snowy pictures.

VERTICAL LINEARITY

"Now to the vertical linearity problem. On all sets exhibiting this fault I have found that Q306 vertical output and Q353 vertical switching transistors (both 2SC1448A or 2SC2073) are low in gain (compared with a new transistor) and/or exhibit collector-emitter leakage. With these faults any attempt to obtain correct height invariably causes vertical linearity problems. In severe cases vertical blanking, vertical foldover, and partial collapse can be encountered.

"Another common fault in the vertical system is for C339, 22μF/50V electro to go open circuit. Other faults include low contrast caused by a faulty C241, 47μF/16V electrolytic, and loss of vertical hold due to diode D301(IS1555) going short circuit.

"I hope these comments may help you and your readers in the future."

Well, thank you R.R., and I'm sure readers will appreciate the very valuable information you have been able to supply. In regard to the particular set in question I cannot be sure now whether your suggestion was the true nature of the fault. However, I will keep the idea in mind against the next time I can get my hands on that set.

At the same time, and assuming that R.R.'s suggestion is correct, there is still the mystery of why a particular electrolytic capacitor appeared to cure the fault.

And next, a few more thoughts on the very brief comment with which I concluded last month's notes. This was based on a letter from D.R. of The Entrance, NSW, pointing out that the suffix "T" on Japanese fuse markings indicates a time delay type fuse. He suggests that this may have some bearing on the puzzling sequence of events involving de-gauss thermistor and fuse failures in a National set.

On reflection, I'm not sure whether this fact, had I been aware of it, would have provided the total answer to the problem. I still feel that the addition of the power transfer to what was, basically, a transformerless chassis, was at least partly responsible. But of course I can't be sure; I and other readers should keep D.R.'s comment well in mind in the event that the same problem is encountered again.

CONFUSION

Either way, I am sure that we are all grateful to D.R. for raising the point. The truth is that I – and several colleagues to whom I mentioned the matter – was completely misled by the "T" suffix. In English fuse designations the letter "T" has always stood for "tubular", implying the glass tubular types with which we are all familiar.

The use by the Japanese of "T" to indicate time delay (TD might have been better) is just another example of the confusion which can arise due to language differences. Together with the Japanese English one so often encounters in service and user manuals, the language problem can be a major headache for serviceman and user alike.

For my next comment I must refer readers to a story back in January 1981 (how time flies). This was a contributed story concerning a failed tripler in a Rank 2601, and how the owner repaired it with "Five Minute Araldite". Although the repair appeared to be satisfactory, I subsequently received a letter from a large service organisation pointing out that this material has already been tried and found wanting, at least on a long term basis.

They recommended a Dow Corning

product, distributed by Selleys Chemical Co, called "Clear Silicone Sealant", previously called "Silicone Rubber Sealer", and also sold as "Clear Silicone Sealant 781". I published this information in the May 1981 notes.

Subsequent to this I received yet another comment, this time from a Mr K.B.S. of Wahroonga, NSW. He submitted a copy of a report on this and similar Dow Corning products (source unfortunately not specified) which pointed out a serious limitation when used in electronic equipment.

While there is little doubt that this material has excellent mechanical, adhesive, and electrical qualities when it cures – which it does on contact with air at room temperature – it is the curing process which is the problem. To quote from the above mentioned report there is a "strong release of acetic acid while curing". The report goes on to point out that this could constitute a risk to adjacent printed boards and other components, and that this risk has been recognised by the RAAF.

ALTERNATIVES

The recommended alternatives are Dow Corning 3145 and 738RTV which, while apparently having all the desirable physical and electrical qualities, boast a "non-corrosive" cure. One of the problems with these products is the multiplicity of names and type numbers under which they appear. The "781" designation by Selleys, as it appears in the hardware stores, is apparently the same as "731RVT" as listed in the report. And I suggest you will look in vain for "3145" or "738RTV" at the hardware stores.

Following this I made some enquiries among colleagues about the extent to which they attempted to repair triplers, with what success, and what they used. It transpired that a surprising number undertook this job as a matter of course, partly because some replacement triplers are quite expensive, and partly because they were often in short supply.

And just as interesting was the fact that most of them used the "781" material and, apparently, with complete success, some quoting repairs of up to five years old, with no sign of failure to either the tripler of adjacent components. And what about the acetic acid? Oh yes, they all agreed the vapour was most noticeable, even objectionable, during the curing period. One mentioned that he had found it necessary to don rubber gloves while applying the stuff, to avoid irritation to sensitive skin.

All of which seemed to add up to a rather inconclusive situation. There seemed no doubt that the vapour was given off, quite strongly, during the cure, but there was no evidence that it had caused any long term problems. It was all rather confusing and, not having had to face up to the problem myself, I pushed it into the mental "too hard" basket.

That is, until recently. The author of the January 1981 story, having read the warning in the April 1981 issue, contacted me and confirmed that the prediction was all too accurate; his tripler had failed again – or, at any rate, was on the point of doing so. Becoming aware of a faint hissing sound from inside the cabinet he had discovered a weak brush discharge from what appeared to be a crazing pattern on the Araldite.

So what should he do? Cut his losses and buy a new tripler? Or could the situation still be salvaged, using something like the suggested "781"? I told him I thought that a second repair was well worth a try, at the same time realising that here was the incentive to finalise the investigation I had started after his first failure.

So I contacted Selleys and spoke to one of their chemists. He was very helpful and confirmed the acetic acid characteristics. When I put it to him that this was a problem in regard to electronic equipment he immediately suggested an alternative product which as nearly as I can make out, is a proprietary version of the Dow Corning "3145".

In its most convenient form it is sold in a 75g tube as Selleys Silicone Roof and Gutter Sealant. It also carries the type number "780", though this is not very prominently displayed. In spite of its humble intended application, the Selleys chemist assured me that it has all the physical and electrical characteristics of the "781" product, but without the acetic acid problem.

I passed this advice on to my contributor and this was enough to convince him that it was worth a second try to salvage the tripler. After all, what did he have to lose, apart from the price of a tube of sealant? So off he went to the local hardware store.

He rang me back the next morning to report that all had gone according to plan. He had no difficulty finding the product on the Selleys bar, and the labelling seemed to tally exactly with what I had been told. One point he noted, however, was that the product is not supposed to keep for more than six months after unsealing the tube.

He managed to peel off the old Araldite, though he admitted that this was a bit tricky. At one stage he feared that he would have to remove the tripler completely and grind it off. Then he coated the offending area with the new product and crossed his fingers. The instructions suggest that the product

EASTERN
COMMUNICATION CENTRE

COMMUNICATIONS, ELECTRONICS AND COMPUTERS

168 ELGAR ROAD, BOX HILL SOUTH, 3128
Phone enquiries: 288 3107

CONTACT Keith VK3ACE or David VK3UD
HOURS: Mon.-Fri. 9-5.30, Sat. 9-12
BANKCARD WELCOME OR WE CAN ARRANGE FINANCE

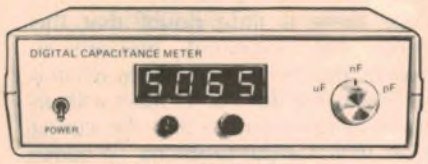
ALTRONICS DISTRIBUTOR ● FULLY EQUIPPED SERVICE CENTRE

7 DIGIT FREQUENCY COUNTER

UNBELIEVABLE 0.005% ACCURACY

FUNCTION GENERATOR

DIGITAL CAPACITANCE METER



with Deluxe Instrument Case

TW 4000A-70cm/2m DUO-BANDER

$699

VS1—VOICE SYNTHESISER—$40

50V 5A LABORATORY POWER SUPPLY

New switchmode supply can deliver anywhere from three to 50V DC and currents of 5A at 35V or lower. Highly efficient design.

EA May, June 1983 **$140.00**

EASTERN CONVERTER!

CW/RTTY/COMPUTER

Hooks straight up to your RS232 Terminal or Teletype via 20mA loop.

RTTY COMPUTER

Connect to terminal and modem.

See EA November, 1982

POWER UP

A MUST FOR YOUR COMPUTER SYSTEM

This great new Project from EA is the answer to a Maiden's Prayer.

What Does It Do?
A single 240v mains plug and lead feeds one unswitched master 240v outlet plus 4 switched 240v outlets. **With say a hi-fi system,** plug your main equipment item (eg Amp) into the master outlet and whenever you "switch on" your amp – presto – mains power is applied to the other 4 outlets ie simply "turning on" your amp turns on your tape cassette, tuner, turntable, graphic equaliser without mains spikes, plops, etc.

Just the shot for your Computer System.

The Altronics Kit includes case and all outlets.

Cat K6000 . . . . . **$39.50**

LABORATORY MULTIMETER

100K OHMS/VOLT CHECKS TRANSISTORS AND MEASURES CAPACITANCE

Q 1040 Multimeter **$72.50**
Q 1041 Carry Case **$14.50**

From Tokyo Laboratories, Japan

Remember the days when high grade precision laboratory multimeters were available only from UK and then they cost a King's Ransom?! – Well, that's history – the new Q 1040 is everything a high quality meter should be **PLUS** it checks transistor HFE and ICO and measures capacitors from 50pf-50uF.

★ 100K OHMS/Volt DC ranges ★ 8.5 UA movement ★ Fuse and diode movement protected ★ Inbuilt oscillator for capacitance measurement. **RANGES: DCV** 250MV, 2.5V, 10V, 50V, 250V, 1000V. **ACV** 5V, 10V, 50V, 250V, 1000V (10K/V). **DCA** 10UA, 2.5MA, 25MA, 500MA, 10A. **ACA** 10A **Resistance** x1, x10, x1K, x10K. **Transistors** NPN/PNP. **HFE** 0-1000 **ICO** 0-50UA. **Capacitors** 50PF-3UF. .01 UF-50UF.

FAX-80

$495 plus Tax

80 column printer. Bi-directional graphics printer.

HAMPACK II MODEM!

Plugs into APPLE® or compatible computers. Software and documentation for instant CW BAUDOT, ASCII transmissions.

Can be adapted for Commodore

$210

ORDER NOW – LIMITED STOCKS

EPROMS – COPIED AND PROGRAMMED PCB's MANUFACTURED TO ORDER.

REPAIRS TO APPLE, COMMODORE & TRS 80

forms a skin after 15 minutes, cures to the touch in an hour, and cures fully in 24 hours.

In general, this seemed to be the pattern, except that the "cure to touch in one hour" seemed to be somewhat optimistic. Depending on how one interprets the condition, he felt that up to twice this long may be needed in some cases. But, apart from that, all went according to plan. The set was now working, free from hissing noises, and he hoped it would continue that way.

In fact, that was several months ago and, at a recent check, all was going well. I have no doubt that the repair will probably outlive the set. In the meantime, if other readers have had experience along these lines, I would be happy to pass it on.

To change the subject completely, my older readers may recall that I often used to list items under the heading of JISP — Journalistic Interpretation of Scientific Phenomena; a phrase coined by a member of the IREE who, like yours truly, used to get hot under the collar over some of the outrageous statements on scientific matters which appear from time to time in the daily press.

Maybe I've mellowed a little with the passing years (though heaven forbid) but I don't seem to have encountered as many of these lately as in the past. But one I encountered recently was just too good to pass up, if only because it is good for a laugh.

It was a story in the Sydney Sun for Tuesday, July 26, 1983. It concerned a near tragedy involving three men erecting a TV tower at North Wollongong on the NSW south coast.

SAVED BY EARRING

The report went on: "The men were erecting an antenna at a house in Porter St ... yesterday morning when it touched overhead (33 000V) power cables. 'It's lucky they weren't all killed,' said Mrs Phyllis Thornton at her home today.

" 'The police said the young fellow was saved by his earring. They reckon the electricity hit the earring and he was thrown over the fence'.

"Mrs Dianne Vormister said her son Aaron could be released from hospital today. She said he had suffered burns around the left ear where he wore the earring."

Well, after that, I would award the prize to the policeman. By comparison, the fireman's story about electricity building up inside TV sets (causing fires) positively pales into insignificance. And, in fairness I suppose, one can hardly blame the journalist; after all, he apparently only reported what other people said.

Just the same, I think it is a pity that stories like that are published without qualification. They only add to the ignorance and old wives' tales about the effects of electricity, and do nothing to educate people as to the real dangers and how to avoid them.

And, to finish off, here is a short, but interesting, contribution from a reader, Mr R.T. of Pennant Hills, NSW. It describes how old age can effect a loud speaker in an unusual way. This is how he tells it.

I would like to relate a story about a recent repair to the family's 1953 AWA mantel receiver. The fault is one which I cannot recall reading about before.

This set used an electro-dynamic speaker — probably one of the last to do so — and when it developed a misalignment fault it was feared that there would be serious problems in finding some way to replace it. This nearly led to the whole set being discarded.

The usual cause of misalignment is sagging of the cone suspension to the point where the voice coil rubs against the magnet pole-piece. As in this case, it can cause the sound to have an annoying "edge". As it turned out, however, the cause in this case was quite different.

The problem involved the normally flexible braid between the terminals on the frame and the voice coil on the cone which, in this case, had become quite rigid. This was both limiting the cone's total movement back and forth, and also pivoting the cone about the cone/braid junction, causing the voice coil to rub against the magnet.

The trouble was apparently due to flux travelling along the braid, by capillary action, during soldering, together with various chemical changes (aided perhaps by the heat) that occurred over some 30 years of daily operation, which had caused the braid to harden like a piece of solid wire.

Repairs were simple. Careful manipulation of the braid with a pair of long nose pliers was all that was required to break up the flux and restore normal operation.

Well, thank you R.T. It certainly is an unusual fault and one that I have not heard of before. At the same time, I wonder how many loudspeakers might have been consigned to the garbage bin, as being beyond repair, due to this simple fault. All too often, I'm afraid, the possibility of a repair is not even considered until there is no alternative

Build a Dick Smith kit – your guarantee of quality!

- Every component in your Dick Smith kit is prime spec, guaranteed - no manufacturer's seconds or other rubbish!
- Every component is included - down to the last nut and bolt where required! Even special parts like silk-screened front panels and PCB's are in many kits.
- Most kits include our specially prepared instruction manuals - with step-by-step guides in many cases. They make construction a breeze!
- Over 200,000 kits sold every year: people wouldn't keep on coming back for more if they weren't satisfied!

Don't be conned . . . many kit suppliers sell kits which pretend to be just like Dick Smith kits. Why buy the imitation when you can have the real - guaranteed - Dick Smith kit for no extra?

Don't lower your standard!

BARGAIN COMPUTER PRINTER

. . . as described in September E.A.

The best news computer owners have heard in years! A 40 column printer for less than $300! Yes, of course there's a catch. You have to supply a couple of hours labour to build the power supply yourself and connect it to the printer mechanism. So for the cost of a bit of assembly, you'll save heaps!

FEATURES:

- 40 column dot matrix format
- Fast 48 cps print in two colours (red & black)
- Full ASCII character set (caps & lower case) plus Greek symbols & accented characters.

SEE EA SEPTEMBER 1983

POWER SUPPLY KIT Cat K-3437 **$36.50**

Built up Printer Mechanism & Controller Board: Cat X-3240 **$249.00**

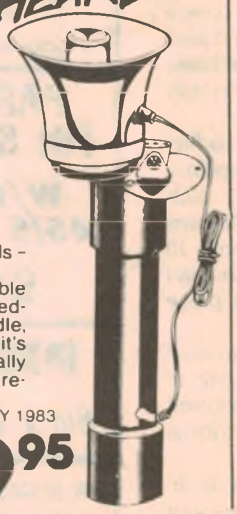
Spare Ribbons to suit: Cat X-3241 **$4.95**

Box & switches not included

NOW YOU CAN BE HEARD!

See August ETI

Loud Hailer



A great new kit for the kids - their own loudhailer! With exclusive detachable horn for minimising feedback, battery holder/handle, amplifier and mic module, it's so easy to build and it really works well! (Horn can be remotely connected too).

Cat K-3507 SEE EA JULY 1983

Top value **$29.95**

SPEEDY FAULT FINDING!

AMAZING VALUE! **Transistor Tester**

Not just another Transistor Tester! This one tests bipolar transistors, diodes, F.E.T.'s and even S.C.R.'s and P.U.T.'s. This practical low-cost test instrument is simple enough to be built by a beginner and then provide him with a valuable piece of test equipment. Battery operated and supplied with one of our new 50mm meters in a deluxe 'Zippy' case. Cat K-3052

SEE EA JULY 1978

$19.75

SAVE!

LED Level Meter

One unit will display the sum of the peak channel output voltages (power) or use two for separate stereo readouts. 10 green LED's for display, 1 yellow for max. power and 1 red for overload. All solid state mounted on a small PCB with readout at right angles for easy mounting in a cabinet. Requires 10V - 16V or DC at 50ma. Cat K-3370

$14.95

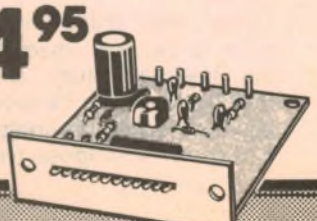
Economy Car Alarm

This alarm senses the voltage drop in your car's electrical system when a thief breaks into it. There's a visual warning for thieves so that chances are they will not even attempt a break-in. Easy to install - saves a lot of trouble. Cat K-3250

SEE EA NOVEMBER 1974

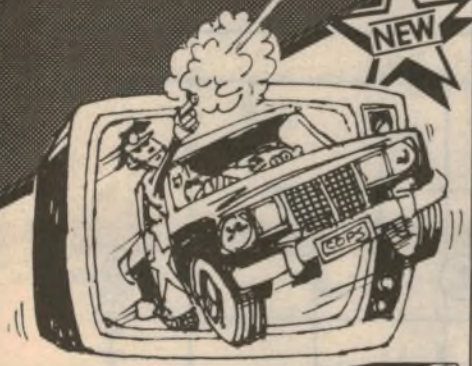
COULD SAVE YOU $1000s!

$13.50

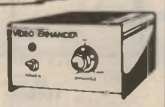


A61S/CT

NEW



Video Enhancer



VCR's are all the rage. But the quality is often pretty crook. A video enhancer can help considerably. Build this one and find out - and it won't break the bank! Don't forget the patch over your eye . . . **Cat K-3463**

SEE EA OCTOBER 1983

AMAZING VALUE! **$35.95**

Video Recorder Cable Set

Connects ANY video to ANY video with its unique adaptor system. A must for all VCR owners! **Cat W-1287**

ONLY **$19.95**

NEW

TV SERVICEMEN: BUILD-IT-YOURSELF BARGAIN!

TV Pattern Generator

A bargain for the serviceman, technician, hobbyist, etc. We had one of these 5 years ago and sold thousands! Now there's a brand new kit giving crosshatch, dot & raster for fast and simple convergence, etc. **Cat K-3472**

SEE EA NOVEMBER 1983

EXCLUSIVE! VIDEO MODULATOR INCL IN THIS KIT

ONLY **$29.95**

Parabolic Microphone

A birdwatcher's special (either feathered or skin variety!). Instructions tell you how to make your own parabola; kit includes mic insert & preamp. You'll be amazed at the range a parabola gives! **Cat K-3096**

SEE EA NOVEMBER 1983

HEAR, HEAR VALUE AT ONLY **$9.95**

The not so random Breath Tester

Beware boys in blue and booze buses bailing belligerent Brabhams blowing bad breath into bags before banning.
Check out our breath tester kit - it could be the answer to your problems!
Cat K-3391

ONLY **$29.95**

Not a legal check!

Microwave Leakage Detector

Microwave ovens are fantastic - but are they completely safe? Yours could be leaking dangerous radiation! Check it out with this handy meter. No batteries required. **Cat K-3095**

TOPS FOR VALUE! ONLY **$13.95**

TV Masthead Amp

Why put up with poor TV reception when you can improve your TV's picture with this easy-to-build kit. Cuts out snow effect in low signal areas. Can reduce 'ghosting' effect caused by multiple signal pickup from feeder cables. Good for home unit operation where signal at TV wall outlet is poor. Can be used for the new UHF service. Ideal for boosting FM signals as well! Uses latest OM350 hybrid wideband op amp IC. Instructions and 240V supply included. **Cat K-3232**

SEE EA AUGUST 1979

ONLY **$33.50**

IMPROVE YOUR RECEPTION!

WATTS A WATTMETER

It measures watt watts a watten watt-using wattsamijig uses. Saves turning the appliance around to look at the rating plate on the back.

These days you need to know just how much power your appliances are consuming. Great for fighting the electricity authority when they send you those monstrous bills. Measures up to 3kW in two scales, all cable, plugs and sockets supplied. **Cat K-3453**

SEE EA SEPTEMBER 1983

ONLY **$69.95**

Fluoro Starter

Do your fluorescent lights go blink, blink, blinkety-blink when you switch them on? This substitute electronic starter solves that problem and gives a smooth rapid start EVERY time you switch on. And all the parts are housed in a standard starter case! Far outlasts conventional starters as well as prolonging tube life.
Cat K-3082 **$4.50**

SEE EA OCTOBER 1982

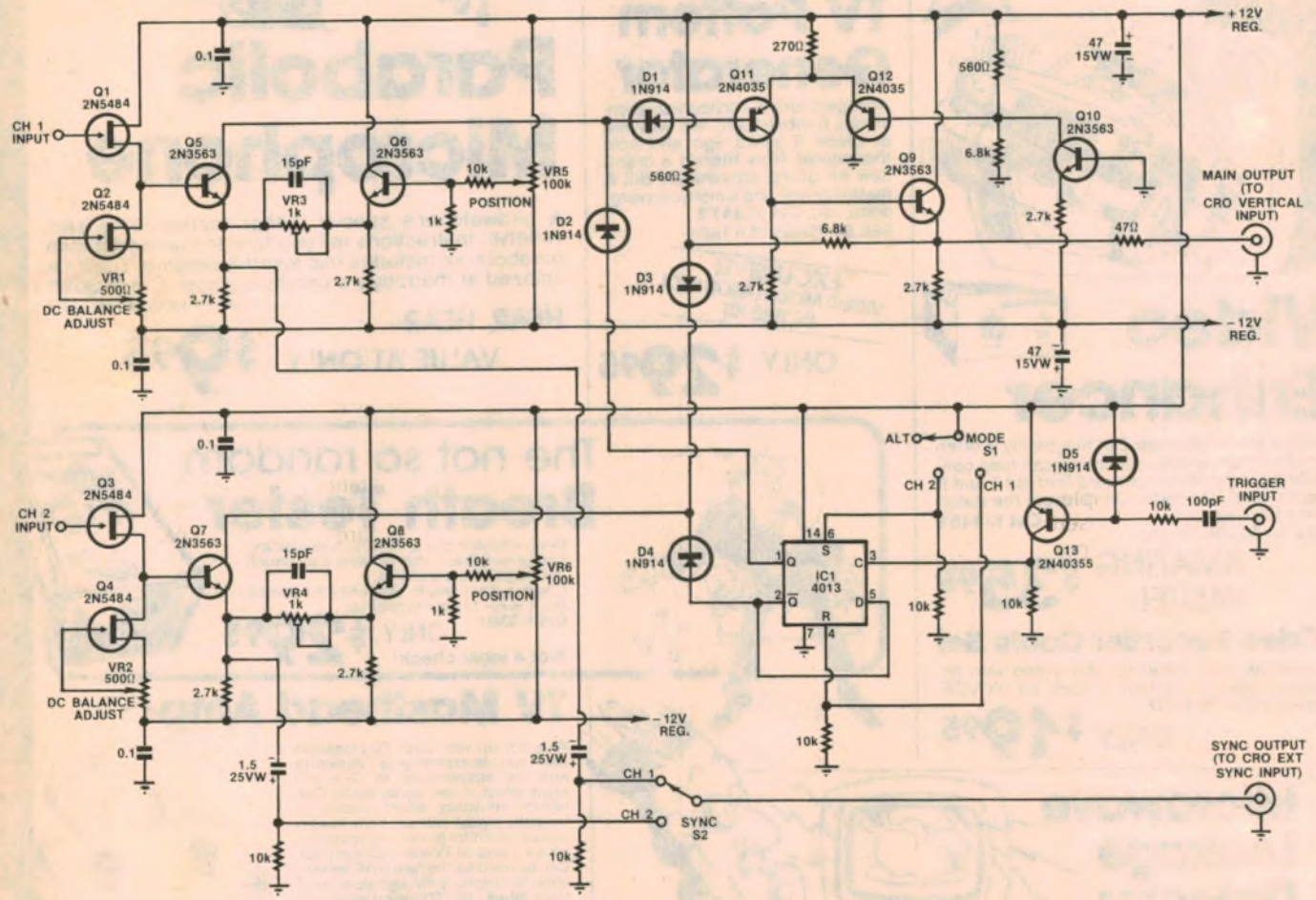
GIVE TUBES LONGER LIFE

DICK SMITH Electronics

See Page 98 for full address details

Circuit & Design Ideas

Interesting circuit ideas from readers and technical literature. While this material has been checked as far as possible for feasibility, the circuits have not been built and tested by us. As a consequence, we cannot accept responsibility, enter into correspondence or provide constructional details.



Dual trace CRO adapter

This dual trace CRO adapter circuit comprises two independent input amplifier stages alternately switchable to a common output stage. With the output connected to a CRO input, a dual trace display of two input signals can be obtained. The circuit incorporates a three position "mode" switch which can be selected so that either one channel (CH1 or CH2) is displayed at a time or both are displayed in an "alternate" mode.

The circuit can also be easily adapted to include a "chop" mode as will be explained later.

To achieve a wide frequency response, discrete transistors were used rather than ICs in the critical signal handling portions of the circuit. Switching between channels is accomplished by means of high speed silicon diodes (D1-D4) controlled by one half of a 4013 CMOS dual flipflop IC. Diode switches were chosen in preference to CMOS IC switches because of their lower capacitances, hence less likelihood of channel crosstalk and of switching transients appearing at the output.

The small signal (1V p-p output) frequency response of the prototype was better than 10MHz per channel, while channel crosstalk and switching transients at the output, although not measured, were quite low. This circuit is capable of a large output voltage swing (approx 15V p-p) and high slew rate (about 80V/μs negative-going and 200V/μs positive-going) measured with a 100pF capacitive load.

To achieve the "alternate" mode of operation, it is necessary to derive a suitable signal from the internal sweep circuit of the CRO, Most CROs include an external sweep (or trigger) output. If not, you will have to delve into the "works" to derive a suitable negative-going pulse.

Transistor Q13 is used to invert these pulses to the correct (positive) polarity required to operate the clock input of the flipflop. In the "ALT" mode, the flipflop changes its output state each time a pulse appears at the "C" input.

If the sweep circuit of a CRO is not readily accessible, the adapter circuit can be easily modified to operate in a "chop" mode. All that is required is to feed a pulse or square wave signal of appropriate amplitude and desired frequency directly to the "C" input of the flipflop. The astable oscillator configuration used in the circuit described in EA February, 1981 (pp 40-47) would probably be quite suitable. However, it should be noted that the supply terminals of the CMOS IC should now be connected to +12V and ground, not to ±6.8V as in the EA circuit.

Sync signals for the CRO are taken off

Sensational sound, dressed to kill... from Sanyo.

Mini & Slim Portable MW/SW_1/SW_2/FM Stereo cassette recorder with 2-way, 6 speaker system

M7740K

6 speakers

to create the right sound for every occasion

6 colours

in today's most fashionable shades, silver, black, red, white, blue and pink

6 ways better value

* sensational sound never looked so good.
* light enough to take with you wherever you go.
* space a problem? The Mini & Slim stacks on its end.
* Automatic Music Select System (AMSS). High speed scanning to select the songs you want to hear.
* 3-position tape selector automatically adjusts for normal, Cr02 or metal tapes.
* one button record takes the hassle out of recording your own tapes.

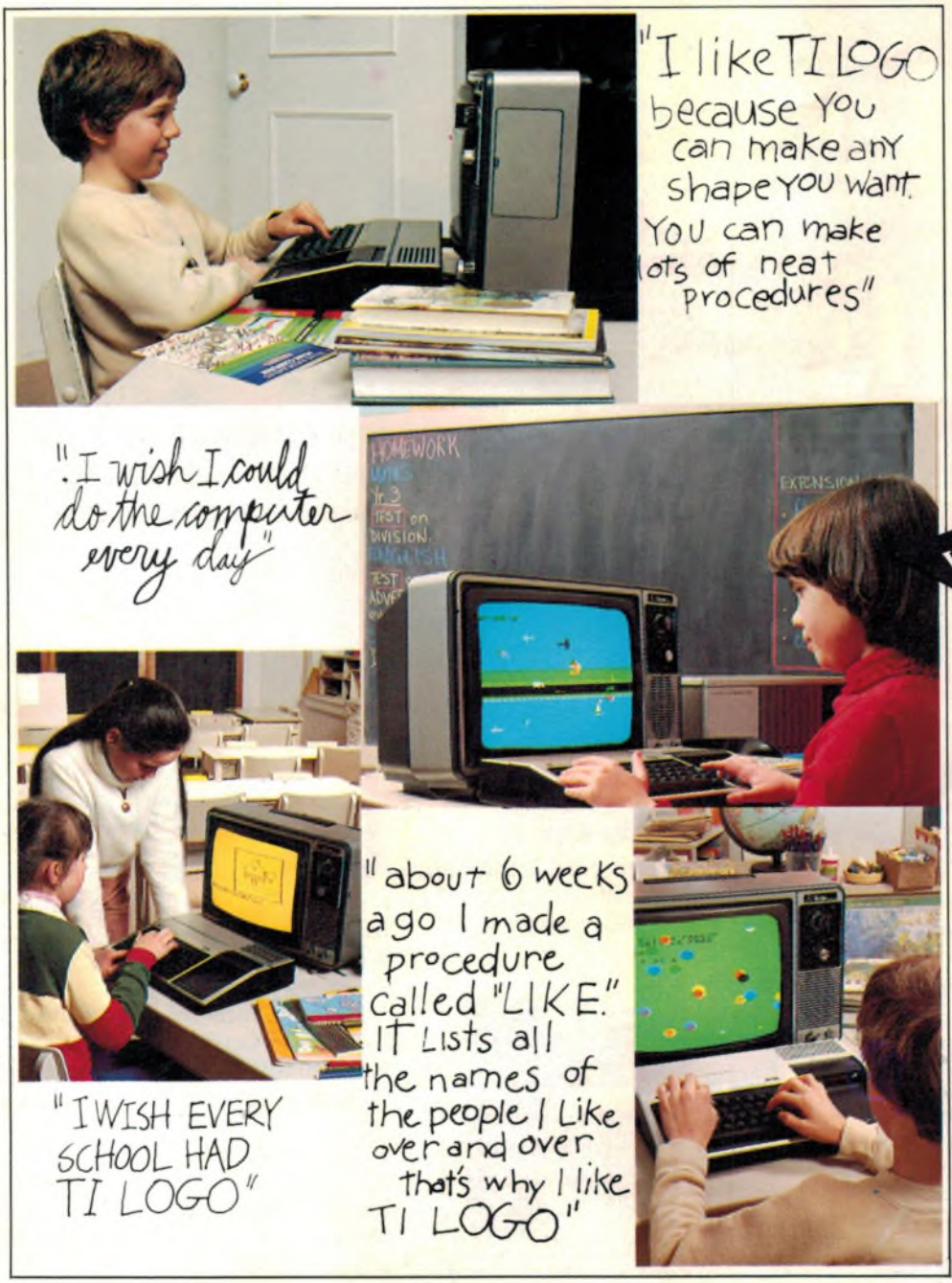
SANYO

That's Life!

TI LOGO

Giving your children the Educational Edge.

A lesson in Educational Software from Texas Instruments.



The natural way to learn

TI LOGO is the innovative approach to education that not only develops computer awareness, but enriches a child's math, logic and communication skills in a natural step-by-step way.

WHAT THE EXPERTS SAY ABOUT TI LOGO

Step-by-step learning

TI LOGO is a child-appropriate computer language. This means students of all levels of ability can communicate with the computer using an easy-to-understand language. To accomplish a specific task the student must "teach" the computer what to do. This puts the student in control of the computer

and so can set his or her level of achievement. Learning is therefore fun and rewarding.

Exploring increasingly complex learning

TI LOGO can teach students on a personal level helping them to discover the importance of skills like spelling, communication and sequential thinking. With the help of "Turtle Graphics" students can learn a computational style of geometry by "acting out" the role of the turtle, from simple to advanced stages. The procedure can be saved on a diskette, or cassette and re-used as required. Animated "Sprites" can also be used to create designs already known to the computer, or any shape the student designs.

In the home or classroom, a Texas Instruments Home Computer with TI LOGO programme plays a special role in today's teaching and learning. That's the educational edge.

For further information on TI LOGO or TI HOME COMPUTER send this coupon to Texas Instruments P/L, 8-10 Talavera Road, North Ryde 2113

NAME: _____

ADDRESS: _____

_____ POSTCODE _____

Creating useful products and services for you.

TEXAS INSTRUMENTS

TEXI0086A

The Digital vs. Analog battle is over.

From $110* buys you the new champion. **The new Fluke 70 Series.**

They combine digital and analog displays for an unbeatable two-punch combination.

Now, digital users get the extra resolution of a 3200-count LCD display.

While analog users get an analog bar graph for quick visual checks of continuity, peaking, nulling and trends.

Plus unparalleled operating ease, instant autoranging, 2,000+ hour battery life and a 3-year warranty.

All in one meter.

Choose from three new models. The Fluke 73, the ultimate in simplicity. The feature-packed Fluke 75. Or the deluxe Fluke 77, with its own multipurpose protective holster and unique "Touch Hold" function (patent pending) that captures and holds readings, then beeps to alert you.

Each is Fluke-tough to take a beating. American-made, to boot. And priced to be, quite simply, a knockout.

So call or write for more information.

Fluke 73	Fluke 75	Fluke 77
$110*	$129*	$165*
Analog/digital display	Analog/digital display	Analog/digital display
Volts, ohms, 10A, diode test	Volts, ohms, 10A, mA, diode test	Volts, ohms, 10A, mA, diode test
Autorange	Audible continuity	Audible continuity
0.7% basic dc accuracy	Autorange/range hold	"Touch Hold" function
2000+ hour battery life	0.5% basic dc accuracy	Autorange/range hold
3-year warranty	2000+ hour battery life	0.3% basic dc accuracy
	3-year warranty	2000+ hour battery life
		3-year warranty
		Multipurpose holster

P.O. Box 30, Concord, N.S.W. 2137
13-15 McDonald Street, Mortlake, N.S.W
Telephone (02) 736 2888
Telex 25887

P.O. Box 107, Mt. Waverley, Victoria 3149
21-23 Anthony Drive, Mt. Waverley, Victoria.
Telephone (03) 233 4044
Telex 36206

G.P.O. Box 2360, Brisbane, Queensland 4001.
243 Milton Road, Milton, Queensland.
Telephone (07) 369 8688.
Telex 44062.

Adelaide: (08) 271 1839
Perth: (09) 398 3362

bankcard

FLUKE®

SOLD & SERVICED IN AUSTRALIA BY

ELMEASCO Instruments Pty. Ltd.

N.S.W. Ames Agency 699 4524 • George Brown 519 5855. (049) 69 6399• Bryan Catt 522 4923 • DGE Systems (049) 69 1625 • Davred 267 1385 • Macelec (042) 29 1455 • Radio Despatch 211 0191 • Sheridan Electronics 699 6912• Standard Components 896 1755 ***N.T.*** Thew & McCann (089) 84 4999 ***A.C.T.*** George Brown (062) 80 4355 ***VIC.*** Radio Parts 329 7888• Browntronics 419 3986• G.B. Telespares 328 4301• Elanco 428 4345 • Ellistronics 561 5844• Stewart Electronic Comps 543 3733• Nilsen-Rowe 347 9166 ***QLD*** L.E. Boughen 36 1277• Colourview Wholesale 275 3188 • ECQ Electronics 376 5677 • Electronic Shop (075) 32 3632 • W.G. Watson (079) 27 1099 • GEC Electrical Wholesale (079) 51 3155• Nortek (077) 79 8600• Solex (077) 72 2015• Integrated Technical Services (070) 51 8400 ***S.A.*** Trio Electrix 51 6718• Protronics 212 3111• Lab Service 278 7488 ***W.A.*** Atkins Carlyle 321 0101• Protronics 362 1044• Brookeades 276 8888• Cairns Instrument Services 325 3144 ***TAS.*** GHE Electronics (02) 34 2233 & (003) 31 6533

* All prices are plus Sales Tax if applicable and subject to change without notice.

Circuit & Design Ideas

low impedance points in the CH1 and CH2 input amplifiers. Ideally, a wideband IC amplifier (not shown) with a voltage gain of 10 or more could be used between the sync select switch (S2) and the sync output to raise the sync signal level to something comparable to that appearing at the main output terminal.

A few hints on construction may be helpful. Because of relatively wide parameter spreads in FETs it is desirable that Q1, Q2 and Q3, Q4 be selected to be as closely matched as possible. A simple way of doing this is to temporarily short the gate to source of each in turn and measure the drain current (Idss) with a voltage of 10 to 15V applied between drain and source. Then, when installing the FETs select Q2 with a slightly higher Idss reading than Q1 and Q4 with a slightly higher Idss reading than Q3.

This will ensure that the DC balance for each channel can be properly adjusted within the ranges of VR1 and VR2.

The balance adjustment is made (after wiring has been completed and the power switched on) by setting VR5 and VR6 each to its centre position, setting the mode switch (S1) to CH1 or CH2 position and adjusting VR1 or VR2 as appropriate to obtain zero output voltage with the input at zero volts. This is repeated for the other channel.

Next, the voltage gain for each channel can be adjusted by means of VR3 or VR4. For this an input signal, preferably square wave, of known amplitude is needed. In the prototype each channel was adjusted for a voltage gain of 10.

The final adjustment is for optimum square wave response at high frequencies. For this a square wave signal of about 1MHz with short rise and fall times and minimum overshoot is ideal. If the signal is known to be "clean" but ringing shows up on the display then the value of the 47Ω resistor in series with the main output will have to be adjusted, or it may be necessary to insert a resistor in series with the input (say, 100Ω or so). Now, adjust C1 and C2 by trial and error or use trimmer capacitors to obtain optimum square wave form.

Constructors should also take the usual precautions to minimise stray signal coupling between input and output paths and signal paths should be kept as short as possible (or shielded). Finally, tie all unused CMOS inputs to either +Vcc or ground.

H. Nacinovich,
Gulgong, NSW.

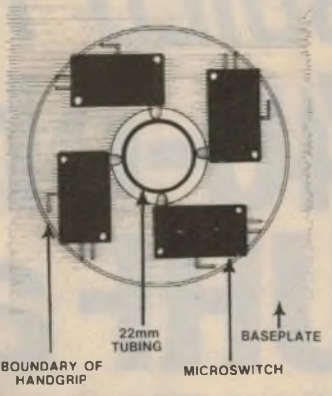
Editorial note: The above circuit will require a frequency-compensated attenuator circuit if the claimed frequency response is to be obtained.

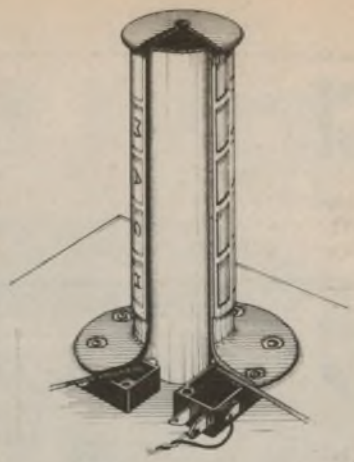
Effective joystick

If you are seeking the ultimate joystick, this easy-to-build unit should fit the bill. It is built around a rubber motorbike handgrip, the base of which, when bolted to a strong baseplate, provides a self-centring, multidirectional hinge. The handgrip is linked to microswitches, wired to the unit to be controlled.

The main component is the handgrip, and this should have a large springy base about 65mm diameter and about 4mm thick, with a simple, comfortable grip design. The prototype had "OGK MODEL 68-15R" printed on the bottom, and "MACH" within the grip lattice. This grip has proved itself over two years of fanatical usage.

A section of 22mm tubing is fitted snugly into the handgrip so that about 15 to 20mm protrudes beyond the base. A metal baseplate is prepared with an oversize hole in the centre through which the tubing will pass when the base





of the grip is mounted on it. This baseplate requires either side sections or rubber feet so that those parts underneath it will clear the surface on which the joystick is used.

Four microswitches are mounted underneath the baseplate in such a way that the activating pins just touch and are barely depressed by the metal tubing. This allows diagonal movement ie, up and left, to activate two switches simultaneously. The switches used in the prototype measured 25 x 15 x 10mm, and are rated at 250V, 15A. Smaller switches could be used.

Mounting holes (3mm) are drilled through the handgrip base and the baseplate, and fitted with 3mm x 20mm machine screws with washers to prevent the heads of the screws from pulling through the rubber. A firing button can be added by simply screwing it in the top or, for those who prefer a trigger action, through the side.

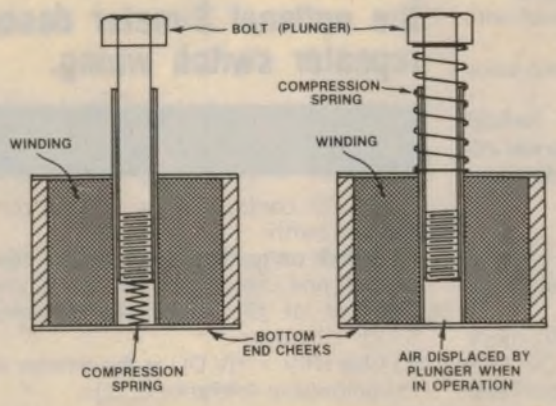
Ian Fieggen,
Edithvale, Vic.

Improving the solenoid

A problem with the solenoid described in the "Build Your Own Solenoid" article in EA for March 1983 was the energy lost in the spring loaded version, due to the high reluctance of the air gap caused by the compression spring.

This can be overcome by mounting the spring externally, thus reducing the reluctance, since the air is displaced by the plunger. The plunger is now allowed to contact the end cheek at the bottom, locking it into position by the added magnetism of the cheek. To separate the plunger from the end cheek now requires a greater pulling force.

R. Christophers,
Liverpool, NSW.



WANTED

PSST! Got any neat circuit ideas? We pay between $5 and $40 per item, depending on how much work we have to do to publish it. Send your idea to "Electronics Australia," PO Box 163, Chippendale 2008.

by GREG SWAIN

BUILD THIS:
40-channel UHF amateur transceiver

PART 3 TEST AND ALIGNMENT

Our final article this month details the alignment procedure of the new UHF transceiver and describes the optional S-meter described. Also shown is the repeater switch wiring.

Alignment of the new 70cm UHF transceiver is straightforward, although you do need a certain amount of anciliary equipment. The items that you need are as follows:

1. A UHF signal generator covering 438-439MHz, or a synthesised 2-metre transceiver;
2. A multimeter (preferably digital);
3. A 10MHz CRO or a shortwave receiver;
4. Plastic alignment tools for coils and trimmers;
5. A 500MHz DFM or a synthesised 2-metre transceiver.

Initial preset adjustments

(a) Set VR67 (modulation adjustment) to mid position;
(b) Set VR86 (offset adjustment) to mid position;
(c) Set all trimmer capacitors to mid position;
(d) Set the ferrite core of L13 level with the top of the can;
(e) Set the ferrite core of L28 down two turns from the top of the can;
(f) Set the ferrite core of L17 down two turns from the top of the former;
(g) Set the ferrite core of L14 level with the top of the can;
(h) Set the ferrite core of L34 two turns down from top of can.

Important: L10 and the helical resonators are factory preset. Do not adjust these until you are told to do so.

Voltage checks

Connect the transceiver to a 13.8V DC power supply and make the following voltage checks:

(a) **Without switching on the unit,** check that the input voltage is 13.8V DC. This voltage can easily be measured between the switch contact on the volume control and earth;
(b) **Switch on (without microphone connected)** and check for +10V DC at the collector of Q1 (allowable tolerance 0.5V);
(c) Check for +10V DC at the emitter of Q4 (allowable tolerance 0.5V);
(d) **Connect microphone, operate PTT** and check for +10V DC at the collector of Q5 (allowable tolerance 0.5V);
(e) Operate PTT and check for +12V at the junction of R7 and C6 (allowable tolerance 0.5V).

Note: Do not operate PTT for more than 10 seconds as the transmitter may

SPECIAL NOTE

Some Victorian repeater stations are outside the tuning range of this transceiver. Dick Smith Electronics has advised that subsequent kits will include instructions on how to program the PLL using the existing channel switch to cover these repeaters.

draw excessive current in the unaligned state. Also, do not touch L26 whilst adjusting the unit in the transmit mode. Large circulating currents flow in this coil and can cause RF burns.

Synthesiser adjustment

(a) Use a 10MHz CRO to check for an 8.5333MHz signal at TP1. The signal level should be approximately 2V peak to peak. If a suitable CRO is not available, operation of the 8.5333MHz oscillator can be verified using a shortwave receiver tuned to this frequency. Couple the oscillator output at TP1 via a 1pF ceramic capacitor to the receiver's antenna terminal and observe the S-meter reading to verify oscillator operation;
(b) Connect a multimeter (preferably digital) between TP2 and earth and adjust L12 for a reading of +2.5V DC. Rotate the channel switch until the lowest voltage is observed and readjust L12 for +2.5V. This position on the channel switch corresponds to channel 1 (438.025MHz). Set the channel knob to indicate channel 1.

This position can also be verified by using a shortwave receiver or DFM to check the corresponding mix down frequency (2.425MHz). Couple test point TP3 to the receiver's antenna terminal via a 1pF capacitor and check for an S-meter reading at 2.425MHz. (Note: If using a CRO, check that the level at TP3 is greater than 0.5V peak to peak);
(c) Connect a multimeter between TP2 and earth and set the transceiver to channel 1. Operate PTT and adjust VR86 (the offset adjustment) for a reading of +2.5V.

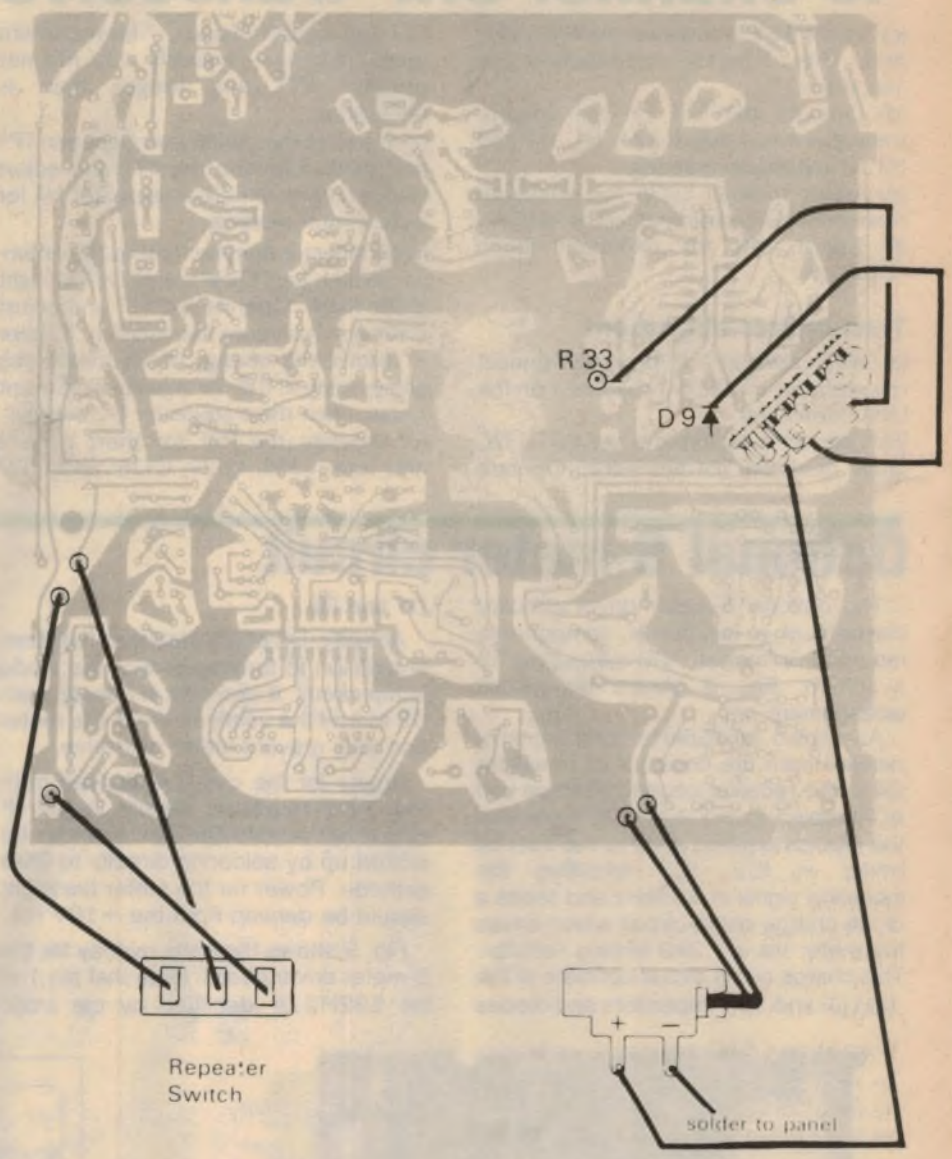


Fig. 7: Optional signal strength meter and repeater switch wiring.

Receiver alignment

Receiver alignment can be carried out using either a UHF FM signal generator or any 2-metre FM transceiver. Both methods are described below.

Receiver Alignment using a UHF FM Signal Generator:

(a) Disconnect microphone, set squelch control fully anticlockwise and adjust the volume control to a suitable level. Connect the signal generator to the antenna socket and connect a millivoltmeter or CRO across the speaker terminals;
(b) Set the signal generator to 438.025MHz as follows: modulation 1kHz, deviation 3kHz, output level 1mV;
(c) Adjust L10 for maximum level or for maximum noise in the speaker if a millivoltmeter or CRO is not available (note: only a slight adjustment should be necessary);
(d) Connect the speaker and adjust both sections of helical resonator H3 for best signal;
(e) Adjust L34, H1 and H2 for maximum recovered audio. Reduce the signal input level as sensitivity is improved so that the recovered audio has some audible noise content;
(f) Adjust trimmer C136 for maximum recovered audio;
(g) Adjust coil L10 for minimum audio distortion (note: this coil adjusts the centre frequency of the IF strip at 455kHz).

Receiver alignment using a 2-metre amateur transceiver:

(a) Disconnect microphone, set squelch control fully anticlockwise and adjust volume control to a suitable level;
(b) Place a 2-metre synthesised transceiver in close proximity to the UHF transceiver. Terminate the 2-metre transceiver socket with a suitable dummy load or antenna.

40-channel UHF transceiver

(c) Set the UHF transceiver to 438.3MHz and the 2-metre transceiver to 146.1MHz.
(d) Operate the PTT on the 2-metre transceiver and adjust L34, H1, H2 and H3 for maximum quieting;
(e) Adjust trimmer C136 for maximum recovered audio using an off-air signal;
(f) Adjust L10 for minimum audio distortion.

Transmitter alignment

(a) Select repeater "off" position, connect microphone, and select channel 1 on the UHF transceiver.
(b) Connect a multimeter set to 5V DC range between TP4 and earth. Operate PTT and adjust L14 and L17 for maximum meter reading – typically +2V (do not operate PTT any longer than is necessary);
(c) Connect the multimeter between TP5 and earth. Operate the PTT and adjust both sections of helical resonator H4 for a maximum reading;
(d) Connect a dummy load to the antenna socket (eg, Dick Smith D7024 light globe load). Operate the PTT and adjust C109 for maximum illumination. If there is insufficient energy to illuminate the globe, tune C109 for maximum current drawn from the transceiver DC supply;
(e) Operate the PTT for short periods and tune C118, C125, C126, and C127 for maximum output (ie, maximum illumination of the load or maximum current consumption). The transmitter should now be operating at full power. Normal total DC current drain is about 2A and RF power output should exceed 5W:
(f) Set UHF transceiver to channel 12, operate PTT and adjust C134 to bring transmitter to the correct frequency (438.300MHz). This will correspond to a maximum S-meter reading on a monitor receiver or a 2-metre transceiver on 146.1MHz;
(g) Adjust VR67 for 5kHz transmitter deviation. In practice, a satisfactory result can be achieved by adjusting VR67 for best signal using on air tests. Alternatively, an FM deviation meter can be used if available.

Optional S-meter circuit

The optional S-meter driver circuitry consists of a handful of components mounted on a small PCB measuring 32 x 20mm. Fig. 8 shows the circuit arrangement.

As shown, a 455kHz input signal is derived from the collector of transistor Q8 in the receiver second IF stage and AC-coupled to pin 2 of IC3. Note that the input is derived prior to the internal limiter in IC2. IC3 amplifies the incoming signal at 455kHz and feeds a diode charge pump circuit which drives the meter via a 1.2kΩ limiting resistor. This charge pump circuit consists of the .001μF and 1μF capacitors and diodes D1 and D2.

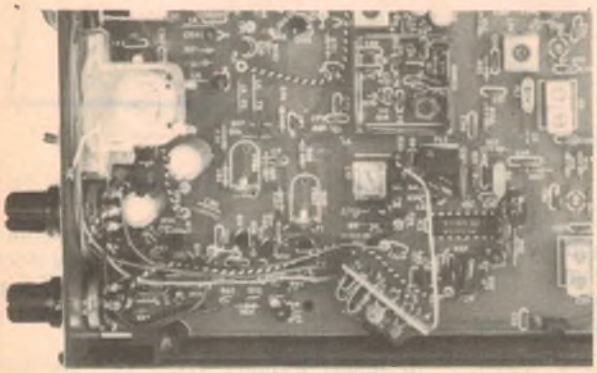
Actually, D2 performs a dual function. In addition to forming part of the diode pump circuit, it also acts in concert with D3 to limit the voltage across the meter and thus prevent meter overdrive.

Power for the circuit is derived from the 5.6V regulated supply in the IF circuit (ie, across D9) and this can be picked up by soldering directly to D9's cathode. Power for the meter backlight should be derived from the +10V rail.

Fig. 9 shows the parts overlay for the S-meter driver circuit. Note that pin 1 of the 592H2 is identified by the small bevel at one end of the plastic case (see Fig. 8). Take care also with the polarity of the three diodes.

The S-meter board is mounted near IC2 on the main PCB and is supported by two PC stakes. These should be positioned so that they line up with vertical earth tracks on the S-meter board as shown in the accompanying photograph. Carefully solder the S-meter board to these solder stakes, then complete the wiring as shown in Fig. 9.

Note that the input signal lead should be kept as short as possible. This connection is most conveniently made by soldering the lead direct to R33.



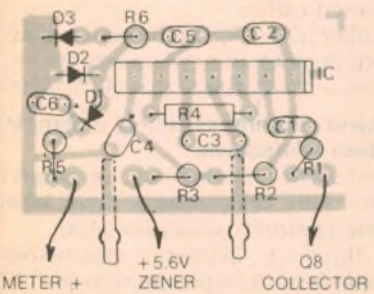
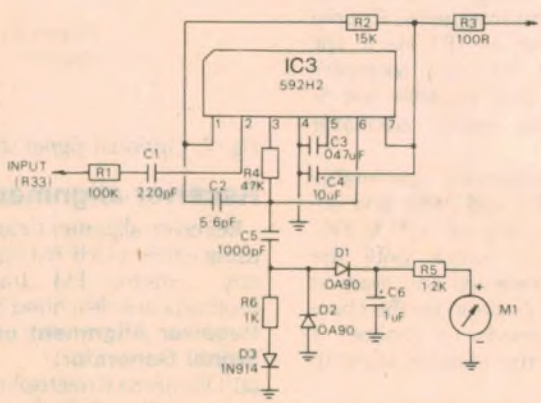


Fig. 9: Parts overlay diagram for the S-meter driver board.



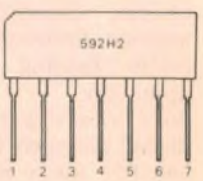
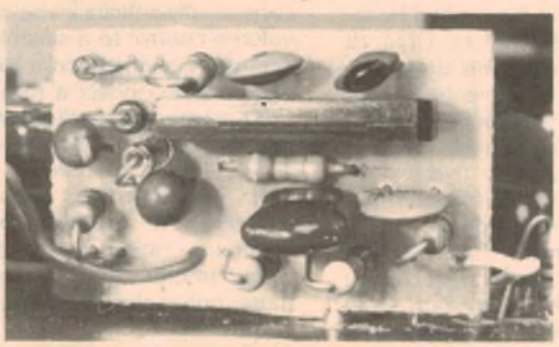


Fig. 8 (left); S-meter driver circuit. The diagram above shows the pin outs for the 592H2 IC.



The S-meter board is mounted vertically on two PC stakes as shown at left and top left.

Repeater offset alignment

(a) Set repeater switch to "on" and select channel 1 (438.025MHz);
(b) Connect multimeter on 5V DC range between TP5 and earth;
(c) Operate PTT and tune rear section only of H4 for maximum power output as indicated by light globe load;
(d) Operate PTT and adjust C167 for a transmit frequency of 433.025MHz using a DFM with a suitable sniffer probe (do not connect DFM directly to antenna socket). If a DFM is not available, adjust C167 for a maximum S-meter reading on a 2-metre transceiver set to 144.342MHz;
(e) Operate PTT and check that voltage at TP2 is approximately 1V DC. Adjust VR86 slightly if necessary to ensure a "locked condition" in both simplex and repeater modes.

Waxing the VCO

Once alignment has been completed, the VCO box must be filled with wax to ensure mechanical stability and thus prevent microphonics. The procedure is as follows:
(a) Select channel 1 and check the voltage at TP2. Note this reading;
(b) Using your soldering iron, melt a liberal coating of transformer wax (supplied) on to the various components in the VCO but do not cover coil L12 at this stage;
(c) When cool, readjust L12 for the voltage reading previously noted, then use the transformer wax to seal L12.

In some cases, where high ambient noise forces the use of high volume from the internal speaker, microphonics may still occur despite the shield and the wax. If this occurs, the best way around the problem is to use an external speaker.

Construction of the UHF transceiver is now completed.

Errata

A wire link is missing from the parts overlay diagram on p75 of last month's issue. This link should be run from the junction of R159 and C166 (grid reference A16) to a solder pad for the +10V Tx rail located at A15. Note that this link is deleted if the repeater switch option is installed. (See Fig. 7.)

Readers should also note that, in the early batch of kits, either of two different antenna sockets may be supplied. They are easily identified – the correct socket contains a brown dielectric while the incorrect socket has a white dielectric. The latter does not have the necessary mechanical specifications and should be returned to DSE for exchange at no cost.

Finally, there is an error in the wiring to the speaker socket on p81 of the October issue. The wiring on page 49 of the Dick Smith manual supplied with the kit is correct.

SUPER DEALS

JAYCAR ELECTRONICS & No. 1 FOR COMPUTERS,

microbee®

Australia's leading personal Computer

Now with Jaycar Dealer Support

Microbee features:

- 16K and 32K.
- Non-Volatile CMOS RAM.
- Programmable RS232 Serial Port.
- Programmable 8 Bit I/O Port.
- Display 64 x 16 and 80 x 24 screen format.
- 6545 Programmable VDU Driver.
- Cassette Interface, 300 and 1200 baud.

New Model
video monitor

Screen – 12"
Display area – 80 characters by 24 lines
Input – RCA
Bandwidth – 10Hz-20MHz
Input sig. 0.5 to 2.0 pp composite, sinc neg.
240V AC & 12V DC
Weight 8.6 kg

$199

Cat. YM2000

green screen

data cassette

Micron adjustable azimuth – data compatible cassette

$49.50

green screen video monitor
KAGA DENSHI

18MHz Bandwidth makes this the best quality monitor on the market. Due to bulk buying we've been able to slash $66 off the price!

Cat. XE-1190

WAS $325
SAVE $66

$259

pricing information

Cat. XE-5000	MicroBee 16K Plus	$469.00
Cat. XE-5050	MicroBee 16K IC	$499.00
Cat. XE-5100	MicroBee 32K Plus	$559.00
Cat. XE-5150	MicroBee 32K IC	$599.00
Cat. XE-5200	MicroBee 64K Plus	$699.00
Cat. XE-5250	Single Disc System	$1099.00
Cat. XE-5255	Add-on Disc	$559.00
Cat. XE-5260	Dual Disc Drives	$1599.00
Cat. XE-1205	Printer Cable Interface	$49.95

MICROBEE

KITS KITS KITS KITS KITS

ETI 733 RTTY Convertor. Ref: ETI April 1983. This simple project allows you to hook up your MicroBee to a HF receiver and print radio teletype messages on a monitor screen. Listen to world news for FREE!!
Cat. KE-4654 ONLY $17.95

ETI 649 MicroBee Light Pen. Ref: ETI August 1983. This simple, low cost device plugs into the Bee's 8 bit port. The "pen" gives you an entry into the world of light pens and interactive software.
Cat. KE-4656 SHORTFORM $19.50
SPECIAL PROBE CASE TO SUIT (as specified in ETI article) Cat. HB 6400 $19.95

ETI 668 MicroBee EPROM Programmer. Ref: ETI February 1983. This simple, low cost EPROM programmer just plugs into the Bee's I/O port and enables you to save programs in any of the 5 different common EPROMs available (2716, 2532, 2732, 2732A, 2764). Kit comes complete with 'Personality' plug and all IC sockets.
Cat. KE-4650 $46.50

Parallel Interface Kit for the MicroBee. Includes 15 pin 'D' plug – add $15.00 if Centronics plug required.
Cat. KE-7017 $15.00

FOR COMPUTERS!

microbee

ELECTRONIC AGENCIES
SOFTWARE & PERIPHERALS

Comes with special MicroBee plug and circuitry to interface directly with your MicroBee. Do not confuse with units that will not work with the Micro-Bee!!!

$49.95

MICROBEE JOYSTICK
New for the MicroBee is the Quickshot Joystick. Connects straight into the MicroBee's I/O port and provides real time action in games. This unit can be mounted on a table with its suction cups giving one handed operation. With its contour design and very fast response this unit will give you the edge in winning computer games.
Cat. XE-7030 $49.95

Matrix Printer
LOW PRICE

- Paper width 112mm
- 120 CPS print speed – bidirectional
- Serial thermal dot matrix
- 40 char/line, 5 x 7 dot matrix, 96 character ASCII, 50 graphic symbols, 280 dots/horiz. line.
- Friction feed
- Centronics style 8 bit parallel interface
- Dimensions 71(H) x 250(W) x 182(D)mm
- Weight 3.3Kg

$299

STAGGERING VALUE AT ONLY $299

DO NOT CONFUSE WITH OTHER PRINTERS

OTHER MICROBEE 'THINGS'

RF MODULATOR FOR MICROBEE
Allows you to connect your MicroBee to your TV
Cat. XE-8052 $17.50

REPLACEMENT CASE
Cat. XE-6300 $29.50

EDITOR ASSEMBLER IN ROM
Cat. XE-6505 $59.50

WORDBEE IN ROM
Cat. XE-6505 $59.50

5¼" MEMOREX DISKETTE
Double sided, double density, soft sector
Cat. XE-3510 $6.95

MICROBEE PLUGPACK
Cat. XE-5410 $17.50

MICROBEE MONITOR LEAD
Cat. XE-5420 $9.50

QUALITY BLANK COMPUTER CASSETTES

XE-3530	C10	$1.10	$0.99	$0.90
XE-3540	C20	$1.20	$1.08	$0.99
XE-3545	C30	$1.40	$1.26	$1.15
		1–9	10 – 19	20 or more

The quality tapes are supplied to us in boxes of 20, so make it easier and buy at our special 20 or more price and save money!

Replacement Battery for Backup Circuit
Cat. XE-8030 $5.50

BOOKS FOR THE MICROBEE

INTRODUCTION TO MICROBEE YOUR FIRST 100 PROGRAMS
This book is specially prepared for people who have never had their hands on a computer before.
Cat. XE-8010 $14.95

MICROBEE BASIC MANUAL
The very manual that is supplied with the Micro-Bee is available separately.
Cat. XE-8005 $14.95

EDITOR ASSEMBLER TECHNICAL INSTRUCTION MANUAL
Cat. XE-8000 $11.50

WORD-BEE TECHNICAL INSTRUCTION MANUAL
Cat. XE-8001 $15.95

WILDCARDS VOL 1
A potpourri of application notes and tips for the MicroBee. Excellent book.
Cat. XE-8015 $15.00

PAPER & RIBBONS

If you have bought an 80 CPS matrix printer lately chances are that it is called a "Something or other 80" most of these machines are identical.
Jaycar has them too but we are one of the few with paper (sprocket feed) and spare ribbon cartridges to suit.

Cat. YM-2405
2000 sheets (fan form) paper lined sprocket feed perforated ends (sprocket paper can be removed)
Sheet size 240(W) x 280(H)mm
$39.50

Cat. YM-2402
Cartridge ribbon. Suitable for 80 series dot matrix printers
$14.95

MX-80 – CP-80
FX-80 – FAX-80
– – – 80,
– – – 80,
– – – 80, etc

Cat. No	Description	Price
BE-8150	Computers for Everybody 135 x 210mm 259 pages	$9.95
BE-8152	International Microcomputer Dictionary 110 x 165mm 119 pages	$7.50
BE-8155	Introduction to Word Processing 150 x 227mm 205 pages	$23.95
BE-8157	CP/M Handbook over 300 pages 225 x 150mm	$27.95
BE-8162	Your First Computer 140 x 215mm 258 pages	$16.95
BE-8165	Your 1st Basic Program 188 pages 180 x 275mm	$14.95
BE-8170	How to Start with CP/M 158 pages 215 x 140mm	$25.95

JAYCAR
125 YORK ST. HAS CLOSED – WE ARE NOW TRADING AT 117 YORK ST. OUR TELEPHONE NUMBER REMAINS UNCHANGED (02) 264 6688

Jaycar
Incorporating ELECTRONIC AGENCIES

SYDNEY SHOWROOMS
117 YORK STREET – PHONE: (02) 264 6688 and (02) 267 1614
TELEX 72293

CARLINGFORD
Cnr. CARLINGFORD & PENNANT HILLS ROAD – PHONE: (02) 872 4444

CONCORD
115 – 117 PARRAMATTA ROAD – PHONE: (02) 745 3077

HURSTVILLE 121 FOREST ROAD – PHONE: (02) 570 7000

NUMBER 1 FOR KITS

POST AND PACKING CHARGES
$5 – $9.99 ($1.50) $10 – $24.99 ($3.20)
$25 – $49.99 ($4.50) $50 – $99.99 ($6.50)
$100 – $198 ($8.00) Over $199 ($10)
"Free INSURANCE for Road & Registered Post over $200"
All heavy or bulky items (over 20kg) sent Comet Road Freight $12.00 anywhere in Australia
SHOP HOURS CARLINGFORD, CONCORD & HURSTVILLE
Mon – Fri 9am – 5.30pm Sat – 9am – 12pm Thurs night 8.30pm
SHOP HOURS SYDNEY
Mon – Fri 8.30am – 5.30pm Sat – 8.30am – 12pm Thurs night 8.30pm
MAIL ORDERS AND CORRESPONDENCE: BOX K 39 HAYMARKET SYDNEY 2000

Mail Order By

BANKCARD Via Your Phone

Design Techniques for

Rhythm generators, for use with electronic organs or as an adjunct to a musical group, can add a great deal to the final musical effect. And, as an exercise in electronic design, they present an intriguing challenge with almost unlimited scope for the designer's imagination. In this and a subsequent article the author discusses both the theory and practice of these circuits.

One of the unfortunate aspects of modern technology is that the home constructor who uses large-scale integrated circuits, probably hardly understands what he is doing. Somewhere, a highly specialised designer channelled all his experience into a package, adding instructions as to what to connect to which pin to make "it" work.

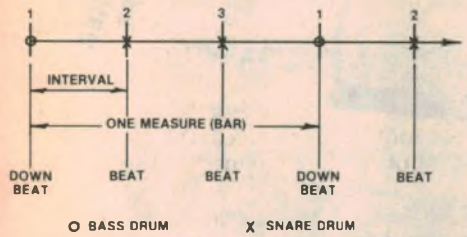


Fig. 1

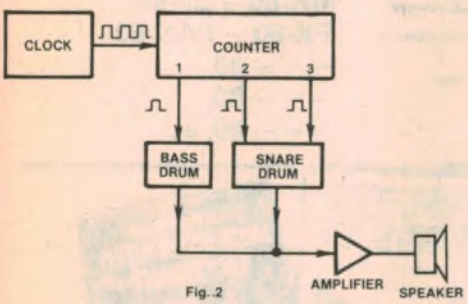


Fig. 2

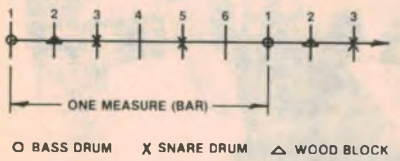


Fig. 3

There are however more problems than just this one. As the chips become more specialised, it becomes harder for the average hobbyist to buy the particular IC he needs. If he is lucky enough to find what he wants, he is usually faced with yet another disadvantage. The end result of his project is pre-determined by the designer of the chip and, as it is usually "hard-wired", the home constructor has no way of altering the design to suit his particular purpose.

This may be acceptable for "run of the mill" projects like amplifiers and radios where the aspect of personal taste is mostly directed to the cabinet in which the unit is housed; it is an entirely different matter with more creative instruments like organs and rhythm units. The rhythm patterns created by a rhythm chip are seldom to the liking of the user and always monotonous.

What is needed is freedom of choice to enhance the creativity of the hobbyist. Especially when playing an instrument, the need for new and different rhythm patterns occurs all the time. It should be possible to listen to a record, to analyse the rhythm pattern and to simulate this on an electronic rhythm unit. To accommodate this need, the author started to experiment with rhythm generators, setting the following objectives:

– full flexibility in rhythm programming.
– Simple circuitry, using only easy-to-buy components.

Some of the results of these experiments are discussed in this article. The emphasis of this discussion will be on rhythm pattern generation rather than on instrument simulation, although some examples of these will also be given.

The most basic rhythm generator is a clock that produces a constant stream of "ticks". In a somewhat modified version, the clock is called a metronome. Here, by changing the length of the pendulum, we can alter the tempo of the ticks to suit the music played. We can play any piece of music against these ticks as there is nothing that differentiates one tick from the other.

Waltz rhythms

Let us assume that we want to play a waltz. This kind of melody is built upon a rhythm consisting of three distinct "ticks", the first of which (the "down beat") has more emphasis, eg [BOOM – TICK – TICK] [BOOM – TICK – TICK] (etc). A drummer would hit the bass drum on the BOOM and the snare drum on the TICKS. Each hit would be separated by exactly the same time interval to keep the tempo constant. In musical terms, this is called "three beats in the measure", "three beats in the bar", or "3/4 time". The measure (or bar) is a given period of time in which the three beats have to occur. Obviously, each beat in this example of the basic waltz represents 1/3 of a measure (bar). (Fig. 1).

Rather than discussing other and more complex rhythm patterns at this stage, let us stick to this simple example for a while and replace it with an electronic device, performing the same task. Assume we have two electronic circuits capable of producing a sound through an amplifier-loudspeaker system, one like a bass drum, the other like a snare drum. Each time the circuit receives an electrical pulse at its input, the respective sound is produced. In other words, the hit by the drummer is now replaced by the "hit" of the pulse.

To provide the "hits" we require a pulse generator. In its simplest version, this could be a square wave generator

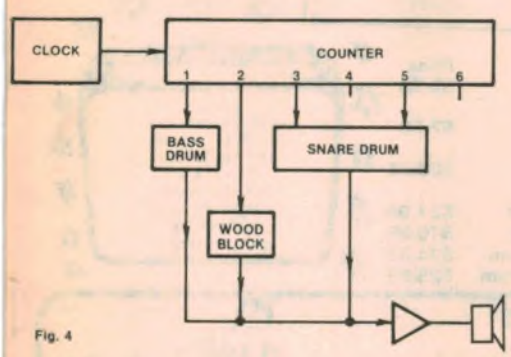


Fig. 4

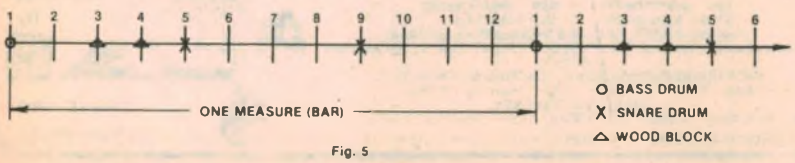


Fig. 5

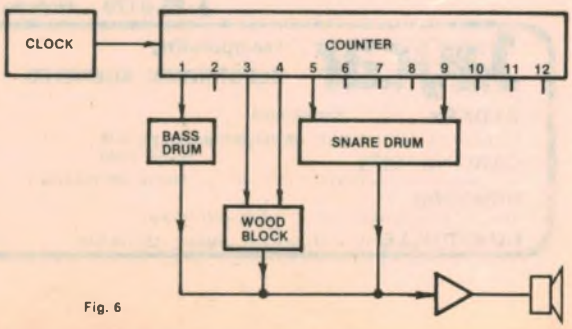


Fig. 6

Rhythm Generators

by NICK LABORDUS*

*5/3 Durham C1, North Ryde, NSW 2113

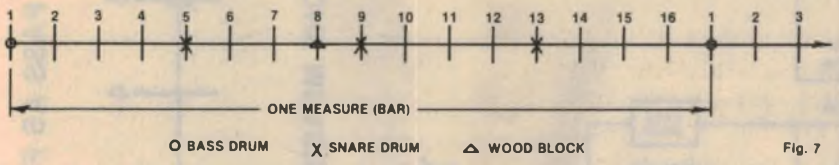


Fig. 7

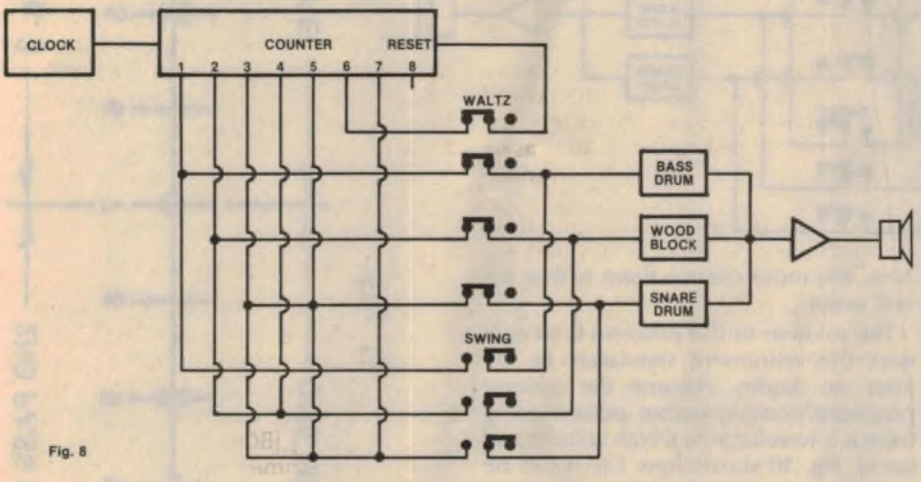
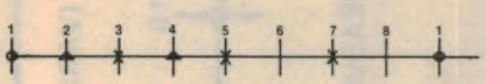


Fig. 8



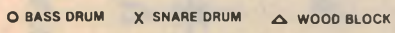


Fig. 9

built around a 555. This unit produces a constant stream of pulses at its (one) output line. Connecting this output to the input of either sound simulator, we recreate the metronome effect ie, a constant stream of BOOMS or TICKS but nothing like the required BOOM-TICK-TICK.

Sequencing

Obviously, the sound simulators cannot distinguish between any of the incoming pulses. A way to overcome this is to separate the pulses by channelling them sequentially into separate output lines. This can be achieved by feeding the pulses into a counter with (for this example of a waltz) three output lines. The first pulse will activate line 1, the second pulse will activate output 2 and the third one output line 3.

The incoming pulses are now separated into three distinct output lines, each of which will produce a pulse in sequence. If we connect output 1 to the bass drum circuit and outputs 2 and 3 to the snare drum circuit, we do get the required effect: [BOOM – TICK – TICK] [BOOM – TICK – TICK] etc. The block diagram of this "rhythm unit" is given in Fig. 2. The way we connect the counter output lines to the sound simulators determines the rhythm pattern. The frequency of the pulse generator (clock) determines the tempo.

For the moment, let us stay with the waltz, but ask the drummer to give some variations to the old BOOM – TICK – TICK which by now is getting a bit boring. Assume he hits a woodblock just halfway between the bass drum and first snare drum hit. This would sound like: [BOOM – TOCK-TICK – TICK] [BOOM – TOCK-TICK – TICK] etc. The woodblock "TOCK" sound appears in the measure at 1/6 of the time (Fig. 3).

To re-create this sound electronically we have to add a woodblock simulator to our two instruments. It will be clear by now that we also need a different counter, ie one with six output lines to allow us to pick the 1/6 time interval. In this counter the 7th input pulse will appear on line 1 again. Fig. 4 shows the block diagram of this rhythm unit. Note that only four of the six output lines are used in this example and that the clock must run at double the frequency to maintain the same tempo, as the pulses must pass through double the number of counter stages.

Not satisfied with this, our drummer introduces a further variation and gives the woodblock another hit between the first woodblock hit and the first snare drum hit. Without any further explanation it will be clear that this last hit is 1/12 of a measure (Fig. 5). Just for the sake of this one extra hit we have to use a 12-output line counter in our electronic equivalent, most of which will remain unused in our example. The clock has now to run at four times the frequency of the first (three line) example to produce the same tempo. Fig. 6 gives the block diagram of this rhythm unit. Obviously, by having 12 output lines available, we can now program a large number of other variations, like the drummer using his fantasy to create new and exciting effects.

Complex rhythms

So far we have discussed only those rhythm patterns with three basic beats in the measure. A lot of music is based upon a basic two beats in the measure (eg, a march and a two-step) and even more on four beats in the measure (eg, foxtrot, swing, tango, etc). It will not be difficult to understand that for such patterns we need a counter with four, eight, or 16 output lines, following the same examples as above. Fig. 7 shows a 16 line pattern for a swing rhythm sounding like [BOOM – TICK KA-TICK – TICK] [BOOM].

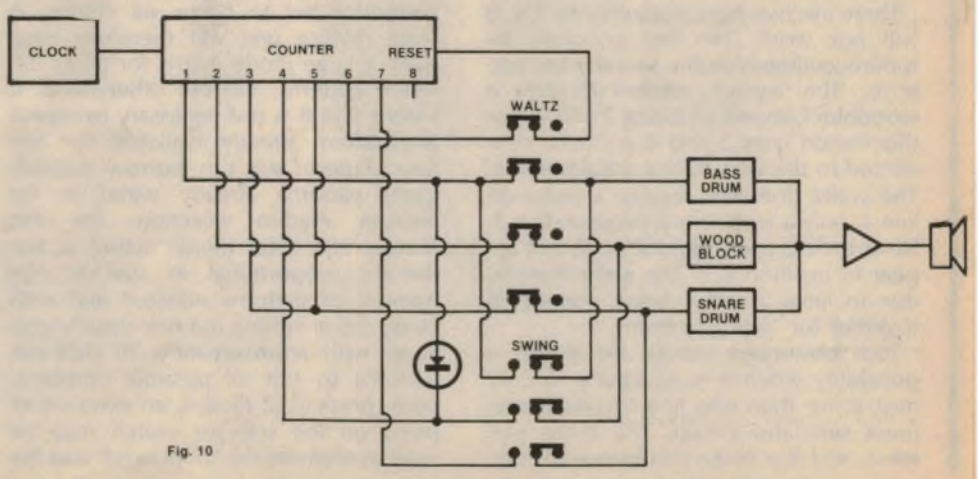


Fig. 10

Design Techniques for Rhythm Generators

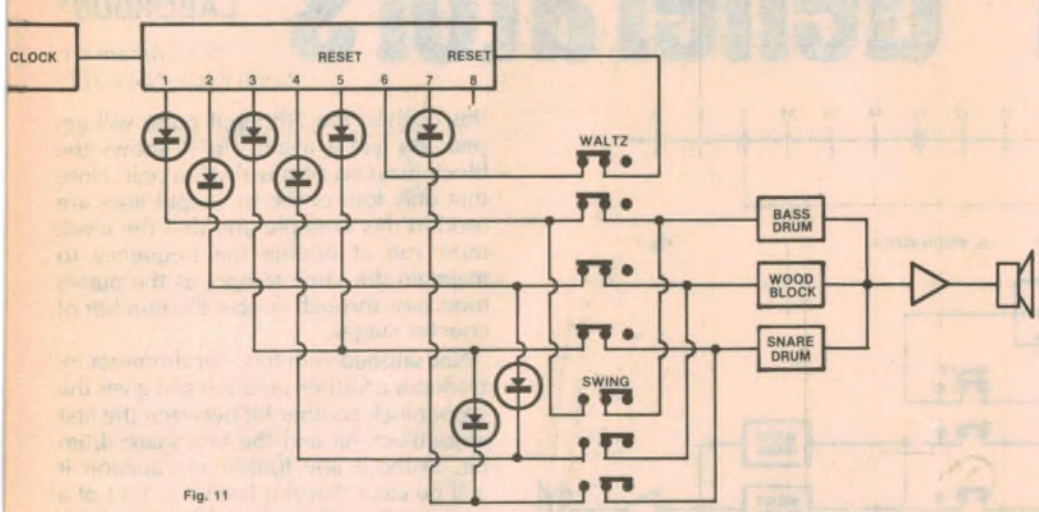


Fig. 11

Most counters can be forced to return to line 1 before they have reached the last counting line. This means that we can use a 16 line counter for a waltz rhythm by "resetting" it after line 12. Keep in mind that this reset pulse must force the counter into its zero position before the next input pulse arrives, otherwise the rhythm unit will produce a hiccup after each measure. This is achieved by using the trailing edge of the clock pulse for the reset function.

Fig. 8 shows a rhythm unit that allows selection between two rhythm patterns, one for the waltz, the other for the swing. The switches used cancel each other, so that only one of the two patterns can reach the instrument simulator circuits at the time. In Fig. 8, the waltz switch is "on" and the swing switch is "off". Note that we have chosen the eight line version for simplicity's sake. The swing pattern is wired according to Fig. 9 and the waltz according to our previous example (Fig. 3). Everything looks fine and one would expect this to work. Regrettably it does not.

Unwanted effects

There are two basic reasons why Fig. 8 will not work. The first concerns interference between the two rhythm patterns. The "swing" pattern dictates a woodblock sound on beats 2 and 4. For this reason lines 2 and 4 are both connected to the woodblock simulator line. The waltz does not require a pulse on line 4, only a woodblock pulse on line 2. Nevertheless a woodblock pulse will appear in position 4 in the waltz rhythm, due to lines 2 and 4 being connected together for "swing" pattern.

Such unwanted effects are always a possibility when it is necessary to connect more than one line to one instrument simulator circuit. The more patterns, and the more complex each pattern, the more chance there is that this will occur.

The solution to this problem is to connect the instrument simulators to the lines via diodes. Assume the counter produces positive output pulses (going from a low voltage to a high voltage and back). Fig. 10 shows how Fig. 8 can be modified to solve the problem involving lines 2 and 4. Similar problems, such as might arise with other configurations, may require the other simulator lines to be similarly isolated.

The second problem concerns the loading effect on the counter outputs where two outputs are joined together, eg, pins 3 and 5 in Fig. 8. Here the problem is that pin 3 cannot go high whilever pin 5 is being held low, and vice versa. The solution to this problem is to isolate each output pin with a diode, the final modified circuit being shown in Fig. 11. This circuit will work. (Although we have separated these two problems, for ease of explanation, both can in fact occur together, as in the case of pins 2 and 4, depending on the various rhythm patterns involved.)

All this means that rhythm pattern programming has to occur via diodes. A large rhythm unit will therefore have quite a large diode matrix for all its different patterns. On the other hand, it means that it is not necessary to repeat any pattern already available. For any new pattern, we can borrow suitable (part) patterns already wired in for another rhythm selection. For this reason, the total diode matrix is not directly proportional in size to the number of patterns selected and with some clever sorting out one usually gets away with approximately 20 different patterns to suit all possible combinations. (Instead of diodes, an extra set of poles on the selector switch may be used to separate the "borrowed" and the "additional" pattern.)

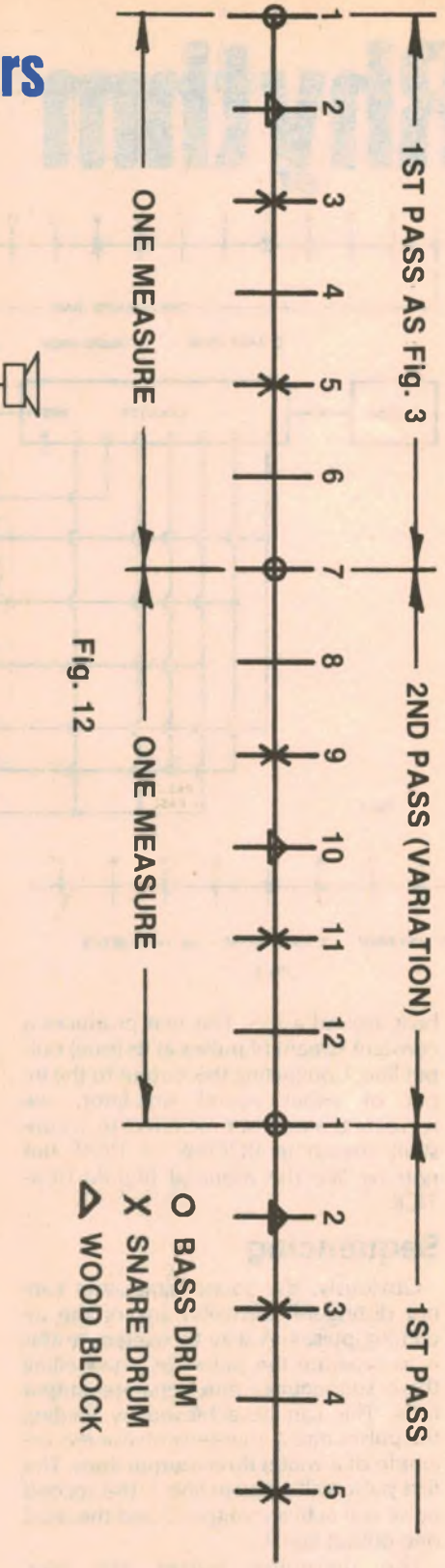


Fig. 12

The rhythm unit described above can produce a waltz or a swing rhythm in a pre-programmed pattern. It would be possible to re-arrange the diodes in a different manner to create other patterns. For each rhythm added (eg, a foxtrot or a tango), an additional selector switch is required. For any additional instrument

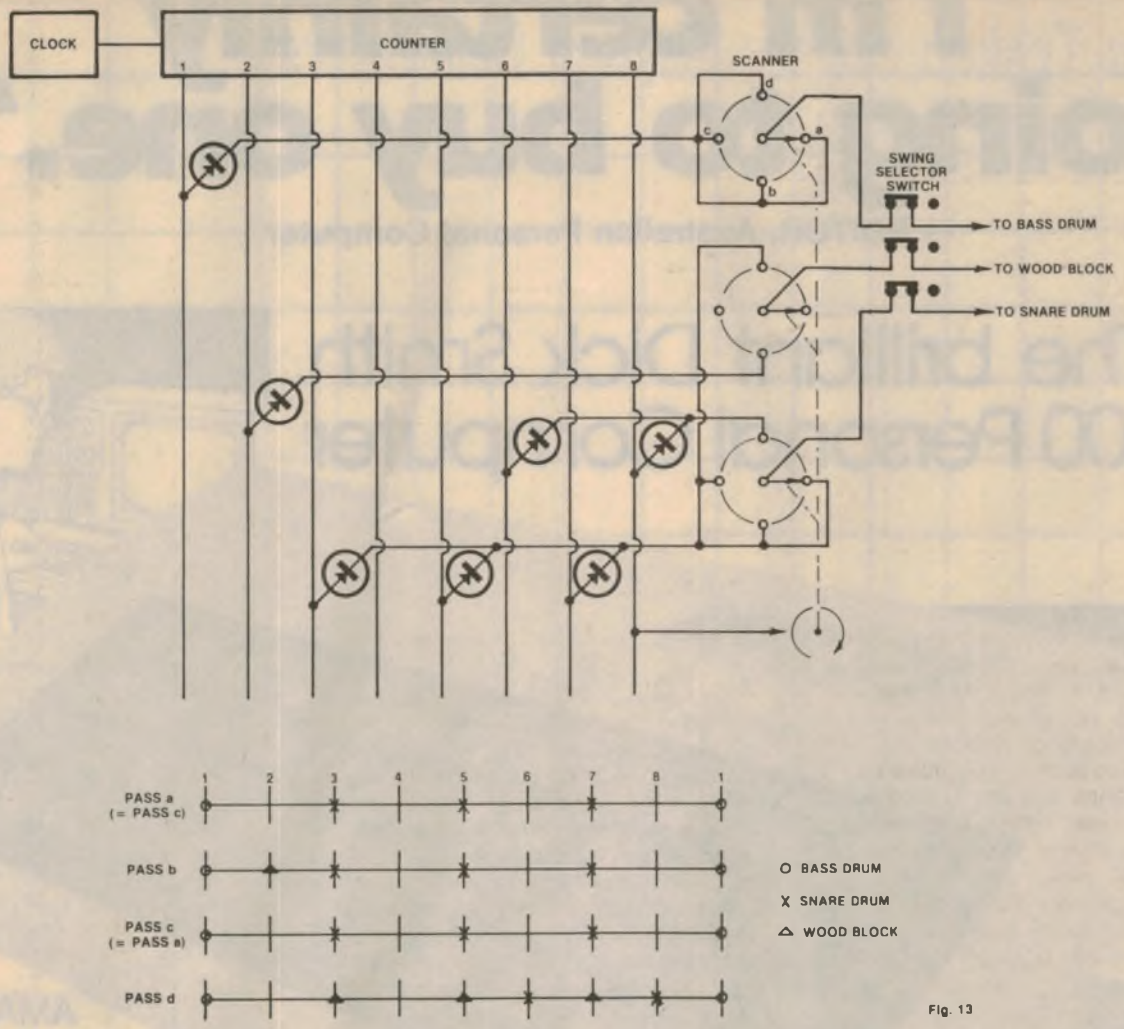


Fig. 13

Design Techniques for Rhythm Generators

simulator, each switch must have one more set of contacts.

This means that a complex rhythm unit may require, say, 10 selector switches, each with six to eight sets of poles to accommodate all available instruments. Here we strike the problem of general availability of such multi-pole switches. The average home constructor is forced to buy from retailers as the quantities required by him are low. The chances of finding a retailer who stocks the exact switch required are virtually zero.

Having encountered this problem, it was decided to steer away from multi-pole switches and use only easy-to-buy single pole versions. These were used to drive (equally easy-to-buy) electronic switches which come in IC packages of four at a time (type 4016). In this way, the number of poles can be extended indefinitely and all problems are solved. The cost is also lower, which is an additional advantage.

All rhythm units described so far have a common disadvantage. Each rhythm pattern selected will be repeated again and again. This monotony can become quite irritating and is the reason why so many rhythm units remain unused after a while.

If we return for a moment to the pattern Fig. 3, using six output lines, we could program that same pattern on the first six lines of a 12 line counter, leaving the second six lines free. We could use these free lines to program a variation on the pattern, as illustrated in Fig. 12. This gives two different "passes" for the same rhythm selection, reducing the monotony a little.

At the same time, however, we have sacrificed the possibility for a 1/12 beat. This could be overcome by using a 24-line counter, programming the first 12 lines for one pattern and the other 12 for a variation. We could add another variation by using a 36-line counter and reduce the monotony further by adding more and more lines. This results in very complicated wiring and a lot of money spent on counters. It is not a practical solution.

Another way to approach this problem is to introduce yet another counter, acting as a scanning switch. (Not to be confused with the rhythm selector switches.) While the rhythm selector switch stays in the chosen position (eg, "tango"), the scanning counter switches from one relevant rhythm pattern to the next variety each time the counter has reached its final line (and before the next input pulse reaches the counter). The number of output lines of the scanner counter determines the maximum number of pattern variations that can be created per chosen rhythm type.

In Fig. 13 the scanner is shown as a constantly rotating multi-pole switch. In practice, the scanner is not a switch (shown for easy understanding) but a counter, the output lines of which sequentially enable certain diode programs to be connected to selected instrument simulators via electronic switches.

In Part 2, some practical circuits will be discussed, ranging from a simple 16-line one pass rhythm generator to a scanning version. Some circuits for instrument simulators will be discussed and a few examples of practical diode matrices will be given to allow the home constructor to start his own experiments.

"I'm certainly going to buy one."

— EDITOR, Australian Personal Computer

The brilliant Dick Smith VZ-200 Personal Computer

AMAZING VALUE!

$199

Cat X-7200

LIMITED STOCK— HURRY DON'T MISS OUT!

Here it is — the breakthrough you've been waiting for! A personal computer with all the right features: colour graphics, sound, standard Microsoft BASIC for easy programming, a whopping 8K bytes of RAM memory, the ability to work with a standard TV set, and much more. Yet thanks to modern electronics and our buying power, the Dick Smith VZ-200 will cost you only $199 — far less than any comparable computer (and you get our 7-day money back satisfaction guarantee!). There'll never be a better time to invest in your family's future....

What the experts say:

"....this is a great machine, and one that is likely to change the face of Australian personal computing." — Editor, APC.

"We are impressed with the excellent implementation of Microsoft BASIC, full on-screen editing, repeat keys and easy-to-use graphics features." — Creative Computing, May 1983.

"If....you want a computer for playing games, for self-education, for learning about BASIC and perhaps for writing your own programs, the VZ-200 has one overwhelming advantage — the number of features for its price." — EA, July 1983.

Now every family can afford their own personal computer!

Yes, for just $199, the Dick Smith VZ-200 gives you amazing computing power — far more than many machines two, three or even four times the price. Now *you* can find out what computers are all about. The kids can use it with their school work. It can keep track of your home budget. It can even help you in your business!

DICK SMITH Electronics

See page 98 for address details

A618/TH

& look at these exciting ways to expand your system

Technological Breakthrough!

Colour Printer/Plotter at an amazingly low price!

Don't buy just a printer – here's a fantastic NEW 4 colour printer that is an X-Y plotter as well! Use it to produce graphs, pie charts, printing in many different sizes and lots more – all in four colours. Thanks to its built-in microprocessor, all of this can be done easily using simple commands in your BASIC programs.

Look at some of the features:
★ 4 colours! (black, green, red, blue [uses ball pen inserts]) ★ A PLOTTER as well as a printer ★ Standard Centronics-type parallel interface ★ 10 chars. per sec. printing speed ★ Software switching between printing and plotting ★ 40/80 columns per line ★ Resolution 0.2 mm ★ Step size 0.2 mm min. ★ Full 96 char. ASCII set (caps and lower case) ★ Inbuilt microprocessor provides 'intelligence' – plots lines, etc in response to simple commands ★ Plotting speed 52 mm/sec max vertical and horizontal, 73 mm/sec for 45° plotting.
★ & the best feature of all is THE PRICE!

Cat X-7208

AVAILABLE THIS MONTH ONLY $299

Write & store your own programs/data!

VZ Datasette

Get the most from your VZ-200 – store your programs on this deluxe recorder. Made just for the VZ-200 so it's better than any normal cassette unit.
Cat X-7207

ONLY $69.50

Use any Centronics type printer with this

Printer Interface

Now get a printed 'hard copy' of both your programs and your data with this low cost Printer Interface. This superb compact module simply plugs into the back of your VZ200 alongside the memory expansion module, and lets you connect it to any standard Centronics-type printer, (like the X-7208 above). Includes printer cable.

Cat X-7210

ONLY $49.50

WANT MORE MEMORY? SIMPLY PLUG IT IN!

16K MEMORY MODULE

Want to write your own programs but find the memory of your computer unable to handle it? This happens with almost every computer, no matter how large its memory! But with the VZ200 the answer is simple – just plug in the memory expansion module and now your VZ200 has a whopping 24K of total RAM! Cat X-7205

$79

WE'VE GOT NEW BOOKS TOO!

VZ-200 Technical Manual

Want to get the most from your VZ-200? This technical manual explains all the ins and outs, ups and downs. For the real computer enthusiast or the beginner who wants to know more! Cat B-7204

$9.50

Introduction to Computing

Are you a 'babe in the woods' when it comes to computing? Try this one out: written just for YOU! In a language you can understand, it will have you a VZ-200 expert in just a few days! Cat B-7200

$9.95

First Book Of Programs

Tried, trusted and true programs for your VZ-200. There's something for everyone – and remember, they're all written in BASIC so you can save these on cassette so you only have to key them in once! Cat B-7202

$6.95

A great range of games software

POKER
Straight draw poker – just you and the computer. You can bet, raise, call, bluff and fold, just like the real thing. Cat X-7232.

MATCHBOX
A great memory tester! Behind the letters on the grid are pairs of symbols, but you can only see one at a time. Which letters have which pairs behind them? Good colour graphics and sound effects. Cat X-7231

BLACKJACK
Ever wanted to visit Las Vegas? This is the next best thing – OR a good way to practice if you're planning a trip there. Blackjack or '21' is the game and the screen shows all the cards.
Cat X-7235

HANGMAN
If you can't guess the mystery word (8 letters) the figure on the screen is hanged – you lose! Based on the popular children's game, this program helps kids with spelling and vocabulary.
Cat X-7233

NOTE: Some programs may require 16K memory module.

EXCITING NEW GAMES AVAILABLE

SLOT MACHINE/KNOCK OFF/ RUSSIAN ROULETTE Cat X-7234
CIRCUS Cat X-7236
BIORHYTHYM/PAIR MATCHING/ CALENDAR Cat X-7237
HORSE RACING Cat X-7238
INVADERS Cat X-7239
DYNASTY DERBY Cat X-7240
GHOST HUNT Cat X-7242
HOPPY Cat X-7243

ALL ONE PRICE! $12.50 ea.

Plus these great financial & educational programs

STATISTICS 1
A great introduction to the basic principles of statistical analysis. Explains about the Mean, Variance, Standard Deviation, different types of Distribution etc. Gives you the opportunity to test your knowledge by working out examples. Cat X-7251

STATISTICS 2
Following on from Stat 1, this program deals with more advanced concepts. Tests of statistical significances. Students T-test, the Chi Square test and so on. Cat X-7252

MATRIX
Working out mathematical matrices can be a real chore. This program gives you more skill in handling them by practice. Cat X-7253

TENNIS LESSON/GOLF LESSON
Challenge your computer to a game of tennis or golf. It plays by the rules so even if don't win you can learn a quite a lot about the game
Cat X-7254

PORTFOLIO MANAGEMENT
Like to invest in the share market? This program will help you to analyse and manage your portfolio for max. profit and min. risk. It gives you a working model of your portfolio, so you can see the likely effects of any changes. Cat X-7261

DISCOUNTED CASH FLOW ANALYSIS
An ideal working tool for executives, accountants etc, providing a model for market capital budgeting decisions and minimising an investment without prejudicing a project's liquidity. Cat X-7262

FINANCIAL RATIO ANALYSIS
A program for the professional accountant, investment advisor, or small business owner who doesn't want to stay small! Cat X-7263

ONE LOW PRICE $12.50 ea

How to obtain better TV reception Pt. 5

While most people purchase a ready made antenna, making your own can be a project for the handyman who has a few basic metal-working tools such as a vice and a hacksaw. In this article we give details of four-element Yagis suitable for single-channel reception and go through the practical exercise of modifying an all-channel array to cover channel 0.

by LEO SIMPSON

Before you all start to clamour about the cessation of channel 0 transmissions and how such an exercise won't be necessary after 1984 let us look at the whole situation. It is true that channel 0 is expected to cease transmissions at the end of 1984. That fact was announced in our last issue. But whether it will actually happen remains to be seen.

Second, we assume that some readers will still want to "have a go" at modifying their antenna for channel 0 even though the utility of such a project may be strictly limited. Bear in mind also that channel 0 is allocated to translator use in some parts of the country and whether or not these services will also cease remains to be announced.

Finally, we decided to go ahead in giving details of this exercise to give a practical example of how a single channel antenna could be constructed.

Why build a single channel antenna?

Even if your present antenna is giving sterling performance in receiving your local channels there may be a good reason to consider a separate single channel antenna. For example, if you are a sports fan living in the capital city of your state you may want to pick up one of the ABC regional stations. These stations often give better sports coverage than the metropolitan stations. Witness the coverage of the America's Cup yacht races – only the ABC rural stations did it. And during the cricket season the ABC rural stations have the best of it.

The chances are that the rural station you want will require a different orientation to that of your main antenna and is not covered by your main antenna in any case. And the polarisation may also be different.

Before you seriously consider going to the trouble of making an antenna especially to suit an extra channel, investigate the feasibility of the project. Do you presently get a sniff of a signal with your existing antenna? Can it be improved by pointing the antenna in the right direction and perhaps changing the polarity from vertical to horizontal, or vice versa? Are any of your neighbours presently able to receive a worthwhile signal? That last question may be no guide at all since your neighbours may not have your inquisitive and innovative mind.

Finally, how far awar is the transmitter of the station you want? Even if it is as much as 100km or more it may still be feasible to obtain a good signal with one of the antennas described here. For example, in the coastal suburbs of Sydney it is easy to obtain first class reception of both Newcastle and Wollongong stations where the signal path is about 100km and 80km respectively.

It is for single channel use that the Yagi design, described in part 3 of this series, really comes into its own. The design is straightforward, requires few compromises and gives good performance.

Four-element Yagis

Over on the opposite page is a table giving the dimensions of four-element Yagi antennas for every TV channel from 0 to 11. This basic design has been well proven over many years and gives a performance which is superior to the reception that can be expected from any antenna which is designed to cover more than one channel.

Such a four element Yagi can be expected to have a gain of about 8dB with respect to a simple dipole cut to the same frequency. And without actually quantifying it, the front-to-back ratio is quite good and a very deep null is to be

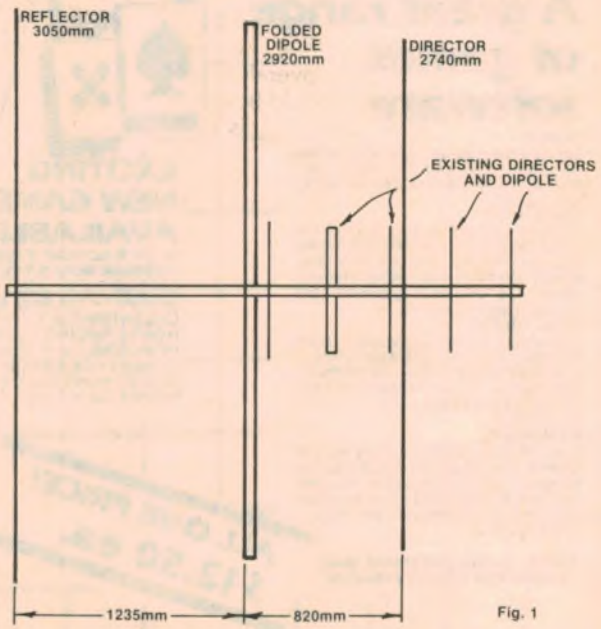


Fig. 1

At right are the dimensions for a Hills 215 antenna modified to receive channel 0. Note that the spacing between dipole and director is less than 0.2 wavelength, to take advantage of existing hardware on the boom.

found in the side of the array, as is to be expected with this design. The presence of that deep null is very useful if you have a ghost signal which comes in from the side of the antenna.

When you build your own antenna or modify an existing unit you will have the satisfaction of knowing that the resulting job will be very much sturdier and probably last longer than a manufactured unit. This is in spite of the fact that the manufacturers can use special hardware designed for the purpose and can employ heavy duty anodising for corrosion resistance.

The main criticism which can be directed at commercial antennas is that the long elements are too flimsy and likely to be bent by perching birds. The reason the elements are flimsy appears to be cost and so all antennas intended for consumer use employ rolled tubing (ie, not seamless) about 10mm in diameter and with very thin walls. As a result most antennas have bent or sagging elements after only a few years service.

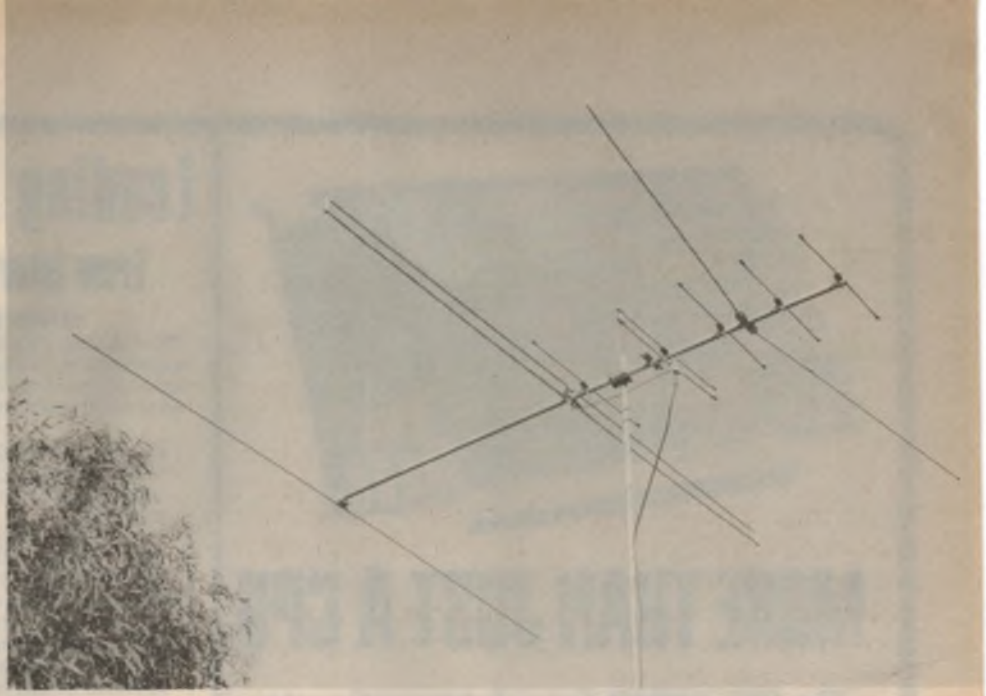
At least one manufacturer, Hills Industries Ltd, does make a heavy duty version of its largest log periodic antenna. Designated the HD4, it is made entirely of stainless steel for long lasting resistance to corrosion. This antenna was shown in last month's article on log periodic antennas.

Even the most enthusiastic amateur antenna constructor is unlikely to want to use stainless steel. It is too expensive and is difficult to work with. Where the handyman can improve on the commercial antenna is to use seamless aluminium tubing with greater wall thickness and larger diameter for the longer elements.

Corrosion

In my opinion, and this is backed up by normal amateur radio practice, any antenna element with an overall length of two metres or more, should be made with 12mm diameter tubing. This does add a little extra weight and a little more windage (wind resistance) but not enough to be of real concern.

While using thicker tubing may prevent or lessen the chance of elements bending it does nothing to reduce corrosion. In fact, without the benefit of anodising corrosion of an antenna which has been put together by a handyman is likely to be very rapid. This is exacerbated by the inevitable use of dissimilar metals so painting the antenna is essential as we shall see.



The modified 215 antenna with low band dipole cut for channel 0. Note that it must be mounted at least half a wavelength clear of surrounding objects or other antennas. In this case, that means a spacing of three metres.

The dimensions shown in the table below are cut to the centre frequency of the respective channel. It is important that these dimensions be followed closely as far as element length is concerned. Other dimensions, such as element spacing, are not so critical, but unless you have good reason for making variations, stick to the figures given.

In each case the length of the boom is not given directly but can be calculated simply by multiplying the element spacing by three and adding an amount at each end to take account of the element mounting clamps. With the channel 0 antenna for example, the boom length should be about 3.55 metres. In all cases the boom should be a minimum 25mm in diameter.

The biggest problem to be faced is obtaining the necessary antenna hardware. It helps if you are a bit of a scrounger and one who habitually keeps an eye out for antennas being thrown out on council cleanup days. Even without that approach much of the hardware can be made using standard U-bolts and muffler clamps which can be purchased from auto accessory stores.

What about the price?

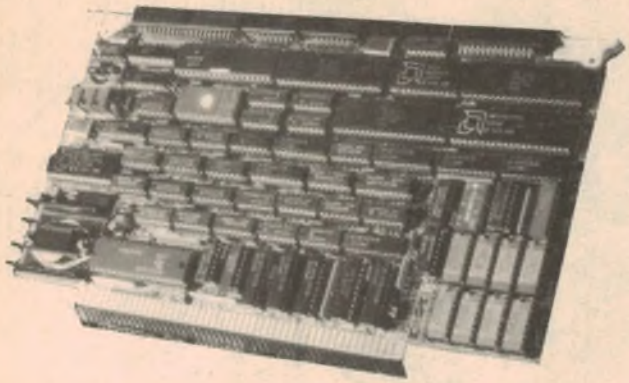
Price used to mitigate against building your own antenna but now the do-it-yourself job can be an economic proposition. This is because anything made of metal these days is inflated by Australia's relatively high labour costs. But before you rush in and buy the materials find out what the cost of a comparable single channel antenna is. Several manufacturers do make such antennas. Compare that price with the necessary aluminium tubing, muffler clamps and paint you will need.

You may also wish to figure in the cost of your own labour but if you are that serious you should not be considering this project. After all, half the fun of such an exercise is to learn something and

TV ANTENNA DESIGN DATA

CHANNEL	0	1	2	3	4	5	5A	6	7	8	9	10	11
REFLECTOR	3048	2489	2223	1666	1519	1412	1054	945	803	772	744	699	676
DIPOLE	2902	2367	2118	1588	1448	1346	1003	792	765	737	709	665	643
1st DIRECTOR	2769	2254	2019	1511	1377	1283	955	754	729	701	676	635	612
2nd DIRECTOR	2711	2216	1981	1483	1352	1257	937	742	716	688	663	622	599
SPACING	1235	1008	902	678	615	574	427	338	325	313	302	284	275

These antennas are designed to operate in the centre of the respective channel. Element spacing is 0.2 wavelength. All dimensions are in millimetres.



MORE THAN JUST A CPU

The CPZ-48000 From Intercontinental Micro Systems

A HOST OF USES

The CPZ-48000 will act as more than a CPU. Use it as a multi-user-tasking host, a multi-processing host or a CPU with high speed serial data link capability for network architectures. It will also act as a highly sophisticated single board system.

'SOPHISTICATED SINGLE BOARD SYSTEM' MEANS MULTIPLE FUNCTIONS.

Like an onboard floppy disk controller, 4 channels of DMA, priority interrupt controller, memory management, 64K onboard RAM, 2K onboard EPROM, 2 parallel and 2 serial ports.

And more:

- ☐ IEEE 696.1/D2 S100 compliance. The CPZ-48000 will interface with most IEEE S100 bus products on the market.
- ☐ Z-80A,™ 4Mhz Operation.
- ☐ Floppy disk controller (FDC) with onboard data separator. Single or double sided. Single or double density. 8" or 5¼". The choice is yours.
- ☐ Two synchronous or asynchronous serial I/O channels (SIO). One channel can be programmed in direct memory access (DMA), interrupt, or programmable I/O mode.
- ☐ Two parallel I/O channels (PIO). One channel is programmable in DMA, interrupt or programmable I/O mode.
- ☐ Four channel DMA controller.
- ☐ 64K on board RAM. Bank selection puts 4K-64K under software control.
- ☐ Memory management unit (MMU). Addresses up to 16 megabytes of system memory.
- ☐ Eight vectored priority interrupts are chained with serial and parallel I/O interrupts for use with Z-80A mode 2 interrupts.
- ☐ Provisions for 2K or 4K onboard EPROM. A boot up function and monitor in a 2K EPROM is supplied.
- ☐ Software selectable baud rates.
- ☐ IBM Bisync, HDLC, SDLC and other protocols. All are handled through a Z-80A SIO chip.
- ☐ CP/M,™ MP/M™ and Turbo-DOS™ operating systems available.
- ☐ Turbo-Disk® implementation included.

Leading Edge S100 Slaves

From Intercontinental Micro Systems

LEADING EDGE? EVERYONE SAYS THAT. PROVE IT.

When you read the features, the specs and the description, we're betting you'll be impressed by the capabilities of our CPS-MX slaves. Compare them to any of the competition. And when you discover our prices, we hope you'll allow us to help you with your distributed processing needs.

FEATURES

- ☐ IEEE 696.1/D2 S100 bus compliance.
- ☐ Compatible with CPZ-48000 SBCP, any Z-80A based CPU with extended address capability or 16 bit based CPUs complying with IEEE 696.1/D2 bus specification.
- ☐ Z-80B™ 6 Mhz (CPS-6X) or Z80A 4Mhz (CPS-4X) operation.
- ☐ Two synchronous (CPS-MS) or asynchronous (CPS-MA) serial I/O ports.
- ☐ TURBOdos™ & CP/NET™ compatible.
- ☐ Master confiscation of slave memory for diagnostic purposes.
- ☐ Two parallel I/O ports; eight data bits + 2 handshake lines per port.
- ☐ 64 Kbytes of onboard dynamic RAM.
- ☐ Master/slave memory-to-memory transfers under DMA control @ 571 Kbyte/sec transfer rate when used with CPZ-48000 SBCP.
- ☐ Software selectable baud rates.
- ☐ Usable as an intelligent I/O processor in single user systems.

FEATURES ARE FINE BUT IT'S PERFORMANCE THAT COUNTS.

The model CPS-MX slave processors are Z-80A (4Mhz) or Z-80B (6Mhz) based single board computers compatible with TURBOdos and CP/NET distributed processing operating systems.

CPS-MX slave processors together with an S100 bus master (host) like Intercontinental's CPZ-48000 SBCP, constitute a high performance, high throughput network which can be integrated into most S100 bus mainframes. Master/slave communications take place over the S100 Bus via slave/host bidirectional memory transfers under control of the host processor. In an architecture where the host is the CPZ-48000 SBCP, those memory transfers may take place under direct memory access (DMA) control. The data transfer rate under DMA is 571 Kbytes/sec which is a 300% increase in speed over Z-80A block move rates. Data transfer rates in non-DMA mode are one-half of the maximum transfer rates for I/O mapped slave processors. Data transfer rates in DMA mode are up to one-sixth of the maximum transfer rates of I/O mapped slave processors.

Winchester Storage

— added to your computer system the easy way!

MONITOR DYNAMICS designed the HDC-1010 series Easy Disk Controllers to interface a maximum variety of Winchester Disk Drives to any S-100 system with a minimum of complexity. The HDC-1010 interfaces to many types and sizes of drives — 5¼ inch (Seagate ST-506), 8 inch (Shugart SA-1000) and 14 inch (SA-4000) compatible, including 8 inch Memorex/Fujitsu drives. The New World Computer Mikro Disk** (5¼" and 8") Drives are supported by the HDC-1110 Controller. Only four switch selectable I/O ports are used, fully compatible with the IEEE-696 standard and all known variants.**

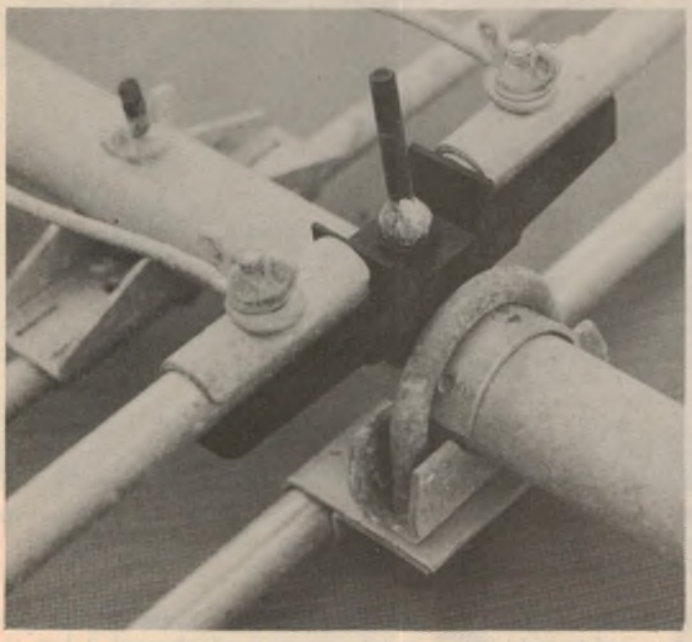
A single chip microprocessor, coupled with a simple, high-speed PROM based micro-controller provides bit-slice performance at a fraction of the cost and power consumption. Several innovative features reduce operation system overhead and drive size, including automatic seeking, soft error recovery, write verify and bad sector remapping.

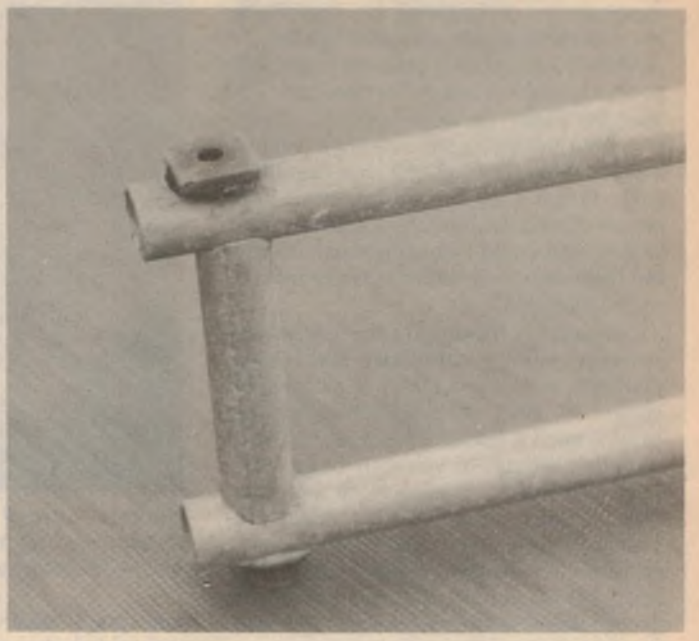
A typical disk operation requires only the new ID parameters (if any) and a read or write command to be sent to the controller, which returns an error code upon completion. What could be easier?

absolute electronics

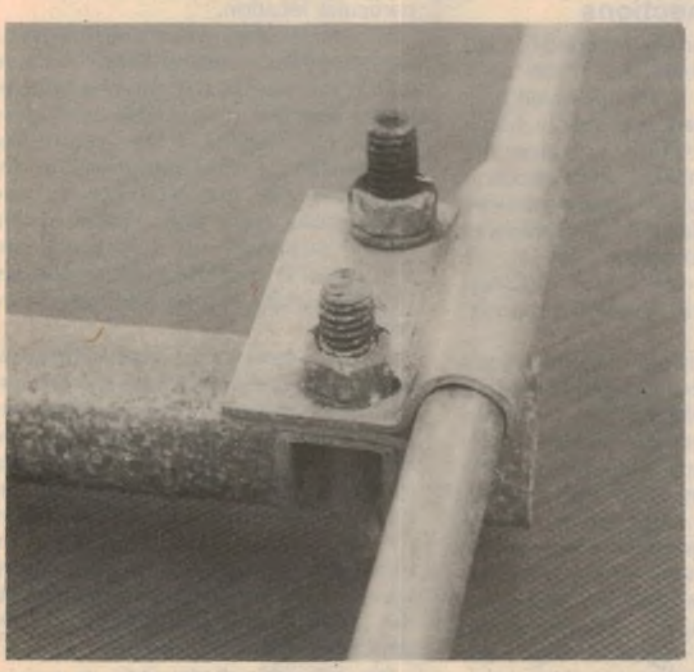
483 Centre Road, Bentleigh, 3204

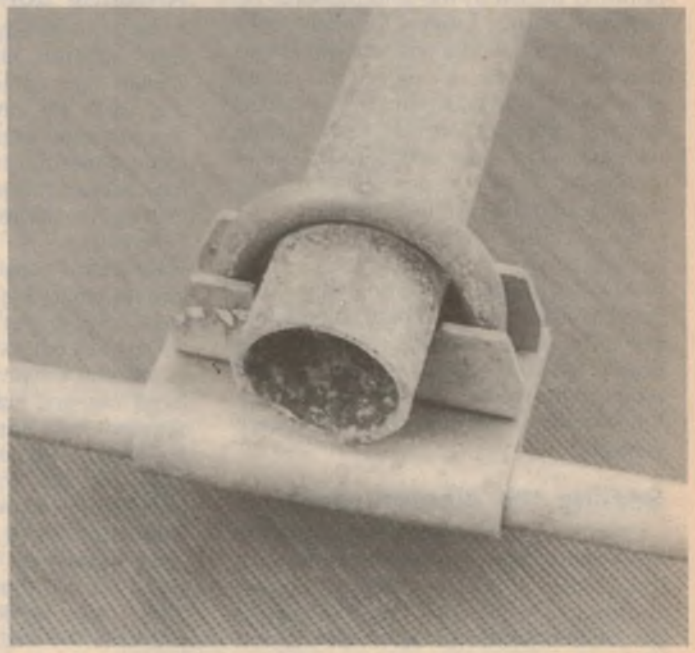
TELEPHONE: (03) 557 3971





These photos show some of the mechanical details of antenna construction and incidentally show the degree of corrosion which can be expected after a few months exposure to seaside conditions, if not painted.





gain a sense of accomplishment. Right? Not many people can point to their TV antenna and say, "I built that (and it works)."

Modifying an antenna

As one of a number of experiments in obtaining better TV reception the author decided to modify a standard Hills 215 antenna for channel 0 reception. This antenna was for many years the most popular unit for Sydneysiders and tens of thousands of them are still giving service although many of them would not now be fully up to par.

At the low end, the 215 is cut to suit channel 2. I wanted to use it for channel 0 so the first thing to do was to extend the boom to take into account the greater spacing between the folded dipole and the reflector.

Effectively, this meant that the existing boom had to be extended by about 370mm. Since the existing boom was 25mm aluminium tubing I elected to use a spare length of the same diameter which was at hand. The method of joining the two was crude – just jam a length of a broomstick up both pieces of tubing and rely on the force-fit to hold the join tightly together. What should have also been done was to put screws through both sections of tube into the broomstick as eventually it did become loose.

A better way of doing it would be to use a length of tubing of sufficient diameter to be a force-fit over the existing boom tubing and once again use a couple of screws to secure the joint.

The aluminium tubing purchased by the author for this project was 12mm in

diameter and 0.8mm in wall thickness. While it is possible to obtain thicker grades of tubing the extra weight and expense is not justified by the slight improvement in strength and rigidity.

While 25mm tubing may be regarded as a practical minimum for the boom it may be easier to work with 31.75mm (1¼ inch) tubing to suit readily available muffler clamps or U-bolts. For example, while I used a 25mm boom I could not obtain 25mm muffler clamps from auto supply stores and I was too mean to pay the higher price of such hardware from a ship's chandler.

One way of making up the difference between muffler clamp size and tubing diameter is to use a piece of aluminium sheet. In one of the accompanying photos such a packing piece is visible. It is better though, if you can obtain the right size muffler clamp. Note also that the U-bolts and clamp hardware available from ship's chandlers may also be more corrosion resistant than that intended for automobile use. You could go for stainless steel hardware with this in mind. But it will certainly cost more.

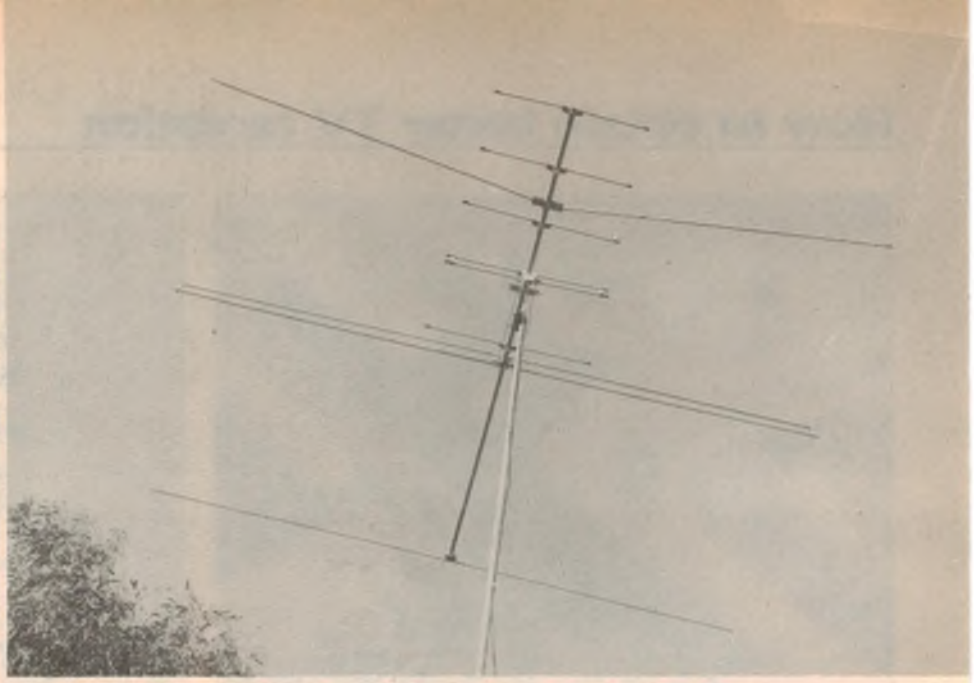
The method of attaching the larger 12mm diameter elements to the 25mm boom is shown in the photographs. As indicated above, I used a muffler clamp in conjunction with a wraparound clamp fashioned from a piece of scrap aluminium. This was bent and wrapped around a piece of leftover 12mm tubing with the aid of a vice and judicious use of a hammer. Finally, it was drilled to take the U-bolt of the muffler clamp.

While this method was entirely workable you could go for a more involved arrangement using large and small U-bolts and a mating aluminium plate. The large U-bolts would grip the boom while the small U-bolts would retain the element. Two of each size U-bolt would be required to mount each element.

Sealing the element ends

Commercial antennas always have the ends of the elements pinched off to stop them from whistling when they are exposed to wind. You can either pinch the ends together or seal them with a blob of epoxy adhesive or a silicon caulking compound. Another good idea is to insert a length of sash cord down the long elements to stop them from ringing and eventually breaking due to metal fatigue.

By far the biggest problem will be obtaining a suitable termination block for the folded dipole. I used the block from the original antenna but if you are building from scratch it may not be that easy. Perhaps the best material to use would be an exterior grade of Masonite which has very good resistance to water and weathering provided it is well sealed with paint. Again, a muffler clamp or a pair of U-bolts can be used to hold the Masonite panel to the boom.



Another view of the modified antenna. The photographic angle has distorted the dimensions slightly. Note that if used in conjunction with another antenna a splitter/coupler will be required to combine the two signals.

Antenna connections

The 215 was originally intended for use with 300ohm ribbon but these days 75ohm coax cable is the approved way and while the antenna probably has a low enough impedance to drive the cable direct the unbalanced connection may "skew" the polar response pattern, leading to unpredictable performance. Therefore, a suitable balun of waterproof construction was obtained and terminated at the antenna terminals. Herein lies a trap.

If you set out to do a modification such as this you will probably find that the low band Yagi and high band Yagi are linked together with aluminium busbars which are attached at each end with butterfly nuts. Do not think that the antenna connection can be made to either end of those busbars. It must be made at the high frequency Yagi connection. The reason is that those busbars constitute a "stub" at a particular frequency which prevents the high frequency Yagi from being loaded by the low frequency Yagi. As a result, if you make a connection to the wrong end of the busbars the reception on at least one of the high-band channels is likely to be non-existent at worst or simply lousy at best. Be warned and see how the connection is shown in the photos. I learnt this the hard way.

Finally, what did the revised antenna do for the reception, particularly on channel 0. The antenna was compared with a Hills EFC3/24 which is cut to suit the low band channels 2, 3 and 4. (There is another version of this antenna cut to suit channels 0, 1, 2 and 3). This gave good reception of channel 2 but the signal for channel 0 was well down into snow, as would be expected at the particular location.

By contrast, the revised antenna gave a strong signal on channel 0 and the strong null in the side of the antenna enabled better rejection of a troublesome ghost signal. On channel 2 the picture had deteriorated a little compared to the reception with the EFC3 but the low level ghosts were also weaker so the overall reception was very good. And the overall cost of the exercise was less than $15 which is a lot less than a new antenna.

So the whole effort was worthwhile but for one drawback. Since the exercise had been an experiment no effort had been made to prevent corrosion. The intention was to leave the antenna just long enough to prove the concept and then take it down again and paint it or try some other approach (which has been done). Inevitably then, the antenna was left up there for many months until the accompanying photos on the opposite page were taken.

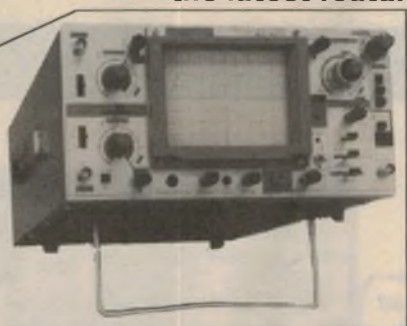
The pictures tell the story in graphic detail. What had been glistening aluminium tubing and brightly plated muffler clamps were now dulled, pitted and corroded. In some cases the U-bolt threads and nuts had actually started to rust! After just a few months!

The solution is quite straightforward. Coat the whole antenna with a metal-etch primer and then add a couple of coats of British Paints "Silvar" or other aluminium loaded paint. This will preserve the metal surfaces for many years, even in seaside areas, without reducing performance.

FOR PERFORMANCE & VALUE AARON HAS TO BE YOUR FIRST SCOPE CHOICE

All these scopes are dual trace and incorporate the latest features such as high brightness rectangular CRTs.

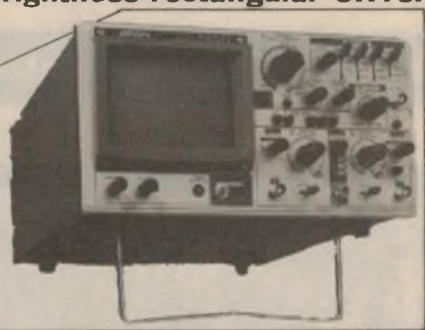
SIGNAL AND TIMEBASE DELAY



- 7.7nS risetime
- Single sweep
- Trigger delay
- TV sync
- X-Y, dual, chop, add, subtract etc.

45MHz/1mV
BS625 $1095

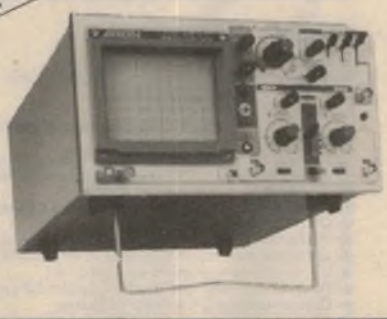
ALTERNATE AND DELAYED TIMEBASE



- 21 range timebase
- 100mS-1 μS trigger delay
- Front panel trace rotate
- X-Y, dual, chop, add, subtract etc

35MHz/1mV
BS635 $875

BUILT-IN COMPONENT TESTER



- Check components on screen
- 19 range timebase
- Triggerable to over 30MHz
- 17nS risetime

20MHz/5mV
BS601 $535

BATTERY PORTABLE

- 2 hour operation from built-in NiCad battery
- Automatic recharging
- Auto trigger free run
- TV sync

15MHz/2mV
BS310 $795

COLINE SP100 PROBE

Professional 100MHz probe offering x1, ref, x10 positions. 1.5m lead with BNC connector and selection of tips. Complete in heavy duty plastic pouch. **$28**

QUICK SPEC CHECK

AARON

MODEL	B WIDTH	SENS	SIG DEL	TRIG DEL	SCREEN	T BASE
625	45MHz	1mV	Y	Y	150mm	0.2μS 0.5S div
635	35MHz	1mV	N	Y	150mm	0.1μS 0.5S div
601	20MHz	5mV	N	N	150mm	0.5μS 0.5S div
310	15MHz	2mV	N	N	95mm	0.5μS 0.5S div

All prices are plus sales tax if applicable and subject to change without notice

ELMEASCO Instruments Pty. Ltd.

MAIL COUPON FOR FREE GUIDE

Please send me a copy of your shortform oscilloscope guide.

NAME _____

ADDRESS _____

_____ P CODE _____

TELEPHONE _____

P.O. Box 30, Concord
N.S.W. 2137
13-15 McDonald Street,
Mortlake, N.S.W.
Telephone (02) 736 2888
Telex 25887

P.O. Box 107, Mt. Waverley
Victoria 3149
21-23 Anthony Drive,
Mt. Waverley, Victoria
Telephone (03) 233 4044
Telex 36206

Adelaide: (08) 271 1839
Brisbane: (07) 369 8688
Perth: (09) 398 3362

bankcard

N.S.W. Ames Agency 699 4524 • George Brown 519 5855 (049) 69 6399 • Davred 29 6601 • DGE Systems (049) 69 1625 • Macelec (042) 29 1455 • Radio Despatch 211 0191 • Sheridan Electronics 699 6912 ***N.T.*** Thew & McCann (089) 84 4999 ***A.C.T.*** George Brown (062) 80 4355 ***VIC.*** G.B. Telespares 328 4301 ***QLD.*** Colourview Wholesale 275 3188 • St Lucia Electronics 52 7466 • Electronic Shop (075) 32 3632 • W.G. Watson (079) 27 1099 • Nortek (077) 79 8600 • Integrated Technical Services (070) 51 8400 ***S.A.*** Trio Electrix 51 6718 • Protronics 212 3111 ***W.A.*** Atkins Carlyle 321 0101 ***TAS.*** GHE Electronics (002) 34 2233 & (003) 31 6533

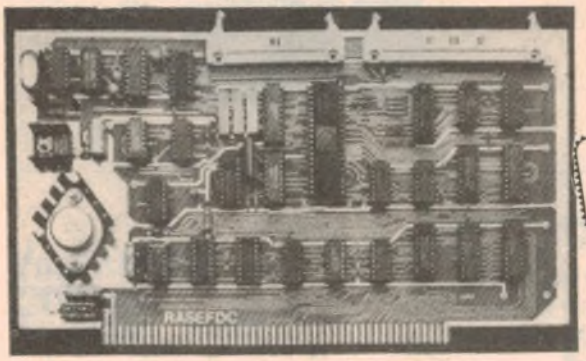
ROD IRVING ELECTRONICS

425 HIGH ST, NORTHCOTE 3070 VIC PHONE (03) 489 8131

S100 PRODUCTS

Australian Designed and Manufactured

S100 Floppy Disc Controller



GENERAL DESCRIPTION:

The extensive capabilities of the rasefdc are to a large part due to the presence of the Western Digital WD1795 double density controller chip. This device will perform the majority of the timing and control functions as required by floppy disk drives when carrying out the following operations:

1. Head loading and unloading
2. Track seeking
3. Address reading and writing
4. Data conversion during read and write
5. IBM3740 soft sector compatibility
6. CRC error code inspection generation
7. Double density write precompensation

The board uses the phase locked loop technique when recovering data from disk, the vco of the phase locked loop is under the control of the WD1691 circuit to ensure very reliable data recovery during double density operations. To ensure syncronism between the CPU and the controller card during disk read and write operations the rasefdc will insert wait states until the WD1795 is ready to pass or receive the next byte of data.

When used with rase80 CPU card the raselde card is available with full software support in the form of an eprom that is designed to interface with the rase80 monitor for console message passing. As well as the double density raw bios on the eprom there is a full disk diagnostic routine that permits the following operations to be carried out:

1. Head seek testing
2. Sequential sector write read testing with random data
3. Read testing for CRC and seek errors
4. Random sector write read testing with random data
5. Multi drive random write read testing
6. Disk formatting (any type of disk)

During implementation of the above tests, any errors that may occur are fully reported back to the console for operator action.

When using either CP/M or MP/M the rasefdc and rase80 CPU card are fully supported with boot, bios and xbios routines that will ensure a very smooth transition into the use of the above systems. Under normal circumstances the board operates within a polled environment, however when using interrupt based disk operating systems there are provisions for jumpering the necessary interrupt onto the S100 bus.

Bare Board **$150 & tax**
Kit Price **$295 & tax**
Assembled & Tested **$350 & tax**
Manual Available Separately for $12 inc. Postage

The Mitsubishi range of disc drives

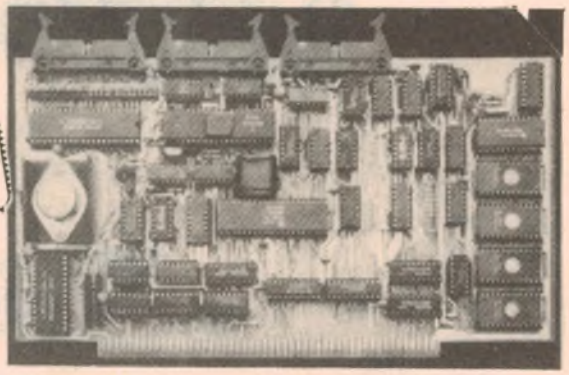
M2896-63
Slimline 8" Disk Drive. Double Sided. Double Density. No AC power required. 3ms track to track. 1.6 mbytes unformatted. 77 track side. 10^9 bit soft error rate.
$495 + tax. Box & Power supply to suit $95 + tax

M2894
Standard size 8" drive. Double sides, double density. 3ms track to track access. 77 track side. 10^9 bit soft error rate.
$495 + tax. Box & power supply $95 + tax

M4854
Slimline 5¼" disk drive. Double sides, double density. 96 track inch. 9621 bits inch. 1.6 mbytes unformatted. 3ms track to track access. 77 track side.
$395 + tax. Box & power supply $65 + tax

M4853
Slimline 5¼" disk drive. Double sides, double density. 1 mybyte unformatted. 3ms track to track. 80 track side. 5922 bits inch. steel band drive system.
$375 + tax. Box & power supply $65 + tax

S100 CPU Card



HIGH TECHNOLOGY PRODUCTS AND EXPERIENCE

GENERAL DESCRIPTION:

- ★ Z80A CPU running at a full 4 MHz
- ★ Battery backed real time clock and calendar
- ★ 2K of CMOS ram as standard
- ★ 2716/2732 Eprom from 2K to 16K
- ★ Z80A CTC with all 4 channels available to user
- ★ 2-RS232 serial ports available
- ★ Software controlled baud rates one each channel
- ★ 16-baud rates from 50-192200 baud available
- ★ 3-8 bit parallel ports via an 8255A
- ★ Centronics compatible printer port via 8255A
- ★ DMA operations supported
- ★ Power on jump to any 4K boundary in memory
- ★ On board memory enable/disable for full 64K operation
- ★ Vectored interrupt chain via Z80 CTC
- ★ Daisy chain interrupts through system full supported
- ★ Comprehensive 2K monitor available
- ★ Complemented by Disk, Memory and Input/output cards
- ★ Local software and hardware support available
- ★ A QUALITY AUSTRALIAN PRODUCT

Bare Board **$180 & tax**
Kit Price **$295 & tax**
Assembled & Tested **$350 & tax**
Manual Available Separately for $15 inc. Postage.

What's Coming

- *** 256K Dynamic Ram Card (S100)**
- *** Intelligent Video Card (S100)**
- *** Versatile I/O Card (S100)**
- *** Hard Disc Controller**

"Magnetic Media Experts"

We stock a very comprehensive range of diskettes

Verbatim Discs

5¼"SOFT SECTORED
-S- side double density **$30.00/10**
-D- side double density **$47.50/10**

8" SOFT SECTORED
-S- side single density **$32.00/10**
-D- side double density **$49.00/10**

ALL PRICES PLUS 20% SALES TAX

Please write or call for full floppy disc price list.

errors & omissions excepted

Well Known Brand
12 month data guarantee

5¼ SS.DD.
for only **$29.00** for 10
plus tax

48-50 A'BECKETT ST, MELBOURNE 3000 VIC **PHONE (03) 347 9251**

Mail Order Delivery Instructions: Minimum Pack and Post $2.00 for Australia Post. Please allow extra for bigger orders and Certified, Airmail or Registered Post. Minimum order is $5.00. Please address orders to Mail Order Department, PO BOX 235, NORTHCOTE, 3070, VICTORIA. PHONE (03) 481 1436.

ROD IRVING ELECTRONICS

425 HIGH ST, NORTHCOTE 3070 VIC PHONE (03) 489 8131

SERIES 5000

As designed by ETI

PREAMPLIFIER

$259

SPECIFICATIONS

Frequency response	High-level input 15Hz-130 kHz +0 -1 db Low-level input — conforms to RIAA equalisation. +0.2 dB
Distortion	1kHz -0.003% on all inputs (limit of resolution on measuring equipment due to noise limitation)
S/N noise	High-level input, master full, with respect to 300 mV input signal at full output (1.2V) -92 dB flat -100 dB A-weighted MM input, master full, with respect to full output (1.2V) at 5 mV input, 50 ohm source resistance connected -86 dB flat -92 dB A-weighted. MC input, master full, with respect to full output (1.2V) and 200 µV input signal -71 dB flat -75 dB A-weighted

POWER AMPLIFIER

Please note that the "Superb Quality" Heatsink for the power amp was designed and developed by Rod Irving Electronics and is being supplied to other kit suppliers. This product cost $1,200 to develop so that your amplifier kit would have a professional finish as well as sound. We also have a new range of rack mounting boxes which will be released soon.

SPECIFICATIONS

Power output	100W RMS into 8 ohms (+-55 V supply)
Frequency response	8 Hz to 20 kHz +0 -0.4 dB 2.8 Hz to 65 kHz +0 -3 dB. NOTE These figures are determined solely by passive filters
Input sensitivity	1V RMS for 100W output
Hum	100dB below full output (flat)
Noise	-116 dB below full output (flat, 20 kHz bandwidth)
2nd harmonic distortion	0.001% at 1 kHz (0.0007% on prototypes) at 100 W output using a +-56 V supply rated at 4 A continuous 0.003% at 10 kHz and 100 W
3rd harmonic distortion	0.0003% for all frequencies less than 10 kHz and all powers below clipping
Total harmonic distortion	Determined by 2nd harmonic distortion (see above)
Intermodulation distortion	0.003% at 100 W (50 Hz and 7 kHz mixed 4:1)
Stability	Unconditional

$299

THIRD OCTAVE GRAPHIC EQUALIZER

SPECIFICATIONS

Bands	28 Bands from 31.5 Hz to 16 kHz
Noise 20 kHz bandwidth	<0.008 mV sliders at 0 gain at 0.1 -102 dB)
Distortion	0.007% at 300 mV signal sliders at 0 gain at 0 max 0.01% sliders at minimum
Frequency Response Boost & Cut	12 Hz-105 kHz +0 -1 dB all controls flat 14 dB

MX-1200 MICROPHONE/AUDIO MIXER

1 unit $189
2 units $359

This unit features 12 microphone line inputs with pan, bass, treble, effect and fold back controls for each channel • LED peak indicators for each channel • 2 turntable inputs with cross-fade and individual output controls • master equaliser for bass, midrange and treble • variable headphone output etc. etc • complete with carrying case

$699

SPECIFICATIONS

INPUTS
Level/impedance Mic 46 db 1K
Line 22 db 16K x 12
Phono 32 db 50K STEREO x 2 (2mV at 1kHz)
Effect Return (Aux) 20 db 50K x 1
OUTPUTS
Level/impedance L & R 0 db 2K
Effect Send 0 db 2K F.B Out 0 db 2K
Head phone Stereo +10 db 600 (100 - 1K)
EQUALISATION
Channel
Bass ±15db
Treble ±15db
Master
Bass ±12db
Treble ±10db
Middle ±12db

FADER & CONTROLLERS
12 channel fader Slide 60mm LOG 25%
2 Master fader Slide 60mm LOG 15%
12 F.B Volume 300 LIN
12 F.B Master Vol. 300 LIN
12 Effect Send 300 LIN
1 Effect Return 300 LOG 15%
2 Phono 300 LOG 15%
1 Head Phone 300 LOG 15%
S/N 58DB
FREQUENCY RESPONSE 20-20 kHz
TOTAL HARMONIC DISTORTION Less than 0.5%
METER 2 illuminated VU Meters 0db = 0.775v
PEAK INDICATOR 12 LED Peak Indicators
VOLTAGE 240 VAC 50Hz
POWER CONSUMPTION 7.2 watts
DIMENSIONS 620 (W) x 385 (D) x 108 (H) mm
(supplied complete with carrying case)

EXTRA FEATURES OF OUR KITS

POWER AMPLIFIER

KIT PRICE $299 P&P $8.00

- 1% Metal Film Resistors are used where possible
- Prewound Coils are supplied
- Aluminium case as per the original article
- All components are top quality
- Over 200 Kits now sold
- We have built this unit and so know what needs to go into every kit
- SUPER FINISH Front panel supplied with every kit at no extra cost to you
- We are so confident of this kit that we can now offer it assembled and tested so that people who do not have the time can appreciate the sound that this amplifier puts out. This is done on a per order basis delivery approx two weeks after placement

only $425

*All parts available separately for both kits

PREAMPLIFER

KIT PRICE $259 P&P $8.00

- 1% Metal Film Resistors are supplied
- 14 metres of Low Capacitance Shielded are supplied (a bit extra in case of mistakes)
- English Lorlin Switches are supplied no substitutes as others supply
- We have built and tested this unit and so know what needs to go into every kit
- Specially imported black anodised aluminium knobs
- Again as with the power amp we are offering this kit A & T at a price which we do not believe there is a commercial unit available that sounds as good. Same delivery as the P.A

only $425

Errors and omissions excepted

48-50 A'BECKETT ST, MELBOURNE 3000 VIC PHONE (03) 347 9251

Mail Order Delivery Instructions: Minimum Pack and Post $2.00 for Australia Post. Please allow extra for bigger orders and Certified, Airmail or Registered Post
Minimum order is $5.00. Please address orders to Mail Order Department, PO BOX 235, NORTHCOTE, 3070, VICTORIA. PHONE (03) 481 1436.

STORE LOCATIONS

NSW	Cnr. Swift & Young Sts	ALBURY	21 8399
	Parramatta Rd & Melton St	AUBURN	648 0558
	T55 Terrace Level	BANKSTOWN SQ.	707 4888
	613 Princess Hwy	BLAKEHURST	546 7744
	Oxford and Adelaide Sts	BONDI JCT.	387 1444
	531 Pittwater Rd	BROOKVALE	93 0441
	147 Hume Hwy	CHULLORA	642 8922
	162 Pacific Hwy	GORE HILL	439 5311
	315 Mann St	GOSFORD	25 0235
	4 Florence St	HORNSBY	477 6633
	Elizabeth Dr & Bathurst St	LIVERPOOL	600 9888
	Lane Cove & Waterloo Rds	NORTH RYDE	88 3855
	George & Smith Sts	PARRAMATTA	689 2188
	The Gateway, High & Henry Sts	PENRITH	32 3400
	818 George St.	RAILWAY SQ.	211 3777
	6 Bridge St	SYDNEY	27 5051
	125 York St	SYDNEY	267 9111
	Tamworth Arc & Kable Ave	TAMWORTH	66 1961
	173 Maitland Rd	TIGHES HILL	61 1896
	263 Kiera St	WOLLONGONG	28 3800
ACT	96 Gladstone St.	FYSHWICK	80 4944
VIC	260 Sydney Rd.	COBURG	383 4455
	Nepean Hwy & Ross Smith Ave	FRANKSTON	783 9144
	205 Melbourne Rd.	GEELONG	78 6766
	399 Lonsdale St.	MELBOURNE	67 9834
	Bridge Rd & The Boulevarde	RICHMOND	428 1614
	Springvale & Dandenong Rds.	SPRINGVALE	547 0522
QLD	293 Adelaide St.	BRISBANE	229 9377
	166 Logan Rd	BURANDA	391 6233
	Gympie & Hamilton Rds	CHERMSIDE	359 6255
	Bowen & Ruthven Sts	TOOWOOMBA	38 4300
	Ingham Rd & Cowley St West End	TOWNSVILLE	72 5722
SA	Wright & Market Sts	ADELAIDE	212 1962
	Main South & Flagstaff Rds	DARLINGTON	298 8977
	Main North Rd & Darlington St	ENFIELD	260 6088
WA	Wharf St & Albany Hwy	CANNINGTON	451 8666
	William St & Robinson Ave	PERTH	328 6944
	Centreway Arc, Hay St	PERTH	321 4357
TAS	25 Barrack St	HOBART	31 0800

STORE HOURS

All Dick Smith Stores are open for trading during the normal trading hours for their particular area (either 9-5.30 or 8.30-5). Many stores are also open for late night trading. Please ring the store concerned for their particular hours.

bankcard welcome here

Terms available to approved applicants through...

HFC

100% AND PROUD OF IT!

MAJOR RESELLERS

● **Atherton Qld**: Maarten's Music Centre, 55 Main St. 91 1208 ● **Ballina NSW**: A. Cummings & Co. 91-93 River St. 86 2285 ● **Broken Hill NSW**: Hobbies & Electronics, 37 Oxide St. 88 4098 ● **Cairns QLD**: Electronic World, Shop 27 K-Mart, Westcourt Plaza, Mulgrave Rd. 51 8555 ● **Cairns QLD**: Thompson Instrument Services, 79-81 McLeod St. 51 2404 ● **Campbelltown NSW**: Fishers "Chip" Shop, Shop 3, 274-276 Queen St. 27 1475 ● **Coffs Harbour NSW**: Coffs Harbour Electronics, 3 Coffs Plaza, Park Ave. 52 5684 ● **Darwin N.T.**: Ventronics, 24-26 Cavanagh St. 81 3491 ● **Deniliquin NSW**: Deni Electronics, 220 Cressy St. 81 3672 ● **East Maitland NSW**: East Maitland Electronics, Cnr 99 High St. 33 7327 ● **Echuca VIC**: Webster Electronics, 220 Packenham St. ● **Geraldton WA**: KB Electronics & Marine, 361 Main Terrace, 21 2176 ● **Gladstone QLD**: Purely Electronics, Shop 2, Cnr Herbert & Auckland Sts. 72 4321 ● **Gosford NSW**: Tomorrow's Electronics & Hi Fi, 68 William St. 24 7246 ● **Kingston TAS**: Kingston Electronics, Channel Court, 29 6802 ● **Launceston TAS**: Advanced Electronics, 5a The Quadrant, 31 7075 ● **Lismore NSW**: Dacro Electronics, 3a/6-18 Carrington St. 21 4137 ● **Mackay QLD**: Stevens Electronics, 42 Victoria St. 51 1723 ● **Maryborough QLD**: Keller Electronics, 218 Adelaide St. 21 4559 ● **Mt. Gambier SA**: Hutchasson's Comm, 5 Elizabeth St. 25 6404 ● **Mildura VIC**: McWilliam's Electronics, 40 Lemon Ave, 23 6410 ● **Morwell VIC**: Morwell Electronics, 128 George St. 34 6133 ● **Nambour QLD**: Nambour Electronics, Shop 4, Lowan House, Ann St. 41 1604 ● **Orange NSW**: M&W Electronics, 173 Summer St. 62 6491 ● **Penrith NSW**: Acorn Electronics, Shop 12, 541 High St. 21 2409 ● **Port Macquarie NSW**: Hall of Electronics, 73 Horton St. 83 7440 ● **Rockhampton QLD**: Purely Electronics, 15 East St. 21 058 ● **Shepparton VIC**: G.V. Electronics Centre, 189b Corio St. 21 8866 ● **Southport QLD**: Amateurs Paradise, 121 Nerang St. 32 2644 ● **Toowoomba QLD**: Hunt's Electronics, 18 Neil St. 32 9677 ● **Townsville QLD**: Tropical TV, 49 Fulham Rd, Vincent Village, 79 1421 ● **Wagga NSW**: Wagga Wholesale Electronics, 82 Forsyth St. ● **Wodonga VIC**: A&M Electronics, 78a High St. 24 4588 ● **Whyalla SA**: Mellor Enterprises, Shop 2 Forsythe St. 45 4764

SPEEDY PHONE/BANKCARD ORDER SERVICE

Just phone your order and Bankcard details - it's so simple!

(02) 888 2105

ORDER ONLY ON THIS NUMBER

ENQUIRIES: (02) 888 3200

HEAD OFFICE AND MAIL ORDER CENTER:
P.O. Box 321, NORTH RYDE, NSW 2113.
TEL. (02) 888 3200

POST & PACKING CHARGES

ORDER VALUE	CHARGE	ORDER VALUE	CHARGE
$5.00-$9.99	$2.00	$50.00-$99.99	$5.00
$10.00-$24.99	$3.00	$100.00 or more	$6.50
$25.00-$49.99	$4.00		

Charges are for goods sent by post in Australia only — not airmail, overseas or road freight.

Dear Customers,

Quite often, the products we advertise are so popular they run out within a few days. Or unforseen circumstances might hold up shipments so that advertised lines are not in the stores by the time the advert appears. And very occasionally, an error might slip through our checks and appear in the advert (after all, we're human too!). Please don't blame the store manager or staff; they cannot solve a dock strike on the other side of the world, or fix an error that's appeared in print. If you're about to drive across town to pick up an advertised line, why not play it safe and give the store a call first... just in case.

Thanks.

Dick Smith and Staff

OR SHOP FROM THE COMFORT OF YOUR ARMCHAIR

with our lightning fast fully computerised new mail order system.

Yes! Our mail order service has 'gone computer' offering you even faster, more efficient service than ever before—and (we believe!) much better than anyone else can offer.

Whether you choose to shop by mail, by our phone-in Bankcard order line (see above) or even by telex (No. 20036) you'll find it receives the personal attention that only our friendly, expert staff can give—plus the incredible speed and accuracy of our computer.

When you place your next order you'll find a special note enclosed telling you all about our amazing new system. We think you'll agree....it's pretty special!

DON'T BE CONNED

buying elsewhere. You could save a fortune by using Dick's 'Don't be conned' checklist.

DICK'S 'DON'T BE CONNED' CHECK LIST

1. Watch out for the sneaky little 'plus sales tax' message hidden somewhere in the advert. All Dick Smith's prices INCLUDE sales tax!
2. Watch out for hidden extras. Some people don't tell you the whole story - the extra (essential!) bits you'll need. If any of our kits, etc, are 'short form' - we tell you so!
3. Watch out for guarantees - or lack of them! If there is one, can it be backed up? Dick Smith has a large, well equipped service centre - just in case you have any problems!
4. Watch out for fly-by-nighters. There's always someone out to make a quick buck and disappear! Dick Smith Electronics is now in its sixteenth year . . . you can trust Dick Smith.

Dick Smith Electronics

A614/CT

New Products...

Product reviews, releases & services

Compact scanning receiver from Emona

Scanning radio receivers may well be the most sought-after product next to computers in the consumer electronic marketplace. Emona Electronics Pty Ltd has just announced a new scanner with features and capabilities which, says Emona "will topple anything in its path".

The AR-2001 from Emona combines both a communications receiver and a scanner and is said to be the only product which provides such a dual function. Thanks to the use of integrated circuitry throughout, the AR-2001 is also one of the smallest scanners available, measuring just 138 x 200 x 80mm (W x D x H) and weighing 1.1kg.

As a communications receiver the AR-2001 provides continuous coverage of VHF and UHF frequencies between 25MHz and 550MHz. An expander, still in development, will extend this coverage to 1.3GHz. The receiver also operates in AM, narrowband FM and wideband FM, as used by the UHF broadcast band and television channels.

As a scanner the unit will cover the designated frequency range in search frequency increments of 5, 12.5 or 25kHz, scanning at a rate of approximately five channels per second and searching frequency bands at a rate of around six seconds per megahertz. The frequencies and mode information for up to 20 channels can be stored in the unit's on-board memory with frequency and messages displayed on an LCD readout.

Other features of the AR-2001 include priority sampling, memory scanning on the basis of information in memory, band inclusion scanning and channel lock-out. Technical specifications for sensitivity and selectivity are more than adequate and audio power is around 1W.

Suggested applications for the scanner include use by government agencies, police, security and fire brigade organisations, broadcasting and television stations, and of course, hobbyists.

For further information contact Emona Electronics, 649 George St, Sydney, NSW, 2000 or PO Box K21, Haymarket, NSW, 2000. Phone (02) 211 0531.

Intermec universal bar code reader

Intermec's Model 9300 bar code reader is a "universal" bar code reader designed to fulfill the needs of most on-line wand reading applications. The 9300 offers the speed and accuracy of bar code scanning, combined with a highly flexible asynchronous serial communications capability.

The 9300 is programmed to read eight popular bar codes. Selection is implemented with easily accessible switches. Three codes are available in combination with the standard Code 39 and the reader automatically determines which code has been scanned. Bidirectional scanning of all codes is standard, and depending on the code type, label length is fixed, switch selectable, or variable length (up to 64 characters).

The model 9300 reader is compact and lightweight and can be easily mounted underneath a work station or attached to the side of a video terminal. Applications include libraries, video libraries, stock control, production monitoring, blood banks and many others.

For further information, please contact Intermec Australia Pty Ltd, 9 Woodbine Court, Wantirna, Vic, 3152, or telephone (03) 221 9788.

National Semiconductor CMOS A/D chip

National Semiconductor has announced details of a new 8-bit CMOS successive approximation analog to digital converter chip. The new device, the ADC0844, contains an internal clock and features a maximum conversion time of 40μs. It can be used either ratiometrically or with a fixed voltage reference and is designed to interface easily to a variety of microprocessors.

The unit is TTL and MOS compatible, consumes just 12.5mW in operation and is provided in a standard 20 pin IC package. No zero or full-scale adjustments are required, according to National and the chip will accommodate an input voltage range from zero to 5V using a single 5V power supply.

New Products...

Journal covers semi-custom IC's

The latest issue of the Microelectronics Journal from Benn Electronics Publications is devoted to the subject of semi-custom ICs, with members of the UK consulting firm of Mackintosh International providing an overview of trends in the area and a number of noted experts contributing other items of interest.

"Semi-custom" integrated circuits are arrays of uncommitted logic gates which can be connected together in a pattern specified by the user in the final customisation phase of production. Chief advantage of fully customised integrated circuit designs is the greatly reduced turnaround time from specification to finished product.

Mr Pyne of Mackintosh writes "When a count was taken in late 1982, it was found that there were nearly 70 companies offering their own gate array products worldwide and the number was and is still rising. Only two years previously that number was probably less than a dozen . . . Few of these products are second-sourced and more importantly there is little standardisation in the design tools provided for users."

By 1986 the consultancy researchers suggest, the annual market for semi-custom products will reach $US1.3 billion, a figure which although it appears large, represents just 5% of the anticipated worldwide IC market for that year. The problem is a familiar one – the technical means of producing gate arrays has out-stripped the ability of designers to make use of them. An array with 20,000 uncommitted logic gates has already been announced, but the software tools needed to design working products using such arrays do not yet exist.

In the same issue of Microelectronics Journal various articles deal with the design problems and opportunities created by semi-custom arrays, including detailed analyses of the design aids available and future directions for semiconductor companies specialising in custom ICs.

Further information on the Journal and other publications is available from Benn Electronics Publications Ltd, 57 Guildford St, Luton Beds, LU1 2NT, England.

Power converters from Warburton Franki

Stevens-Arnold Inc, represented in Australia by Warburton Franki, has introduced the ES series of isolated triple-output DC/DC converters with a total output power rating of 15W.

The series consists of 12 models, providing DC outputs of 5V and ±12V, 5V and ±15V, 12V and ±5V or 15V and ±5V with inputs of 12v, 24v or 48V DC. All models use MOSFET circuitry with a 100kHz switching frequency and provide claimed operating efficiencies of up to 82%. Features of the range include 500V DC minimum isolation, short circuit and over-voltage protection and compact packaging.

The units are said to be especially well suited for use in remote, portable and battery-operated equipment and will not degrade RFI emission performance.

For full specifications on the ES series power converters contact your local Warburton Franki office.

Versatile new range of Unimec switches

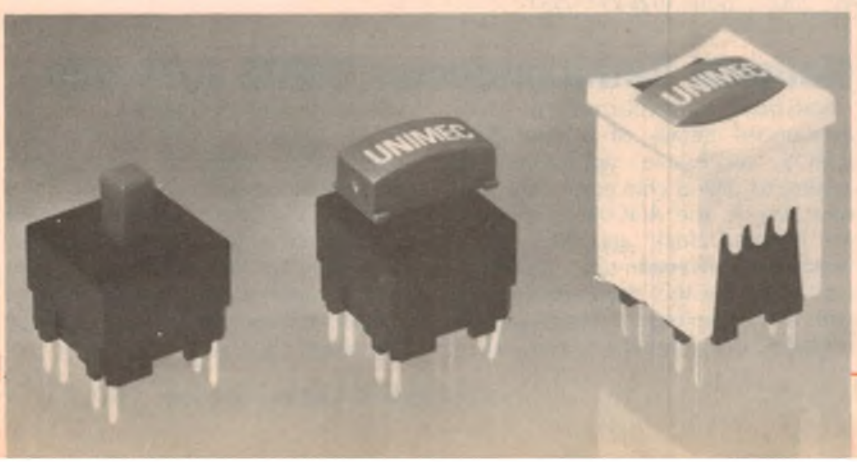
Associated Controls Pty Ltd now has available a new range of switches from MEC, a Danish manufacturer. The "Unimec" switch range consists of just two versions – a momentary contact type and an alternate action key switch, but each version contains the necessary contacts to provide five different functions.

Each switch has two changeover contacts, two normally open contacts, two normally closed contacts and two make and break contacts, with the required switch function selected by wiring to the appropriate switch terminals.

The two switch versions are colour-coded and are said to offer significant inventory savings by minimising the number of parts which must be stocked by equipment manufacturers.

The pushbutton switches are 10mm high and are designed for mounting on 2.54mm PCB grids. Buttons and bezels are available in a choice of 10 colours with or without LED illumination.

For further information contact Associated Controls Pty Ltd, 55 Fairford Rd, PO Box 21, Padstow, NSW. Phone (02) 709 5700.



Solar power for household applications

You don't have to live in the outback to be denied electricity. Hundreds of people living within 100km of Sydney can never be connected to regional power supplies. But thanks to a Chatswood company, even if you live near a remote bend of the Hawkesbury, or on a mountain top, you can now obtain a supply of electricity . . . from the sun.

Amtex Electronics is marketing a system by which solar modules convert the sun's energy to DC electricity which is stored in special deep-cycle batteries. From there it provides power for lighting and to run TV receivers, hi-fi equipment and other 12-volt DC appliances. On the larger systems, an inverter converts the

Continued on page 102

AMATEURS: CAN YOU MEET THE CHALLENGE!

Remember the 'good old days' of amateur radio? When an amateur built his own gear – and was **so** proud of it!

adly, those days passed! With incredible advances in echnology, it became economically and technically im- ossible to compete with commercially built equipment.

ow home brewing is here again!

nd what's more, with the all-new Dick Smith UHF xplorer, you'll end up with a transceiver less than the ost of a commercial unit – and not just as good, **it's etter!**

ES! A completely up-to-the-minute design featuring hase-locked-loop frequency synthesis.

'HOME BREW' – the very latest technology . . . build yourself a UHF Transceiver

WE APOLOGISE . . .

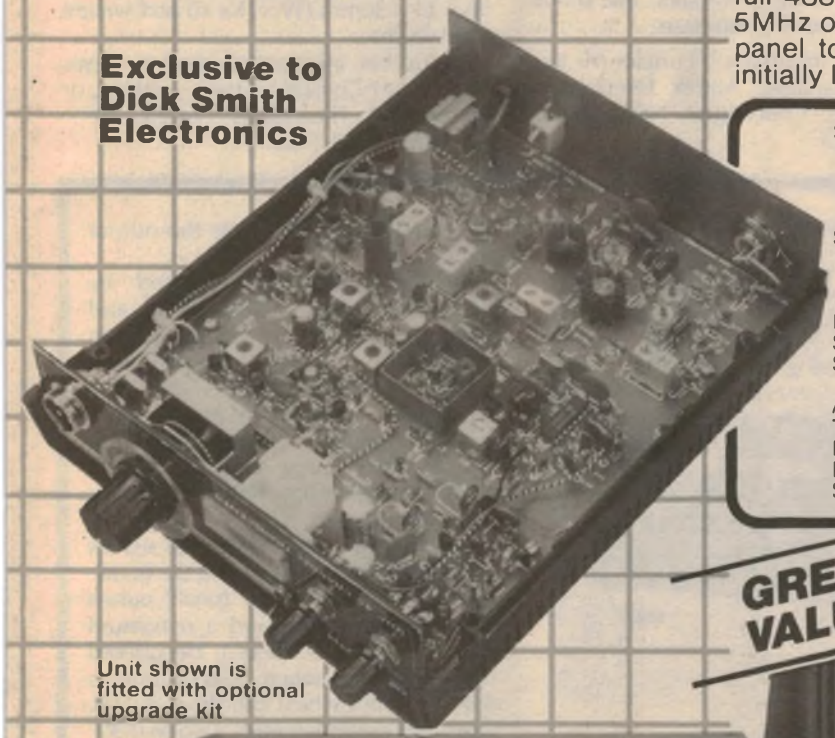
Hundreds of amateurs have wanted this outstanding new kit . . . far more than we could supply! Now for the good news:

We've made up some more kits for distribution to our stores and mail order centre. Be warned – some parts are still pretty scarce so we haven't been able to make all the kits we wanted to. To avoid further disappointment, order your kit NOW!

And for those waiting for the upgrade kit . . .

It's now available! Yes, you can give your transceiver full 438-439MHz repeater capability with standard 5MHz offset, PLUS 'S' meter, and a brand new front panel to suit. Once again, supplies of this kit will initially be limited so hurry in and get yours now!

Exclusive to Dick Smith Electronics



Unit shown is fitted with optional upgrade kit

SPECIFICATIONS	
Frequency Coverage	438.025-439.000MHz in 25kHz steps
No. of Channels	40
Mode of Operation	FM
Supply	13.8v DC. Receiver 340mA with full audio output and all options. Transmitter 2A more (5 watt output)
Receiver	Dual Conversion Superhet
Sensitivity	0.4uV for 20dB quieting
Selectivity	+/−7.5kHz - 6dB, +/−15kHz - 60dB
Adj. Chan. Reject	Better than 80dB
Transmitter	
Power Output	5W (typical)
Deviation	+/−5kHz
Spurious Emissions	Better than -60dB

GREAT VALUE!

DICK SMITH EXPLORER UHF TRANSCEIVER

ONLY $199

Cat K-6300

OPTIONS AVAILABLE:

Upgrade Kit (Cat K-6302) (Repeater, S meter, additional xtal filter & new front panel) **ONLY $24.50**

Antenna Kit (Cat D-4014) ¼ wave stainless steel whip, co-axial fed UHF antenna base, PL-259 plug, 3.5m low loss UHF co-ax, gutter grip mount and cutting instructions ..... **ONLY $24.50**

DICK SMITH Electronics

Full address details on page 98. (Stocks may still be limited in some stores).

DSE/A616/LL

New Products...

Continued from page 100

stored energy to 240-volt AC electricity, to operate most 240-volt appliances. On all but the smallest system, a charge controller ensures that the batteries are not over-charged or over-discharged, leading to longer battery life.

"If your home is not connected to mains electricity, you either generate your own, or do without," said Amtex Electronics' Manager Jim Kuswadi. In recent years, if you wanted to generate your own power, you had to use a petrol or diesel generator, with accompanying noise, pollution and maintenance, plus constantly rising fuel costs. Now we can offer you an energy source that doesn't have these problems and won't send you a bill every quarter.

"Our systems are designed to be installed by the average handyman. However, if a customer prefers us to organise the installation, we will gladly arrange this through one of our distributors, or through our parent company, Telecon Australia Pty Ltd, which has 31 branches throughout Australia."

Amtex offers a choice of these systems including a solar lighting kit which provides four hours of light each night for all three 13-watt fluorescent lamps. On sunless days, a fully charged battery will keep the system operating for five days or more.

The home power system could provide power for four 20-watt fluorescent lights for three hours, a 50-watt portable colour TV for three hours, a transistor radio for six hours and a small water pump for half an hour, on a typical day.

240V AC systems are also available in small medium and large sizes, to meet customers' varying requirements. These units supply power for most 240 volt appliances including lights, TV, hi-fi equipment, sewing machine, kitchen blender, refrigerator, small washing machines, electric drill and water pump. The large kit contains two independent power systems so that if one system requires servicing or repairs, the other system continues to operate.

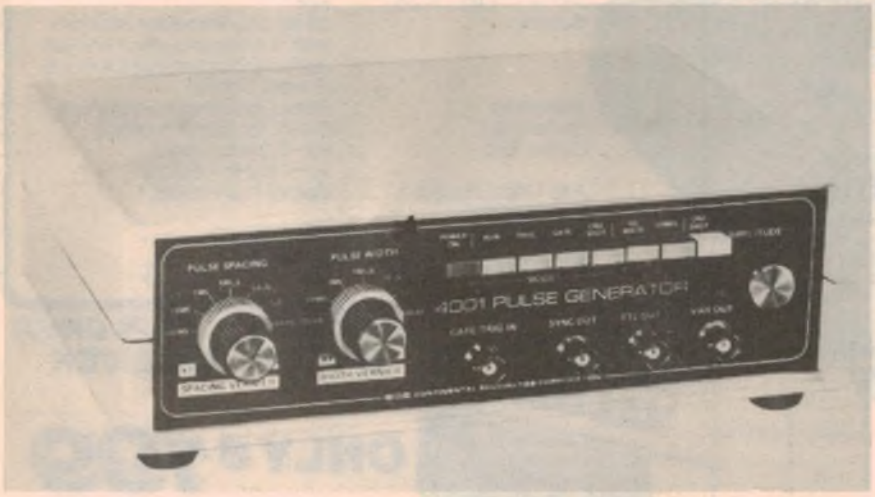
For further information contact Mr Jim Kuswadi, Manager, Amtex Electronics, PO Box 285, Chatswood, NSW, 2067. (02) 411 1323.

AC line conditioner for internal mounting

Aegis Pty Ltd has released a compact PCB mounted 240V AC line conditioner. Designated the CZ5053, the low-cost unit operates at currents of up to 3A and provides a fast and efficient way of isolating sensitive equipment from mains-borne RFI and troublesome spikes and transients.

The conditioner is built as a stand-alone module and is designed for easy assembly into electronic equipment at the construction stage. Dimensions are 88 x 41 x 30mm (W x D x H) and weight is 90 grams.

For further information contact Aegis Pty Ltd, 141 Christmas Street, Fairfield, or PO Box 49, Thornbury, Victoria, 3071. Phone (03) 481 1422.



Model 4001 precision pulse generator

A new low-cost precision pulse generator with a comprehensive range of independently variable controls has been introduced by Global Specialties Corporation. Offering rise and fall times of less than 30ns, the Model 4001 covers a frequency range from 0.5Hz to 5MHz, with pulse width and pulse spacing each independently variable from 100ns to 1sec to give a 10^7:1 duty-cycle range.

Six modes of operation are available on the Model 4001: run (frequency-settable from 0.5 to 5MHz via the normal controls); trigger (which accepts DC – 10MHz signals from an external source); gate (which starts the generator synchronously with the leading edge of a gate signal); single-shot (which produces a pulse each time a pushbutton is pressed); square-wave (producing a signal up to 2.5MHz); and complement (which inverts the output signal).

Operating mode is selected by pushbutton and pulse-width and spacing controls each provide seven overlapping decade ranges with continuous adjustment to within ±5% by vernier controls. A single-return vernier adjusts the output amplitude over a 1-10V range and the output exhibits a maximum 400Ω impedence at full amplitude.

The input for trigger and gate signals is TTL compatible, accepting 2V (peak-to-peak) sine waves, 1V (peak) pulses of longer than 40ns and a maximum input of ±10V; it offers a decoupled 10kΩ input impedance. A TTL output is also provided, which can drive 40 TTL loads and can sink 64mA at up to 0.8V. A sync output provides an output of 2.4V minimum, will drive up to 10 TTL loads, and will sink up to 16mA at up to 0.8V.

The Model 4001 measures 25.4 x 7.6 x 17.8cm and weighs 1kg. It will operate over a temperature range of 0°C to 50°C and power consumption is 6W at 240V AC, 50Hz.

Global Specialties equipment is available from the Australian Distributors, Vicom International Pty Ltd, 57 City Road, South Melbourne.

Price/performance Breakthrough

DON'T PAY ~~$699~~

$499 including tax.

Need RS232 serial interface? Just buy the RS232 serial card and plug it into your FAX-80. Others charge up to $300 extra for serial interface. Our price is a low: **$79.95**

The unbeatable FAX-80

Australia's best value printer – now at an unbeatable Sheridan price!!

If you've been looking for a high quality printer at a down to earth price, the FAX-80 is right for you. It offers features equal to printers costing over $1,000 . We have made a huge purchase of these superb printers and reduced the price by a staggering $200. We believe this is Australia's best value dot matrix printer. Look at the features and specs. We don't think there's another printer near the price that even comes close.

- **Accepts 4" to 10" paper**
- **High resolution 9x9 matrix (including graphics)**
- **Adjustable tractor and friction feed**
- **80 characters per second with bidirectional printing**
- **User detachable print head**

Specifications

Printing Method	Serial Impact Dot Matrix
Printing Matrix	9x7 (8x8 Graphics)
Printhead	9 wires printhead
Print Rate	80 CPS
Line Spacing	1/6" x 1/8" Software selectable
Number of Columns	80, 142 (40, 71 Enlarged)
Printing	Bidirectional
Character Set	96 ASCII plus European
Switches	Power On/Off, Line Feed, Form Feed, On-Line
Indicators	Power On/Off, On-Line, Ready, Paper Out
Interface	Standard Centronics parallel (completely compatible with Epson MX-80). Optional RS232.
Paper Width	4" to 10"
Printing Ribbon Type	Cassette with endless loop
Ribbon Life	6 x 10^6 characters
Print head life	30 million characters (replaceable)
Dimensions	390mm(W) x 320mm(D) x 115mm(H)

Save on latest Weller WTCPN Soldering Station

Now you can afford the best soldering station on the market. Protect expensive components with this superb "closed loop" temperature controlled iron. Low voltage protects sensitive CMOS ICs — tip voltage to ground less than 0.01V. Redesigned transformer case features large wipe pad and quick disconnect plug for iron.

Special for November only $77.00 inc tax

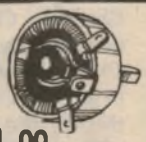
6116LP3 CMOS RAMS

Now in stock. Save a fortune on these low power high speed (150nS) RAMs. Massive savings while stocks last!!

Only $8.00 each, $7.50 10 plus

*Please note we cannot afford credit card purchases on quantity discounts.

Rheostats 150ohm/25W

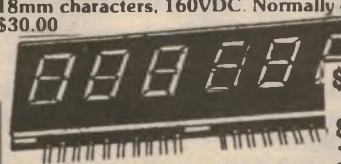


Massive savings on these ceramic body ¼" shaft rheostats. Normally $12.00 each. What a giveaway!!

$1.00 each

NEON DISPLAY

6 Digit orange neon display (as used in pinball machines etc). From Cherry of Waukegan USA. 18mm characters, 160VDC. Normally over $30.00



$8.00

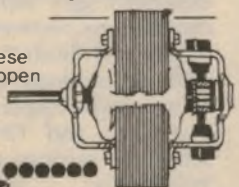
$6.50 10 up

New 2114AP2 Memory ICs

These fantastic low power memory ICs from Hitachi are going for a song!! High speed (200nS) and low power consumption.

Only $1.50 each

Fantastic 240VAC Motors



Scoop purchase of these fantastically versatile open frame motors.

$2.00 each

$1.20 Bridges under wholesale price!

High quality 400V/10A bridge rectifiers from International Rectifier (IR).

10 for $10.00

SHERIDAN ELECTRONICS

164-166 Redfern St., Redfern NSW 2016. Phone (02) 699 6912, (02) 699 5922. Mail Orders to Dept ETI, PO Box 229 Redfern NSW 2016

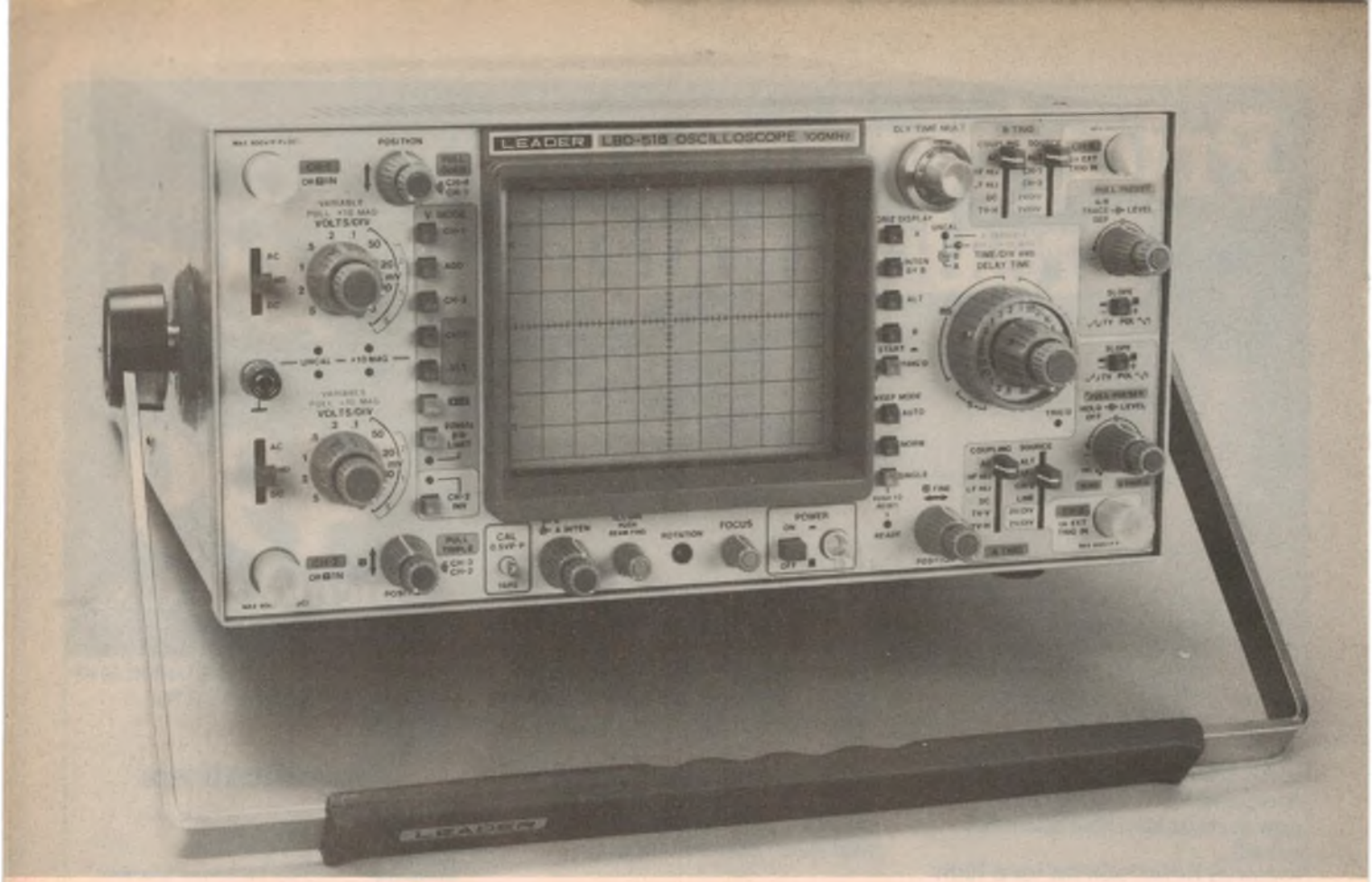
Trading Hours:-
Mon-Fri . . . 9am-5.30pm
Thursday 9am-7pm
Saturday . . . 9am-12noon

All prices include sales tax

Mail Charges:

$5.00-$9.00	$3.50
$10.00-$24.99	$4.00
$25.00-$49.99	$6.00
$50.00-$99.99	$7.00
$1000 or over	$8.00

Note: We regret we cannot give quantity prices on credit card purchases.
Credit Cards: We accept both Bankcard and American Express
Minimum order $6.00 Heavy or bulky items sent freight on.



Electronics Australia review

Leader LBO-518 dual trace CRO

This versatile and compact oscilloscope from Leader of Japan has two channels which can each display an A and B trace on independent timebases. In addition the two external trigger inputs for the A and B traces can be used to provide four channels in all and a capability to display eight traces at the one time.

100MHz oscilloscopes are now becoming more popular due to the necessity to view high speed waveforms. Modern electronic circuitry is becoming much faster with high speed digital circuitry and VHF/UHF waveforms of TV and transmitter/receiver sets. Viewing of glitches and timing problems is easily seen on a 100MHz oscilloscope. Again when viewing complex waveforms, the triggering facilities of a 100MHz oscilloscope enable a clean trace of the waveform on the screen. The Leader LBO-518 100MHz quad trace, delayed timebase oscilloscope is a modern unit with features suitable for the above applications.

The LBO-518 is a single gun oscilloscope which displays many traces at the one time by using chopping and alternating techniques to rapidly switch the beam from one trace to another.

Two vertical sensitivity controls are available, one for each of the two main channels, CH1 and CH2. Each channel can display two traces, A and B which are separately controlled with the timebase. This allows four traces to be displayed at the one time, the A traces of CH1 and CH2 being controlled by one timebase and the B traces of CH1 and CH2 controlled by the second timebase. In addition, the B trace can be delayed to display the waveform at a preset time after the A trace has triggered.

The two further channels available CH3 and CH4, are normally used as the external trigger inputs of the A and B channels respectively. Again these can display with both the A and B channels. With all channels selected up to eight traces can be displayed. Note, however, that CH3 and CH4 have only two sensitivity settings at 0.2V/division and 2V/division.

As should be expected with an oscilloscope of this complexity the control panel has an abundance of knobs and switches although these have

DON'T BE CONNED!

before buying elsewhere you could save a fortune by using Dick's "DON'T BE CONNED" checklist!

NEW!

Deluxe Slimline TEAC HI FI

at a Dick Smith bargain price!

Looking for a great hi fi? Check these out: Teac's new A-505 DC integrated stereo Amplifier and the matching T-303 AM/FM Stereo Tuner. 30W plus per channel, full range of inputs and switching for the most demanding audiophiles. And the new slimline appearance looks a million dollars!

WHAT A BUY!

AMPLIFIER (Cat A-1305) **$249**

TUNER (Cat A-1505) **$209**

NEW 70cm H/held

Yaesu FT-708R

Covers full 438-439 MHz band in 25kHz steps, with simplex AND standard 5MHz repeater split

● 10 memories ● Low 720g weight ● Switchable 200mW/1W output NiCad battery (& charger), and rubber duckie whip are included! Cat D-2930

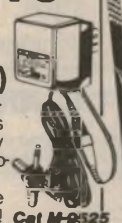
$399

The battery saver!

JUST **$10.95**

3V, 6V 9V DC (200mA)

The 3 most-used voltages for battery powered equipment—simply plug in & save battery dollars! ***Cat M-9525***



NEW! AMAZING

Bosch Digitimer

Cat Y-1121

Unbelievable microprocessor controlled flexibility of all timing and switching functions—like burglar alarms, industrial processors, even swimming pool filters! 4 3-pin outlets—switch on or off individually as required!

DON'T MISS OUT! IT'S JUST $99.50

NEW!

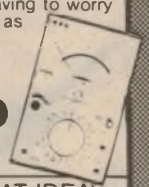
20k/v MULTI-METER

(inbuilt logic probe)

Amazing value. Not just a superb high sensitivity multimeter (20k/V) with 18 ranges, it also has inbuilt LEDS for instant recognition of high, low & pulse states. Modern circuit-checking can be involved enough without having to worry about logic levels as well!

VALUE! $32.50

Cat Q-1026.



BACK-UP SENSOR!

Blind spots in your rear vision? Reverse park by the 'touch' method? An easy to fit backup sensor lets you forget about the dings!

Cat A-8520

$59

CABLE VALUE! 75OHM COAX!

Designed for TV feeders. For up to 400MHz. A 5mm diam. insulation over braided shield.

Cat W-2080 **45c M**

$32.50 for 100M roll.

HIGH RATING Power Relay

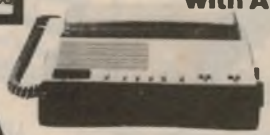
12 volt coil with a huge 10-amp contact rating —and they're mains rated too! Versatile!

$9.75

Cat S-7200

WHAT A GREAT IDEA!

'Hands Free' Phone with AM/FM Clock Radio!



Wow! A Telecom permitted clock radio phone, ideal for the bedside table. And you don't even have to pick up the handpiece! **Cat F-5104**

Telecom Permit No. C83/32/69

$129 LIMITED STOCK!

PUSH BUTTON DIALLING WITH STYLE

Features galore! Last number redial, ringer ON/OFF switch, super-light weight! Don't be without the

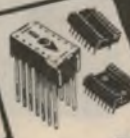
Dick Smith Pal Phone $29.95 Cat F-5188

Telecom Permit No C83/30/31

DICK'S 'DON'T BE CONNED' CHECKLIST

1. Watch out for the sneaky little 'plus sales tax' message hidden somewhere in the advert. All Dick Smith's prices INCLUDE sales tax!
2. Watch out for guarantees—or lack of them! If there is one, can it be backed up? Dick Smith has a large, well equipped service centre—just in case you have any probiems!
3. Watch out for fly-by-nighters. There's always someone out to make a quick buck and disappear! Dick Smith Electronics is now in its sixteenth year....you can trust Dick Smith!

GOLD AT A TIN PRICE



IC SOCKETS

For circuits that need top reliability (and isn't that all of them???) use these deluxe gold plated IC sockets. As used in top computer systems, space shuttles, missiles, etc.

			10 or more:
14 pin	Cat P-4314	*$1.50*	*$1.30*
16 pin	Cat P-4316	*$1.80*	*$1.60*
18 pin	Cat P-4318	*$1.90*	*$1.70*
22 pin	Cat P-4322	*$2.30*	*$2.10*
40 pin	Cat P-4340	*$3.95*	*$3.50*

WHY PAY MORE?

A6:2/TH

A Solemn Promise

Dear Customer,

Altronics has experienced incredible growth in the past year (What recession??). I'm firmly convinced this is due to our energetic approach to our business and our ability to provide our valued customers with quality products at competitive prices. **To further improve our service** we have installed an **INWATS** phone service whereby bankcard holders may ring an order to us for the cost of a local call (around 12 cents!). That's right — from anywhere in Australia up to 6pm Eastern Standard Time.

We promise that this service together with our Overnight Jetservice Delivery will be superior to that offered by any other Australian Supplier for the products we advertise in this magazine. Should you find otherwise you can return your purchase to us for a full refund plus $5 for your inconvenience . . . . . Regards,

Jack O'Donnell

* This offer is made in good faith and subject to Stock Availability

XMAS BONUS

A FREE "LEATHER LOOK" CARRY CASE WITH EVERY Q1001 OR Q1002 PURCHASED THIS MONTH

UNIVERSAL MULTIMETER

PORTABLE WITH BENCH STAND

★ 23 RANGES ★

★ 20,000 OHMS/Volt DC ★ 10,000 OHMS/Volt AC ★ Mirror backed scale ★ Overload protected ★ Unique carry handle doubles as a bench stand ★ High-impact resistant case ★ Uses 1 AA Penlight battery (incl.) ★ Comes complete with battery, test leads and instructions. **RANGES: DC Voltage** 0-.25, 1, 2.5, 10, 25, 100, 250, 1000. **AC Voltage** 0-10, 25, 100, 250, 1000. **Decibels** 20 to + 22 db. **DC Current** 0-50, 500 UA, 0-5, 50, 500MA. **OHM Meter** 0-6 megohms in 4 ranges, 30 ohms centre scale. Sizes 135 × 91 × 39.

Q1002 . . . . . **$24.50**

4 or more **$22.50**

ECONOMY TESTER

OVERLOAD PROTECTED

High 2000 OHMS/Volt sensitivity overload protected. Dimensions 90 x 60 x 30. Mirror back scale prevents Parallax error. **Complete with test leads and instructions.** Uses 1 AA Penlight batt. (incl.) **Ranges:** DC and AC 0-10, 50, 250, 1000V. **Decibels:** 10 to + 22 db. DCA 0-100MA. OHMS 0-1 meg. OHM in 2 ranges.

Q1001 . . . **$14.50**

4 or more **$13.00**

PROFESSIONAL QUALITY

SOLDER SUCKERS

Not to be compared with inferior "Hobby types". Saves countless hours in fault finding and repair of complex PCB's.

SINGLE HANDED OPERATION
SELF CLEANING PLUNGER
LONG LIFE TEFLON TIP
DOUBLE DIAPHRAGM, DUAL O-RING SEAL
225mm x 20mm(d)
50mm STROKE
POWERFUL SUCTION

And if you order this month ASK FOR A FREE REPLACEMENT TIP CAT. T1241 **YOU MUST ASK!!**

T1240. . only **$11.95**

T1241. Replac tip. **$1.95**

XMAS GIFTS FOR THE ENTHUSIAST

TECHNICIAN'S UTILITY PARTS CASE

H 0449
Now
~~$6.50~~
$6

Lightweight and durable This Parts Case is a MUST!

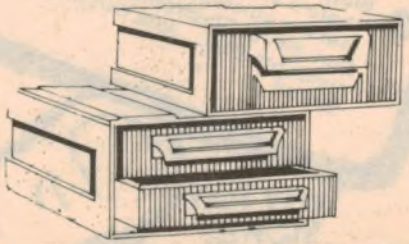
Featuring:— Clear lid (tell contents at a glance); Positive action snap lock; 30 partition combinations.

INTERLOCKING PARTS DRAWER

Unique side and top/bottom keying system allows you to use just a few or build a whole wall of drawers as your parts expansion dictates. Quality designed drawer slides will not "stick" or seize. Slide handle also takes ident. cards. Single or double drawers available.

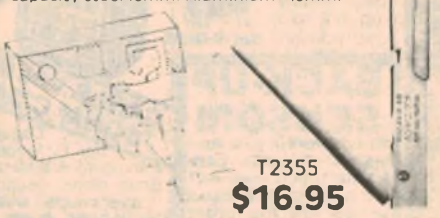
H0435 Single Way. **$2.20**

H0436 Double Drawers. **$2.20**



SHEETMETAL NIBBLING TOOL

Cuts any shape cut out in steel, aluminium or plastic. Very easy to use. Capacity steel .6mm. Aluminium 1.6mm.



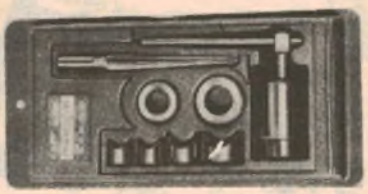
T2355
$16.95

Gold Embossed "Leather Look" Carry Case Included at No Extra Cost

HOLE PUNCH SET Fantastic Value

A must for every enthusiast or serviceman. Cuts holes in metal up to 1.6 mm (16 gauge). Set of 5 punches and tapered reamer.

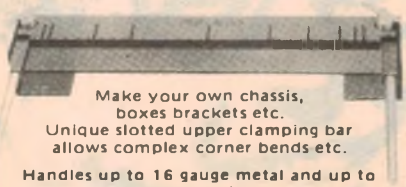
Punch sizes:
16mm
18mm
20mm
25mm
30mm



T2360 . . . . . **$18.50**

* PANBRAKE SHEET METAL BENDER

Our Panbrake Sheet Metal Bender proved to be so incredibly popular that the 1st shipment went in no time. Now at last they're back in stock. **Make your own chassis and save a fortune!**



Make your own chassis, boxes brackets etc.
Unique slotted upper clamping bar allows complex corner bends etc.

Handles up to 16 gauge metal and up to 445mm wide.

New low direct import price!

T2400 . . . . . **$79.95**

DE-SOLDER BRAID

HALF PRICE

T1230 . . . . . **$1**

ALARM CONTROL MODULE

EASY TO INSTALL ★ BUILT IN SIREN DRIVER — DIRECTLY DRIVES LOW COST 8 OHM HORN SPEAKERS, SIREN HORNS AND MECHANICAL BELLS ★ LOW POWER 12V DC OPERATION.

The AC-811 is a low cost professional burglary protection system which detects the presence of an intruder who breaks into your home, office or business. The system also allows connection of emergency panic buttons, wall vibration switches, smoke and heat sensors, as well as freezing or flooding detectors to form a complete protection system.

EXIT/ENTRY DELAY
BOTH N/C AND N/O CONTACTS
Ideal for homes, offices, factories, shops, caravans, any area requiring protection.

S5042.. Only **$39.50**

DELUXE ABS INSTRUMENT CASE

Case color light grey
front-rear panels black

Our superb new instrument case will give your projects the professional appearance they deserve.

- ★ Internal mounting posts enable a wide combination of PCB's, Transformers, etc to be accommodated (screws supplied)
- ★ PCB guide rails provided internally allow vertical PCB positioning to several locations.
- ★ Removable front and rear panels. Attractive textured finish one side and plain the reverse side. (Enables direct engraving, silk screen printing etc to plain side.)
- ★ Great for test instruments and other high grade projects.

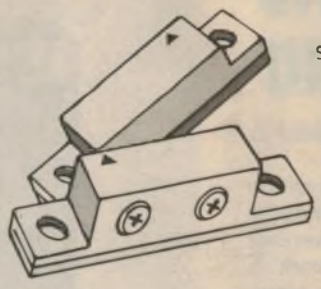
Overall Size: 200W x 160D x 70mmH

HO480..... only **$13.50** ..... 10 UP $11.50

OEM'S — Manufacturers — Bulk Users: Your product will look like it's straight out of "Hewlett Packard's" factory with this brilliant low cost case. Contact our Wholesale Department for Bulk Prices.

FULLY ENCAPSULATED

REED SWITCH & MAGNET SETS



Powerful Magnet
Self-Adhesive or Screw Mount.

N/C Reed & Magnet
S5055..... **$2.50**
10 up..... **$2.10**

N/O Reed & Magnet
S5056..... **$2.95**
10 up..... **$2.75**

LOW COST WEATHERPROOF

HORN SPEAKER

5 WATT 8 OHM

Fully weatherproof. New unique voice coil construction ensures high dependability on full drive.
Suitable for PA intercom and security systems etc.

C2010..... **$9.50**
10 Up..... **$8.90**

WEATHER PROOF

SIREN HORN

12V DC operated — Deafening Siren Wail. Super handy for audio signalling, security systems etc. Current drain 500MA approx. Completely weatherproof. Attractive off-white PVC finish.

S5058..... **$22.50**
10 Up..... **$20.00**

ALTRONICS

105 STIRLING ST. PERTH — FOR INSTANT SERVICE

008 999 007 TOLL FREE

(09) 328 1599 PERTH METRO AREA & AFTER HOURS RECORDED SERVICE

All Mail Orders: Box 8280, Stirling St, Perth WA 6000.

Phone toll free 6am - 8pm (EST) for personal service, or take advantage of our 24 Hour 7 day p/week Bankcard phone order service. Give your name address with postcode, phone number, bankcard number and expiry date then your order — and presto your order will be processed and back to you in a flash. — Please nominate Jetservice if you want overnight delivery.

$2.50 DELIVERY AUSTRALIA WIDE We process your order the day received and despatch via Australia Post. Allow approx. 7 days from day you post order to when you receive goods. Weight limited 10kgs.

$4.50 DELIVERY AUSTRALIA WIDE We process your order day received and despatch via Jetservice for delivery next day.

BANKCARD HOLDERS CAN PHONE ORDERS UP TO 8PM (EST) FOR NEXT DAY DELIVERY — SOUNDS INCREDIBLE DOESN'T IT? Alright you cynics just try us! Weight limit **3.3kgs.** Jetservice cannot deliver to P.O. box numbers (Australia Post would have a fit).

$10.00 HEAVY HEAVY SERVICE — AUSTPALIA WIDE All orders over 10kgs must travel on the heavy service, that is — road express. Delivery time 7 days average.

ALTRONICS RESELLERS

Please note that resellers may not have all the items advertised in stock, and as resellers have to bear the cost of freight, prices may be slightly higher than advertised. ALTRONICS reseller prices should however represent a considerable saving over our competitors' prices.

VICTORIA

CITY
All Electronic Components 662 3506
Ellistronics 602 3499
MaGraths Electronics 347 1122

SUBURBAN
BENTLEIGH
Absolute Electronics 557 3971
BOX HILL SOUTH
Eastern Communications 288 3107
CHELTENHAM
Talking Electronics 550 2386
DANDENONG
Billco Electronics 791 8655
FOOTSCRAY
Acron Electronics 689 1911
SOUTH CROYDEN
Truscott Electronics 723 3860

COUNTRY
BENDIGO
Lindrea & Johnson 41 1411
MILDURA
Electronic and Digital Services 23 3380
SHEPPARTON
GV Electronics 21 8866
WODUNGA
A & M Electronics 24 4588

ACT

CITY
Electronic Components 80 4654
Scientronics 54 8334

WESTERN AUSTRALIA

COUNTRY
ALBANY
BP Electronics 41 2681
ESPERANCE
Esperance Communications 71 3344
GERALDTON
Geraldton TV and Radio 21 2777
KALGOORLIE
Todays Electronics 21 5212
MANDURAH
Kentronics 35 3227
WYALKATCHEM
D & J Pease 81 1132

TASMANIA

CITY
D & I Agencies 23 2842

QUEENSLAND

CITY
Delsound P/L 229 6155

SUBURBAN
BIRKDALE
Wholesale Sound Accessories 207 2502
FORTITUDE VALLEY
St Lucia Electronics 52 3547
PADDINGTON
ECO Technics 369 1474
SALISBURY
Colourview Wholesale 275 3188
SLACKS CREEK
David Hall Electronics 208 8808

COUNTRY
CAIRNS
Thompson Instrument Services 51 2404
GLADSTONE
Purley Electronics 72 4321
IPSWICH
P & P Electronics 281 8001
NAMBOUR
Nambour Electronics 41 1604
PALM BEACH
The Electronics Centre 34 1248
ROCKHAMPTON
Purley Electronics 2 1058
TOOWOOMBA
Hunts Electronics 32 9677
TOWNSVILLE
Solex 72 2015

SOUTH AUSTRALIA

CITY
ADN Electronics 212 5505
Protronics 212 3111

SUBURBAN
CHRISTIES BEACH
Force Electronics 382 3366
ELIZABETH GROVE
A E Cooling 255 2249
KESWICK
Freeway Electric Wholesalers 297 2033
PROSPECT
Jensen Electronics 269 4744

COUNTRY
PORT PIRIE
G F & J A Pointon 32 5141

NEW SOUTH WALES

CITY
Avtek Electronics 267 8777
David Reid Electronics 267 1385
Electronic Agencies 29 2098
Jaycar 264 6688
Radio Despatch 211 0191

SUBURBAN
CONCORD
Electronic Agencies 745 3077
DEE WHY
David Ryall Electronics 982 7500
LEWISHAM
PrePak Electronics 569 9770
MATTRAVILLE
Creative Electronics 666 4000

COUNTRY
ALBURY
Webb's Electronics 25 4066
BATHURST
Sound of Music 31 4421
BROKEN HILL
Crystal TV 4803
COFFS HARBOUR
Coffs Harbour Electronics 52 5684
GOSFORD
Tomorrows Electronics 24 7246
KURRI KURRI
Kurri Electronics 37 2141
NEWCASTLE
D.G.E. Systems 69 1625
NOWRA
Vimcom Electronics 21 4011
PENRITH
Acorn Electronics 21 2409
PORT MACQUARIE
Hall of Electronics 83 7440
RICHMOND
Vector Electronics 78 4277
TOUKLEY
TES Electronics 96 4144
WINDANG
Madjenk Electronics 96 5066

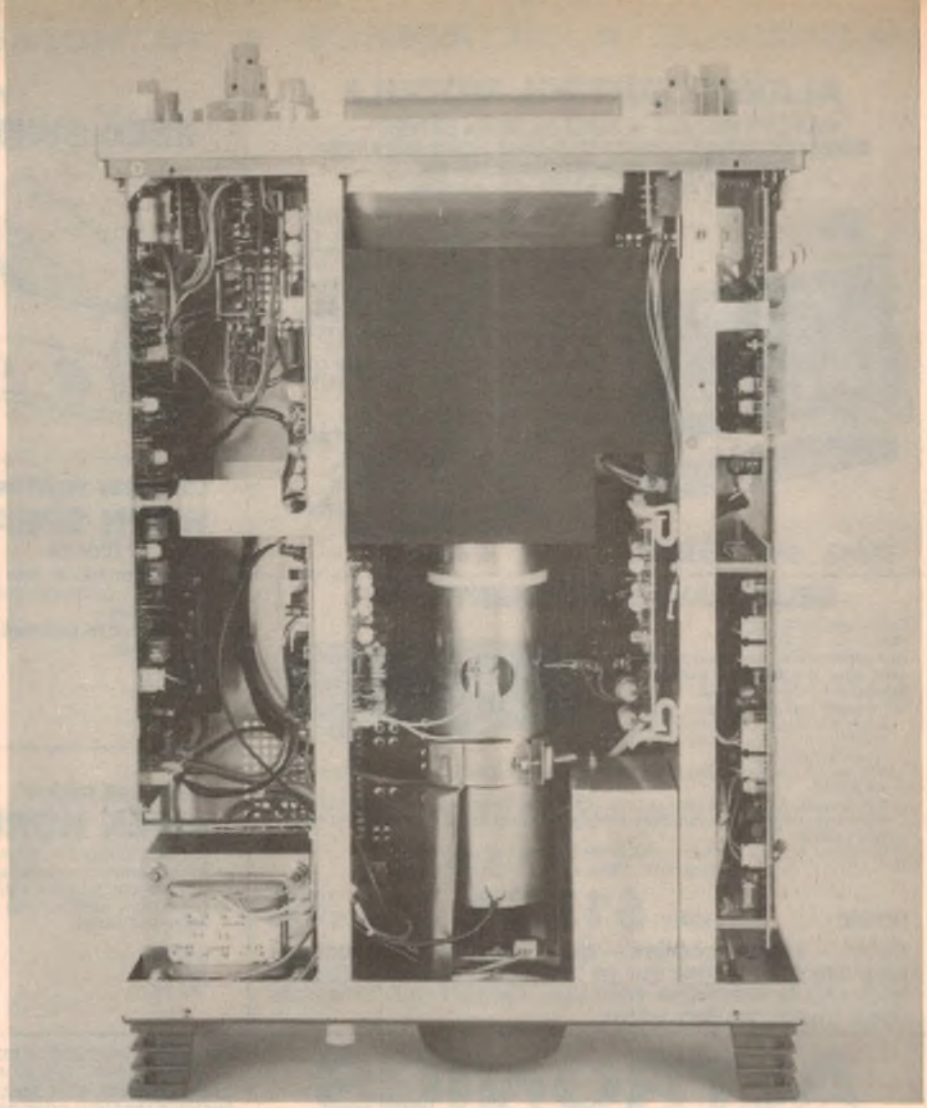
NT

DARWIN
Radio Parts Darwin 81 8508
Ventronics 81 3491
ALICE SPRINGS
Ascom Electronics 52 1713
Farmer Electronics 52 2967

RESELLERS WANTED IN ALL AREAS (Including WA).

Phone: STEVE WROBLEWSKI (09) 381 7233 for details.

Leader LBO-518 dual trace CRO



Internal lay out of the Leader LBO-518 is compact but allows easy service access.

been arranged to simplify operations as much as possible.

Commonly used controls, such as the vertical sensitivity, position and timebase are well spread apart and in convenient locations. The front panel artwork is colour coded into sections which group the switches as to their control functions.

LEDS are used to indicate power, triggering, 20MHz BW limit, CH2 invert, for uncalibrated timebase and sensitivity positions and when the vertical sensitivity and timebase are in their x10 positions.

CH1 and CH2 each have a set of input controls: vertical sensitivity (V/division), vertical position and input coupling (AC, DC, GND).

Vertical sensitivity for both CH1 and CH2 is switchable in 10 steps from 5mV to 5V/division. The x10 gain control increases sensitivity to 0.5mV/division. A variable calibration control allows a reduction in sensitivity from the calibration position.

Dual concentric knobs are used for the vertical position for both CH1 and CH2. The inner knobs provide vertical position for CH4 and CH3 respectively. Selection of CH1, CH2 and CH3 can be made by pulling out the CH3 vertical position knob. For all four channels to be displayed, the CH4 vertical position knob can be pulled out.

The Vertical MODE control switches allow the selection of CH1 or CH2, ADD (the addition of CH1 and CH2) and CH2 INVert. This final feature allows CH1 and CH2 subtraction, if ADD is also selected. In addition there is CHOP or ALTernate selection, X-Y display and a 20MHz bandwidth limit, which eliminates higher frequency components from the screen.

Two separate timebase controls are provided via a dual concentric switch; the outer for the A-trace and the inner for the B-trace. The sweep time is adjustable in 23 steps from 0.5s/division to 20ns/per division in a 1-2-5 sequence. The x10 magnification switch further increases the timebase sweep speed to a maximum of 2ns/division.

The B-trace can be set to a faster timebase than the A-trace to facilitate a closer observation of the waveform. This control is prevented from being set to a slower timebase than the A-trace by a mechanical locking system.

The portion of the A-trace shown on the B-trace can be indicated on the A-trace by a brighter section of the waveform. The delay time between the start of triggering of the A waveform and the start of the B waveform is adjustable with the vernier Delay Time Multiplier from 0.2x to 10x the A sweep time per division. Vertical separation of the A and B traces is effected with the A/B Trace Separation which is a dual concentric control incorporating the B trigger level.

The A trigger level is also a dual concentric control which incorporates the Holdoff. This allows adjustment of the time between successive sweeps and can be controlled to the extent that the holdoff time can be 10x the normal value. The control is used when displaying signals which jitter on the screen due to a noisy or jagged waveform edge on which the oscilloscope triggers. In slowing the successive time between sweeps, the effect is less noticeable.

The trigger level control adjusts the signal slope point where triggering occurs. Both plus and minus levels can be triggered by rotating the Level control. When the inner knob of the Level control is pulled out, the trigger point is set close to the zero crossing point of the waveform.

Triggering for the A trace is selected by the six trigger source switch positions. These are CH1, CH2, ALTernate, Line and two external positions. For the CH1 position, CH1 is the trigger source. Similarly for the CH2 position, CH2 is the trigger source. In the ALT position, triggering occurs between CH1 and CH2 sources. Signals which are not harmonically related can therefore be locked. The ALT selection on the MODE switches must be chosen for this triggering. The Line position triggers on the mains frequency. The 0.2V/div external input and 2V/div external input are for external triggering on the CH3 input.

Trigger selection for the B trace is the same as the A trace with the exception that a Line trigger input has not been included. For external triggering the CH4 input is used.

Trigger coupling for the A channel can be either AC, HF rejection, LF rejection, DC, TV vertical and TV horizontal sync triggering. Similarly for the B channel, with the exception that the TV vertical sync triggering is omitted.

For both the A and B trace a switch provides selection of positive or negative triggering and this can also be used to invert the video when TV trigger coupling is selected.

Three triggering modes are available. These are AUTO, NORMal and SINGLE.

With the Automatic triggering the trace is present whether triggered or not. Normal triggering will only display the trace when triggered. The Single triggering mode provides only one sweep until reset by pushing the Single switch again.

While the CH3 and CH4 inputs are used as the external trigger inputs, these can also be used to provide extra traces, however, without the feature of a vertical sensitivity control. Vertical sensitivity is fixed at 0.2V/division and 2V/division, being selected by the triggering source switch.

If the triggering source switch is set to any of the other positions such as CH1 or CH2, then it is this trigger signal which is displayed rather than the CH3 or CH4 external inputs. Both the A and B traces are available on each.

The Horizontal Display switches select the type of display required. The A selection allows only the A trace to be shown, while the ALT selection displays both the A and B traces. The INTENsified-by-B selection shows both the A and B traces with the B trace sweep waveform intensified on the A trace. The B trace selection shows only the B trace which triggers after the delay set by the DLY Time Multiplier. If the After DLY switch is pressed in, the delay triggering feature is not used.

The remainder of the front panel controls are: Focus, Horizontal shift (including a fine control), A and B intensity, Scale illumination/Beam find and Trace Rotation. For calibration, a 1kHz square wave output is provided.

At the rear panel are A and B gate signal outputs, CH1 output and a Z axis input, all BNC connectors. The Z-axis input is for intensity modulation of the oscilloscope trace.

Overall dimensions of the LBO-518 are 305 × 145 × 400mm (W × H × D). The mass is 9.5kg. A large carry handle/tilting bail is supplied with the oscilloscope which has 22.5 degree detents.

The instruction manual supplied with the oscilloscope provides examples which help the user quickly familiarise with the controls. It also provides information on measuring waveform frequencies and phase using Lissajous figures off the screen. A very short maintenance section provides calibration procedure for astigmatism, deflection, and sweep speeds. The information appears sufficient for these simple tasks, however for servicing, no circuit diagram is provided nor is any servicing information. A service manual will be necessary if a fault occurs.

Bandwidth is specified from DC to 100MHz at the −3dB point and is −3dB at 10Hz when AC coupling is selected. The input impedance is 1MΩ in parallel with 25 pF. Maximum imput voltage is 600V DC + AC peak. Accuracy of the vertical sensitivity is ±3% while a similar accuracy is given for the timebase. With the x10 magnification, accuracy is ±5% for both timebase and sensitivity. Display jitter is specified as 1/20,000.

Internally, the Leader LBO-518 is laid out on well packaged PC boards but access for servicing appears to be quite good. Very little wiring between boards is present which makes for a neat layout. Much use is made of digital ICs and in particular, hybrid high speed types. Overall, the unit is well constructed.

In use we found the unit to provide a clean, well triggered trace and the range of the brightness controls was sufficient for a bright trace even with all eight traces on the screen. When observing a 100MHz waveform we were also able to obtain a clean and well triggered trace.

Overall the oscilloscope performs very well. We liked the easy-to-use controls and the LED illuminators, particularly the triggering and uncalibrated indicators. Also the beam finder feature was found to be very useful for locating the trace before any other controls are used. The beam finder compresses the trace into a small area so the direction of the trace from the centre of the screen is known.

One unusual but useful feature is the ability to display the triggering source. This enables the user to quickly determine the type of waveform on which the oscilloscope is triggering.

Graticule markings are located directly on the screen face to avoid the possibility of parallax errors in measurement reading. Also 10% and 90% graduations are provided for rise time measurements.

Also supplied with the oscilloscope were two LP-011100MHz probes. These are fixed at x10 sensitivity. They have a small tip and are suitable for clipping to IC leads and other small component leads. They are of high quality and we found them handy to use on modern solid state circuitry.

Generally, the Leader LBO-518 represents a high quality, high performance oscilloscope with some unusual but useful features. The extra channels available by using the external trigger inputs are very useful when checking digital circuitry where the lack of vertical sensitivity adjustment is unimportant. The CRO should be a valuable addition to the well equipped laboratory or workshop for analysis of high speed digital and analog signals.

For further information contact Amalgamated Wireless (Australasia) Limited, Instrumentation Department, 422 Lane Cove Road, North Ryde, NSW 2113. Telex AA20623. Phone 887 7438. Recommended price of the LBO-518 including the LP-011 probes is $2195 + 20% sales tax. (J.C.)

Books & Literature

Advanced assembly language

LEVEL 2 ROM ASSEMBLY LANGUAGE TOOLKIT by Edwin Paay. Published by Micro-80 Pty Ltd, Adelaide, 1982. Soft covers, 150 x 216mm, 169 pages, supplied with DBUG program on cassette. Price $30.

This book is a guide to the machine language routines contained in the ROM-based Basic interpreter of the TRS-80 Model 1 and Model 3 and the System-80 computer. The comprehensive treatment of the subject combined with the DBUG program supplied enables programmers to fully utilise the resources of Microsoft Basic.

While there are other books available on assembly language programming for the TRS-80 they mainly focus on using the low-level monitor routines. This is the first book we have seen which fully explains the significance of the Basic floating point accumulator, used for passing parameters to and from the machine code which implements Basic statements. With the guidance provided by the text a wide range of possibilities is opened, such as assembly language trigonometric routines, use of the Basic interpreter to parse text input and the extension of Basic itself with the addition of new commands.

Examples and explanations are provided for all Basic routines, under the headings such as "arithmetic", "compare and test", "data conversion" and input and output routines.

DBUG, supplied on cassette with the book, is a machine language debugging program with commands for examining and altering memory in hex or ASCII, setting breakpoints, disassembling particular instructions and examining and modifying the registers of the Z80 CPU. Four versions of the program are supplied to cater for various memory sizes as well as disk-based systems.

This is not a book for the beginner wishing to learn assembly language as it assumes extensive familiarity with the Z80 instruction codes and the internal workings of TRS-80 Basic. Once the fundamentals have been grasped however, the book would be invaluable to anyone wishing to apply the full power of the TRS-80 or System-80 computers, and will also be convenient for users of other machines who want to know more about Microsoft Basic.

While $30 may seem a high price for a spiral bound soft cover book, the wealth of information and the DBUG cassette more than compensate. Our review copy was supplied by McGills Newsagency, 187 Elizabeth St, Melbourne 3000.

Australian business computer guide

BUSINESSMAN'S GUIDE TO MICROCOMPUTERS published by Deloitte, Haskins and Sells, Sydney, Australia, 1983. Soft covers, 178 x 234mm, 200 pages, illustrated with photographs and fold-out charts in colour indexed with colour-coded pages. ISBN 0 9592451 0 3. Price $19.95.

"Businessman's Guide to Microcomputers" was first intended as a service to the clients of Deloitte Haskins & Sells, and only later made available to the general market. This accounts for the price, which is remarkably low.

This book claims to be the first comprehensive guide to micro-computers written specifically for the Australian business user. Compiled by a team of chartered accountants at the Sydney firm Deloitte, Haskins & Sells the text is divided into five large sections; covering computers for the newcomer, requirements for starting out, reviews of hardware available in Australia and the Australian market generally, applications software and a guide for purchasers, including "Common first-time buyer pitfalls" and "Where to get assistance".

The text is not intended for "computer buffs", as the press release puts it, but for the business executive who is seeking guidance in the sometimes confusing world of business computer applications. It assumes no prior knowledge of computers and in fact the headline of sections detailing the internal features of the machines reviewed is "Technical Humbug". Pricing, marketing support and available software receive much more attention than details of processors and clock speeds, which is as it should be in the business field.

Although various programming languages are discussed there is no indication that the business user is expected to write his own programs.

Published in May of this year the text is right up to date, with detailed reviews of the latest equipment from Apple (although not "Lisa"), Commodore, Tandy, Mitsui Sord, IBM, NEC, Digital Equipment Corporation (the Rainbow 100), Sirius, Wang, ICL and Wicat. The reviews and fold-out comparison charts are very well done, showing evidence of considerable research and careful evaluation and focusing on those issues which are of most concern to the business user.

Section one is a brief introduction to mainframe, mini- and microcomputers, including an explanation of the jargon of the computer field. Section two is titled "What Do You Need?" and offers detailed coverage of the components of a typical microcomputer, prefaced by a section called "Knowing where to start". Applications programs, hardware and operating systems are covered.

Section three contains an excellent overview of the Australian marketplace, which as the authors point out is in some ways very different to those of the United States and Europe. With over 200 different machines available in the under $15,000 range the Australian purchaser has access to the best equipment from Europe, the United States and Japan as well as a handful of locally manufactured products. The price of this wealth of alternatives is an increased chance of confusion for the buyer, but the "Guide" should provide the antidote.

Section three also contains reviews of selected computer systems, divided into three price categories, starting at around $7000 (A TRS-80 Model II with printer) and extending to the 68000-based multi-user Wicat with 30MB disk, for $30,000. The reviews are detailed, and obviously written by authors aware of the requirements of business. Each is prefaced by a knowledgeable guide to

Books and Literature . . . Continued

the manufacturer of the equipment.

Section four covers software, with an introduction to the Australian marketplace and divided into subsections covering financial modelling, database management, word processing, and general accounting packages. Again the impression is of careful research and attention to detail.

Section Five provides advice to purchasers, emphasising the basic message of the book "Application first . . . equipment second" and the need to avoid making a buying decision solely on price. "Don't computerise a mess . . . clean it up first" is also sound advice from this brief section.

Overall this is an excellent book.

Our review copy came directly from the publishers, who state that copies are available from selected bookshops and computer retailers. (P.V.)

Laboratory handbook updated

RADIO AND LABORATORY HANDBOOK edited by M. G. Scroggie assisted by G. G. Johnstone. Published by Newnes-Butterworth, London 1980. Hard covers, 140 x 220mm, 592 pages. Illustrated with many photographs and diagrams. ISBN 0-408-00373-1. Price in Australia $59.00.

Few engineers or serious experimenters will need any introduction to M. G. Scroggie; his name has appeared on no less than nine editions of this handbook, going back to 1938. He has also been a prolific contributor to technical magazines and journals.

According to the author, the aim of the book is as it has always been; ". . . to provide the experimenter with guidance on means and methods . . ." The author also emphasises the need to understand the underlying principles of experimenting and the approach to it, and has devoted three chapters to this subject.

It would also appear that this edition has been considerably updated and expanded on the previous one, a lot of the revision being credited to Mr G. G. Johnstone. Much of this work was inspired by the general trend away from discrete components and analogue readout devices and their replacement by integrated circuits and digital displays.

It is difficult to summarise a book of this size in any depth, but our impression is that the author has striven to strike a balance between the pure theory; the formulas, the tables, the basic circuits etc, and the practical problems which are so frequently encountered in a laboratory or workshop, but which are seldom dealt with in the text books. Chapter 2, for example, on premises and layout deals with such diverse subjects as how to store patch cords, instrument racks, and screened rooms.

The following chapter headings should give some idea of the contents. (1) The ends and the means. (2) Premises and layout. (3) Fundamental principles of measurement. (4) Sources of power and signals. (5) Indicators. (6) Standards. (7) Composite apparatus. (8) Choice and care of equipment. (9) Measurement of circuit parameters — audio, RF, and active devices. (10) Signal measurements. (11) Measurement of equipment characteristics. (12) Dealing with results. (13) For reference. (This last chapter covers over 100 pages.)

To sum up; not a cheap book, but one which should find a place in most professional laboratories and large workshops, or in technical education libraries.

Our copy from the Australian agents, Butterworths Pty Ltd, 586 Pacific Highway, Chatswood, NSW, 2067. (PGW).

MAIL ORDER MAIL ORDER MAIL ORDER

MAIL ORDER MAIL ORDER MAIL ORDER MAIL ORDER MAIL ORDER

ACTIVE ELECTRONICS

4 KING STREET SANDRINGHAM VICTORIA 3191
PHONE (03) 67 1137

OUR COMPUTERISED INVENTORY SYSTEM AND LOW OVERHEAD ALLOWS US TO GIVE YOU FAST DELIVERY OF YOUR ORDERS AND LOWEST POSSIBLE PRICES.

ALL PRICES INCLUDE SALES TAX

NOW IN STOCK
LUTRON DIGITAL LCD MULTIMETER

3½ Digit, 5" Display, 10 meg input, Transistor HFE Tester up to 10 amp. DC current. 1% accuracy.

$69

NEW VIDEO MONITORS

SAMKOR'S TRADITION OF QUALITY AFFORDS UNMATCHED MONITOR VALUE FOR AN ECONOMICAL PRICE

HIGH PERFORMANCE VIDEO DISPLAY MONITOR

MCG-12G (12")

OUTSTANDING FEATURES:

- LOW COST, HIGH QUALITY
- SMART, RELIABLE
- COMPACT DESIGN & LIGHT WEIGHT
- LOW POWER CONSUMPTION
- NON-GLARE, GREEN/AMBER OPTION
- WIDE VIDEO BANDWITH (20MHz) FOR CLEAR & SHARP PICTURE
- INTERFACES WITH ALL POPULAR PERSONAL COMPUTERS LIKE IBM PC, APPLE
- FCC, UL APPROVED
- 1000 LINES RESOLUTION

GREEN PHOSPHOR .. $185
ORANGE PHOSPHOR ... $210

POST AND PACKING CHARGES.

	ORDER VALUE	P&P
POST & PACKING FOR GOODS SENT BY STANDARD MAIL IN AUSTRALIA ONLY	$5 - $9.99	$1.00
	$10 - $24.99	$2.00
	$25 - $49.99	$2.50
	$50 - $99.99	$3.00
	$100 OR MORE	$3.50

MAIL ORDER ONLY
(NO SHOP SALES)

VERBATIM VEREX

12 MONTH WARRANTY
5¼ SOFT SECTORED
$35.00/10

S-Side
Double Density

ALL PRICES INCLUDE SALES TAX.

NOW YOU CAN BUY YOURSELF COMPONENTS AT PRICES WELL BELOW THE NORMAL RETAIL PRICES, SO SAVE YOURSELF MONEY. SEND YOUR ORDER TODAY.
ALL COMPONENTS ARE FULL SPEC BY LEADING MANUFACTURERS

PRICES CORRECT AT TIME OF PUBLICATION BUT SUBJECT TO CHANGE WITHOUT NOTICE.

BANKCARD VIA YOUR PHONE

$7.50

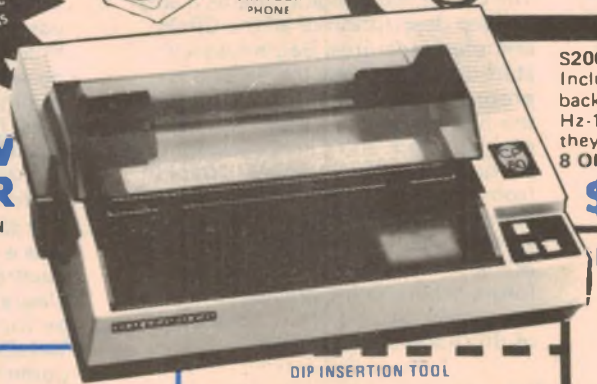
S2010 PVC weatherproof re-entrant horn / speaker. Very attractive "off white" colour. 8 ohm 5 Watt RMS. Ideal P.A. use. Individually boxed.

SPECIAL PRICE

AMAZING NEW CP-80 PRINTER

QUALITY PRODUCT MADE IN JAPAN
MONEY BACK GUARANTEE

$495



S2000 8" (200mm) wide range general purpose. Includes transformer, mounting holes for P.A. and background use. Very smooth over-all response 45 Hz-12 KHz. Fitted to a 1.9 cubic ft vented enclosure they sound unbelievable.
8 Ohm 8 Watt RMS 5.6 oz magnet.

$8.95

Bankcard Mail Orders Welcome

Please debit my Bankcard

Bankcard No. . . . . .

Expiry Date . . . . . .

Name . . . . . .

Signature . . . . . .

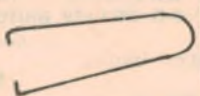
AE 3/83

DIP INSERTION TOOL

Ideal for the hobbyist or laboratory engineer. One piece spring steel construction. Will extract from 8-24 pin devices safely.

$5.25ea

16 PIN

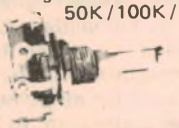


DIP EXTRACTION TOOL $1.95

Industrial quality. Narrow profile enables work in densely packed areas. Tool includes a remarkable pin straightener built into the handle.

POTS

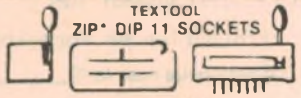
All with ¼ in. shafts Linear 500/1K/10K/20K/50K/100K/500K/1M/2M Logarithmic 1K/5K/10K/20K/50K/100K/500K/1M/2M



All one price

75¢

TEXTOOL ZIP* DIP 11 SOCKETS



16 Pin Zip * Dip 11	$10.95
24 Pin Zip * Dip 11	$10.95
40 Pin Zip * Dip 11	$21.50

* Zero Insertion Pressure

MAIL ORDER MAIL ORDER MAIL ORDER

MAIL ORDER MAIL ORDER MAIL ORDER

MORE 20% DISCOUNT ON 100 UP QUANTITIES OF EACH TYPE OF SEMICONDUCTOR

7400

7400	.39
7402	.40
7403	.48
7404	.50
7406	.55
7407	.48
7408	.48
7410	.48
7411	.48
7413	.45
7414	.51
7416	.60
7417	.51
7420	.48
7421	.35
7423	.40
7425	.35
7426	.50
7427	.51
7430	.50
7432	.48
7437	.54
7438	.48
7440	.48
7442	.52
7444	1.60
7445	.98
7446	.98
7447	.84
7448	1.60
7451	.35
7454	.35
7470	.52
7472	.41
7473	.63
7474	.51
7475	.72
7476	.54
7483	.78
7485	.84
7486	.54
7489	3.50
7490	.62
7492	.66
7493	.75
7495	.75
7496	.96
7497	1.50
74107	.40
74122	.72
74123	.66
74125	.57
74126	.67
74145	.53
74147	2.20
74148	1.25
74150	1.92
74151	.72
74153	.58
74154	2.16
74155	.78
74156	.83
74157	.66
74160	1.12
74161	.96
74162	1.20
74163	.70
74164	.86
74165	.96
74166	1.32
74167	3.00
74174	.72
74175	.72
74176	1.20
74177	1.10
74180	1.02
74182	1.30
74184	3.50
74190	.72
74191	1.20
74192	.84
74193	.96
74194	.80
74195	.67
74196	1.20
74197	.94
74198	1.80
74199	1.75
74221	2.10
74251	1.35
74279	.70
74283	.90
74290	.90
74293	1.10
74298	.90
74365	.90
74366	.90
74367	.90
74368	.90

74LS00

74LS00	.45
74LS01	.45
74LS02	.45
74LS03	.45
74LS04	.45
74LS05	.45
74LS08	.45
74LS10	.45
74LS11	.45
74LS12	.45
74LS13	.45
74LS14	.51
74LS20	.45
74LS21	.45
74LS26	.45
74LS27	.45
74LS30	.45
74LS32	.45
74LS33	.45
74LS37	.45
74LS38	.45
74LS40	.45
74LS42	.62
74LS47	.72
74LS48	.72
74LS49	1.50
74LS51	.45
74LS54	.45
74LS55	.45
74LS73	.45
74LS74	.55
74LS75	.55
74LS76	.55
74LS83	.72
74LS85	.55
74LS86	.45
74LS90	.60
74LS92	.60
74LS93	.72
74LS95	.75
74LS96	.79
74LS107	.60
74LS109	.54
74LS112	.48
74LS122	.72
74LS123	.84
74LS125	.66
74LS126	.70
74LS132	.66
74LS136	.45
74LS138	.90
74LS139	.72
74LS151	.60
74LS152	.72
74LS153	.72
74LS154	1.40
74LS155	.72
74LS156	.71
74LS157	.72
74LS158	.54
74LS160	.86
74LS161	.84
74LS163	.84
74LS164	.84
74LS165	.91
74LS170	1.00
74LS173	.80
74LS174	.75
74LS175	.75
74LS190	1.06
74LS191	1.10
74LS192	.80
74LS193	1.05
74LS194	.96
74LS195	.84
74LS197	.84
74LS221	.84
74LS240	1.00
74LS241	1.20
74LS242	.90
74LS243	.90
74LS244	1.60
74LS245	1.80
74LS248	.55
74LS249	1.00
74LS251	.80
74LS253	.70
74LS257	.60
74LS258	.60
74LS259	.96
74LS266	.45
74LS273	1.10
74LS279	.55
74LS283	.74
74LS290	.60
74LS293	.81
74LS298	.84
74LS352	.80
74LS365	.60
74LS366	.70
74LS367	.60
74LS368	.60
74LS373	1.20
74LS374	1.20
74LS375	.62
74LS377	1.50
74LS378	.72
74LS390	.96
74LS393	1.02
74LS447	1.02
74LS629	4.20
74LS640	2.50
74LS670	1.40
81LS95	1.85
81LS96	1.85
81LS97	1.85
81LS98	1.85

74F00

74F00	.98
74F02	.98
74F04	.98
74F08	.98
74F10	.98
74F11	.98
74F20	.75
74F32	.96
74F64	.96
74F74	1.10
74F86	1.40
74F109	1.45
74F138	1.92
74F139	1.92
74F151	1.92
74F153	1.92
74F157	1.92
74F158	1.92
74F175	3.12
74F181	5.50
74F182	3.00
74F189	8.64
74F190	4.27
74F191	4.62
74F194	2.58
74F241	4.20
74F243	4.68
74F244	4.20
74F251	2.34
74F253	2.04
74F257	2.38
74F258	2.38
74F350	3.80
74F352	2.38
74F353	2.38
74F373	4.78
74F374	4.27
74F399	2.98
74F521	4.51
74F533	4.27
74F534	4.27

74S00

74S00	.63
74S02	.66
74S03	.62
74S04	.60
74S05	.54
74S08	.60
74S10	.54
74S11	.63
74S15	.78
74S20	.52
74S30	.58
74S32	.62
74S40	.54
74S51	.63
74S64	.60
74S74	.65
74S86	.84
74S112	.87
74S113	1.00
74S132	.84
74S133	.60
74S135	1.27
74S136	2.50
74S138	1.20
74S139	.94
74S140	.45
74S151	1.30
74S153	1.40
74S157	1.40
74S158	1.20
74S161	4.80
74S174	1.26
74S175	1.26
74S188	2.80
74S189	4.80
74S194	1.86
74S242	3.95
74S253	1.40
74S257	1.30
74S258	1.40
74S283	4.40
74S287	3.00
74S288	2.90
74S289	5.00

74C00

74C00	.48
74C02	.45
74C04	.40
74C08	.40
74C10	.40
74C14	.65
74C20	.46
74C30	.58
74C32	.45
74C42	1.30
74C48	1.65
74C73	.70
74C74	.90
74C83	2.20
74C85	1.50
74C86	.55
74C89	5.50
74C90	1.40
74C93	1.40
74C95	1.60
74C107	1.10
74C150	4.10
74C151	2.90
74C154	5.10
74C157	2.60
74C160	1.30
74C161	1.50
74C162	1.40
74C163	1.40
74C164	1.50
74C165	1.65
74C173	1.14
74C174	1.10
74C175	1.44
74C192	1.70
74C193	1.20
74C195	1.65
74C200	12.95
74C221	2.20
74C240	2.35
74C244	2.60
74C373	2.60
74C374	2.50
74C901	.85
74C902	.90
74C904	.90
74C906	.75
74C907	.75
74C908	1.60
74C910	12.95
74C911	11.85
74C912	12.50
74C914	2.20
74C915	1.95
74C917	12.00
74C918	1.90
74C920	5.90
74C922	5.60
74C923	5.40
74C925	7.80
74C926	7.90
74C927	6.80
74C928	8.50
74C929	5.80
74C930	6.12
74C941	2.50
74C989	8.60

4000

4000	.35
4001	.35
4002	.35
4006	.90
4007	.40
4008	.90
4009	.70
4010	.62
4011	.35
4012	.35
4013	.48
4014	1.10
4015	.96
4016	.51
4017	.96
4018	1.02
4019	.60
4020	.84
4021	.96
4022	.96
4023	.36
4024	.72
4025	.36
4026	1.30
4027	.60
4028	.96
4029	1.05
4030	.59
4031	3.50
4033	1.95
4034	2.70
4035	1.20
4040	.90
4041	1.20
4042	.83
4043	.92
4044	.72
4046	1.20
4047	1.05
4048	.58
4049	.54
4050	.54
4051	1.10
4052	1.15
4053	.96
4055	2.66
4060	1.00
4063	1.40
4066	.50
4068	.40
4069	.36
4070	.36
4071	.38
4072	.35
4073	.34
4075	.36
4076	.86
4077	.34
4081	.36
4082	.34
4085	.80
4086	.60
4089	2.70
4093	.54
4094	1.20
4099	1.20
4104	2.70
4160	1.00
4161	1.30
4163	1.20
4174	1.10
4175	1.10
4194	1.10
4409	5.60
4411	12.00
4419	3.50
4469	14.00
4495	3.80
4500	5.80
4502	1.40
4503	.85
4507	.35
4508	1.20
4510	1.05
4511	1.05
4512	.90
4514	2.60
4515	1.95
4516	1.10
4518	.96
4519	.68
4520	.96
4521	2.60
4522	1.50
4526	1.50
4527	1.25
4528	1.30
4529	1.50
4531	1.30
4532	1.50
4534	6.00
4538	1.60
4539	.80
4541	1.30
4543	1.10
4553	3.50
4555	.80
4556	.80
4558	1.90
4560	2.70
4569	2.40
4572	.75
4583	1.20
4584	.90
4585	1.05
4599	4.20

9000

9300	.80
9302	1.50
9304	.80
9307	2.00
9308	2.50
9309	.82
9310	1.10
9311	2.10
9312	.75
9314	.76
9316	.96
9318	1.95
9320	6.00
9321	1.10
9322	.72
9324	1.45
9328	1.68
9334	1.60
9338	1.68
9340	3.60
9368	1.70
9370	1.20

LINEAR ETC

AD570	58.00
AD7524	14.20
ADC0800	14.90
ADC0804	5.50
ADC0808	12.60
ADC0809	8.00
ADC0817	13.60
ADC1210	58.00
AY-3-1015	6.50
AY-3-8910	10.00
BR1941	11.50
BR1943	12.00
CA3028	2.52
CA3036	5.76
CA3039	2.05
CA3059	5.80
CA3081	1.44
CA3130	1.74
CA3130T	1.70
CA3140	.96
CA3140T	1.92
CA3146	2.65
CA3401	.99
DAC0800	3.20
DAC0808	2.50
DAC1220	12.50
DM8121	2.50
DM8130	5.20
DM8131	2.95
DM8309	.68
DM8310	.91
DM8312	.58
DM8316	.82
DS8820	1.70
DS8830	1.70
DS8833	1.90
DS8836	1.50
DS8859	2.05
DS8869	2.05
DS75107	1.26
DS75108	1.58
DS75110	1.50
DS75150	1.75
DS75154	1.50
DS75451	.72
DS75452	.72
DS75453	.96
DS75454	.66
FD1771	21.00
FD1791	39.00
FD1793	39.00
FD1795	35.00
ICL7106	17.50
ICL7107	18.00
ICL7660	4.80
ICM7217A	17.50
ICM7218A	18.00
ICM7555	1.95
ICM7556	2.70
L120	2.82
L121	2.76
LF347	2.18
LF351	.62
LF353	.94
LF356	1.66
LF357	1.25
LF398	4.75
LF398H	6.50
LF13741	.86
LH0002	10.95
LH00042CH	9.60
LH0070-1H	15.90
LH0071-1H	17.50
LM10CH	6.50
LM304H	3.17
LM307	.68
LM310	2.16
LM311-14	1.30
LM318	1.97
LM319	2.05
LM322	1.95
LM325	4.50
LM329	.86
LM334	1.60
LM3352	1.63
LM3362	1.55
LM349	1.80
LM358	.66
LM358AN	1.42
LM374	4.80
LM377	2.30
LM380-8	1.20
LM380-14	1.10
LM381	2.05
LM382	1.75
LM383	2.05
LM386	1.10
LM387	1.60
LM394CH	4.70
LM565	1.20
LM566	2.05
LM567	[illegible]
LM1830	3.20
LM1886	6.00
LM1889	3.30
LM2917-14	2.70
LM3080	1.05
LM3089	2.90
LM3524	3.40
LM3900	.84
LM3905	1.60
LM3909	1.20
LM3911	2.00
LM3914	3.50
LM3915	3.95
LM3916	3.90
LM4250	2.10
MC1350	1.80
MC1408	9.90
MC1445	4.50
MC1456	1.80
MC1466	14.00
MC1494	8.10
MC1495	7.50
MC1496	1.80
MC3340	1.80
MC3370	3.70
MC3470	11.00
MC3486	3.50
MC10118	1.70
MCM66740	16.00
MM5303	6.50
MM5837	15.00
MM58167	11.50
MN3001	16.50
MSM58372	15.00
NE530	2.30
NE558	2.25
NE571	2.40
NE5534	1.50
NE5534AN	2.30
OM321	12.00
OM335	19.50
OM350	9.30
SAB0600	7.20
SAK140	1.50
SN76477	7.20
SN76488	10.50
TA7205	1.80
TCA220	10.50
TL061	1.40
TL062	1.80
TL071	1.30
TL072	1.70
TL074	3.60
TL075	3.30
TL081	.60
TL082	1.40
TL084	2.70
TR1602	7.40
TR1863	6.70
TR1983	9.95
UA301	.65
UA301H	1.50
UA305H	1.50
UA308	1.70
UA311	.62
UA311H	1.60
UA324	.84
UA339	.67
UA348	1.40
UA393	.72
UA555	.41
UA556	1.05
UA709	.72
UA710	.75
UA711	.90
UA723	.60
UA723H	1.70
UA725	2.90
UA739	1.20
UA741	.39
UA741H	1.15
UA747	1.20
UA1458	.55
UA1488	.96
UA1489	.96
UA2901	.96
UA3086	.75
UA4136	1.65
UAA170	5.00
UAA180	4.50
ULN2003	1.80
WD1393	65.00
WD1691	17.50
XR2206	5.95
XR2207	5.50
XR2208	3.40
XR2211	7.20
XR2216	2.80
XR2240	3.00
XR2243	3.20
8T26	2.34
8T28	2.76
8T95	2.20
8T96	2.30
8T97	2.30
11C90	14.00
95H90	14.50

MICRO

2102	2.40
2112	8.00
2114	2.50
2532	6.95
2564	16.50
2708	8.00
2716	4.95
27128	55.00
2732	6.80
2764	9.50
2816	40.00
2911	32.00
2912	22.00
2920	120.00
4116 150NS	2.95
4164 150NS	8.95
6116P3	9.90
6502	10.20
6502A	10.80
6505	13.50
6507	9.60
6520	3.40
6522	9.00
6522A	11.80
6532	12.00
6545	22.00
6551	17.00
6800	5.60
6802	6.60
6808	5.20
6809	16.00
6810	3.85
6820	3.40
6821	3.55
6840	6.60
6844	15.50
6845	15.50
6847	8.80
6850	2.80
6852	4.20
6854	9.60
6875	11.00
68A09	36.00
68B00	9.90
68B21	4.40
68B40	8.40
68B45	18.20
68B50	4.90
68B54	12.40
8080	6.90
8085A	10.80
8086	59.00
8088	48.00
8155	9.80
8156	9.80
8185	39.00
8202A	60.00
8203	65.00
8206	120.00
8212	3.80
8214	9.50
8216	3.70
8224	4.80
8226	3.70
8228	7.80
8233	285.00
8237	47.00
8238	13.90
8243	7.90
8251A	8.50
8253	9.00
8255A	6.95
8257	11.90
8259	10.90
8271	106.00
8272	33.00
8273	65.00
8274	46.00
8275	46.00
8276	26.00
8282	8.50
8283	8.40
8284	11.00
8286	8.40
8287	8.40
8288	26.50
8289	35.00
8291A	47.00
8292	38.00
8293	29.00
Z80CPU	5.40
Z80ACPU	5.90
Z80BCPU	11.20
Z80PIO	5.15
Z80APIO	5.80
Z80SIO	14.50
Z80ASIO	16.00
Z80CTC	5.30
Z80ACTC	6.50
Z80DMA	15.50
Z80ADMA	19.50
8741A	39.50
8748 8	35.00
8749	55.00
8755A	39.00

VOLT REGS

LM309H	3.90
LM317HVK	7.50
LM337T	2.20
LM337HVK	12.00
LM337K	6.80
LM338K	8.60
LM350K	6.30
LM350T	4.50
LM396K	18.90
LM79L05	.70
LM79L12	.67
LM79L15	.62
SH1605	17.40
UA317T	1.40
UA317K	4.80
UA309K	2.40
UA494	5.04
UA7805	.84
UA7805K	2.16
UA7806	.94
UA7808	.82
UA7808K	2.38
UA7812	.78
UA7812K	2.38
UA7815	.72
UA7815K	2.38
UA7818	.82
UA7818K	2.38
UA7824	.82
UA7824K	2.38
UA78H05K	8.30
UA78H12K	9.95
UA78HGKC	10.00
UA78L05	.46
UA78L12	.50
UA78L15	.46
UA78M05	.82
UA78M12	.82
UA78P05K	15.70
UA78S40	3.50
UA7905	.96
UA7905K	2.35
UA7908	
UA7908K	2.38
UA7912	.96
UA7912K	2.35
UA7915	.98
UA7915K	2.38
UA79HGKC	16.90
UA79M05	.90
UA79M12	.90

OPTO

4N25	1.20
4N26	1.20
4N28	1.20
4N32	1.20
4N33	1.50
4N35	1.20
MCT6	1.90
MCT2	1.20
FND357	2.90
FND500	1.98
FND507	1.98
FND800	4.20
TIL31A	2.50
TIL81	2.00
BPW50	2.00
CQY89	.75
MOC3020	2.90
MOC3021	2.98
MAN72A	1.50
MAN74A	1.50
FCD820C	1.10
FCD825C	1.10
FCD850C	1.50
FPT100R	1.50
MSM3914	8.50
MSM3916	8.50

LEDS

TLG123 SGS 3mm GREEN	.16
TLR123 SGS 3mm RED	.10
TLO123 SGS 3mm YELLOW	.16
TLG113 SGS 5mm GREEN	.16
TLR113 SGS 5mm RED	.10
TLO113 SGS 5mm YELLOW	.16
Z0160 RECT RED	.25
Z0162 RECT GREEN	.25
Z0164 RECT YELLOW	.25
FLS016 5mm LED CLIP	.04

DIODES

1N4148	.05
1N914	.05
IN4001	.06
IN4002	.06
IN4004	.08
IN4007	.12
IN5404	.24
IN5408	.27
OA47	.46
OA90	.18
OA202	1.14
OA636	.96
P600G 6A400V	.59
BAW62	.30
BA102	.70
OA91	.27
OA95	.26
IN3492 25A100V	2.10
IN3492R 25A100V	2.10
IN5060	.35

BRIDGES

VJ448 10A400V	2.20
BR154 15A400V	3.50
BR254 25A400V	3.95
BR354 35A400V	4.50
P04 6A400V	1.50
RS20? 2A40? INLINE	.96
SB20? 2A400V	.75
W04 1.5A400V	.48

ZENERS

IN4733A 5.1V 1 WATT	.24
IN4734A 5.6V 1 WATT	.24
IN4736A 6.8V 1 WATT	.24
IN4740A 10V 1 WATT	.24
IN4742A 12V 1 WATT	.24
IN5349B 12V 5 WATT	1.10
BZX61/C75 75V 1.3 WATT	1.10

TRANSISTORS

AC126	.70
AC127	.60
AC128	1.20
AC187	.70
AC188	1.30
AD149	2.10
AD161	1.70
AD162	1.70
AF127	1.25
BC107	.35
BC107B	.40
BC108	.35
BC108C	.40
BC109	.35
BC109C	.40
BC177	.40
BC178	.42
BC179	.42
BC212	.25
BC318	.18
BC327	.18
BC328	.18
BC546	.18
BC547	.12
BC547C	.18
BC548	.12
BC548C	.18
BC549	.12
BC549C	.18
BC550	.18
BC556	.18
BC557	.12
BC557B	.18
BC558	.12
BC558B	.18
BC559	.12
BC559B	.18
BC637	.42
BC639	.40
BC640	.40
BCY70	.52
BCY71	.64
BD135	.44
BD136	.55
BD137	.47
BD138	.57
BD139	.50
BD140	.50
BD233	.52
BD235	.55
BD236	.55
BD237	.72
BD238	.57
BD262	.96
BD263	.94
BD437	.62
BD647	2.20
BD677	.81
BD681	.71
BD682	.71
BDV64B	2.80
BDV65B	2.80
BDV96	3.50
BDV92	3.90
BF115	.75
BF167	.75
BF173	.70
BF180	1.06
BF184	.78
BF198	.22
BF199	.22
BF337	.86
BF458	.68
BF459	.70
BF469	.95
BF470	.95
BF494	.31
BFY50	.60
BFY90	1.10
BU126	2.90
BU208	2.90
BU326A	2.90
BUX80	3.95
MFE121	1.45
MFE131	1.80
MJ413	4.90
MJ802	6.50
MJ1001	2.90
MJ15003	5.50
MJ15004	5.50
MJ2955	1.70
MJ4032	9.80
MJ4035	11.20
MJ4502	5.20
MJE340	.80
MJE350	1.30
MJE521	1.25
MJE700	.69
MJE800	.61
MJE2955	2.20
MJE3055	2.20
MPSA05	.19
MPSA06	.19
MPSA12	.20
MPSA14	.24
MPSA42	.27
MPSA56	.21
MPSA92	.25
MPF102	.56
MPF103	.79
MPF105	.79
MRF237	4.50
MRF454	35.00
MRF475	6.50
MRF901	3.30
TIP31	.53
TIP31A	.54
TIP31B	.60
TIP31C	.85
TIP32	.66
TIP32A	.67
TIP32B	.79
TIP32C	.80
TIP41	.99
TIP41A	1.06
TIP41B	1.14
TIP41C	1.16
TIP42	.93
TIP42A	1.25
TIP42B	1.30
TIP42C	1.32
TIP111	1.04
TIP112	1.10
TIP116	1.17
TIP117	1.45
TIP120	.84
TIP122	.92
TIP125	.99
TIP127	1.60
TIP2955	1.87
TIP3055	1.14
2N301	4.30
2N697	.59
2N918	.65
2N2219	.60
2N2219A	.65
2N2222	.42
2N2222A	.48
2N2369	.60
2N2484	.60
2N2646	.96
2N2647	2.50
2N2894	.53
2N2904	.73
2N2905	.73
2N2905A	.73
2N2906	.73
2N2907	.50
2N2907A	.50
2N3019	.69
2N3053	.64
2N3054	2.25
2N3055	1.30
2N3302	.53
2N3440	1.13
2N3441	2.60
2N3442	2.78
2N3563	.18
2N3564	.18
2N3565	.18
2N3566	.18
2N3567	.18
2N3568	.18
2N3569	.18
2N3638	.18
2N3640	.18
2N3641	.18
2N3642	.18
2N3643	.18
2N3644	.18
2N3646	.18
2N3702	.27
2N3704	.25
2N3771	4.85
2N3772	4.85
2N3773	5.40
2N3819	.80
2N3866	1.26
2N3904	.20
2N3906	.20
2N4032	.77
2N4033	.84
2N4036	.85
2N4121	.20
2N4236	1.80
2N4237	1.25
2N4250	.21
2N4258	.27
2N4355	.23
2N4356	.20
2N4360	.80
2N4401	.18
2N4402	.18
2N4403	.18
2N4416	1.40
2N4427	1.15
2N5088	.18
2N5089	.27
2N5179	1.56
2N5190	.86
2N5191	.88
2N5192	.98
2N5193	.81
2N5195	.86
2N5210	.24
2N5245	.83
2N5303	4.70
2N5401	.20
2N5457	.60
2N5458	.68
2N5459	.74
2N5461	.82
2N5485	.72
2N5486	.82
2N5590	17.80
2N5591	20.00
2N5770	.19
2N5777	1.20
2N5873	1.75
2N5944	15.50
2N5946	24.50
2N5961	.25
2N6027	.58
2N6084	22.00
2N6121	.77
2N6122	.77
2N6123	.74
2N6124	.78
2N6125	.81
2N6126	.98
2N6129	1.40
2N6130	1.80
2N6131	1.80
2N6133	1.95
2N696	1.30
2N918	.65
2SA683	.70
2SC1017	3.10
2SC1061	.83
2SC1096	.86
2SC1106	4.80
2SC1226	.95
2SC1306	1.50
2SC945A	.39
2SD350A	3.30
2SJ49	6.50
2SK134	6.50
3N201	2.18

SCR & TRIACS

C103D	.79
C106D	.96
C122D	1.75
C122E	2.30
C230D	6.80
Q4010L4	1.90
Q4015L5	2.70
Q6010L5	3.20
Q6015L5	3.50
Q6025H	9.80
S4015L5	2.20
S4025H	8.20
SC141D	1.35
SC146D	1.92
SC151D	2.84
ST2	.62
ST4	.80

TANTALUM

1UF 35V	.29
22UF/35V	.29
33UF/35V	.29
47UF/35V	.29
1UF/35V	.30
1.5UF/35V	.30
2.2UF/35V	.35
3.3UF/35V	.35
4.7UF/35V	.52
10UF/35V	.66

ELECTRO PCB

1UF/50V	.15
2.2UF/25V	.15
4.7UF/25V	.15
10UF/25V	.15
33UF/25V	.15
47UF/25V	.15
100UF/25V	.16
220UF/25V	.20
330UF/25V	.35
470UF/25V	.42
1000UF/16V	.45
1000UF/25V	.60
2200UF/25V	1.20

ELECTRO AXIAL

47UF/63V	.20
1UF/63V	.20
2.2UF/63V	.20
3.3UF/25V	.20
4.7UF/25V	.20
10UF/160V	.35
10UF/16V	.20
10UF/25V	.22
10UF/63V	.25
22UF/25V	.24
22UF/63V	.28
47UF/16V	.22
47UF/25V	.24
47UF/63V	.29
100UF/25V	.31
100UF/63V	.45
220UF/16V	.25
220UF/25V	.35
220UF/63V	.65
470UF/16V	.48
470UF/25V	.50
470UF/63V	.80
1000UF/16V	.55
1000UF/25V	.82
1000UF/35V	.98
2500UF/16V	1.14
2500UF/25V	1.50
2500UF/35V	1.90
2500UF/50V	2.60
4700UF/35V	3.45

ELECTRO METAL CAN

2500UF/80V	3.50
4000UF/75V	5.80
5600UF/40V	4.10
8000UF/75V	8.95

ELECTRO BIPOLAR

2.2UF/50V	.35
4.7UF/50V	.38
6.8UF/50V	.39
10UF/50V	.40
22UF/50V	.46

GREENCAPS

001UF/100V	.12
0015UF/100V	.12
0022UF/100V	.12
0033UF/100V	.12
0039UF/100V	.12
0047UF/100V	.12
0056UF/100V	.12
0068UF/100V	.12
0082UF/100V	.12
01UF/100V	.12
015UF/100V	.12
022UF/100V	.12
033UF/100V	.12
039UF/100V	.12
047UF/100V	.14
056UF/100V	.14
068UF/100V	.18
082UF/100V	.18
1UF/100V	.18
15UF/100V	.18
22UF/100V	.18
27UF/100V	.22
33UF/100V	.30
47UF/100V	.34
1UF/250V	.85
2.2UF/250V	1.25
3.3UF/250V	2.30
4.7UF/250V	2.80
6.8UF/250V	4.40
10UF/250V	5.90

GREENCAPS HIGH VOLTAGE

01UF/630V	.22
022UF/630V	.24
033UF/630V	.26
047UF/630V	.30
1UF/630V	.38
22UF/630V	.45
33UF/630V	.46
47UF/630V	.50

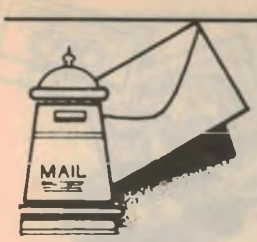
CERAMIC

1PF	.08
1.5PF	.08
2.2PF	.08
2.7PF	.08
3.3PF	.08
3.9PF	.08
4.7PF	.08
5.6PF	.08
6.8PF	.08
8.2PF	.08
10PF	.08
12PF	.08
15PF	.08
18PF	.08
22PF	.08
27PF	.08
33PF	.08
39PF	.08
47PF	.08
56PF	.08
68PF	.08
82PF	.08

STYROSEAL

56PF 630V	.25
68PF 630V	.25
82PF 630V	.25
100PF 630V	.25
120PF 630V	.25
150PF 630V	.25
180PF 630V	.25
220PF 630V	.25

MAIL ORDER MAIL ORDER MAIL ORDER



Letters to the editor

Comments on the Wattmeter design

I bought your September 1983 issue on account of the Wattmeter article . . . it seemed an inexpensive way to find out about transconductance amplifiers. Having read your article, I find I am only partially enlightened.

My main objective in writing was initially to ask you to furnish a more accurate description of the operation of the circuit, particularly the portion around IC1C. To my possibly inexpert eye, IC1C is a current summing amp, summing instantaneous values of power and current. Why this is necessary I'm not sure . . . for my sake, and for the sake of other equally confused readers, an explanation would be welcome.

Now to more important matters. As a practising electrical engineer who has had the misfortune to witness more than one electrical fatality over the years, I am appalled at the voltage and current sampling techniques you have employed in this circuit. If I, as electrical safety representative, at the site where I work, were asked to inspect such a device, I would condemn it on the spot. Furthermore, any company who furnished such a device would probably have a job to remain on any of our approved supplier lists.

Although I'm sure you are capable of picking up the problems for yourselves, I will list the obvious difficulties I can see.

1. The only truly acceptable way to "get at" the mains current and voltage values is to use suitable isolating transducers . . . in this case voltage and current transformers. For the degree of accuracy you are likely to achieve with this device, I would not expect provision of such devices to be a problem.

2. An inexperienced person following your schematic may well assume that your signal ground symbol is also chassis ground (it very often is). Grounding the neutral (possibly LIVE if the wiring is wrong) violates AS3000, as well as creating a severe safety hazard.

3. Has the unit NOT ONE fuse??

4. If you really are going to live with the device in its non isolated form, it must be prominently labelled, inside and out.

5. Is the PL range of transformers adequately rated as regards allowable voltage, secondary to ground? Does their approval allow them to be used with mains on the secondary side?

6. Is there not liable to be a hazard with the zero adjust screw on some types of meter?

I appreciate that you may not wish to publish this letter. However, I do suggest that you prominently note in your next issue some of the hazards inherent in this device. Better still, publish some CT and VT details – I know they can't be obtained in DIP packages, but I'm sure you'll manage.

Bruce Varley,
Melville, W.A.

COMMENT: Suitable current and voltage monitoring transformers are not readily available, and are expensive and are not really warranted for a circuit of this type. This circuit is no more dangerous than a light dimmer, drill speed controller or transformerless TV set. They all should be treated with great caution.

There really should not be any need for a fuse since the device is supposed to monitor standard appliances, most of which are not fitted with fuses themselves, eg, radiators. We accept your comment on the need for labelling. We are assured by Ferguson Transformers Pty Ltd that the bobbin method of manufacture of the PL range of transformers does render them suitable for the Wattmeter application. They also meet AS C126 which requires a high voltage test from secondary to core.

There may possibly be a hazard with a meter having a metallic zero adjusting screw but we do not know of such meters. In our experience, it is not the inexperienced constructor who is likely to make the mistake of not following the circuit. The circuit does have two different earth symbols and nowhere does it suggest that the circuit reference earth is connected to mains earth. Nor does either diagram suggest grounding the neutral.

Having said all that, we admit that the earth symbol on the circuit could be misleading and so we will avoid this in the future.

And again . . .

Let me first say that I owe a great deal to Electronics Australia from the days when I would re-read issues at least eight times in my struggle to understand more and more of the basics of electronics.

Several times in the past 15 years I have been tempted to write to your magazine; not the least of these being with April publication of the electronic carpenters' level (or was that bevel) which contributed immeasurably to the mental health of termites and sent me into embarrassing fits of appreciation.

There has, however, been an error repeated in many of your recent projects where they deal with mains power. (In places other than just to supply the transformer.)

This error has been the haphazard use of the earth symbol in these circuits. By definition an earth symbol means that body of mass on which we stand when our shoes get muddy. Yet the earth symbol in these circuits has been used for the purpose of indicating a common point of connection on the power supply.

Usually there is no harm in this departure from its correct use; but where it is used in a circuit which interacts with the 240V AC power supply it is, at minimum, misleading and, in some cases, downright dangerous.

The latest faux pas occurred in the Electronic Wattmeter of September 1983 where, if wired according to the circuit diagram, the wattmeter would not work. This is because the circuit places an earth on the load side of the neutral current measuring device and hence shorts it out.

I hope that your magazine takes this letter to heart and that no budding experimenter is added to the number of people electrocuted each year, in his attempt to wire one of these circuits faithfully.

L Daley,
Sunshine, Vic.

COMMENT: See the previous letter.

Happiness is a CD player

It was a very pleasant surprise indeed to hear of my success in the EA/Marantz crossword. Several weeks have now passed since the arrival of my CD73 Compact Disc Player, it being delivered and installed by Mr Peter Rahilly, the Victorian branch manager for Marantz.

I now have a growing collection of discs and wish to report that all claims of superb fidelity and total absence of surface noise are true. Listening has been a pleasure.

Peter Andrews,
Westmeadows, Vic.

REVIEWS OF RECENT Records & Tapes

CLASSICAL • POPULAR • SPECIAL INTEREST

Mahler: "Norman's finest recorded effort"

MAHLER

The Song of the Earth. Jessye Norman and Jon Vickers with the London Symphony Orchestra conducted by Sir Colin Davis. Philips Digital Disc 6514 112.

When I saw Jessye Norman's name in the soprano role I thought excitedly "Here's one in the Ferrier class". And in the farewell, despite its slow tempo, I was not disappointed. It is, I think, Norman's finest recorded effort to date.

I was not quite so happy about some of the other aspects of the ultra complex score. In the first movement, "Drinking Song of the Earth," Jon Vickers attacks it with such haste as to suggest over eagerness to get to the cellar. His fierce enthusiasm almost suggests that he has already been there. Recorded very forward, his voice sometimes comes perilously close to the Bayreuth bark.

In the "Lonely man in Autumn", a chilly oboe hints momentarily at an interposition of Sibelius. Then Norman enters, her low notes as thrilling as her soaring peaks – a bewitching performance.

The third movement, "Of Youth," is the least satisfying in the whole work. Haste adds nothing, just as in the First. It has indeed the opposite effect. The Li-Po text tells of a fragile pavilion made of porcelain in which friends meet wearing exquisite clothes and write elegant poetry. It is all as simple as an early Chinese landscape painting. But not here. A pugnacious Vickers sounds like he's biting the notes and Davis' fast chinoiseries reminds me of an orchestral version of the old piano "chopsticks".

As if to make amends, in "Of Beauty" he couldn't make his fine orchestra sound more sensitive. He catches to perfection the athletics of golden youth. Vickers sings "The Drunkard in Spring" as if flinging a challenge at his audience; "I'll fight any man in the bar" sort of thing.

Then comes Norman's great "Farewell" and here is enchantment. Although it lasts 35 minutes it embraces the mind and emotion the whole time. And Davis partners her to perfection. Her glorious voice is always under complete control enabling the most sensitive nuancing.

Wonderful as she is in the whole movement it is in the final coda, the irresolution of the last fading repeated bars drifting out of consciousness into silent eternity that she is all engrossing. I admit I scarcely breathed as I listened to it. And Davis' co-operation is incalculably fine.

Throughout the entire work the digital sound has impeccable clarity and is never marred by too wide a dynamic range. And the London Symphony Orchestra has never played better. (J. R.)

SIBELIUS

Symphony No. 5 in E Flat. Finlandia. Valse Triste. Berlin Philharmonic Orchestra conducted by Herbert von Karajan. DGG Analog Disc (Resonance series) 2535 319.

This mixture of nobility and mystery receives a full measure of both in this superb performance. Karajan has recorded the work several times before but I think this is his best. In it he is at his most spacious, a feature that suits this symphony admirably. Many musicians think this is Sibelius' finest symphony but those with a deeper appreciation of his work give this place either to the dour Fourth or the Sixth, both in form and content.

In his previous recordings of the Fifth Karajan sought – successfully – the rich atmospheric effects that can be emphasised. In the pressing under review Karajan dwells on the colder, more remote, true Sibelian qualities of the work. Yet he never sacrifices tone colour or sonority and the whole work is directed towards the great broad final theme which suddenly changes unexpectedly into the major towards the end.

It is here that the engineering, splendidly up to date, grows into something magnificent though one listens to the final bars with unease on account of one's neighbours. By the way, the dynamic range, though unusually wide, is never soft enough at the lower end to make the pianissimo notes inaudible, though I cannot imagine them softer. The sound (analog) is resonant and has on it an irresistible bloom.

Karajan makes of the first movement one of those desolute unpeopled landscapes so familiar to lovers of his work. If one is fanciful one might imagine, during one passage, having stumbled across a village with some small bustle. But perhaps that's going too far. The second movement could not be made to sound more chilly except in an occasional effective bar and towards the end of the movement.

The finale starts like spring after winter. The great wide tune expands (under wise restraint) until the apotheosis when it bursts into the true grand manner.

Of the two fills, the fiercely proud nationalistic Finlandia is made to sound almost unbearingly exciting with its magnificent brass writing in the often-repeated starkly rhythmic interruptions, and Waltz Triste is just that, only probably more triste than you have ever heard before. Altogether a superb production. (J. R.)

TCHAIKOVSKY

Hommage a Kiril Kondrashin. Piano Concerto No. 1 in B Flat Minor. Martha Argerich (piano) with the Bavarian Radio Orchestra conducted by Kondrashin. Philips Analog Disc 6514 118.

Here is an amazing feat of virtuosity marred, alas, at times, but not too often, by a slip of the finger, and such is the speed, occasional loss of clarity in the fastest of the fast passages.

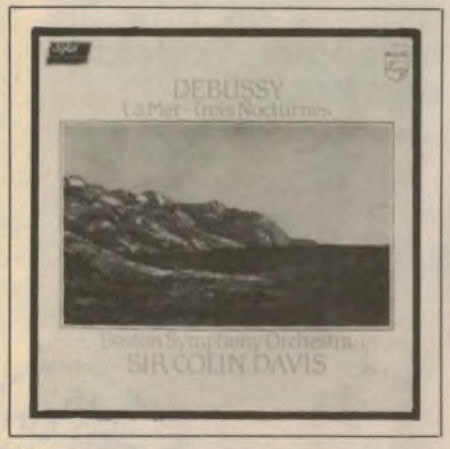
This lack of clarity could be put down

to a live performance made fairly recently in Munich but, alas, I fear not. Ms Argerich is strong minded about her speed: whenever she embarks on a new section she presses forward, pulling the orchestra with her. The record is titled "Homage to Kondrashin" and he certainly deserves homage for the way he manages to keep his orchestra up with the soloist's fleetness.

There are bars where the balance is not the best, where the band fades behind the piano part. The delicious little nursery tune in the second movement is an example where the orchestra becomes almost inaudible between merely mezzo-fortissiso piano playing. But generally speaking the balance is satisfactory during the bulk of the concerto and perhaps the uncertainty of live acoustics may account for the rare lapses.

Ms Argerich's first descending run in the first movement prepares you for a spirited performance and you are not betrayed. Some might think her rubatos a bit overdone. I don't, and think there is nothing wrong in introducing them into so luscious a piece as this work

So here it is, as fast a performance as, at a guess, has ever been recorded and none the worse for it. The analog sound is fine: some tendency to reverberation is obviously due to the hall. (J. R.)



DEBUSSY

Three Nocturnes, Clouds, Fetes, and Sirens. La Mer. Boston Symphony Orchestra conducted by Colin Davis, Philips Digital Disc 6514 260/

These two compositions are the most frequently coupled of all Debussy's orchestral music and here is an example you will have to go far to beat. The Boston is at its best, the sound (digital) fine and Davis completely in sympathy with his orchestra and composer.

It is the sort of recording you can listen to in complete security satisfied that nothing will go wrong. Starting with the Nocturnes the clouds, huge cumulus ones, drift lazily across the sky over a peaceful landscape. Davis' long legatos are a joy to listen to.

Then comes the startling contrast of Fetes. I have never been able to come to terms with Debussy's own explanation of what he intended to depict. He claims he was describing the light dancing off sun-illuminated dust motes in the air. In which case why the title Festivals? To me it means just that, bustle, rhythmic dancing, and in one spot even a procession. It was in this piece I found my only disappointment – the magnificent side drum that ushers in the magnificent climax to the procession can scarcely be heard. But the rest of the piece glitters superbly. And the important percussion is faultlessly balanced. Its energy seems boundless. Then comes the mystery of Sirens, the wordless women's chorus emerging with just the right vagueness from a mist shrouded island. No wonder they had to tie Ulysses to the mast if it sounded like this to him.

La Mer receives equally elegant treatment. I was particularly impressed by the delicate sparkling ebb and flow of the wavelets over rock pools in Jeu des Vagues, in the second movement. Then came the interruption of a full-sized wave. I think this was the reason Debussy chose the great Hokusai print of "The Wave" as an illustration to the first printed score.

The last movement is menacingly stormy in constantly uneven movement. It is a pity that on my pressing the final flute solo sounds a little flat. These two tiny faults mar what would have otherwise been perfect performances and recordings. (J. R.)

MOZART

Piano Quartet in E flat major, K.493.

FAURE

Piano Quartet in G minor. New England Ensemble, Cherry Pie/Festival Audiophile Analog. LA 07726.

Here is another near immaculate analog disc from Cherry Pie/Festival, faithfully reproducing every nuance. The level is very forward, so adjust your gain accordingly. In the Mozart, the piano ripples beautifully with a true Mozartian touch. The others, too, preserve a good tone throughout. This is no tick-tock Mozart but the real thing – no blaring fortissimos or inaudible pianissimos.

It also has one of the Master's greatest slow movements in the larghetto. Deeply felt, it is never sombre in its affectionate musings. It seems churlish among

such goodies to pick out the piano for special mention but, in the nature of things, it has the most prominent part. It is even more dominant in the Finale but never puts a foot wrong. The fast passages are cream smooth. I consider this well worthy of overseas distribution.

I didn't like the Faure quite as much. The players seem to try just a trifle too hard to make it sound like French. Not that I am advocating nonchalance but a gutsy style is not Faure's. In the second movement the complex changes of time signature come off highly commendably, without a single falter. The third movement, as in the Debussy recently reviewed, comes closest to the French style. The Finale is also full of unexpected changes of rhythm all brought off successfully. The prestissimo sequence is as good as you'd hear anywhere. (J.R.)

CLAUDIO ARRAU — A RETROSPECT

Piano works by Liszt, Schumann, Chopin, Debussy and Ravel. Three boxed analog discs of remastered recordings from 1945 to 1952. CBS75434.

That great pianist Claudio Arrau is about as versatile as any playing today and he is equally talented in this retrospective album comprising three analog discs recorded over quite a span of years. The album comprises the two Liszt concertos and smaller pieces and Schumann's great Kreisleriana with some Chopin, Debussy and Ravel put in for good measure and splendid contrasts.

Arrau is now 80 and like his great contemporary, the late Arthur Rubinstein, shows no sign of ageing in his playing. In the space available here it is not possible to review all the works individually but taken as a whole they form a fine memorial to one of the greatest artists of his time.

But there is one point I'd better mention. You might find some of this Debussy and Chopin a trifle straight-

The story of a most incredible journey!

Dick Smith's Solo helicopter flight

The Earth Beneath Me

In a word . . . magnificent! See the world as it's never been seen before in this day-by-day account of one of the aviation events of our time.
From the scorching deserts of the Middle East to the frozen wastes of the Arctic, Dick has captured every incredible moment for all to share and enjoy.
And even more: a 'guided tour' of Dick's helicopter VH-DIK, showing all the controls, what they do – even how to fly it!
A beautifuly hard-bound edition for years of enjoyment – you must read 'The Earth Beneath Me'. Cat B-9105

- Over 100 magnificent full colour plates.
- 256 pages, including sections on how the helicopter operates and flies

AS SEEN ON JOHN LAWS' WORLD

A wonderful collector's item and gift idea! ONLY $24.95

Also Available on Video Cassette
Contains three one hour commercial documentaries of the flight, as seen on John Laws' World. Available in either VHS of BETA formats. (Mail order only) ONLY $69.50

DICK SMITH Electronics

STORES THROUGHOUT AUSTRALIA OR USE THIS EASY MAIL ORDER FORM

FREE POSTAGE & PACKAGING

THE EARTH BENEATH ME
BOOK B-9105 ☐ @ $24.95 ea VIDEO VHS ☐ @ $69.50 ea
VIDEO BETA ☐ @ $69.50 ea

I enclose cheque/postal order for $ .....
Or please charge to my Bankcard

CARD NO. | | | | | | | | | | | | | | | |

Signature .....
Name .....
Address .....
..... P/code .....

DICK SMITH MAIL ORDER CENTRE
P.O. Box 321
North Ryde, N.S.W.
2113

A 621/L1

Records & Tapes

laced but there is a reason for it. Arrau once told me he was reluctant to put rubatos into recordings. Live, on the concert platform, yes. But recorded he thought that with the listener knowing exactly where to expect it one would find it tiresome to hear it repeated regularly in the same place. I think he might have something there. The sound stands up very well. (J. R.)

Arthur Fiedler and the Boston Pops

MR MUSIC

Arthur Fielder and the Boston Pops Orchestra. Stereo, two LPs, originally released through Polydor/DG, now distributed by World Record Club as R-11010.

"How to enjoy a symphony orchestra without having to listen to a symphony" would be an apt description of the Boston Pops Orchestra under Arthur Fiedler. While his background would have supported a career in the classical music field, and while he had the direction of a very capable orchestra, both were fated to find greater public acceptance playing scaled-up popular music, spiced with just a few classical excerpts.

To judge by the copyright notes, the contents of this double album set were recorded mainly during the period 1970-1976, with Fiedler aging, but still very active. When he died in 1979, the items were grouped in this double album, along with a black-and-white portrait from the Boston Public Library and an appeciation by Michael Steinberg reprinted from the Boston "Phoenix".

The album is obviously much less topical now than it was then but it still contains an impressive array of popular music, given the big orchestral treatment. All told, there are 28 tracks on the four sides; it is not practical to list them all here but we can name a few:

On side one: a generous orchestral medley from "Hair" – Day by Day from "Godspell" – September Song (Kurt Weill).

On side two: The Entertainer – Snow White and the Seven Dwarfs Fantasy – Love Theme from The Godfather – Sesame Street Theme.

Side three: Maple Leaf Rag – Stardust – Bugler's Holiday – Jalousie – Let It Be – Bridge Over Trouble Waters, etc.

On Side four: A brief glimpse of Arthur Fielder and his classical "first love": the most animated version of the Sabre Dance (Khachaturian) that you'll hear in many a day – Claire de Lune (Debussy) – Hallelujah Chorus (Handel) – Entrance March from "the Gypsy Baron" and more.

Recorded during the '70s, the sound quality is well up to normal analog standards. In its class, its good value, both as a memento and as a source of entertainment in its own right. (W.N.W.)

POULENC

GLORIA for Soprano, Choir and Orchestra. Sylvia McNair and the Atlanta Symphony Orchestra and Chorus. CONCERTO for ORGAN, STRINGS and TIMPANI. Michael Murray, Organ. Digitally mastered stereo, Telarc DG-10077. [From P.C. Stereo Pty Ltd, PO Box 272, Mt Gravatt, Qld 4122. Phone (07) 343 1612.]

Composed in 1959-60, Poulenc's "Gloria" was commissioned by the Koussevitsky Music Foundation in the Library of Congress and was first performed by the Boston Symphony Orchestra under Charles Munch in 1961.

Although of the Catholic faith and

professedly a deeply religious man, Poulenc did not hesitate to re-examine and re-think the ancient hymns on which his Gloria is based and to reject much of the stuffy formality which had become associated with them over the intervening centuries.

His opening "Gloria", a hymn introduced into the Christmas Mass during the fifth century, swirls with movement and joy as the angels announce the birth of their Saviour before the Heavenly Throne. "Laudamus Te" and "Domine Fili Unigenite" glow with adoration of the newborn Son of God. "Domine Deus" has a sense of fervent awe, the work ending in passionate devotion to the Messiah: "You alone are the Lord. You alone are the Most High".

In this context, the soloist, the chorus, orchestra and conductor make their commendable contributions to the whole, with attracting conscious attention – this meant as a tribute, not a criticism. The recording itself is similarly an adequate part of the whole: clean, full sound, without being obtrusive in the technical sense.

On side 2, the Organ Concerto is a musical experience of another kind. Poulenc had little first-hand knowledge of the organ but, according to the jacket notes, drew on the resources of his friend Maurice Durufle, a virtuoso and composer "with roots in the grand tradition of Franck, Gigout and Vierne".

The concerto, first performed in 1938, requires the use of an instrument with finely voiced solo stops as well as adequate ensemble and chorus combinations. The instrument used here is an Aeolian-Skinner in the American classical organ tradition, installed in the Cathedral of Saint Philip in Atlanta. It has 4 manuals and pedals, 94 stops and 112 ranks of pipes.

Playing this magnificent instrument, Michael Murray, himself a protege of the French organ virtuoso Marcel Dupre, sounds completely at home. The feature and charm of the Concerto is the manner in which the organ voices and strings merge and emerge, one from the other in constant interplay. There is much here for the organ enthusiast to enjoy.

Recorded last year in Atlanta Symphony Hall, and in the Cathedral of Saint Philip, the sound was captured by Telarc's usual combination of three Schoeps Colette series microphones and recorded on a Soundstream digital tape system. The associated circuitry was transformerless and, after the initial set-up, no monitoring or processing of the signal occurred during the recording.

One needs only to add that the sound off disc is all that you would expect: smooth and clean. (W.N.W.)

DION

I PUT AWAY MY IDOLS. Stereo, Dayspring DST-4109. [From Word Records Aust, 18-26 Canterbury Rd, Heathmont, Vic 3135. Phone (03) 729 3777].

As pictured on the jacket, with tweed cap and guitar over his shoulder, Dion looks like a young man straight out of London. But his name is Dion DiMucci and the recording originated in Miami, Florida.

Dion is lead singer, guitarist and arranger and he is backed by the "Bran Muffin" Band – named musicians playing guitars, percussion, bass, piano, organ, harp, synthesiser, sax and congas, plus a string support group.

The first two tracks "Here Is My Servant" and "Trust In The Lord" both come with a heavy beat. "Day Of The Lord" follows, by contrast a gentle duet with Pamela Sessody. The title track "I Put Away My Idols" is a clear testimony which says just that, in a heavy rock format. Track 5, "Daddy", reverts to soft rock.

On side 2, "Very Soon" brings a touch of Latin-American, while "They Won't Tell You" reverts to the big beat. Then follow "Healing", "Give Up And Surrender", rock style, and a very quiet "My Prayer For You".

As you've doubtless concluded by now, this is primarily an album for the younger generation, but one with a clear message, picked up on the jacket "Where your treasure is, there will your heart be also" (Matthew 6:21).

The diction is quite good and the sound is clean. (W.N.W.)

PIERRE FALCO

Chante Francis Lai. Powderworks Records Stereo. POW 3017. (Festival release).

Anyone who grabs this record on impulse as they walk through their supermarket should be more careful. You might think that it has some connection with the Austrian group "Falco" which had the recent hit "Der Commandant".

Pierre Falco would appear to have no connection with that group. Instead, he sings in French, songs of the composer/arranger Francis Lai. As such, he is a good singer and the overall production will appeal to those who want a romantic setting for a candlelight dinner.

The recording quality was very good except that the overall balance had a slight tendency to be heavy in the bass register.

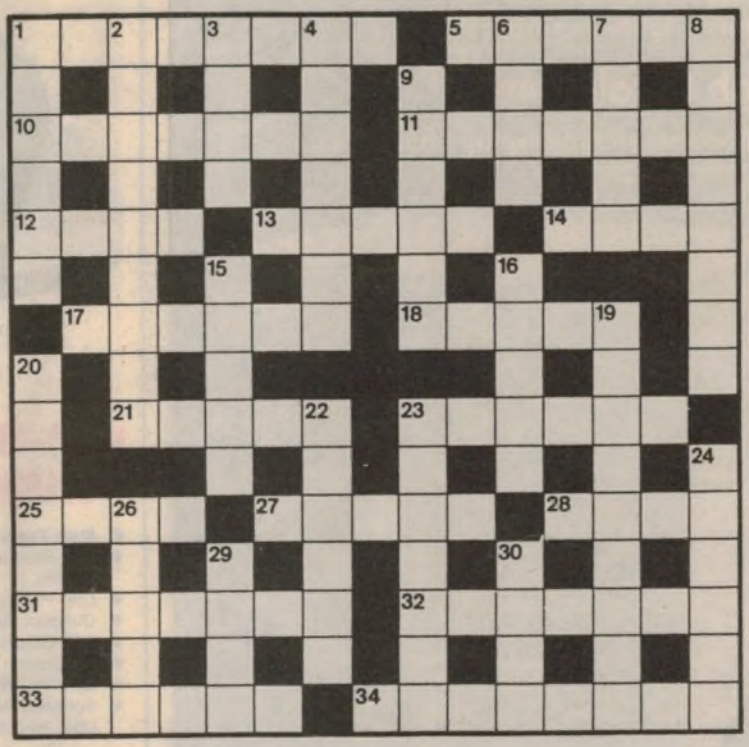
The 10 tracks are as follows: Quand on S'en Va Le Coeur Oublie – Vivre D'amour-Un Homme Et Une Femme – Garde Toi-Loin De Paris – L'oiseau Bley S'en Va – Hotel Du Hasard (Passion Flower Hotel) – La Chanson De Melissa-Mon Voyageur De Lune – Love Story (Une Histoire D'amour). (L.D.S.)

Solution for October

T	R	I	O	D	E		B	A	N	D	P	A	S	S
H		N		A		F		M		A		M		T
E	L	E	C	T	R	O	N	S		T	I	M	E	R
O		R		A		C		I		E		E		I
R	A	T	E		S	U	R	G	E		S	T	E	P
Y		I		M		S		N		P		E		P
	F	A	R	A	D		R	A	S	T	E	R		E
F				I		P	A	L		Y				R
A		R	A	N	D	O	M		S	P	A	R	K	
I		E		S		S		B		E		A		A
L	E	A	K		M	I	X	E	R		A	T	O	M
U		C		T		T		E		E		I		P
R	O	T	O	R		I	M	P	E	D	A	N	C	E
E		O		U		V		S		G		G		R
S	C	R	E	E	N	E	D		N	E	S	S	I	E

Electronics Australia

NOVEMBER CROSSWORD



ACROSS

1. Physical components of a computer system. (8)
5. Traverses a CRO screen. (6)
10. Sources of a field. (7)
11. Component of computer logic. (3,4)
12. US space exploration organisation. (4)
13. The state of electronics nowadays. (5)
14. Cause of heterodyne effect. (4)
17. Extract information from signals. (6)
18. Powerful underwater ray. (5)
21. Computer memory. (5)
23. What produces the piezo-electric effect? (6)
25. Type of electronic switch. (4)
27. Undesirable circuit. (5)
28. Possible shape of a bridge. (4)
31. Improve the quality of a received signal. (7)
32. Composed of individual units. (7)
33. Bares insulated wire. (6)
34. Complementary material for 1 across. (8)

DOWN

1. Function of a radio beacon. (6)
2. Components of a memory system. (9)
3. Produce tears. (4)
4. Clear a memory. (7)
6. Unit of power. (4)
7. Remove a recorded signal. (5)
8. Range of frequencies. (8)
9. Rare element used in transistors. (6)
15. Computer language. (5)
16. Characteristic of xenon, neon, argon and so on. (5)
19. What follows electronics in this magazine? (9)
20. Unmodulated waves. (8)
22. Sources of TV blurring. (6)
23. ACT mountain observatory. (7)
24. Simplest way of buying an electron gun? (6)
26. Once-proposed medium of electromagnetic waves. (5)
29. Part. (4)
30. Remove unnecessary text. (4)

ROD IRVING ELECTRONICS

425 HIGH ST, NORTHCOTE 3070 VIC — PHONE (03) 489 8131
48-50 A'BECKETT ST, MELBOURNE 3000 VIC — PHONE (03) 347 9251

NEW VIDEO MONITORS

Get a clear honest image!

Computer data and graphic displays never looked better, brighter, sharper

High Resolution

- Recommended Display Characters: 1920 (80x24).

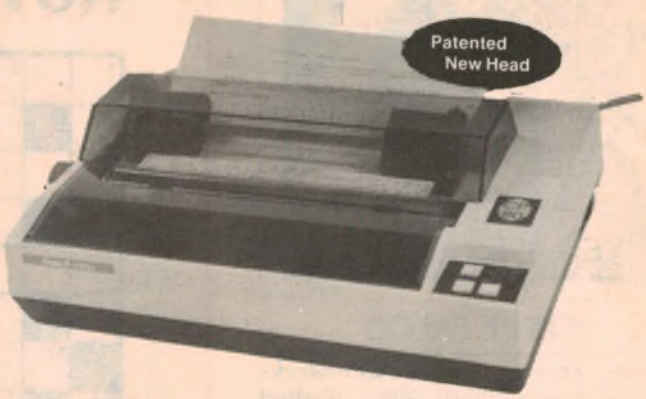
SCHOOL AND CLUB BULK BUYS — Please ring for pricing

- High quality, non-glare CRT
- Compact and Lightweight with all Controls Inside Front Panel.
- All units 100% Factory Burned-In.
- 800 lines centre resolution.
- Suitable for Apple® — and other computers. (Apple is a registered trademark of Apple Computer Computer, Inc.)
- Green or Orange Phosphor available.
- 18 MHZ.
- Direct Import Price

GREEN PHOSPHOR $199.00 S.T.I.

ORANGE PHOSPHOR $229.00 S.T.I.

Free box of 2000 sheets of paper with each Printer sold



A NEW PRINTER NOW!

CP-80/I, 80-COLUMN IMPACT PRINTER

■ **Main Features of CP-80/I**

- With Slide to Stratification Technology Head for high Density Dots Printing.
- Low Price.
- Compact, and Lightweight Designed.
- 640 Graphic Dots Line.
- 80 Column dot Matrix Printer with a full of Functions.
- Cartridge Ribbon.
- Connectable to the many types of Computers for the Home or Office USE, also for OEM.

Specifications

1. Functional specifications

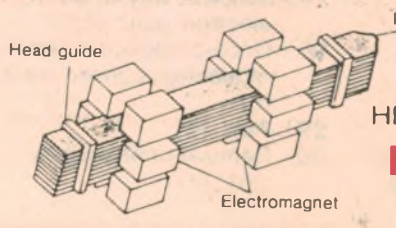
Printing method: Serial impact dot matrix. *Printing format*: Alpha-numeric — 7 x 8 in 8 x 9 dot matrix field. Semi-graphic (character graphic) — 7 x 8 dot matrix. Bit Image graphic — Vertical 8 dots parallel, horizontal 640 dots serial/line. *Character size*: 2.1mm (0.083")-W x 2.4mm (0.09")-H/7 x 8 dot matrix. *Character set*: 228 ASCII characters; Normal and italic alpha-numeric fonts, symbols and semi-graphics. *Printing speed*: 80 CPS, 640 dots/line per second. *Line feed time*: Approximately 200 msec at 4.23mm (1/6") line feed. *Printing direction*: Normal — Bidirectional, logic seeking. Superscript and bit image graphics — Unidirectional, left to right. *Dot graphics density*: Normal — 640 dots/190.5mm (7.5") line horizontal. Compressed characters — 1280 dots/190mm (7.5") line horizontal. *Line spacing*: Normal — 4.23mm (1/6"). Programmable increments of 0.35mm (1/72") and 0.118mm (1/216"). *Columns/line*: Normal size — 80 columns. Double width — 40 columns. Compressed print — 142 columns. Compressed/double width — 71 columns. The aboves can be mixed in a line. *Paper feed*: Adjustable sprocket feed and friction feed. *Paper type*: Fanfold. Single sheet, thickness — 0.05mm (0.002") to 0.25mm (0.01"). Paper width — 101.6mm (4") to 254mm (10"). *Number of copies*: Original plus 3 copies by normal thickness paper.

2. Mechanical specifications

Ribbon: Cartridge ribbon (exclusive use) black. *MTBF*: 5 million lines (excluding print head life). *Print head life*: Approximately 30 million characters (replaceable). *Dimensions*: 377mm (14.8")-W x 295mm (11.6")-D x 125mm (4.9")-Hincl. sprocket cover. *Weight*: Approximate 5.3Kg (11lb). *Power requirement*: 100VA max. *Temperature*: Operating — 5 to 40 degree C (41 to 104 degree F). Storage — minus 30 to 70 degree C (−22 to 158 degree F). *Humidity*: Operating — 5 to 90% RH, no condensation. Storage — 0 to 95% RH, no condensation. *Shock*: Operating — 1G (less than 1 msec). *Vibration*: Operating — 0.25G, 55Hz max. Storage — 0.5G, 55Hz, max. *Insulation resistance*: 10 Meg ohm between AC power line and chassis. *Dielectric strength*: Between AC power line and chassis, AC 1KV (RMS) 50Hz or 60 Hz, during one minute and no abnormal condition shall be observed.

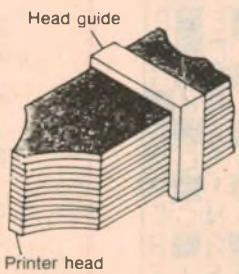
3. Interface specifications

Interface: Standard Centronics parallel. Optional RS-232C. (SERIAL). *Data transfer rate*: 4000 CPS max. *Synchronization*: By external supplied STROBE pulses. *Handshaking*: By ACKNLG or BUSY signals. *Logic level*: Input data and all interface control signals are TTL level.



HEAD CONSTRUCTION

PARALLEL $495.00



SERIAL $595.00

Dealer and Bulk enquiries welcome

NB: Printers might differ slightly to the photo.

Mail Order Delivery Instructions: Minimum Pack and Post $2.00 for Australia Post. Please allow extra for bigger orders and Certified, Airmail or Registered Post. Minimum order is $5.00. Please address orders to Mail Order Department, PO BOX 235, NORTHCOTE, 3070, VICTORIA. PHONE (03) 481 1436.

ROD IRVING ELECTRONICS

425 HIGH ST, NORTHCOTE 3070 VIC PHONE (03) 489 8131

WHERE ELSE COULD YOU GET A DISK CONTROLLER FOR A MICROBEE™

FOR $395 INC. TAX

YES, WE HAVE PRODUCED OUR OWN DISK CONTROLLER AND IT HANDLES 8" DRIVES OR 5" DRIVES. COME AND SEE IT WORKING AT OUR CITY STORE.

CONTROLLER CARD + 1M BYTE DRIVE + CASE + POWER SUPPLY

$795

INC. TAX ($695 EXC TAX)

CONTROLLER CARD + 2 1M BYTE DRIVES + CASE + POWER SUPPLY

$1195

INC. TAX (1045 EXC TAX)

Note these prices do not include operating system.

ALSO AVAILABLE WITH TWO 8" DRIVES — $1695 INC. TAX.
Yes, we have a BIOS for 8" on the way.

WHAT ABOUT AN S100

(IEEE — 696) EXPANSION 5 SLOTS FOR $450

This unit has all the S100 signals so you can add in boards to carry out a host of functions. (Available in 4 weeks). (Note: Master/Slave operation of the Microbee unit is not implemented).

CHECK OUR PRICES ON PRINTERS PAPER — DISKS AND RIBBONS

For example 2000 9" x 11" sheets, keen edge $34.80 inc. tax.

™ MICROBEE is a registered Trademark of Applied Technology.

48-50 A'BECKETT ST, MELBOURNE 3000 VIC **PHONE (03) 347 9251**

Mail Order Delivery Instructions: Minimum Pack and Post $2.00 for Australia Post. Please allow extra for bigger orders and Certified, Airmail or Registered Post. Minimum order is $5.00. Please address orders to Mail Order Department, PO BOX 235, NORTHCOTE, 3070, VICTORIA. PHONE (03) 481 1436.

MicroBee IC comes with software

by PETER VERNON

The MicroBee IC is the newest version of the well-known MicroBee computer, with features that should further enhance the popularity of the system.

While retaining the same case and keyboard, the MicroBee IC (for Integrated Computer) provides faster operation as a result of upgrading the system clock speed to 3.375MHz and comes with an extensive array of built-in software.

We first reviewed the MicroBee computer in our February 1983 issue and our comments then remain applicable – "a compact, neatly presented unit . . . not much bigger than some machines being promoted as 'handheld' computers". The potential of the MicroBee as a portable computer has yet to be exploited, chiefly due to the need for an external plug-pack power supply.

The powerful MicroWorld Basic interpreter was fully described in the previous article so we will not go into detail here. Version 5.22e, supplied with the IC system, has a number of modifications worth mentioning however, more for the light they throw on Applied Technology's plans than for their current usefulness.

The new version of Basic is fully upward-compatible with older versions so programs written for previous versions will run without changes under the new. The major modification is the inclusion of new statements to support colour operation so that no software changes are necessary when a colour display board is installed in the MicroBee. The COLOUR statement allows the selection of one of 32 foreground colours in conjunction with one of eight background colours specified by COLOURB. A third statement, COLOURM, selects a half-intensity background colour mode. Colours are specified for each character block on the screen, so any graphics character, for example, can be displayed in one colour only, limiting the high resolution capability of the system.

Other new statements include the PAK command, which allows the selection of one of several banks of Read Only Memory. Future plans for the MicroBee include the production of ROM cartridges, a number of which could be installed in the system and activated by the appropriate PAK (number) command. At the moment these cartridges are in the planning stage, and the PAK command is equivalent to typing EDASM (it activates the ROM software installed at address C000).

One other minor change is the inclusion of the commands LISTU and LISTL, which gives the user the option of listing programs with Basic keywords in upper or lower case – contributing to the readability of listings.

The Admate DP-80 printer is distributed by Applied Technology for use with the Microbee computer. The 80cps dot matrix printer provides a range of type fonts and sizes and dot-addressable graphics, accepting either friction or tractor-feed paper.

Word processing is built in

The MicroBee IC also features an enhanced version of WordBee, a ROM-based word processing program. Version 1.2 of the program incorporates several modifications, both to eliminate defects of the earlier version and to implement suggestions from users.

The major (and very welcome) change is that WordBee now supports redirection of input and output in the same way as does Basic, allowing a parallel printer to be used with the system with a minimum of fuss. The new "O" command allows output to parallel and serial printers (at either 300 or 1200 baud) or output to a cassette recorder, and will also work in conjunction with the NET communications program.

The new WordBee also supports the special features of the low-cost Centronics-type dot matrix printers now appearing on the market. Underlining and double-strike printing can be switched on and off by inserting user-defined markers in the text, and the .XN and .XY commands are now fully implemented, allowing a printer to be switched on and off-line by the computer. Also available is the .ES command which allows control codes to be sent straight through to the printer port to enable features such as double-width printing and bit-mapped graphics.

Other modifications to the word processing program have generally speeded up operation. Text wrap-around and screen updating are now much faster (no more dropped characters, even at typing speeds of 50 words per minute). The on-screen HELP files (a nice feature) have

The Microbee IC in operation. On the screen is the initial WordBee menu.

also been re-formatted for greater clarity.

To make room for the additional code required for these enhancements the diagnostic "tape CRO" program has been removed from the new WordBee ROMs. It is still available on cassette tape however.

Using WordBee

The first screen display on entering WordBee is an "interface menu" which serves as a despatch point for subsequent commands. Either of the two HELP files can be used to display editing or printer control codes and text can be loaded or saved to tape. Printing of a text file is initiated from this level, and the user can also activate Basic, the network communications program or the machine language monitor from this menu. At any time during text entry the interface menu can be activated by pressing the line feed key on the keyboard.

Pressing RETURN while in the interface menu puts the user in the text editing mode, signified by a blank screen with a flashing block cursor. Combinations of the Control key and a letter key control the movement of the cursor and allow the insertion and deletion of lines and characters in the text and activate a separate block move mode.

The cursor control keys are chosen so that they are arranged in a diamond pattern on the standard typewriter keyboard. CTRL-E, for example, moves the cursor up one line, CTRL-S and -D move the cursor left and right respectively and CTRL-X moves the cursor down one line. CTRL-A moves the cursor to the start of the current line, and in answer to numerous requests there is now also a CTRL-F combination which will move the cursor to the end of the current line. The logic of this choice is dictated by the layout of the other cursor movement keys, but it does mean that the search command of previous versions of WordBee (CTRL-F for "Find") has had to be re-named. The search function is now initiated by pressing CTRL-L (for "Locate").

While not new, we should also mention the insert and delete functions provided by CTRL-V and CTRL-G because we missed them last time. Control-V activates a character insert mode which moves existing text to the right to make space for new characters as they are typed. Control-G on the other hand deletes the character under the cursor and moves the text to the left to close up the vacant space. This is not quite the same as using the Delete key, which will erase characters without closing up the space.

An interesting use of the I/O redirection facility allows on-screen review of the appearance of the final printed document. By specifying "O" in the interface menu before beginning a print-out, the text will be sent to the video screen rather than the printer. The dot commands which specify printing format will be operative however, allowing the user to check specifications such as line length, line spacing and justification before the text is committed to paper.

Print formatting commands are extensive but there is a noticeable lack of versatility. As the manual puts it "Whilst WordBee can do an excellent job of printing a complete document that will totally fit into memory, it is somewhat deficient when it comes to printing just part of a document, or a document that is too large to fit into memory. These tasks can be handled by WordBee but often require a bit of fiddling round with DOT commands and the shuffling of bits of the file to or from cassette". There are two commands for printing – one to print the entire document and the other to print from the position of the cursor to the end of the file. There is no provision for printing a single paragraph or a group of lines in the middle of a file, which makes updates and corrections a tedious matter.

Several features of WordBee are particularly attractive – we especially liked the file status and word counting utilities, for example, and the provision for automatic page headings and page numbering. WordBee does have some problems, however.

The MicroBee computer is a rapidly evolving product, and it seems that each new suggestion for improvements and modifications is eagerly implemented, sometimes with undesirable side-effects. Time and again the manual for the first version of WordBee uses phrases such as "The code is not yet optimised, and . . ." or worse still, "It is hoped that these problems will be cured by the next release of WordBee". The most glaring example is this quote, again taken from the manual for the first version:

"Several users have discovered that if you enter a line of text that is exactly one screen width long and then press the (RETURN) key the program will sometimes either destroy the file or omit the line from the file. I cannot see any easy fix for this one but will ensure that it is fixed by the next release. In the meantime if you have a long file in memory keep backups in case you are unlucky enough to be caught by this bug."

We can only report that, yes, some problems have been fixed while yet some remain. In effect, owners of the MicroBee must expect to serve as a captive test market and quality control department. In this spirit we can report that there seems to be some fault in the block movement routines. Each time we attempted to relocate a paragraph within the text, following the directions given in the instruction manual, the result was to reset the computer, dump-

MicroBee IC computer

ing us back into Basic. It was no surprise, but extremely frustrating, to return to the word processing program and find that all the text in memory had been erased.

Network communications

An outstanding feature of the MicroBee IC is the provision of network communications software in Read Only Memory. The Network ROM is activated with the command NET from Basic or by selecting the "N" option of the WordBee interface menu and allows word processor files and Basic or machine code programs to be transferred into and out of the computer, either via a modem or a direct RS232C link to another system.

Once activated the network ROM displays a menu of commands and options to be used for setting communication parameters. Standard transmission rates from 110 to 4800 baud can be selected, data format established and either full or half duplex communication initiated from this menu.

For modem communications the default transmission speed is 300 baud, but a terminal emulation mode can also be selected at speeds of up to 1200 baud to allow the MicroBee to be connected directly to a host computer. If two MicroBees were connected via an RS232C link data can be transferred at up to 4800 baud, while intermediate baud rates are provided to allow the use of a wider range of serial printers.

Other facilities are also provided by the network ROM in conjunction with Basic. The Basic command OUT#6 now sets the screen to an 80 x 24 lines format, as used by the terminal emulation routines of the NET program. Under Basic this facility is of limited use, as graphics, screen positioning commands and the CLS statement are not supported in this mode. A second command, IN#7, selects input from the buffered RS232C port, while I1 selects input from the parallel port. The manual for the IC suggests that some users may like to add an encoded external keyboard (either parallel or serial) to suit their own requirements, and these two commands make the addition easy.

The communications protocol used by the network ROM is one which has been publicised as the "Ward Christensen" format, widely used by hobbyist and commercial networks in the United States and gaining increasing popularity in Australia. One factor in this wide support is that various programs are available to implement the protocol under CP/M, allowing communication between the MicroBee and CP/M systems. A number of computer clubs have also announced plans for computer bulletin boards based on the MicroBee and this communications protocol.

Machine language monitor

An extensive monitor program is also provided by the MicroBee IC. Accessible from Basic, NET or WordBee, this monitor includes commands for examining and modifying the contents of memory, running machine language programs, moving blocks of memory and searching memory for a particular pattern of characters. Other routines provide direct access to the NET commands for sending and receiving data files and saving and loading files from tape at 1200 baud. The MicroBee IC manual also provides the details required to allow a user program to make full use of the communications routines contained in the network ROM.

Both the monitor and the networking ROM allow the user to activate the MicroBee's self-test routine which provides a screen display and automatic check of the functioning of the keyboard, ROM and RAM and the character generators of the system. Just what you do when a fault is reported is not mentioned however. A trouble-shooting guide, internal details and circuit diagrams are not included in the MicroBee manual.

The Hardware

Internally the MicroBee consists of two circuit boards, one containing a mixture of RAM and ROM and the other carrying the Z80 microprocessor, support chips, video display circuitry and keyboard. A programmable tone generator and cassette interface are also provided.

The MicroBee 32, as the name implies, provides 32K bytes of programmable memory while the other half of the memory board has provision for up to 28K of Read Only Memory. MicroWorld Basic occupies 16K, with the remaining space available for the WordBee, NET and monitor ROMs. A feature of the MicroBee is its use of CMOS memory which draws very little current. A 4.5V battery provides sufficient power to allow the memory to be maintained on standby when the main supply is switched off. Programs and text in memory are retained between uses unless explicitly erased.

At the rear of the machine is a 25-pin D-type connector for the RS232C serial interface and a 15-pin connector which gives access to the pins of a Zilog PIO (Parallel Input/Output) chip. As it stands this port is unsuitable for driving a parallel printer and requires an additional IC and a few minor components. This circuit was incorporated in the printer cable of the review machine.

Two other openings at the rear of the case are provided for later expansion of the system and the circuit board is designed to allow for the addition of an expansion interface connector. There is not enough information available to make this practicable for the average hobbyist, however.

In conclusion

With an array of built-in software; powerful Basic interpreter, word processor and communications programs, the MicroBee IC seems ideally suited for the hobbyist. Deservedly the machine is also attracting a lot of attention in the educational field because of its potential as a teaching system, and software for a wide variety of applications is becoming available.

There may be problems with business

MicroBee IC Specifications

Processor	Z80 at 3.375MHz clock rate
RAM	32K plus 4K for video
ROM	28K
Interfaces	RS232C and parallel ports
Keyboard	60 keys, typewriter style
Display	64 x 16 lines upper and lower case, underline and inverse graphics modes 80 x 24 terminal emulation mode
Graphics	Low resolution 128 x 48 High resolution 512 x 256 using programmable characters. A colour option is available
Sound	25 tones with duration in increments of ⅛ second
Software in ROM	MicroWorld Basic WordBee 1.2 Network communications M/L monitor
Documentation	Reviewed EA, July 1983, page 118

GET INTO ELECTRONICS FOR $4.95

OVER 30 000 SOLD!

WITH DICK SMITH'S FUNWAY INTO ELECTRONICS

This is the top selling Fun Way Into Electronics Vol. 1 that has proven that electronics can be fun. For the raw beginner, this book introduces 20 exciting projects that can be built by using a unique 'breadboard' construction system - no soldering, so it's safe. Each project is fully illustrated so that mistakes are virtually impossible. This top-selling book is now into it's fourth printing proving just how popular it has been. Don't miss out! Cat B-2600

ONLY $4.95

Vol 1 KITS

Kit to build projects 1-10

You can build any of the first ten projects from 'Fun Way Into Electronics' with this kit. It even includes the base board on which you assemble the circuits! Cat K-2600 $7.25

Kit to build projects 11-20

This kit contains the slightly more specialised components which, together with the components from kit 1, will enable you to make any of the projects in the book. Cat K-2610 $7.90

PARENTS PLEASE NOTE

All Fun Way Into Electronics kits are battery powered so they are completely safe. Also, Fun Way Vol. 1 kits require no soldering.

FUNWAY VOL. 2 20 MORE PROJECTS

After mastering Fun Way Vol. 1 what better way to go than Vol. 2. In Vol. 2 you are introduced to printed circuit boards and soldering. Both are fully explained and illustrated and they give you the choise of making your own boards or buying ready made. The basic laws of electronics, plus chapters on component codes, assembly hints etc. are fully explained. ..... Cat. B-2605 $6.95

FUNWAY VOL 2 KITS FROM $2.95

MULTI-PURPOSE LED FLASHER $2.95
A really simple kit that can be used as a warning device, electronic jewellery, etc. Cat K-2621

DING DONG DOORBELL $4.50
Welcome visitors to your home with this integrated circuit doorbell! Cat K-2622

MORSE CODE TRAINER $4.50
This simple oscillator circuit lets you learn Morse code the easy way! Cat K-2623

UNIVERSAL TIMER $5.50
Use it as an egg timer, a darkroom timer, etc: in fact, it's got a lot of applications! Cat K-2624

ELECTRONIC DICE $4.95
Throwing a dice is old hat: do it electronically! Simple circuit has other uses too. Cat K-2625

MONOPHONIC ORGAN $7.95
Easy to build, and easy to play! And it even has 'vibrato' – just like the big ones! Cat K-2626

POCKET TRANSISTOR RADIO $7.95
Simple to build, and it's nice and small. Listening is so much more fun! Cat K-2627

TOUCH SWITCH $5.50
One touch on, next touch off – or 'on while touched'. Dozens of uses in the home. Cat K-2628

MOSQUITO REPELLER $4.95
Do they really work? Research suggests they might. Find out for yourself. Cat K-2629

SIMPLE AMPLIFIER $6.50
A useful little amplifier for all those projects needing audio amplification. Cat K-2630

WIRELESS MIC. $6.50
A tiny transmitter that can be received on any FM receiver. A great little kit! Cat K-2631

LIGHT ACTIVATED SWITCH $5.50
Highly useful for alarms, night light switches, etc etc. Sensitive and reliable. Cat K-2632

METAL/PIPE LOCATOR $6.50
A simple BFO circuit you can use to find metals, pipes, wiring, etc – maybe gold! Cat K-2633

SOUND ACTIVATED SWITCH $6.95
Picks up sound waves and trips a relay. Use as a telephone bell extender, too. Cat K-2634

HOME/CAR BURGLAR ALARM $6.50
Learn how burglar alarms work when you install your own! For home or car. Cat K-2635

ELECTRONIC SIREN $4.95
Great for alarm use – or where any warning is required. Good for kids toys, too! Cat K-2636

LED LEVEL DISPLAY $8.95
This fascinating project shows you the audio level of any amplifier. Cat K-2637

INTERCOM UNIT $8.95
Communicate! Build this intercom and talk between rooms, etc. Cat K-2638

LED COUNTER MODULE $7.95
Learn how digital circuits work by building a counter. Count slot car laps, etc. Cat K-2639

SHORTWAVE RECEIVER $6.95
Listen in to the exciting world of shortwave radio amateurs, foreign countries! Cat K-2640

SCHOOLS, RE-SELLERS, ETC.:
We'll negotiate a special price for bulk quantities on either books or kits, or both!

DICK SMITH ELECTRONICS

SEE PAGE 98 FOR ADDRESS DETAILS

A383/CT

A DMM you can be proud of . . . At a price you can afford!

Optional carrying case available $10.00*

Basic DCV accuracy 0.1% (7040)
Battery life to 2000 hrs
Brilliant quality LCD display
Current ranges to 10A (7040)
3 1/2 digits

A breakthrough in price, performance and quality! Our new Models 601 and 7040 Digital Multimeters are superb quality instruments that will serve you faithfully for many years. They feature all the accuracy, facilities and rugged serviceability that you're ever likely to need. — At a remarkably low price.

Ask at your local stockist about the 601 and 7040 for unbeatable value.

*Prices do not include sales tax.

PARAMETERS PTY LTD

PERFECTION IN MEASUREMENT
Sydney 439 3288 Melbourne 580 7444

(Incorporated in Victoria)

Xypar246

BEST SELLER

BEST ELECTRONICS SOURCES

WIRELESS TELEPHONES PORTABLE FACSIMILES & MICRO COMPUTERS (DESK TOP & PORTABLE)

- 50-300 Km Long Distance VHF Mobile/Portable Wireless Telephones.
- Cordless/Handy Phone & Citizen Band (CB) 200/400 channels Radios.
- Amateur Communication Equipments (Yaesu/Icom/Kenwood) & Antennas.
- Portable Facsimile Transceiver, Transmit & Receive Documents/Pictures Through Normal Telephone.
- Business/Home Entertainment Microcomputer Best Software/Hardware Support, Fully Compatible with Apple II, CP/M.
- Car Driving Computers, Automobile/Marine Electronic Accessories.

All item are ex-stock and prompt delivery. For more details, please call, telex or write to:

Airmail Order Available at Best Export Price

TECHTRON ENGINEERS CO PTE LTD
10, Anson Road, #02-97A,1st Floor, International Plaza,
Singapore 0207. Republic of Singapore.
Cable: 'MICSYSTEMS' SINGAPORE
Tel: 2209442/2237618 Telex: RS 20067 MITECH

MicroBee IC computer

applications of the machine however. While the honesty of the WordBee manual is a refreshing change from the ambitious claims of more commercially oriented authors and manufacturers, it does leave a lingering doubt as to the reliability of the software. While it's nice to draw your customers' attention to program defects that may effect their use of the computer it is far preferable to ensure that the bugs are eliminated before the product is sold.

In the near future expansion options will be available to add a colour display to the MicroBee IC, and to convert the standard model to a 64K disk-based CP/M system. At its present stage of development the MicroBee is a remarkable product and at $599 offers exceptional value for money. Its wider appeal however, will depend to a great extent on "polishing" the software to bring it up to the standard expected by business and professional users.

Parabolic Microphone . . . ctd from page 67

isolates the bias network from any noise imposed on the supply line. It is not necessary to resort to such measures for the op-amp, since it has excellent supply rejection.

The series resistor and capacitor in the emitter circuit of Q1 provide AC negative feedback for that transistor. DC negative feedback is provided by the 2.2kΩ resistor between Q1's emitter and the output.

The collector of Q1 is coupled directly to the base of Q2, a BC328 PNP transistor. This drives both output transistors, one of which is another BC328 and the other an NPN BC338. It would be feasible to connect the bases of the two output transistors directly to each other but this would result in severe crossover distortion. This accounts for the diode and trimpot connected between the bases.

As the trimpot is adjusted to minimum resistance, the quiescent current of the output stage is minimised. In this condition the whole circuit will have a quiescent current of around 6mA but crossover distortion will be quite apparent, particularly for pure tones at low signal level.

Adjusting the quiescent current is a compromise between battery current drain and crossover distortion. With around 10 milliamps current through Q3 and Q4 the crossover distortion is largely eliminated while still giving a modest no-signal current drain of around 16 milliamps.

The output signal is taken from the junction of the emitters of Q3 and Q4. This is passed through a 100μF capacitor before being fed to the headphones, preventing any current from flowing in the output circuit unless there is a signal present.

Construction

All of the electronics except the microphone are on the printed circuit board (PCB). This PCB is coded 83ma11 and has dimensions 51 x 67mm. No problems should arise with construction, so long as you mount the low profile components, such as resistors, first. Take care with the orientation of the polarised components, ie, diode, transistors, IC, and electrolytic capacitors. Particularly watch the electrolytic with axial leads – it's very easy to put it in with reversed polarity.

Although we have not built our amplifier into a box, there are a number of plastic project boxes which would be suitable for the purpose. Remember that it also has to accommodate the six batteries. The most important consideration in using the project as a microphone amplifier is to keep the input lead as short as possible. This may necessitate mounting the PCB directly on the back of the parabolic reflector.

Making the reflector is probably the most time consuming and tricky part of the project. We have given the dimensions of the parabolic curve on which our reflector is based, and this should assist in determining the correct shape for the cardboard assembly.

We have also indicated the dimensions of the segments used – you will need 12 of these. The best approach is to carefully draw one segment to the given dimensions and use this as a template when it is cut out. Note that each segment has a flap on one side. Bending the segments to shape will be easier if you score along the boundary of the flap and the segment proper and also cut across the flap at a number of points. These cuts provide stress relief so that the cardboard can accept a double curvature.

Each segment side will have a slight curvature and to achieve the parabolic shape, adjacent curves must butt up to each other for the full length of the side. They are held in place initially with adhesive tape, although this may later be replaced with a suitable glue. Joining the

Continued on page 150

BANKCARD HOLDERS — PHONE YOUR ORDERS TOLL FREE!

AUSTWIDE

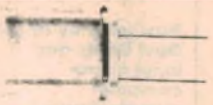
NEXT DAY DELIVERY

ALTRONICS 008-999-007

VIA JETSERVICE
(CAPITAL CITY & SUBURBAN AREAS)

ALTRONICS • BANKCARD JETSERVICE DELIVERY NEXT DAY • ALTRONICS • BANKCARD JETSERVICE DELIVERY NEXT DAY • ALTRONICS

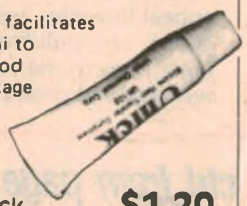
TOP QUALITY XTALS



			ea.	10 +
Y 1000	1.0000 mHz	Parallel	$11.50	$10.25
Y 1003	1.8432 mHz	Parallel	9.50	8.75
Y 1006	2.0000 mHz	Parallel	7.50	6.75
Y 1010	3.5875 mHz	Series	3.00	2.75
Y 1012	4.0000 mHz	Parallel	5.00	4.50
Y 1015	4.1940 mHz	Parallel	5.00	4.50
Y 1017	5.0000 mHz	Parallel	5.00	4.50
Y 1018	6.0000 mHz	Series	5.00	4.50
Y 1019	8.0000 mHz	Series	5.00	4.50
Y 1020	10.0000 mHz	Series	5.00	4.50
Y 1025	12.0000 mHz	Series	5.00	4.50
Y 1030	16.0000 mHz	Series	5.00	4.50

HEATSINK COMPOUND

Heat conducting paste facilitates heat transfer from semi to Heatsink. One tube good for up to 30 TO3 package semiconductors.



H 1600...7.5g Pack..... **$1.20**
New trade pack
H 1610...150g Pack..... **$7.50**
SAVE UP TO 33%

VELOSTAT

Non-static sheeting for storing CMOS IC's, LSI's etc. 1000 times better than aluminium foil. Will store up to 150 IC's on one 225 x 150mm sheet.

H 0500..... **$3.50 per sheet**

DIL SWITCHES

GOLD PLATE SELF WIPING CONTACTS

	EA	10Up
S 3050 4 Way	$1.50	$1.35
S 3060 8 Way	$2.00	$1.75

NEW HITACHI F SERIES
SQUARE SCREEN DUAL BEAM CRO

SUPERB NEW MODEL V152F DC TO 15 mHz 1Mv/DIV DUAL TRACE

FREE DELIVERY ANYWHERE IN AUSTRALIA THIS MONTH

CAT Q0152
PRICE ONLY
$579 TAX EXEMPT
$649 TAX PAID

Features ★ X-Y Operation ★ Vertical sensitivity 1mV/div. ★ 10 x Sweeptime magnification with 1-touch operation ★ Convenient Ch1 signal DVM output ★ Z-axis input provided — possible to use as CRT display ★ 0.2us to 0.2s — wide sweep range setting ★ Five modes of vertical operation ★ Panel layout with colour coding of respective functions

SPECIFICATIONS

• Vertical deflection	
Sensitivity	5mV/div to 5V/div (5 10 calibrated steps 1mV/div to 1V/div (6 (When using ×5 amplifier) Uncalibrated continuous control between steps 1 and 2.5 (provided with click positioning function)
Bandwidth	DC to 15MHz, -3dB (at 4div) DC to 7MHz, -3dB (at 4div) (When using ×5 amplifier)
Rise time	24ns (for ×5: 70ns typ)
Signal delay line	
Max. input voltage	600Vp-p or 300V (DC + AC peak at 1kHz)
Input Coupling	AC, GND, DC
Input impedance	Direct: 1M ohm approx. 30pF
Operating modes	CH1, CH2, DUAL, ADD, DIFF
X-Y operation	CH1: X axis, CH2: Y axis
Sensitivity	5mV/div to 5V/div (when using ×5 amplifier: 1mV/div)
Phase difference	DC to 10kHz within 3°
X bandwidth	DC to 500kHz, -3dB
Dynamic range	4div or more
CH1 output	
Output voltage	20mV/div or more (terminated into 50Ω)
Band width	50Hz to 5MHz, -3dB
Output impedance	Approx. 50Ω

• Horizontal deflection	
Trigger modes	AUTO, NORM, TV (-), TV (+)
Trigger source	CH1, CH2, LINE, EXT
Trigger coupling	AC
TV sync	TV sync-separation circuit
Internal	1div or more I/V sync-signal
External	1Vp-p or more I/V sync-signal
Trigger sensitivity	Frequency / Internal / External: 20Hz to 2MHz: 0.5div, 200mV; 2 to 15MHz: 1.5div, 800mV
AUTO low bandwidth	30Hz
Trigger slope	
External trigger input	Input impedance approx. 1M ohm, 30pF or less; Max. input voltage 100V (DC + AC peak) at 1kHz
Sweep time	0.2us/div to 0.2s/div (5% 19 calibrated steps; Uncalibrated continuous control between steps 1 and 2.5 (provided with click positioning function)
Sweep time magnifier	10 times (±7%)
Max. sweep time	100ns/div (20ns/div and 50ns/div, not calibrated)
• Amplitude calibrator	
Waveform	Approx. 1kHz (±10% (typ)), square wave
Voltage	0.5V (±5%
• Power requirements	100/120/220/240V (±10% 50 to 60Hz, approx. 40W
• Dimensions	Approx. 275(W) × 190(H) × 400(D)mm
• Weight	Approx. 8.5kg

Powerful New 6000 RPM Mini Drill for PC Work

Tons of Torque. Just the shot for PCB work. 12V DC operated from external Power Pack 1.2mm chuck capacity. Supplied c/w 1mm drill bit.

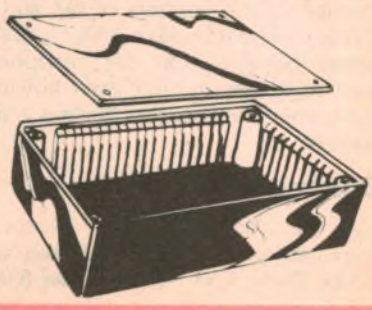
T2302 ..... $12.95

Drill Bits:
T2320 (0.8mm) ... $1.25
T2325 (1.0mm) ... $1.25

ALTRONICS JIFFY BOXES — Incredible offer!

Black plastic body with 22 g. aluminium lid and 4 st. screws supplied. Unique horizontal PC "Snap In" mounts as well as vertical card guides. Order your PC Boards presized and dispense with costly stand offs, screws etc. These utility boxes are used in dozens of E.T.I. and E.A. projects.

Box	Dimensions	Board Width Vertical	Board Width Horizontal	Price this month
H 0101	150 x 90 x 50	90	87	**$1.90**
H 0102	195 x 113 x 60	106	103	**$2.90**
H 0103	130 x 68 x 41	62	60	**$1.80**
H 0105	83 x 54 x 28	50	47	**$1.20**



• FOR DESPATCH P&P CHARGES AND ADDRESS DETAILS PLEASE REFER TO OUR AD. ON PAGE 107 •

2 YEAR WARRANTY

NEW 20 WATT P A AMPLIFIER

UNCONDITIONALLY STABLE

The AS-20 is a **rugged, reliable general purpose public address amplifier.** Designed and manufactured in Australia this amp is suitable for use by **schools, sporting clubs, function centres** and in **professional installations** (paging systems, background music).

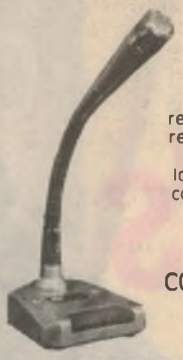
- Balanced Low Z mic input
- Unbalanced Low Z mic input
- Mic muting function (mutes program music with PA announcement)
- 4-16 OHM output • AUX Treble and Bass controls
- 100V Balanced line output
- Full 20 Watts RMS into 8 OHMS
- Short circuit load protection
- Less than 1% Distortion

WHY PAY OVER $200.00 FOR AN INFERIOR UNIT?

A2000..... **$149.00**

TOP QUALITY

PAGING MIC



STURDY ROBUST BASE

Has tapered low frequency response for articulate speech reproduction. Low impedance balance line. PTT switch with lock facility. Additional switch contacts for remote switching, muting etc. Gooseneck approx. 350mm.

C0166..... **$59.95**

SUPER SPECIAL

SPEAKER TWIN FLEX

2 x 19/.193

WO204 .... RED TRACE **35c/m**
WO205 BLACK TRACE **$34/200m**

PROFESSIONAL

HORN SPEAKERS

BOTH MODELS FULLY WEATHER PROOF

NOW IN USE WITH THE WEST AUSTRALIAN EDUCATION DEPT AND PWD

30 WATT WITH LINE TRANSFORMER

Multitap inbuilt line transformer allows taps 330/30W, 660/15W, 1000/10W, 2000/5W. Universal swivel mounting bracket supplied.

C2033..... **$69.95**
4 or more..... **$67.80**

15 WATT WITH LINE TRANSFORMER

Multitap inbuilt line transformer allows Z taps 660/15W, 1K/10W, 2K/5W, 4K/2.5W. Mounting bracket clears line TX allowing rear wall mounting.

C2030..... **$59.95**
4 or more..... **$56.00**

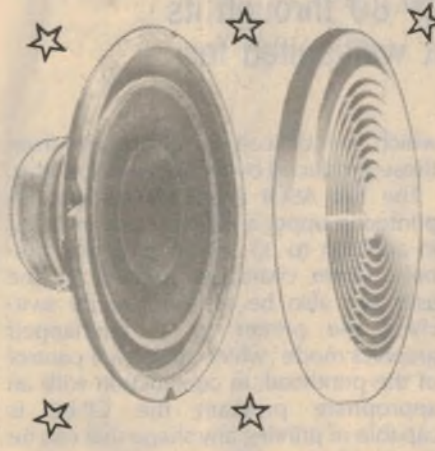
8 INCH WIDE RANGE DUAL CONE SPEAKER

200mm (8 In.). 10 Watts Max. power input. Public Address, Background Music. Ideal HI Fi extension speaker. Includes transformer holes at 51mm. Over 30,000 sold in Australia! Mounting holes 140 x 140mm.

C2000..... **$9.50 ea**
10 Up..... **$8.70**

8 INCH CEILING SPEAKER GRILL

C0800..... **$2.75**
10 Up..... **$2.00**



20W HIGH POWER SPEAKER TRANSFORMER

Primary Power Taps (100V Line) 1.25/2.5/5/10/15/20W (Halve these for 70V line) Secondary Taps 4/8/16 OHMS

M1120.... **$10.80**
10 or more **$9.90**

4W MULTI-PURPOSE SPEAKER TRANSFORMER

Primary: 2.5K, 5K OHMS
Secondary: 2, 4, 8, 16 OHMS
Frequency Response: 30 Hz - 12 KHz. Mounting hole centres 51mm. Ideal for high quality constant voltage PA systems.

M1105..... **$4.95**
10 Up each **$4.50**

GRAIN ORIENTED STEEL CORE

SAVE 25% THE SET OF TEN
B9995..... **$79.50**
PLUS $10 P&P

TOP SELLING MOTOROLA BOOKS

IF YOU MISSED OUT LAST TIME, ORDER NOW!
LATEST EDITIONS JUST ARRIVED

MOTOROLA CMOS DATA

B 1105..... $11.50

A comprehensive reference covering 40XX, 45XX CMOS family's along with specialty devices such as LCD drivers, telephone and general communication functions and industrial control.
862 pages essential in all spheres of electronics.

MOTOROLA MECL DATA

B 1100..... $9.95

Emmiter Coilector Logic (ECL) is today's fastest form of digital logic providing the most direct way of improving system performance. **This previously hard to get manual provides data on the 10KH, 10K and III families. MECL memory and PLL CHIPS.**

MOTOROLA OPTO DATA

B 1118..... $8.95

Handy reference provides data and application notes on opto couplers, infra red LEDS, Photo transistors and a complete chapter on fibre Optics, a communications system which is fast gaining usage worldwide. **VERY EDUCATIONAL.**

MOTOROLA POWER DATA

B 1101..... $12.95

Motorola are the undisputed world leader in Power Transistors. Renowned for their low cost and reliability. Book includes a 9 page selection guide, application notes and Data Sheets for over 700 Devices. 989 pages. **Previously over $20.00.**

MOTOROLA MASTER SELECTION GUIDE

B 1104..... $7.95

The most useful book ever printed. Covers MOS IC'S listed by function, LINEAR IC'S listed by function, INTERFACE IC'S listed by function, LSI memory, TTL ECL power products, SCR'S, diodes, transistors listed by application and ratings, RF small signal and opto devices listed by application and ratings. Essential Data given for all devices.
TERRIFIC VALUE

MOTOROLA LINEAR IC'S

B 1114..... $9.95

Popular data manual. At last readily available. Approx. 800 pages full Data Design proceedures and equivalent listings for 1000's of devices under headings OP AMPS, VOLTAGE REGULATORS, CONSUMER CIRCUITS (eg. TV, AUTOMOTIVE POWER), HIGH FREQUENCY CIRCUITS and SPECIAL PURPOSE CIRCUITS.

MOTOROLA LINEAR INTERFACE IC'S

B 1115..... $11.50

Complements the Linear IC Manual. Gives data, design proceedures and equivalent listings for, MEMORY, MICROPROCESSOR SUPPORT, LINE DRIVERS/RECEIVERS, TELEPHONY, COMPARATORS, VOLTAGE REFERENCE AND DATA CONVERSION DEVICES.
Includes comprehensive selector guide.

MOTOROLA MICROPROCESSOR DATA

B 1120..... $14.95

Over 1200 pages covering all aspects of motorola's microprocessor, microcomputer and peripheral components. A clearly written Manual providing all the data necessary to design and build a working computer system from scratch.
100's of circuit examples, flow charts, Truth Tables and programme routines.

MOTOROLA MEMORY DATA

B 1113..... $8.95

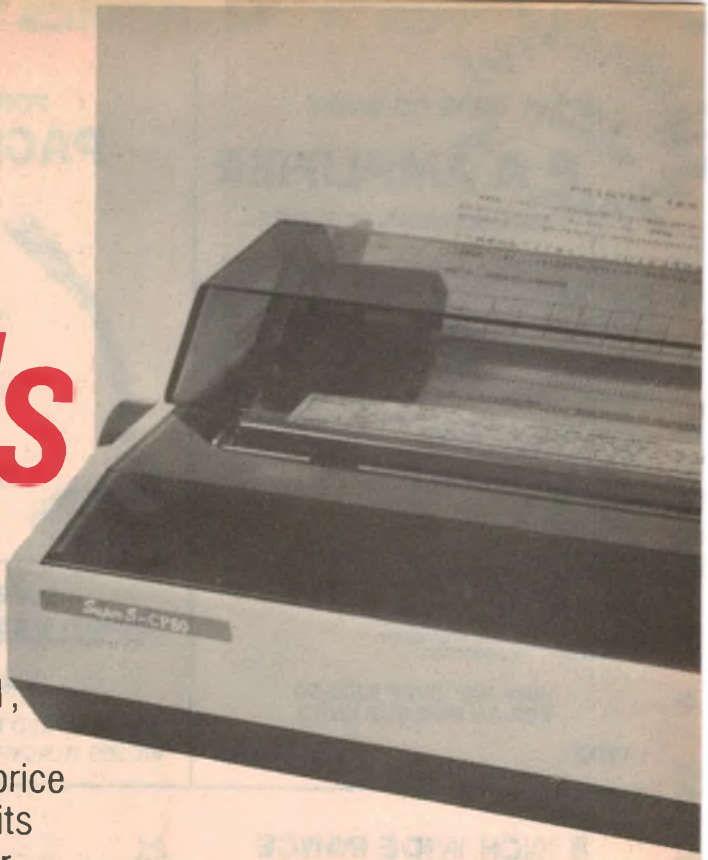
An absolute must for the microprocessor Buff. This is the latest reprint of Motorola's famous Memory Data Manual and includes all the latest specifications and design application data on TTL RAM, TTL PROM, MECL MEMORY, MECL RAM, MECL PROM, MOS dynamic RAM, MOS static RAM, MOS EPROM, MOS EE PROM and MOS ROM.
Worth many dollars more!

SCHOTTIKY TTL DATA

B 1109..... $9.95

Essential reference for the enthusiast and engineer alike. Designing, building and servicing digital circuitry is an absorbing pastime. Data for the LS, ALS and FAST families along with design considerations and circuit characteristic are logically presented in this manual, making it quick and easy to use.

Computer Peripherals from Rod Irving



Rod Irving currently has available the CP-80/1, a compact 80-column dot matrix printer with some exceptional features and an attractive price tag. We were able to put the CP-80 through its paces in our office and found it well-suited for general-purpose printing.

As implied by the designation, the CP-80 prints a standard line length of 80 normal size characters at 12 characters per inch. Characters are formed on a 7 x 8 dot matrix in an 8 x 9 grid, allowing fully formed descenders on lowercase letters, which contribute greatly to the readability. A character occupying the full matrix (an "M", for instance) measures 2.4mm x 2.1mm (W x H).

A variety of other print styles can be selected, including double-size printing (at 40 characters per line), condensed printing (132 characters per line), emphasised and double-strike printing and an italic type font. When double-strike printing is selected the CP-80 first prints a line and then returns to the beginning of the line and overprints each character, with the printhead slightly offset to fill in the gaps between individual dots. Although slower than normal mode printing, double-strike produces characters which are difficult to distinguish from those produced by a daisywheel printer.

The full ASCII character set can be printed in upper and lowercase or italics in addition to 35 special graphics symbols. Other characters defined by the user can also be reproduced by switching the printer to a "bit-mapped graphics mode" which allows full control of the printhead. In conjunction with an appropriate program the CP-80 is capable of printing any shape that can be displayed on a video screen.

The CP-80 is bidirectional, meaning that it prints characters when the carriage is moving to the right and prints the next line as the carriage returns to the left. "Logic seeking" circuitry detects situations where a full carriage return is unnecessary (a line beginning with spaces, for example) and positions the printhead for the fastest response time. Rated speed of the printer is 80 characters per second although "special effects" will reduce this speed.

Front panel bushbutton switches are provided to select ON LINE/OFF LINE status, line feed or form feed, and rectangular LED lamps indicate Power On, Ready, On line and Out of Paper. An internal sound generator provides an audible indication of Out of Paper or any other fault condition, and can also be activated by the host computer with LPRINT CHR$(7), the ASCII BEL code.

The CP-80 provides both tractor feed and friction feed, so single sheets can be used as well as standard fan-fold paper. In both cases the maximum width of paper is 23.75cm (9.5 inch).

Dimensions of the unit are 377 x 295 x 125mm (W x D x H) and mass is around 5.3kg.

Setting up the printer is easy. Thanks to the standard Centronics interface we were able to plug the CP-80 directly into the printer port of the System-80 expansion interface. After some experimenting however we found it necessary to

```
T H I S   I S   A N   E X A M P L E   O F   E N L A R G E D   P R I N T I N G

THIS IS AN EXAMPLE OF CONDENSED PRINTING

AND THIS IS NORMAL SIZE

THIS LINE IS EMPHASISED

THIS LINE IS PRINTED WITH DOUBLE STRIKE
```

Shown above are some of the printing modes of the CP-80. Lower case, italics and graphics are also available.

change the setting of one of the internal DIP switches to force the printer to add a line-feed after each carriage return sent from the computer.

The instruction booklet with the printer gives full details, although the "Japanese English" did cause some head-scratching. Thankfully the extensive diagrams provided with the text cleared up any ambiguities. Opening up the printer to alter the switch positions was easy, and gave us a chance to inspect the innards of the unit.

The CP-80 appears to be solidly-constructed and quite capable of standing up to normal wear and tear. According to the distributors the Mean Time Between Failure (MTBF) is five million characters and the print-head is rated for 30 million characters. What these figures mean is that the CP-80 is unlikely to need servicing until it has produced output equivalent to around 10 average books – some years of work, in fact.

Programming print formats

Printing modes, line length, line spacing and horizontal tabs are set by sending a sequence of ESC characters to the printer. ESC A, N for example, sets the space between lines to N/72 of inch. In Basic, the code for 1/8 inch line spacing would be sent by the statement;

LPRINT CHR$ (27); "9"

Spacing between lines is programmable in increments of either 1/72 inch or 1/216 inch, allowing a maximum vertical resolution of 216 dots to the inch.

Double-width characters are selected with the SO (Shift Out) code, as follows;

LPRINT CHR$(14)

and cancelled with;

LPRINT CHR$(20)

By combining these control sequences any of the available printing modes can be mixed within one line of text, as examples in the manual demonstrate.

In the bit-mapped graphics mode the CP-80 prints 640 dots to the line, or 96 dots per inch. ESC K [LPRINT CHR$(27); "K"] initiates the bit graphics mode and must be followed by a two byte number designating the number of character patterns to be printed. Each character pattern corresponds to one vertical column of dots in the printed image, so some planning and translation of graphics representations is required to use this mode. Once this is done results are eminently satisfactory.

Cost of the CP-80 printer with a Centronics interface is $595. An RS232C serial version can also be supplied for $695, and additional ribbon cartridges for either version cost $16.95. All prices include sales tax.

For further information on the CP-80 printer or the Intra video monitor contact Rod Irving, 425 High Street, Northcote, Vic 3070. Phone (03) 489 8131, or 48-50 A'Beckett St, Melbourne, (03) 347 9251. (P.V.)

30cm video monitor

Also from Rod Irving is the Intra video monitor, available with either green or orange phosphor screen and suitable for use with computers displaying lines of up to 80 characters or dot graphics with a horizontal resolution of 640 pixels. Vertical resolution is a nominal 800 scan lines at the centre of the screen, more than adequate for a 25-line display.

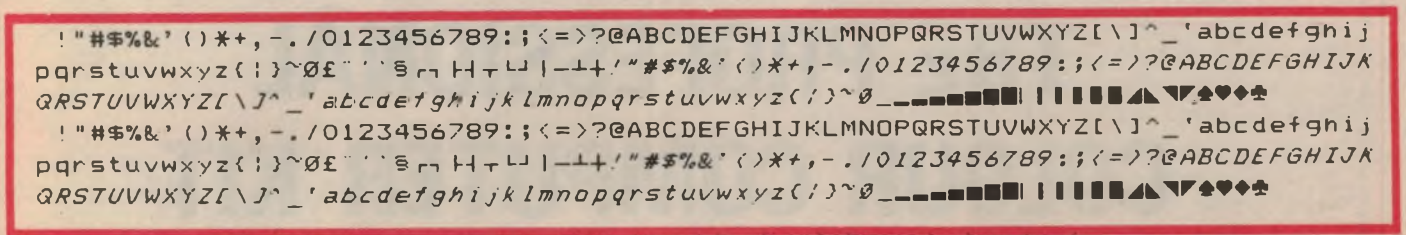
The 30cm (diagonal screen measurement) video monitor is a stylish unit, supplied in a metal cabinet with low-glare grey plastic trim. A flip-down door covers a panel containing the usual controls, with a rocket rocker-type power switch and red LED indicator power indicator to the right.

At the rear are BNC sockets for composite video input and output and a switch to select 75Ω or high impedance input termination. The presence of a video output is an unusual feature but makes comparison testing very easy as it allows two or more monitors to be connected in parallel to the same video source. One obvious application would be classroom use with several monitors placed for maximum visibility and driven by the one computer.

The display is clear and stable with no sign of jitter or blurring of characters even at the corners of the screen. The face-plate has been treated to reduce reflections and glare, making the monitor very easy on the eyes.

Dimensions of the unit are 300 x 300 x 300mm and weight is 9kg.

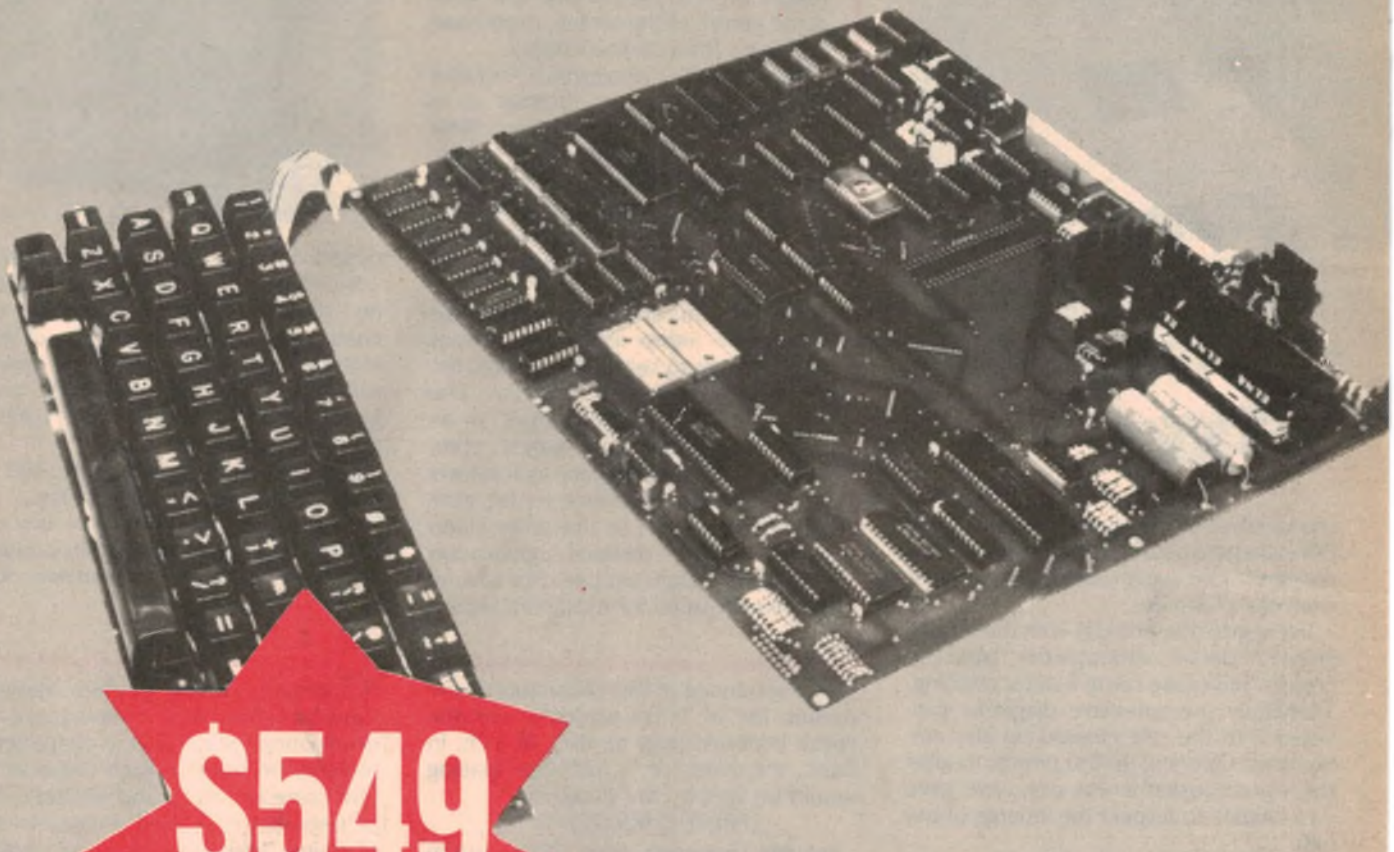
Price of the green screen unit is $199 (including sales tax). An orange phosphor version is available for $229.



Two sets of the standard size character set of the CP-80. User defined symbols can also be printed.

Excalibur 64

AUSTRALIAN DESIGNED AND DEVELOPED



$549

OPTIONAL:
Fully assembled and tested, add $70.00

"ORDER NOW"

THE PROFESSIONAL COLOUR COMPUTER KIT

UNBEATABLE FEATURES AT AN UNBELIEVABLE PRICE

16K ROM, 64K RAM

A powerful 16K ROM utilising extended Microsoft BASIC and a massive 64K RAM makes the EXCALIBUR 64 a truly versatile machine.

Microsoft BASIC is universally accepted as the world's most popular computer language. Thousands of books and programs have been written using this language so with the EXCALIBUR 64 you can immediately take advantage of this.

CP/M COMPATIBLE

EXCALIBUR 64 is fully expandable to Disk Drives. Shortly we will have available, in kit form a disk controller board which will plug on board the EXCALIBUR 64. You then simply run an appropriate cable to a Disk Drive of your choice. EXCALIBUR 64 will also run CP/M giving you access to hundreds of exciting software packages and making it, we believe the lowest cost CP/M colour computer in the world.

AUSTRALIAN DESIGNED

EXCALIBUR 64 is a unique and new computer which has been designed and developed here in Australia. Compare the EXCALIBUR 64 feature for feature with any other computer currently on the market and you will be convinced that it offers unparalled value for money.

EXCALIBUR 64 has been designed and developed by BGR Computers Pty. Ltd. and a team of Australian engineers who believe that this country is as advanced as any other in the design of computer technology.

IMAGINE BUILDING YOUR OWN COLOUR COMPUTER

Modern technology now makes it possible for the average enthusiast to build this highly sophisticated piece of machinery with virtual ease. Although we would not recommend this kit to the absolute beginner, it is very easy to build. Any person capable of using a small soldering iron and can solder neatly should have no difficulty in construction. This is due to our unique double sided board design which means there is no other wiring. Our board is covered with professional 'solder mask', this makes soldering much easier without the problems of bridges etc. To further simplify construction all components positions are marked on the PCB board.

SERVICE BACKUP

If for some reason you are unable to get your EXCALIBUR 64 to operate and you have fully built it using IC sockets as supplied in your kit, simply send us your complete board along with $95 and our service centre will repair it. We will not complete half built kits, then get them to work: your kit must be complete before taking advantage of this service. Our service fee includes necessary replacement of components.

COMPARISON CHART

	Excalibur 64	Microbee 32K	Apple II	Atari 800	Commodore 64	Tandy Colour
Base Price	$549	$599	$2100	$1199	$699	$549
ROM	16K	16K	12K	10K	20K	8K
RAM	64K	32K IC	48K	48K	64K	4K
Colours	16	NO	15	16	16	8
Screen Display	40 x 24 or 80 x 24	64 x 16 or 80 x 24	40 x 24	40 x 24	40 x 24	32 x 16
Resolution	640 x 288	512 x 256	280 x 160	320 x 192	320 x 200	192 x 256
RF Output	YES	NO	NO	YES	YES	YES
RS232C	YES	YES	NO	NO	NO	YES
Centronics/Parallel Port	YES	NO	NO	NO	NO	NO
Extended Microsoft BASIC	YES	NO	YES	NO	NO	NO
CP/M Compatible	YES	NO	NO**	NO	NO**	NO
Power Supply Built-in	YES	NO	YES	NO	NO	NO

* *Does not include case*
** *Will accept modified CP/M*

TECHNICAL SPECIFICATIONS

CPU:	Z80A	**Cursor:**	Flashing block
Clock Speed:	3.5 Mhz	**Video:**	RF output, Direct video output and RGB
RAM:	64K	**Keyboard:**	Full size 60 key (QWERTY layout) 4 programmable function keys
ROM:	16K	**Cassette Interface:**	Built in: Software controlled at 1200 and 300 baud
Screen Memory:	2K (separate from User RAM)	**I/O Ports:**	Serial: RS232C Parallel: 8 bit centronics compatible
Language:	Extended Microsoft BASIC	**Expansion:**	2 expansion sockets providing all major Z80 control lines
Colour:	16 forground and 8 background colours	**Audio:**	Programmable under BASIC
VDU Display:	24 lines by 40 characters 7 x 12 dot matrix (TV or monitor)	**Power Supply:**	On board
	24 lines by 80 characters 7 x 12 dot matrix (monitor required)	**Optional Accessories:**	Professional case (available soon) Disc controller board (kit form). Modem (Direct Connect)
	Low resolution: 320 x 288 pixels High resolution: 640 x 288 pixels Dot bit addressable graphics		
Graphics Mode:	128 programmable characters 96 ASCII characters (upper and lower case) 128 graphic characters		

BGR COMPUTERS P/L

PHONE ORDERS AND ENQUIRIES: (03) 267 2147
MAIL ORDERS: G.P.O. BOX 5302BB, MELBOURNE, 3001
SHOWROOM: SHOP 13, GROUND FLOOR, FAWKNER TOWERS, 431 ST. KILDA ROAD, MELBOURNE, 3004

SAVE TIME – ORDER DIRECT

ROD IRVING ELECTRONICS

BREADBOARDS

Breadboards for Prototyping

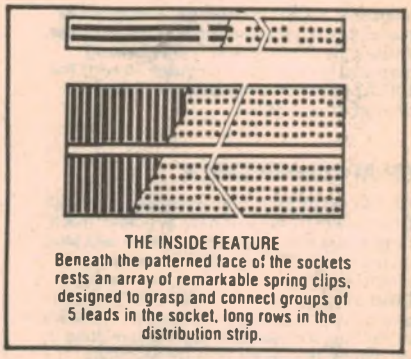
This inexpensive range of modular interlocking units enables a quick, easy way of experimenting with new circuits and ideas. There are two main units consisting of a Terminal Strip or distribution strip and a Central plug-in unit.

Points to remember:

- Boards accept 20 to 29 AWG solid wire
- Dual in line Package (DIP)
- The boards accept all sizes including LS1, MS1, RTC, TTL, DTL, and CMOS integrated circuits.
- Passive components such as resistors, capacitors, chokes will fit.ng.
- Boards are keyed to enable simple "adding on" so that larger circuits can be designed and tested.
- All boards are mounted on a ground plane so that they are ideal for HF, high speed and low noise applications.
- Components used in this system can be re-used and there is no heat to damage components so that they can be used almost indefinitely.

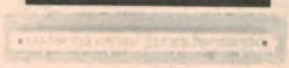
Errors & omissions excepted

Dealer and School enquiries especially welcome on these products



THE INSIDE FEATURE
Beneath the patterned face of the sockets rests an array of remarkable spring clips, designed to grasp and connect groups of 5 leads in the socket, long rows in the distribution strip.

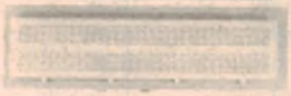
100 HOLES



P11000

1–9 **$2.50** 10+ **$1.95**

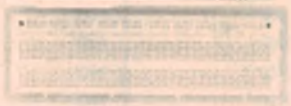
640 HOLES



P11005

1–9 **$8.95** 10+ **$7.95**

640 + 100 HOLES



P11007

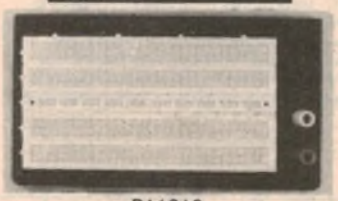
1–9 **$11.95** 10+ **$9.95**

640 + 200 HOLES

P11009

1–9 **$13.95** 10+ **$11.95**

1280 + 100 HOLES



P11010

1–9 **$15.95** 10+ **$13.95**

1280 + 300 HOLES

P11011

1–9 **$24.95** 10+ **$21.95**

1280 + 400 HOLES

P11012

1–9 **$28.95** 10+ **$24.95**

1920 + 500 HOLES

P11015

1–9 **$44.95** 10+ **$38.75**

2560 + 700 HOLES

P11018

1–9 **$59.95** 10+ **$49.95**

CRYSTALS

CAT No.	PRICE 1–9	10+									
Y11000 1 MHz	$11.50	$9.50	Y11022 4.194304 MHz	$4.90	$3.90	Y11060 10 MHz	$4.90	$3.90	Y11100 27 MHz	$4.90	$3.90
Y11003 1.8432 MHz	$7.50	$6.50	Y11023 4.44 MHz	$4.90	$3.90	Y11065 11 MHz	$4.90	$3.90	Y11105 32 MHz	$4.90	$3.90
Y11005 2 MHz	$6.90	$6.50	Y11024 4.75 MHz	$4.90	$3.90	Y11070 12 MHz	$4.90	$3.90	Y11110 36 MHz	$4.90	$3.90
Y11007 2.3040 MHz	$6.50	$5.90	Y11030 5 MHz	$4.90	$3.90	Y11072 14.31818 MHz	$4.90	$3.90	Y11115 48 MHz	$4.90	$3.90
Y11008 2.4576 MHz	$6.50	$5.90	Y11033 5.0688 MHz	$4.90	$3.90	Y11075 15 MHz	$4.90	$3.90	Y11120 100 MHz	$6.90	$5.50
Y11010 3 MHz	$4.90	$4.25	Y11040 6 MHz	$4.90	$3.90	Y11080 16 MHz	$4.90	$3.90	Y11125 32.768 Khz	$4.90	$3.90
Y11015 3.5795 MHz	$3.00	$2.50	Y11042 6.14 MHz	$4.90	$3.90	Y11082 18 MHz	$4.90	$3.90			
Y11020 4 MHz	$4.90	$3.90	Y11045 6.6670 MHz	$4.90	$3.90	Y11085 18.432 MHz	$4.90	$3.90			
			Y11050 8 MHz	$4.90	$3.90	Y11090 20 MHz	$4.90	$3.90			
			Y11055 8.867238 MHz	$4.90	$3.90	Y11095 24 MHz	$4.90	$3.90			

ALL PRICES ON THIS PAGE LESS 30% FOR NOVEMBER

425 HIGH ST, NORTHCOTE 3070 VIC
48-50 A'BECKETT ST, MELBOURNE 3000 VIC

PHONE (03) 489 8131
PHONE (03) 347 9251

Mail Order Delivery Instructions: Minimum Pack and Post $2.00 for Australia Post. Please allow extra for bigger orders and Certified, Airmail or Registered Post. Minimum order is $5.00. Please address orders to Mail Order Department, PO BOX 235, NORTHCOTE, 3070, VICTORIA. PHONE (03) 481 1436.

Micronews

Stylish new video monitor from Mitsubishi

Nexus Electronics now has available a new monochrome video display monitor, the Mitsubishi SV 1290X. Features of the monitor include a P31 green phosphor, 30cm (diagonal measurement) non-glare screen and a bandwidth of 18MHz.

The 1290X is unusually styled, with a rectangular cabinet extending some 15cm towards the rear and then tapering sharply to a smaller rectangular cross-section which provides clearance for the neck of the CRT tube. The face-plate and front of the CRT display are angled backwards by about 10 degrees, contributing to the comfort of the user when the monitor is used at or below eye level. A small pedestal forms an integral part of the underneath of the cabinet and overall the monitor is no bigger than absolutely necessary.

Overall dimensions are 314 x 324 x 278mm (W x D x H) and mass is 6kg.

The cabinet is in white, high-impact plastic with a grey screen surround. On the right-hand front is a pushbutton power switch with LED indicator and unobtrusive brightness and contrast controls are mounted up against the pedestal, under the front overhang of the screen.

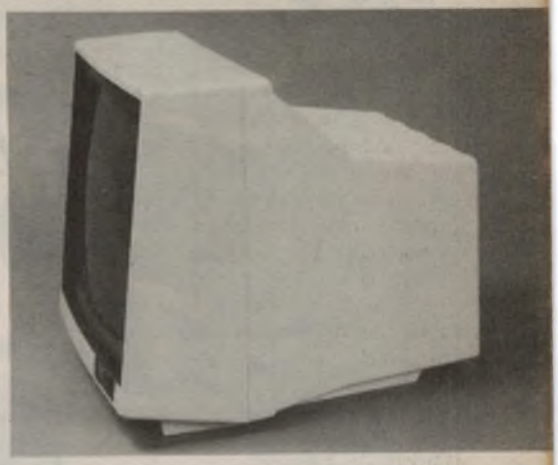
At the rear of the cabinet are connectors for composite video input and output, input impedance selector switch and controls for vertical hold, height and sub brightness. Except for vertical hold these controls are recessed behind cut-outs in the rear panel and require the use of an alignment tool for adjustment. No adjustments were required to the review model, although the user's manual states that the units are factory set for 60Hz operation, so other monitors may require adjustment of vertical hold and height controls for use with a 50Hz supply.

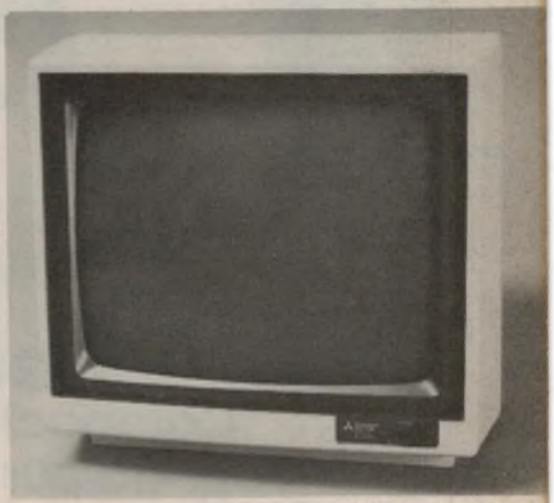
The composite video input is an RCA type connector and is switchable for use with 75Ω or high impedance signal sources. Specifications of the video input indicate that the monitor is designed to accept a nominal 1.5V peak-to-peak composite video signal with negative sync. The video signal input also appears at the video out jack, allowing the computer output to be displayed on more than one monitor for classroom or demonstration use.

The 1290X video monitor is designed for use with systems displaying up to 25 lines of 80 characters each in a 5 x 7 dot character cell and graphics with a resolution of 320 x 200 pixels. The display is clear and sharp and our tests showed linearity to be excellent, allowing the display of complex character shapes without distortion, even at the corners of the screen area.

The active display area is 215 x 150mm (width by height) and is centred on the screen. The yellow-green characters and stable and jitter-free display make for a highly legible screen. Power consumption is quoted as 30W.

Design specifications to UL and FCC electrical safety and RFI emission standards reinforce the impression of reliability and high quality formed on using the display unit. The compact, stylish design and clearly legible display make the 1290X well worth investigating if you are looking for a video monitor.





Trade enquiries should be directed to Nexus Electronics Pty Ltd, 339 Pacific Highway, Crows Nest, NSW, 2065, phone (02) 922 1722. In Melbourne contact Systems Reliability (Australia) Pty Ltd, 49-53 Tope St, South Melbourne, 3205. Phone (03) 699 8433.

Dot matrix printer from Dick Smith Electronics

Recently a number of "third generation" dot matrix printers have appeared on the market, all boasting features comparable with the Epson MX80 but carrying a lower price tag.

Not to be outdone, Dick Smith Electronics is currently stocking the BX-80, from the Japanese company BMC (well known for its video monitors). According to DSE the BX-80 "combines not only the most commonly required features for today's printers but adds speed and silence to its impressive list of features".

The BX-80 prints characters in a 7 x 8 dot matrix and will produce 40 columns of double-width characters or up to 142 normal size characters per line at printing speeds of up to 80 characters per second. Upper and lowercase characters are supported as well as an italic character set, and a range of double-strike, boldface and other special effects are available. Underlining and sub and superscript printing are also supported.

In the bit-mapped graphics mode the BX-80 produces a matrix of 8 dots vertically by 640 dots horizontally per line. Careful programming will allow the BX-80, for example, to reproduce high resolution graphics displays or individual user-defined characters for special applications, without the need for special interfaces or hardware adapters.

Both sprocket-fed fanfold paper and single sheet stationery can be used with the BX-80, which can produce up to three carbon copies in addition to the original print-out. The printer ribbon is a standard cartridge of the "endless loop" type, with replacement ribbons priced at around $15.20 (depending on the supplier).

With a standard Centronics parallel interface the BX-80 printer costs $649.00 from Dick Smith Electronics stores.

DICK'S GOT TWO NEW ONES!

PRICE BREAKTHROUGH

Compact Four Colour Printer/Plotter at only $299

Unbelievable! Now every computer user can afford a high resolution 4 colour printer/plotter. Yes, this remarkable plotter can not only print text in four bright colours, it can produce designs, pie or bar charts....even maps!

Yet it is amazingly simple—with four ball point pen elements, print medium replacement is easy and economical—and avoids many of the problems that occur with more complicated types.

Look at these amazing features:

- Suits all standard Centronics-type computer interfaces.
- Uses non-coated (economical!) standard paper (114mm wide rolls).
- All operations (colour, type size, graphics/text, etc) software controlled under simple BASIC 'LPRINT' statements.
- Minute 0.2mm resolution and minimum step size
- Standard 96 ASCII character set
- 10 characters per second printing speed

Cat X-3245

AMAZING VALUE!

NOW

A low cost dot matrix printer that's quick and quiet

Everything about this outstanding new BX-80 printer from Dick Smith Electronics says 'quality'! A super-fast print speed of 80 characters per second, the latest patented technology of 'in-line' print needles... the BX-80 has all the features you want and need. And to add to the already-impressive list, this superb unit is amazingly quiet in operation!

Yes! The BX-80 will produce excellent graphics. And yes—it operates via normal software control. Combine it with virtually any computer which uses a standard Centronics printer interface! And by the way—an excellent manual, complete with program samples, is provided! What value!

Features:

- 40 column (double width) to 142 columns per line
- Fan form (sprocketed) or friction feed (single sheet) stationery.
- Proportional and bold face printing, plus super-scripting and sub-scripting
- Very easy to move around—it weighs just 5.3kgs!
- Head life quoted at an amazing 30 million characters!
- Outstanding value for money!

Cat X-3268

for only

$649

COMPARE OUR PRICE!

SAME VALUE FOR ACCESSORIES

Paper Rolls To suit X-3245 printer. Quality! Cat X-3246. $6.50

Pen Sets Replacements for the X-3245. Cat X-3247. $7.50 EA

Fan-form Paper To suit X-3268 2000 sheets. Cat X-1182. $36.50

The Computer Specialist

DICK SMITH Electronics

See page 98 for address details

A620/TH

Micronews

Computer cleaning products from Falcon

Falcon Safety Products Inc has announced the availability of the "Dust-Off System II", a computer cleaning and maintenance kit based on the new Dust-Off II Mini-Vac and accessories.

Used in various combinations the Dust-Off II and its accessories are said to enable the computer user to improve performance and protect computer systems against head crashes, media drop-outs and expensive down time by safely blowing away dust particles, removing dirt and cleaning hard to reach places.

Dust-Off II, the central component of the cleaning kit is a "propelled dusting system" which features an exclusive lockable valve that provides continuous blasts of filtered air or brief blasts of graduated strength.

When fitted with a Dust-Off II "Mini-Vac" the dusting system becomes a miniature vacuum cleaner which picks up dust, dirt and lint particles and traps them in a removable filter for later disposal. A uniquely designed dust trap prevents the accumulated material being ejected onto the clean surface or work area and extra length flexible hoses allow the system to be used in hard-to-reach places.

Dust-Off products are distributed in Australia by Kayell, 27 Paul St, North Ryde (02) 887 1944 or 33 Coventry St, Melbourne (03) 690 1844 and outlets in other capital cities.

Mobile computers for WA police force

The DL800 from Omnitronics was developed in conjunction with the Western Australian Police Department to provide an advanced computer-controlled vehicle despatch system using police VHF and UHF radio networks.

Linked to a mainframe or minicomputer, the DL800 equipment can be used to send computer-generated information to mobile units. Omnitronics supply the necessary interface circuits and assistance in developing software for the base-station host computer.

The DL800 uses a four line by 40 character liquid crystal display. Four screens of information can be stored in the internal memory for display as required.

A full alphanumeric keyboard with an additional 15-key special function keypad is supplied with the standard unit, while other keyboard configurations are available to suit particular space requirements and dash layouts. A 40-column plain paper printer is also included for hardcopy of information transmitted to the vehicle.

The equipment also includes a "beacon" function which allows police vehicles equipped with UHF transmitters to be tracked from the base station.

For further information on the DL800 contact Omnitronics Pty Ltd, Unit 3, 42 Osborne Place, Stirling, WA 6021. Phone (09) 445 2633.

Micronews

CBS introduce Coleco Adam computer

The Coleco "Adam" computer is to go on sale in Australia in April next year if all goes as planned. The Adam comes with 80K of memory, keyboard, a daisywheel printer and a digital tape storage system which is claimed to be "almost" as fast as a floppy disk drive. Software cartridges for games can be plugged into the system and word processing and Basic capability are also included.

Press releases announcing the debut of the Adam at the Chicago International Electronics Show say "It is the first family computer system that the whole family will find easy to use and understand. In the words of the manufacturer ADAM thinks like you, so you don't have to think like a computer". They don't, unfortunately, say how a computer "thinks".

US magazine for VIC20 and '64

Wayne Green Inc, the United States publisher of "Microcomputing", "Desktop Computing", "80 Micro" and "HOT CoCo" (for the TRS-80 Color Computer) and other magazines and books has announced plans to introduce a new magazine specifically for users of the Commodore VIC 20 and '64 computers.

Entitled "RUN", the first issue of the magazine will be published in the United States this month.

Victory for Apple in copyright case

In an important victory for major computer manufacturers a Federal Appeals Court in the United States has apparently ruled that computer programs stored in ROM can be copyrighted in the same way as paper listings of the software. A lower court had previously ruled that programs in Read Only Memories were not documents within the meaning of the US copyright laws.

The case, between Apple Computers and the manufacturers of the Franklin Ace has extended copyright protection to cover the ROM-based operating system of the Apple IIe and the next step is for Apple to seek an injunction to bar Franklin from selling their Ace 1000 model, a computer which claims full compatibility with the Apple.

Apple has previously taken legal action against several companies in Australia, New Zealand and South-East Asia which were selling computers which emulate the functions of the Apple II.

News from clubs

● A new computer club has been formed in Tasmania for users of the Spectravideo 318 and 328 computers. Membership fee is $15 per year and includes a subscription to a planned monthly newsletter.

For further information contact Mr P. W. Deckert, 48 Heather St, Launceston, Tasmania, 7250. Phone 44 4836.

● A new Microbee Users Group has been formed in South Australia and already has over 100 members. Membership fee is $15 per year which includes 11 newsletters. Group activities include machine language programming, hardware projects, Basic programming and games sessions. For further information contact Brian Uren of the Microbee Users Group of South Australia on (08) 260 5038 (6pm-8pm) or write to GPO Box 767, Adelaide, SA 5001.

● The Townsville Microbee Users Group (T-MUG) meets at 7pm on the second Monday of each month at Town & Country Computers, CTL Centre, Anne Street, Aitkenvale, Queensland. For further information contact President Chris Hayes on (077) 79 6065 or Secretary John Johnson, (077) 79 5628 (ah)

● The Adelaide Micro User Group is currently setting up a bulletin board service for users of the TRS-80 and System-80 computers. Format for communications will be 8-bit words with one stop bit and no parity at 300 baud. For details contact the group secretary Rod Stevenson on 51 5241 or 337 6682 (after hours). The postal address of the Group is 36 Sturt Street, Adelaide 5000.

More software with the Cromemco C-10

Adaptive Electronics, one of the major distributors in Australia of Cromemco computer systems, has announced a new package which integrates MicroPro's WordStar, InfoStar, CalcStar and MailMerge software with Cromemco's C-10 computer and several of Cromemco's own programs.

The new package combines all the software mentioned with Cromemco's WriteMaster, PlanMaster, MoneyMaster and CDOS operating system with Structured Basic. (For details of this system see EA August, 1983).

JUST RELEASED

WORLD'S FIRST

3 IN 1

- 3 Mode SCANNER
- 3 Mode COMMUNICATION RECEIVER
- 3 Mode VHF-UHF Monitor

FEATURES:

- **25-550 MHz continuous**
- **NBFM — for communication**
- **WBFM — for BC & TV monitoring**
- **AM — for Air band monitoring**
- **20 CH memory**
- **Priority Channel**
- **Clock**

Now you can listen to signals denied to you by all other scanners — Space shuttle, military and satellite comm. and many others!

AR-2001 ONLY $699

INCL. TAX

SPECIFICATIONS:

Frequency Range:	25MHz - 550MHz Continuous		
Search Frequency Increments:	5KHz, 12.5KHz, 25KHz		
Mode:	Narrow band FM Wide band FM AM		
Number of Memory Channels:	20 including Mode informations		
Sensitivity:	Narrow FM	0.3uV	12DB SINAD
	Wide FM	1.0uV	12DB SINAD
	AM	0.5uV	10DB S/N
Threshold Squelch:	NFM	0.2uV	
	WFM	2.5uV	
	AM	0.2uV	
Selectivity:	NFM	±7.5KHz @6DB, ±20KHz @70DB	
	WFM	±50.0KHz @6DB, ±250KHz @60DB	
	AM	±5.0KHz @6DB, ±10KHz @70DB	
Spurious and Image Rejection:	−50DB		
Modulation Acceptance:	NFM	±7.5KHz	
	WFM	±50KHz	
	AM	100%	

IF Frequencies:	1st IF 750MHz	SAW Filter
	2nd IF 45.0275MHz	Crystal Filter
	3rd IF 455KHz	Ceramic Filter
	(WFM) 5.5 MHz	Ceramic Filter
Reference Oscillator:	(Synthesiser) Crystal Controlled	
Scanning Rate:	Approx. 5 Channels per Second	
Search Scanning Rate:	Approx. 6 Seconds per mega-Hertz	
Scan Delay:	Normal.	Approx. 1 second
	With Delay Option	Approx. 2.5 seconds
Search Delay:	Approx. 2.5 seconds	
Priority Sampling Rate:	Approx. 2 seconds	
Audio Output:	1W @10% or less Distortion	
Speaker (Internal):	8 Ohms	
Power Requirements:	12V - 14V DC	
Frequency and Message Readout:	LCD Type	
FCC Certified:	Part 15 Subpart C	
Size:	138mm Wide x 80mm High x 200mm Deep	
Weight:	1.1 kgs	

DEALER ENQUIRIES WELCOME

EMONA electronics pty ltd

ALL MAIL TO: P.O. Box K21, HAYMARKET, N.S.W. 2000 PHONE (02) 211 0531

MAYBE YOU JUST NEED A COMPUTER AND OUR SPELLBINDER WP SYSTEM.

Spellbinder is a full feature word processing system that helps you in the day to day running of your office.

Standard prompters and messages are built in to help you over the initial stages of use. Mailmerging and sorting extras on other systems are standard on **Spellbinder**. And even special features such as these are easy to use.

Also, **Spellbinder** has a flexible print format. It can drive inexpensive dot matrix printers, letter quality precision printers and typographic quality ones to full capacity.

And our powerful macro capability allows you to add features that help with any unique requirements you might have. So if you're looking for help in the office perhaps you should stop writing out classified advertisements and start filling in the coupon.

See Software Source for Basic/z, C-86, Directory Sort, Modem 86, Punctuation & Style, SuperCalc, WordPlus, VSpool & VEdit.

Software Source Pty Ltd

P.O. Box 364, Edgecliff, N.S.W. 2027. Tele: 389 6388

Please send me full details of your **Spellbinder** system.

Name

Company

Address

EA

SS3

Shortwave Scene

by Arthur Cushen, MBE

KNLS Anchor Point begins regular operation

After its initial test broadcasts, Alaska's first shortwave broadcasting station, KNLS, can now be heard on a regular schedule. Gospel programs in Russian and Chinese are broadcast over the Pole from the transmitter at Anchor Point.

The site of KNLS is at Anchor Point on the Kenai Peninsula and the transmitter towers, studio and transmitting building are all located in a clearing in a forest. Two towers each 120 metres high support the 16 dipole curtain array, while two smaller towers each 50 metres high carry the experimental antenna system to beam programs over the North Pole. The transmitter is 100kW and programming consists mainly of transcribed material which is received at the station in recorded form.

The station is operated by the World Christian Broadcasting Corporation based at Abiline, Texas, who also plan stations for the Caribbean area to reach Central and South America. Broadcasts initially on KNLS are in Russian and Chinese and the schedule which is in effect up to November 6 is: 0900-1200 in Russian on 9620kHz; 1200-1330UTC in Chinese on 6170kHz and 1330-1630UTC in Russian on 6170kHz.

As from November 6-March 5 the tentative schedule is: 0700-1730 on 6170kHz and 1730-2000UTC on 6185kHz. Verification has been received on a form letter with some personal remarks from the Director of Engineering, Francis M. Perry, who advises that verification cards will shortly be available. The address is KNLS, the "New Life" Station, PO Box 473, Anchor Point, Alaska 99556.

KFBS SAIPAN

The Far East Broadcasting Company originated in Manila in 1946 with its first gospel broadcast, and now has stations in San Francisco, and Saipan on mediumwave, with shortwave transmitter at the Saipan site on Northern Marianas. The first 100kW transmitter is operating to the following schedule: 0900-1100UTC on 15115; 1100-1300UTC on 15150; 1300-1500UTC on 9575; 1500-1730UTC on 15110; 2100-2200UTC on 9505 and 2200-2400UTC on 15125kHz. Two further transmitters each of 100kW are due to begin operation later this year or early next year, using the call sign KFBS. According to the WRH Newsletter the transmissions are beamed to Asia.

LATIN AMERICAN NEWS

PARAGUAY: Radio Nacional, Asuncion, using 9735kHz has been heard opening at 1000UTC. In the past broadcasts were on 11915, which was a difficult frequency for reception, but the new channel is heard without interference from sign-on. The Deutsche Welle relay station on Antigua uses the frequency up to 0950UTC, and Radio Nacional opens at 1000 with the national anthem, full station identification and then a music program.

PERU: A seldom received Peruvian station Radio Nor Peruana, has been heard on 9655kHz opening at 1100UTC by Owen Cullen, Hikurangi NZ. A classical tune is used as the theme when opening and station identification in Spanish includes medium and shortwave calls and frequencies with a music program following.

VENEZUELA: Radio Nacional, Caracas has been noted by Chris Martin, Sydney, opening at 1000UTC on 9540kHz. The frequency is subject to severe interference from Radio Peking which makes listening difficult, but on occasions the signal from Caracas has dominated the channel.

AUSTRALIAN WINS CONTEST

The well known Sydney listener Andrew Elwell, was placed first in the annual contest conducted by Radio Monitors International. This year listeners were asked to log as many DX Programs as possible, and Andrew logged 88 different DX programs, 39 of which contained DX Club segments, in a week's listening. This is his second successive win in the competition, while Douglas Doull of Auckland NZ was placed third, having previously been placed first in 1978, third in 1980, and 5th in 1981 and 1982. Andrew Elwell took a week's vacation and listened at a special listening point 150km from his home, using three different radios, and two antennas beamed at Europe and South America.

Second place this year went to an Argentine listener, while the majority of the other placings went to listeners in India.

POPULARITY POLL

A recent survey conducted by the Review of International Broadcasting found that listeners still rate the BBC World Service as the most popular shortwave station. The other preferences were Radio Canada International, Radio Netherland, Radio Australia and the Voice of America in that order. The most popular program for shortwave listeners is Radio Canada International's Shortwave Listeners Digest, followed by Radio Netherland's Media Network, BBC World News, WRNO's World of Radio, and Swiss Ratio International Swiss Shortwave Merry-go-round. Once again, Ian McFarland of Radio Canada International was voted most popular broadcaster. Radio Canada International's Shortwave Listeners Digest is heard on Saturday at 2135UTC on 15325, 17820, 17875kHz and on Monday 0405UTC on 9755kHz.

Notes from readers should be sent to Arthur Cushen, 212 Earn Street, Invercargill NZ. All times are UTC (GMT). Add eight hours for WAST, 10 hours for EAST and 12 hours for NZT.

50 & 25 YEARS AGO

"Electronics Australia" is one of the longest running technical publications in the world. We started as "Wireless Weekly" in August 1922 and became "Radio and Hobbies in Australia" in April 1939. The title was changed to "Radio, Television and Hobbies" in February 1955 and finally, to "Electronics Australia" in April 1965. Below we feature some items from past issues.

Wireless Weekly 3p

November 1933

Television on 180 lines: The television bloke, J. L. Baird, has projected 90-line pictures satisfactorily on a screen 8 feet by 6 feet. A 500 watt television transmitter, for 180-line television, is expected soon to be operating from the Crystal Palace, London, transmitting films, and covering a radius of 30 or 40 miles.

☆ ☆ ☆

Marconi on microwaves: Marchese Marconi, according to advice received by Amalgamated Wireless, is starting on a new cruise in his steam yacht, "Elettra", for the purpose of carrying out futher experiments in the transmission and reception of microwaves – wireless waves of less than one metre length.

In addition to repeating and checking his long distance tests of last year, when microwave signals were transmitted and received over the record distance of 162 statute miles, Marchese Marconi has planned a new series of investigations into the propagation properties of these waves. It is hoped that his investigations will lead to further important discoveries, opening the way to the wider application of microwaves for wireless telephone and telegraph services.

☆ ☆ ☆

First "Amateur Radio": We (W. M. "Bill" Moore, VK2HZ) have to hand the first copy of "Amateur Radio," the new organ of the Wireless Institute of Australia and Association of Radio Amateurs. In this the VK hams see the first wholly and solely amateur radio magazine, printed as a representative paper for the VK ham in general. Possibly every other national amateur body has its own official organ, and it's fine to see the WIA stepping into line with these organisations.

The first issue, of some 20 pages, is chock-full of data and notes that should be of interest to every amateur and intending amateur. The WIA is to be congratulated on its initiative. It is left to the hams in Australia whether this organ will live and thrive or no.

☆ ☆ ☆

The good old days: The BBC is experimenting with a lady announcer. Let us be quite explicit. Mrs Giles Borrett is the first woman announcer to be heard from the Broadcasting House studios. Many letters on this interesting subject have been received. The only complaints were from women. American stations which do not employ lady announcers are said to be watching the experiment with great interest.

RADIO TELEVISION AND HOBBIES

November 1958

Atom train: The Soviet Union is planning to put an atom-driven passenger train into service between 1960-1965 which would reach speeds of 312 mph, according to the Hungarian newspaper, "Magyar Ifjusag".

The Russians planned to put the train in regular service between their East and West borders.

It would make two round trips without requiring refuelling.

☆ ☆ ☆

Transistorised Japan: The transistor radio set in Japan is the forerunner and probably the most rapidly spreading product of a new science and new industry.

Japan regards it as a "hope" among Japan's exports, as the Japanese-made camera has been.

The tiny and lightweight transistor radio set is replacing the conventional radio of vacuum tubes and the ordinary portable radio.

Transistor radios represent 87 per cent of the total production of sets in Japan, compared with 14 per cent in February, 1957.

The production in one month this year totalled 159,000 units against 30,000 units of conventional radio sets.

The present production capacity is 30,000 units monthly.

Domestic prices have decreased to as low as 9,000 yen (£9 sterling) from the original 15,000 yen (£15).

☆ ☆ ☆

Radiation keeps food: Steaks good for a year and hamburgers which can be cooked 10 months after purchase will be on sale in the US within 10 years, food experts say.

The food would be treated with radiation, a new technique for preserving food pioneered at the Massachusetts Institute of Technology under Professor Bernard Proctor.

Already slices of beef treated with the technique have been stored for more than three years and are still edible.

The US Army is building a new radiation-preservation centre at Stockton, California, and will shortly begin field tests of irradiated food at Fort Lee, Virginia.

☆ ☆ ☆

X-ray light amplifier: A new family of electronic devices that appears destined to ease the task of the doctor, the radiologist and the radar viewer is taking shape at the RCA Laboratories, Princeton, New Jersey.

The principal identifying features of these devices are a thin panel type of construction plus an ability to receive dim or invisible radiation on the one side and convert it to bright, electronic light on the other.

A thin screen amplifier for X-ray viewing, is capable of multiplying by 100 times the brightness of X-ray images in certain types of medical examination, and at the same time reducing exposure to X-rays.

☆ ☆ ☆

Ceramics in valves: Using a ceramic mounting method for internal elements, a new type valve has been produced with a conventional type glass envelope. Valuable production advantages and great rigidity are claimed.

AED UNIVERSE HAS POWERFUL, INTELLIGENT BUFFERED I/O AND SUPPORT SYSTEM

Over the last few months in this column we have examined many of the features that make the AED UNIVERSE computer one of the fastest, most powerful, expandable, and compatible microcomputer systems available in Australia or perhaps the world. This month we look at AED's new intelligent, buffered UNIVERSE I/O system option.

The speed and power of the 8, 16 and 32 bit CPU's available for the AED UNIVERSE have been increasing over recent years, also new operating systems such as CP/M-86 concurrent and MP/M-86 are capable of superior performance when the peripherals have local intelligence. In response to this trend, AED have developed an I/O and system support card which they claim is the most powerful currently available in S100 form.

Peripherals typically interface via, RS232 serial, or CENTRONICS parallel interfaces. Normally microcomputer systems provide one or both of these standards. They normally provide no buffering or local intelligence. Thus the CPU has to spend significant time servicing the printers, plotters, modems, etc that are connected to them.

The AED I/O & SUPPORT system comprises two programmable RS232 serial, and two CENTRONICS parallel interfaces, all of which are buffered from the S100 bus by a slave Z80 CPU with up to 256k bytes of dynamically allocated memory buffer. Typical printer dumps occur almost instantly with the slave processor doing all the hard work. This leaves the main CPU free to do other tasks. This buffering is extremely useful in communications applications as the system can never lose incoming characters and block checking will not slow-down the system. Telex interfacing can also be done with substantial buffering allowing the operator to service them at leisure when finished with the current task.

The new card offers a clock calendar which benefits from the slave Z80. A queue of times that tasks are to be performed can be loaded into the slave memory and an interrupt will automatically be generated at the appropriate time and date.

Full programmable interrupt facilities are provided with a "tick clock" for multi-user and interrupt driven op-systems. The slave can be interrupt or pole driven from the main system.

Additional features of the card are programmable timer-counters and an analog to digital converter on the slave processor which examines the peak, average, and ripple content of the S100 bus and drive power supplies. This acts as an early warning system of supply problems.

We can help you with:
• CONSULTANCY • SERVICE CONTRACTS • CUSTOM SOFTWARE • STANDARD SOFTWARE

The choice is yours.

Further information about the technology leading features of the AED UNIVERSE computer can be gained by referring to the previous four months issues of Electronics Australia. Next month in this column we discuss AED's memory swedo disk card which simulates a 1 Megabyte disk drive and offers speed exceeding that of the well known GODBOUT Memory drive.

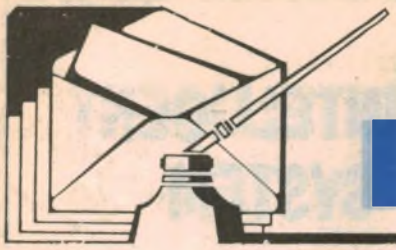
For a complete UNIVERSE information kit contact:—

AED

Sydney: AED COMPUTERS, 24 DARCY ST, PARRAMATTA, NSW 2150.
Phone: (02) 689 1744. Telex: AA70664 GIRFRI.

Melbourne: AED COMPUTERS (MELBOURNE), ELSTON MICRO, 53 WAVERLEY RD, EAST MALVERN, VIC 3145.
Phone: (03) 211 5542. Telex: AA30624 ME447.

Canberra: AED COMPUTERS (CANBERRA), 217 NORTHBOURNE AVE, CANBERRA 2601.
Phone: (062) 47 3403 Telex: AA62898 HARSUR.



Information centre

DRIVEWAY SENTRY: A friend recently built the driveway sentry as detailed in EA December 1982. I purchased a kit of the same project. Although both designs are marginally different, they both have the same problem. The carport light that I control with the unit switches on during daylight hours and cannot be controlled. The cancel button will only reset the unit for a minute or so.

The headlight sensing LDR is connected to my driveway gate and therefore exposed to indirect sunlight each day. To try to correct the problem I put the ambient LDR outside the carport with a line to the control unit. This has not worked. The only thing that did work was to control the unit with a time clock which, with summer approaching, requires frequent resetting. Can you suggest a means by which I can get the unit to work without the need for the time clock. (V.J., Chadstone, Vic.)

● Your description indicates the ambient light LDR connected between pins 3 and 4 of the 555 is not doing its job of inhibiting the circuit. This suggests that the resistance of the LDR is too high and it should be exposed to more ambient light rather than less. To confirm this try connecting pins 3 and 4 of the IC with a 220-ohm resistor. This should inhibit the relay. If not, the 555 is probably faulty.

EXIDY SORCERER: I have been the proud owner of an Exidy Sorcerer Mk II for several months, and after playing the various games I decided to try the utility software from Dick Smith. My first problem is that I am unable to locate any other Sorcerer software dealers in Australia. I hope you will be able to help me in my quest.

My second query is in regard to user groups. I have been successful in finding an interstate Sorcerer users' group, but at present I cannot find any trace of a Victorian branch or group. I hope you can help.

My final query is in reference to modems. I would greatly appreciate it if you could tell me the maximum baud rate at which a modem can operate over Australian phone lines. (P.G., Clifton Springs, Vic.)

● As you may know, the Exidy Sorcerer is no longer manufactured and Dick Smith Electronics recently held a sale which seems to have cleared their stocks of programs for the Sorcerer. The two most prominent independent suppliers of Sorcerer software are PJB Systems, 24A Simpson St, Bondi, NSW, 2026 and Software Source, 344-348 Oxford St, Woollahra, NSW, 2025. PJB also advertised a sale in the August 1983 issue of "Electronics Australia", so the message seems to be "get in quick" before supplies dry up.

Our club listing in the September 1982 issue lists the Sorcerer Computer Users (Australia) group in Doncaster, Victoria. The postal address is PO Box 144, Doncaster, Vic, 3108. You may also wish to contact Mr G. T. Dick of the ACT Sorcerer Computer Users of Australia, 31 Creswell St, Campbell, ACT, 2601 or Steve Buttery of the Microcomputer Club of Melbourne, 15 Judith Court, Mount Waverley, Vic, 3149. This last is a

Ubiquitous microphones can kill:

HOT MICROPHONES: As a working musician, I was interested by the letter from S.S., St Peters, NSW in your September 1983 issue.

However, your columnist neglected to explain, in reply, that the main danger to the guitarist (or bassist) whose amplifier develops a fault of the kind that sent power along the lead to the guitar was the fact that most guitar makers ground the strings and tailpiece of virtually all electric guitars and basses. This is done by running a wire between the tailpiece and the earth connection of the output jack, and supposedly helps reduce pickup noise. It also means that when the amplifier is faulty, the strings may well be carrying 240 volts AC ready to go to earth through the unsuspecting player's hands and body.

The solution is inexpensive, simple to install and also effective. Install a 220kΩ resistor and a 500 volt (or greater) .001 capacitor (in parallel) in the line to the tailpiece. This will limit the voltage on the strings to around 40 volts, enough to warn you to switch off and disconnect at the mains but not likely to kill you (parts cost less than $1.00 per instrument).

Also for any musician using a power supply board with multiple power points, may I recommend the use of at least a circuit breaker for overload protection. Also, if you can afford it, replace the first power point in the wiring sequence with an HPM "Electrosafe" core balance relay. This will protect you against electrocution.

As a final item, perhaps you might care to explain to us musicians what the danger is when playing places with 3-phase power. I've heard of a number of singer-guitarists being electrocuted, while playing and singing, when they touched a microphone with their mouths. What went wrong?

Is simply having the PA and instrument amplifier plugged into different phases of the power supply enough to cause this, or does either the PA or amplifier have to be faulty? (M.F., Telopea, NSW.)

● Your letter is most interesting and should be a useful pointer to guitarists. Our injunction not to tamper with the mains earth on amplifiers still applies though.

Your question about 3-phase power and musicians being electrocuted when they touched a microphone is also very salutary. We doubt whether it has much to do with amplifiers being plugged into different phases of the mains supply. Only one amplifier has to develop a mains fault for it to become lethal, regardless of whether different mains phases are present or not. The point about being electrocuted via the microphone is that the internal resistance of the body is very much lower than normal skin resistance, perspiration notwithstanding. This means that a given leakage voltage from an amplifier is likely to be much more dangerous.

NOVEMBER OPENING SALE

KITS · KITS · KITS

SHOP AT CARINGBAH

Electronic Echo & Reverberation Amplifier

This ECHO EFFECT AMPLIFIER could create a sensational sound effect through the ECHO EFFECT, TIME DELAY and DEPTH CONTROL. Simply connect this unit to any existing hifi between the Pre-amp & Power-amp.

Kit includes all components, transformer, a professional finished cabinet & front panel as well as LED level display!!!!!!!

20% DISCOUNT WHILE STOCKS LAST

SPECIFICATIONS:

Input Sensitivity	150mV/50K ohm
Frequency Response	10Hz to 50KHz ±1dB
Total Harmonic Distortion	Less than 0.05%
Signal to Noise Ratio	90dB at 1V
Out Level	150mV/1K ohm (at 1KHz)

WAS $190.00 **NOW $158.00**

A Stereo Pre-amp + Graphic Equaliser 2 IN 1

A great compact TWO IN ONE stereo Pre-amp saving the cost and space of extra cabinet & power supply. Accepts Phono, Tuner, Tape & Aux Input.

Kit includes all components, power supply, & a professional finished cabinet & knobs.

SPECIFICATIONS:

Input Sensitivity	Phono 2mV/47K
	Others 130mV/50K
Frequency Response	10-100KHz +0.5, -1dB
Total Harmonic Distortion	Less than 0.05%
Graphic Equalizer Control	±12dB/Octave

WAS $179.00 **NOW $144.20**

A FAST SPEED PRE-AMP K-2800

A complete stereo Pre-amp plus TONE CONTROL using fast speed FET IC OP-AMP. & other quality components e.g. stepped volume control.

SPECIFICATIONS:

Input	Phono 2.5mV/47K
	Others 100mV/100K
THD	0.005%(rated output)
RIAA Equalisation	±0.2dB (20-20KHz)
Signal/Noise	Phono 75dB
	Others 90dB

Volume, Balance, Bass, Mid-range, Treble controls, Loudness & Tone Defeat provision.

ONLY $40.00

BEST VALUE $89.00

SOUND & TOUCH RELAY KTY-38 $14.50

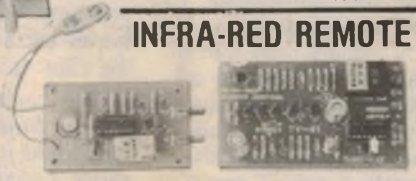
+ ½ MINUTE TIMER OUTPUT

FM MIC SET

INCLUDE BOX KTY-35 $9

INFRA-RED REMOTE CONTROL SWITCH

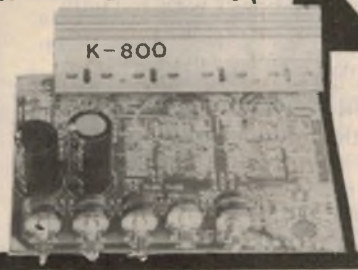
KTY-41 RELAY OUTPUT $39.00



CONTROL DISTANCE UP TO 10 METRES

80W x 2 DC AMPLIFIER KIT

A complete stereo Pre- & power Amplifier including 3 tone controls, heatsink, & power regulator all on a SINGLE Pcb. Require only a transformer with 28Vx2,AC 4A.



SPECIFICATIONS:

Freq. Resp. 0-100KHz, +3dB
TID: Less than 0.01%
DC Supply ±24-40V, 3-5A
SPEAKER PROTECTION INCLUDED !

3½ digit measure 0·1mV to 200V Auto ± sign WITH METAL CABINET

AUTORANGE DVM $49.00

6V-60V DIGITAL PANEL METER KC-23 $29.00

Hi-com Unitronics International Pty Ltd

Box 20 Post Office Sylvania N.S.W. PHONE (02) 524 7878

Shop 7, 45 President Ave, Caringbah, NSW 2229

MAIL ORDER

bankcard welcome here

ADD POST & PACK CHARGES	
under $25	$2.00
$25 - $50	$3.00
$50 - $100	$4.50
OVER $100	$6.00

Please debit my Bankcard

Bankcard No. _____

Expired Day _____

Name _____

Signature _____

WE STOCK ALTRONICS KITS AND MOST ETI AND EA CIRCUIT BOARDS

general interest group but it is a fair bet that it includes some Sorcerer owners.

All dial-up services, bulletin boards etc available to hobbyists currently use 300 baud for modem communications. Some business groups use a second standard, with a 1200 baud up-link and a 75 baud return line, usually on specially leased telephone lines. Higher data transmission rates are in service in some cases, including AUSPAC, Telecom's "packet-switching" network, but for general hobbyist use a 300 baud modem is likely to be adequate for the next few years at least. It is worth noting that the Sorcerer provides both 300 and 1200 baud RS-232C communications, although a "dumb terminal" program is required to make best use of this facility.

RS-232C INTERFACE: In Robert Gareb's design for a parallel to serial interface (EA, July 1983, page 96) he repeats again a so-called RS-232 output circuit that has been promulgated at least once before in "Electronics Australia". In this circuit, a transistor is coupled to −12 volts at its emitter, and to +12 volts via a 470-ohm resistor at the collector. The purported RS-232-compatible output data, TXD, is taken from this collector-resistor junction.

Now, forgetting about the 1.25 watts dissipated by this resistor (which we appreciate during NZ winters), the effect of this circuit is that for part of the time at least, its output is connected directly to the −12 volt rail. I have personally confirmed that if you connect the output of a proper 1488 RS-232 driver IC to ±12 volts, the 1488 will die, particularly, I think, if the 1488 is not powered up.

Yet the real RS-232 specification states that any terminals must be capable of being connected together without any damage to any part of the system! Because of the confusing way that the RS-232 standard specifies pins 2 and 3 (output and input) there is at least a 50% chance that the mild-mannered output driver of the expensive printer or peripheral will find itself linked to the hot-blooded ±12 volt output used by Mr Gareb (and by G. Cohn before him).

At the very least, the output driver should have some resistance added in series with the output. Alternatively, a proper RS-232 driver could be used or, very cheaply, a 741 op amp. (J.M., Christchurch, NZ.)

● You are right. In our article on the RS-232C standard published in December 1979 we outlined a discrete TTL-to-RS232 interface which was similar to the design in question except that it incorporated a series 270-ohm resistor in the output. There was also a .0022μF shunt capacitor to limit the maximum slew rate to 30V/μs. These parts could be added easily.

EXPLODING BATTERIES: Last week I was looking through some back issues of EA and came across the topic of exploding lead-acid batteries.

I may be stirring up old issues but I feel that a hidden and very real danger may exist for the unwary. If the charger is not turned off, the clips uninsulated and disconnected at the same time, upwards of 120 volts may be produced across the clips. It could be fatal!

The sudden break of the secondary field does, with some variation, produce these voltages. I know – I've felt it, and so has a mechanic friend of mine.

Apart from the spark-hydrogen combination, the charger must be turned off before removing or replacing the clips. (J.S., Salisbury, SA.)

● We agree that disconnecting a charger from a lead-acid battery while it is charging is a dangerous practice. It can cause a spark and a resultant explosion which could lead to acid in the user's eyes. However, we feel that the back-EMF which causes the spark would be unlikely to cause a fatal shock even though it may give you a nasty "bite".

VIBRATION PROBLEM: I would be very grateful if you could provide me with the solution to a vibration problem. The problem concerns a CB transceiver mounted on an off-road motorcycle. This machine shakes so badly that the CB has now been put out of action by broken connections at least four times and is now completely wrecked.

I have tried to cure the problem by coating the circuit board with silastic, which helps but is difficult to force into awkward corners. Could you suggest something a little thinner that will flow into all the crevices, gaps etc, around components and stop them from moving around? (B.H., Meekatharra, WA.)

● We are reluctant to recommend a potting procedure which may render the CB transceiver unable to be repaired in the future and we would have assumed that one of the silicone caulking compounds would be adequate for the task. An alternative is to coat the whole of the inside of the unit with a thick layer of transformer wax. Why not try mounting the whole transceiver in a spring-loaded cradle or even a saddle made of thick foam rubber, to try and isolate the unit from the worst of the road bumps?

Electronics Australia Reader Service

"Electronics Australia" provides the following services:

PHOTOSTAT COPIES: $3 per project, or $6 where a project spreads over multiple issues (price includes postage). Requests can be handled more speedily if projects are positively identified, and if not accompanied by technical queries. We reserve the right to supply complete back issues instead of photostats, where these are available.

CHASSIS DIAGRAMS: For the few projects which require a custom metal chassis (as distinct from standard cases) dyeline plans showing dimensions are normally available. $3 including postage.

PC BOARD PATTERNS: High contrast, actual size transparencies: $3, including postage. Please specify positive or negative.

PROJECT QUERIES: Members of our technical staff are not normally available to discuss individual projects, either in person at our office, or by telephone.

REPLIES BY POST: Limited to advice concerning projects published within the last three years. Charge $3. We cannot provide lengthy answers, undertake special research, or discuss design changes. Nor can we provide any information on commercial equipment.

OTHER QUERIES: Technical queries outside the scope of "Replies by Post" or submitted without fee may be answered in the "Information Centre" pages, at the discretion of the Editor.

COMPONENTS: We do not sell electronic components. Prices and specifications should be sought from advertisers or agents.

BACK ISSUES: Available only until our stocks are exhausted. Within six months of publication, face value plus 30c for post and packing for each issue. Seven months and older, $3 (includes post and packing and storage fee).

REMITTANCES: Must be negotiable in Australia and made payable to "Electronics Australia". Where the exact charge may be in doubt, we recommend submitting an open cheque endorsed with a suitable limitation.

ADDRESS: All requests to the Assistant Editor, "Electronics Australia", Box 163, Chippendale, 2008.

Notes & Errata:

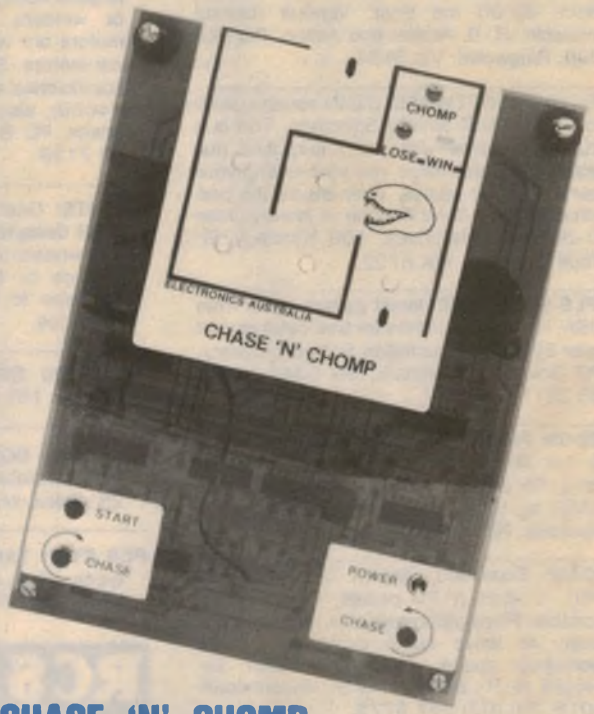
ELECTRONIC WATTMETER (September 1983, File 7/M/63): The negative terminal of the meter is connected to VR4. On the wiring diagram the lead marked "9" connects to the negative terminal of the meter. On the circuit diagram, pin 4 of IC2b should be marked "−" rather than "+".

SIX DECADE CAPACITANCE METER (October 1983, CDI page 70): The author has advised that the trigger input terminals of the 74121, pins 3 and 4, must be grounded to enable the monostable function, not taken to Vcc as shown.

ABSOLUTE VALUE AMPLIFIER (September 1983, File 8/DT/130): The circuit on page 33 should drive a high impedance load, not a short circuit, as shown.

50V/5A LABORATORY POWER SUPPLY (June 1983, File 2/PS/55): The BD139 package outline shown in the circuit diagram has the base and emitter leads incorrectly marked. The correct lead sequence is: (from the left of the drawing) emitter, collector, base. The ECB markings on the parts overlay diagram are correct.

Next month in Electronics Australia



CHASE 'N' CHOMP

Emulating a popular video game, Chase 'N' Chomp is a hand-held electronic version that will bring hours of enjoyment. It uses novel bi-colour LEDs, features simple sound effects, and is easy to build.

VK POWERMATE

Want to power an amateur transceiver from the mains? Our new VK Powermate supply provides 13.8V DC at up to 10 amps (intermittent). Features include good load and line regulation, over-voltage protection, and negligible hum output.

ELECTRONIC IGNITION

Based on our well-proven TAI unit, our latest electronic ignition system uses a Hall effect device to replace the breaker points in the distributor. The system locks in engine tune and is virtually maintenance free.

PLUS:

ARTICLES ON rhythm generators, TV antennas, and video cameras (including the new Betamovie integrated camera and recorder).

* Although these articles have been prepared for publication, circumstances may change the final content. However, we will make every attempt to include the articles featured here.

EA marketplace EA marketplace

FOR SALE

CPM USERS GROUP: Discs up to No. 90 inc. Businessmaster II software, cat $8.00, discs $9.00 inc post. Various formats available. R. B. Archer and Assoc, PO Box 696, Ringwood, Vic 3134.

SPECTRUM SOFTWARE: Castle escape game for the 16/48K Sinclair Spectrum. This is a frustrating game with many surprises (full graphics), it also helps you start writing your own computer games. Only $8.95 inc p&p (on cassette). Send cheque or money order to Softpac Enterprises, 109 Kennedy St, South Hedland, WA 6722.

APPLE SOFTWARE: latest games direct from USA. Rent or buy. Write for free catalogue of over 200 titles. Australian Software Library, PO Box 808, Renmark, SA 5341. (085) 88 2877 any time.

AMIDON FERROMAGNETIC CORES: Types to suit all receiver and transmitter applications. For data and price list send an A4 size SASE to: RJ & US Imports, PO Box 157, Mortdale, NSW 2223.

ORGAN: Expanded version of Playmaster 760. 2 kbds (F-F), pedals, in well made console. Photograph available. Builder lacks ability to solve audio problems. Needs workshop space. Reasonable offer accepted. R. H., 88 Bayview St, Williamstown 3016. Ph: (03) 397 6773.

ELECTRONIC IGNITION: Australian designed, fully built and tested. Stops points burning, maintains engine tune, unique pulsed action, delivers high energy spark, (improvement over dwell extension), rugged construction, in diecast aluminium. $46, including pack & post. Installation arrangeable in Sydney. Chipspeed Electronics, PO Box 337, Wentworthville 2145, NSW.

AIRCRAFT STARTER-GENERATORS: Gen. Elec. CM-7, 30hp, 400 amps, with driveshaft couplings, 400 ammeters, shunts, and 400 amp. Silver contact relays. In good cond. Suitable as electric car motors or welders. These high quality surplus motors are widely used in USA as electric car motors. Several available complete with accessories at $750 (new price in excess of $4000), also plans avail. Electricar Enterprises, PO Box 223, Kuranda, Qld. (070) 93 7139.

ROBOTS: Gears, motors and more for the robot designer builder. Kit of motors, gears and wheels for a turtle robot, $47 plus $2 postage or send stamped self-addressed envelope to Box 21, Parkville, 3052 for catalogue.

SUPER 80 SOFTWARE: Send SAE to J. Hawley, 151 Denton Ave, St Albans 3021.

UV LIGHT BOX: Commercial and hobbyist types available. See advertisement on page 23. Kalex, phone (03) 458 2976.

PCB ETCH TANK: Commercial and hobbyist types. See advertisement on page 23. Kalex, Box 174, Heidelberg 3084.

DISPLAY ADVERTS IN MARKETPLACE are available in sizes from a minimum of 2cm x 1 col rated at $15 for a col cm.

CLASSIFIED RATES $3.60 for 40 letters or part thereof per insertion payable in advance. Minimum 80 letters.

CLOSING DATE is six weeks prior to the on-sale date. Issues are on sale the first Wednesday of each month.

RISTON: Negative resist PCB material. Write for information sheet, Kalex, Box 174, Heidelberg 3084.

UHF RADIO COMMUNICATIONS SYSTEM: "Philips" complete with Base Station, remote console and microphone, repeater unit, battery charger and six Pye pocket phones. For further information, contact Mr J. Harper, University of New South Wales — Property Division, phone (02) 662 2504. All offers should be forwarded in writing to: The Property Manager, The University of NSW, PO Box 1, Kensington, NSW 2033.

WIND DRIVEN GENERATORS: Solar panels, inverters, flourescent lighting. For information: Pioneer Wind & Solar, 19 Balowrie St, Yowie Bay NSW 2228.

READER SERVICE

COMPUTER CLINIC: Repairs and services Tandy, Sorcerer, Apple, System 80, Microbee, Osborne, etc, disk drives and printers, Bankcard. (07) 269 8573, PO Box 68, Aspley, Qld 4034.

COMPUTER SERVICES: Repairs to personal/games computers. TRS 80, System 80, Microbee, Sorcerer, Vic 20, etc. 104 Crowley St, Aspley, Qld. (07) 263 4354.

FOR HIRE

MICRO RENTAL: Microcomputer systems of various modelos with peripherals are available for short-term hire from Dorf Microcomputer. Start-up and reference manuals included. Sydney (02) 922 1644 or (02) 960 1808 (AH)

FUNDAMENTALS OF SOLID STATE

Fundamentals of Solid State has been reprinted, revised and updated showing how popular it has been. It provides a wealth of information on semiconductor theory and operation, delving much deeper than very elementary works but without the maths and abstract theory which make many of the more specialised texts very heavy going. It begins with atomic theory, diode types, unijunction, field effect and bipolar transistors, thryistor devices, device fabrication and microcircuits. A glossary of terms and an index complete the book. Fundamentals of Solid Stae has also been widely adopted in colleges as recommended reacing — but it's not just for the student, it's for anyone who wants to know just a little bit more about the operation of semiconductor devices.
Available from:
"Electronics Australia", 57 Regent St, Chippendale. **PRICE** $3.50 OR by mail order from "Electronics Australia", PO Box 163, Chippendale, 2008. **PRICE** $4.40.

Parabolic Microphone . . . ctd from p129

segments will initially seem very awkward but the parabolic shape should eventually emerge. Use the profile drawing to verify the shape when all of the segments have been joined, and make any necessary adjustments.

When the reflector has been assembled, the paper pasting can commence. Take several newspaper pages and tear them into strips about 10 to 15cm wide, and long enough to run from the centre to the edge of the reflector. Then mix up a simple flour paste, using plain flour. The ratio of flour to water depends on how viscous you want the paste to be – for the first layer, not too much water. As you are ready to use each strip of paper, run it through the paste so that it is well and truly impregnated.

The first layer of paper took around half a day to dry and subsequent layers a couple of hours. It is wise to remove any irregularities as they occur – this becomes increasingly difficult after each layer. Just moisten a small area with a damp cloth and manipulate it into the correct shape. Using this method, each damp patch will dry in about 10 minutes.

When the parabola is complete, a small mounting frame for the microphone will have to be manufactured. Again, cardboard can be used. Remember, the face of the microphone should be at the focus.

To test the project, plug in a pair of headphones and set both trimpots to their anti-clockwise extreme. Allow the circuit a few seconds to stabilize after switch on and then slowly advance the volume control. Background noise should quickly become apparent but just to make sure, whistle at the microphone. If you are nearly deafened by the noise, everything is OK.

A.C.E. RADIO ELECTRONICS CENTRE

136 VICTORIA RD, MARRICKVILLE, NSW 2204
PHONE 51 3845

PROUD TO BE AUSTRALIAN

BARGAIN PRICES ● PERSONAL ATTENTION ● SLICK MAIL ORDER SERVICE ● SATISFACTION

• 12V 1.2AH LEAD ACID BATTERY •

FULLY SEALED ABS PLASTIC CASE. IDEAL FOR ALARM SYSTEMS. DC OPERATED ELECTRONIC GEAR. TV, VIDEO CAMERA, LIGHTING, ETC

RECHARGEABLE
TIME AFTER TIME,
AFTER TIME

$15.95

NSW $2.75
V, Q, SA, T $3.75
WA, NT $4.75

DISCHARGE CURRENT . . . 20 HR RATE 60 MA. CHARGE RATE . . . 120MA 10-14 HRS. SIZE 100L x 45W x 53H mm.

12V HIGH POWER ALARM SIREN

WARBLER TONE. 105dB at 1 METRE. **$21.95**
INDOOR/OUTDOOR
IDEAL FOR CAR, HOME, BOAT ETC.

PP NSW $2. INTERSTATE $2.85

KRIESLER

BELT DRIVE STEREO PLAYER
WITH MAGNETIC CARTRIDGE
DIAMOND STYLUS . . . . .

$66.00

P-P NSW $5.50.
Q. V. T. SA $6.50.
WA, NT $7.50

LIMITED STOCK

Features — big aluminium turntable ● 2 speeds 33-45rpm ● Cue lever ● Calibrated adjustable counterweight ● Calibrated anti-skate ● Auto return-stop ● Switch click suppressor ● Power cable, RCA connectors ● 240 VAC

A1 QUALITY FIBREGLASS PRINTED CIRCUIT BOARD

350 x 81MM. 4 FOR **$2.95**

P-P NSW $1. INTERSTATE $1.50.

1" DOME TWEETER

(Similar design to Philips ADO 161)

8 OHMS 100 WATTS
2000-20,000Hz

$9.50

P-P NSW $1.50
INTERSTATE $2.50

NEW ECONOMY RANGE ETONE SPEAKER SPECIALS

GENUINE FACTORY PRICES ALL WITH FACTORY WARRANTY

Model	Size	Cone Type	V/coil	ResonHz	Freq Hz	Watts Rms	Price Ea		2 for
8 HiFi	20cm	Foam surround	8 Ohms	50	40-4000	40	$17.50	or	$33.30
10 HiFi	25cm	Foam surround	8 Ohms	50	40-4000	50	$21.70	or	$41.00
12 HiFi	30cm	Foam surround	8 Ohms	40	30-4000	50	$27.50	or	$52.00
8 PA	20cm	Rugged paper	8 Ohms	70	60-8000	20	$14.90	or	$28.00
10 PA	25cm	Rugged paper	8 Ohms	70	60-8000	25	$18.50	or	$34.00
12 PA	30cm	Rugged paper	8 Ohms	60	50-6000	30	$22.75	or	$42.50

Pack — Postage. Add — for one 20/25cm, NSW $2.75, Interstate $4 — for two 20/25cm, NSW $4, Interstate $5.50 — For one 30cm, NSW $3, Interstate $4.50 — for two 30cm, NSW $4.40, Interstate $6.

2-GANG VARIABLE CAPACITOR

$5.75

P.P. $2.50

2 x 415PF Inbuilt slow motion or direct drive 6mm shaft. Size 55 x 50 x 33mm.

ELECTROLYTICS

4700μF 35V AX	4 for $7
1000μF 40V AX	4 for $6
2500μF 16V RB	4 for $3
10μF 25V T Tant	10 for $4
4.7μF 16V T Tant	10 for $3

P-P $1.50

CABINETS

$22.95

P.P. NSW $4.50. V, SA, Q, T $5.50. WA, NT $6.50

Direct from a manufacturer of sophisticated electronics ● Fully moulded, hi-impact, heavy duty ABS plastic ● The colour is battleship grey ● Detachable U-shape top and bottom, front and back panels ● Front panel has cut-outs, and will easily accept a blank panel ● 4 jumbo countersunk plastic screws secure the 4 sections ● Underside has ample ventilation, and dimples for rubber feet ● Dimensions 350mm (W) x 130mm (H) x 350mm (D) material 5mm thick. BRAND NEW PERFECTS. **PROFESSIONAL QUALITY**

240V 50HZ HEAVY DUTY SOLENOID

25mm travel. Ideal for electro-mechanical applications.

$12.50

P-P NSW $1.50
INTERSTATE $2.50

BIG POWER TRANSFORMER

Aust. Made. 240V 50Hz
Primary 285V . . . CT . . .
285V 180MA 6.3VCT
6A 5V 3A.

BRAND NEW

$27.50

P-P NSW $5
INTERSTATE $7.50

HI-POWER BRIDGE RECTIFIER

400 PIV
35 AMP

$3.75 P-P 75c

DIODE IN 4004. 50 FOR $2.50

P-P 80c

EX-COMPUTER FAN MOTORS

!KEEP IT COOL!

4" sq. 230V 50/60Hz

EXCELLENT WORKING ORDER GUARANTEED

Amps ● Power Supplies ● Electronic Equipment will operate far more efficiently ● Imp protected ●

$8.95 EA

P.P. NSW $2.50
INTERSTATE $3.50

HIGH GRADE POTTER AND BRUMFIELD RELAY

P-P 95c **$3.50**

KU series ● 240 VAC 50Hz operation ● 3 sets of 240V 10 amp change over contacts ● perspex cover and mounting base included ● size 50mm x 37mm x 35mm ● ex-computer ● as new condition. At less than ⅓ of the normal price.

LOW PROFILE FERGUSON TRANSFORMER

INPUT 240V AC 50 HZ.
SIZE 70 x 60 x 37MM

24V 1A

$6.95

P-P NSW $2
INTERSTATE $3.50

TRANSMITTING TRANSISTOR

2N3927. NPN. 175MHZ.
TO-60 12W. GOLD PLATED.

2 FOR **$8.50** P-P $1.50

240V 50Hz 5 AMP MAINS FILTER

$9.50

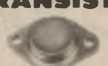
Professional Quality. Ex-computer.

Also ideal audio gear, receivers, etc.

P-P $1.50

2SD200 = BU205 TRANSISTOR

NPN VCBO 1500V ● VCEO 700V ● 2.5 AMPS



4 FOR **$3.75** P-P 75c

A1 QUALITY TRANSISTORS

2N3055

10 FOR **$6.** P-P $1.50

MJE 3055 TRANSISTORS

10 FOR **$12** P-P $1.50

EA Magazine Holders

The binders and magazine holders are available over the counter from Electronics Australia, 57 Regent Street, Sydney, NSW — Price: $5.10 binders, $4.50 holders.

Mail orders should be sent to Electronics Australia, PO Box 163, Chippendale, NSW 2008.

Prices including postage are:

Holders: $5.50 NSW; $5.60 other states; or six for $29.00 NSW; $31.50 other states, $A33.00 NZ.

Binders: $7.00 NSW; $8.50 other states; or six for $33.00 NSW; $36.00 other states, $A37.00 NZ.

EA PC BOARDS AND FRONT PANELS

Some readers have problems obtaining PC boards and front panels for projects. Many of our advertisers sell these items and their advertisements should be checked in the first instance. Failing that, below is a list of firms which produce or sell PC boards and front panels.

NSW

Dick Smith Electronics,
125 York Street,
Sydney, 2000.
Telephone 290 3377.
DSE also has branches and resellers throughout Australia.

Jaycar Electronics
117 York Street,
Sydney 2000.
Telephone 29 2098.

115-117 Parramatta Road,
Concord, 2137.
Telephone 745 3077.

Radio Despatch Service,
869 George Street,
Sydney 2000.
Telephone 211 0816.

RCS Radio Pty Ltd,
651 Forest Road,
Bexley, NSW 2207.
Telephone: 587 3491

VIC.

Rod Irving Electronics,
425 High Street,
Northcote, 3070.
Telephone 489 8131.

48 A'Beckett Street,
Melbourne 3001.
Telephone 347 7917
347 9251.

Kalextronics,
101 Burgundy Street,
Heidelberg 3084.
Telephone 743 1011.

Shop 11,
Regional Shopping Centre,
Melton 3338.
Telephone 743 1011.

Sunbury Printed Circuits,
Lot 14, Factory 3,
MacDougal Road,
Sunbury 3429.
Telephone 744 2714

WA

Altronics,
105 Stirling Street,
Perth 6000.
Telephone 328 1599.

Jemal Products,
5 Forge Street,
Kewdale, 6105
Telephone (09) 451 8726

N.Z.

Marday Services,
PO Box 19 189,
Avondale, Auckland.

Mini Tech Manufacturing Co Ltd,
PO Box 9194,
Newmarket.

Printed Circuits Limited,
PO Box 4248,
Christchurch

SUBSCRIPTION SERVICE

ELECTRONICS Australia

Subscription Rates

$29.00 per year within Australia
$31.00 per year elsewhere

Make sure you receive every copy of the magazine by ordering it from your newsagent or the publisher. For publisher subscriptions post this coupon, with your remittance to Electronics Australia Subscription Dept, John Fairfax & Sons Ltd, GPO Box 506, Sydney 2001. Subscription will start with first available issue.

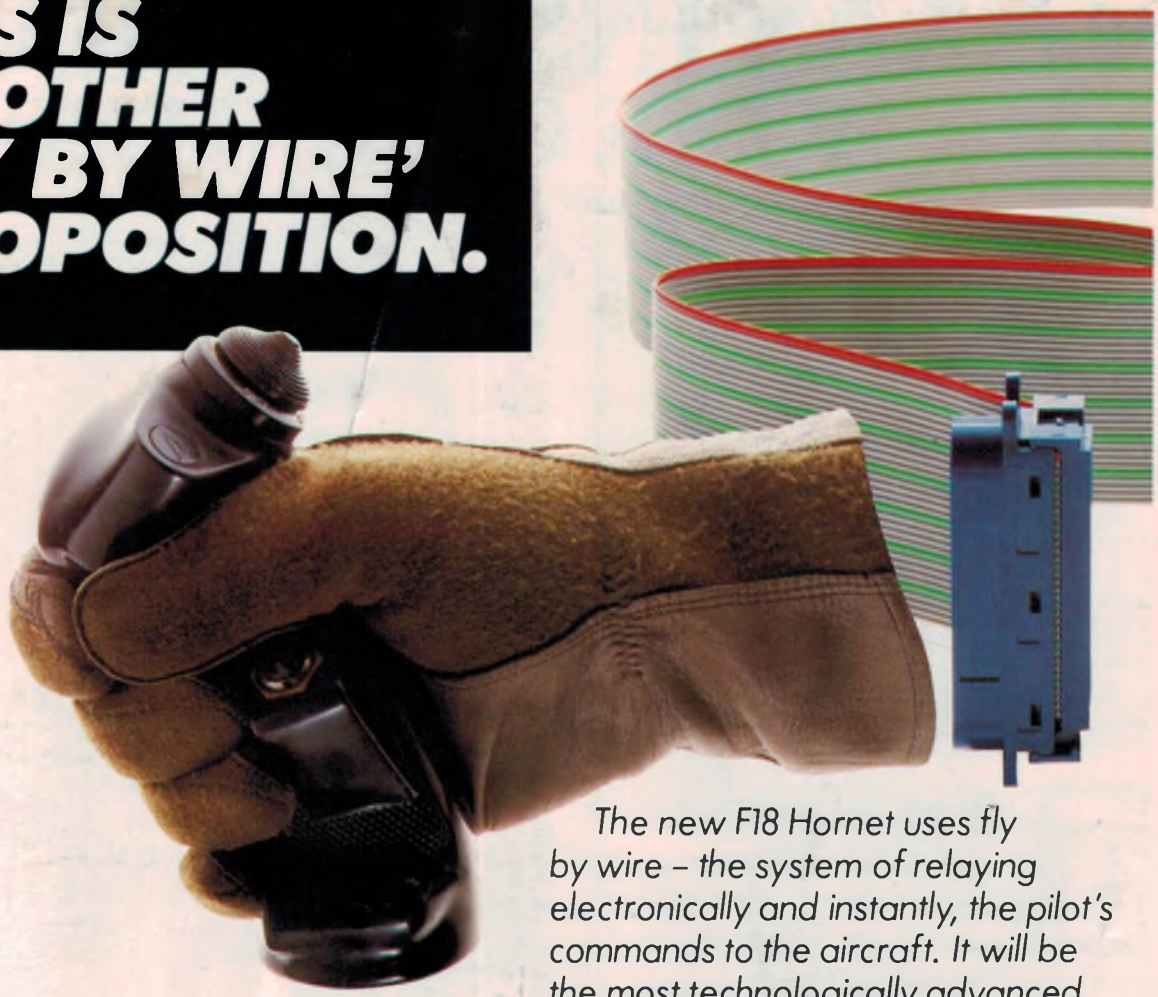
Name .....

Address .....

Postcode ..... Enclosed is ..... for ..... years

ADVERTISING INDEX

THIS IS ANOTHER 'FLY BY WIRE' PROPOSITION.



The new F18 Hornet uses fly by wire – the system of relaying electronically and instantly, the pilot's commands to the aircraft. It will be the most technologically advanced aircraft ever to grace the Australian sky. And Australia's Air Force needs technically minded young men and women as Electronics Technicians to keep it flying.

If you have successfully completed at least year 10 with passes in English, Maths and Science, you may just turn an interest in electronics into a full time career.

JOIN AUSTRALIA'S AIR FORCE.

If you're an Australian citizen (or eligible to become one), aged 17-34, telephone your nearest Air Force Careers Adviser on: Sydney (02) 212 1011, Newcastle (049) 25 476, Wollongong (042) 28 6492, Parramatta (02) 635 1511, Canberra (062) 82 2333, Melbourne (03) 61 3731, Geelong (052) 21 1588, Brisbane (07) 226 2626, Townsville (077) 72 4566, Adelaide (08) 212 1455, Perth (09) 325 6222, Hobart (002) 34 7077, or write to Box XYZ in your capital city.

Authorised by Dir. Gen. Recruiting Dept. of Defence.

RG17FPC 63

TEXAS INSTRUMENTS
HOME COMPUTER

A limitless learning environment for children to give them the Educational Edge.

Creating useful products and services for you.

TEXAS INSTRUMENTS

TEXI0086B