AUSTRALIA'S DYNAMIC ELECTRONICS MONTHLY!

Electronics Today INTERNATIONAL

eti
November 1984
$2.50*
NZ $3.25

HI-FI VIDEO
The Might and the Magic!

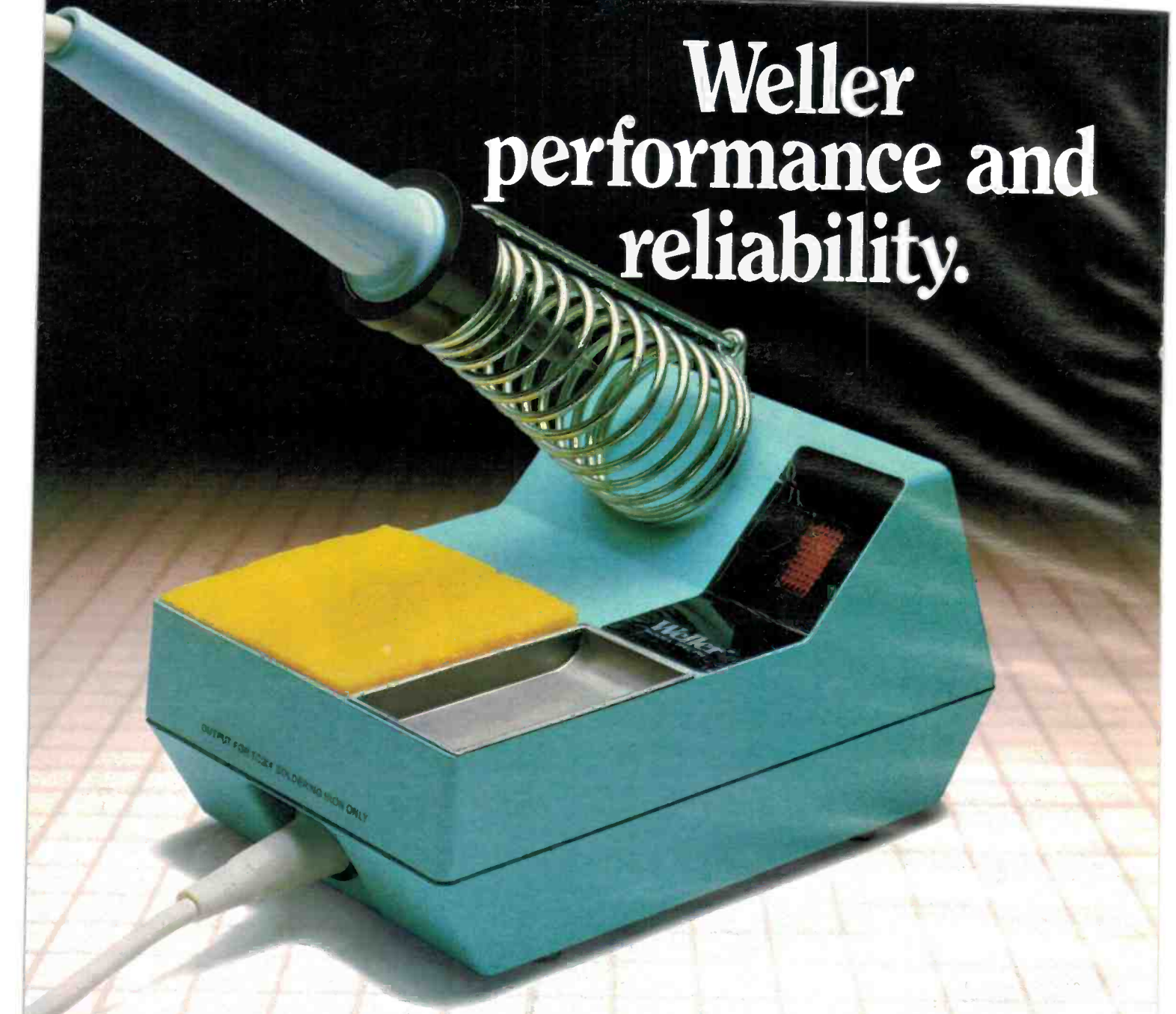
'TALKMAN' TRANSCEIVERS TO WIN

PROGRAMMABLE CONTROLLERS
An Introduction

RADIO AMATEURS:
Two RTTY Projects

AMSTRAD COMPUTER REVIEWED

THREE-REEL POKER MACHINE PROGRAM



Look-alikes aren't that simple.

You could buy a lower priced soldering station that looks very similar to the Weller WTCPN But it wouldn't perform like it.

By changing the heat sensing tips, the Weller WTCPN automatically controls output and temperature in three stages (315°C, 370°C and 430°C). Once selected, you can be assured of constant, accurate temperature control without dials to turn or settings to watch. To make working with sensitive components that safe and simple, Weller has incorporated state-of-the-art technology into an attractive impact resistance case, that's ideally suited for assembly work.

Don't be fooled by look-alikes.
Check with your Electronics Distributor.

The Weller WTCPN

CooperTools

COOPER INDUSTRIES

CRESCENT LUFKIN NICHOLSON PLUMB TURNER WELLER WIRE-WRAP WISS XCELITE

The Cooper Tool Group Limited, P.O. Box 366, Nurigong Street, Albury NSW 2640, Australia, Tel: (060) 216866, Telex: AA 56995

EDITORIAL

OVER THE PAST ten years a mild, but nevertheless far-reaching, revolution has taken place in the 144 and 432 MHz bands — namely, the introduction of FM repeaters. Sited in good locations, they provide wide, reliable coverage for the myriad low power FM mobile stations. It is not unusual for a repeater to service an area of between 10 000 and 30 000 square kilometres — the entire metropolitan area of Sydney or Melbourne, for example.

There are currently more than 100 repeaters in operation, spread through every state and territory in Australia. The majority have been got together and are maintained by small groups of dedicated amateurs. Some repeaters, to the credit of those involved, have been designed and built 'from scratch'. Most are supported financially by a local club.

As a 'service' within the 'amateur radio service', they're a *damn fine idea*, generally well-executed in practice. We're fortunate in this country that, by general 'gentlemen's agreement', they're all "free access". Anyone who can transmit and receive on the appropriate frequencies, and is within range, can use a repeater. But therein lies the rub.

It didn't take long for certain cretins in the community to discover this and use the repeaters for their own perverse ends, broadcasting obscene abuse to all and sundry and/or particular amateurs of groups, apart from making a general nuisance of themsleves with various animal noises, etc. Clearly, by their very actions, some are unlicensed — refugees from no man's land between 27 and 28 MHz, with the thrilling stench of spectrum piracy fresh in their nostrils. But equally clearly, some are licensed — which must be judged a worse crime.

These characters hide behind the anonymity of the microphone and the disguised voice, cowards all, breaking in on others' contacts to interrupt, abuse, malign and defame. The *anonymouth* has much unassailable power, and knows it. And therein lies a problem for the repeater groups.

An anonymouth uttering defamatory remarks or statements about someone or some group on a repeater leaves the repeater owners/operators open to a defamation action because they provide the instrument by which the defamation is broadcast. Defamation is a complex can of worms for the defamation lies in the slight the words carry, not in the actual words, and there are few defences. All it requires is for one person to utter a comment about another such that a third person, hearing that, thinks less of them. Those involved in broadcasting the defamation can be adjudged equally culpable, be it transmitted by print or radio waves. Broadcast stations running "talk-back" programmes employ a seven-second delay for this very reason.

Will the same, or some other, provision be instituted for amateur repeaters in order to deal with anonymouths? If the amateur service is to be self-regulatory to any extent, anonymouths must be rooted out and dealt with or it won't be long before someone brings a defamation action against a repeater group where their repeater is plagued by one (or more). It's a pity that such a tremendously handy service, so useful for everyday amateur activities as well as for public emergencies, should be jeopardised by the actions of so few. Repeater groups will have to seriously face cleaning out the anonymouths or face being 'cleaned up' in court.

Roger Harrison
EDITOR

SERVICES

TECHNICAL INQUIRIES: We can only answer readers' technical inquiries by telephone after 4.30pm Mondays to Thursdays. The technical inquiry number is (02) 662-4267. Technical inquiries by mail must be accompanied by a stamped, self-addressed envelope. There is no charge. We can only answer queries relating to projects and articles as published. We cannot advise on modifications, other than errata or addenda. We try to answer letters as soon as possible. Difficult questions may take some time to answer.

COPYRIGHT: The contents of *Electronics Today International* and associated publications is fully protected by the Commonwealth Copyright Act (1968). Copyright extends to all written material, photographs, drawings, circuit diagrams and printed-circuit boards. Although any form of reproduction is a breach of copyright, we are not concerned about individuals constructing projects for their own private use, nor by bands (for example) constructing one or more items for use in connection with their performances. Commercial organisations should note that no project or part project described in *Electronics Today International* or associated publications may be offered for sale, or sold in substantially or fully assembled form, unless a licence has been specifically obtained so to do from the publisher, The Federal Publishing Company, or from the copyright holders.

GENERAL INQUIRIES: For all inquiries about back issues, subscriptions ($24.00 for 12 months/12 issues), photocopies of articles, artwork or submitting articles, call (02) 663-9999 or write to: ETI Reader Services, 140 Joynton Avenue (PO Box 227), Waterloo, NSW 2017.

CONTRIBUTIONS: Submissions must be accompanied by a stamped, self-addressed envelope. The publisher accepts no responsibility for unsolicited material.

LIABILITY: Comments and test results on equipment reviewed refer to the particular item submitted for review and may not necessarily pertain to other units of the same make or model number. Whilst every effort has been made to ensure that all constructional projects referred to in this edition will operate as indicated efficiently and properly and that all necessary components to manufacture the same will be available, no responsibility is accepted in respect of the failure for any reason at all of the project to operate effectively or at all whether due to any fault in design or otherwise and no responsibility is accepted for the failure to obtain any component parts in respect of any such project. Further, no responsibility is accepted in respect of any injury or damage caused by any fault in the design of any such project as aforesaid.

QUICK INDEX

FEATURES
News by microwave 14
More practical unis? 17
Programmable logic controllers . 46
'Talkman' contest 98

AUDIO/VIDEO
Hi-Fi stereo video
— how good? 28

PROJECTS
ETI-278 Directional door minder . 65
ETI-661 Chord tutor 74
ETI-755 RTTY modem 88
ETI-756 VZ200 glass RTTY 106

ELECTRONICS
Starting electronics:
Know your components! 58
Ideas for experimenters 80
Idea of the month 82

COMMUNICATIONS
Updating the ETI-733 101
The world of mediumwave 114

COMPUTING
Amstrad CPC464 review 126
Programming for the eclipse 135
Three reel poker for the VIC-20 .. 138
Microbee column 142

SPECIAL OFFERS
Nashua floppies offer 122
Casio computer offer 133

NEWS
News Digest 8
Sight & Sound 24
Equipment 37
Component 41
Communications 84
Computing Today 119

GENERAL
ETI books 131
Shoparound 144
Mini-mart 145
Dregs 146

EDITOR
Roger Harrison VK2ZTB

EDITORIAL STAFF
Mary Rennie
Jon Fairall B.A.
Geoff Nicholls B.Sc./B.E.
Peter Ihnat B.E., B.Sc.
Robert Irwin

ASSOCIATES
David Tilbrook VK2YMI
Jonathan Scott
B.Sc./B.E. (Hons) VK2YBN

DRAUGHTING
David Currie

PRODUCTION
Chris Gerelli

ADVERTISING SALES
John Whalen (National)
Cathy Darnell
Bruce Burrel

ART DIRECTOR
Ali White B.A.

ART STAFF
Toni Henson
Brian Jones
Vicki Jones

READER SERVICES
Arlene Grimshaw

ACOUSTICAL CONSULTANTS
Louis Challis and Associates

MANAGING EDITOR
Jamieson Rowe

PUBLISHER
Michael Hannan

HEAD OFFICE
140 Joynton Avenue, (PO Box 227)
Waterloo, NSW 2017.
Phone: (02) 663-9999 Sydney.
Telex: 74488, FEDPUB.

ADVERTISING OFFICES AND AGENTS:

Victoria and Tasmania: Virginia Salmon and Eric Baines, The Federal Publishing Company, 23rd Floor, 150 Lonsdale Steet, Melbourne, Vic. 3000. Phone: (03) 662-1222 Melbourne. Telex: 34340, FEDPUB.

South Australia and Northern Territory: The Admedia Group, 24 Kensington Road, Rose Park, SA 5067. Phone: (08) 332-8144 Adelaide. Telex: 82182, ADMDIA.

Queensland: Geoff Horne Agencies, PO Box 247, Kenmore, Qld 4069. Phone: (07) 202-6813 Brisbane. Telex: AA41398 HORNAG.

Western Australia: Cliff R. Thomas, Adrep Advertising Representative, 62 Wickham Street, East Perth, WA 6000. Phone: (09) 325-6395 Perth.

New Zealand: Chris Horsley, 4A Symonds Court, Symonds Street, Auckland. Telex: NZ60753, TEXTURE. Phone: 39-6096. Auckland.

Britain: Peter Holloway, John Fairfax and Sons (Australia) Ltd, Associated Press House, 12 Norwich Street, London EC4A 1BH. Phone: (01) 353-9321 London. Telex: 262836, SMHLDN.

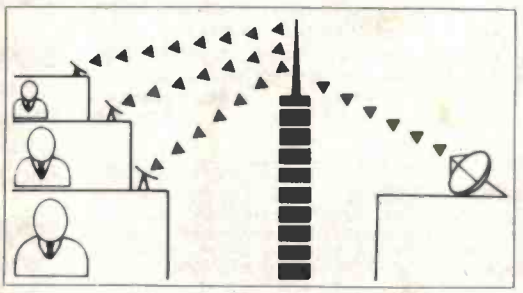
Japan: Genzo Uchida, Bancho Media Services, 5th Floor, Dai-Ichi Nisawa Building, 3-1 Kanda Tacho 2-chome, Chiyoda-ku, Tokyo 101. Phone: (03) 252-2721 Tokyo. Telex: 25472, BMSINC.

PROUDLY PRINTED IN AUSTRALIA

ELECTRONICS TODAY INTERNATIONAL is published monthly by the Electronics Division of the Federal Publishing Company Pty Limited, 140 Joynton Avenue, Waterloo, NSW 2017. Typeset and printed by ESN-The Litho Centre, Sydney. Distributed by Gordon and Gotch Limited, Sydney. Cover price $2.50 (maximum and recommended Australian retail price only; recommended New Zealand price, $2.95). Registered by Australia Post, Publication No NBP0407. ISSN No 0013-5216.

COPYRIGHT © 1984, THE FEDERAL PUBLISHING COMPANY

WIN A PAIR OF THESE 'HANDS FREE' TRANSCEIVERS page 98



SPREADING THE NEWS BY MICROWAVE page 14

RTTY DELUXE page 68

NEWS

NEWS DIGEST	8
SIGHT & SOUND	24
EQUIPMENT	37
COMPONENT	41
COMMUNICATIONS	84
COMPUTING TODAY	119

COLUMNS

MICROBEE	142

DEPARTMENTS

IDEAS FOR EXPERIMENTERS	80
IDEA OF THE MONTH	82
SHOPAROUND	144

This page is to assist readers in the continual search for components, kits, printed circuit boards and other parts for ETI projects and circuits. If you are looking for a particular item or project and it is not mentioned here, check with our advertisers.

MINI-MART 145

• We'll publish up to 24 words (maximum) free of charge for you, your club or your association. Copy must be with us by the first of the month preceding the month of issue. Please — please — print or type advertisements clearly, otherwise it may not turn out as you intended! Every effort will be made to publish all advertisements received; however, no responsibility for so doing is accepted or implied. Private advertisements only will be accepted. We reserve the right to refuse advertisements considered unsuitable.

• **Conditions:** Your name and address plus phone number (if required) must be included with the 24 words. Reasonable abbreviations, such as 25 W RMS or 240 Vac, count as one word. Advertisements must relate to electronics, audio, communications, computing, etc — general advertisements cannot be accepted. Send your advertisement to:
ETI Mini-Mart,
P.O. Box 227,
Waterloo NSW 2017.

MAIL ORDER BOOKS	130
DREGS	146

COVER:
Picture from CBS Fox Video; design by Ali White.

CONTENTS

FEATURES

14 **Microwave — spreading the news**
Giga Hertz, cake tins and the information age.

17 **Towards a more practical university?**
Academia and industry — getting closer together

46 **Programmable logic controllers**
Replacing all those cumbersome relay systems.

58 **Starting electronics**
Beginners' series: Part 4 — know your components!

98 **Win a pair of 'Talkman' transceivers!**
A simple contest — prize is a pair of voice-activated transceivers.

101 **Updating the ETI-733 RTTY demodulator**
Just keeping you abreast of the times.

114 **The world of mediumwave**
The broadcast band has much to offer beyond our shores.

135 **Programming for the eclipse**
Catch this month's eclipse — last chance this century!

138 **Three-reel poker for the VIC-20**
Don't do your dough at the local club — do it at home!

PROJECTS

65 **ETI-278: Directional door minder**
Sounds the alarm when breaking a beam one-way, but not the other.

74 **ETI-661: Chord tutor**
Learn to play chords — with this simple add-on for the '660 Learners' Micro.

88 **ETI-7 5: A computer-driven radioteletype modem**
Versatile unit attaches to the Microbee, and other computers.

106 **ETI-756: A 'glass teletype' for the VZ200**
An add-on modem for the radioteletype enthusiast.

REVIEWS

28 **Hi-Fi Stereo video — how good?**
Louis Challis reviews the Sony Beta and the National VHS machines.

126 **Amstrad CPC464 Computer**
Should give a few of the 'big boys' a challenge.

NEXT MONTH

DIGITAL TV
The convergence of TV and digital electronics will bring about a revolution inside our TV sets. The German electronics giant, ITT, started the ball well and truly rolling with a chip set they developed that digitally processes the TV signal off-air. We tell the story of their "Digivision" and how they got the Japanese on the hop.

'BUDGET' PA SPEAKERS
As we've done a few PA systems recently, this article shows how to build some suitable column speakers using low-cost 6" speakers commonly available. We also give some hints on how to install them for best effect.

THE "MINDMASTER" PERSON-COMPUTER LINK
Strap on the headband, line up the Infra-red link, sit back and drive that cursor/gunship around your screen — no hands! This project plugs in the joystick port of your computer and provides pulses to control the video in place of the joystick.

KEYBOARD UPGRADE FOR THE 'BEE
This mod. for Beekeepers smooths the way for inveterate hackers or just quickens the qwerty for the w/p fanatic!

ADVERTISERS INDEX

Ace Electronics 40
Acme Electronics 43
Altronics 18,19,78,79,99
Amtex 77
Applied Technology 22,23
Aust. School of Electronics 26
Avtek 121
AWA-Thorn 6,7
C & K Electronics 77
Cashmore Sound 20
Cooper Tools .....IFC
Daneva 44
John Delforno 42
Delsound 120
Dick Smith 68,69,113
Discoworld 35
Dual Systems 54
Ellistronics 60,61,81
Emtronics 117
Energy Control 137
Exciting Lighting 83
GFS Electronics 100
Grafton 39
David Hall Electronics 83
Fred Hoe 141
Hi-Tech Light & Sound 10,11
Huber & Schuner 102
ICOM 13
ICS 145
Jaycar 56,57,94,95,104,105
Mayer Krieg 117
Micro-Analog Gen. 102
Mini Tools Aust. 125
Nashua 16
Newtron Electronics 36
Nilsen Rowe 55
Pacific Electronics 100
Plessey 125
Porchester 118
Pre-pak 83
Promark 42
Rod Irving 64,87,97 130,132,134
Rose Music .....OBC
Scan Audio 26
Scientific Devices 137
Sharp 125
Siemens Industries 45
6 Up 85
Soanar 21
Sony .....IBC
TMPC 50
Truscott Elect 42
Vicom 38
Len Wallis 27
Warburton Franki 49
WIA 100
Geoff Woods 73

The computer system that won't give you any arguments at home.

CPC 464
complete
with
monitor
and
datacorder

It's eight in the evening. The weekly soap is about to start on the box. And you're in the middle of a program.

Either way, there's going to be trouble.

The new CPC464 gets round the problem very neatly.

It comes complete with its own colour monitor or green screen VDU. Yet it costs around half the price of a comparable home micro system.

That's not all. As well as the monitor, the CPC464 includes a built-in cassette data recorder, 64K of RAM (42K available), 32K of ROM, typewriter style keyboard and a very fast extended BASIC.

And it comes complete and ready-to-go. Just plug it in.

High resolution graphics. Stereo sound.

The quality of the graphics on the CPC464 screen beats the micro/domestic TV combination out of sight.

That's because our monitor drives each colour on the screen directly from the computer. Nothing gets in the way of the best possible picture. And you won't have tuning problems.

It sounds good, too. Especially when you feed the 3-voice, 7-octave stereo output through a hi-fi amplifier and speakers.

64K RAM.

With 64K of RAM there's plenty of room for sophisticated and complex programs.

Over 42K is available to users, thanks to the implementation of ROM overlay techniques.

Dollar for dollar, other micros simply can't match the CPC464's memory.

Amsoft. Exciting software range.

Arcade games, educational programs and business applications are all designed to utilise the CPC464's impressive graphics, sound and processing abilities.

A rapidly expanding range of programs is already available. High quality software that takes advantage of the CPC464's high specification and speed-loading capability. Which means even complex programs can be loaded quickly.

Amstrad. User Information Service.

Whether you're interested in serious commercial applications or you're a games fanatic you'll want to receive the latest information about your AMSTRAD Computer. Upon request you will be advised about the latest software and its application, special information concerning your CPC464, available peripherals and software reviews. There will also be programs and exercises to try.

User Clubs.

In addition to the User Information Service you will be given details of where you may contact your nearest independent user club.

Green screen VDU.

Perfect for data management with high resolution screen, 80 column text display and up to 8 text windows.

An optional power supply and modulator (MP-1) is available for use with a colour TV.

CPC464 green screen VDU (GT64)

CPC464. Unlimited scope for expansion.

We're with you all the way. That's why there's a built-in parallel printer interface. A low cost optional disk drive system including CP/M* and LOGO. A joystick port. And the virtually unlimited potential of the Z80 data bus with sideways ROM support.

Optional disk drive DDI-1 including interface CP/M* and LOGO

Optional 80 column dot matrix printer DMP-1. Offers high performance computerised text processing

Distributed and guaranteed throughout Australia by:

AWA-THORN AMSTRAD

*Trade mark Digital Research

I'd like to know more about the incredible CPC464 complete computer system and where to see one.
Please send literature right away.

NAME

ADDRESS

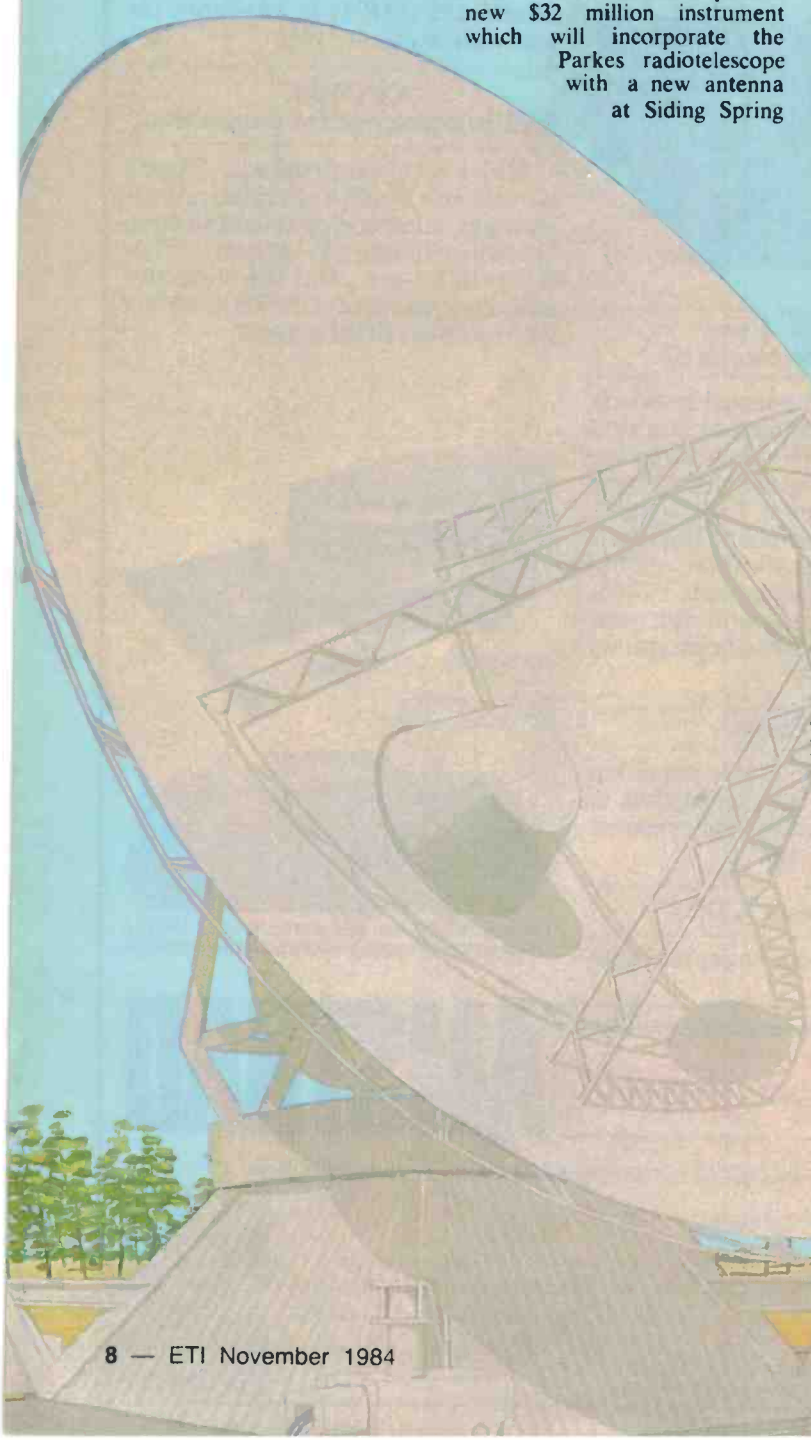
POSTCODE

To: AWA-THORN Consumer Products Pty. Ltd.,
348 Victoria Road, Rydalmere, N.S.W. 2116.

CODE NO: TPB 186

Construction commences on Australia Telescope

The Minister for Science and Technology, Mr Barry Jones, inaugurated the construction of the Australia Telescope at Culgoora, near Narrabri in northern New South Wales, on 27 September.



The Australia Telescope is a new $32 million instrument which will incorporate the Parkes radiotelescope with a new antenna at Siding Spring near Coonabarabran, and a 6 km array of six new antennas at Culgoora. By linking these antennas electronically, they can be operated as one to simulate a giant telescope 300 km in diameter. The project is a Bicentennial activity due for completion in 1988.

Speaking at the ceremony at Culgoora, Mr Jones praised the CSIRO Division of Radiophysics for establishing a world class reputation in radioastronomy over the past few decades. Developments overseas and the limitations of the 64 metre radiotelescope at Parkes, now 23 years old, had threatened the ability of Australian radioastronomers to remain at the leading edge of such research.

Accordingly, after detailed design studies and a vigorous campaign by the normally reticent scientists, funding for the new telescope was approved in the 1982 Federal budget.

"One of the aspects of this project which makes it so important to Australia," said Mr Jones, "is the fact that radioastronomy provides a fertile breeding place for new ideas and techniques in such diverse areas as antenna design, precision panel manufacture, feed horn developments, cryogenics and the whole fields of microelectronics and signal and information processing.

"My Government's support for CSIRO's pursuit of radioastronomy is based on two criteria. Firstly, the need to encourage scientists to pursue curiosity-motivated research in order to develop the creative thinking which is the hallmark of science. Secondly, the recognition that the pursuit of radioastonomy results in advanced technological spin-offs, many of which are directly applicable to this new information age in which we find ourselves today."

The project at its peak will employ 38 new staff in addition to the 27 staff seconded to it from the Division of Radiophysics. Upon completion, the telescope will be operated as a national facility by the CSIRO Division of Radiophysics and provide employment for 28 staff.

Several major contracts have been let to date, including those to MacDonald Wagner Pty Ltd, for the design of both the antennas and the civil work at Culgoora and Siding Spring.

Other speakers at the Ceremony included Dr Paul Wild, Chairman of the CSIRO, and Dr Bob Frater, Chief of the Division of Radiophysics and Project Director. They noted that in the Australia Telescope, Australia will have the most versatile radio telescope in the world. The innovation of the design, and later the quality of the research that can be performed with it, will result in considerable prestige to this country.

"The Australia Telescope," Dr Wild concluded, "is a scientifically and technologically demanding project that symbolises our past achievements in science, and more importantly, will ensure the continuation of this outstanding tradition by future generations of Australians."

Videotex too expensive?

After unveiling plans for a national videotex service, Telecom has met strong resistance to the proposed charges for organisations supplying the service with information.

This is belived to be a flat charge of $1,000 a month for every information source on the new Viatel service, plus $1 per page per month storage fee.

Charges for users of Viatel are likely to be about $5 a month for domestic customers plus 10 cents per minute connected.

In addition to this, some information providers may charge a rate per page of information accessed.

Charges for business users are likely to be higher — probably $10 a month.

Users will also have to buy a special adapter to use a domestic television set as a videotex terminal or buy a special terminal. Adapters are likely to cost between $250 and $650, while the terminals will cost between $1,350 and $2,000.

Telecom's charges are significantly higher than private videotex services now operating.

For example, the Australian Federation of Travel Agents' Aftel videotex service charges information providers $50 a month for those supplying up to 25 pages.

Larger information providers are charged an initial fee of $1,000 plus 50c per page per month.

Small operators would face a charge of $12,300 a year from Telecom for providing 25 pages of information on the Viatel service. The corresponding fee on Aftel would be $600 a year.

Elders Pastoral, the rural division of Elders IXL, is establishing a national videotex network aimed at the rural sector.

Information providers on the service are not charged if they are providing information which enhances the service, particularly in an area not covered by Elders.

Other information providers, such as merchandiser suppliers, are charged a flat rate of $10,000 a year if they want national coverage. Charges for users of the Elders service are likely to be $500, which will include the cost of the terminal.

Telecom itself will be a major information provider — it will almost certainly have some form of electronic Yellow Pages directory on Viatel.

NOTES & ERRATA

Sept. '84, Soldering, p.22: Murphy (c.f.: Law) was not a metallurgist, but your Editor has some background in the subject and should have spotted that there was an error in the second column under 'Solder'. The melting point temperatures of tin and lead were transposed. Tin melts at 232°C and lead melts at 327° C. Amend your copy now. Nobody's perfect (Mad Dan Eccles, 'Tales of Old Dartmoor').

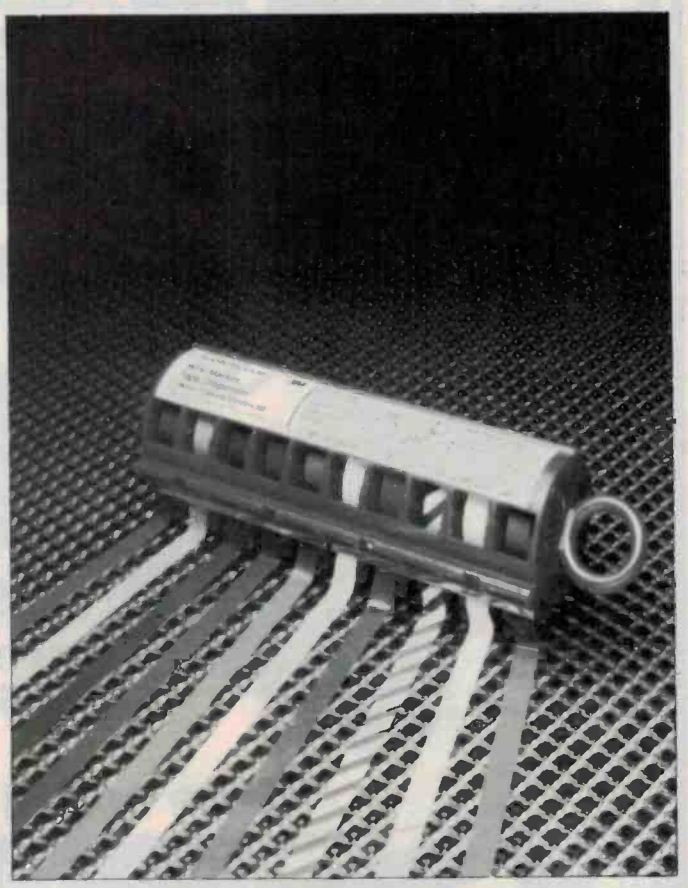
Licence fees go up

The Minister for Communications, Mr Michael Duffy, announced in August that radiocommunications licence fees would rise by an average of 7.5% in 1984-85.

"The increase will maintain in real terms the fee scale introduced in September 1983 and can be classed as moderate," the Minister said.

"The extra revenue will, in part, offset the cost of upgrading the Department of Communications' planning, licensing and regulatory functions," Mr Duffy said.

The revised licence fee scale applies from 1 September 1984. As an example, aeronautical station fees go from $45 to $50 and amateur station fees from $19 to $21 (damn! — I had to pay last month, Ed.). However, CB licence fees remain at $11 and disaster station fees at $25.



Keeping track of wires

In the short period since its worldwide launch, the 3M "ScotchCode" Brand Wire Marker Dispenser has revolutionised the wire and cable identification market, the company says.

This innovative product replaced the awkward and cumbersome slide-on and card systems and eliminated the need for insulating tape for colour coding.

Originally developed by 3M in the United States, the product utilised existing 3M industrial electrical tape technology and combined it with a simple dispenser.

According to David Padula, 3M's Marketing Supervisor, Electrical Products Group, the "ScotchCode" Wire Marker Dispenser has enjoyed an equivalent success in Australia.

"The original product dispensed numbered or lettered rolls of adhesive tape and achieved an unprecedented acceptance by electrical contractors, maintenance contractors and Telecom linesmen."

Now 3M has launched a new "ScotchCode" Wire Marker Dispenser which it is confident will also be rapidly accepted. This new product has the benefits of the unique "ScotchCode" dispenser while offering the added option of a colour coding system for wire and cable identification.

The pocket-sized dispenser holds high-quality electrical grade tape which conforms to the standard colours for wire and cable marketing. The flame-retardant epoxy film tape resists oil, solvents, dirt and extreme heat and has excellent conformability and adhesion to clean neoprene, hypalon, nylon and pvc insulation materials. A choice of three complementary "ScotchCode" marking systems, numbers, letters and now colours, is offered.

For further information about the "ScotchCode" Wire Marker Dispenser, contact the 3M Electrical sales representative in your state.

Hi-TECH LIGHT AND SOUND

HIRE * SALES * SERVICE

63 Hardgrave Road, West End 4101
Postal Address: P.O. Box 377, West End
Phone: (07) 44 4971

GENEROUS TRADE TERMS AVAILABLE TO INSTALLERS

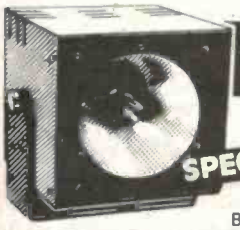
MATRA DISCO CONSOLE
SEE APRIL ETI.

DEMO TODAY

$1695.00
Stereo Model
$1995.00

ALL ITEMS SHOWN ARE ON DISPLAY AT OUR BRISBANE PREMISES.

Distributors for:
GETLIT
LEISURE LIGHTING



ICE STROBES
Save up to $80
SPECIAL DEAL
Sale Price
BUY ONE **$289.00** each
BUY FOUR **$269.00** each
Superb quality - remote control - variable speed. Highly polished parabolic reflector! Simply the best there is - available from Hi-TECH - as usual at the best prices!!!

Write or call for a catalogue today!

Zero 88 -FX4

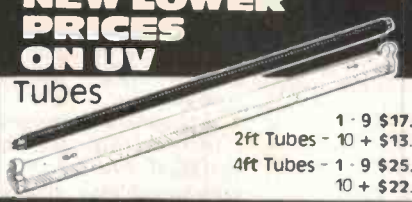
Combined Lighting + Strobe Controller -

featuring "button" control for switching over - ALL LIGHTS OFF - STROBE CHASE ON!
Will operate 4 channels of inductive Load Lighting + Remote Control on up to 4 Strobes
Many other combinations, patterns and displays controllable through the "all button" keyboard.
A "Hi-Tech" controller at a "Low-Tech price

Special Offer
$520.00

UV Active
FLUORO TUBING
PRICE PER METRE
4mm ROUND **$4.00**
8mm ROUND **$1.50**
2mm FLAT **$0.20**
100mm FLAT **$5.80**
WHITE, TRANS, YELLOW, RED, PINK, GREEN, BLUE, ORANGE, YELL/GR.

NEW LOWER PRICES ON UV
Tubes



1 - 9 **$17.50**
2ft Tubes - 10 + **$13.50**
4ft Tubes - 1 - 9 **$25.00**
10 + **$22.00**

Mail Orders + Installations + Other Info

CREDIT CARDS
Bankcard, M/Card, AGC Credit Line

CLUB INSTALLATIONS
Excellent service through Australia.

INSTALLERS
Write to us for attractive Trade Terms.

MAIL ORDERS (AUST)
Add packing & post (P&P) as follows (Aust. only) MINIMUM MAIL ORDER $25

Goods $25-$49	P&P $3.50
Goods $50-$99	P&P $5.00
Goods $100-$149	P&P $7.50
Goods $150-$199	P&P $10.00

Goods $200 + Add 5% to Order value or otherwise by individual quotation.
Send to: **HI-TECH LIGHT & SOUND**
63 Hardgrave Rd.
West End Q. 4101.

If the following names mean nothing to you, why not come and see what they are? SUPERNOVA, LIGHTBUD, COMET 36, SATEL DEATH STAR, ASTRORAGGI, GALACTIC 2, GALACTIC 3, ASTROSFERA.
(P.S. They are all lighting effects!)

A superb U.F.O. type effect - ideal for the disco club. One high power quartz lamp in the centre (2000 hr. life) shoots parallel beams of light through the 12 lenses on the perimeter.

Astron 3 - UFO Type Effect

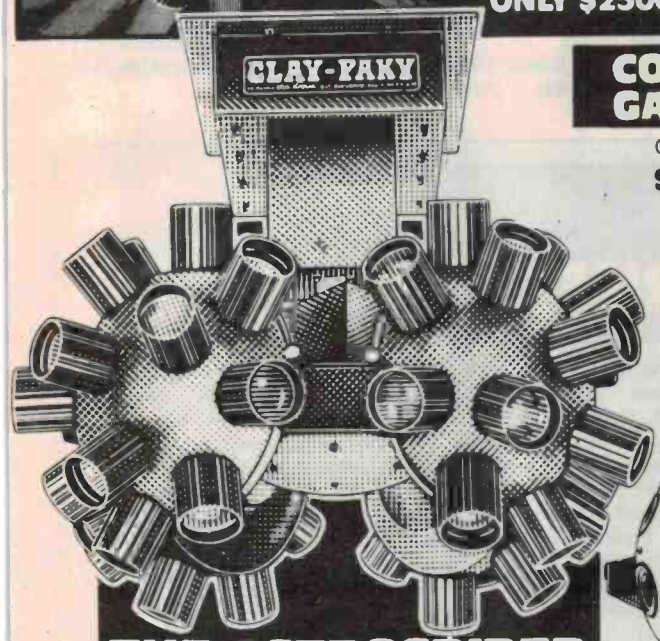
Separate controls for revolving speed, tumble and "hover"

ONLY $2500.00

LAMPS & BULBS

PAR 38 FLOOD
Red Blue Green & Amber
PRICE **$4.90**

For Club Owners and Installers!



THE ASTROSPIDER

(Tarantula) - Dramatic Multi-Direction moving display - beams of light scan in all directions!

$3590.00

COEMAR GALAXY BALLS

Galaxy 12 Sale Price
$1790.00

ALL COEMAR PRODUCTS AVAILABLE - BEST TERMS!
Illustrated above the Galaxy 36 from Coemar

Price includes 12x PAR 36 lamps
Also generous Trade Terms to installers - ask for quote.

SMOKE 'N' FLASH

$970.00 ORDER YOUR SMOKE SYSTEM TODAY

Le Maitre MINI-MIST Smoke Machines
The best selling machine on the market
5 FREE SMOKE CANNISTERS worth $10.91 each

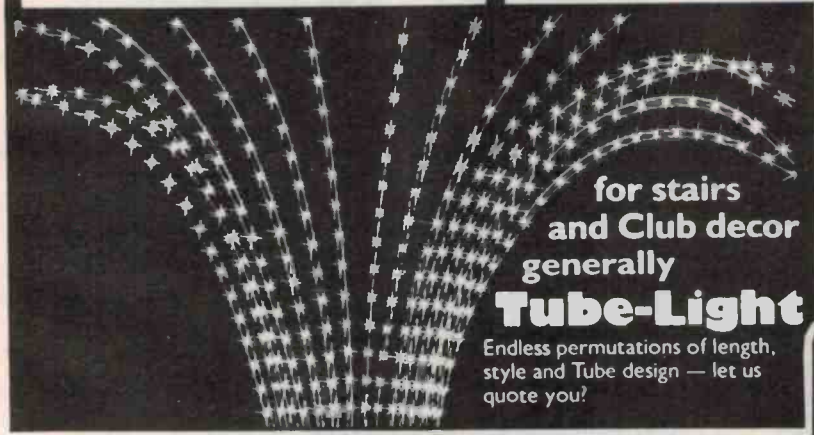
PYROFLASH SYSTEMS

COMPLETE OUTFIT
for instant 'Smoke' or 'Flash' efects on stage at the touch of a button (remote system included)

A DETONATOR SYSTEM
(Including Flashbox) $228.00

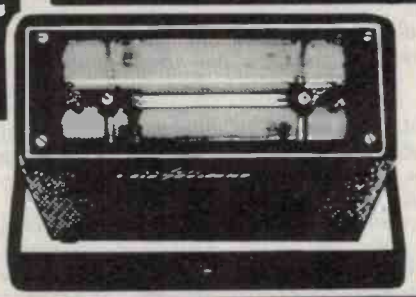
B CARTRIDGES
(Theatrical Flash) $3.60 each
$40 per doz boxed
Also available SILVER STAR GOLDEN STAR COLOURED FIRE (Various Colours)

SUGGESTED OUTFIT
Starter Pack A + B ONLY $268.00
including 12 cartridges



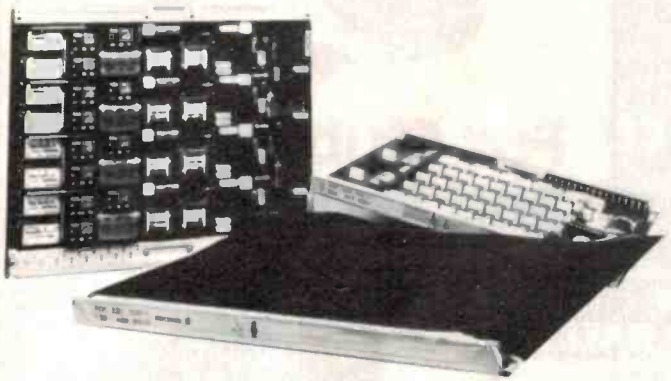
for stairs and Club decor generally Tube-Light

Endless permutations of length, style and Tube design — let us quote you?



White Lightning $690.00

The White Lightning is Opti's most powerful strobe. Gives a real 'freeze' flash and is particularly suitable for large venues. Can be used in multiples from a strobe controller. Maximum tube power is 150 watts at 15 flashes/second. The compact rectangular satin silver and matt black body is particularly neat on a ceiling



Audio cables from Hitachi

STC-Cannon Components, the Australian distributor for Hitachi Cables now have available details of Hitachi LC-OFC audio cables.

The data available covers speaker cables, interconnect cables, interconnecting cables assembled with pin plugs and microphone cords.

LC-OFC (Linear-Crystal Oxygen-free-copper) conductors are used as the interconnecting cable with Hitachi cables, and result in clear sound with minimal distortion, fine electrical characteristics and high durability due to inner plastic moulding, according to the company.

For more information contact **STC-Cannon Components, 248 Wickham Road, Moorabbin, Vic 3189.**

Anti stat pac

Teno AB of Sweden — a plastic packaging manufacturer — has been first to develop an antistatic bag for transporting semiconductors with a transparent window.

The material used is ET-semicon from Asea Compound, a butylgrafted polyethylene that has been co-extruded with ordinary polyethylene.

Using the semicon plastic, Teno has succeeded in solving the problem of non-transparency of semiconductive plastics. By co-extruding a window at the extreme bottom of the bag, a package has been produced that satisfies the combination of requirements for antistatic properties and visibility of the bag contents.

The new packaging idea is known as Tenostat, and one of the companies that immediately found it attractive was the Ericsson Group. Ericsson now packages all of its electronic components in semiconductive bags, to protect them against static electrical charges. Due to the transparent window, no expensive and work-intensive marking of the packages is necessary, and the risk of incorrect marking has also been eliminated.

For further information, please get in touch with **Specialised Polymer, 25 Edward Street, Oakleigh Vic 3166. (03)568-0799.**

Gold plated connectors

East-West Electronics has released the AMP Interconnect System, Ampmodu. This miniature cabling interface system starts by providing an ultra-reliable contact in a large variety of modes. Each termination is based on dual gold-plated phosphor bronze cantilevers providing a minimum of two contact points per conductor.

These high-quality conductor reciprocals are fitted to a precision-moulded housing, which provides solid cable relief. Receptacle assemblies are available in dual or single-row, pcb or cable mount.

Pin header assemblies are manufactured with the same attention to detail. Posts are made from gold-plated phosphor bronze and mounted into a polyamide for easy handling. Stand-up or right-angled posts provide the design engineer with maximum flexibility. Shunt plugs are available for those nasty configuration jobs previously done by messy wiring across the printed circuit board.

The pin header assemblies can be mounted on a printed circuit board to provide a matrix of connectors providing the engineer with a large variety of shunts or configuration modes. This is a neat and cost effective way of accomplishing what was a nightmare.

For more information contact **East-West Electronic Distributors, 117 Smith Street, Fitzroy, Vic 3065. 419-9833.**

BRIEFS

Australian Electronics Industry Association president, Bruce Goddard, urged the Federal Government to give priority to Australian suppliers in servicing the satellite production industry. Mr Goddard predicts the industry will explode in 1984/85 to values of about $200-$300m. Overseas companies have already signalled their interest in the market.

The Helix Bubble Disk memory for the Apple and IBM micros is now available from Energy Control, PO Box 6502, Goodna Qld 4300 or PO Box 12153, Wellington North in New Zealand. It features disk emulation, fast access built-in error checking and correction.

Promark Electronics have signed a distribution agreement with Tideland Energy to distribute Tideland's range of solar electric panels. Individual wafers are also available from Promark for experimenters.

Promark Electronics has signed a distribution agreement with Varitronix for the marketing of LCDs in Australla. Varitronix is very big in the area of customised LCDs and intelligent dot matrix modules.

The world's largest supplier of polished silicon wafers, Monsanto, has chosen Milton Keynes, just north of London, as the site of its $54.25m European research and production base. Construction will begin before the end of the year.

Rupert Murdoch, the newspaper and broadcasting magnate, is heading for another tussle with the British government over his plans to direct broadcast to British homes via satellite. Because his company, News International, is Australian owned he has been unable to get a place in the British direct broadcast consortium. So he has bought a controlling interest in the European-based 'Sky Channel'. But it's illegal to receive unlicensed broadcasts in Britain, and the government has indicated it has no intention of letting Mr Murdoch in on the act.

NOTE ON ETI-669 EPROM ERASER

A warning note should have appeared with the copy of this project, published in the June '84 issue, but was unfortunately omitted. Take note:

EXPOSURE TO SHORTWAVE UV LIGHT MAY CAUSE EYE DAMAGE.

Tubes supplied for the application generally have a warning notice included. The project included a protective cover, the main purpose of which is to prevent viewing of the lamp during operation.

ICOM IC-R71A

The Best Just Got Better

ICOM introduces the IC-R71A 100KHz to 30MHz superior-grade general coverage receiver with innovative features including keyboard frequency entry and wireless remote control (optional).

This easy-to-use and versatile receiver is ideal for anyone wanting to listen in to worldwide communciations. Demanding no previous shortwave receiver experience, the IC-R71A will accommodate an SWL (shortwave listener), Ham (amateur radio operator), maritime operator or commercial operator.

With 32 programmable memory channels, SSB/AM/RTTY/CW/FM (optional), dual VFO's, scanning, selectable AGC and noise blanker, the IC-R71A's versatility is unmatched by any other commercial grade unit in its price range.

Superior Receiver Performance. Utilizing ICOM's DFM (Direct Feed Mixer), the IC-R71A is virtually immune to interference from strong adjacent signals, and has a 100dB dynamic range.

IC-RC11 Infrared Remote

Passband tuning, a deep IF notch filter, adjustable AGC (Automatic Gain Control) and noise blanker provide easy-to-adjust clear reception, even in the presence of strong interference or high noise levels. A preamplifier allows improved reception of weak signals.

Keyboard Entry. ICOM introduces a unique feature to shortwave receivers... direct keyboard entry for simplified operation. Precise frequencies can be selected by pushing the digit keys in sequence of frequency. The frequency will be automatically entered without changing the main tuning control. Memory channels may be called up by pressing the VFO/M (memory) switch, then keying in the memory channel number from 1 to 32.

VFO's/Memories. A quartz-locked rock solid synthesized tuning system provides superb stability. Three tuning rates are provided: 10Hz / 50Hz / 1KHz.

32 Tunable Memories. Thirty-two tunable memories, more than any other general coverage receiver on the market, offer instant recall of your favorite frequency. Each memory stores frequency, VFO and operating mode, and is backed by an internal lithium memory backup battery to maintain the memories for up to five years.

Options. FM, synthesized voice frequency readout (activated by SPEECH button), RC11 wireless remote controller, CK1 DC adapter for 12 volt operation, MB12 mobile mounting bracket, two CW filters FL32 — 500Hz, and FL63 — 250Hz, and high-grade 455KHz crystal filter FL44A.

Discover a new deal with

ICOM AUSTRALIA PTY. LTD.

7 DUKE STREET WINDSOR 3181 VICTORIA, AUSTRALIA
TEL: (03) 529 7582 TLX: AA 35521 ICOMAS

ICOM
The World System

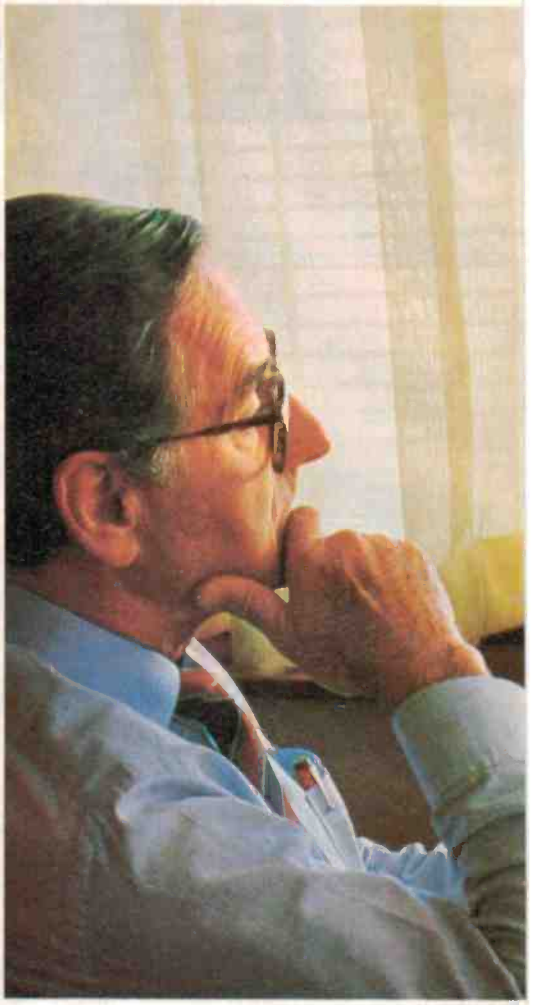
WARNING: When purchasing an ICOM unit please confirm you are dealing with an **Authorised ICOM Dealer,** as the ICOM Warranty applies **only** to units supplied by **ICOM Australia Pty. Ltd.** to Authorised ICOM Dealers. All stated specifications are approximate and subject to change without notice or obligation.

Adgroup ICM 698

MICROWAVE

Spreading the news

Jon Fairall



THE FIRST SYSTEMATIC dissemination of news in modern times began in the nineteenth century when Baron Julius Reuter used carrier pigeons to deliver news from Aachen to Brussels, the capital of Belgium. Twenty years later the Reuters company was sending information across the world using submarine cables and telegraph wires.

But it was not a cheap exercise. In 1872 it cost nine shillings and fourpence to send a single word from London to Sydney. The rental cost of a substantial four bedroom house in Sydney at the time was about twelve shillings per week.

Those first messages from London to the outposts of Empire were received in Sydney by the Australian Associated Press. It was the start of a relationship between AAP and Reuters that continues to this day. Both companies are still in the business of keeping Australia in touch with the world, and using considerable technological expertise to do it.

MDS

The latest in a long line of technological innovations by AAP is the Multipoint Distribution Service (MDS). MDS is a microwave system that ties satellite, computer and microwave technology together to produce one of the fastest news distribution systems in existence. In essence, microwave links are established between a subscriber anywhere in the metropolitan area and a central transmitter. Pages of text can then be selected at will, and displayed on a VDU.

The origin of the text received by the subscriber is the AAP news rooms in Sydney and Melbourne. Here editorial staff compose copy on a VDU (itself developed by an AAP collaboration with the US manufacturer about ten years ago). This information is then processed through various stages before being fed to the Systems Application Computer. The SAC composes the copy into 'pages' that can be displayed on the VDU and cycles them out one at a time. This is sent to a modem as a 0.5 Mbit data stream, where it is converted into an NTSC video signal with a frequency of 2.093 GHz. The system is designed to operate with 4 Mbits, and will do so when running at full capacity.

The signal is beamed by microwave dish up to a convenient very high point (in Sydney it's Centrepoint, in Melbourne it's the top of the Commonwealth Trading Bank). Here an omni-directional antenna radiates the signal to subscribers.

When the system was in the design state a number of different distribution media were considered; leased Telecom lines for instance, or optical fibre, or even the switched telephone network. Microwave was chosen because it gave the best mix of economic and technical advantages. It is relatively cheap, very flexible and it can handle the data rate required.

Reception

There is a number of different configurations possible at the reception end of the chain. The most elegant was designed by Mitec, a company set up by the Federal government in 1981 at Queensland University with the specific intention of developing industrial microwave projects.

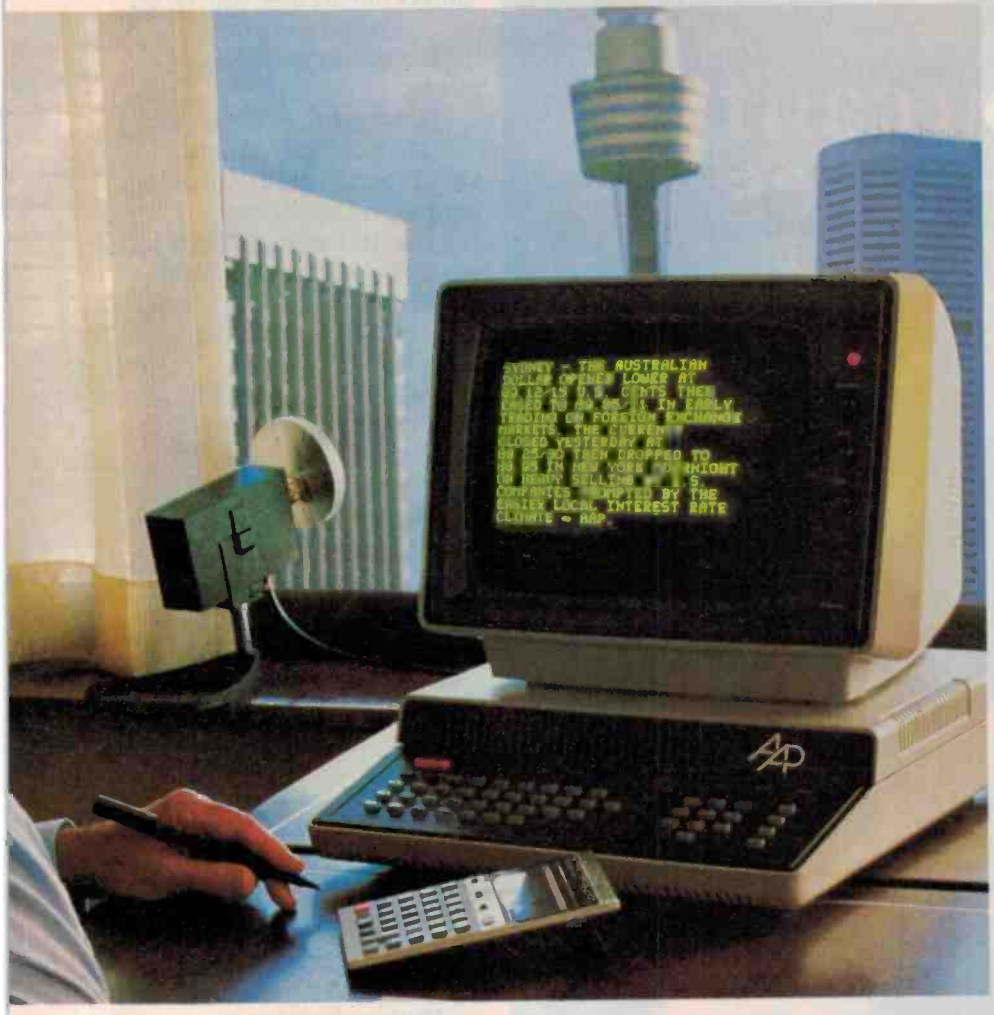
The antenna Mitec designed is known colloquially as the 'cake tin'. It's a planar design, i.e: the collecting surface is flat rather than the conventional paraboloid shape. The unit is only a few centimetres across and so can be sited quite happily on a window ledge or even on a desk top. It gives excellent reception out to a distance of about five kilometres.

Further out, conventional parabolic antennae are needed. Generally, these are sited on the roof, and the signal is ducted by copper cable to the subscriber's office. The MDS standard antenna uses a two-foot dish, but there are plans to use a four-foot dish out at the periphery of the reception area (about 30 km out).

The big problem with receiving microwaves is that they are strongly line-of-sight, to such an extent that a fair-sized tree in the transmission path can effectively cut communications. To duct the signal down into the canyons of a modern city liberal use must be made of translators. In MDS parlance, these are the 'corner antennae'. They are only slightly larger than the cake tin, so they can be sighted unobtrusively on rooftops or even on the side of buildings. They work by taking the line-of-site signal from the main transmitter and rebroadcasting it. Unlike a conventional TV translator, it's not necessary to change the frequency of the signal to avoid self-interference. The antennae are so strongly directional at these frequencies that there is no significant multipath reception.

Down-conversion

Whatever the arrangement of aerials, when the microwave signal has been received it is down-converted to VHF frequencies so that it can be handled in the distribution system. The down-converter began life in 1981 as a result of discussions between David Vu, the Development Manager at AAP, and John Ness, Mitec's chief engineer. AAP could not find any satisfactory overseas designs for the proposed network. The problem



We live in the information age. The ability to move information around is growing more important to society as a whole, and the means being used to do it are growing more diversified. A major new initiative is the dissemination of news via microwaves throughout the major cities of Australia.

seemed to be that overseas applications of this type of system are usually for subscription TV or other image media. These can tolerate a much higher error rate than text systems like MDS. As a result these systems tend to be built to much less exacting criteria than MDS, particularly with respect to permitted signal and noise levels.

The down-converter takes the 2 GHz signal and remodulates it to sit in the frequency band between 73 MHz and 108 MHz. This is right across the VHF radio frequencies, but AAP reports no problem with interference, mainly because of the use throughout of high-quality cable and connection shielding.

Display

There are two possible destinations for the signal. One is a cutomized dedicated terminal supplied by AAP. This has a small alphanumeric keyboard for the selection of information and a VDU on which the information can be read. A printer can be attached to the terminal if a printout is required.

The other destination is a modem, which allows the system to be interfaced with a computer, via an RS232 interface. Virtually any system that uses RS232 can be interfaced, whether it be a humble micro or a local area network of some kind. According to AAP the software necessary for this implementation of MDS consists of a set of simple commands. Once within the user's computer system the information can be handled in any way the consumer may desire, depending only on the available software.

Operating the system

Whatever the system configuration, the end result is a data stream consisting of pages of text. There are about 200 of these at present, and they take about five seconds to cycle through. The user can select one for viewing by keying in either a page number or its title. In order to speed up the subjective response time of the system, the beginning of each page is cycled more often.

There is a menu page at the beginning of the cycle that allows the user to see what's on the system at any given time. Pages are continually updated during the day by editorial staff in the newsroom.

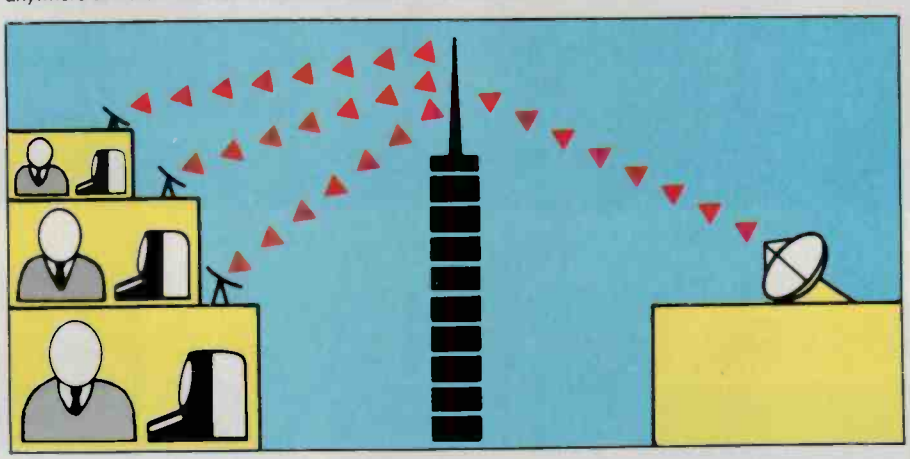
Future expansion

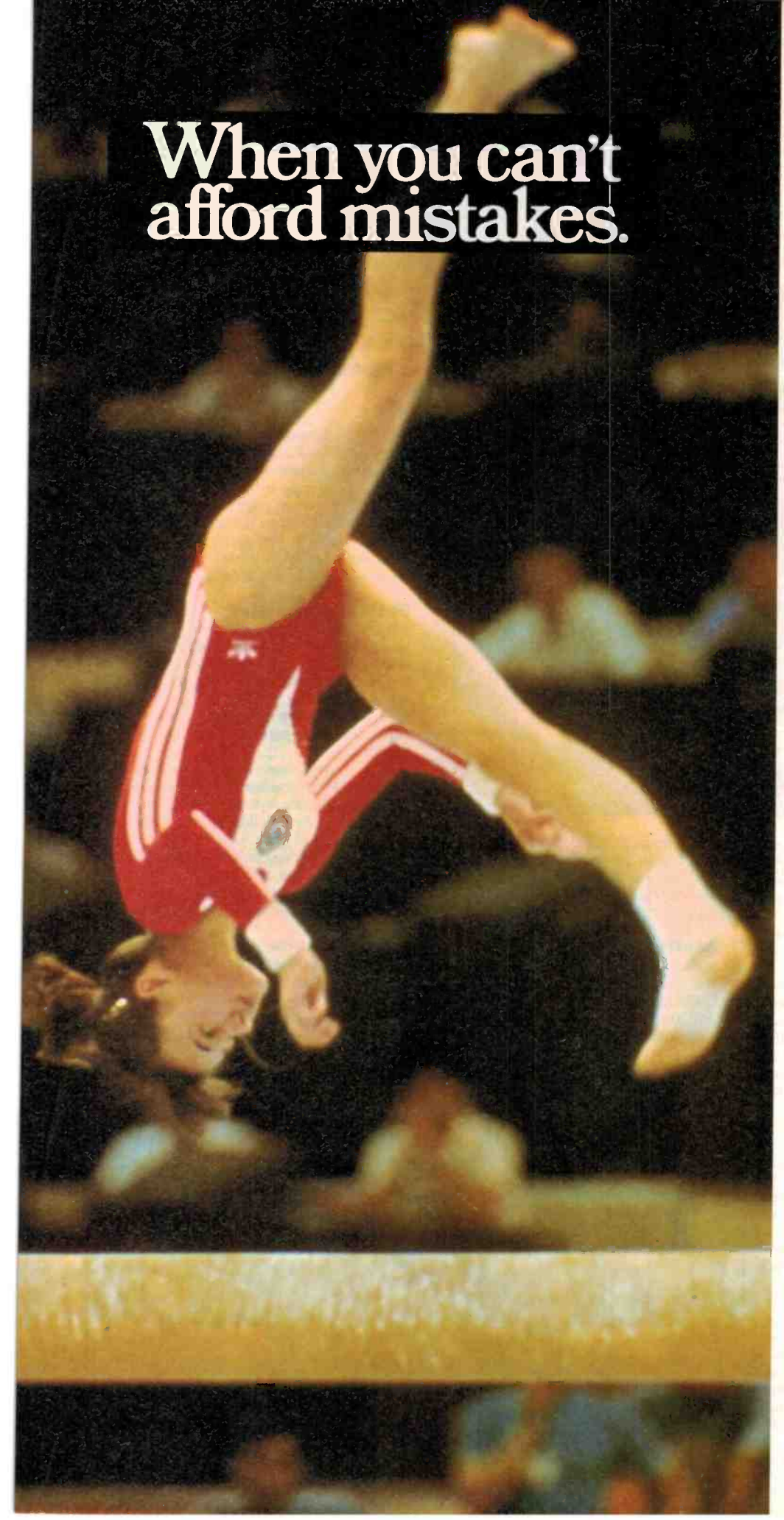
At present, there is only one service provided on MDS, called the corporate report. It has news, sport, weather and business information of interest to executives. Within the next few years, AAP expects to widen the scope of the operation considerably, expanding its reporting in the light of market analyses.

The system went into operation in Sydney and Melbourne on 12 October with two essentially similar systems. When the Australian domestic satellite becomes available the service will be reorganised. The data stream from Sydney will be beamed directly up to the satellite and distributed not only to Melbourne but also to all the capital cities and 50 regional centres around the country.

AAP predict they will have 500 terminals in position by the end of the year, and as the service expands they can look forward to many thousands in the years ahead. But at $350 a month rental the service will not be available to just anyone. ●

The link. The multipoint microwave distribution transmitter is located atop a high point in the city (Sydney tower in Sydney) and the data beamed to it from the originating company (AAP in Sydney). Users anywhere aim their receiver unit at the distribution transmitter.





When you can't afford mistakes.

There really is a difference in disc pack and diskette brands.

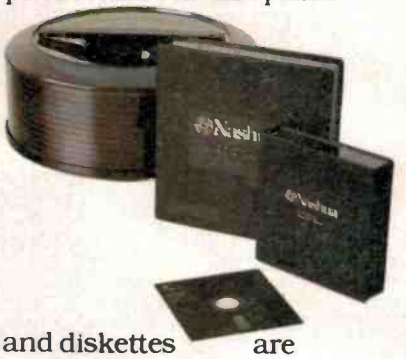
It's in the way they are made.

Because the computer industry cannot afford variation in quality of disc packs and diskettes, Nashua looked for, and found a way to ensure absolute consistency.

Here's how we do it.

Quality Circles.

At Nashua we've found the best way to attain this 'consistency' is to ensure that at each stage of production our disc packs



and diskettes are statistically checked to make sure the quality is 'built-in' every step of the way.

Rather than long production lines, we have 'Quality Circles' – small groups of people whose job it is to make sure that each Nashua disc pack and diskette is right in the first place.

The result is a product with such consistency that it is chosen by those people who can't afford mistakes.

Phone Sydney 958 2044, Canberra 47 0511, Melbourne 428 0501, Brisbane 369 4244, Adelaide 42 0021, Perth 328 1888, Darwin 81 6204, Auckland 77 5468, Wellington 85 1965, Christchurch/Dunedin Whitcoulls Ltd, PNG 25 6766.

Nashua

There really is a difference.

Ruwald & Skinner 405 NA/A

Towards a more PRACTICAL UNIVERSITY?

Co-operation between academia and industry has a long history in Australia, even if it hasn't always resulted in Australians making money from Australian inventions.

Prof. Lou Davies, A.O., BSc (Sydney), D. Phil. (Oxford). Foundation Fellow of Australian Academy of Technological Sciences, Fellow of Aust. Academy of Science, Fellow of IEEE.

SCIENTISTS AND INDUSTRIALISTS alike are calling for close co-operation between universities and the commercial world outside. Ambitious, enthusiastic, and sometimes just plain patriotic researchers are finding they are in a position to play a more positive role in the dollars-and-cents world of industry.

Yet co-operation between the two groups is not the innovation that some critics would claim — especially as far as the University of NSW is concerned. Professor Lou Davies of the School of Electrical Engineering is entering his twentieth year of an arrangement which has — both directly and indirectly — demonstrated how co-operation can bring benefits to both sides.

When Davies is not wearing his professorial hat at UNSW, he is chief scientist in charge of what he calls the "forward-looking part" of the R & D effort of Amalgamated Wireless Australasia (AWA). Since his two-way contract has now been renewed six times, it is fair to assume that everybody is happy with it.

"It's what the Yanks would call 'a deal' — all three parties benefit," says Davies. "The University is happy to have someone from industry who's got pretty close tabs on the university system. From the company's point of view, my job is to keep the company's finger on what is going on — and one good way of doing that is to be mixed up in the biggest, brightest and best School of Electrical Engineering in Australia."

And from his point of view, he says, he can utilise ideas which originate in the company, but which have no commercial application or fall outside AWA's sphere of interest, as propositions to be worked on as thesis topics.

In 1953 Davies was working with the CSIRO in the very new field of transistors. After a spell in the USA he came home and built the first transistors ever made in Australia, in the CSIRO's radio physics division. Rex Vowels, who was then head of the School of Electrical Engineering, got to hear about these developments, and recognised them to be of supreme importance to electrical engineering.

By 1955 Davies was giving lectures at the University on a regular basis — lectures which Vowels himself attended. After a stay abroad in the late fifties he picked up the lectures again. After five years of this, during which time Davies left the CSIRO and moved to AWA, Vowels made him the offer of a part-time professorship.

From the start the arrangement worked well. "I was certainly in the position when I first got here to start the School's research effort up in areas which I think were important, and in which the University really had no-one working," Davies says. In fact he started up a whole new department — the Department of Solid State Electronics — of which for a while he was head. (It has now evolved into simply the Department of Electronics.)

Since then there have been spin-offs in both directions. One was a specialised integrated circuit with greatly increased sensitivity for detecting magnetic fields.

"Fellow staff member Dr Maurice Nield and I developed an integrated circuit which incorporated a silicon Hall element of novel design. The element made the resultant integrated circuit quite a sensitive magnetic field sensor. There wasn't an adequate marketing opportunity for it in Australia at the time, but about seven or eight years after we did our work I noted that devices very similar to the ones we had worked on had become available in the product lines of some specialist manufacturers."

There were successes too with certain acoustic wave devices which were being researched by UNSW students.

"A surface acoustic wave is rather like a miniature earthquake which you launch onto a crystal by using a little electro-mechanical transistor. That miniature earthquake travels down the crystal at about one-hundred-thousandth the speed of electro-magnetic signals, so that it enables you to delay signals by quite substantial amounts. It turns out that you can use these delay lines in oscillators in a variety of interesting applications. Some of the ideas have certainly filtered into the literature, and no doubt filtered into industrial practice around the world."

One extremely important area in which close contact between the University and the industry has played a part is in the development of optical fibres in communications. The Ph.D. student most recently supervised by Professor Davies was Dr Frank Donaghy — himself employed by AWA as deputy head of the firm's physics laboratory. It is fair to say that the work he did was a judicious blend of the experiments he was able to perform at AWA and analysis carried out at the university.

Optical fibre research and development has dominated work at Professor Davies' AWA laboratory for more than 10 years. This is a form of communication system which is very much to the fore at the present time, in relation to the interconnection of computers, voice terminals, display terminals and any other piece of equipment which generates data or information.

Davies is also jointly supervising another student who is working on the application of optical fibres in local area networks. The whole optical fibre field, Professor Davies believes, is one in which Australia could have a part to play on a world scale.

"Most of the work we have done has run in parallel with work in the rest of the world. But it is fair to say that we have made one or two advances which I think lead the way in the world sense. One of these would be Dr Donaghy's work on strength under continuous load, and that has been quite exciting." ▶

BANKCARD HOLDERS—PHONE ALTRONICS TOLL FREE 008 • 999 • 007 FOR NEXT DAY JETSERVICE DELIVERY

ALTRONICS
MONEY BACK ★ PLUS $5.00 GUARANTEE

Dear Customer, At Altronics we are continually trying out methods of improving our range of quality products and the high standard of service we offer our Shop, Mail and Phone order customers. I believe our future prosperity will be a direct reflection of the standards of service we have adopted. So for November and December 84 we pledge that if you find our products and/or service is not as we claim you may return your purchase to us for a **full refund plus $5.00** for your inconvenience (mail/phone order customers please allow transportation costs)

Regards *Jack O'Donnell*

AMAZING LOW COST SMOKE/FIRE DETECTOR

Scoop Purchase Sensation

Were Selling for $59.95

Cat A 0090

USA QUALITY PRODUCT

Attractive ceiling mount type

$14.99ea

Every year 100's of Australian Men Women and Children perish thru house fires and smoke inhalation.

Virtually none would have died had a **Smoke Sentry Alarm** been fitted to their home.

- Brilliantly Designed Dual Chamber ionization sensor detects particles of combustion (smoke) at earliest stages of fire e.g. smouldering etc.
- Loud, persistent 85db alarm wakes the soundest of sleepers.
- Low cost 9 volt battery lasts approx. 1 year, easily replaced.
- Low battery alarm ★ Test Switch.
- Dead easy to install - takes less than 10 minutes - all you need is a screw driver!

Protect yourself and your whole family as of today

Stop Press Stop Press Stop
Altronics Scoop Altronics Scoop

80 CPS Printers Are Out!! The New Micron 100 CPS is in

★ ULTRA SMOOTH QUIET OPERATION

Features ■ Extra Fast 100 characters per second ■ 192 ASC11 characters (96 standard, 96 Italic) ■ Bit Image Graphics ■ Friction and Sprocket Paper Feed (100mm to 254mm Paper) ■ Columns - Normal/80,Condensed/142, Enlarged/40 condensed double width/71 Elite/96, Enlarged Elite/48. ■ Logic Seeking - bi directional ■ Letter quality print. Two **Models** D 1170 parallel interface (standard Centronics) D 1172 Serial RS 232 **with Flag Control and X on/X off Handshaking.**

2 MODELS
PARALLEL
D 1170 **$379**
SERIAL
D 1172 **$399**

Spare Ribbons
D 1175 **$12.50**

OSCILLOSCOPE SENSATION!

Altronics and **EA** have come up with the best value Oscilloscope on the market today - **IN A KIT** -

NEW

CAT K 2000

Over the years many people have asked, "Do you have a CRO kit?" - Our answer-up until now-has been that built and tested units were not dearer than kits, if you could get a kit at all. The Altronic K 2000 Cathode Ray Oscilloscope kit has a guaranteed 5MHz band width but should go to around 6.5MHz. It also features 75mm (3") CRT Blue Phosphor with accurate graticule, separate vertical and horizontal BNC type input sockets etc. Remember a 5MHz scope is usually adequate to troubleshoot most micro processor and other digital circuitry as well! This is a wonderful opportunity to learn electronics and end up with a valuable piece of test equipment as well. The Altronic K 2000 kit is absolutely complete. The chassis is prepunched and every component including nuts and screws are provided, along with instructions.

ONLY $229 Ref: EA October 1984

Programmable Mini Mobile Robot

ONLY **$49.95** Cat D 2000

Low-cost fun learning with this sophisticated robot! Have hours of educational fun programming this fun device to do what you command through the 25-key keyboard on its head!!

FEATURES:
- 4 bit microprocessor controlled
- 3 speed gears selected by programming thru' micro
- Can travel in 4 directions plus angles and curves
- Has lights and audio
- Complex routines can be easily programmed (up to 48 commands long)

Programming Handbook Supplied

SAVE WITH ALTRONICS

4 BIT DEDICATED MICRO PROCESSOR CONTROLLER

FULLY APPROVED DC PLUG PACKS

Just the shot for powering Battery operated devices such as Video Games etc. Two Models—cover 99% of battery powered products. Super attractive blister packaging.

M 9000	M 9005
240/3,4.5,6,7.5,9,12v @300 mA	240/6,9,12v @ 500mA
$12.50	$14.95

Manufacturers, Resellers—Contact our Wholesale Department for our fantastic bulk rates. Phone Steve Wroblewski or Peter Stark on 09 3817233.

HEATSINK COMPOUND
BUY THE BULK 150g PACK — IT'S 378% MORE ECONOMICAL!

Heat conducting paste facilitates heat transfer from semi to Heatsink. One tube good for up to 30 T 03 package semiconductors

K 1600 7.5gm Pack $1.80
K 1610 150gm Pack $9.50

BANKCARD HOLDERS—PHONE ALTRONICS TOLL FREE 008 • 999 • 007 FOR NEXT DAY JETSERVICE DELIVERY

FAMOUS VOYAGER CAR COMPUTER

AS REVIEWED
EA OCT '82 P26-28
ETI NOV '82 P26

COMPLETELY BUILT AND TESTED

ONLY $125 MADE IN ENGLAND! — QUALITY!

Contains equivalent of thousands of transistors — uses massive custom LSI chip to achieve low price.
Never before has such a comprehensive car performance computer been offered at such a low price! Once again miracle microprocessor technology has enabled us to pass enormous savings on to you!
But don't let the low cost fool you. The "Voyager" car computer **is the most comprehensive product that we have seen.** No other car computer matches this one **at even twice the price!** You could buy a $20,000 Holden and not get a better car computer!
Just check the features. We are sure that you will calculate that the "Voyager" represents outstanding value!
FEATURES: ★ Instant fuel consumption in litres/100km and MPG! (most others have only one of the above) just switch from one to the other as you drive along. ★ Instant speed, time and other fuel data. ★ Visual and audible excess speed alarm.
INSTALLATION: The "Voyager" comes complete with an unbelievable array of mounting configurations, on dash, under dash or stalk mount. All installation hardware is supplied (even a roll of insulation tape!) as well, of course, as the speed and fuel sensors. A lavishly illustrated installation manual is provided as well as a comprehensive operators manual.

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 2 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**

LOW COST HIGH EFFICIENCY HORN SPEAKER

Two Models 5&10 Watt 8 ohm
Fully weatherproof. New unique voice coil construction ensures high dependability on full drive.
Suitable for PA intercom and security systems etc.

	ea.	10up
C 2010 5W	**$9.50**	**8.50**
C 2015 10W	**$11.50**	**9.50**

Telephone Type Cable

Supplied on 200m rolls, enclosed in tough PVC bags in the traditional way. Enables tangle free extraction from centre of roll through hole in the side of PVC bag.

FOUR WIRE
RED/BLACK/BLUE/WHITE

W 0302 per metre ..... .50
per 200m roll $46.00

SIX WIRE (Three Pair)
RED/BLACK/BLUE/
WHITE/GREEN/ORANGE

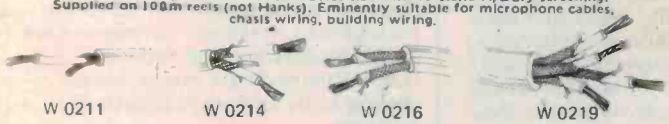
W 0303 per metre ..... .60
per 200m roll $56.00

20 WIRE (10 Pair)
Pairs 1-5 BLUE/ORANGE/GREEN/BROWN/SLATE with White mates
Pairs 6-10 BLUE/ORANGE/GREEN/BROWN/SLATE with Yellow mates

W 0310 per metre $1.50
per 200m roll $200.00

SHIELD AUDIO CABLES

Lap screened 14/.12mm inner conductor size with 48 stand H/Duty screening. Supplied on 100m reels (not Hanks). Eminently suitable for microphone cables, chasis wiring, building wiring.



W 0211	W 0214	W 0216	W 0219
SINGLE CORE	TWIN CORE	TWIN CORE Fig "8"	4 CORE
Per Metre 40	Per Metre . .50	Per Metre . .60	Per Metre $1.00
Per 100m ... $25	Per 100m . $39	Per 100m . $40	Per 100m $60.00

MASSIVE PRICE BREAKTHROUGH!
ELECTRONIC BELT DRIVE TURNTABLE
BSR QUALITY

Altronics has made a sensational purchase of **Belt Drive Turntables - BELOW** Manufacturers Cost!! Because of our buy we can pass them on to you at a **MASSIVE SAVING.** The Turntables are made in England by B.S.R. They are unmounted and suitable for Disco Consoles, 3-in-1's etc. They are also ideal as replacements for existing 3-in-1 sets. (See Specifications). But there is an aspect that is **really amazing!** You can work the Turntable from 9-12V DC. This means that you can run the unit from a car or truck!! (The A 0612 model can of course run on 240V mains). The Turntable features quality Belt Drive operation, lightweight Transcription type arm, Cueing facility and Stereo Ceramic cartridge with Diamond Stylus. The platter has calibration markings to check speed. A simple neon on 240V will 'strobe' to the markings). Whilst the 33 & 45 rpm speed has been accurately set in the factory, you have the facility to make pitch adjustments underneath the turntable. The DC Motor Drive (as used in the best turntables) is electronically controlled!! Each unit comes with complete instructions. Quantity limited! You will have to hurry to avoid disappointment.

SPECIFICATION

* Dimensions 330 (W) x 285 (D) x 60 (H) mm overall.
* Platter Diameter 280 mm.
* 2 speed 33 and 45 rpm.
* Pick up Arm Counter balanced type with cueing facility.
* Pick-up ceramic stereo with diamond stylus.
* Turntable operation - auto stop, returns to rest automatically. Turntable chassis is sprung on all corners.
* Output stereo RCA sockets provided.
* Weight 1.5KG.

AMAZING LOW PRICE
CAT.A 0612 $29.95

240V VERSION (includes 12V adaptor)
CAT A 0614 $39.95

Freight Packing - due to the bulk and weight of this unit - freight is $5.00 per unit.

"MICROBEE KEYBOARD"

Now ONLY $19.50

Microbee is a registered trademark of Applied Technology Pty. Ltd

D1510
$29.95

Full 60 Key Qwerty Computer Keyboard exactly the same type that has been used with the famous Microbee Computer SPST Keys Complete with mounting plate **(Fully Assembled).**

Superlative MICRON SERIES II MONITORS

★ 1050 lines resolution at centre screen. ★ 22MHz bandwidth. ★ Video input impedance switch allows networking use. ★ Incredible — repeat Incredible — resolution.

Guaranteed (we mean it) to out perform any other low cost monitor in Australia.

$20 OFF THIS MONTH

D 1115 Series 2 Nonglare Green **$199.50**
D 1116 Series 2 Nonglare Amber **$210.00**

SPECIFICATIONS:
Screen — Green phosphor. **Front Controls** — Power on/off, character brightness/intensity, display centering. **Rear Controls** — Background intensity, vertical and horizontal adjustment etc. **Input Impedance** — Switch 75/10K Ω. **DC Socket** — 12V DC output at 1.1 amp — power your micro direct from the monitor. **Bandwidth** — 10Hz-22MHz. **Resolution** — 1050 lines minimum at centre screen.

FOR NEXT DAY JETSERVICE DELIVERY
BANKCARD HOLDERS—PHONE ALTRONICS TOLL FREE 008 • 999 • 007

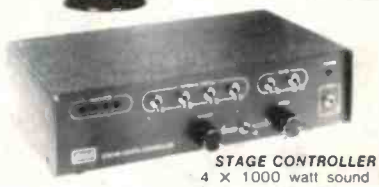
Cash More Sound

☆ ☆ ☆ ☆

SOUND SYSTEMS
DISCOTHEQUE'S & LIGHTING

pin spots

12"-18"-20" + oval mirror balls



STAGE CONTROLLER
4 X 1000 watt sound to light chaser inbuilt mic

SOUNDCENTRE DISCOTHEQUE CONSOLE
200 X 200 watt inbuilt amplifiers
JVC — National D/Drive T/Tables — cassette deck — 2 mic inputs W/V/oride tape & aux in-out carpet covered.

4 arm spinners

cosmo balls

Strobes

Ropelights 30ft 4 colours

* 18-lamp bar rotator
* projectors * fuzz lites
* fog machines * scanners
* colourer par 30 lamps
* light boxes * mics-stands

Manufacturers of speaker cabinets discotheque consoles — rope lights chasers etc.

For your entertainment needs contact: —

CASH-MORE SOUND

or visit the showrooms:
356 LIVERPOOL RD., ASHFIELD, NSW 2131
TELEPHONE: (02) 798 6782 TLX: AA74549

HIRE—SALES—INST—SERVICE

Practical University?

In ten years' time, Davies predicts, there will be an optical fibre communications network from Perth to Townsville.

"It will be the longest optical fibre network in the world and will bring with it problems which are peculiar to the Australian scene which doubtless we will have worked on and solved."

Further exciting work in UNSW which has found applications in industry — and will find more — is that conducted by Associate Proessor Martin Green with Davies on photovoltaic cells. The project, supported by an ARGC grant, is looking at producing new sorts of transistors using Metal — Insulator Semiconductor techniques. It is already possible to produce photovoltaic cells which have higher conversion efficiencies of solar energy directly to electricity than any such devices in the world.

The most immediate application of this work will probably be on long stretches of telephone line, such as from Alice Springs to Darwin or Carnarvon to Wyndham, currently being installed. Such stretches conventionally involve microwave repeater stations every 50 kilometres or so — baton changes when the message is received, reamplified and retransmitted. Such stations have to be on hilltops or mounted on towers, and are frequently in inaccessible and rugged terrain. They cost a small fortune to refuel, maintain and repair.

But a photovoltaic cell could sit on the roof of a structure and provide enough power to keep these systems going without anyone going near them more than about once a year, to check them and top up the batteries.

"And if anything does go wrong you really only need a radio mechanic to go out because the whole thing is electronic in its nature. It is not so much Australia's long hours of sunshine which suggest photovoltaics have a big future," says Professor Davies, "but the remoteness of many outback settlements and the prohibitive cost of supplying them with their energy needs."

As the price of solar cells comes down the dividing line between what is economic and what is not will ultimately move up to the point where remote homes can use photovoltaic cells for the generation of all domestic requirements. They are already being widely used in marine beacons and in aircraft navigation beacons.

But if there have been solid benefits for Australia resulting from university-industry contact, Professor Davies is convinced that there could have been still more if governments had been more supportive.

"Successive governments of Australia have not really bitten the bullet and supported local Australian industry by having a firm policy of local procurement," he says.

"Every country in the world except Australia does this in the telecommunications field. It is fair to say that Telecom has adapted a de facto policy of this sort, which has resulted in a strong local telecommunications industry." But this is nothing to the 'Buy American' acts in the the USA, Professor Davies says, which prevent various government departments there from buying equipment other than from American producers. The recent award of the Australian-developed Interscan microwave landing system contract to an US manufacturer could have been avoided if the right action had been taken early enough.

Davies is also a firm supporter of the investment incentive recommended by the Espie Report, which is about to become law. His stance on this is hardly surprising since he was himself a member of the Espie Committee.

"One of the most important conclusions of the Committee I believe was that there is no country in the world in which companies requiring venture capital have prospered without the intervention of government to set the environment in some way."

It was this recommendation which will lead shortly to the establishment of Management Investment Companies — MICs — aimed at making investment, particularly in high technology companies, more profitable and secure.

"If we fail to do this then all the products of Australian brain power trickle overseas and become the subject of investment through MICs in California or Europe."

Was it coincidence that there seemed to be a fair number of Barry Jones supporters in engineering at UNSW?

"I think we are in this University because it has always been the University in Australia most closely orientated along the path which involves co-operation and co-ordination with industry," Professor Davies says.

Reprinted with permission from Vol. 1 (1984) of 'Alumni Papers', the publication of the University of New South Wales Alumni Association.

MICs — A REALITY

Since this article was written, some five management investment companies have gained licences from the Federal Government and have begun actively seeking funds for venture projects in Australia.

SOANAR

AUSTRALIAN DISTRIBUTORS

For **NEC**

- MICROCOMPUTERS • MICROPROCESSORS
- PERIPHERAL INTEGRATED CIRCUITS
- TANTALUM AND MONOLITHIC CAPACITORS
- RELAYS • SUPERCAPS Available Ex stock All States

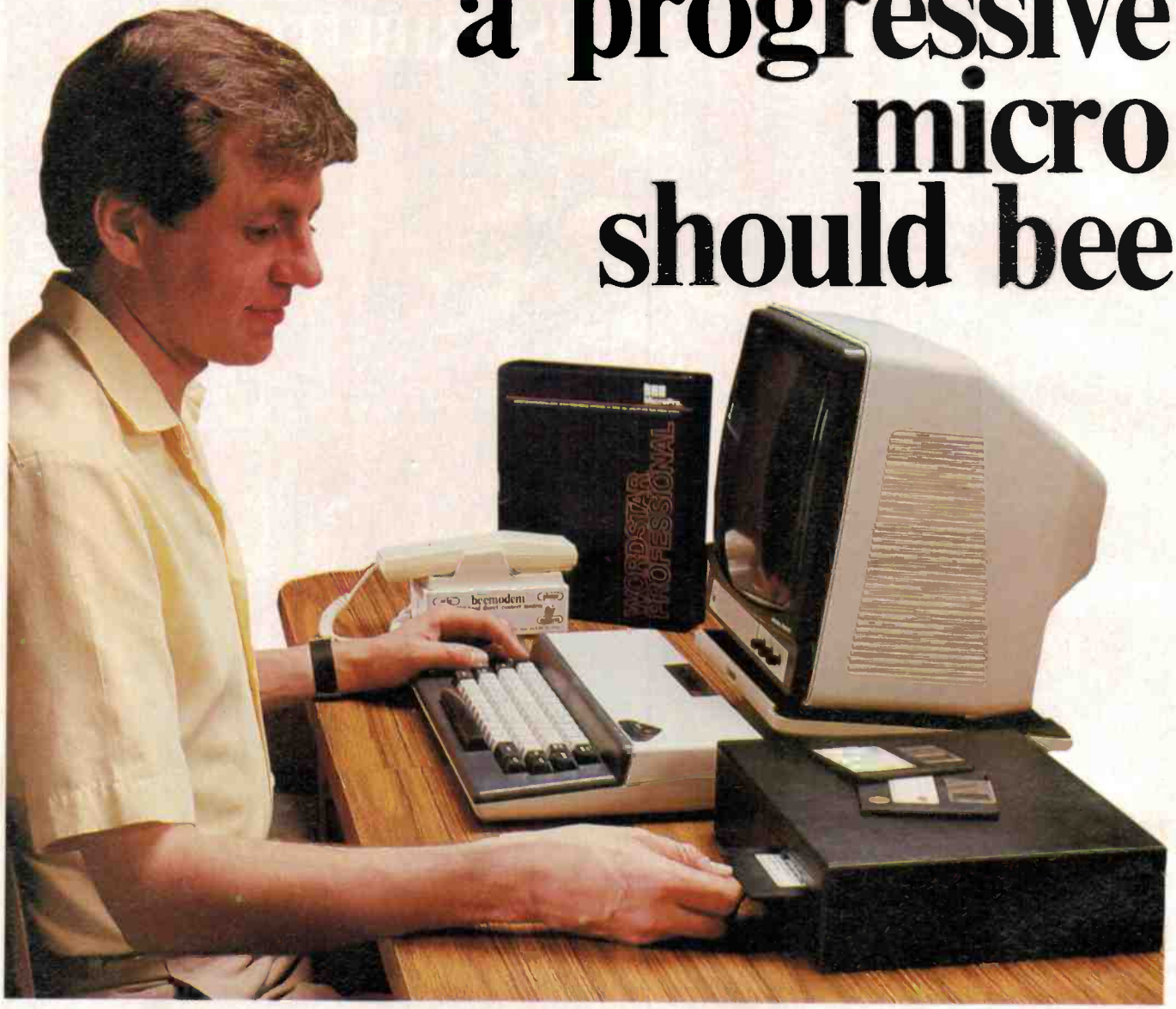
SOANAR

SOANAR ELECTRONICS PTY.LTD.
INCORPORATED IN VICTORIA
30-32 Lexton Road, Box Hill, Vic., 3128, Australia.
Telex 34303

VICTORIA: 895 0222
N.S.W.: 789 6744
STH. AUST: 297 0811
QUEENSLAND: 852 1133
WEST AUST: 381 9522
TASMANIA: 31 6533

New Release

Everything a progressive micro should bee



The hottest new development in the Microcomputer World is the new high density, low cost 3.5 inch disk drives. Already standard on the Apple Macintosh, HP 150 Touch Screen Computer and the ACT Apricot these new drives offer giant 500K capacity using a fully enclosed diskette. Essentially the 3.5 inch drives have the same or more capacity as the 5.25 inch drives but occupy 30 percent of the volume. The results are obvious: Low cost, high reliability disk drive storage in a small easily portable system.

Microbee 3.5 inch Disk System The Computer-in-a-Book!

Ideal for the home library, the **microbee** COMPUTER-IN-A BOOK series is available in matching volumes expandable to meet your changing computer needs. The **microbee** COMPUTER-IN-A-BOOK is available in several options designed to suit the varying needs of the user. If you require an ultra low cost system which essentially adds disk drive capability to the power of Microworld Basic, Wordbee Wordprocessor and is capable of running a wide range of educational

and entertainment software then the **microbee 64K/Book (Volume I)** system is ideal. Supplied with CP/M you will have the full library of world class software at your fingertips. The **microbee 64K/BOOK (Volume I)** can be expanded to use additional disk drives **(Volume II)** at any time.

The **microbee Computer-in-a-Book** is supplied with demonstration/training software, Microworld Basic, Wordbee, Telcom, CP/M 2.2 and a range of powerful utilities. Included with each **Computer-in-a-Book** is a special software registration form entitling the owner to purchase optionally Wordstar/Mailmerge, Spellstar, Microsoft Basic, Multiplan at substantial savings because we have prepaid the licence fees for you.

microbee Computer-in-a-Book

VOLUME I

microbee 64K/Computer-in-a-Book (Volume I) comes with Microbee 64K keyboard unit, single 3.5 drive unit and software on diskettes including:
Demonstration diskette, Microworld Basic, Wordbee wordprocessor, Telcom and CP/M with utilities. A matching owner's manual is supplied.

Microbee 64K Computer-in-a-Book Volume 1 with single disk drive and bundled software $995

VOLUME II

(Volume II) Add On Drive is available in a matching volume to Volume I and expands the system to twin drive capacity. Dual drive operation enables you to use complex and interactive software, back-up operating disks easily and is ideal even for professional applications.

Volume II add-on disk drive $345

Additional equipment recommended

Hi-res. Green Monitor $149.50
Hi-res. Amber Monitor $169.50
Swivel Base $24.50
DP100 Dot Matrix Parallel Printer (with cable) $399
DSY120 Daisy Wheel Printer (with cable) $549
Beemodem $169.50
Beetalker $99.00
Beethoven $99.00

SOFTWARE

Software for the microbee Computer-in-a-Book on 3.5 diskettes.

Wordstar/Mailmerge diskette with manuals $69.50
Spellstar with Australian Dictionary $59.50
Microsoft Multiplan $59.50
Microsoft Basic/Simply dB Database $59.50
Borland Turbo Pascal $69.50
Microworld Disk Library Managment $19.50
Arcade game collection $29.50
Learning Can Be Fun Series . . . $29.50
Bee Scientist A $29.50

bankcard welcome here

DIRECT ORDERS
PHONE (02) 487 2711
TELEX AA72767
APPLIED TECHNOLOGY RETAIL PTY LTD

microbee technology centres

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

VIC.
729 Glenferrie Rd,
Hawthorn 3122, Vic.
Phone (03) 819 5288

W.A.
141 Stirling Highway,
Nedlands, W.A.
Phone (09) 386 8289

S.A.
151 Unley Road,
Unley 5061, S.A.
Phone (08) 272 1384

QLD.
455 Logan Road,
Stones Corner, Qld 4120
Phone (07) 394 3688

FACTORY
Koala Crescent,
West Gosford 2250.
Phone (043) 24 2711

Authorised Dealers in:—

- Carlingford
- Coffs Harbour
- Concord
- Hurstville
- Lismore
- Sydney
- Melbourne
- Townsville
- Cairns
- Milton
- Adelaide
- Edwardstown
- Port Lincoln
- Mount Tom Price
- Launceston
- Belconnen.

microbee®

Designed and manufactured in Australia

Recordable laser disks

Once again, a Japanese consumer manufacturer has demonstrated the beauty of a bottom-up approach, with technology developed for consumer electronics making a large contribution to a high-tech product. Matsushita Electric Industrial Co. has introduced a system for optically recording and playing back 13⅓ min. of colour video with stereophonic sound on 8-in. disks.

The setup uses two linear integrated circuits originally developed for video cassette recorders, which speeded up development and reduced production costs. Direct access to individual frames is provided; it is possible to record 24,000 individual frames if the user prefers still frames to motion video.

The system is designed for one-time laser recording on pregrooved disks coated with a thin-film layer of tellurium oxide approximately 1.20 nm thick. As deposited, the layer is amorphous and has a reflectivity of about 10%. But when a beam with a power of about 9 mW at 830 nm is applied to the disk from a 25 mW laser, it changes the layer to a crystalline structure with a reflectivity of about 20%.

Erasure is not possible; for playback, the laser output is reduced to 3 mW. (A companion unit designed for playback-only uses the smaller laser.)

Signal format is similar to VCR tape with the video luminance signal recorded as a frequency-modulated carrier. The chroma signal is shifted to a low-frequency sub-carrier at 629 kHz — the same as in VHS recorders — while the two stereo channels are FM subcarriers at 1.3 and 1.5 MHz.

Use of a VHS chroma chip helps solve the problem of crosstalk between chroma signals on adjacent tracks by a method similar to that used in standard VHS recorders. This crucial development made it possible to decrease track pitch to 1.6 μm from the 2.5 μm spacing used on earlier laser-disk systems for recording single television frames.

The higher track density gives a 60% increase in disk capacity. Although the new system features a single spiral track and the old system used concentric circular tracks, disks made by old systems can be played back on new ones.

Crosstalk in luminance and audio channels is much less of a problem because FM detectors tend to be captured by the strongest signal. But use of an IC that was developed for high-fidelity VCRs has helped to keep the price down.

Frames can be written on a disk at any time in any desired order, Matsushita says. Access time to any frame on the disk averages 0.5 s. Front-panel control, TV-type remote control, and computer control through a built-in RS-232-C interface are all available. They can also select among standard speed, slow motion, and fast motion — or sequences of these modes.

Applications are expected to include product catalogues, various types of medical imaging, flight simulators, TV broadcast, and movie real-time playback or editing.

Push-pull drivers lift bass

Danish speaker manufacturer, Jamo, has produced a range of three hi-fi speakers featuring push-pull woofers to extend the bass response.

Distributed here by Scan Audio, the speakers have two woofers mounted face-to-face, with their axes vertical, in the lower cabinet. The upper one is inside a sealed chamber while the lower one is vented to the outside via the sides of the cabinet.

Jamo claim this technique results in an improvement of at least 5 dB at 20 Hz and smooths out the impedance characteristics in the lower bass region.

There are three models in the range: the TT 1000, rated at 100 W and featuring a claimed response of 32 Hz to 20 kHz; the PP 2000, rated at 160 W with a claimed response of 28 Hz to 20 kHz; and the PP 3000, rated at 200 W with a claimed response of 20 Hz to 20 kHz.

The TT 1000 measures 265 x 235 mm and stands 835 mm tall. The PP 2000 measures 290 x 280 mm and stands 980 mm tall, while the PP 3000 measures 310 x 340 mm and stands 115 m tall.

Further details from **Scan Audio Pty Ltd, PO Box 242, Hawthorn Vic 3122. (03)819-5352.**

Audiophile compact disc player from Meridian

Designated the MCD, Meridian's first CD player is based on the enormously successful Philips 101/Marantz CD63 and offers performance improvements over these versions in four major areas — servo operation, error concealment, power supply and analogue circuitry, Meridian claim.

Meridian's extensive modifications are carried out at their Huntingdon (UK) plant where all other Meridian products are manufactured.

The Meridian MCD was scheduled for release during September in the UK and should reach here shortly.

Its general appearance resembles the Philips/Marantz models but with the addition of Meridian's durable and highly attractive mid-grey Nextel finish with its suede-like appearance and feel, to match the new high-performance Zebra modular component amplifier series.

Bob Stuart, Meridian's electronics designer, has always applied technical innovation to his company's products. In the MCD compact disc player this results in the characteristic level of achievement that distinguishes all Meridian components and reflects the company's concern for integrity and function in its products, they claim.

The anticipated retail price of the Meridian MCD is $899. For further information please contact **Mike Bartlett, Audio 2000. (02)939-2159.**

Video BO in stereo

Bang & Olufsen has just released its range of television receivers and VHS video recorder onto the Australian market.

There are six different television models available, two of which are equipped to receive the latest stereo sound transmissions. All sets come with a cordless remote control that operates the television and the video recorder.

The stereo sound can be enhanced by use of the 'Stereo Width' control which controls stereo separation. It can be ducted through B & O's master control link system so that the stereo sound from the television can be picked up in other rooms of the house through a Bang & Olufsen system and used to enhance viewing on a conventional mono television set in other rooms (a networking system if you like!).

The B & O television receivers are priced from $1390 up to $1990 for the deluxe models with the sliding timber Tambour door.

For more information contact **Bang & Olufsen (Australia), 136 Camberwell Rd, Hawthorn East, Vic 3123. (03)82-1256.**

VCRs from Philips

Philips is marketing a new range of VCRs.

There are four in the new range. They are the VR6440 economy VHS VCR, the VR6540, the VR6640 stereo VHS VCR, and the VR6740 semi-deluxe stereo VHS VCR.

All four models include front end loading with video search.

For more information contact **Philips, 15 Blue St, North Sydney NSW 2060. (02)925-3281.**

New VCR: The Philips VR6640 stereo VCR.

Video enhancer

MFJ Enterprises of have just released, through their Australian distributors, an updated video enhancer combination unit, the MFJ-1421. It combines a video enhancer that incorporates extremely effective noise cancelling circuitry, a distribution amplifier for driving up to three outputs and a sync stabiliser for reshaping degraded sync pulses.

The MFJ-1421 has been especially optimised for use on the Australian PAL TV System. Unlike a lot of other imported enhancers which are designed for the United States NTSC system, it provides optimum enhancement of picture.

For further details contact **GFS Electronic Imports, P.O. Box 97, Mitcham, Vic 3132. (03)873-3777.**

Supersound

CBS Records has released an improved high-quality cassette, called 'Supersound'. All future recorded CBS cassettes will be released on Supersound quality tape.

CBS has been aware of the growing public demand for higher-quality cassettes, both in sound and presentation. With this end in mind, CBS engineers have refined the quality of recorded tape for the buying public.

Supersound cassettes feature a premier high-grade 'hot oxide' tape. They have an improved casing with mechanically superior cassette bodies.

For further information contact **CBS, P.O. Box 88, Darlinghurst NSW 2010. (02)339-0255.**

Spectrum from Hughes

Hughes Communications has announced its appointment as sole Australian distributor for the entire range of premium quality Spectrum audio components.

First shipments will include the full range of TRP Spectrum loudspeakers, with models ranging from diminutive bookshelf units to professional studio monitors.

Each model in the range has been designed to maintain phase coherency of the wavefront over the entire operating frequency spectrum. Each speaker is tested via B & K measuring equipment as it comes off the production line. The result is a sound that challenges the transient response and low distortion figures previously associated only with electrostatic designs, but at a fraction of the price.

All models can handle power commensurate with their size and are finished in rosewood or pine. Prices vary from $549 for the bookshelf (TRP Model VIII) to $1179 for the Model VI, to $1799 for the studio monitor.

For more information contact **Hughes Communications, 2/58 Moonya Road, Carnegie Vic 3163. (03)568-0612.**

Compact discs made in UK

Britain became the second European manufacturer of compact discs in May when a factory located in Monmouth, Wales, went into action.

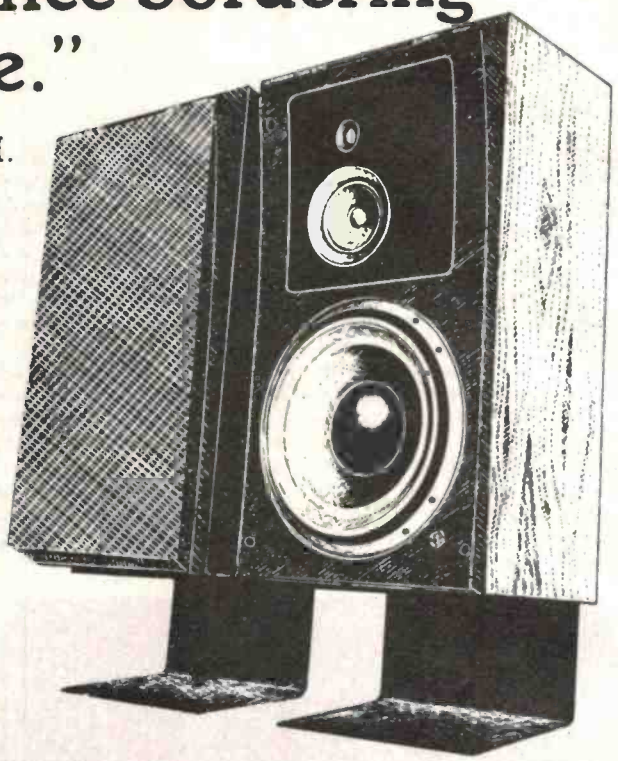
Nimbus Records, formed with Government and private sector financial backing, plans to produce a million of the 114.3 mm diameter plastic discs in its first year of operation. It will be acting as a custom manufacturer for a number of record labels from all over the world.

Recording companies will send their master tapes to the Nimbus factory for turning into discs. It is likely to be three or four years before there is adequate factory capacity to meet demand. At present discs are being made in Japan and West Germany.

Initially the Nimbus factory will be concerned with audio discs but the team expects to expand to video and computer production. Nimbus believe that the technologies for these different areas are beginning to merge. One of the first "marriages" would be digital disc video, giving sharp picture definition with digital sound.

"...offer a performance bordering on the superlative."

Louis Challis, ETI.



This statement, made by one of Australia's highly respected hi-fi critics, is no exception.

The Danish JAMO Loudspeakers are acclaimed world wide. Their unique way to solve the problems which plague ordinary speakers have made JAMO one of Europe's best speakers today

No other speakers on the market feature all these benefits:

- **Patented CBR-system (Centre Bass Reflex)** which eliminates cabinet resonances and decreases distortion to an absolute minimum.
- **Acoustically dead insert** around tweeter and midrange ensures perfect stereo image.
- **Optimum phase linearity** assured by slightly curved front panel which position the drivers on axis.
- **Acoustic attenuators.**
- **Electronic overload protection.**

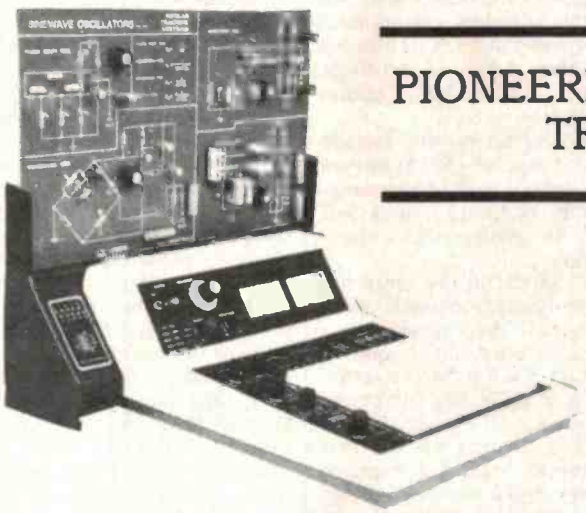
If you are considering spending from $400-$2000 on a pair of loudspeakers make sure that you arrange an audition of the incredible JAMO Professional loudspeakers.

Please contact us for brochures, reviews and your nearest dealer.

SCAN AUDIO PTY LTD
P.O. Box 242,
HAWTHORN. VIC. 3122.
Phone (03) 819 5352

jamo HI-FI

CBR - 1304
130 watt RMS
$1095.00 incl. stands



PIONEERING ELECTRONICS TECHNOLOGY TRAINING AND EDUCATION

The Australian School of Electronics invites all interested persons to inspect the "hands-on" training facilities of their Part-Time Studies division in Melbourne.

REGISTRATION for 1985 is now open for the following Courses:
—FUNDAMENTALS OF ELECTRICITY/ELECTRONICS
—MICROPROCESSOR FUNDAMENTALS

EMPLOYERS please note that special short courses and group fees can be tailored to suit specific company requirements.

The above courses are specifically oriented to the fields relative to Service & Maintenance Engineers with emphasis on evaluation, comprehension and trouble-shooting circuits.

PLEASE NOTE: Applications accepted will be strictly limited to 14 per class

For free information booklet please phone or write to the Registrar at P.O. Box 108 Glen Iris, Vic. 3146
PHONE: (03) 523 5622

YAMAHA CD-2

Natural Sound Compact Disc Player

Available in silver or black

$699

5 YEAR WARRANTY

NEW MODEL

COMPLETE WITH:

- REMOTE CONTROL
- COMPACT 3-BEAM LASER PICKUP
- RANDOM MEMORY PROGRAMMING
- MUSIC REPEAT FACILITY

MAIL ORDER: Send cheque or phone through Bankcard, VISA or Mastercard Numbers and we will deliver anywhere in Australia free of charge.

Now there is no competition....
The world of Hi Fi awaits you at Len Wallis Audio.

SHOWROOM AND SOUND LOUNGES.

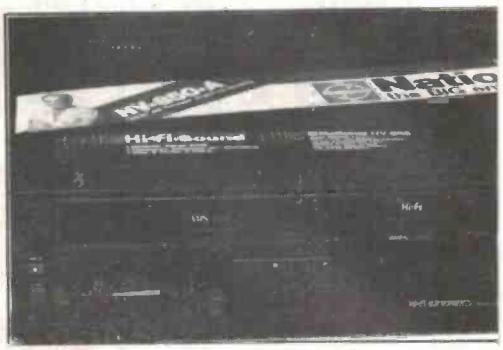
Len Wallis Audio

WHEN YOU'RE SERIOUS ABOUT HI FI.

Shop 9, The Village, 43-45 Burns Bay Road, Lane Cove.
Phone 427 1204, 427 1205 for bookings, or drop in.
OPEN ALL DAY SATURDAY

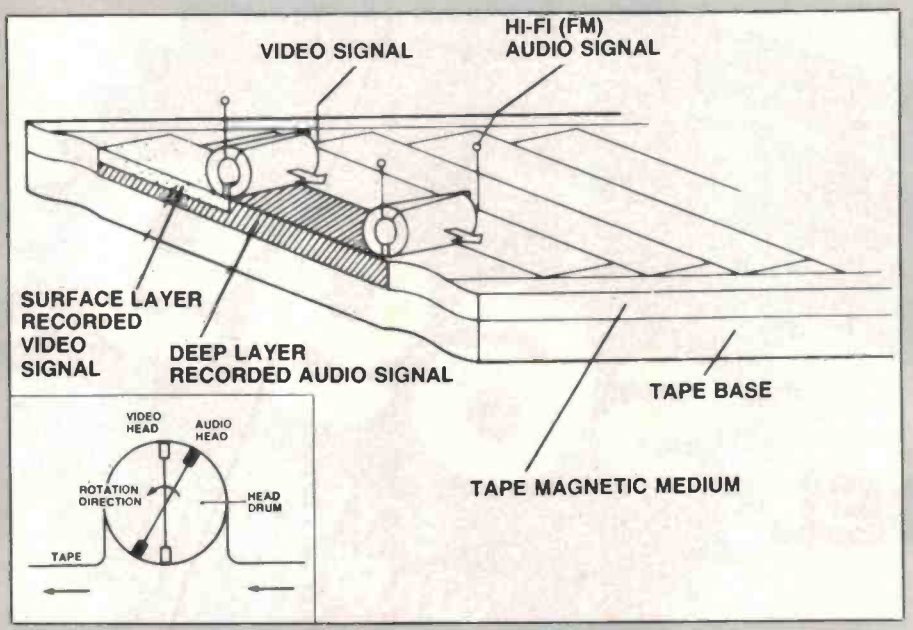
LWA002/FP

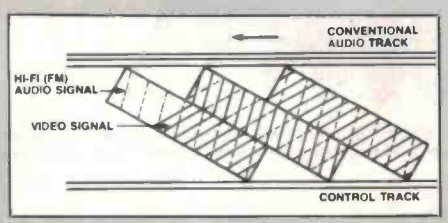
To save the suspense, we'll answer the question about how good these machines are right away — fantastic! Sony launched the stereo hi-fi video format for VCRs on an expectant market just over a year ago and first released a product in Japan and North America a few short months later. It was designed to give Beta a big boost — which it seems to have done. But the VHS makers had to fight back, and quick. The resultant performance, in both Beta and VHS formats, has to be experienced to be believed. The achievement is truly a triumph of modern engineering technology. Now available in Australia, it's no holds barred in the battle between Beta and VHS.

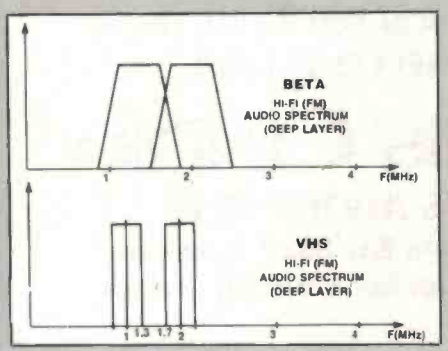


The big entertainer. National's NV-850-A stereo hi-fi VCR features still and stepped slow motion facilities.

Louis Challis







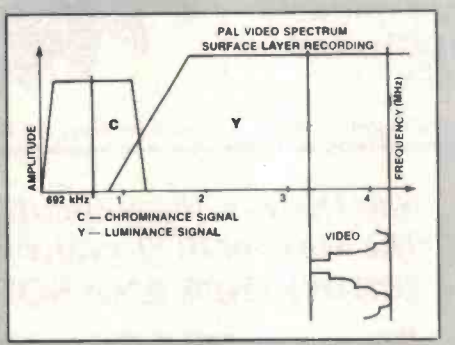


Figure 1. Showing how the hi-fi audio signal is 'written' on the tape using 'depth modulation'. The audio heads are located on the drum slightly ahead of the video heads and write at a different azimuth. The conventional longitudinal audio track is recorded simultaneously. The two audio channels are frequency modulated (FM) onto separate RF carriers, the Beta and VHS systems using carriers of different frequencies.

AFTER LAST month's review on the Sansui PC-X1 PCM modulator, you probably guessed that the editor would decide to ask me to review at least one of the latest stereo hi-fi video cassette recorders. As there are two separate and somewhat different formats (Beta and VHS) available, he elected to review both the latest Sony Beta hi-fi and the latest National VHS stereo hi-fi VCRs.

It wasn't surprising that within a day or two of receiving the recorders, I received the first of many questions from relatives and friends: "Which format should I buy and which offers superior performance?"

Before attempting to answer those questions, it would be appropriate to quickly review the background of stereo hi-fi video cassette recorders.

The contentional VCR uses a rotating video head with one head on each side of the drum to produce a discontinuous helical scan across the 12 mm wide video tape. This records the AM modulated video (picture) signal with a bandwidth extending up to approximately 4 MHz. The conventional video signal used by both the NTSC and PAL systems contains two separate sets of video data.

This signal contains a 'chroma signal' covering the band between dc and 1 MHz and a 'luminance signal' extending from approximately "1 MHz to beyond 4 MHz" for the PAL system only. The NTSC system incorporates a separation band between the chroma signal and the luminance signal. Both the Beta and VHS formats are basically similar in this respect and both of them record the normal audio channel along the edge of the tape in the form of an FM modulated signal with a dynamic range restricted to approximately only 45 dB.

A dynamic range of only 45 dB is unquestionably poor and offers a performance which is inferior to just about everything you could think of, barring telephone calls. Fortunately the frequency bandwidth of the TV's FM signal is generally much better than the average telephone line, as it extends beyond 12 kHz. The conventional TV copes fairly well with the restricted dyn-

Beat-ah, or bet-ah? Sony's SL-HF100AS Beta format hi-fi stereo VCR, shown with its remote control unit.

STEREO HI-FI VCRs

How good?

amic range, but seldom optimises or utilises the extended frequency capabilities of the medium, as a result of poor loudspeaker design.

The format of a conventional VCR does not immediately appear to present much scope for adding either supplementary audio content or even additional video data, particularly if the format is to retain a compatibility with existing VCRs.

This problem was neatly solved by Sony for the American and Japanese markets (where NTSC formats are used) by using the convenient gap in the video format between the chroma signal and the luminance signal. Sony neatly shoe-horned the two FM carriers required for the stereo hi-fi signal into that gap and thereby set the pace for the competition, who would undoubtedly have liked to do the same.

As the PAL system format is different from the NTSC format, this stratagem could not be used. Instead both Sony, who actually was well ahead of the competition, and the competing VHS VCR manufacturers, led notably by Matsushita, were forced to find some other 'innovative solution'.

In what has become a time-honoured pattern for the Japanese engineers over the last few years, they found that solution in the least expected way.

Quart in a pint-pot

The solution they developed was in the area of the modulation format, where they achieved the equivalent of turning a 'pint-jar' into a 'quart-pot'. They achieved this without actually adding any additional tape width, space for bandwidth (violating Shannon's law), or even by narrowing the recording track head width or scanning width. If anything, the contrary is true.

As Figure 1 shows, the conventional recording head has two video heads on opposite sides of the rotating drum, and both the Beta and VHS formats have added two additional video heads to the main rotating head drum. These heads carry the audio signals for two FM carriers, which are centred at approximately 1.3 and 1.7 MHz in the VHS system and approximately 1.3 and 2 MHz in the Beta system. These signals are recorded onto the tape before the video signal is recorded using a principle known as the 'Depth Multiplex Recording System'. This dual recording process utilises a quirk in physical recording principles that has found that the highest frequencies of the composite video signal are retained on the uppermost surface layer of the magnetic tape, whilst the lower frequency FM modulated audio signal (at 1.3 and 1.7 MHz) is retained below the surface of the video signal without being erased.

The result of this double recording is a composite frequency signal which contains both the video and audio information within the same composite layer of the magnetic coating. On replay, the rotating head reverses the process and the quadruple heads separately scan the tape and, through the use of selective filters, extract the appropriate video and FM audio signals with an unbelievable ease. In the case of the Sony recorder this is achieved by the use of high frequency pre-emphasis on record and de-emphasis on replay, whilst in the case of the National recorder it is achieved through the use of a noise-reducing circuit with a dynamic range compression on recording and expansion on replay.

Because of the format chosen for the audio signal, the tape containing the stereo FM audio carriers is completely compatible with the video signal on a normal VCR, and the ordinary pre-recorded tape without the FM stereo signals is also capable of being played on the stereo hi-fi VCR (but obviously with or without the stereo audio capability respectively).

The major attributes of both the Beta and VHS stereo hi-fi systems are that the theoretical dynamic range is extended an *almost unbelievable 90 dB!* This performance is on a par with the ubiquitous compact disc (CD) players, which produce a 96 dB theoretical dynamic range and practical ranges lying between 90 and 100 dB.

The major disadvantage of the concept is that in order to be able to listen to those new signals you have to connect the two stereo outputs from the stereo hi-fi VCR to a separate high fidelity amplifier and two additional loudspeakers. That additional requirement may initially discourage some potential users, but not most, I believe.

The cosmetic differences between the Sony SL-HF100AS and the National NV850A are considerable, and the functional differences are more marked than I would have expected. If I describe the two recorders in turn it will be easier for you to appreciate their features.

The Sony

The Sony unit is somewhat larger and much heavier than any normal VCR with which we have been familiar in the past. The unit is finished in grey/black with the front panel controls set in three distinct levels.

The top row of controls is, from left to right, the On/Stand-by switch, with the receptacle into which you insert the cassette featuring a pair of clear see-through swing-door-type elements. These neatly keep the dust out of the cassette well.

To the right of this is the Peak Level Meter featuring two parallel sets of LEDs. This meter has calibration points of minus infinity, −40, −30, −20, −15, −10, −3, (with green LEDs) and 0, +2 and +5 dB (with red LEDs). To the right of this is a recessed remote sensor which accepts the signal from the remote control provided with the VCR if the signal transmitter falls within an arc of a little more than ±30°, and within a distance in excess of 7 metres (I was able to reliably use the remote control at 11 metres from the recorder).

On the extreme right-hand side at the top of the deck is the time counter display, which shows the event numbers, the day of the week, the time and which VHF or UHF TV channel has been selected (up to a maximum of 12).

The second row of controls extends across the horizontal median line of the fascia. From left to right these are the headphone loudness control; the Eject button, which electronically ejects the cassette from ▶

the well; an orange LED to indicate that a cassette is already loaded inside; an illuminated green 'Beta hi-fi' escutcheon which lights up when a tape with only an audio signal (and *no* video) is being played back; a green LED to indicate sound; and a Record pushbutton with its own red integral LED. The stereo audio channel's recording volume is provided by a pair of parallel slide audio volume controls. A red LED indicates when the Timer Recording button (behind the front panel) is pressed to activate the stand-by mode. Adjacent to these controls are Clock Counter buttons and Reset buttons, so that the time display can be converted into a tape counter display. To the right of these controls is a switch labelled TV/VTR, which allows a TV program to be viewed or a recording on the machine to be monitored through the interconnected TV set or TV monitor. A panel light indicates when a stereo TV programme is being received, whilst the last control in this line-up allows either or both of the two languages of a bilingual TV program to be selected.

Immediately below this array of controls are two large touch-buttons marked '+' and '−', which are used to alter the selected TV channel to the next pre-tuned channel memorised by the internal TV tuner.

On the bottom row of controls is a miniature 3 mm tip-ring and sleeve socket for stereo headphones and five large touch-buttons for Rewind, Play, Fast Forward, Stop and Pause. When the Play button is pressed in conjunction with either Fast Forward or Rewind, the picture search mode is activated. This allows you to use the 'skip-scan' function, about which more will be said later.

On the bottom right-hand side of the escutcheon and below the major controls is a neat flip-down cover, behind which are located all those program controls that you would not normally want anyone else to touch (and especially not children!). The first of these is an input select switch with three positions for Line/Camera, which allows signals to be recorded from the video and audio jacks on the back; Tuner for recording TV programmes; and Simul(cast) for recording FM simulcast programs or timer-activated audio recordings.

The next switch provides for activation or deactivation of the peak program level meters. Adjacent to this is a switch which provides the capability to record both audio and video signals or just an audio signal without the video signal. This has specific relevance for those people who wish to use their VCR in the role of a high-quality audio recorder. The switch next to this allows you to activate an internal multiplex filter when recording signals from an FM tuner incorporating the conventional 19 kHz pilot tone system. The next switch provides the ability to play back either the stereo video track or the conventional FM audio track during sound playback. In the 'AUTO' position the VCR automatically selects the video track with Beta hi-fi prerecorded tapes, and the conventional (normal) FM audio track for tapes recorded without the Beta hi-fi modulation system. The last of these specific controls is a high frequency de-emphasis switch, which only operates on the normal audio track to provide a high-cut to reduce exaggerated high frequency characteristics.

The right-hand side of the escutcheon contains eight control buttons for setting the clock, timer and the programme on the digital display. On the extreme right-hand end of the bottom of the panel is a potentiometer for adjusting the tracking alignment of the video heads with the pre-recorded signal.

The left-hand side of the metal lid of the VCR features a large, clear viewing window through which the tape drive can be inspected to see if a cassette has been loaded. On the right-hand side is a removable cover providing access to the individual station tuning control buttons, which have been cleverly designed to provide automatic frequency search and tuning (AFT) facilities. These are supplemented by an array of fine-tuning buttons and LED indicators for fine-tuning of stations in both the VHF and UHF bands. This particular facility is supplemented by an internal battery supply which retains the pre-selected signal settings even if the VCR is disconnected from the power for a considerable time.

The rear of the recorder features a pair of BNC video input and output sockets, a pair of male and female Belling-Lee type video sockets for connecting to the aerial and external TV set, two pairs of coaxial RCA audio input and output sockets, a camera remote control socket, and a DIN interconnecting socket for an external video camera. The normal switch for selecting channel 0 or channel 1 for the RF output signal is provided, and the rest of the back panel is taken up by a large finned heatsink and a power on/off button.

After removing the covers, the inside of the recorder does not reveal much, as most of the components are stacked on multiple horizontal or vertical printed circuit boards which are so close you wonder if the original cabinet should not have been made larger to cope with the extensive circuitry involved. Where the printed circuit boards don't inhibit your viewing, the metal covers over RF circuit components stop you looking at the circuitry.

The printed circuit boads are of phenolic-type construction and are neatly stencilled on the reverse side to show the positions of all components. These are stacked four deep from top to bottom on the right-hand side of the chassis and two deep on the left-hand side. These horizontally disposed printed circuit boards are supplemented by multiple vertical boards at the front of the chassis. The overall impression I gained from the evaluation of the internal circuitry is that the designers are providing an awful lot of complex and advanced circuitry for what seems a remarkably low price.

The National

The National NV850A is similar in many respects to the Sony recorder, yet features sufficient differences in functional characteristics and peripheral features to interest many possible purchasers.

The front fascia of the National NV850A bears a passing similarity in appearance to the front of the Sony SL-HF100AS. The controls are arranged in two layers instead of three, although the timing, programming and tape counting functions are quite different and are separated from one another, unlike in the Sony recorder, where they are combined in one section of the escutcheon. The top line of controls and functions of the National recorder incorporates its front-loading facility by means of a top-hinged single flap, instead of with a double flap as provided by the Sony recorder.

In the middle of the panel are two controls which select Stand-by and OTR. These functions are unusual in that you can key in the time delay in four delay increments of half an hour, one hour, one and one half hours or two hours, and similar increments for the length of that recording onto the tape. This is a nifty facility which provides simplified recording features that are more likely to be used than the adjacent fourteen-day eight-programme timer, which is obviously more complex and time-consuming in its programming requirements. To the right of these controls is the display panel in which the time, day of the week, AFC and video channel number (up to a maximum of 16) are indicated.

In the supplementary display immediately below this panel, data relating to the left, left + right, right channel, normal (FM) audio, two-channel (bilingual) and stereo audio channel selection are indicated. On the extreme right-hand side of the front panel are the two large touch buttons for increasing or decreasing the pre-tuned TV channel selected. At the bottom half of the fascia, from left to right, is the Eject button; the VTR activation button (with its integral LED); a display which indicates that the VTR has been activated; and the tape counter (in seconds). Immediately below this is a pushbutton for selecting left channel and right channel of audio level, which is in the form of a plasma-type display that is also switched to indicate the correct tracking of the tape. In the audio mode this plasma display becomes the peak-level meter to indicate recording signals from minus infinity to +10 dB.

To the right of the plasma display are a Counter Reset button and a Memory Search button with three selectable positions. These illuminate the Memory Search bezel when activated. The six primary deck control buttons of Stop, Play, Pause, Fast Forward, Reverse and 'Still-Advance' (which is a feature unique to the VHS system), are located to the left of the centre of the deck. The Still-Advance feature provides the ability to lock a single still picture, without significant jitter or noise, to facilitate examination of any section of the video recording or to be able to play the picture forwards or backwards at high speed, again with minimum distortion or horizontal line distortion on the picture.

On the right-hand lower corner of the front fascia is a drop-down cover with a similar appearance to that of the Sony recorder, behind which again National has located all those secondary functional controls that you wouldn't want inadvertently disturbed. These include pushbuttons for left, left + right, right channel and normal (FM) audio channels, which when selected are displayed on the escutcheon above. These are supplemented by the Record but-

ton, the Audio-Dub button and the Audio-Record Mute button, which allows you to remove unwanted noise sections from the audio portion of the tape.

Buttons are provided for a three-way clock control, a programme check button and six controls for setting the time, day, hour and minutes as well as the timer record control On/Off button. All these controls are supplemented by confirmatory information in the main display section above.

At the bottom of this panel is a picture quality control pot, the head azimuth picture tracking pot, the AGC and audio recording level control, a conventional tip and sleeve microphone socket and an input selector for external video camera, external FM tuner or combined simulcast requirements.

On the left-hand side of the top of the cover is a clear plastic window through which you can see the tape transport mechanism, allowing you to see whether a cassette has been loaded in the machine. On the right-hand side of the top of the VCR is a small removable panel. This provides access to the internal TV channel tuner controls, which provide automated searching and fine-tuning for the VHF and UHF channels, up to a maximum of 16.

The rear panel of the VCR has two pairs of RCA coaxial audio-in and audio-out sockets and a switch for selecting the colour, auto or test signal. Instead of a small volume control the desigtners have seen fit to provide a three-position switch for setting level sensitivity for a tip-ring and sleeve headphone socket. The video requirements are provided with a pair of BNC sockets for video-in and video-out, and Belling-Lee female and male sockets for RF-in and RF-out. The RF-in is sensibly provided with a separate attenuator switch to cater for high-level signals when located near TV stations. The last control on the back panel is a switch for selecting channel 1 or channel 0 for the RF-out signal fed to your TV set.

The metal cover is well ventilated by a large area of longitudinal slots, and following its removal reveals just how complex the designs of the latest generation of consumer electronics have become.

At the front of the deck is the cassette drive mechanism, which is a complex composite of steel pressings and plastic mouldings in which the precision rotary head with its integral drive motors is located. Behind and to the right of this are multiple electronic printed circuit boards, interconnected by a very large number of plug-in wiring harnesses and parallel ribbon feeders. Behind these are the power supplies, heatsinks, transformers and a wide range of other components which are all interconnected with a large motherboard located near the base of the chassis. The main support chassis is a massive precision diecasting, which ensures mechanical stability at the expense of an obvious weight increase.

The printed circuits feature a large number of LSI circuits, including one large proprietary 64-pin chip, one 42-pin chip and copious quantities of conventional 16-pin dual-in-line integrated circuits. Amongst these special circuits and components is a new noise reduction chip, developed for the ▶

	Sony SL-HF 100AS	National NV 850A
Dimensions:	*430 mm (wide) x 108 mm (high) x 380 mm (deep*	*430 mm (wide) x 115 mm (high) x 370.2 mm (deep)*
Weight:	*10.5 kg*	*9.6 kg*
Remote Control:	*RMT-216*	*National Unit*
RRP:	*$1149.00*	*$1299.00*

National NV850
VHS HiFi Video Cassette Recorder

MEASURED PERFORMANCE OF

NATIONAL NV 850 VHS HI-FI VIDEO CASSETTE RECORDER

Serial No. G6KH01166

LINEARITY

INPUT LEVEL dB	OUTPUT LEVEL dB
+6.0	0
-4.0	-9.9
-14.0	-19.8
-24.0	-28.9
-34.0	-39.9
-44.0	-50.0
-54.0	-60.3
-64.0	-70.8
-74.0	-80.6
-84.0	-91.4
-94.0	-102.2

SIGNAL TO NOISE RATIO (see graph)
Re +6.0dB: 84dB(Lin) 90dB(A)

RECORD TO REPLAY RESPONSE (see graph)
20Hz-20kHz

ERASURE RATIO
for 1 kHz signal recorded at +5 VU: -109dB

MEASURED WOW AND FLUTTER: 0.1% WRMS

DISTORTION

At 1kHz			
INPUT LEVEL	+6.0dB	0.0dB	
2nd	-54.7	-67.0 dB	Lower levels
3rd	-62.3	-73.2 dB	In Noise
4th	-70.0	-	
5th	-	-	
THD	0.2	0.09%	

At 6.3kHz					
INPUT LEVEL	+10.0	+6.0	+2.0	0	-10.0 dB
2nd	-24.1	-25.9	-36.7	-37.8	-60.4 dB
3rd	-25.6	-27.3	-46.5	-47.8	-68.6 dB
4th	-31.1	-31.5	-50.2	-	- dB
THD	8.6	7.1	1.6	1.4	1.0 %

At 100Hz				
INPUT LEVEL	+6.0	0	-10.0	-30.0 dB
2nd	-53.9	-66.9	-67.8	-55.3 dB
3rd	-57.2	-58.3	-58.9	-55.3 dB
4th	-61.9	-	-	-60.5 dB
5th	-76.7	-	-	-60.1 dB
THD	0.25	0.13	0.12	0.27 %

Sony SL-HF 100AS
VHS HiFi Video Cassette Recorder

MEASURED PERFORMANCE OF

SONY SL-HF 100AS HI-FI VIDEO CASSETTE RECORDER

Serial No. 201670

LINEARITY

INPUT LEVEL dB	OUTPUT LEVEL dB
+5.0	0
-5.0	-10.0
-15.0	-20.2
-25.0	-30.6
-35.0	-40.9
-45.0	-51.2
-55.0	-61.4
-65.0	-72.0
-75.0	-82.3
-85.0	-92.6

SIGNAL TO NOISE RATIO (see graph)
Re +5.0dB: 76dB(Lin) 87dB(A)

RECORD TO REPLAY RESPONSE (see graph)
+0.5, -1.5dB: 10Hz-20kHz

ERASURE RATIO
for 1 kHz signal recorded at +5 VU: -116dB

MEASURED WOW AND FLUTTER: 0.1% WRMS

DISTORTION

At 1kHz				
INPUT LEVEL	+5.0	0	-15.0	dB
2nd	-63.6	-66.2	-63.8	dB
3rd	-53.0	-59.6	64.7	dB
4th	-66.6	-	-	dB
5th	-71.6	-	-	dB
THD	0.24	0.12	0.09	%

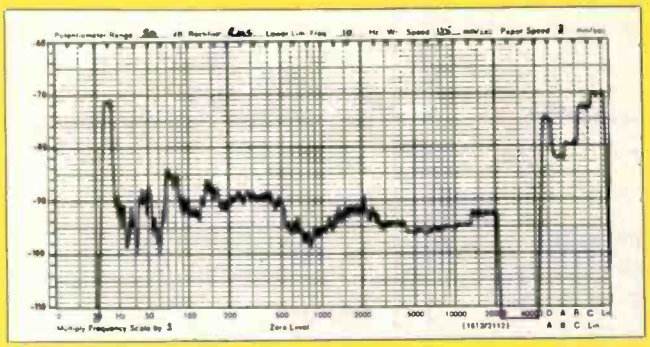
At 6.3kHz					
INPUT LEVEL	+5.0	+2.0	0	-15.0	dB
2nd	-44.3	-44.5	-44.3	-46.9	dB
3rd	-50.2	-52.5	-	-	dB
4th	-51.3	-53.0	-	-	dB
THD	0.75	0.68	0.57	0.45	%

At 100Hz				
INPUT LEVEL	+5.0	0	-15.0	-30.0 dB
2nd	-62.3	-60.8	-60.3	- dB
3rd	-47.6	-51.7	-56.0	-57.2 dB
4th	-77.0	-76.3	-	- dB
5th	-70.7	-	-	- dB
THD	0.42	0.28	0.24	0.16 %

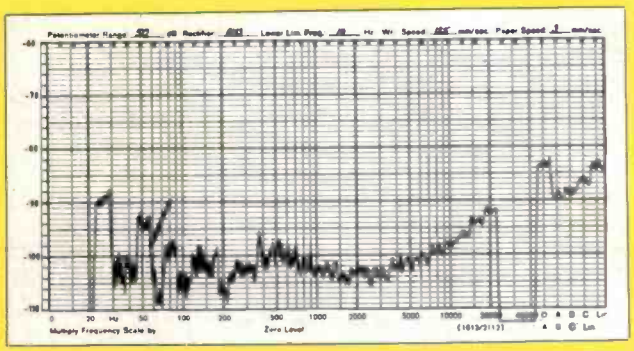
SONY SL-HF 100AS

NATIONAL NV-850-A

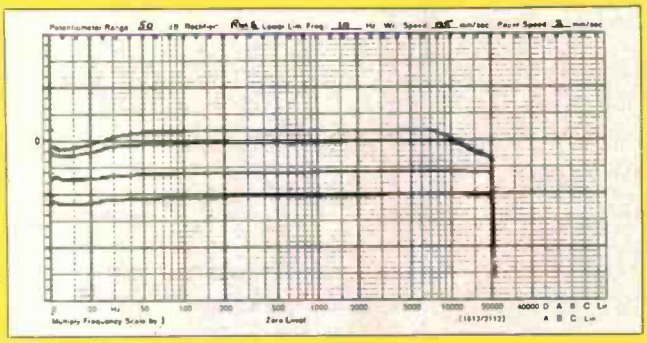
Signal Noise Ratio



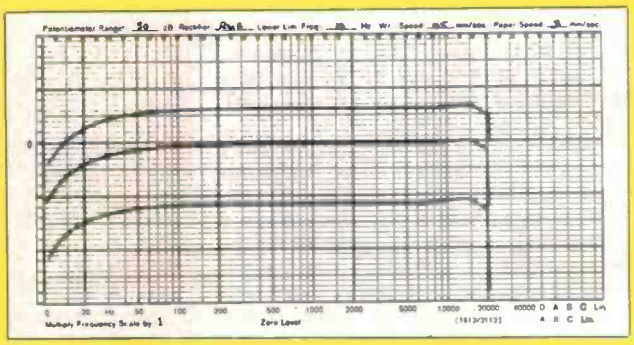
Signal Noise Ratio



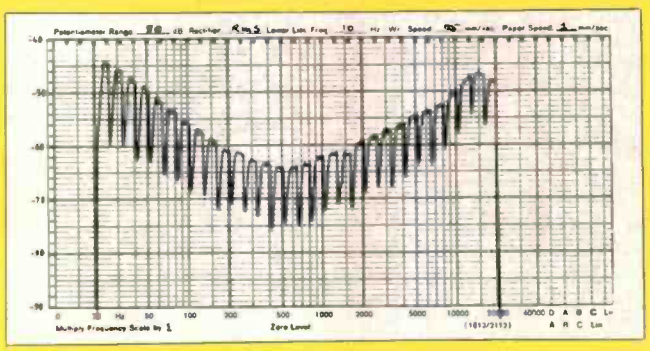
Record Replay



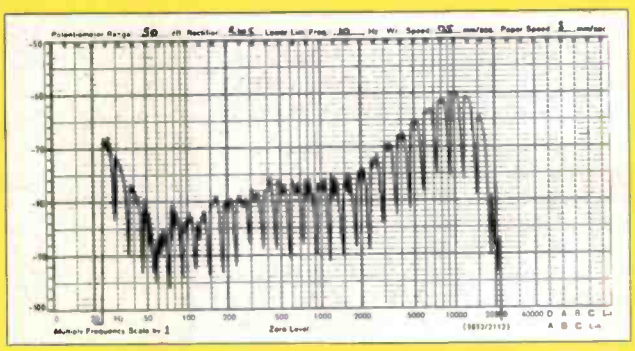
Record Replay



Crosstalk R Into L



Crosstalk R Into L



RSM235 cassette deck, which provides the dbx-type noise compression and expansion required to achieve the 90 dB dynamic range that this recorder features.

The unit is double insulated, and apart from the choice of the laminates in the printed circuit boards and some of the capacitors and resistors, is fabricated to standards that are equal to professional equipment rather than being consumer oriented.

Objectively

The objective assessment of the two video recorders proved to be a much more straightforward task than I would have expected. Ease of usage is an essential requirement of the design philosophy, as the recorders must end up being as easy to use as a conventional cassette recorder if the full potential and prospective market are to be developed.

The test results measured for each of the recorders proved to be particularly exciting for almost every single parameter we evaluated. The first, and probably the most often requested parameter, is the frequency response of each of the units.

In the case of the Sony SL-HF 100AS, this is +0, −1.5 dB from 10 Hz to 20 kHz at all levels from −5 VU down. At higher levels, because the recorder incorporates a high frequency pre-emphasis circuit, the upper frequency linearity is artificially restricted over the 7 kHz to 20 kHz region (see attached level recording). This feature is relatively common in digital and FM-type modulation circuits and is not at all comparable with the tape saturation characteristics which result in the primary limitation affecting the achievement of full frequency bandwidth capabilities over the full dynamic range of ordinary reel-to-reel or cassette recorders.

The National NV850A recorder does not offer the same flat frequency response that the Sony recorder achieves at the bottom end of its frequency response curve, as it introduces what appears to be a deliberate rollover below 50 Hz. As a consequence its frequency response at 0 VU is +0, −3 dB

from 23 Hz to 20 kHz. Both recorders, however, produce exemplary frequency responses between 50 Hz and 15 kHz, with the only significant deviations from a flat frequency response being above and below those frequencies. These two frequency responses should be compared with the measured results on the Sansui PC-X1 PCM modulator (see October ETI), which achieves an even flatter frequency response because of the digital encoding/decoding principles. By contrast, the dynamic range of each of these video recorders just exceeds that achieved by the PC-X1, but admittedly by only 1 dB(A) and 4 dB(A) respectively.

The Sony recorder thus provides a 76 dB unweighted and 87 dB(A) weighted dynamic range, whilst the National provides an 84 dB unweighted and 90 dB(A) weighted dynamic range. The lower figure of unweighted dynamic range produced by the Sony recorder is primarily the penalty of incorporating an extended low frequency response. By contrast, the National recorder has deliberately rolled off the bottom end and thus achieves a marginally higher unweighted dynamic range. Nevertheless, the numerical differences in (A)-weighted dynamic range for the two recorders is almost inconsequential, and with dynamic ranges of 87 and 90 dB(A) respectively the dynamic range performance is to all intents and purposes almost as good as you could expect from the latest compact disc players.

The distortion characteristics of each of the records are interesting, in that at +6 and +5 dB respectively the distortions are reasonably similar, being slightly higher in the Sony recorder than in the National; however, because of the use of the dbx-type expansion circuit in the National recorder, I would have expected these positions to be reversed. The distortion levels at lower recording levels fluctuate in each of the recorders, being generally less than 0.25% and normally being lower than the comparable figures I have measured in either professional reel-to-reel recorders or in various compact cassette players. It is interesting that the distortion at maximum recording level is still remarkably low, and substantially lower than the conventional 3% third harmonic levels that one normally expects in any recorder at either the specified maximum recording level or at the maximum recording level displayed on the highest setting of the recording level meter.

The next set of parameters we evaluated was the direct assessment of the record-to-replay linearity. This has particular significance in any recorder incorporating a compression/expansion or pre-emphasis/de-emphasis facility. This linearity was measured over a 90 dB dynamic range for the Sony recorder and over a 100 dB dynamic range for the National recorder.

As the results show, there is a clearly measurable non-linearity in the replay response of both recorders, which in part accounts for the moderate level of residual distortion which we had previously measured. This distortion is a combination of both FM modulator and demodulator non-linearities, which can never be perfectly matched in such circuits, as well as from the expansion/compression circuits which the National recorder incorporates. The measured degree of non-linearity is, however, more than satisfactory for non-professional applications and most probably quite adequate for many semi-professional applications.

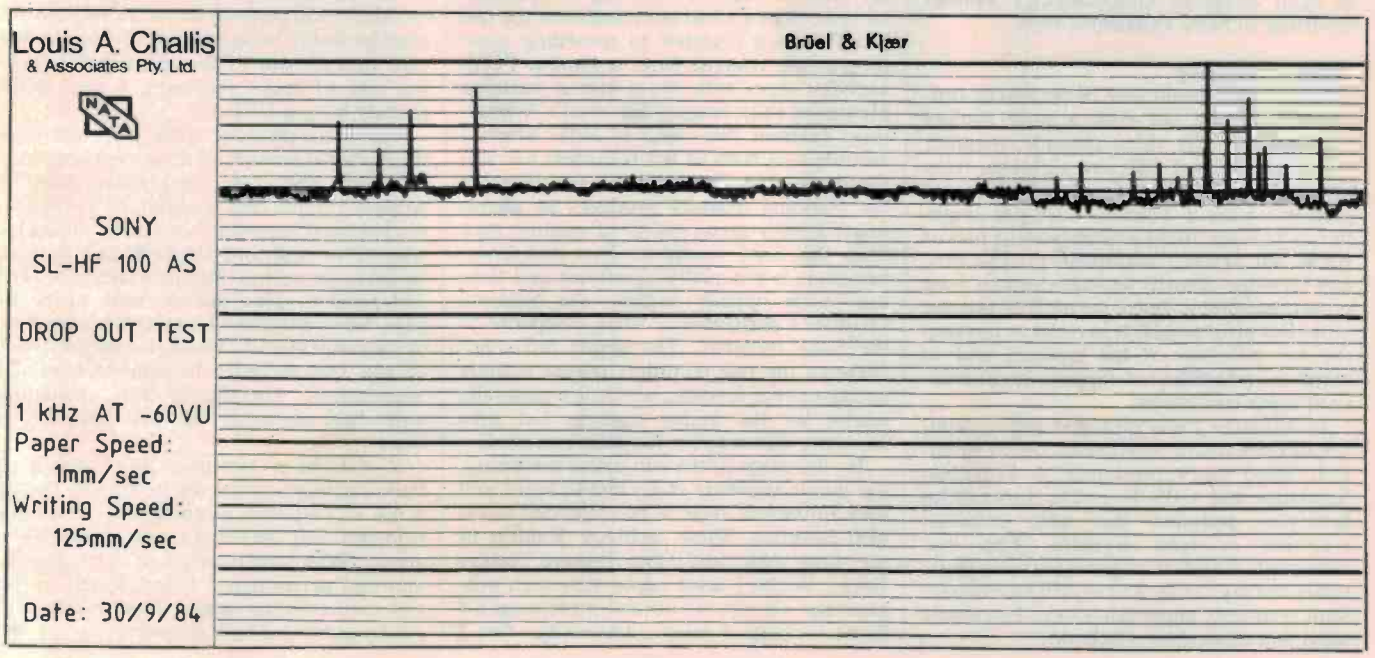
The channel separation achieved in each of the recorders is positively outstanding, with the Sony recorder achieving better than 60 dB at all frequencies and the National better than 45 dB at all frequencies (see attached level recording). Both recorders provide their best channel separation in the critical mid-band region, with the Sony providing better than 75 dB separation and the National better than 65 dB.

The measured wow and flutter of both recorders was not as good as the manufacturer's literature would have us believe, as the levels we measured for both machines were typically 0.1% weighted WRMS. Our measurement procedure was based on feeding a direct sinewave signal into our wow and flutter meter whilst simultaneously observing the same signal on a cathode ray oscilloscope. I also evaluated this signal on our two-channel fast Fourier analyser and got essentially the same answer. If one were to pre-filter the signal one might get a different (lower) figure. Nevertheless, it is clear that the audible signal has substantially the same sort of flutter as one would measure on a high-quality compact cassette recorder and not the sort of flutter figures you would find on a compact disc.

The erasure test of the two recorders provided absolutely spectacular results, with the Sony recorder displaying an erasure ratio of −109 dB. These levels were relative to a +5 VU signal recorded at 1 kHz for both recorders. The achievement of such high erasure ratios is obviously a primary result of the use of very high FM frequencies in the recording process, which are to all intents totally erased during the re-recording process.

Drop-out effects

We carried out one test which few people initially consider and which manufacturers do not refer to in either their detailed specifications or the general literature they produce. This test involved recording a test signal at −60 VU on the recorder and replaying it on a level recorder with an expanded dynamic range of 10 dB in lieu of the conventional 50 dB dynamic range ▶



potentiometer. The results of this test proved to be the opposite of what happens in a conventional compact cassette recorder. In a conventional magnetic tape recorder the tape drop-out gives rise to a loss of recording signal in the form of what can be best described as 'negative-going spikes'.

By contrast, the presence of imperfections on the tape in these VCRs gives rise to a loss of signal being fed from the FM modulator to the tape during the recording process, or alternatively to a loss of signal being fed to the demodulator during the replay process. The net result of such drop-outs is a series of very rapid and very short bursts of noise whose audible level is slightly higher than the recorded signal. These bursts of noise can be observed on a cathode ray oscilloscope, and if you listen very carefully to the sinewave signal you can just detect the infrequent variations in signal level by 'gluing your ear' to the loudspeaker or by wearing high-quality headphones which exclude extraneous noise. In the unlikely event that you don't use a high-quality video tape, you expose yourself to a similar sort of condition that you would create with your video signal as a result of using poor tape or in the presence of dirty or worn tape heads. By replaying the same sections of the tape again I was able to confirm that the drop-out phenomenon is primarily a function of the quality of the recording tape and its specific characteristics during the recording process, rather than being a function of the replay process.

Both recorders exhibited similar characteristics, though they were obviously not exactly the same, and as the tapes (and the formats) were different we decided it was unwise to draw final conclusions as to the relative merits of the two recorders in terms of their drop-out characteristics without resorting to more exhaustive tests.

Subjectively

The subjective evaluation of the two recorders was carried out with a Sony Profeel Model KX-27PS1 video monitor, together with a number of different elements from my existing home hi-fi system. The primary elements were a Yamaha C2A pre-amplifier, a Yamaha 101M amplifier and a pair of B&W 801 Series 2 loudspeakers. The Profeel monitor actually incorporates its own power amplifiers, but I decided to use the more powerful amplifier in order to develop the full potential of the medium and to avoid the possibility of clipping under transient input conditions.

Fortunately I was provided with a number of outstanding new pre-recorded stereo hi-fi video tapes produced by Polygram Spectrum and CBS Fox. The tapes from Spectrum included the same material recorded in both formats. This was extremely useful as it provided an opportunity for my family and myself to evaluate both recorders under what were essentially ideal and equivalent conditions.

The scope of the audible review was undoubtedly improved as a result of the quality of the video picture produced by the Profeel monitor. This particular colour monitor is an outstanding piece of engineering, as it provides an extremely good, stable, sharp and linear picture quality. This obviously enhanced the excellent quality of the pre-recorded video tapes. Since it is the quality of the audio content that is the subject of this review, I found I had to close my eyes to avoid being ensnared by the visual content, which is an unquestionably overpowering factor in the latest hi-fi video cassettes. The presence of the picture coupled with superlative soundtracks made my reviewing task one of the most pleasant I can recall over the last sixteen years.

The most outstanding of these tapes were two (Beta and VHS) tapes in which Luciano Pavarotti was recorded in a Royal Command Concert with the Royal Philharmonic Orchestra in London for Her Majesty the Queen Mother in 1983. No other pre-recorded tape has ever impressed me quite as much as these tapes did in terms of audible quality, signal-to-noise ratio, low distortion and impeccable stereo imaging.

I compared the same tape on both the Sony and National recorders and had great difficulty in picking any significant difference in either the picture quality or the audio quality between the two recorders. I listened carefully for 'panting' and the audible effects which the dbx system is sometimes prone to produce. As hard as I listened I could not detect this effect on the pre-recorded material. The reasons for this most probably relate to the type of microphones used and the relatively great distances at which these were located with respect to Pavarotti.

In the case of the Roxy Music (CBS Fox 790-585-2 VHS) and Elton John's Video Singles (CBS Fox 791-564-2 VHS) tapes, I could readily detect panting and close modulation effects, but regrettably did not have the comparable Beta tape for direct comparison. The conclusions I could draw are thus no closer to resolving that particular issue than if I had not conducted the test at all! I then resorted to recording some programme content from a Denon PCM-encoded disc, with the German baritone Hermann Prey singing Schubert's Winterreise (Denon No. 38C 7-7240), which I recorded on both of the recorders for subsequent replay. On replay this revealed that the National recorder produces an *almost imperceptibly greater* level of panting than does the Sony recorder. This difference, however, is not really significant and does not in my opinion degrade the National recorder's performance when compared to the Sony recorder. The major difference between the two recorders relates entirely to ergonomic feaures, which are generally similar for the major controls but substantially different for the minor controls.

By this stage of the subjective reviewing, the junior members of my familly were well into a different class of pre-recorded video hi-fi cassettes. These included 'Raiders of the Lost Ark' and 'The Empire Strikes Back'. Whilst I must admit that such programmes are not my normal preference for home viewing, I must acknowledge that I was soon just as enthralled as my younger son and was inexorably drawn into the plot through the feeling of a total environment sensation created by the superlative sound and the equally superlative picture.

Those of you who may recall my comments about stereo TV may well wonder whether I consider that Beta or VHS stereo hi-fi suffers from the limitations of sound dispersion and the artificiality which I criticised in my review of the stereo TVs (see ETI September '84). The audible content of the opening sequence of 'Raiders of the Lost Ark' is a wonderful example of precise stereo imaging which almost *completely dispelled* my fears concerning the lateral dispersion of high-quality sound from widely spaced speakers with a picture which is substantially smaller than the sound field.

I did not observe any trace of audible smear, nor a sensation of a disproportionate audible field relative to the size of the picture. With a very small TV set (with a diagonal size of 400 mm) this problem was more evident, although not quite as marked as it was on the stereo TV set with normal station-transmitted programmes.

My overall impression of both the Sony and National stereo VCRs is that they have achieved a degree of functional quality and excellence which has to be admired and acknowledged. For the modest cost of approximately $1150 you can purchase the Sony video recorder, or for about $1300 the National recorder. With such a recorder you can record and replay ordinary video cassettes, pre-recorded hi-fi video cassettes, record high-quality simulcast video programmes and, last but not least, record and replay quality stereo audio tapes. These can produce a genuine 20 Hz to 20 kHz bandwidth. The hi-fi pre-recorded versions of these tapes or those that you produce yourself will have a dynamic range that will not really be bettered by either the present generation or probably the next generation of digital recorders. Even the present generation of professional digital recorders doesn't provide a substantially better performance. With that sort of capability and a recommended retail price of under $1300 you will most probably be as tempted as I am to discard your present VCR or contemplate buying one of these recorders if you don't already have a VCR.

The Sony recorder costs $150 less than the National recorder and as a consequence probably offers the best value from a straight capital cost standpoint. However, the National recorder, because of the inclusion of its still and stepped slow motion facilities as well as the associated forward and reverse video cueing, may prove to have more attractive features for a number of potential buyers. These people may wish to use this recorder in semi-professional applications, specifically for examining individual segments of their own video films.

A definitive statement as to which of these recorders offers the best performance is not an easy one, as each offers slight advantages over the other in one or more key areas. With such excellent and closely matched performance I find myself in the awkward position where *I must unreservedly recommend both recorders.* ●

Amplifiers

TD300 $510.00
Slave Amp (150 watts per channel into 16 ohms) with stereo to mono switching.

ZPE SERIES II $1300.00
500 Mosfet Output Stages 250W into 8 ohms

Disco Mixers

CITRONIC SM 330 $695.00
6 Channel Input (2 Mikes + 4 aux)

ARISTA $330.00
6 Channel Input with Equalization.

Lamps

DX100-ES, 240v, 100w $3.75
Discolux (soft glass) E.S. assorted Colours Box of 25 – $75.00

DX60-ES, 240v, 60w $3.00
Discolux (soft glass) E.S., assorted Colours Box of 25 – $65.90

G40BC, 240v, 40w $0.88
BC Lamps in Blue, Yellow, Orange, Red, Green, Box of 100 – $70.50

G25BC, 240v, 25w $0.78
Box of 100 – $62.50

Turntable

CDC 8003 $225.00
Direct Drive with Pitch Control

BONUS!
One FREE TDK 180 Video Tape

Jumbo Strobe

FLA 701 $153.48
White Flash Jumbo Strobe with Speed Control.

Helicopter

A GE 4515 lamp in housing can be swivelled and directed up or down spinning 360° in the one place.

RPS 102 2 ARM SPINNER $198.00
RPS 104 4 ARM SPINNER $289.00
RPS 108 8 ARM SPINNER $497.89
UFO 324 UFO LIGHT (24xGE 4515) $1698.55

Scanner

S101 $99.45
Search Lighting effect

Scanner Bar

S104S $342.86
Light bar housing four GE 4515 lamps scanning with individual motors.

All housing complete with front cover and with provision for colour gel.

Micro phones

129B 12" Flexible Chrome Arm, goose-neck $21.55

186C Chrome Base Mount $19.74

518C Soundmaster Mikes $89.75

UD312 Primo Mike $96.95

102 Mike Stand, Adjustable $93.80

HL43U Flexible Arm Mike Holder – $6.99

SMOKE MACHINE, (Great for Special Effects!) $328.00

Pinspot

PS 112S (Par 36 can) $48.94
(6v, 30w) Designed specifically for Mirror Ball Spotting. Used widely to achieve a bullet beam effect.

BONUS OFFER:
Buy 10, Get One FREE!

PS 112L (Par 46 can) $58.99

Halogen Beacons

WL 104 – $132.59
Warning lights are available in different colours.

Sun Light

A Rotating Cylinder having slits of different colours and giving a rainbow lighting effect.
Has one 500 watt lamp within.

SUN 111A $194.75
Horizontal Mount

SUN 111B $194.75
Vertical Mount

Rope Lights

FOR BANDS DISCOS & CLUBS

PRL 803 7 Metre Rope Light in a Red or Blue or Green or Yellow Tube.
$109.77 each colour

MULTI COLOURED:
7 Metre Rope Light, White reinforced spiral tube; Tred-proof.
SRL 801 – $115.88
RLC-405 – $86.59
Rope Controller

Border Lights

BL104 – $163.70
Gel Filter Frame $8.00
Mount Bkts $5.60

Disco World pty. ltd.

Reg. Office:
10 Deschamps Street
Lilydale, Melb., Vic. 3140
Postal Address:
P.O. Box 509, Lilydale, Melbourne
Victoria 3140
Telephone: (03) 735 0588

Mirror Balls

MB 005, 5" $13.82
MB 008, 8" $37.20
MB 012, 12" $64.58
MB 014, 14" $93.54
MB 018, 18" $125.34
MB 020, 20" $153.79
MB 012C Mirror Cylinder (12" length) 6" Dia. – $43.18
MB 008H Half Mirror Ball & Motor, 8" – $54.11
MB 012H Half Ball & Motor, 12" – $76.11

MIRROR BALL MOTORS:
D.C. 1.5v Motor – $9.95
A.C. 240v – $29.99

Cosmos Light

Mirror Ball housing 24 x GE 4515 lamps with provision for colour gel spinning in two planes (vertical and horizontal)
CLG 324 – $1980.68

DOUBLE COSMOS:
Two Mirror Balls in each housing, 12 x GE 4515 lamps.
DCL 212 $2452.37

HALF BALL ROTARY LIGHT:
14" Dia. housing 6 x GE4515 lamps, Provision for Colour gel.
HLG 06 $357.28

Rolling Light

Metal framed housing rotating 360° in two planes, all with provision for colour gel.
RL 108, 8 x GE 4515 lamps $958.95
RL 124, 24 x GE 4515 lamps (Horizontal) $1985.45
RL 224 24 x GE 4515 lamps (Vertical) $1985.45

Special Disco Package

1 X SM 330 CITRONIC MIXER	$ 695.00
2 X CDC8003 TURNTABLES	$ 450.00
1 X 518C COUNDMASTER MIKE	$ 89.75
YOU PAY ONLY	$1234.75

and get FREE

1 X PRL 803 ROPE LIGHT	$ 109.77
1 X RLC 405 R/L CONTROLLER	$ 86.59
FREE VALUE OF	$ 196.36

Audio & Video Tapes

TDK D60 Audio Tapes	per nine $18.00
TDK D90 Audio Tapes	per nine $24.00
TOK 180 Video Tapes	each $14.20

PLEASE NOTE: *Some installation items do not include power cords.*
ALL PRICES ARE INCLUSIVE OF SALES TAX.

MAIL ORDERS:

ADD PACKING & POSTAGE (P&P) PAYMENT WITH ORDERS:

$5.00	$ 0 – $ 49.99	$10.00	$150 – $250.00
$6.00	$50 – $ 99.99	$17.00	$251 and more
$8.00	$100 – $149.99		

DELIVERY INSTRUCTIONS:

- STANDARD MAIL AS PER P & P.
- REGISTERED MAIL – EXTRA $4.00.
- ROAD FREIGHT – FLAT $17.00 Australia Wide.
- FREIGHT INSURANCE – Extra $1 Per $100 Value.

BE ADDED TO OUR MAILING LIST FOR FUTURE SPECIALS TOO HOT TO PRINT HERE BY SENDING S.A.E. TO US.

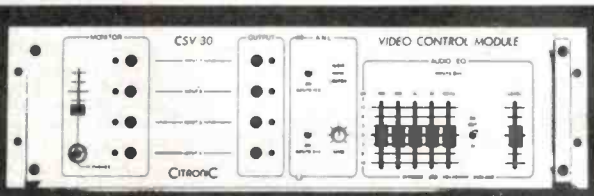
NEWTRON ELECTRONIC SOUND REINFORCEMENTS

Electronic and audio requirements — sales/production and service
Suite 4A 123 Old Cleveland Road, Capalaba, Qld 4157
Telephone: (07) 390-3686 — Telex: AA41043

TAMAR MICRO DISCO CONSOLE

Direct Drive Quartz Lock
Switchable Variable Speed
Control/Low Acoustic Feed
at **$2395**
MATRA MONO **$1595**
MATRA STEREO **$1845**
CONSOLES

GRAPHIC EQUALISERS BY SUPLEX
Mono 31 Band **$399**
Stereo 10 Band **$298**
Stereo 15 Band **$449**



CSV30 VIDEO CONTROL MODULE $1275

- ★ Integrates Audio and Video
- ★ Pre-view Facility
- ★ Noise reduction system
- ★ EQ on VCR Audio Channels
- ★ Pre-set Input Gains
- ★ Push Button Channel Selection

SUPLEX MX3000 AUDIO DISCO MIXER + EQ $475

DISCO & PA SPEAKER CABINETS
with Professional Loudspeaker Components

Cat 200

Personal computer system **$1800**
Compatible to CP/M[tm], Applesoft[tm], and Pascal[tm] based software packages.
64K Dynamic Ram, dual disk drive expands to 192K.

$2498 each — ***RENKUS-HEINZ BI CABINETS***

NEW

1000WT PER CABINET
THESE ARE INDESTRUCTIBLE
+ PROCESSOR
MONO 1690
STEREO 2190
2 x 15" RH 400WT EACH
SSD 3301 RH HORN

NASHUA GAFF ®
50 METER ROLLS **$7.25**

THINKING OF MAKING YOUR OWN PROFESSIONAL *SPEAKER CABINETS*
WITH EACH PAIR OF SPEAKER COMPONENTS PURCHASE FREE PROFESSIONALLY PORTED CABINET DESIGN PLANS

JBL

	$
E110 — 8Ω — 10"	298
E120 — 8Ω — 12"	369
E140 — 8Ω — 15"	389
2220H — J — 15"	428
2225H — J — 15"	428
2441 2" Throat	1178
2445 2" Throat	868
AND OTHERS	

RENKUS-HEINZ

	$
SFD 1400	360
SFD 1800	305
SFD 3300	684
SFH 820	189
SFH 800	189
SFH 500	285
AND OTHERS	

RCF

	$
P200Bass 15"	320.16
541 Mid 15"	249.48
544 Mid 12"	221.76
N580 Drive 60 watt	203.74
H3709 Horn Flare	50.40
AND OTHERS	

FLIGHT CASES
CUSTOM MADE TO YOUR NEEDS FROM $79

MAIL ORDERS + INSTALLATIONS + OTHER INFO

CREDIT CARDS
Bankcard, M/card, AGC Credit Line

CLUB INSTALLATIONS
Excellent service through Australia

INSTALLERS
Write to us for attractive trade terms

MAIL ORDER (AUST)
Add Packing & Post (p&p) as follows (Aust. only) MINIMUM MAIL ORDER $25

Goods $25.$49 ..... p&p $3.50
Goods $50-$99 ..... p&p $5.00
Goods $100-$149 ..... p&p $7.50
Goods $150-$199 ..... p&p $10.00

Goods $200 + add 5% to order value or otherwise by individual quotation

Send to:
Newtron Electronics
123 Old Cleveland Road,
Capalaba. Qld. 4157

The third hand

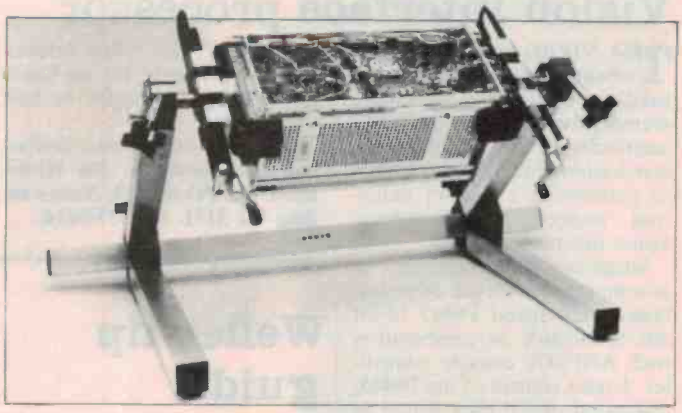
Scope — Panavise has released two models of a new chassis holder for the assembly and maintenance of chassis up to 450 mm wide. It pivots horizontally with friction brake and positive lock detent.

Both models are portable, (6 kg) capable of accepting up to 50 kg chassis with pivot centre height of 225 mm from bench top. One model (602) has twin self-centring clamps opening to 225 mm. The other model (601) has scissor clamps with swivel jaws to accept odd-shaped chassis.

For safety a positive lock detent is visible while rotating the chassis, with a visual indicator showing when the safety latch is engaged.

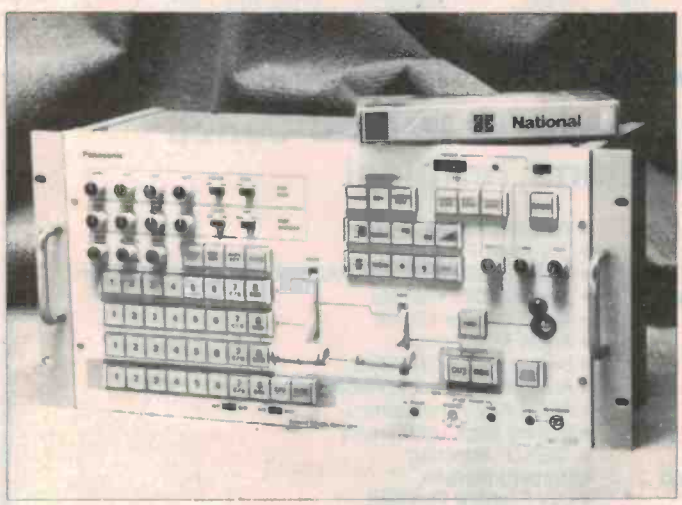
An all-metal friction brake on each bearing is also fitted.

For further details contact **Ian Pittman, Scope Laboratories, 3 Walton St, Airport West 3043. (03)338-1566.**



Video special effects generator

A new colour special effects generator has been released by GEC's Video Systems Division.



Special effects. The new WJ-5600 from GEC.

A professional industrial standard unit, the multi-functional National WJ-5600 is said to be suitable for use by educational institutions, production houses and business in-house production studios — indeed anyone engaged in colour program production or video software creation.

The WJ-5600 offers eight inputs and two built-in mixing amplifiers for all channel mixing in the fade-in/fade-out and dissolve modes.

Nine wipe patterns are available in the special effects generator, with switchover in three directions — normal, normal reverse and reverse. All wipe waveforms can be edge adjusted in three stages — soft, sharp and colour border.

It also features edge modulation on wipes with frequency and amplitude adjustable.

The colour for both border wipe and matt key is controlled by one colour generator with a separate generator for downstream keying. Both generators can be independently adjusted for hue, saturation and luminance. There is a negative/positive switch for the Matt Key function, and a built-in sync pulse generator.

To allow use in the studio or in mobile video units, the WJ-5600 can be ac or 12 Vdc powered.

For more information contact **GEC Australia Limited, Video Systems Division, PO Box 563, Crows Nest 2065. (02)887-6222.**

ESD simulator

A fully-modular ESD (Electrostatic Discharge) simulator group has been introduced by KeyTek Instrument Corp of the US to meet IEC, EIA, MIL and other standards.

The new simulators, called the Series 2000, allow the user to define test configurations based on both his own and industry standards.

The Series 2000 can mimic discharge networks for human body simulation or tips to simulate tools or a human finger. Current injectors provide repeatable waveforms for diagnostic tests. Modules and accessories are available for separate simulations of the effects of pre-discharge corona as well as electric and magnetic fields.

For further information, contact **The Dindima Group, P.O. Box 106, Vermont Vic 3133. (03)873-4455.**

Voice synthesised alarm autodialler

Email's Relay Division has released a radical new automatic dialling alarm unit called 'Minidial', featuring microprocessor control and synthesised voice reporting.

The use of microprocessor generated synthetic voice gives two major advantages: the elimination of the traditional tape mechanism with its inherent reliability problems, and the ability to report accurately analogue values.

When used as a stand-alone alarm dialler Minidial transmits a vocal alarm status and analogue level report in response to alarm conditions. It also responds to interrogation calls with a complete status report.

Minidial can also be used with a companion Minitran telemetry system for transmission of digital data and control information over the switched telephone network.

Front panel facilities include telephone number entry, adjustment of analogue alarm set points and comprehensive test and report functions. Information is displayed locally using the same synthesised voice output.

Minidial holds Telecom Permit No. C84/3/74.

For more information contact **Email, PO Box 160, Oakleigh Vic 3166. (03)544-8244.**

Vision interface processor

The VIP100 is a video processing card which can be used as a simple frame-grabbing memory for camera to computer interfacing or as a sophisticated stand-alone processor, capable of performing a host of industrial inspection and robotic vision functions.

Single-board processing is accomplished with use of an on-board high speed F9445 16-bit microprocessor in combination with ANF9470 console controller. Under control of the F9445, converted digital data stored in the resident memory may be acquired through either the multibus, a 16-bit parallel port or either of two RS-232C ports.

The VIP100 accepts either standard RS170 or non-standard video. Input analog data is converted into binary (black/white) formats by comparison to two programmed DAC voltages. Binary video signals are exclusive ORed and packed on a pixel-by-pixel basis into 16-bit words for storage by the F9445. Once in memory, the video information is available for on-board processing, or transfer to host processor.

For more information contact **Fairchild Australia, 366 Whitehorse Rd, PO Box 19, Nunawadding Vic 3131. (03)877-5444.**

Weller tip guide

An illustrated colour poster of Weller soldering and desoldering tips has been released by Cooper Tools, Albury, manufacturers of Weller soldering equipment.

The poster features by number, temperature and range all Weller Tips available for the WTCPN, EC2000D and WMCP-EC temperature controlled soldering stations and the W60D line-voltage temperature controlled soldering iron. Desoldering tiplets for the Weller DS100 and DS50 are highlighted and include Weller desoldering accessories for the TC201 and W60D irons.

The poster complements Weller tip display boards now on view at Weller electronic distributors.

For a complimentary copy of the Weller tip display poster, contact **The Cooper Tool Group, P.O. Box 366, Albury, NSW 2640. (060)21-5511.**

Free. The poster from Weller Irons.

VICOM Australia brings you the new Tono Series 5000E Communications Terminal

- AMTOR Feature
- Low-rate Spurious Radiation
- Built-in Time Clock
- Timer Transmission/Receiving Feature
- Selcall System
- Built-In Demodulator
- Pre-load Function
- "RUB-OUT" Function
- Automatic CR/LF
- WORD MODE Operation
- LINE MODE Operation
- WORD-WRAP-AROUND Operation
- Automatic Idle Insertion
- "ECHO" Function
- Cursor Control Function
- Test Message Function
- CW Ident Function
- MARK-AND-BREAK (SPACE-AND-BREAK) System
- Variable CW Weights
- Audio Monitor Circuit
- AFSK Modulator
- Built-in CW, FSK Keyer
- Automatic Transmit/Receive Switch
- ASCII Key Arrangement
- Battery Back-up Memory
- "SEND" Function
- Printer Interface
- CW Practice Function
- CW Random Generator
- Bargraph LED Meter for Tuning
- AC/DC Power Supplies
- VICOM AND TONO . . . BRING YOU TOTAL DIGITAL CONTROL WITH THE STATE-OF-THE-ART SERIES 5000E COMMUNICATIONS TERMINAL.

PLACE YOUR ORDERS NOW — STOCK DUE IN NOVEMBER AND WILL NOT LAST AT OUR PRICES!

VIC.
Vicom Australia Pty. Ltd.
P.O. Box 366, South Melbourne 3205
Telephone: 62 6931. Telex AA36935

N.S.W.
Vicom Australia Pty. Ltd.
118 Alfred Street, Milsons Point 2061
Telephone; 957 2766. Telex AA70619

Grattons

Professional Lighting & Sound

The Specialists

Focal 1 Lighting Desk SOLE NSW AGENTS

• Modular manual desk with A + B mastering on 2 presets • Available in any configuration: 12-60 channels. Use larger frame than you need, to enable expansion • Best feeling flash buttons available • Selectable control voltage — will drive most available dimmer racks • Desks can be linked.

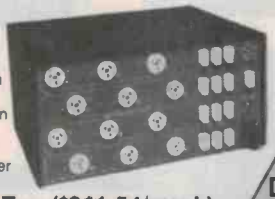
24 Ch. frame with 12 Ch. fitted $1380 (*$8.98/week)

12 ch. $1162.80 (*7.69/week)

36 Ch. frame with 24 Ch. fitted $2170 (*14.10/week)

Series A Dimmer Rack

• 12 x 2400 Watts • Control voltage polarity — Auto select • Can be driven by most available control desks • Open internal construction — allows rapid access for trimming — Much easier than pull-apart modular type racks. • Standard cannon connection • Unique "matching" circuit — will align desk fader position to actual output • High noise supression.



$1774.80 Inc. Tax (*$11.54/week)

Soundcraft AUTHORISED DEALER

16 Channel: **$4800 *(26/week)**

200 Series Desks The Market Leader!

24 Channel: Rec. Retail: $5990 ASK FOR OUR SUPER PRICE!!! *(32/week)

• 4 Subgroups & Stereo output
• 100 mm Faders — Soft feel
• 4 band Soundcraft equalisation
• 4 auxilliary busses
• Outboard power supply

AHB Allen & Heath Authorised Dealer

NEW! 186-18 into 6 Foldback Desk **$4890 RRP inc. tax. (*31/week)**

• Full PFL Insert patching • Outboard power supply
• Complete in roadcase • Sweep Mid EQ
• 100 mm Master Faders

12-2 Desk with Roadcase $2390 (*15/wk)
16-2 Desk with Roadcase $2650 (*17.30/wk)
• 100 mm Soft glide faders • Sweep Mid EQ
• 3 auxilliary busses • Insert points all channels

NO GIMMICKS — JUST LOW PRICES
ASK THE MIC EXPERTS!

SHURE	EV	BEYER	SENNHEISER
SM57 (PE66) $249	PL-88 $118	M69 $139	MD421 $249
SM58 (PE86) $294	PL-9 $199	M600 $239	MD441-V3 $349
PE.15 — Vocal $147	PL9.1A $199	M201 $159	MD431 $239
PE.9 — Instrum. $144	PL-80 $249	M88 $249	MD427 $139

MANY OTHER TYPES AVAILABLE
TRIUS Active D1 Units $110 each
Mic. Stands — Round heavybase $33 ea.
— Complete boom stand $39 ea.
— Shure-type Mic. clips $2.50 ea.

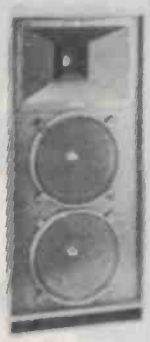
rh RENKUS-HEINZ "SMART SYSTEM"

$2485 ea. inc. Tax

NOW — Microprocessor electronics allow huge output and studio monitor sound quality from very compact enclosures.
The secret behind its amazing speaker cabinet performance is the new RENKUS HEINZ "Smart System" utilising an active crossover processor.
The X1 (Mono) and X2 (Stereo) processor actually monitors speaker and horn functions providing flat frequency response and correcting action at extreme high levels.

"SMART" X1 Processor Mono — $1690 ea. Inc. Tax
"SMART" — X2 Processor Stereo — $2185 ea. Inc. Tax

"SMART" B1: 134 dB continuous 140 dB peak. Complete with 3 flying points top & bottom. EP-8 cannon & safety rigging point. Also available "SMART" B2: 1 x 15" horn $1850 ea. inc. Tax.



ZPE MOSFET POWER AMPS

ZPE 500: 350 Watts per channel into 4 ohms, internal fan **$960**
ZPE 600: 450 Watts per channel into 4 ohms, Internal fan, LED display **$1482**
ZPE 1000: 800 Watts per channel into 4 ohms, internal fan, LED display **$1873**

VESTA-FIRE PROFESSIONAL SOUND EQUIPMENT FROM JAPAN

DUAL COMPRESSOR LIMITER **$599**

• Stereo or dual compressor/Limiter
• Balanced Unbalanced operation
• Variable Attack & Release times
• Suit Insert Effect or System Limit

DUAL FLANGER CHORUS **$589**

• Stereo flanging/chorusing/doubling
• Dual or Stereo operation

EFFECTS LIGHTING

DYNALITE $350
Audio 4 Chaser
• Sound to light
• Multi-chase functions

ALFA 43 $207
• 3-4 Channel Multifunction chaser

OPTIKINETICS $599
White Lightning!!! Brightest Strobe ever!

MODULAR EFFECTS SYSTEM

• MLM-1 Limiter module $171
• MPE-1 Parametric EQ Module $216

Also available: MNT-1 Noise gate module $189
Rack frame to accept 8 modules complete w. power supply $279

SPECIAL! Rack complete — 6 gates/2 Limiters
~~$1755~~ **$1499 (*9.62/week)**

MUCH MORE AVAILABLE!

ROSCO GEL
LEE FILTERS
NEUTRIX
CANNONS
NASHUA GAFF
PHILIPS LAMPS
PAR 64 LAMPS
TOOLS
RIGGING
ROAD CASES
PENN CATCHES
CABLES
HARDWARE
FOG JUICE
SPARES

EX WAZA'S

ALFA PAR CANS

ALFA "BEAMLIGHT" PAR 64 ALLOY CAN $115 (lamp extra)

This is the alloy can that produces a visible **RAY** of **LIGHT** The optics of the ALFA Beamlight are superior to other types available.

ALFA Alloy Par 64 Can $76 (lamp extra)
ALFA Alloy Par 56 Can $57 (lamp extra)

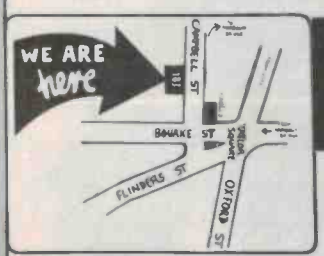
STRAND Leaders in Stage lighting

MINIM 23 — 500W Profile spot with shutters $225 c/w lamp.

PRELUDE 16/30 650W Profile spot with shutters & lamp $352.80

MINIM F — 500W Fresnel c/w lamp **$154.80**

ALL LAMP TYPES AVAILABLE FROM GRAFTONS!



Grattons

Professional Lighting & Sound *The Specialists*

183 CAMPBELL ST., EAST SYDNEY 2010

PH: (02) 331-6888

VISIT OUR SHOWROOM NOW FOR DEMOS, TRIALS & INFO!

MON.-FRI.: 9 a.m.-6 p.m.
SAT.: 10 a.m.-2 p.m.

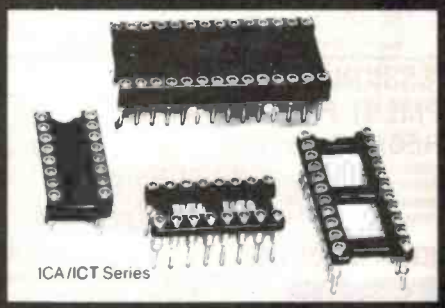
bankcard welcome here

★ NO DEPOSIT REQUIRED!
★ TERMS SHOWN OVER 36 MONTHS MINIMUM REPAYMENT T.A.P. THROUGH BFC. BENCHARGE. FIGURES ARE GUIDE ONLY — INTEREST ADDED TO MONTHLY BALANCE. ASK FOR DETAILS.

DEALER ENQUIRIES WELCOME

EQUIPMENT HIRE A SPECIALTY — SEE US FIRST!

ACE ELECTRONICS SUPER SOCKETS -off-the-shelf, priced right!



Robinson Nugent

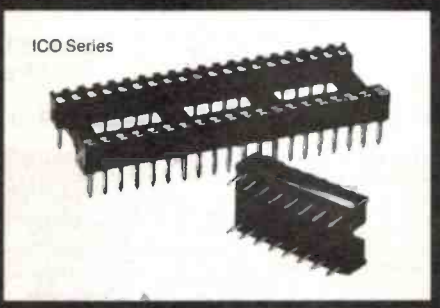
Production SUPER SOCKETS

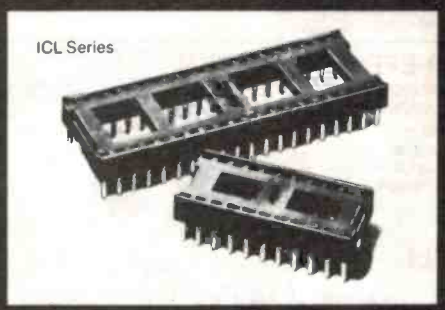
Precision Screw Machine Sockets - ICA/ICT Series Provide maximum reliability and high retention. Options for lowest profile in industry (.122") or lowest insertion force (5oz.). ICA Series, 6 to 64 contacts. Open body ICT Series, 6 to 42 contacts.

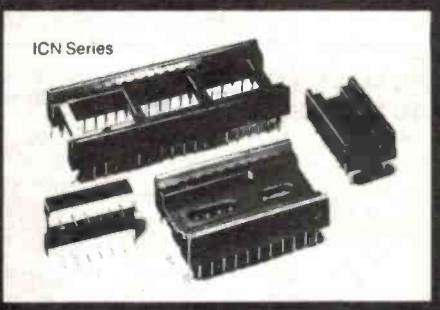
Flux Fighter Sockets - ICO Series Low cost dual contact socket blocks flux entry for less than a penny per pin. Closed at bottom to inhibit flux or solder entry. Open at top for automatic insertion. 6 to 64 contacts.

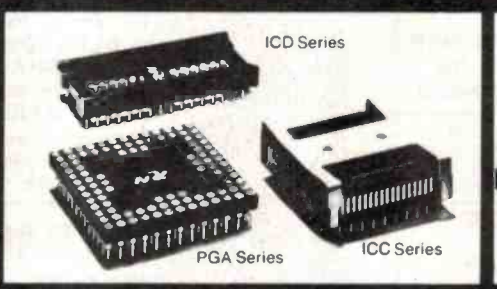
Low Profile Sockets - ICL Series For high volume application where low prices and low profile is required. Easy insertion, high retention force. Anti-over stress contacts. 8 to 40 contacts.

General Purpose Sockets - ICN Series Reliable RN dual leaf side-wipe contacts. Popular for applications where 100 or more in/out cycles are needed. Broadest range of pin counts for 6 to 64 contacts.









RN Burn-in/Test SUPER SOCKETS

DIP Sockets - New TST Series For higher board density. Low insertion force, long life. Hi-temp option available (220° C). 8 to 40 contacts.

Leadless Chip Carrier Sockets - LCS Series For burn-in and testing of IC's in leadless chip carriers. Zero insertion force protects IC's from damage. Available in 31 styles including 8 JEDEC styles. 16 to 84 contacts.

TO-Pattern Sockets - For popular TO-3, TO-8, TO-66, TO-5, and Flat Pak devices.

RN High Density SUPER SOCKETS

Leadless Chip Carrier - ICC Series Accepts JEDEC "A" thru "D" chip carriers .050" to .080" thick. Heat sink in lid. High normal force contact.

Pin Grid Sockets - PGA Series Reliable 4 finger BeCu contact, low insertion force. Molded plastic or G-10 body. Can be customized for 64-172 contacts.

"Shrink" Sockets - ICD Series For DIP IC's with .050" or .070" lead-to-lead spacing. Gas-tight contacts, anti-overstress design. For Burn-in or Production.

RN Special SUPER SOCKETS

Test Sockets - Designed for high insertion/withdrawal cycles for TO Pattern devices. Small signal thur power devices and high frequency. Special chassis mounts available.

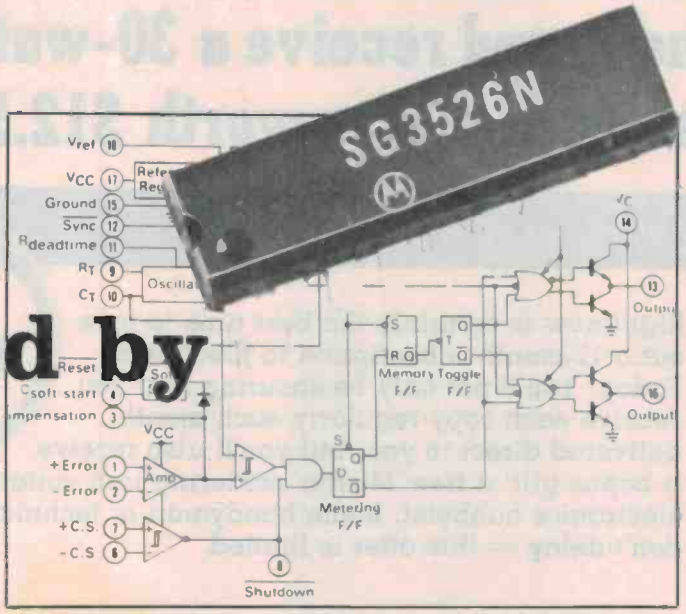
Strip Sockets - SBA Series Precision screw machine contacts for maximum reliability. 64-pin strips notched for snapping to desired length. **SB Series,** general purpose, solder and wrap/pin design. **SBO Series** mates with .025" square header pin.

We are your complete source for RN SUPER SOCKETS...

ACE ELECTRONICS PTY. LTD.
69-75 Reservoir Street, Surry Hills, NSW 2010,
Sydney Australia
Telephone (02) 211 1144 Telex AA75160 ACESYD

AN ALL AUSTRALIAN COMPANY (Inc. in N.S.W.)

Switchmode controller second-sourced by Motorola



Motorola has introduced the second-source on an industry-standard pulse-width modulator (PWM) control circuit family for application in switching regulator power supply systems.

Known as the SG3526 series, the ICs are claimed to provide improved performance and to reduce external parts through inclusion on-chip of all the functional elements necessary for control of a switchmode regulator circuit.

The series includes a ±2% 5 Vdc reference capable of sourcing up to 20 mA. A sawtooth oscillator operates at up to 400 kHz and can be externally synchronised. An error amplifier and current limit comparator are provided for voltage regulation and digital (cycle-by-cycle) current limiting.

The internal logic circuitry safeguards against 'double-pulsing' of the outputs and includes under-voltage lockout with hysteresis. A reset pin indicates the under-voltage lockout state during power supply cycling or interruptions. Other control features include a shutdown pin and programmable soft-start and dead-time pins.

Dual totem-pole outputs permit push-pull or single-ended operation, and provide sink and source output drive current up to ±200 mA. Motorola claim. This feature permits direct drive of TMOS power FETs and transformers without additional circuitry in many applications, they say.

Motorola will offer the SG3526 specified over a junction temperature range of 0° C to +125° C and packaged in 18-pin plastic and ceramic dual-in-line.

Further details from **Motorola, 250 Pacific Highway, Crows Nest 2065 NSW. (02)438-1955.**

Buzzer controller

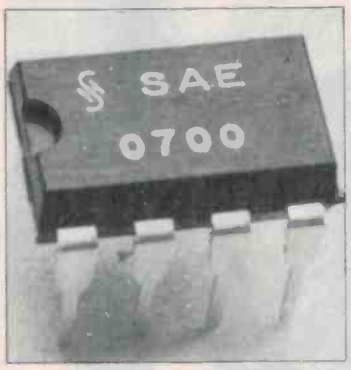
In some motor cars, opening the door on the driver's side while the headlamps are still on will operate a buzzer to prevent the battery from being discharged. With the new SAE 0700 IC from Siemens, this warning signal can be made more melodious. It produces two audio frequencies in the ratio of about 1.4 to 1 which are repeated periodically and can be varied from 100 Hz to 15 kHz.

The signal tone generator IC is designed for ac voltages of 10 V (RMS) or more and for dc voltages of 9 V to 25 V. The reproduction of the audio signals needs a loudspeaker or a piezoelectric transducer. The SAE 0700 is also suited for doorbells or toys.

The tone sequences are heard for as long as power is applied. A capacitor is required to set the tone repetition rate, which ranges from 1 to 50 times per second. By means of only two external components, a resistor and a capacitor, it is possible to imitate police, fire brigade and ambulance horns for toy cars.

The SAE 0700 is accommodated in an 8-pin DIL plastic package. It can be operated in ambient temperatures of −25°C to +85°C.

For more information contact **Siemens, 544 Church St, Richmond Vic 3121. (02)429-7111.**



SAE 0700: A new tone generator IC from Siemens.

Tiny capacitors

Philips has announced the release of new ranges of small capacitors. The three ranges of wet aluminium electrolytics in small and miniature cases have DIN and IEC384-4 long-life grade specifications. The 116, 132 and 133 series have lifetimes of up to 8000 hours at 85°C and very low leakage currents.

The capacitors are ideal for industrial applications which require extra long life, such as telephone / telecommunications equipment and automotive applications, as well as power supplies, measuring and control equipment.

Capacitance values go up to 4700 µF and rated voltages up to 350 V. The leakage current level depends on the individual capacitor ratings.

For more information contact **Philips, 15 Blue St, North Sydney NSW 2060. (02)925-3281.**

Three-phase switching relay

FR Electronics has announced the release of the ZRA 9000 series three-phase solid state relay which has been designed specifically with three-phase application in mind.

The units are capable of switching voltage up to 480 Vac, making them ideal for use with three-phase motors and other three-phase loads. Available with either ac or dc input control voltage, the devices have a standard blocking voltage of 800 V, and 900 V versions can be supplied as an option.

Standard current ratings are either 30 A or 45 A and surge capability is 250 A and 375 A respectively, for 10 mS.

For further information contact **C & K Electronics, 15 Cowper Street, Parramatta NSW 2150. (02)635-0799.**

Subscribe to Electronics Today now, and receive a 30-watt soldering iron worth $12.50

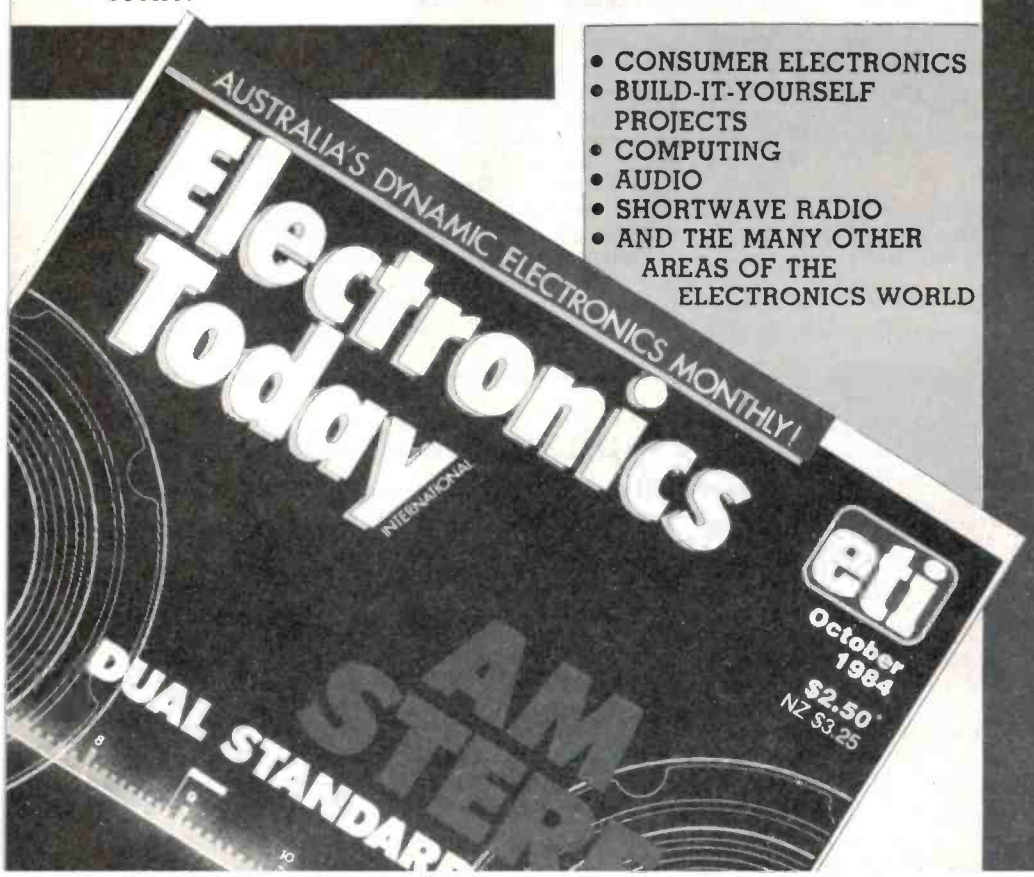
ABSOLUTELY FREE!

Right now is certainly the best time to take out a 12-month subscription to Electronics Today. You'll not only be ensuring that you receive each copy regularly each month, delivered direct to you, but you'll also receive a bonus gift: a free 'Micron' soldering iron suitable for the electronics hobbyist, home handyman or technician. But don't delay — this offer is limited.

Australia's dynamic electronics monthly!

Electronics Today is your key to the exciting world of modern electronics — whether you're a professional, an enthusiast or an interested consumer. Electronics Today provides you with news and analysis of the latest developments, authoritative test reports and reviews of new equipment, down-to-earth information on electronics in theory and practice, and well-engineered construction projects.

Electronics Today is also written right here in Australia, so you know that it really does cover the local electronics scene.



- CONSUMER ELECTRONICS
- BUILD-IT-YOURSELF PROJECTS
- COMPUTING
- AUDIO
- SHORTWAVE RADIO
- AND THE MANY OTHER AREAS OF THE ELECTRONICS WORLD

The Micron T-2430 lightweight 30-watt iron is ideal for most general soldering work. It features interchangeable screw-in tips, a two-metre mains cord with moulded-on plug for safety and durability, and is fully S.E.C. tested and approved. It comes fitted with a plated conical tip, suitable for most general soldering. Normally this quality iron sells for $12.50 — but currently we're offering it to you FREE with each 12-month subscription to Electronics Today!

Just $27.00

That's a $3 saving on our regular 12-month subscription rate!

So don't delay — subscribe now using the card in this issue!

Component NEWS

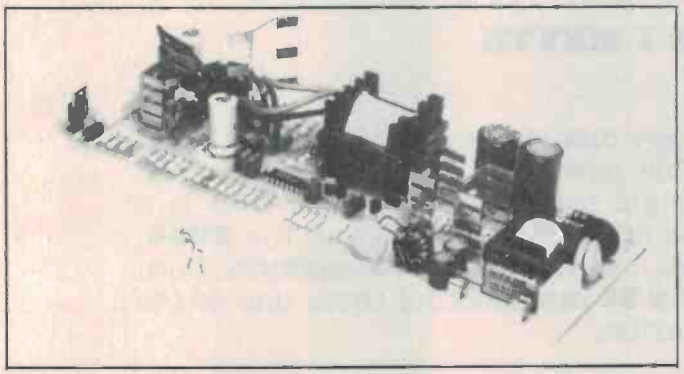
Switched mode power supply

Melbourne based Scientific Electronics has just released a new switched mode power supply, the SM45AD1.

The SM45AD1 features four supply rails from which a total of 45 W can be drawn.

It has been specifically tailored to the needs of computer users and meets Telecom specification 1302.

For more information contact **Scientific Electronics, 6 Holloway Drive, Bayswater Vic. (03)762-5777.**



10 A pushbuttons

Local manufacturer, Swann Electronics, has designed a range of versatile and economic pushbutton switches with contacts rated at 10 amps.

They are designed for interlocking operation with a lockout facility so that two buttons cannot be operated together.

A wide range of buttons include low-cost 240 V neon illumination plus low voltage LED and incandescent lamp illumination. Styles for mounting at 15 mm and 20 mm pitches are available.

Further details from **Swann Electronics International P/L; Melbourne (03)544-3033 or Sydney (02)807-1944.**

New Telefunken rep.

Fastron have been appointed Australian agents for Telefunken Electronic, formally part of the AEG-Telefunken Group.

Fastron are best known as suppliers of power semiconductors and assemblies and now manufacture, under licence to AEG, diodes and SCRs up to many hundred amps.

The Telefunken Electronic range of transistors, linear ICs, diodes and optoelectronic devices will greatly expand their activities. Some devices are already in stock in their Melbourne premises, with other types on the way.

Short-form catalogue for each product group are available on request from **Fastron, P.O. Box 441, Cheltenham, Vic 3192. (03)555-9288.**

Accurate resistance

TRW metal glaze resistors are now offered to 0.1% tolerance and 25 ppm/°C TCR. They are designated RNC55JXXX-XB, C and D (corresponding to ±0.1%, ±0.25%, ±0.5% tolerances respectively).

The units feature thermal compression-moulded thick-film construction and capless soldered terminations. They are rated at 300 V. These features provide a mechanically and environmentally rugged resistor which is used extensively in military, telecommunications, computer and automotive electronic applications.

For further information contact **Total Electronics, 9 Harker St, Burwood, Vic. 3125. (03)288-4044.**

ACME HAVE MOVED

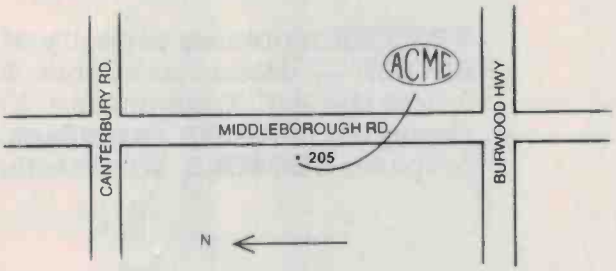
As from 1 October 1984

Acme Electronics

is located at

205 Middleborough Road,

Box Hill 3128, Victoria



(Midway between Canterbury Rd. and Burwood Hwy.)

Melways Map Ref. 61 F3

Phone: **(03) 890 0900**

at the leading edge

3.5" MICRO FLOPPY STORES 1 MBYTE

One of Japan's fastest growing floppy disk drive manufacturers, **CHINON,** has released two new double sided 3.5" microfloppies which accept the **MIC SONY** standard rigid jacket media. The **F-353** is a single sided 80 track drive capable of storing **500KB** and the **F354,** which is a double sided 80 track unit, can hold up to **1 Megabyte.** Both drives measure a mere **104 x 155 x 35 mm** making them one of the most compact data stores on the market.

MINISCRIBE JOINS THE 3.5" HARD DISK BRIGADE

Destined to be the standard to displace the medium capacity 5.25" Winchesters, the 3.5" units to be released soon from **MINISCRIBE,** will offer considerable scope to designers needing compact data storage to complement the array of portable computers entering the market. While not quite to the level of a solder-in component the 3.5" drives are prime candidates for hiding away inside equipment to cut panel clutter.

WHISPERING GALLERY

VERTEX increases capacity of their **V170 70MB 5.25"** Winchesters to **85 MB** — details available NOW. **Streaming tape** drive makers to follow the 3.5" drive outline. New start-up **INTERDYNE** also claims a **floppy look-a-like interface** for their **20MB** offering. **MEGAVAULT** prepares **660MB** 8" Winchesters, hints at **1.2 Gibabyte** units.

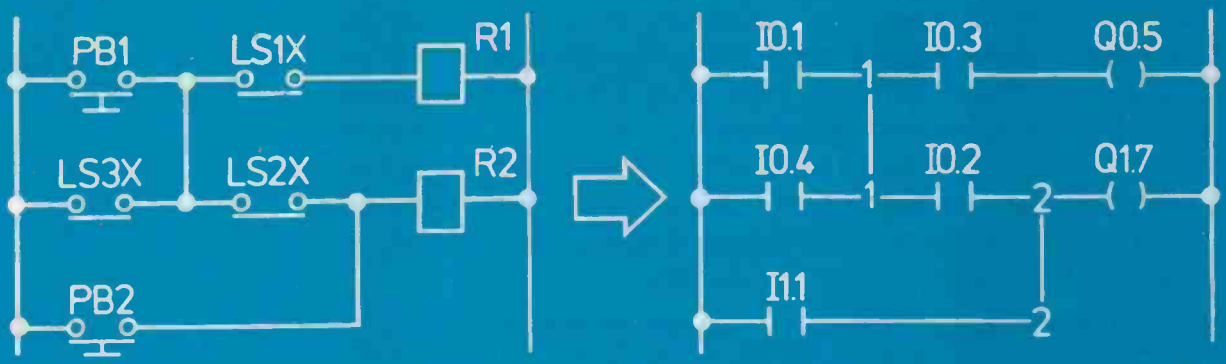
daneva

daneva australia pty ltd
66 Bay Rd. Sandringham, Vic. 3191
P.O. Box 114, Sandringham, Vic. 3191
Telephone 598-5622. Telex: AA34439

Sydney: E&M Electronics (02) 51-5880
Adelaide: DC Electronics (08) 223-6946
Brisbane: Baltec (07) 369-5900

SIEMENS

If you can read this,



you can programme the SIMATIC S5-R series

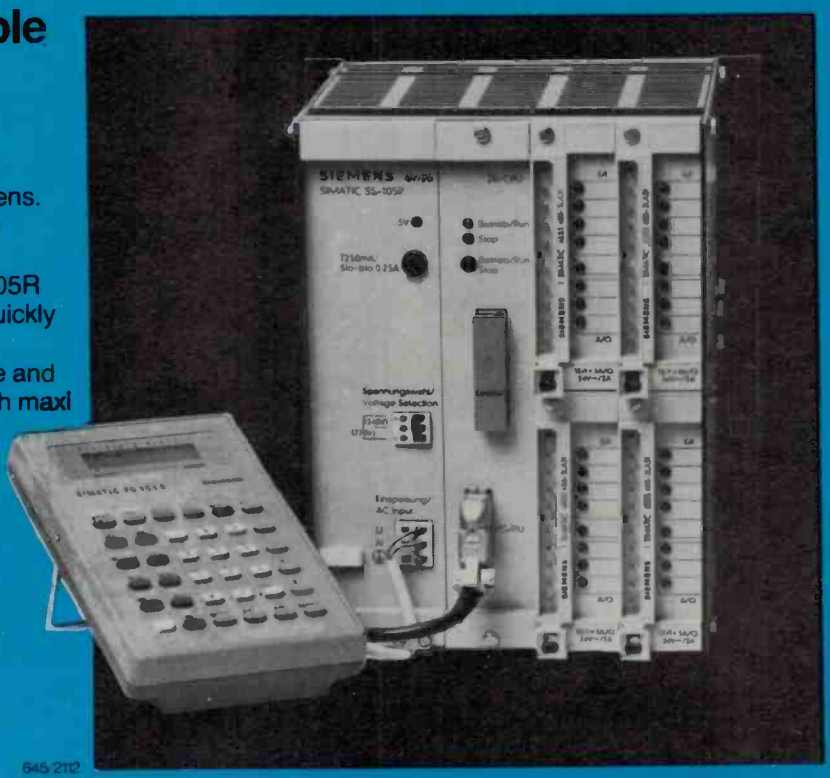
the new mini programmable controllers which cost as little as 15 relays.

Simple conversion of a wiring diagram is the key to programming the new S5-R series from Siemens. It's as easy as that, even if you have no previous experience of PC systems.

And the powerful hand-held programming unit 605R ensures that you can enter your programme – quickly and conveniently.

SIMATIC S5-R series is one of the most versatile and simple to programme systems. It's a mini PC with maxi performance – just one of the Siemens family of programmable controllers.

Demonstrations can be arranged by any of our Branch Offices. Send now for full details.



Siemens Ltd. (Incorporated in Victoria)
544 Church Street, Richmond, Vic. 3121.
Melbourne: 420 7111. Sydney: 436 8711.
Brisbane: 369 9666. Perth: 362 0123.

Distributors:-
Adelaide: R. G. Pank Pty. Ltd. 51 2411
Hobart: D & W Electrical Pty. Ltd. 34 3567
Launceston 31 8622. Devonport 24 4522
Newcastle: Davis & Spence Pty. Ltd. 69 2566
Wollongong: Gordon Macdonald Pty. Ltd. 28 5544

645 2112

PROGRAMMABLE LOGIC CONTROLLERS

What do the names Cutler-Hammer, AEG, Allen-Bradley and Texas Instruments have in common? Certainly more than the letter "e"! These manufacturers are just a few of a large number who produce Programmable Controllers (P.C.s) for industrial use. In this article we'll examine what a P.C. is, why they are used and how they evolved. Note however that the world of industrial control and sequential circuit synthesis is quite large and involved. In these few pages we will barely scratch the surface.

by Peter Ihnat and Lew Pogson,

Head Teacher,
Electrical Engineering,
Wollongong College of TAFE

SINCE THE successful development of the digital computer there has been a steady increase in the application of digital principles and devices in industrial electronics. The reason for this is that digital implementation is efficient, reliable, flexible and, in many cases, cheaper than existing analogue equipment. Couple this with the ability to interconnect digital equipment in the plant with the central computer back at the office and you have a factory which is efficient and economical to run — all stages of production can be easily monitored, and new orders or changes to existing orders can be rapidly passed on to the plant.

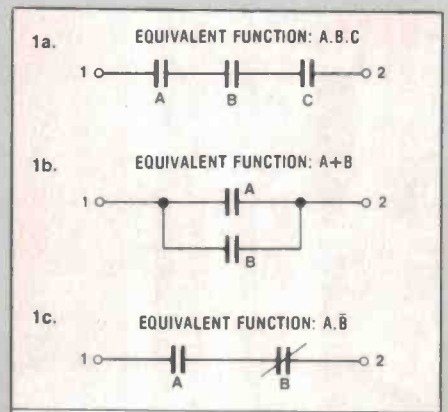


Figure 1. Equivalent logic functions for some simple relay contact connections

Industrial control

Most industrial processes require several operations to produce the required output. Some or all of the following could be involved — manufacturing, machining, assembling, packaging, finishing and transporting. But on closer examination it becomes obvious that each of these operations is composed of other operations.

For example, to machine a particular metal piece may involve loading it into a lathe, machining into shape, drilling appropriate holes and then putting it onto a conveyor to travel to the anodising area. This is where the industrial control system comes into the picture — it must provide precise co-ordination of the individual tasks for the overall system to function.

Controllers can be divided into two general categories — *sequential* and *combinatorial*. Sequential controllers are for processes which require that certain operations be performed in a specific order. Combinatorial controllers, on the other hand, perform operations without regard to the order. The machining of a metal piece as described above is an example of a sequential process needing sequential control — a bit like filling a bottle and then putting the cap on, it has to be done in that order.

An example of a combinatorial process is the placing of labels on the front and back of a cardboard carton — it doesn't matter in which order this is done. In industry, the

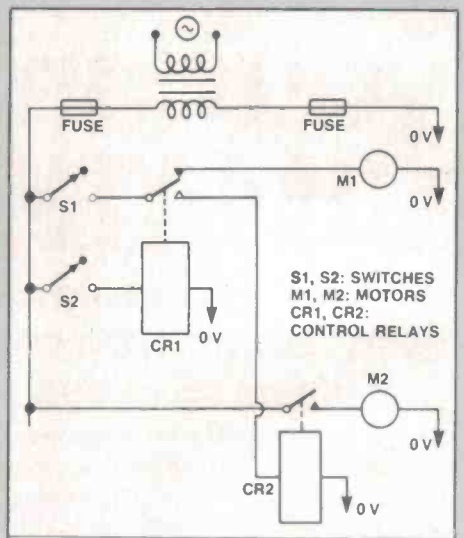


Figure 2a. Example of a simple controller

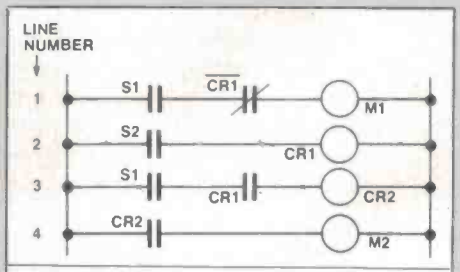
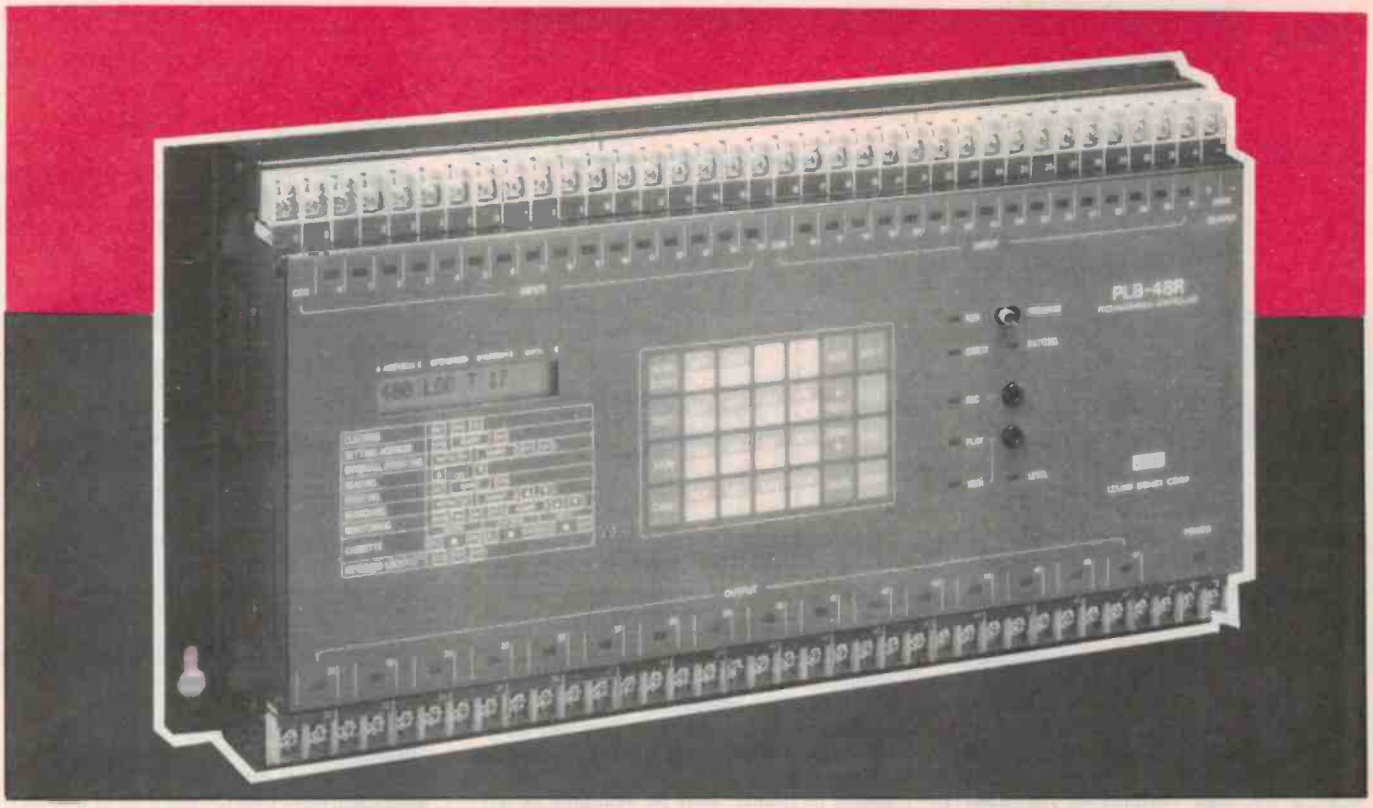


Figure 2b. Relay ladder diagram for Figure 2a.
NOTES: (1) A CR input is actually one of the relay's contacts. A CR output is the relay's coil.
(2) Note how the SPDT contacts of CR1 are implemented (lines 1 and 3).



majority of control problems are sequential but in practice all processes, whether inherently sequential or not, are performed sequentially. This generally reduces setup costs and results in a well-ordered system.

Early controllers used multicontact relays which were interconnected to perform various functions. Control switches such as start, stop, over-ride, etc operated the relay coils. The contacts they switched operated indicator lamps, motors, solenoids and other relay coils. With the introduction of digital logic to industry, design and implemention of these controllers were greatly simplified. Let's examine some simple ideas in the development of digital controllers.

A closed relay contact represents the TRUE or logic 1 state and the open contact FALSE or logic 0. Figure 1 shows some basic relay contact connections and their equivalent logic functions.

Figure 1a shows the AND function — there will be continuity between points 1 and 2 only if contacts A AND B AND C are closed. This will occur if the coils which operate contacts A, B and C are all energised.

The OR function is shown in Figure 1b and results in continuity if contact A OR B (OR both) are closed. Once again this implies that any of the coils which operates contacts A or B is energised (or both are).

Figure 1c is basically the same as 1b except that continuity is realised if contact A's coil is energised and B's coil is not (in other words, B is a normally closed contact which opens when its coil is energised).

To give a more practical example, refer to Figure 2. Figure 2a shows twomotors, M1 and M2, connected to switches S1, S2 and control relays CR1 and CR2. Operation is as follows: Motor M1 is energised if S1 is ON and S2 is OFF. Motor M2 is energised via relays CR1 and CR2 only if S1 AND S2 are both ON.

Figure 2b shows the equivalent "circuit diagram" which is more commonly known as the RELAY LADDER DIAGRAM. The supply transformer usually has fuses in each secondary lead which then extend vertically to form boundary lines for the diagram. The following conventions are used:

- the supply transformer and its fuses are usually not shown.
- switches, relay contacts and other input devices are placed on the left of the diagram.
- relay coils, lights, motors and other output devices are placed on the right of the diagram.
- output devices are shown in the order they are energised during normal sequence of operations. This enables the operation sequence to be easily listed by traversing the ladder diagram line by line.

The actual controller is hard wired by interconnecting banks of relays in accordance with the ladder diagram and then connecting switches, motors, lamps etc to it.

There are several techniques for designing the sequential controller, given a request in the form of word statements, specifications or manufacturing statements. Most are rather involved and require state diagrams, transition tables and minimization techniques and, as mentioned previously, are outside the scope of this article. For very simple cases the "commonsense" approach usually works and basically is a way of producing a relay ladder diagram line by line as one goes through a machine cycle. This is the method we'll use later when showing examples of P.C. programming.

Meet the P.C. A typical programmable controller unit. Note the two banks of 16 inputs along the top and the row of outputs along the bottom, all with screw terminals. This unit can be programmed via the front panel keyboard using simple mnemonic type instructions. This unit is made by Idec Izuml, distributed here by Emall (See Supplier's Index at end of article).

Application of solid-state logic

Originally, the relay ladder diagrams were implemented as implied — racks of relays hard wired to each other, to switches, indicator lights, motors and whatever else needed controlling. You can probably see the major disadvantage of such a system. Any changes required to the control system meant physically changing relays and rewiring the new section — a costly and time-consuming operation.

So it seems quite logical ('scuse the pun) that the next step in the evolution of controllers was to use solid-state digital logic to replace many conventional relay panels. The advantages were higher reliability, lower cost, smaller size, higher speed, *increased flexibility* and compatibility with computers.

The transition to digital logic was straightforward since, as we saw in Figure 1, the various lines in a ladder diagram can be written as Boolean equations. The design process involves converting the control requirements to Boolean form, performing any simplifications, choosing the components to perform the logic decision-making and selecting the proper interfacing devices to match the circuitry to the outside world.

Solid-state logic components are classified into four categories — input interfacing, logic gates, output interfacing and accessory components. Each component is ▶

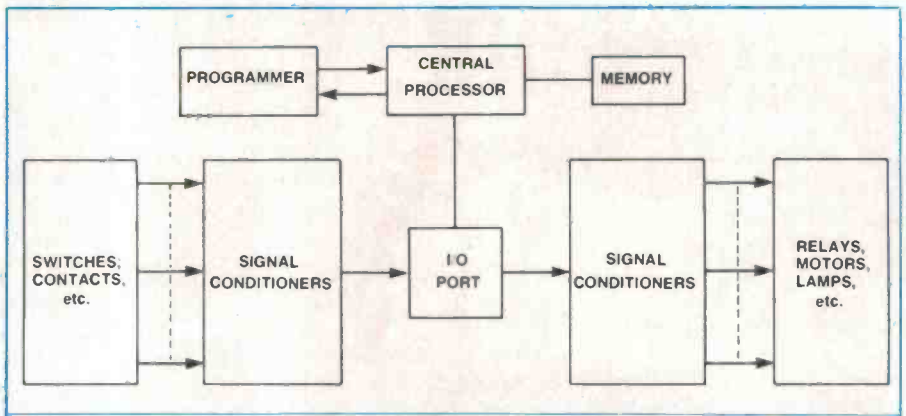


Figure 3a. Block diagram of a programmable controller setup.

a transistorised, plug-in module able to perform one function. Groups of these plug into a base which allows interconnections to be made between the modules. Diagrammatically, the relay ladder diagram is replaced by a logic diagram which uses appropriate logic symbols for the different functions.

Programmable controllers

Even though solid-state logic controllers were simpler to construct than an equivalent relay panel, they were still designed and built for a specific operation or process. The cost of making changes to the circuit was still quite high. In the late 1960s a new type of controller emerged from the automotive industry's need for more flexible control on the factory floor. The programmable controller revolutionised industrial control by being able to have its operation specified by a program.

The transition to using the new controllers was aided by using a programming language already understood by the plant electrician and engineer (relay ladder diagrams).

These days, controllers can replace everything from simple relay circuits to sophisticated process control equipment and, in addition, have new capabilities such as being able to accept analogue inputs, provide analogue outputs and carry out closed loop control. Other invaluable features include the ability to communicate with other P.C.s and with computers over long distances and under adverse conditions with or without separate intelligent data handling equipment.

It's probably not hard to guess that the introduction of P.C.s had something to do with the microprocessor revolution. Basically, a P.C. is a robust microprocessor-based unit which uses memory to store instructions specified in a simple ladder logic programming language. When running, it monitors the conditions of its inputs to provide outputs by implementing logic, sequencing, timing, counting and arithmetic functions.

Architecture

Figure 3a shows the block diagram of a typical P.C. The important sections are the CPU/memory, the programmer and the I/O modules (signal conditioners). These may all be contained in the one unit or, for added flexibility, may be available as separate units. In the latter case, the CPU/memory unit usually includes panels of sockets for the I/O modules to be plugged in. This allows any combination of inputs and outputs to be set up (only limited by maximum number possible for that particular P.C.). Let's look at each section in turn to better appreciate the operation of a P.C.

a) CPU

The CPU is actually the "brains" behind the controller. In many P.C.s it is a standard microprocessor such as the Z80A, 6502 or 6800 (some manufacturers, though, use chips specially designed for logic decision making). With only a few exceptions, all the CPUs are either 8- or 16-bit devices.

The CPU, memory and I/O port form the heart of the unit. The programmer and signal conditioners are usually external units which are simply plugged in as required. Figure 3b shows the arrangement of a typical unit used in practice. The programmer and I/O modules are discussed in the next two sections.

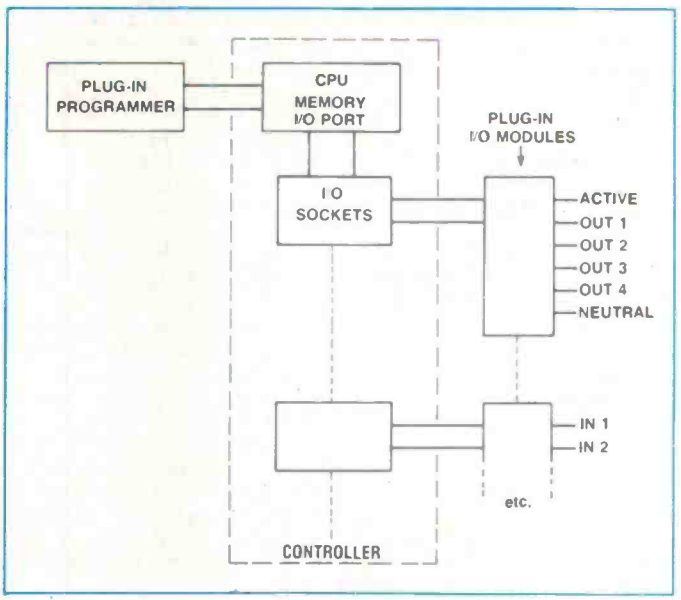
The controller has two modes of operation — PROGRAM and RUN, usually selected by a slide switch or, in some cases, a key-operated switch, making the unit tamper-proof. Programs are entered whilst in PROGRAM mode, which also offers a complete range of editing facilities (we all make mistakes). These include inserting and deleting entries, finding a particular entry, changing parameters of timers and counters etc. Once programmed, it's possible to test the operation by plugging in a test panel made up of switches and indicator lights and going through all input combinations.

Alternatively, most P.C.s implement the "force" function. This allows the operator to force inputs and outputs ON and OFF under software control whether or not there are any inputs or outputs actually connected. Its main use, though, is to aid in trouble-shooting.

Once programmed and checked, the unit is simply left in RUN mode to control the equipment it becomes part of. Obviously, there will be times when power failures will occur and, as every computer buff knows, static RAM loses all its information if this happens.

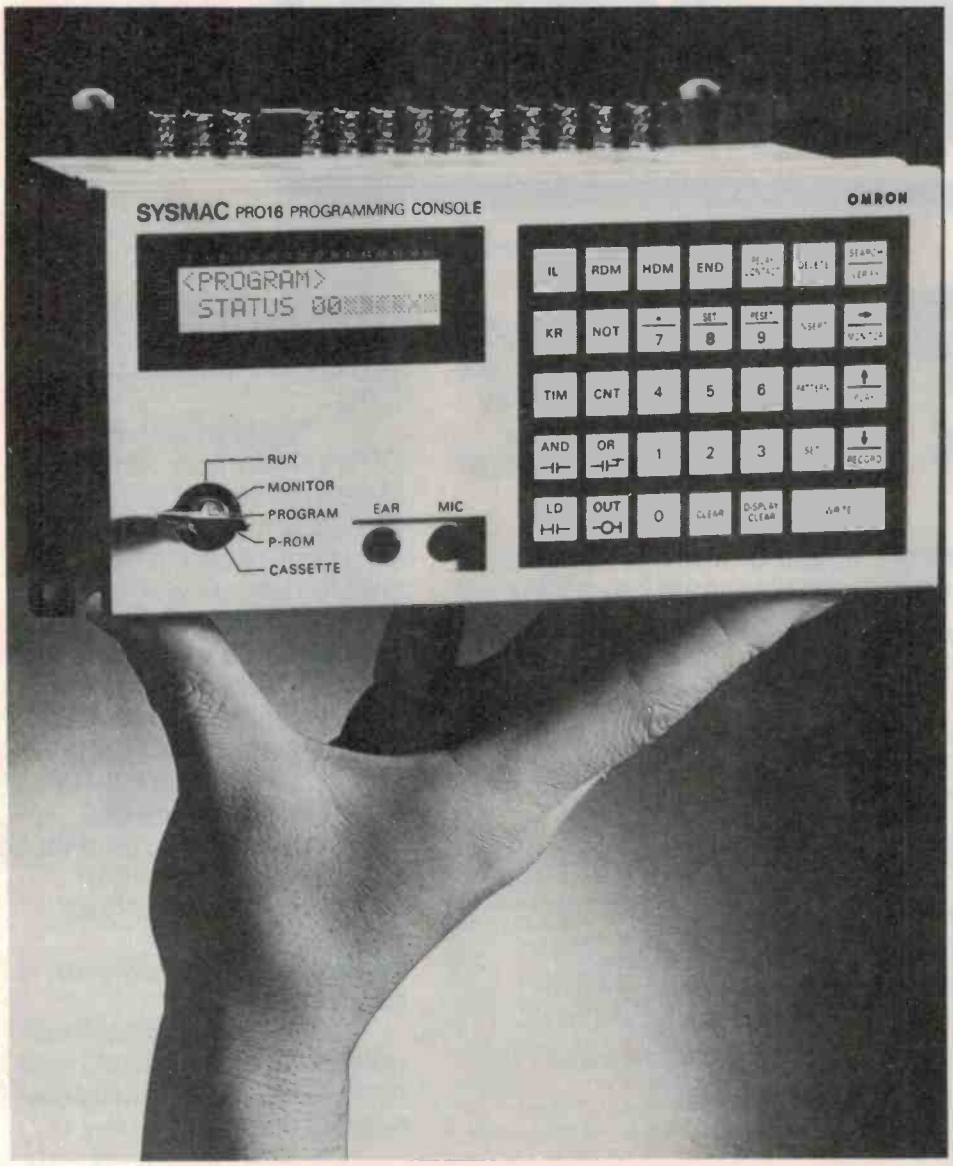
The problem is overcome in P.C.s by three methods. Firstly, internal static RAM always has battery backup. This, however, is not usually a permanent arrangement. It is used when the program is first loaded and de-bugged. If all is well, the program is then ▶

Figure 3b. A typical P.C. used in practise.



How much can you expect from a programmable controller this small?

WITH OMRON SYSMAC-S6 THIS IS HOW MUCH YOU GET.



No more than you need...
Built-in 12 input, 8 output expandable up to 64 I/O. So you get the performance you need at minimum cost, in the smallest space.

No more programming headaches ...
Plug-in EPROM and plug-in programming console with LCD display and full de-bugging facility.

No more expensive downtime ...
Thy Sysmac-S6's comprehensive self-diagnostics cover programming console's LCD section, keyboard and mode selector, and the CPU's various indicators. You can quickly pinpoint what's causing the trouble.

No more service worries ...
Full service support from Warburton Franki's nationwide service network.

That's how much you get from the OMRON SYSMAC-S6! Call Warburton Franki today.

For further information contact your local Warburton Franki office.

Warburton Franki

A DIVISION OF THE ANI CORPORATION LTD (INCORPORATED IN N.S.W.)

● ADELAIDE (08) 356-7333 ● BRISBANE (07) 277-0222 ● HOBART (002) 28-0321
● MELBOURNE (03) 795-9011 ● PERTH (09) 277-7000 ● SYDNEY (02) 648-1711

A BIG LCD ALPHANUMERIC DISPLAY.

The Ladder pattern display programmer.

THE NEW TOSHIBA PROGRAMMABLE CONTROLLER HAS SOME BIG FEATURES.

The LCD programmer.

Unlike the other's single line LCD display or series of lights, the EX range from Toshiba features a large LCD display (9 columns plus 1 coil x 8 rows). This large display ensures quick and correct construction/monitoring of all circuits.

This LCD display together with the "easy-to-use" keyboard has all the necessary functions for programming, monitoring and sending commands to the CPU.

Together with the CPU's 8 bit micro computer the expanded programming functions include differential step sequence, flip flop and shift register as well as error checking and diagnostics.

Expandable input/outputs.

An expansion unit is readily available to increase the number of input/output points from 20 to a big 120.

Surprising low cost.

You would expect these extras to cost more than comparable units without them: not so.

Back-up service, if you need it.

We think that our back-up service is second to none. And we think that you'll never need to find out.

Category	Item.	EX20.	EX40.	EX40H.	Remarks.
Program memory	Program size	0.5 kW	1 kW	1 kW	
	Memory elements	CMOS RAM (Battery backup)/PROM			
	Execution time	60μs/step		3μs/step	
Instructions	Logic				* EX40/40H
	Output				
	Functions	Step sequence shift-register Timer (0.1-second units), Counter, Flip-flop, shift-register *			
I/O	Basic points	12(I)/8(O)	24(I)/16(O)	24(I)/16(O)	
	Maximum points	24(I)/16(O)	48(I)/32(O)	72(I)/48(O)	
	Input method		Junction input		
	Output method	Ry(110/240 V AC; 24 V DC, 2 A), Tnac(110 V AC, 1 A), Tr(24 V DC, 1 A)			
Storage	Internal output	64 points	128 points	128 points	
	Latch output	64 points	128 points	128 points	
	Timer	8(0.1 to 999.9 seconds)	16(0.1 to 999.9 seconds)	64(0.1 to 999.9 seconds)	
	Counter	8(1 to 9999)	16(1 to 9999)	64(1 to 9999)	
Self-diagnosis	Display	POWER, RUN, ERROR, ALARM, (PROM)			
	Item	WD timer check, memory check, execution time check, battery voltage check			LCD programmer memo code display
Peripheral devices	–	LCD programmer			

TMPC
Process Controls

Sydney (02) 609 6666 Newcastle (049) 67 5558 Melbourne (03) 842 8211
Brisbane (07) 277 4811 Hobart (002) 72 6931 Adelaide (08) 47 5022 Perth (09) 381 3931

A Division of Tubemakers of Australia Limited

copied into EPROMs, which plug into the CPU unit. This provides the permanency required by the controller. If any changes are required, these are made in RAM and copied into the EPROMs after erasing the original program.

The third and latest development is to use EEPROMs (Electrically Erasable PROMs) to hold the program. These don't need a UV source for erasing old information and allow changes to be made relatively quickly.

In RUN mode, the CPU performs a number of functions. Firstly, it scans the inputs and loads their status (1 for ON, 0 for OFF) into a temporary store. Also in this store are the outputs — the results of the Boolean, arithmetic and other operations. These are output to their appropriate output modules. Next, the CPU traverses the stored program line by line and logically or arithmetically combines inputs and outputs as specified by the program to produce new outputs, which are placed in the temporary store. The cycle then repeats.

Other functions which the P.C. implements are timers, counters, master control relays, drum controllers etc. These are all implemented in software and, as mentioned before, will not be treated here in any depth.

b) The programmer

There are basically two types of programmers available with P.C.s — *handheld* programmers and *video* programmers. The cheapest is the handheld programmer and is most often used with small P.C.s. Its appearance is similar to that of a calculator and has a display (LED or more recently, LCD) and a sealed keyboard to stand harsh industrial conditions (see Figure 4a). It is plugged into the controller either directly (that is, it physically mounts into a recessed area on the controller) or via a cable of some sort.

Figure 4a. Examples of handheld programmers. The top unit is by Allen-Bradley and the lower unit is by AEG. Both feature liquid crystal displays.

Simple. The AEG Logistat A020 P.C. is probably one of the simplest, low-cost units around. It's distributed here by Nilsen Rowe.

Some controllers have built-in programmers but in many cases this is not required. The reason is that once the controller is programmed and fitted beside the equipment it controls, the programmer is of no further direct use. It can, however, be carried by the plant engineer and plugged into a controller to modify the program, monitor inputs, outputs, internal timers, counters or even change variables or conditions of inputs and outputs *while the controller is running*.

Note that if numerous controllers are used on the plant and if all are identical, then only two or three programmers need be purchased. This reduces the overall cost of the system since not all controllers will require programmers simultaneously once commissioned.

The most sophisticated method of programming and fault-finding is by use of a ▶

Figure 4b. This unit from Allen-Bradley features a detachable touchpad keyboard. The 9-inch display can show multiple ladder logic diagrams. ◁

Portable. This Toshiba features a liquid crystal display that gives a portable programmer ladder logic readout. ▷

video programming unit. These may be standard intelligent VDUs or may be a small VDU built into a unit which has special keys in place of the regular keyboard (see Figure 4b). This type of programmer draws ladder diagrams on the screen as the controller is programmed and if a hard copy is required, a printer can be connected to the system.

When troubleshooting or placed in RUN mode, controller operation can easily be monitored since paths and coils which are energised are shown by thicker lines (intensification of light on a VDU or double lines in printouts). Figure 4c gives an example of a typical printout. Of course, this type of programmer is much more expensive than the other.

c) I/O modules

These modules provide the link between the controller and the outside world. The equipment connected to a P.C. will almost certainly require different operating voltages. In fact in practice, most outputs will need to control much higher voltages and currents than the controller will supply. Inputs may also be high voltage ac and/or dc signals. In all cases, isolation from the controller circuitry is required. This is achieved easily by means of opto-couplers, but sometimes in the case of outputs relays are used.

Figure 5a gives some examples of I/O modules.

Smaller P.C.s have a small number of inputs and ouputs which come built-in. These are isolated internally and can operate devices rated up to 240 Vac. Extra terminals are provided on the I/O strip (similar to a terminal strip) to which an external power supply can be connected for powering each particular device (see Figure 5b).

The outputs and inputs are usually grouped in pairs or fours so that different voltages can be applied to each group. Larger P.C.s simply provide panels of sockets into which input and output modules are plugged. Each module provides four inputs or outputs, each with an individual indicator lamp, fuse and opto-isolator. This provides the greatest flexibility since:

- only the number of I/O modules actually required need be purchased (plus spares)
- a blown module can be easily swapped without switching off the entire system
- number of I/Os can be increased up to the limit of the machine by using expansion modules which hold extra I/O modules.

Typical inputs to a P.C. include pushbuttons, limit switches, sensors, flow switches, controllers, thumbwheels, LDRs and other optical devices, vacuum switches. Some outputs are solenoid coils, motor starter coils, indicator lights, alarm circuits, etc.

Overall advantages

1. Size: A P.C. can be housed in an enclosure which is substantially smaller than that required for its relay counterpart.

2. Reliability: The P.C. has no moving mechanical parts to wear out and fail. With electronic systems, most failures occur during manufacture and testing.

3. Flexibility: The P.C. is ideally suited for control systems whose control schemes may be revised later. Changing a hand-wired relay system often requires long downtimes and high labour costs. By contrast, changing the control system in a P.C. most often only requires the changes to be entered with the programmer.

4. Ease of installation: With a P.C., minimal panel wiring is required for installation in the plant.

5. Simple programming: Most P.C.s are designed to be programmed in ladder logic, a language normally understood by the users.

6. Fault-finding: Fault-finding is relatively easy with the use of ladder diagrams and input/output module indicators.

7. Hostile environment: P.C.s are specifically designed to operate in industrial environments; e.g: a typical operating temperature range could be 0-60°C.

8. Cost: Overall costs of P.C. schemes are less than relay schemes.

9. Range of P.C.s available: Nearly 40 manufacturers in the USA alone produce P.C.s. They vary in size from eight I/Os to 4096!

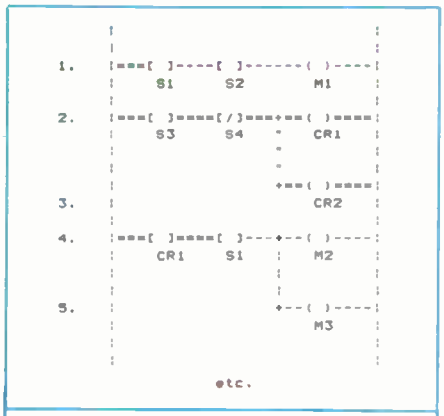


Figure 4c. Example of a P.C. printout.

Normally open contacts (NO)	[ ]
Normally closed contacts (NC)	[/]
outputs	( )
active path	= = = =
inactive path	- - - -

Programming example

Just to complete the discussion of P.C.s, let's look at some very, very simple programming examples.

Example 1: Refer to the example given in Figures 2a and 2b. Since the relay ladder diagram is already given, the controller can be programmed without further simplification. Using a typical programming language we obtain —

```
START X1
AND NOT CR1
OUT Y1
START X2
OUT CR1
START X1
AND CR1
OUT CR2
START CR2
OUT Y2
END.
```

Note that START begins each new line of the program. Inputs and outputs can be represented by X and Y and control relays by CR.

When switches S1. S2 and motors M1 and M2 are connected to the P.C. they connect to I/O terminals X1, X2, Y1 and Y2, respectively. Finally, an ENTER button is usually pressed after each line of programming. Simple! Saves interconnecting relays.

Example 2: Refer to fig. 4c.

```
START X1
AND X2
OUT Y1
START X3
AND NOT X4
OUT CR1
OUT CR2
START CR1
AND X1
OUT Y2
OUT Y3
END.
```

Example 3: Assume we have a room with two doors and one light in the middle of the ceiling. Each door has a switch which operate as follows — the light can be switched ON and OFF by either switch. For example, the light can be switched ON when you enter door 1 and switched OFF as you leave door 2. The same applies if you re-enter via door 1 or door 2.

Those of you into logic will recognise this as the EXCLUSIVE-OR function. If we start with both switches in the UP position, the light will be OFF. If the room is entered via either door and the switch operated, the light will come ON.

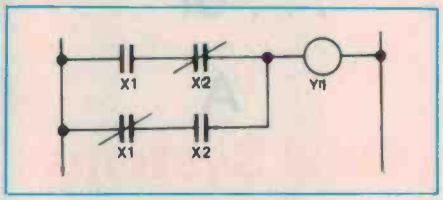
In this condition, one switch will be in the UP position and the other DOWN. When leaving, to put the light OFF, either both switches will be in the DOWN position or both will be UP (depending on which door is used). To put this into digital form, let's call the switches X1 and X2 and the light Y1.

If a switch is put in the UP position then it is represented by $\overline{X1}$ (or $\overline{X2}$). If in the down position, then it becomes X1 (or X2, depending on which switch we're talking about).

For the light to come on, we can deduce from the previous paragraph that one switch must be DOWN and the other UP. If both are UP or DOWN then the light will be OFF. In other words:

$$\text{light ON} = X1.\overline{X2} + \overline{X1}.X2.$$

This is read as "the light will be ON if X1 is DOWN AND X2 is UP OR X1 is UP AND X2 is DOWN". The ladder diagram and program are —




```
START X1
AND NOT X2
START NOT X1
AND X2
OR MEMORY
OUT Y1
END.
```

Note how two lines are started to give the two parallel paths. When the second path is started, the first is stored in memory (like a stack) since it wasn't completed. The OR MEMORY instruction ORs the current line with the stored line. ▶

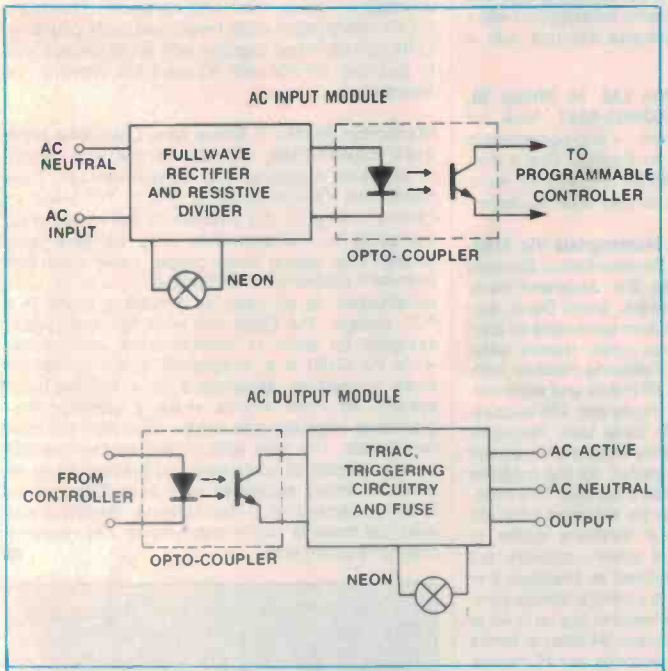


Figure 5a. Block diagrams of typical I/O modules.

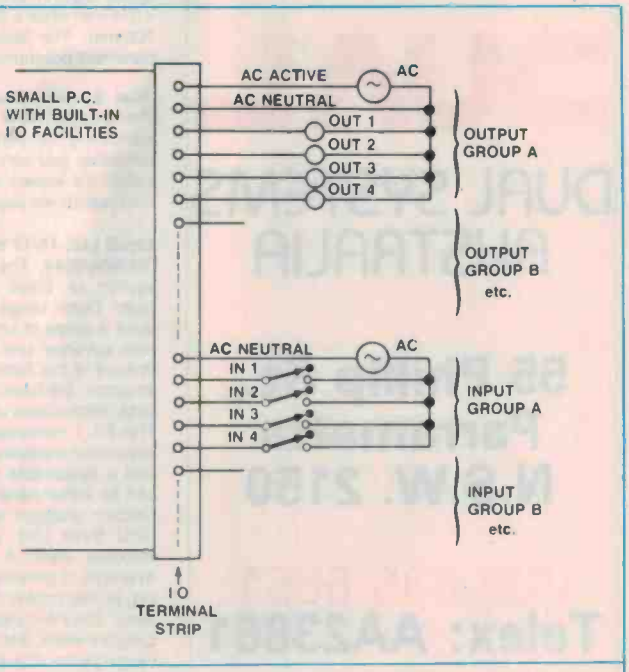


Figure 5b. Example of I/O connections for a small P.C.

Would you prefer a P.L.C. you have to program using those cryptic ladder diagrams?

. . . or

A **Dual Systems 83/00 Control Unit** you can program in *English?*

DUAL

DUAL SYSTEMS AUSTRALIA

55 Phillip St., Parramatta N.S.W. 2150

(02) 635-6651
Telex: AA23861

SUPPLIERS' INDEX

This index is intended as a guide to suppliers of programmable controllers and is based on information supplied from the companies listed. We make no claims that this is a 'definitive' list. Further details on programmable controllers should be sought from the firms listed, not from Electronics Today.

Allen-Bradley Pty Ltd, 188 Whitehorse Rd, Balwyn Vic 3103. (03)80-6171. Australian branch of the Ohio, USA-based electronics manufacturer. They offer a positively huge variety of controllers, from quite 'tiny' systems with just 32 I/O lines and 640 words of memory to monsters with 4096 inputs and 4096 outputs featuring 96K of memory (core or RAM), report generation, prompted programming and other sophisticated features. A-B controllers can be programmed with terminal type or handheld programmers. Allen-Bradley has offices in Sydney (648-2652), Brisbane (343-7900) and Perth (387-1702).

AVH Electrical Engineering Pty Ltd, 86-88 Greville St, Prahran Vic 3181. (03)51-6844. AVH distribute and service the German-made Dold 'Minimaster BT 3200' programmable controller system. This compact unit can be programmed with a personal computer, such as a Commodore 8000 system or the Epson HX-20 portable. They can be supplied with I/O combinations ranging from 32 to 128. It comes with 2K of memory and features 16 internal software timers. Remote potentiometers are available for external and internal timers. Programs can be filed on tape or printer.

Cutler-Hammer Australia Pty Ltd, 27 Leeds St, Rhodes NSW 2138. (02)736-1666. A firm well known in the PLC trade for their PL20-64 range of controllers, Cutler-Hammer has recently introduced the Model PL256 P.C. This is a modular design controller expandable to 256 I/O units and based on an Intel 8085 CPU. Features include 2K of 16-bit word memory, 32 timers (providing 100 ms to 2047 seconds timing delays), 16 counters, 256 internal relays, 32 master control relays and 32 jump commands. The programming language is relay ladder based. The unit uses 16-point I/O modules and the panel space requirements for a 128 I/O system is only 460 x 336 mm while a 256 I/O scheme takes up just 460 x 700 mm. The literature illustrates the unit with a handheld programmer.

Dual Systems Australia Pty Ltd, 55 Phillip St, Parramatta NSW 2150. (02)635-6651. Now for something completely different — a programmable controller you can program in *English*. That's their claim! It's known as their 83/00 unit and for more information we suggest you contact Dual Systems.

Email Ltd, 15-17 Hume St, Huntingdale Vic 3166. (03)544-8244. The Relays Division/Bellco Controls section of Email distributes the Japanese-made Izumi Denki range of controllers. Izumi Denki produce a range of small to medium controllers of both step advance and ladder logic types. Izumi's latest release is the Series FA-1. Featuring modular construction, the basic unit has 16 inputs and eight outputs, expandable up to 128 inputs and 128 outputs. The FA-1 comprises a CPU Base Unit, input-only expansion modules, output-only expansion modules and a detachable program loader. All the modules can be either panel or DIN-rail mounted. The multi-function program loader can be mounted onto the CPU Base Unit, used as a handheld loader or remotely sited. A variety of option modules are available to provide such features as analogue timing, printer control or linking to a central control computer. The FA-1 incorporates features like up to 4K of program steps, 240 internal relays, 64 internal timers ranging from 10 ms to 999.9 seconds and 45 internal counters providing a capacity of 9999 count rates to 1 kHz and add/subtract capabilities.

Nilsen Rowe Australia Pty Ltd, 200 Berkeley St, Carlton Vic 3053. (03)347-9166. Nilsen Rowe import and distribute the German-made AEG-Telefunken Logistat A020 programmable controller. This compact unit features 24 inputs and 16 outputs. It features LED displays to indicate the state of the outputs plus programming via either a portable, LCD readout unit or a terminal using the DOLOG 80 A language. Up to 896 instructions can be handled by the A020. In addition, it can handle up to 16 timer and counter functions, three of which can be set from external decade switches (optional).

Siemens Industries, 544 Church St, Richmond Vic 3121. (03)429-7111. The 'Simatic' S5-101U mini P.C. is new to the Siemens range and features 240 V operation. It has 16 inputs and eight triac outputs, expandable to double that number. It can be combined with other units for 24 V supplies with 20 or 10 inputs and six or 12 relay outputs so that various supply and signal requirements can be mixed. The Simatic S5-101U is programmed in the STEP 5 language which is also used with the larger S5 series P.C.s in world-wide use. The S5-101U rounds off the Siemens S5 range and costs around $600. The Siemens 670 or 675 programmers can be used with it in the 'control systems flowchart', 'ladder diagram' or 'statement list' methods, or with the 605U handheld unit in the 'statement list' form.

TMPC Process Controls, Cnr Victoria & Elizabeth Sts, Wetherill Park NSW 2164. (02)609-6666. TMPC Process Controls (formerly Shankel Controls) is a division of Tubemakers of Australia Ltd, a BHP subsidiary. TMPC markets a comprehensive range of Japanese-made Toshiba programmable controllers. These include the EX Series, suited to small-scale control systems. The Series comprises three models: the EX 20, EX 40 and EX 40H. A consistent concept applies through the three models with the same architectures, common peripherals and expanders. The EX Series are expandable from 20 to 120 I/O points. All units employ ladder network programming, the programming unit featuring an LCD ladder pattern display. The units are lightweight and can be DIN-rail mounted. Three types of output device are available — relay, triac and transistor. The basic EX 20 incorporates eight timers and eight counters. Units can be linked together with an expansion unit to give two EX 20s with 40 point I/O capacity, for example.

Warburton Franki, 7 Birnie Ave, Lidcombe NSW 2141. (02)647-2366. Warburton Franki is a division of the giant Australian ANI Corporation Ltd. They handle the Omron range of P.C.s. The latest in Omron's range is the Sysmac C Series featuring the ability to link expansion units via fibre optic cables, thus saving huge copper cable runs with attendant problems. The Sysmac C500 is of 'slim' construction, to be used as a building block in a P.C. system. The C250 unit is of flat construction designed for small to medium-scale applications, while the C120 is a 'component' type member for small to medium applications in a building-block system. All three models share a common programming language and can be used with common peripherals. The fibre optic linking system permits a large number of controllers and peripherals to be linked at widely separated sites over distances up to 52 km, according to the literature. Resistance to electrical noise is vastly improved as well reducing cabling requirements. ●

I'd like to thank both Lew Pogson and Tony Zom from the Wollongong College of TAFE for their invaluable assistance with this article. **Peter Ihnat**

THE NEW AEG LOGISTAT AO20 PROGRAMMABLE LOGIC CONTROLLER

IDEAL FOR LOGICAL CONTROL APPLICATIONS FROM MODEL RAILWAYS TO PLANT AUTOMATION

$663 (+Tax)

Readers of ETI can deduct 10% off price

YOU CAN PROGRAM THE LOGISTAT AO20 PLC FROM YOUR OWN COMPUTER OR ANY OTHER KEY BOARD WITH RS232 OUTPUT

Features:

RS232 Port

Communicate with the AO20 through Standard terminals, computers ... and over long distance via acoustic coupler/modems.

36 I/O's Expandable to 72.

16 Timers plus 16 Counters
Flexibility and Convenience.

2A, 250V Inductive load output relays Strength and Endurance.

EEPROM user Program Memory.
Eliminates back-up batteries, loss of program during power failure, time consuming UV erasing!

Compact.
218W × 290H ×93D mm

Nilsen Rowe Australia Pty. Ltd.

Phones:
Melb. (03) 347 9166 Syd. (02) 519 1422 Bris. (07) 52 5231 Adel. (08) 268 2300 Perth. (09) 443 1522 Rockhampton. (079) 27 3370 Townsville. (077) 75 2765

For further information on LOGISTAT AO20 PLC Send this coupon to NILSEN ROWE AUSTRALIA PTY LTD., P.O. Box 927, Carlton Vic 3053.

Name: .....

Address: .....

.....

I want to purchase an AO20 at the ETI readers price including sales tax $716.00 nett.
(Approx 5 weeks delivery)

My cheque/postal note herewith, or please debit my Bankcard Account Number
Card Holder's
Signature .....

Card Expiry Date .....

MOVING WAREHOUSE SALE

NEW KIT ELECTRONIC CROSSOVER

REF: EA NOVEMBER 1984

This much sought after kit is now finally available. The unit is for stereo with 2 crossover points for each channel for 3 way speakers.
Commercial units are almost double the price.
Kit comes complete with silk screened, punched rack front panel and quality English made Lorlin switches.
Cat. KA-1570

$199.50

DIESEL SOUND SIMULATOR WITH LIGHTING CIRCUIT FOR RAILMASTER

REF: EA NOVEMBER 1984

You will be amazed how authentic this kit sounds. Kit includes PCB and all parts for sound effects as well as all the components for the lighting circuit.
Cat. KA-1561

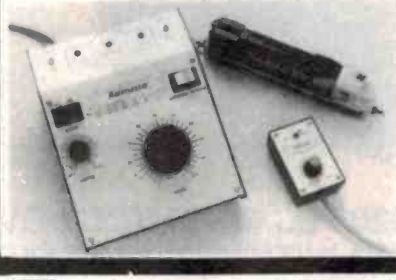
$19.95

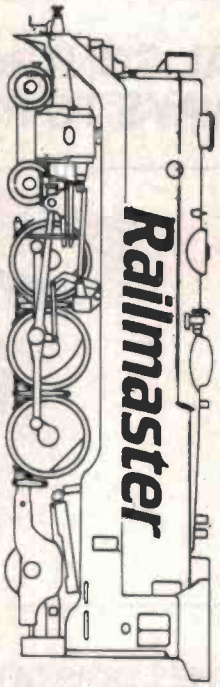
RAILMASTER KIT

REF: EA SEPTEMBER 1984

This is the most up to date train controller kit we've seen in a long time. It offers all those wanted features including inertia, full overload protection and walk around throttle. Kit includes front panel, correct console box and all parts.
Cat. KA-1560

$79.95



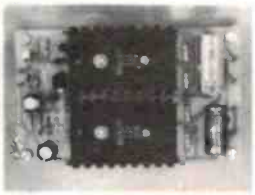


20 WATT LOW COST AMPLIFIER

Ref: EA NOVEMBER 1984

This amplifier module uses only a handful of parts and is simple to build. Kit includes pre-drilled heatsinks which mount on the board.
Cat. KA-1567

$17.50



BRAKE LAMP FLASHER

This little device will flash accessory brake lights three times when the brake pedal is depressed. If you've had a rear end collision you will know how handy this device is.
PCB and components only. REF: EA NOVEMBER 1984
Cat. KA-1564

$16.50

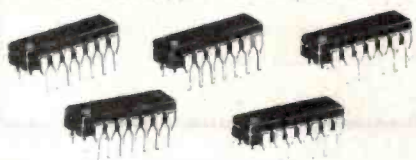
Jaycar ELECTRONICS

MANUFACTURERS SURPLUS IC'S UNBELIEVABLE SAVINGS

These would normally be up to double these prices.

ZK-8842	MM 5395 Tone dialler	$9.50
ZL-3567	LM 567 Tone decoder	$1.50
ZZ-8195	81LS95 Octal buffer	$2.20
ZV-1540	78L06 +6V 100mA Voltage Regulator	80¢
ZZ-8208	9368	$1.75
ZC-4916	74C32 Quad gate	50¢
ZC-4917	74C74 Dual flip flop	$1.50
ZC-4918	74C90 4 bit decade counter	$1.20
ZC-4919	74C107 Dual JK flip flop	80¢
ZC-4920	74C192 Decade up/down counter	$1.40
ZC-4921	74C914 Hex Schmidt trigger	$3.00
ZC-4980	74S287 1K bit PROM 256 x 4	$3.00
ZL-3348	LM 348 Quad 741	$1.50

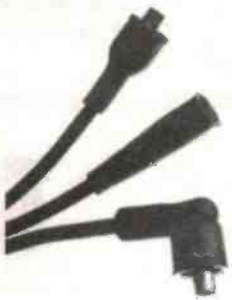
COMPARE THE SAVINGS



NEW H.T. (SPARK PLUG) LEADS Especially for electronic ignitions!! - By popular demand. . .

Jaycar is proud to announce that we have sourced a range of spark plug leads that are without doubt, the best commercial quality in the world! Why are they so good? Well, see technical review (in box). We stock a range of **15** different lengths with combinations of right angle and straight distributor cap entry. The other end all have identical spark plug covers. (Except for coil/dist leads).

Cat. No.	Description	Price
WA-5404	30cm cable, right angle distribution entry	$3.95
WA-5408	40cm cable, right angle distribution entry	$3.95
WA-5412	50cm cable, right angle distribution entry	$3.95
WA-5416	60cm cable, right angle distribution entry	$4.95
WA-5420	70cm cable, right angle distribution entry	$4.95
WA-5434	30cm cable, straight distribution entry	$3.95
WA-5438	40cm cable, straight distribution entry	$3.95
WA-5442	50cm cable, straight distribution entry	$3.95
WA-5448	60cm cable, straight distribution entry	$4.95
WA-5452	70cm cable, straight distribution entry	$4.95
WA-5456	80cm cable, straight distribution entry	$4.95
WA-5460	90cm cable, straight distribution entry	$4.95
WA-5474	30cm cable, coil-to-distributor straight	$3.95
WA-5478	40cm cable, coil-to-distributor straight	$3.95
WA-5482	60cm cable, coil-to-distributor straight	$4.95



TECHNICAL REVIEW - Most H.T. leads supplied originally with a vehicle consist of a rubberised sheath enclosing a central conductor of carbon or carbon-reinforced material. The carbon acts as a "distributed resistor" which helps to suppress ignition interference. Unfortunately, carbon is a very brittle substance. After a fairly short time the continued shock and vibration of the engine enviroment can cause the carbon conductor to break - often in many places. This becomes the weak link in the ignition system.

The new Jaycar ignition leads are ESPECIALLY MADE for electronic ignitions. Instead of a carbon filament, a flat ribbon wire is helically wound around many strands of fibreglass 'former'. The wire is resistive and a RF choke is formed by coiling the wire around the fibreglass strands. The inductance value of the choke is not sufficiently high to significantly impede the rise-time of the spark pulse, but it does help reduce RFI. The important thing to note, however, is the METAL to METAL contact between the resistor and your spark plug.*

If you own a Transistor Assisted or Capacitor Discharge ignition and still have the original leads, you could just be kidding yourself. Why invest a fortune in an electronic ignition system and still leave a very weak link still there?

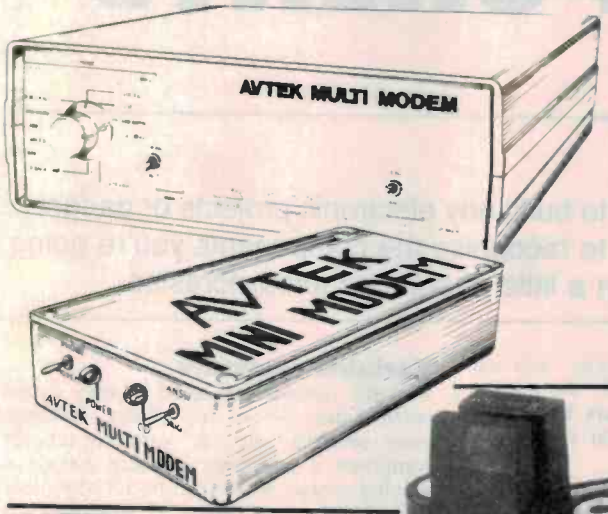
The leads are made in France and factory terminated. (The factory will not sell us the material in bulk because they feel that we would not be able to terminate it correctly). Sparkrite of the UK chose them because, in their opinion they are the best in the world. Each lead is fitted with a spark plug cover and rubber boot on the other end. (see list).

*Finally the Jaycar/Sparkrite plug leads are DOUBLE SHEATHED in a very high quality silicone rubber dielectric. The inner (white) insulator is super-flexible and the outer (red) sheath is designed to withstand abrasion. It, too is very flexible. Far more so than the plastic-type lead.

Fast talkers with all the right answers

MultiModem and MiniModem use the latest VLSI technology. Digital signal processing achieves functions normally requiring analogue filters. The result? Reliable data transfer on lines where most modems just won't go!

Cat. XC-4820



MultiModem only $349 inc. phone

Down the street or across the world, MultiModem speaks the language.

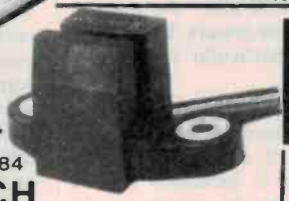
★ 300 baud full duplex, 1200 baud half duplex or 600 baud half duplex, answer or originate
★ CCITT and Bell standards
★ Auto answer and connect ability
★ Plugs straight in (hardwire phone)
★ Superior VLSI chip performance: works reliably with −43dBM signal with S/N ratio of 6dB. Error rate on this level is
★ Telecom approval C84/37/1135

MiniModem only $199 inc. phone

DUE FOR RELEASE IN NOVEMBER

Cat. XC-4825

★ 300 baud full duplex
★ Answer/originate
★ Plugs straight in (hardwired phone)
★ Superior VLSI chip performance (identical to MultiModem).
★ Telecom approval C84/37/1173



NEW - Ref: EA September 1984 HALL EFFECT SWITCH VANE INTERRUPTED

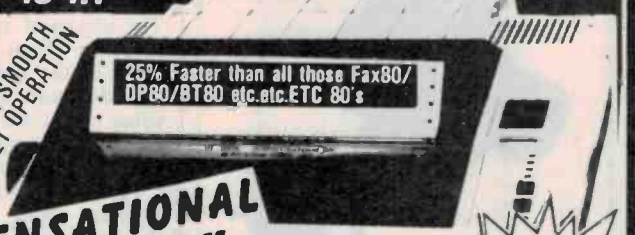
If you have a car that won't take the Jaycar KJ-6655 Hall Effect Kit (i.e. an Australian six or V8) this could be for you! It is the SIEMENS (German) made Hall Switch. It will operate from −30 to +130 C. A simple soft iron vane cut with appropriate slots will commutate the unit.
Cat HK-2101

$19.95

PCB to suit 84T19 $3.45

80 CPS Printers Are Out!! The New Micron 100 CPS is in

★ ULTRA SMOOTH QUIET OPERATION



SENSATIONAL PRINTER!!

$379

FEATURES. ★ Extra fast 100 characters per second ★ 192 ASCII characters (96 standard, 96 italic) ★ Bit image graphics ★ Friction and sprocket paper feed (100mm to 254mm paper) ★ Columns - normal/80, condensed/142, enlarged/40, condensed double width/71, elite/96, enlarged elite/48. ★ Logic seeking - bidirectional.
Cat. XP-4630

Ribbon to suit Cat. XP-4635 **$12.50**

IMPORTERS DISTRESS STOCK - 6" SPEAKERS

4 ohms impedance. Cat. AS-3011

WERE $6.95/$4.95/$2.95
SAVE A MASSIVE $5.00
NOW ONLY $1.95 ea
10 or more $1.60 each

IMPORTERS DISTRESS STOCK

This 400 gram spray can is specially formulated for automotive, marine, electrical and electronic applications.

★ Dries out wet ignitions
★ Protects all metals against rust or corrosion
★ Quickly penetrates and frees rusted parts
★ Lubricates close fitting parts
★ Stops battery corrosion and much more.

Cat. NA-1020

SAVE $3.00
ONLY
$3.95

PRODUCTS FOR THE MICROBEE

Multiply your Microbee's ROM capacity

The Avtek Multiprom Interface Kit allows you to extend the ROM capacity of your Microbee to 44K, or to a total of 308K by daisy chaining up to 6 boards. It takes 2532s or 2764s (can be mixed) and has 11 open collector outputs and eight buffered inputs; the outputs can drive relays etc., the inputs can monitor the status - perfect for alarms, machines, even your model trains! The address of the ports used for EPROM selection can be changed. You can quickly select between Editor/Assembler, WordBee, Logo, MiniPascal etc. with a few keystrokes.
Cat. XC-4880

$99

MultiROM Boards - XM1

Fit inside the MicroBee and lets you select say WORDBEE or EDASM from the keyboard. Suits all Bees with 8000 serial number (or earlier).
Cat. XC-4882

$19.95

XM2 As XM1 but suits all Bees with 9000 (MicroBee IC etc) serial numbers upward. Also responds to PAK1 and PAK2 commands
Cat. XC-4885

$29.95

microbee

Jaycar ELECTRONICS

Incorporating ELECTRONIC AGENCIES
NUMBER 1 FOR KITS

SHOWROOMS
SYDNEY: 117 York Street. Tel: (02) 267 1614.
CARLINGFORD: Cnr. Carlingford & Pennant Hills Road. Tel: (02) 872 4444
CONCORD: 115/117 Parramatta Road. Tel: (02) 745 3077
HURSTVILLE: 121 Forest Road. Tel: (02) 570 7000
MAIL ORDERS: P.O. Box 480, AUBURN 2144. Tel: (02) 643 2000
HEAD OFFICE: 7/9 Rawson Street, AUBURN 2144.
Tel: (02) 643 2000 Telex: 72293

SHOP HOURS	POST & PACKING	
Carlingford, Hurstville & Gore Hill	$5 - $9.99	$1.50
Mon-Fri 9am - 5.30pm. Thurs 8.30pm. Sat 12pm	$10 - $24.99	$3.20
Sydney	$25 - $49.99	$4.50
Mon-Fri 8.30am - 5.30pm. Thurs 8.30pm. Sat 4pm	$50 - $99.99	$6.50
Concord	$100 - $198	$8.00
Mon-Fri 9am - 5.30pm. Sat 4pm	Over $199	$10.00

COMET ROAD FREIGHT ANYWHERE IN AUSTRALIA ONLY $12

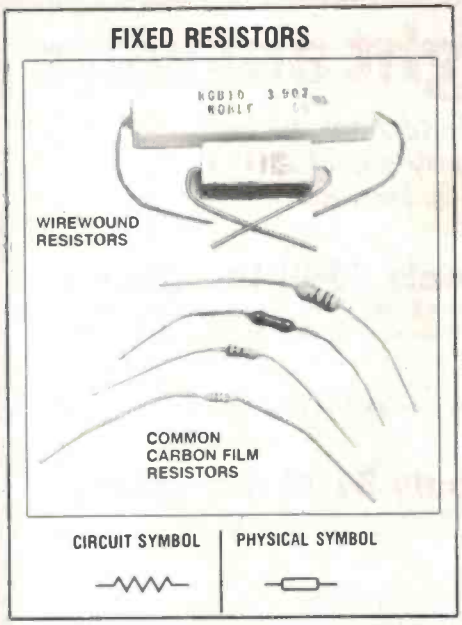
bankcard MasterCard VISA

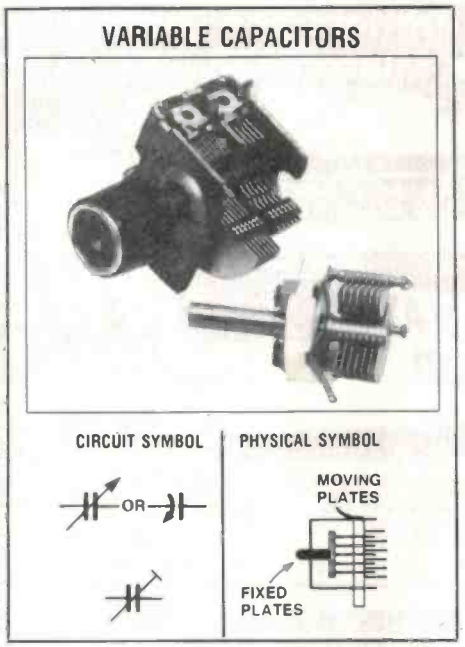
MAIL ORDER VIA YOUR PHONE

KNOW YOUR COMPONENTS

Roger Harrison

Before you can start to build any electronic projects or gadgets, you need to be able to recognise the components you're going to be using and learn a little about their idiosyncrasies.





THE FIRST HURDLE you'll face when starting out in electronics is recognising the components. At first, it will all seem a little confusing. Resistors, capacitors, potentiometers — they're all pretty straightforward, but the "jargon" will get you. Well, it exists for a good purpose. Jargon is a sort of "shorthand". Hence, potentiometer becomes "pot", electrolytic capacitor becomes "electro", etc. Don't worry about trying to learn it all off by heart first. It's best (and *easiest!*) to pick it up as you go along.

This article will give you a brief introduction to the common components you're likely to meet when constructing projects, so you'll have some confidence that you're picking up the right parts when assembling a project from an article. The panels show pictures of typical components you'll meet, their common circuit symbols and the physical symbols often used in layout and wiring diagrams. This way, you can come back to this article and "dip into" it at any time you feel necessary to familiarise yourself with a particular component or its symbol.

Fixed resistors

One of the most common components. The electrical value of a resistor is measured in *Ohms*. This is indicated on the body of the component by means of coloured bands, each colour used having a value code (and we'll explain it in the next part of the series). Some types have the value printed directly on the body.

As resistors dissipate power, they have a power rating measured in *watts*. Those shown in the picture here have ratings, in ascending order, of 1/8 W, 1/4 W, ½ W, 1 W, 5 W and 10 W. The value of a resistor will have a certain manufacturing *tolerance*, expressed as a percentage. Common types have tolerance of 5% and 10%. More expensive types have tolerances of 2%, 1% and ½%.

Modern general purpose resistors up to 1 W have a carbon film deposited on a tubular ceramic body. Close tolerance types have a special metallic substance glazed on the body. Leads are attached to the ends of the body.

For most applications, 5% or 10% tolerance resistors are perfectly adequate. Higher-power resistors employ a wire element wound on a former and sometimes encapsulated in a heat-resistant case (as in the picture).

Resistor values are available in a "preferred series": 10, 12, 15, 18, 22, 27, 33, 39, 47, 56, 68, 82. This is the "E12" series, which provides 12 values in the decade from 10 to 100. The decade below goes 1, 1.2, 1.5 ... etc. It's too expensive and unnecessary to produce values in even steps right through a range from one Ohm to millions of Ohms. The E6 series has six values in a decade, the E24 has 24 values, etc. The tolerance range of each value just overlaps (the maximum tolerance of one value overlaps the minimum tolerance of the next highest, etc). The E12 series is the most common range for both 5% and 10% tolerance types.

Variable resistors

Variable resistors are used to vary circuit performance — ie: as volume controls, tone controls, etc. A variable resistor comprises a resistance element having a moving contact which can be set anywhere between the end limits. There are two basic forms — the *potentiometer* (or pot) and the *trimpot*.

Potentiometers are made for *rotary* operation or *linear slide* operation (slide pots). The rotary types have a shaft which can be rotated for about 240-270 degrees of a full circle. Trimpots are either of the rotary type or multi-turn linear type. They come in two mounting styles — vertical or horizontal. Some types have the element "open", others enclose it.

Rotary pots can be *ganged*, with two units operated from the one shaft (as shown in the picture here), or have concentric shafts (one inside the other), allowing both controls to be separately operated by two knobs, one inside the other (often seen on car radios). Ganged pots are often found in stereo amplifiers.

Pots generally come in three or four values per decade: 10, 20 (and 25) and 50. Or — 1, 2 (or 2.5) and 5, etc. Trimpots are generally available in E6 series values (10, 15, 22, 33, 47, 68).

Most pots can tolerate about half a watt of power being dissipated in them, trimpots much less than that. If any appreciable power has to be dissipated by a pot, then *wirewound* types are used. These have a resistance wire element wound on a former, the moving contact passing over the wire wound on the former.

Common rotary pots have a 23 mm diameter body and a 6.5 mm diameter shaft. Sometimes the shaft has a "flat" on it, to allow the fitting of "press-fit" knobs which require no securing ("grub") screw. Some pots have a 16 mm diameter body and either a 4 mm or 6.5 mm diameter shaft. These are used where space is at a premium. Most potentiometers have "lug" connectors (as in the illustration) for soldering leads to, while some have pins which permit mounting the pot directly on a printed circuit board.

Fixed capacitors

Along with resistors, capacitors are amongst the most common components used in electronics. There is a positively *huge* range of varieties and types, but the ones most commonly encountered are: *polyester* capacitors (one of the "plastic" types), *ceramic* capacitors, *electrolytic* capacitors and *tantalum* capacitors (the last two are related). All capacitors have a *voltage* and *tolerance* rating. The capacitance is given in fractions of a *Farad* (further explained in a later chapter); pF, nF, µF.

Polyester (sometimes called "poly" type) capacitors consist of a thin plastic coil with a thin film of metal deposited on either side. This is "wound up" and leads attached to the two separate metal films. The assembly is then encapsulated in an epoxy material, usually coloured with a dye. The most common ones are coloured green and for that reason are commonly called "greencaps". They come in values from around 1 nF up to about 10 µF.

As they are generally required to be mounted on printed circuit boards, the leads come out one side at either end of the body: "radial" leads (see the illustration). Less commonly, the leads come straight out the ends of the body ("axial" leads). They are generally available in the E12 series of values (10, 12, 15, 22 ... etc). Voltage ratings vary from 50 V to 630 V. In use, a voltage rating is usually specified. The tolerance rating of commonly available poly capacitors is 10%, although 5% and 2% types are seen.

Ceramic capacitors consist of a disc or plate of ceramic with a metal film deposited on either side. Some types have alternate layers of metal/ceramic/metal/ceramic/metal ... etc, with alternate layers connected. Leads are attached to come out one side for convenient pc board mounting. They are available generally in the E12 series of values from under 1 pF up to 100 nF.

Depending on the ceramic material used, and the application, ceramic capacitors are available in voltage ratings from 50 V to 3 kV (or more!). Size varies considerably. Common types for non-critical applications will have a tolerance variation of as much as 50%. Other common types have a 5% or 10% tolerance specification. The type you need will usually be specified. More about this subject in later chapters.

Electrolytic capacitors manage to squeeze a hell of a lot of capacitance into a small package. Instead of ceramic or plastic, they use a special chemical internally. Because of this they are *polarised* and **must only be connected the correct way around.** The case usually indicates which lead is positive and which is negative.

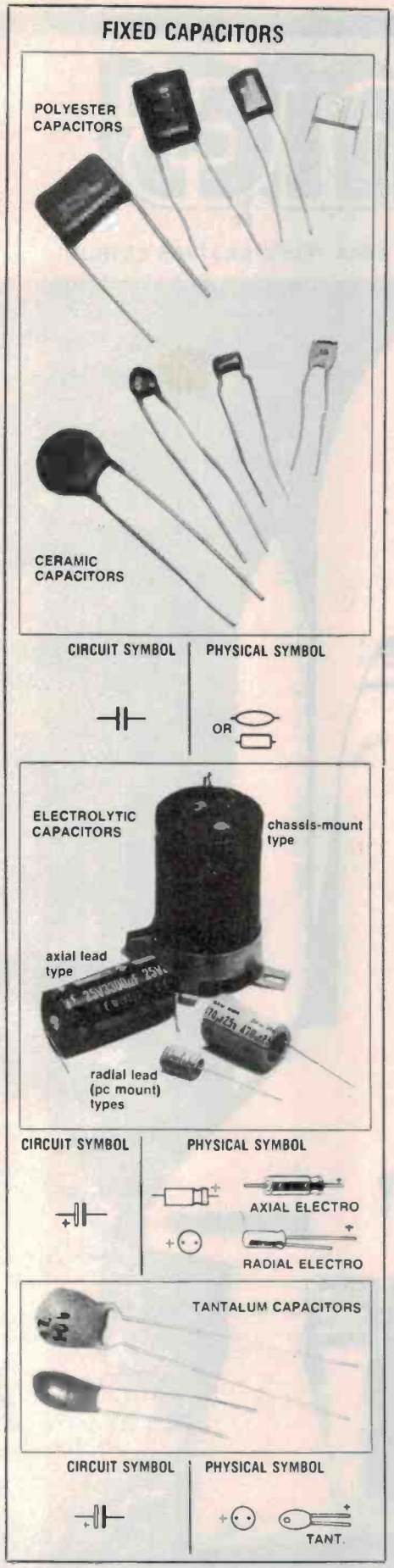
They are commonly available in the E6 range of values, though not all values in the range are widely stocked. In general, they have a wide tolerance — usually ±20% or more. Values available range from about 1 µF to 10 000 µF or higher. Both axial lead and radial lead types are generally available. A variation worth special mention is the "low leakage" (or LL) type for use in some critical applications. Voltage ratings for electrolytics vary from 6 V to 500 V. If substituting, always use a higher-voltage one of the same value.

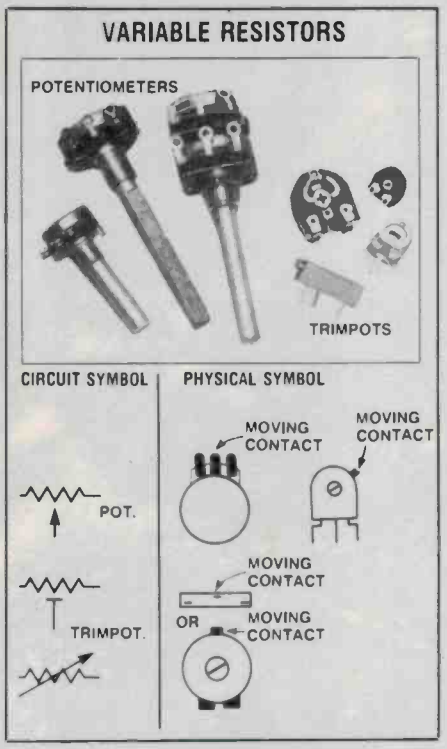
Tantalum capacitors are made from a mineral called "tantalite" (tantalum pentoxide). This type packs even more capacitance in a small package than electrolytics of the same size, but their voltage rating is generally lower. They are generally available in the same values as electrolytics, but have closer tolerance and perform better in certain applications.

Tantalums have generally lower voltage ratings than electrolytics, ranging from 3 V to 35 V for common types. Like electrolytics, **they're polarised and can only be connected one way around.** Some types have the value marked on the body, others employ a colour code.

Most capacitors have their value marked on the body, sometimes in a code — but we'll explain them in a later chapter.

You can always substitute a higher-voltage capacitor of the same value in a circuit, but not one with a lower voltage rating. Hence, if a capacitor is specified as, say, 100n/50 V, a 100n/100 V capacitor may be employed. But watch out that it will physically fit, as higher voltage capacitors are usually larger. ▶





ELLISTRONICS

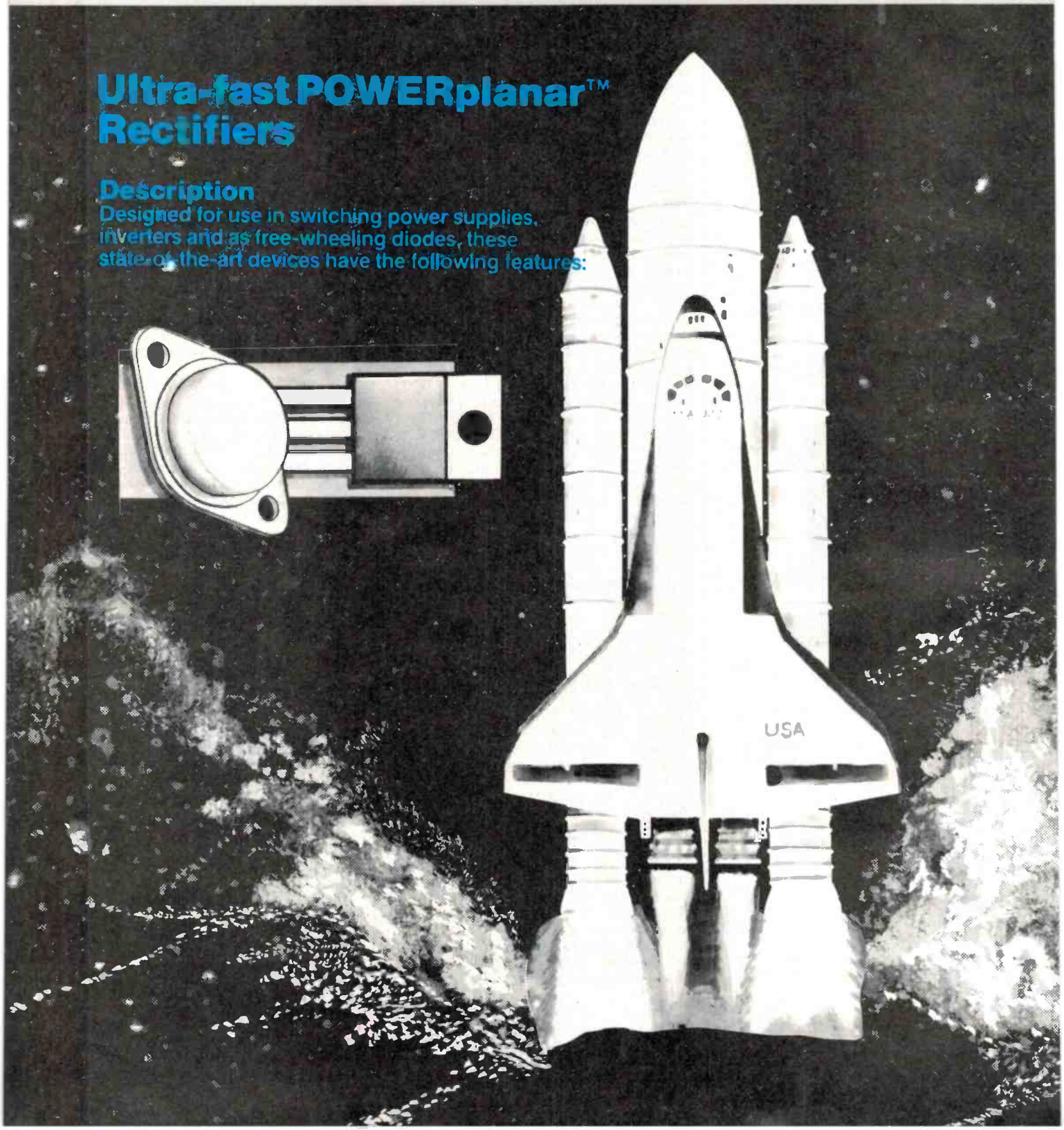
PTY LTD

797 SPRINGVALE RD. MULGRAVE, MELBOURNE, VIC. 3170. PH:(03)561 5844 TELEX AA37758 LSTRON

Ultra-fast POWERplanar™ Rectifiers

Description

Designed for use in switching power supplies, inverters and as free-wheeling diodes, these state-of-the-art devices have the following features:



ELLISTRONICS

PTY LTD

797 SPRINGVALE RD. MULGRAVE, MELBOURNE, VIC. 3170. PH:(03)561 5844 TELEX AA37758 LSTRON

POWER

FRP800 Series 8A, 50-200V
- Ultrafast 35 ns Recovery Time
- Soft Recovery (S > 0.5)
- Low $I_{R(REC)}$
- 150° C Operating Junction Temperature
- Popular DO-220 Package

FRP805 - $1.24
FRP810 - $1.44
FRP815 - $1.64
FRP820 - $1.75

FRM/FRP1600 Series 16A, 50-200V
- Ultrafast 35 ns Reverse Recovery Time
- Soft Recovery (S > 0.5)
- Low $I_{R(REC)}$
- 150° C Operating Junction Temperature
- Popular TO-3 and TO-220 Package

FRM1605 - $4.14
FRM1610 - $4.60
FRM1615 - $4.87
FRM1620 - $5.08

FRP1605 - $1.75
FRP1610 - $2.07
FRP1615 - $2.17
FRP1620 - $2.49

FRP1600CC Series 16A, 50-200V
- Ultrafast 85 ns Reverse Recovery Time
- Soft Recovery (S > 0.5)
- Low $I_{R(REC)}$
- 150° C Operating Junction Temperature
- Popular TO-220 Package

FRP1605CC - $2.07
FRP1610CC - $2.32
FRP1615CC - $2.53
FRP1620CC - $2.79

FRM3200CC Series 32A, 50-200V
- Ultrafast 35 ns Reverse Recovery Time
- Soft Recovery (S > 0.5)
- Low $I_{R(REC)}$
- 150° C Operating Junction Temperature
- Popular TO-3 Package

FRM3205CC - $4.60
FRM3210CC - $4.77
FRM3215CC - $5.19
FRM3220CC - $5.21

PRICES PLUS SALES TAX IF APPLICABLE

ELLISTRONICS NOW IN SYDNEY. 922 3220

Prices shown are for minimum quantities of 100 x each device - Larger quantities - prices on application. All prices correct at publication date.

FAIRCHILD

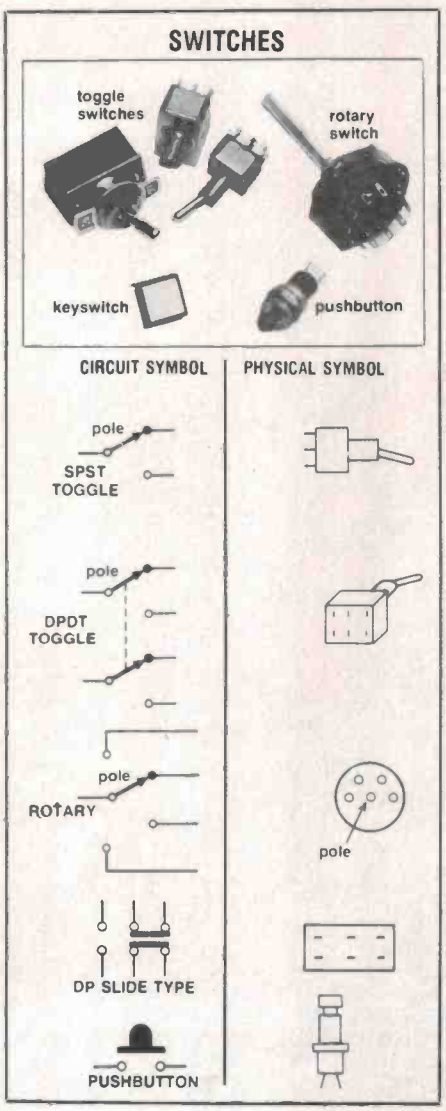
A Schlumberger Company

Variable capacitors

These are used generally in "tuned" circuits to vary the circuit's frequency of operation or to select frequencies. They consist of a set of "fixed" plates, mounted on a frame, and a set of "moving" plates fixed to a shaft which is rotated to vary the capacitance. Some types are ganged, with two or more sets of fixed plates in the frame and two or more sets of moving plates attached to the one shaft. This type is commonly seen in radios and tuners where several circuits have to be tuned in step with one another.

"Trimmer" types are also available, intended for presetting adjustment of a circuit. They generally employ similar construction principles but are adjusted by a flat-bladed tool.

Variable capacitors of differing varieties and constructions are available in values from around 10 pF to around 400 pF maximum capacitance.



Switches

Switches used in electronics come in a positively *enormous* range of types, styles, sizes and contact ratings. There are *toggle switches*, operated by a small lever, *rotary switches*, operated by a shaft which moves a "pole" contact from one fixed contact to the next, *pushbuttons* and *keyswitches*, and even *slide* switches.

All switches have a *pole* contact. This is a moving contact that can be set to link up with one or more fixed contacts. A switch with a single pole and one fixed contact is termed a "single-pole/single-throw", or **SPST**, switch. One with two fixed contacts, where the pole can be set from one to the other, is called a "single-pole, double-throw", or **SPDT**, switch. With two poles and one pair of contacts — it's a **DPST** switch; and with two poles and two pairs of contact, it's a **DPDT** switch. Less common types may have three poles. Some types come with a "centre off" position.

Rotary switches may have from one to six poles on a single "bank" (one wafer with all the poles and contacts). Multiple-bank rotary switches are also available.

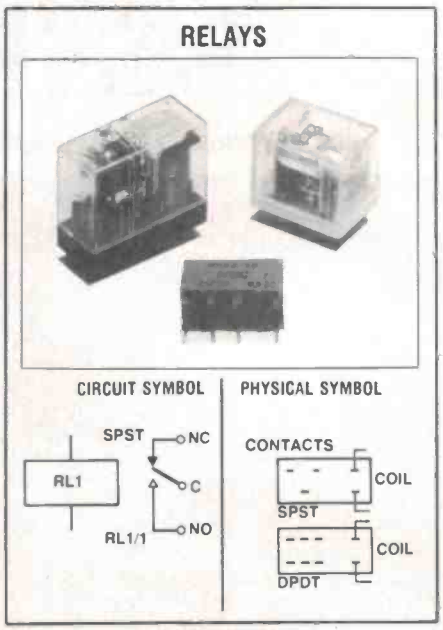
Pushbutton switches may have *momentary operating* contacts or *push-on/push-off* operation. Some have *normally open* contacts (push to close the contacts), while others have *normally closed* contacts (push to open). These are sometimes abbreviated to NO and NC, respectively. Keyswitches are similar.

Slide switches may have few or many pole contacts and several operating positions so that the pole may be switched to one, two or more contacts.

"But which is the pole and which are the contacts?" The wiring diagram for a project will generally indicate the appropriate connections. You can sort it out for yourself with a simple "continuity checker" or a multimeter set to the "Ohms" or "continuity" range — more about that in a later chapter.

Switches have an operating voltage rating and a contact current rating. Neither should be exceeded. Generally, the commonly available toggle switches are rated from 100 V/1 A up to 250 V/10 A. Common rotary switches may be rated to switch up to 100 V at up to 1 A, although they are not generally used for switching high voltages or large currents. Pushbuttons and keyswitches are not rated to switch substantial voltages or currents, and the same goes for slide switches.

Note that *some* switches, particularly rotary types, may have "make-before-break" or "break-before-make" contacts. In the former, the pole will contact the next fixed contact before breaking with the previous fixed contact. Such types are found in audio applications where this action prevents "clicks" or "plops" when changing functions. The break-before-make type completely disconnects the pole when moving from one fixed contact to the next. Unless specified otherwise, the break-before-make type is generally used.



Relays

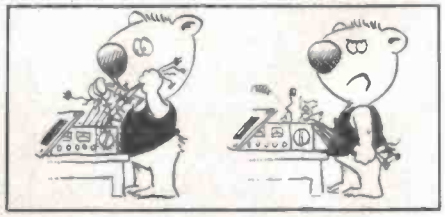
Relays are simply electrically operated switches. In a relay, an electromagnet operates a set of contacts when a current is passed through it. Like switches, they have contact sets which may be single-pole, double-throw (SPDT), DPDT, etc. Those with double-throw contacts are also referred to as "change-over" types.

Relays coils are generally rated to operate at a certain voltage, drawing a specified current. Sometimes only the coil resistance is specified. Always stick to the specified coil rating, unless an alternative is given. Substitutes *may* be made, but you need to know what you're doing. Leave that until you've had a little experience.

The contacts on relays have a voltage and current rating, just like switches. Stick to the specification when building projects, if you can. Note, however, that relays with a similar coil rating but higher contact ratings may be substituted.

Relays are available in a wide variety of sizes, ratings, contact sets and physical arrangements. There are socket-mounting types (sometimes called "cradle" relays after the style of socket), chassis-mounting types and printed circuit mounting types.

... to be continued.

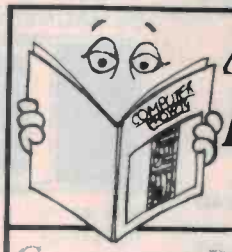


ELECTRONIC PROJECTS FOR CARS

Another topical book in the ETI collection of practical project publications. Containing over 20 projects for the electronic hobbyist interested in adding features and facilities to his vehicle, Electronic Projects for Cars over a whole varierty of topics — from test instruments to ignition systems, from monitoring instruments to accessories, plus a hole bunch of ideas for the experimeter. Among the topical projects are: ETI-316 Transistor-Assisted Ignition, ETI-319 Variwiper, ETI-333 Reversing Alarm, ETI-328 LED Oil Temperature Meter, ETI 324 Twin-range LED Tacho, ETI-325 Auto-probe Test Instrument, ETI-575 Portable Flourescent Light Wand, etc, etc.

All that, and only $4.95 — It's a steal!

If your local newsagent or favourite electronics supplier hasn't got a copy, you can obtain one by mail order direct from ETI Book Sales, Federal Publishing, 140 Joynton Ave, Waterloo, NSW 2017 for $4.95 plus $1 postage



ATTENTION HARDWARE HACKERS

Computer Projects Vol. 1 should be addressed to your input port now.

ENTER THE FOLLOWING DATA

- *A dozen projects to build!*
- *Mods to the '660 Learners' Micro.*
- *Mods for the Blue Label System 80.*
- *Intro to the STD buss.*
- *Modifying TVs for use as monitors.*

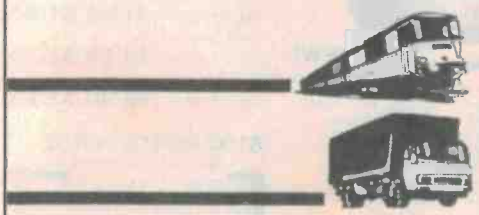
ADD-ONS TO BUILD

Among the projects described, you can build a **direct-connect modem**, an **RS232 Breakout Box**, a **serial-parallel interface**, a Microbee **Proportional Joystick Controller** or a Microbee **MultiPROM interface**.

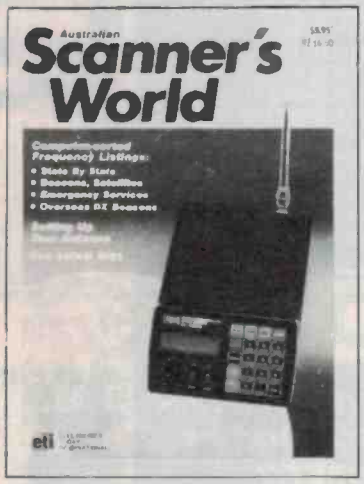
Or, of you want to start 'from scratch', you can build the **Little Big Board** complete Z80-based single-board computer featuring disk controller, two serial ports, STD buss and 64K RAM.

COMPUTER PROJECTS VOL.1
$5.95 at your newsagent
An Electronics Today International publication.

WHERE THE ACTION IS!



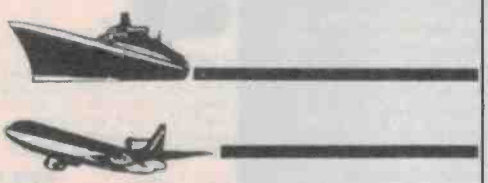
There's a whole other world of communications beyond 'the shortwaves'. Thousands of big businesses, small businesses, government and community services, amateurs and universities use the communications channels scattered from 30 MHz upwards.



How do you get amongst all this 'action'?
With a VHF/UHF scanner!

But you need to know a little more than how to hand over your money, take one home and plug it in.

Australian SCANNER'S WORLD is the book that will introduce you to that other world beyond the shortwaves. It contains an introduction to scanning and scanners, an article on scanner antennas including how to build two types for yourself along with how to erect antennas. The major part of the book is the "Listener's Guide", computer-sorted listings of services throughout Australia and NZ, with their frequencies listed in both frequency order and alphabetical order by service. Beacons are listed also, along with relevant overseas ones. A roundup of scanners, antennas and accessories is also included.



GET AMONGST THE ACTION!
Australian SCANNER'S WORLD

at your newsagent
$5.95

Rod Irving Electronics

425 HIGH STREET.
NORTHCOTE VICTORIA.
Ph:(03)489 8866 489 8131
48-50 A'BECKETT STREET,
MELBOURNE VICTORIA.
PH:(03)347 9251
Mail Order and
correspondance:
P.O. Box 235
NORTHCOTE 3070

★ 95% of our mail orders leave the same day

★ This month only, all orders over $100 and under 3kg freight free! (doesn't apply to account customers)

Mail Order Hotline

(03) 481 1436

POSTAGE RATES

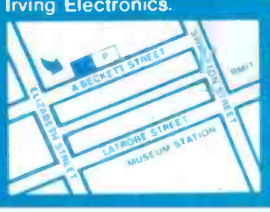
$1-$9.99	$1.50
$10-$24.99	$2.00
$25-$49.99	$3.00
$50-$99.99	$3.50
$100-$199	$5.00
$200-$499	$7.50
$500 plus	$10.00

Certified Post for orders over $100 included "free"! Registered Post for orders over $200 included "free"! Account orders from schools Govt. Depts., Public Cos., gratefully accepted. Min. order of $20. (or a min. $5 accounting fee will apply.) Comet Road Freight, Airmail etc. are extra.

welcome here

HAVE YOU BEEN INTO OUR CITY STORE???

Conveniently located on the edge of the city where parking is easy! Over 4,000sq. ft. of an extensive range of products and great "in store" bargains . . for those interested in computers we have a wide range on display upstairs. For good advice and a good price, see Rod Irving Electronics.



NEW JOINABLE PCB MOUNTING SCREW TERMINALS

Less than half the price of the old ones!

	1-9	10+
2 way Cat. P10542	$0.50	$0.40
3 way Cat. P10543	$0.75	$0.65

(please note these are the new blue ones.)

APPLE JOYSTICKS

Ideal for games or word processing.
Fits most 6502 compatable computers.

Cat. C14200 $19.50

PLASTIC LOGIC PROBE ENCLOSURE

The technical literature of many technical magazines offer various diagrams for logic probes, etc. Now you can build and use them efficiently within this plastic enclosure.

Cat. H10095 $11.95

DISK STORAGE BOXES

25's or 50's

Efficient and practical! Protects your disks from being damaged or lost. Solves all those hassles of finding "that" disk.
A must at these prices

Cat. C16025 25 Disk Box $29.50

Cat. C16050 50 Disk Box $49.50

RELAY AND BASE

Can carry 10A at 28V DC or 5A at 240V AC. Supplied with Chassis Mounting Socket with screw terminals. Great for school projects and demonstrations, switching DC power supplies, central circuits and with contacts parallel up to 20A can be switched. Normally $8.95

Cat. S14074 This month $6.95

MAGNETIC BULK ERASER

The best and by far the quickest way to erase tapes, cassettes and computer discs! Reduces noise levels below recorders own erase head level. On/off switch located in handle. 240V AC operation.

Cat. C14950 $29.50

10,000uF 75V ELECTROS

25% more microFarads! Ideal for those who want a more powerful amp!

	1-9	10+
Cat. R16587	$10.50	$9.00

ELECTRONIC CASSETTE DEMAGNETISER

Save $2. Rec. retail $19.95

Cat. A10006 This month $17.95

PHILLIPS SPEAKER SPECIAL

Cat. C12030 AD01610 T8 $13.95

Cat. C12040 AD02160 SO8 $34.95

Cat. C12045 AD70620 M8 $49.00

Cat. C12050 AD12550 W8 $79.00

You don't have to "Imagine" Phillips quality at these prices!

U.V. TUBES NEW!

Fits into standard 20W flouro holder. Suitable for Scotchcal, Eprom erasing etc. As used in ETI Eprom Erasing Kit.
WARNING: Do not look directly into UV Tubes!!
If ordering by mail please include an extra $2 for "SPECIAL" packing.

Cat. H29600 $24.95

POWERFUL MINI DRILL

Featuring a powerful 6000 r.p.m. motor, this lightweight (113gm) drill is ideal for many jobs. Perfect for PCB work! Has a 0.8 to 1.2mm chuck and 1mm drill bit.
Requires 12V 1 AMP fuse with M19010)

Cat. T12302 $10.95

SUPER HORN

NEW!

Wide dispersion tweeter, handles up to 100W
Sensitivity: 105dB/0.5m
Frequency Response: 3kHz-30kHz
Impedance: 8 OHMS
Size: 145x54mm

Cat. C12103 $12.95

VIDEO GAME COVER

NEW

Keeps dust and grime off the unit while not in use!

Cat. A15033 $5.95

COMPUTER PAPER

Top quality at a very affordable price. Blank 11x9 ½". 2,000 sheet, quality 60gsm bond paper.

Cat. C21001 $29.50

"IBM TYPE" COMPUTER CASING

Give you kit computer a totally professional appearance with one of these 'IBM type' casings. Includes room for 2 5¼ inch disk drives and connection ports. Dimensions: 49x39x 15cm.

Cat. X11090 $89.00

SUPER HORN TWEETER

NEW!

Requires no crossover and handles up to 100W!
Sensitivity: 100dB/0.5m
Frequency Response: 3kHz-30kHz
Impedance: 8 OHMS
Size: 96mm diameter

Cat. C12102

(Rec. Retail $12.95) $9.95

VCR COVER

NEW!

Keep the dust and grit out of your expensive VCR. Fits most VCR's and is made of heavy duty vinyl with a clear plastic front. Available in a variety of colours: Black, Beige, Brown and Silver Grey.
Size: 335(W) x 240(D) x 80(H)mm

Cat. A15031 $7.95

(Larger size also available)

BULK CABLE 100M ROLLS

300 OHM TV Ribbon
Cat. W11220 $10.00

2 Core speaker cable
Cat. W11216 $10.00

2 Core shielded
Cat. W11214 $30.00

DIGITAL MULTIMETER

YFE YF1100 FEATURES
- ★ Large, easy to read 3½ digit display.
- ★ Facilities for transistor and diode testing.
- ★ Clearly laid out front panel.
- ★ 10A DC/AC range.
- ★ Priced to undersell the others!

Cat. A16025 $59.50

MICRON DATASETTE

For data loading and saving, this Micron Datasette suits most home computers and features tape counter, monitor function for audio verification and slide volume control for output level.

Cat. C14900 $39.50

BLANK DATA CASSETTES

Brings out the best in any micro! Perfect for the Micron Datasette above!

1-9	10-99	100
$1.10	$1.00	$0.90

Cat. D11141

BULK 'IC' SPECIALS

	10+	100+	1000+
LM 324	$0.70	$0.65	$0.60
LM339	$0.70	$0.65	$0.60
LM555	$0.40	$0.39	$0.35
LM723	$0.60	$0.55	$0.53
LM741	$0.45	$0.40	$0.37
LM1458	$0.80	$0.70	$0.65
LM1488	$0.60	$0.57	$0.55
LM1489	$0.60	$0.57	$0.55

CANNON TYPE AUDIO CONNECTIONS

We've sold 1000's because of their great value!!

	1-9	10+
3 Pin line male Cat. P10960	$1.90	$1.80
3 Pin chassis male Cat. P10962	$1.90	$1.80
3 Pin line female Cat. P10964	$2.50	$2.10
3 pin chassis female Cat. P10966	$2.90	$2.20

S100 PROTOCARDS

SAVE $10 This month only.
Cat. H19125

Horizontal Buss
Cat. H19125 $29.50

Vertical Buss
Cat. H 19130 $29.50

Pad Per Hole
Cat. H 19135 $29.50

PUSH BUTTON DIALLERS

Tired of old fashion dialling and re-dialling engaged numbers? These convenient push button diallers include last number re-dial (up to 16 digits) and instructions for an easy changeover.

Cat. A12030 $19.95

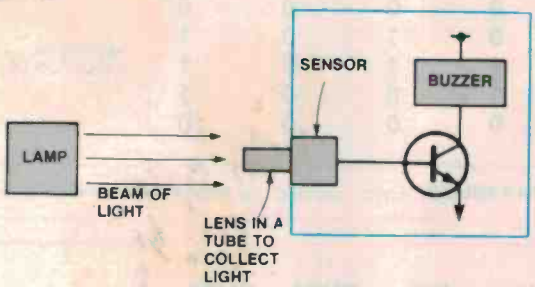
Errors and Ommissions Excepted

DIRECTIONAL DOOR-MINDER

Peter Ihnat

Most electronic door minders function by having a beam of light shining across a doorway interrupted, but are incapable of detecting whether the light beam is broken by a person entering or leaving the room. This project overcomes that problem with the aid of digital logic.

Figure 1a.

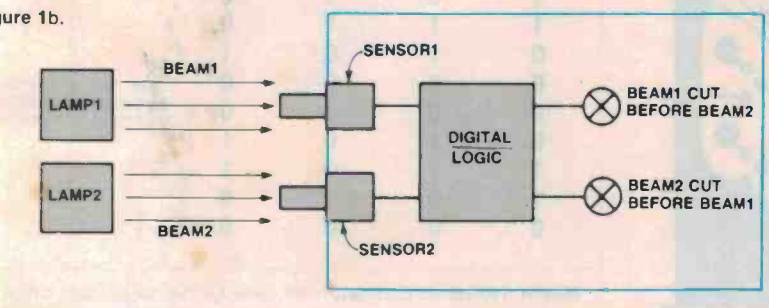


HAVE YOU NOTICED how annoying the buzz of a door minder is every time you enter your favourite bottle shop? What's usually more annoying is having the damn thing sound when you leave. Well, this project solves the problem. It will sound a buzzer (flash a light, operate a counter, etc) when a person either enters *or* leaves a room via the door being monitored. In other words, it senses the direction in which the person is moving.

This immediately opens up the field for much experimentation. For example, the circuit could be adapted to operate as an automatic light switch, that is, to switch the light on in a room when someone enters and off when they leave.

Another use would be to count the number of people entering the premises (similar to a turnstile counter). Or, if you really want to be clever, the two previous ideas can be combined so that the light comes on in a room when a person enters and then the circuit counts ▶

Figure 1b.



Above left.
Simple, Simon. Basic arrangement of a simple door minder. Break the beam and the buzzer sounds.

Left.
The 'directional' method. With two beams, two sensors and a bit of digital logic, one can sense in which direction the beams have been broken.

how many people actually come in. When the same number of people leave, the light switches off (see Ideas for Experimenters, ETI Nov. '82, p.60). But more of this fantasising later; let's look at some background.

Basics

The basic idea behind the operation of a Door Minder is to shine a beam of light across the doorway onto a light sensor which, by means of a simple circuit, controls a relay or transistor feeding power to a buzzer (see Figure 1a). When the beam is interrupted, the buzzer sounds. Simple!

The ETI-278 Directional Door Minder works on a similar principle except that two light beams and sensors are used (Figure 1b). Digital logic combines information from both sensors and, depending on which beam is interrupted first, switches one of the outputs on. Note that once one beam is cut, the circuit latches the appropriate output, which stays latched even if the second beam is now cut. The circuit will reset only when *both* beams return to being uninterrupted.

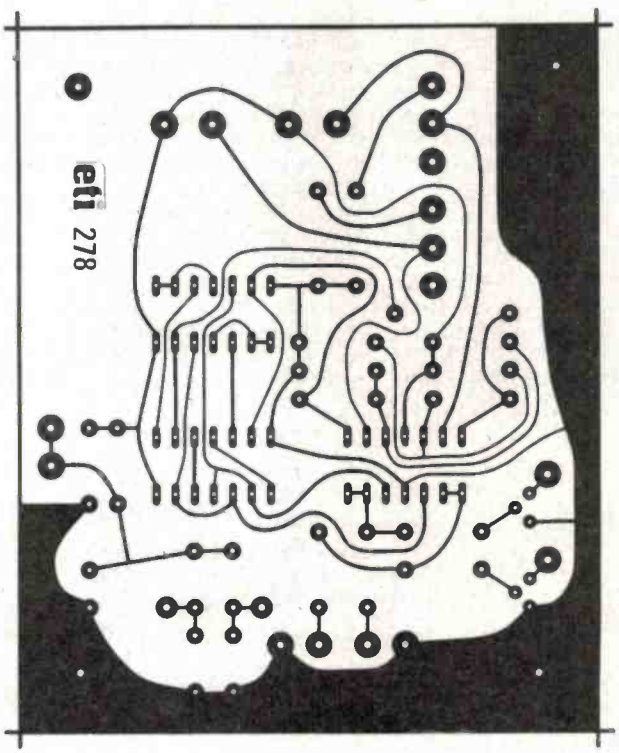
In a practical unit, only one light beam is required to illuminate both sensors. The operation is identical to the two-beam case and much easier to set up.

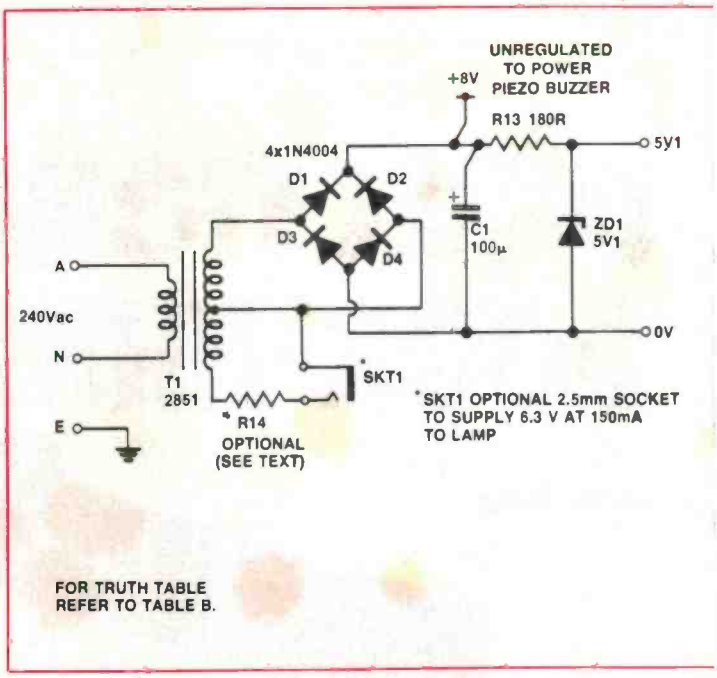
Construction

Begin construction with the pc board. First inspect the tracks to ensure that there are no breaks or shorts. See that all the holes are drilled and of the correct size. Insert the components in the following order — resistors, diodes, capacitors, IC sockets, trimmers and PCB pins. Check the orientation of diodes and the electrolytic capacitors.

The LEDs can now be fitted and, once again, check their orientation with the overlay. On the prototype they sit approximately 13 mm off the board. If your LEDs have shorter leads, then extend them with some lengths of hookup wire (discarded wire from resistor or capacitor leads will do).

Leave the ICs until the power supply has been tested (the last part of construction). ▶





FOR TRUTH TABLE
REFER TO TABLE B.

IN1	IN2	OUT1	OUT2
0	0	0	0
1	0	1	0
1	1	1	0

TRUTH TABLE A

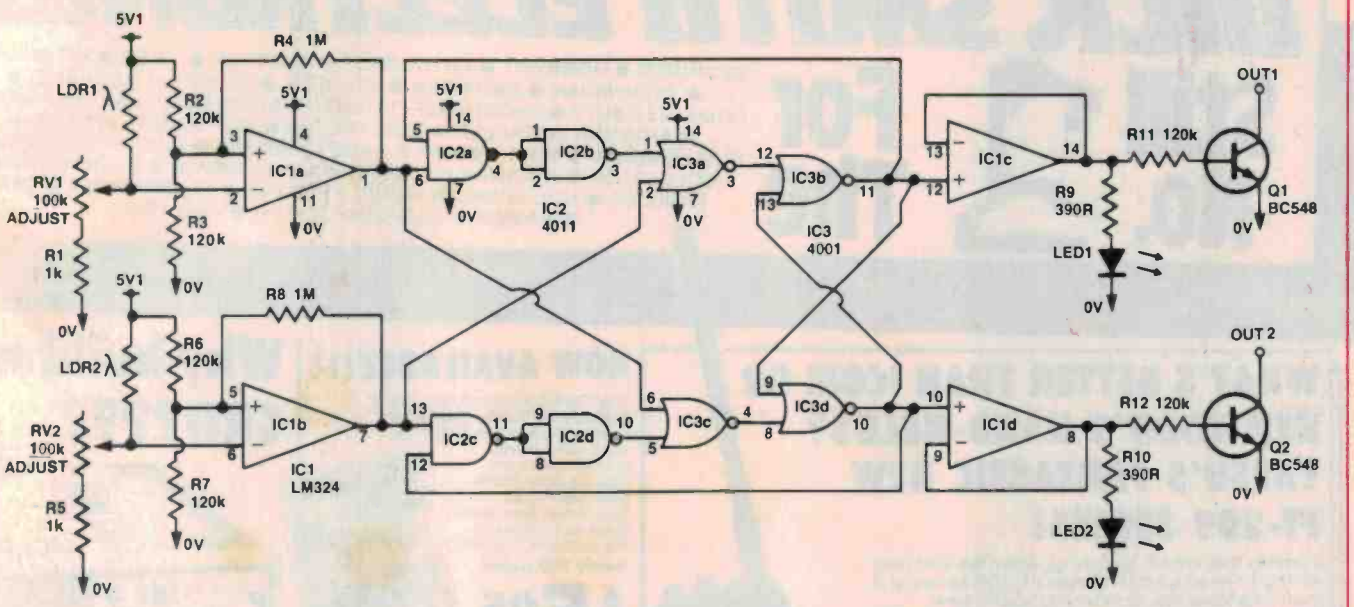
IN1	IN2	OUT1	OUT2	
0	0	0	0	MOVING IN DIRECTION OF 1 TO 2
1	0	1	0	
1	1	1	0	
0	1	1	0	
0	0	0	0	
0	0	0	0	MOVING IN DIRECTION OF 2 TO 1
0	1	0	1	
1	1	0	1	
1	0	0	1	
0	0	0	0	

TRUTH TABLE B: Logic required for the operation of a door minder.

IN1	IN2	OUT1	OUT2	
0	0	0	0	
1	0	1	0	
1	1	1	0	
0	1	0	1	THESE TWO LINES ARE IDENTICAL
0	0	0	0	
0	0	0	0	
0	1	0	1	
1	1	0	1	
1	0	1	0	
0	0	0	0	

THESE TWO LINES ARE IDENTICAL

TRUTH TABLE C: Complete truth table for the simple latch circuit.



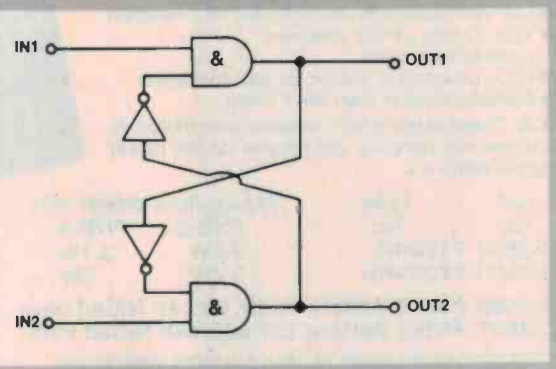
HOW IT WORKS — ETI 278

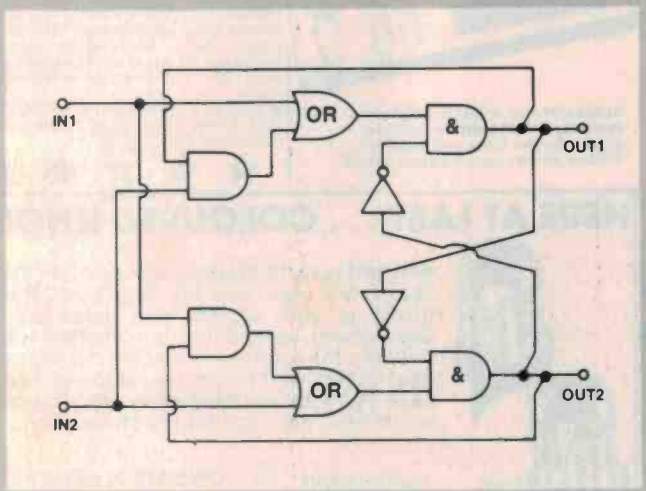
A general description of the operation of door minders is given in the main text. The circuit itself can be broken up into analogue and digital halves.

The analogue part is identical for both sensors so only one will be described. Sensor LDR1, RV1 and R1 form a voltage divider, the output voltage of which depends on the amount of light hitting the sensor (more light produces a higher voltage). RV1 acts as a calibration control and allows the range of voltage available from the divider to be adjusted.

This voltage is then compared with a fixed voltage (2.5 volts produced by divider R2 and R3) by IC1a which produces an output of 5 volts if the sensor voltage is *less* than 2.5 volts, and 0 volts if *greater* than 2.5 volts. Resistor R4 provides a small amount of hysteresis to avoid false triggering. Its value isn't critical and is normally the lowest value which still allows the device to operate. As a compromise, a value of 1M provides sufficient hysteresis for the current application.

The heart of the unit is the digital section. It logically determines which sensor first "sees" an interruption to its light beam and thus latches one of the outputs *until the interruption is removed*. A latch which almost does the job is produced by interconnecting two AND gates, as shown in the diagram above right.





If both inputs are low (assume this represents light beams uninterrupted), the outputs will be low. If input 1 goes high first (that is, beams are traversed in the direction 1 to 2), the corresponding output (OUT1) will go high and, via the inverter, put a low on the input of the other gate, thereby disabling it. If input 2 now also goes high (both beams interrupted), the circuit will remain latched and ignore that input (see truth table A). The operation is exactly opposite to this if the beams are traversed in the other direction.

This, however, is not the complete operation. Truth table B shows what a door minder requires if the two light beams are interrupted by an object moving from 1 to 2. Firstly, beam 1 is broken, followed by both beams broken, then only beam 2 broken and, finally, no beams broken. Output, once latched, should remain so until both beams return to being uninterrupted. Truth table C shows all combinations of inputs for the latch circuit described above. Note how lines 4 and 9 differ from those of table B. Extra circuitry is required to overcome this.

The solution to the problem is to operate the latch in the first instance by either input 1 or 2. Then, extra circuitry needs to be activated so that the output remains latched while input 1 or input 2 (or both) are present. The circuit shown on the left does this.

If input 1 goes high first, output 1 goes high, disabling output 2, and feeds back to enable the top left AND gate. Now, as long as any input is high, the top OR gate keeps feeding a high into the latch to keep output 1 high. Both inputs must go low for the circuit to reset.

The circuitry actually used in the current project is identical except that the AND, OR and NOT functions have been implemented with NAND and NOR gates.

DICK SMITH ELECTRONICS

Still No. 1 For The

BEGINNER ● HOBBYIST ● ENTHUSIAST ● AMATEUR ● CB'ER ● KIT BUILDER ● TECHNICIAN ● ENGINEER ● STUDENT ● QUANTUM MECHANIC ● COMPUTER BUFF ● SHORT WAVE LISTENER ● AUDIO BOFFIN ● TV REPAIRMAN ● ANTENNA INSTALLER ● ELECTRICIAN ● POP GROUP MEMBER ● BUSINESSMAN ● BOAT OWNER ● HANDY (WO)MAN ● CIRCUIT DESIGNER ● COLLECTOR ● NUCLEAR PHYSICIST ● VIDEO PIRATE ● BOOKWORM ● DABBLER ● HOUSEWIFE ● HOUSEHUSBAND ● TELEPHONIST ● CAR REPAIRER ● MAGAZINE EDITOR ● AND YOU!

WHAT'S BETTER THAN ICOM OR KENWOOD'S HAND-HELDS? YAESU'S FANTASTIC NEW FT-209 SERIES!

Coming this month (shipping, wharfies and God willing!) Yaesu's exciting new FT-209 series of 2 metre hand-helds. Combining all the best features of the FT-207, the FT-208 and the FT-203, (plus a few new twists of their own!) FT-209 hand-helds put YOU in control:

- 10 memories
- HUGE LCD display (frequency, split, keyboard info)!
- Direct entry keyboard with dual-function keys
- Full VOX operation with optional YH-2 headset
- Your choice of four different powers/capacities
- High/Low power switch for battery saving
- Actually smaller than the FT-208!

N.B. These sets are NOT supplied with batteries. Choose the batteries you require for the power output required:

Cat No	Type No	Max output power with FNB-3	FNB-4	
D-3502	FT209R	2.7W	3.7W	$359.00
D-3503	FT209RH	3.7W	5W	$399.00
D-3506	FNB-3 Battery 10.8V 425 Ah NiCad pack			$ 59.00
D-3507	FNB-$ Battery 12V 500mAh NiCad Pack			$ 69.00
C-4200	YH-2 Headset (for full VOX operation)			$ 29.00

NOW AVAILABLE!!!

The 1984/5 Wireless Institute of Australia Callbook – from your nearest Dick Smith Electronics store. Why travel across town – or wait for ages in the post: your local Dick Smith Electronics store has copies of the callbook in stock. Nearly 200 pages:

$5.95 B-2322

AT LAST . . . famous REGENCY brand hand-held scanner:

Here it is: a hand-held scanner that goes where you go. With 5 bands from 60 to 525MHz, it's ready for aircraft, emergency services, business, amateurs . . . you name it, it's there! Cat D-2815

ONLY **$379**

Why build a CRO????

ONLY **$299**

Who on earth would pay $229 for a kit which you may or may not get going . . .

with *'a few problems were encountered along the way'* and *'the manual itself a little difficult to understand'* or *'we had a few more problems . . . supplied the wrong sized pot nuts and the wrong sized nuts for the BNC connectors . . . mounting holes . . . had to be drilled in the front panel chassis because this had not been done'* or even *'most difficult job is the wiring . . . we found three problems with the wiring all caused by errors in the manual'* Gad!

(Quotes from Electronics Australia, October 1984).

For just $299 you can buy the **same CRO,** ready built, off the shelf, from your nearest Dick Smith Electronics store.

What's more, you'll get our famous 8-day money back satisfaction guarantee PLUS our 90 day guarantee on the CRO itself. Why bother mucking around with kits!!!

● DUE IN STOCK EARLY THIS MONTH! Dick Smith Ready Built 75mm CRO . . . Complete. Cat Q-1250

★ ★ ★ ★ ★

ONE FOR THE HOBBYIST'S JUNK BOX

What value! Scoop purchase of surplus switch assemblies as used by Telecom inside phones to cut off ringer & switch a LED instead. Yes, totally useless to you and us - but there must be about five bucks worth of A1 grade parts - circuit included!

DPDT C&K switch, LED, diodes, connecting wires. Grab a couple of these! Cat S-1550

ONLY **$1.95**

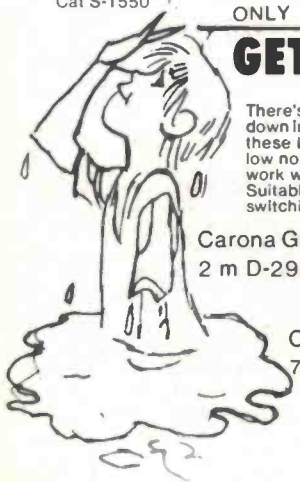
MISS OUT ON OUR TELETEXT DECODER KIT?

First the good news: we're making some more kits – so you don't have to miss out! And now the better news: we've made a scoop purchase of famous RADOFIN Teletext decoders – complete, built up and ready to use. So if you can't get a Teletext kit or don't want to build one, your problems are solved! Cat Y-8520 Strictly limited stock!

ONLY **$299**

Stocks of our K-6318 Teletext decoder kit should be back in stores by the time you read this. Please ask at your nearest store.

GET OUT OF THE MUD!



There's a signal there – but it's way down in the mud! Lift it out with one of these beauties! GaAsFETs for ultra low noise, 12V operated so they'll work with just about anything. Suitable for relay or pin diode switching.

Carona GaAsFET Preamp – 2 m D-2956 **$79.00**

Carona GaAsFET Preamp – 70 cm D-2955 **$89.00**

HERE AT LAST . . . COLOURED KNOBS!

Why put up with dreary black or silver knobs like every man and his dog use? **Really** dress up your project with these 'mazing spectacular splendiferous coloured knobs. Actually the knobs are black – but there's a neat insert which can be removed (just in case you want to change colours!) Fantastic for mixers, etc – to identify channels.

		ALL ONE LOW, LOW PRICE
Red	Cat H-3800	**$1.25** ea **$1.00** 10 up
Orange	Cat H-3802	
Blue	Cat H-3804	
Green	Cat H-3806	

STOCKTAKING BBAARRGGAAIINNSS!

Quick! Grab some of these amazing specials while stocks last. NOTE! NOTE!! NOTE!!! Not all items available in all stores. If you can't get what you want at your local store, another might have some left. But once these bargains are gone, that's it! Original prices shown are advertised or ticket prices on normal sale. Intermediate prices may have varied.

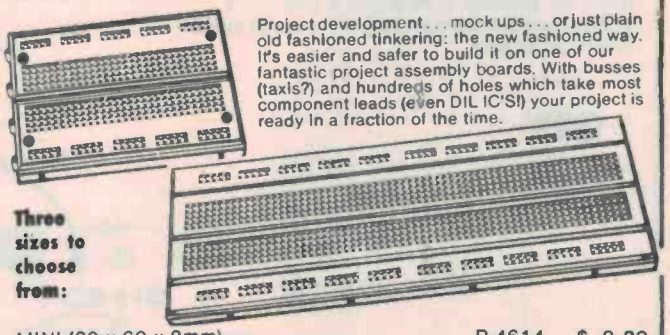
MANY OF THESE LINES ARE WAY BELOW COST. DON'T MISS OUT!

Item	Cat No	Original Price	While They Last	You Save!
TEAC A-505 Stereo Amplifier	A-1305	$249.00	$169.00	$80.00!
DSE Graphic Equaliser	A-1650	$175.00	$129.00	$45.00!
DSE PROfile belt-drive t/table	A-3080	$169.00	$119.00	$50.00
Famous brand BETA 3hr Video Cass.	C-3415	$15.95	$ 7.99	$ 7.96!
5W 6CH HH/held transceiver (27MHz)	D-1123	$125.00	$ 95.00	$30.00
UHF 40 channel CB 'Tiger'	D-1805	$375.00	$325.00	$50.00!
Antenna Quick Disconnect	D-4508	$ 7.90	$ 2.45	$ 5.45
HI-side Receive Crystals for hand-helds — three channels available (27.88 D-6123, 27.90 D-6125, 27.91 D-6126). All originally $5.95 each, now only $2.95 each. Save $3.00!				
BARGAIN KITS!				
LCD Control Timer	K-3085	$ 49.00	$ 19.00	$30.00!
Let Caller	K-3098	$ 19.95	$ 9.95	$10.00
Electronic Roulette	K-3389	$ 29.50	$ 14.75	$14.75
Allen Invaders	K-3393	$ 15.95	$ 9.95	$ 6.00
Remote Display for car computer	K-3405	$ 10.50	$ 8.50	$ 2.00
Loudspeaker Protector	K-3425	$ 14.50	$ 7.25	$ 7.25
System 80 Joystick inc Interface	K-3455	$ 49.50	$ 32.00	$17.50
Prototyper	K-3465	$ 69.50	$ 32.00	$37.50
Electrochune	K-3506	$ 75.00	$ 34.95	$32.05
Mosfet short form mono amp 150W	K-2525	$119.00	$ 89.00	$30.00
CRYSTALS: AT THESE STUPID PRICES YOU SHOULD GRAB SOME FOR THE JUNK BOX: YOU NEVER KNOW ...				
10MHz	K-6032	$ 4.95	$ 2.95	$ 2.00
2.304MHz	K-6034	$ 5.95	$ 2.95	$ 3.00
12MHz	K-6035	$ 5.95	$ 2.95	$ 3.00
FERRITE RODS (ideal for chokes)	K-6036	.50	.20	.30
CDI EYELET ASSEMBLY (no, we don't know what to do with them either — but they're bound to be very, very handy for something: just what you've always needed!) K-6001 30¢ 10¢ 20¢! OR: Guess what — we'll give you a few with every kit purchased from above list. If you find a good use, please let us know!!!)				
BARGAIN SEMIS (need some of these? Might be your very last chance!!!!!)				
CL 33 NPN Display driver	Z-1750	$ 1.00	.40	.60!
CL34 PNP Display driver	Z-1752	.45	.40	.05!
2N5590 15W RF output tranny	Z-2390	$ 8.90	$ 5.90	$ 3.00
2N6084 45W RF output tranny	Z-2394	$ 25.00	$ 9.95	$15.05
TA7214P Audio Power IC	Z-2504	$ 3.50	$ 2.90	$ 2.10
WO2 200PIV 1.5A Bridge Rectifier	Z-3300	.90	.45	.45!
LT204RT 5mm clear (red) LED	Z-4038	.45	.20	.25!
DL747 7seg RED LED display	Z-4127	$ 3.75	$ 1.75	$ 2.00
C122D 8A 400V SCR	Z-4330	$ 1.50	$ 1.00	.50!
TGS812 Gas Sensor	Z-4802	$ 9.50	$ 4.75	$ 4.75
7453 Exp 4 wide 2 inp ADI gate	Z-5053	.40	.30	.23!
7491 8 bit shift register	Z-5091	.73	.50	.23!
95H90 ECL Decade Counter	Z-5360	$ 9.95	$ 5.95	$ 4.00
8629 135MHz Divider	Z-5418	$ 6.90	$ 3.90	$ 3.00
MN3001 Audio Delay Line	Z-6035	$ 12.95	$ 6.25	$ 6.25
UAA170 LED Driver	Z-6290	$ 3.95	.95	$ 3.00
UAA180 LED Driver	Z-6292	$ 3.95	.95	$ 3.00

DICK SMITH ELECTRONICS PTY LTD

See insert for full address details.

LOOK MUM! NO MORE BIRDS NESTS . . .



Project development . . . mock ups . . . or just plain old fashioned tinkering: the new fashioned way. It's easier and safer to build it on one of our fantastic project assembly boards. With busses (taxis?) and hundreds of holes which take most component leads (even DIL IC's!) your project is ready in a fraction of the time.

Three sizes to choose from:

MINI (80 x 60 x 8mm)	P-4614	$ 9.20
BIG (175 x 67 x 8mm)	P-4615	$13.95
HUGE (178 x 172mm in 150 x 225mm holder)	P-4616	$29.50

What shape are your mags in?

DELUXE MAGAZINE BINDER

You know how it is: whenever you want a particular mag, Murphy beats you to it. File them for easy reference, our deluxe binder holds at least 12 issues of EA or ETI (even more if they get any thinner!). Mags cost a lot these days – protect your investment. Cat B-4045

$4.50

MAINS EQUIPMENT – SEE US FIRST!

Power points, light sockets, cord fittings – you'll find them all at your friendly Dick Smith Electronics store!

Double Power Point (10A)
Replace your single GPO's with doubles. Cheaper than a new point!
Cat P-5560 **$8.50**

Architrave Switch
Standard wall mounted (light) switch.
Cat P-5570 **$3.50**

Standard Mounting Box
Takes power outlets, large architrave plates, etc. Ideal for mounting on brick walls.
Cat P-5531 **$1.95**

Junction Box
As used by electricians everywhere. Includes BB Connectors.
Cat P-5625 **$3.30**

Blank Wall Plate
Covers over 'woopses' and moved power point holes. Standard size.
Cat P-5535 **$1.95**

Wall Board Clip
Allows new power outlets to be mounted on plaster, fibro or wooden walls. Simple!
Cat P-5530 **95¢**

Line (3 pin) plug
Make up your own extension cords – or replace the dangerous old plug on that appliance.
Cat P-5400 **$1.30**

Piggy Back Plug
handy – run two from the one outlet without a double adaptor.
Cat P-5405 **$2.20**

Side Entry Plug
Great when you've run out of room – behind stereos, etc.
Cat P-5402 **$1.35**

Suppressor 3 pin plug
Inbuilt capacitors for noise suppression. Fridges, motors, etc – you name it!
Cat P-5425 **$5.95**

Line Socket (3 pin)
The other end of the extension cord!
Cat P-5410 **$2.65**

Surface Socket
Gives standard 3-pin outlet pattern. Stereos, appliances, etc.
Cat P-5415 **$2.50**

LUGS, LUGS AND MORE LUGS

Lugs? We've got 'em. Solder Lugs. Quick Connect Lugs. Spade Lugs. Bullet Lugs. Etc Etc Etc. All at bargain Dick Smith Electronics prices!!!

SOLDER LUGS:

Pack 50 assorted solder lugs. Single and double ended types. Cat P-5044

$1.95 (Pack of 50).

SPADE:

Pack 10 male Cat P-5016 — MALE CONNECTOR for P-5012

95¢ ea.

Pack 10 female Cat P-5012 — QUICK CONNECTOR

95¢ ea. (Pack of 10)

COVER For P-5012 & P-5016

Pack 10 covers Cat P-5022

80¢ ea. (Pack of 10)

DOUBLE ADAPTOR

Pack 6 double adapt. Cat P-5026

95¢ ea. (Pack of 6)

BULLET:

BULLET TERMINAL (Male)

Pack 10 male Cat P-5006

95¢ (Pack of 10)

Pack 10 female Cat P-5008 — BULLET TERMINAL (Female)

95¢ (Pack of 10)

PLASTIC COVER TO SUIT ABOVE

Pack 10 covers Cat P-5009

50¢ (Pack of 10)

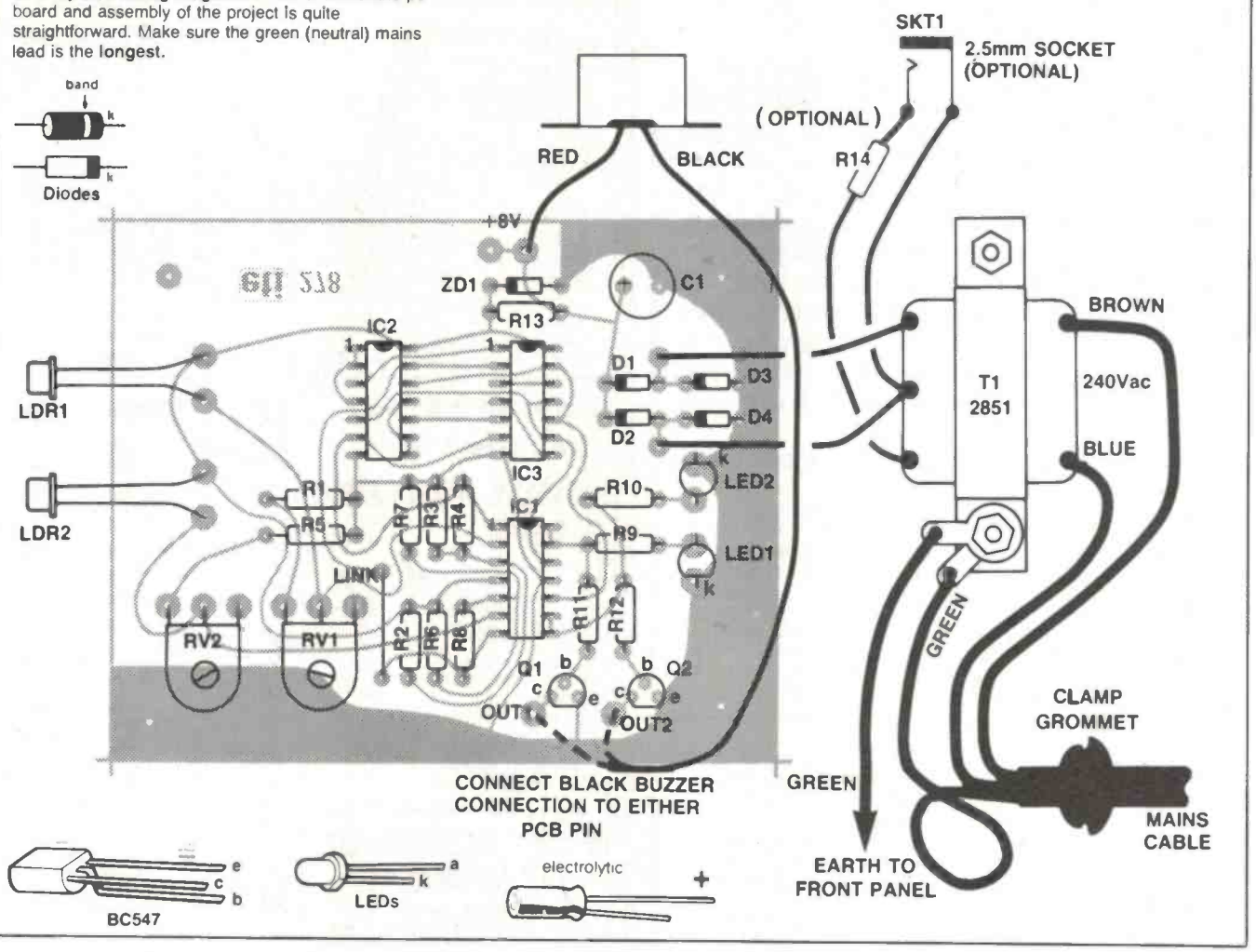
ROUND:

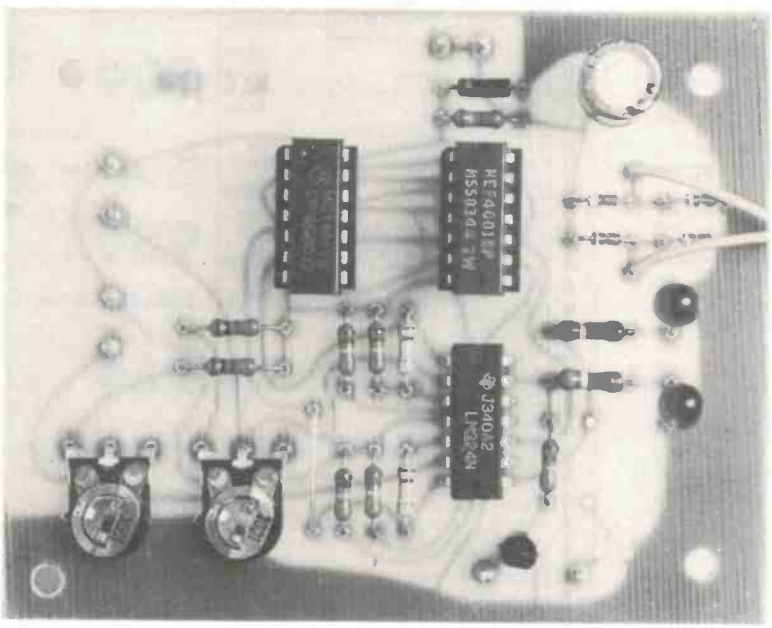
ROUND LUG 3/16" HOLE

Pack 12 (3/16 hole) Cat P-5032

80¢ ea. (Pack of 12)

Overlay and wiring diagram. Construction of the pc board and assembly of the project is quite straightforward. Make sure the green (neutral) mains lead is the longest.





Completed board. The completed board, Note that IC sockets may be used if you wish.

For a guide to components and kits for projects, see SHOPAROUND this issue.

PARTS LIST — ETI-278

Resistors.....all ¼ W, 5%
R1, R5.....1k
R2,3,6,7,11,12.....120k
R4, R8.....1M
R9, R10.....390R
R13.....180R
R14.....optional (see text)
RV1, RV2.....100k trimpots

Capacitors
C1.....100µ/25 V pc-mount electro.

Semiconductors
IC1.....LM324, µA324
IC2.....4011
IC3.....4001
Q1, Q2.....BC547/8/9
D1,2,3,4.....1N4002 or sim. 1A diode
ZD1.....5V1/1W zener
LED1,2.....5 mm red LED
LDR1,2.....Light-dependent resistor or cadmium sulphide cell, AL-12 or similar.

Miscellaneous
ETI-278 pc board; Scotchcal front panel; T1 — 2851 transformer (12.6 volt CT output); 50 x 90 x 150 mm zippy box; piezo buzzer; 10 pcb pins; 2.5 mm socket and jack plug (optional); 6.3 volt (or less) lamp (150 mA if powered by 2851 transformer) and reflector (see text); mains grommet and clamp; mains cable and plug; four 25 mm spacers; solder lugs, bolts, etc.

Price Estimate: $23-$30

The sensor unit can be made next (Figure 2). The prototype was made from a short length of 12 x 12 mm maple left over from a previous project, but any opaque material can be used. For example, plastic, aluminium, etc. I cut the maple in half lengthwise and drilled two 6 mm holes about 15 mm apart to hold the LDRs.

The actual LDRs used are a dual unit and I originally tried to use the two halves in the circuit. Unfortunately, one half interacted too much with the other so the idea was abandoned. Luckily, the LDR is quite cheap so it's no disadvantage to use two of them. Note that only one half of the LDR is used (it doesn't matter which).

Since there is no tag or mark to identify the leads of the LDRs, use the following method. If you look into the window of the LDR, it is possible to see where the external leads are connected to the "chip". At each connection, there is a certain pattern of lines. If you look carefully, you will notice that two of the patterns are similar and one is different.

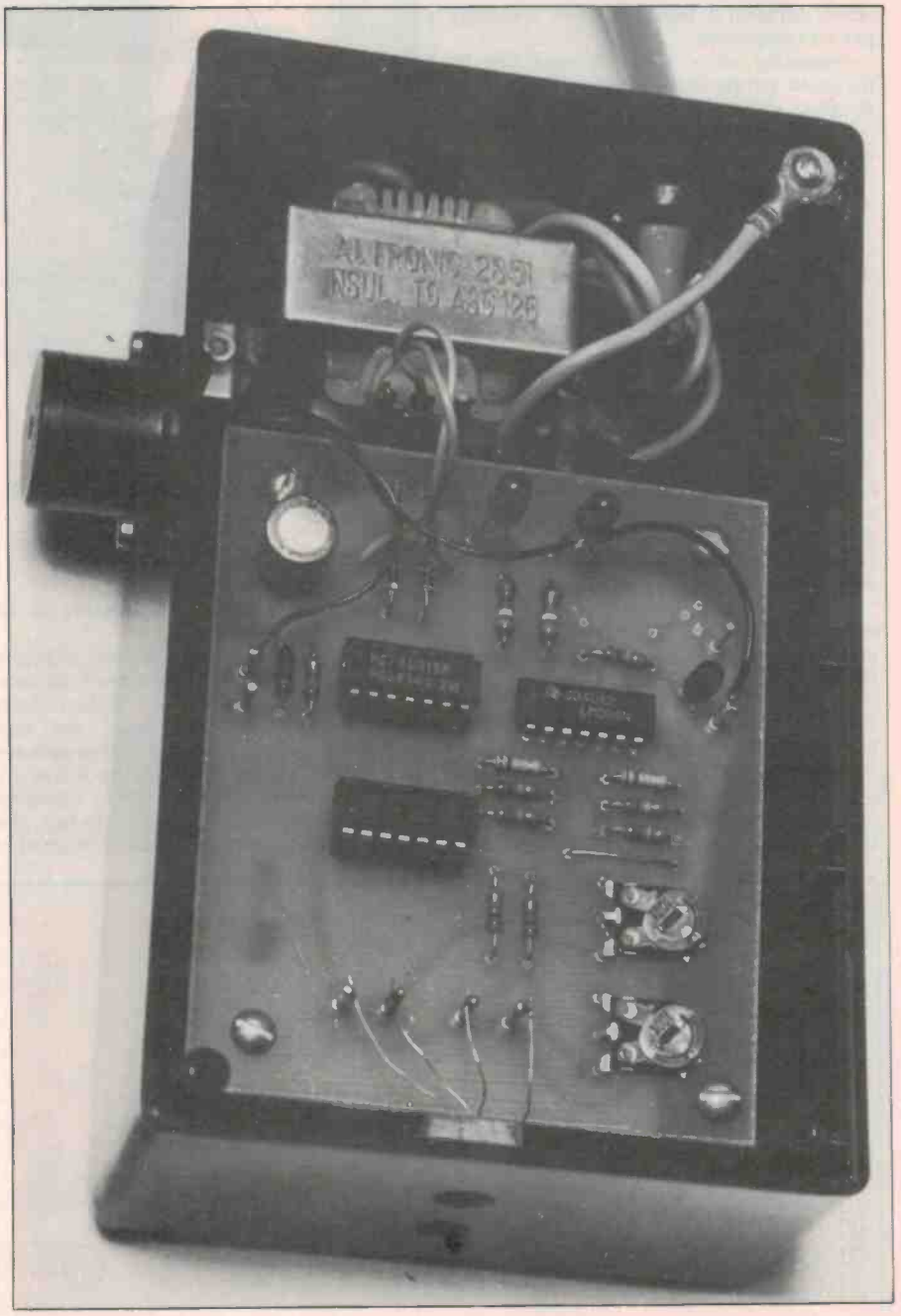
Simply use the lead which goes to the different pattern and one of the other two. Cut the unused lead about 3 mm from the body and, if you like, thread some spaghetti over the other two to ensure they don't short together. Both LDRs can now be glued into the block you drilled before and put aside until dry.

Next, the box. I used a 50 x 90 x 150 mm zippy box for the prototype but any other suitably-sized type may be used. Start by sitting the pc board and transformer inside and mark where mounting holes need to be drilled. Temporarily fit the lid and mark the positions of the two trimmer access holes and the holes for the LEDs; 3 mm holes should be OK for the mounting holes and 5 mm ones for the access ones.

Next, drill two 6 mm holes where the sensor unit is to be mounted and, the hard part, drill and file a hole to hold the mains grommet clamp. Finally, drill three small holes in the top to allow the buzzer to be mounted and its leads to pass through.

The unit can now be assembled. First, strip the mains cable to expose about 60 mm of the three internal cables. Fit the grommet clamp around the cable and push it into place in the side of the box. Solder the blue and brown wires to the 240 V connections of the transformer and bolt it into place. Then mount the pc board into the box on 25 mm spacers and connect the 6.3 V from the transformer to the board. It's now possible to apply power to the unit and check the 5.1 Vdc supply. If all is OK, switch off and plug in the ICs.

To complete the gadget, glue the sensor unit into its correct place, connect the leads to the pc board and mount the buzzer into place. The mains earth wire should be connected to one of the transformer's securing bolts and one of the front panel mounting bolts, as shown in the overlay.



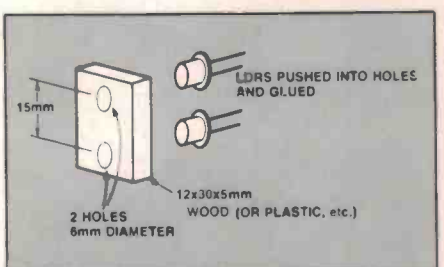


Figure 2. Showing the assembly of the sensors.

Using it

To check the unit, shine a torch onto the sensors and switch the unit on. Start the adjustment procedure with both trimmers turned fully anticlockwise — the LEDs should both be off. Turn one trimmer clockwise until a LED comes on, then back off slightly until the LED just goes out. Repeat for the other trimmer.

Now for the big test. Pass you hand between the torch and Door Minder. When you move your hand back and forth through the beam, first one LED will light and then the other. If not, check for solder splashes ▶

across adjacent pc board tracks or a wrongly placed component.

Assuming all is well, the unit can be mounted permanently on one side of the doorway to be guarded. Double-sided tape is not recommended to hold the unit to the wall. Either use small brackets or drill a couple of holes in a spare area at the back of the box and screw it to the wall.

The buzzer connects between the +8 volts pcb pin and either OUT1 or OUT2, as shown in the overlay. The connection used will depend on whether you want it to sound when a person enters *or* leaves the room. If you like, it's possible to place a SPDT switch between the buzzer, OUT1 and OUT2 to let you switch between the two cases.

The light source on the other side of the door can be created in a variety of ways. Figure 3 shows one possible method which uses the globe and reflector from a very cheap torch available from K-Mart or Coles. Disassemble the torch and fit the reflector and globe in a suitable plastic or wood box.

The globe can be powered by a separate supply or from the transformer in the main unit. If the latter, fit a 2.5 mm socket near the buzzer and connect it to the unused 6.3 V winding on the transformer. Two wires can then be run round the door frame to power the globe. Ensure that it requires no more than 6.3 V at 150 mA. If it runs on a lower voltage then insert R14 in series with the 2.5 mm socket. Its value can be calculated from:

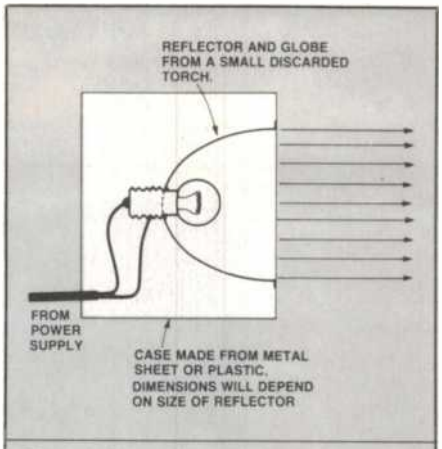


Figure 3. General arrangement of the beam light source.

$$R14 = (6.3 - V_{globe})/I_{globe}.$$

For example, a 2.5 volt, 100 mA globe needs R14 to be

$$(6.3 - 2.5)/100\ mA = 38\ ohms.$$

A 1 W resistor should be suitable in all cases.

Once the lamp unit is mounted opposite the sensors, switch on and adjust the two trimmers as described before. If there is too much background illumination, the unit may switch on but not off or may seem very insensitive. The problem can be solved by gluing two tubes into the sensor openings to make them more directional. In fact, if a much larger distance needs to be covered, a couple of small lenses should be used to focus the light onto the LDRs. Some experimentation may be required.

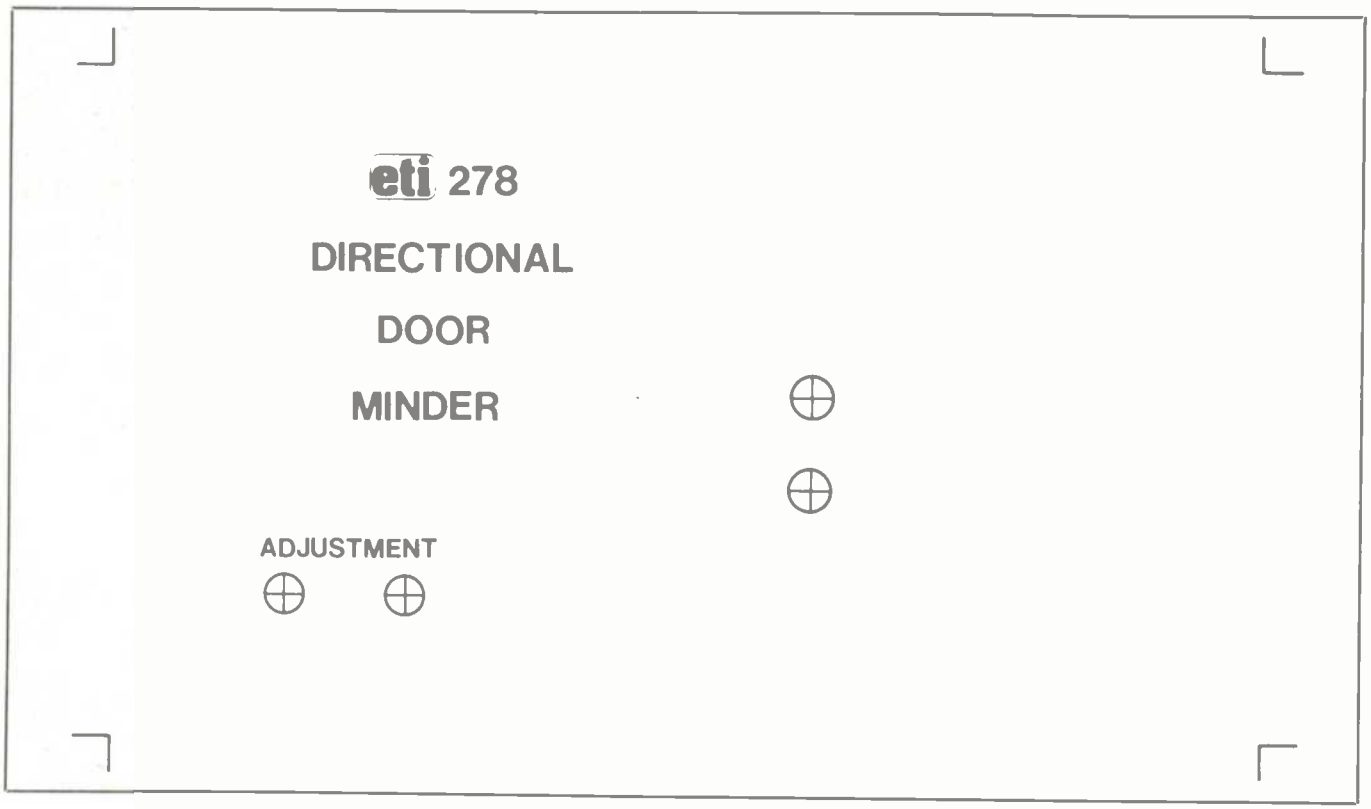
For experimenters

That completes the Door Minder in its basic form. For those readers who like to experiment, here are some tips. Firstly, to avoid running wire around the door frame to power the globe, try mounting the lamp and reflector on the main unit itself (bolt the assembly to the top of the main unit just above the sensors). Then fit a mirror to the other side of the door to reflect the beam back onto the sensors. Although not tried, it should work.

Since a 5.1 V supply is used to power the logic circuitry, the output can easily be made TTL compatible. Connect a couple of 1k pull-up resistors from OUT1 and OUT2 to the 5.1 V supply and two negative-going signals become available to feed a counter, computer or whatever.

If positive-going signals are required, take them from the outputs of IC1c and IC1d. Be careful, though, since these outputs may not swing high enough for some logic circuits due to loading by the LEDs and transistors. If this is the case, simply remove them.

To switch a light on and off, feed the two signals to the *set* and *reset* inputs of a flip-flop. The flip-flop output can then drive a transistor which switches a relay on and off. The possibilities are endless. I'll leave other ideas to your imagination. ●



WOOD FOR CHIPS ... WOOD FOR CHIPS ... WOOD FOR CHIPS ... WOOD FOR CHIPS ... WOOD FOR CHIPS ... WOOD FOR CHIPS ... WOOD FOR C

MEGURO PROFESSIONAL SCOPES AT HOBBYIST PRICES

20MHz MO-1251
2 CHANNEL WITH COMPONENT TESTER

$599.00 INCLUDING TWO (1:1/1:10) PROBES!

- Sensitivity: 5mV/div - 20V/div; 1mV/div at x5 MAG • Bandwidth: DC or 10 Hz - 20 MHz • Sweep Mode: NORMAL, AUTO
- Trigger Source: INT, CH2, LINE, EXT
- X-Y Operation; & Z-Axis modulation
- Component Tester: for R, L, C & diodes

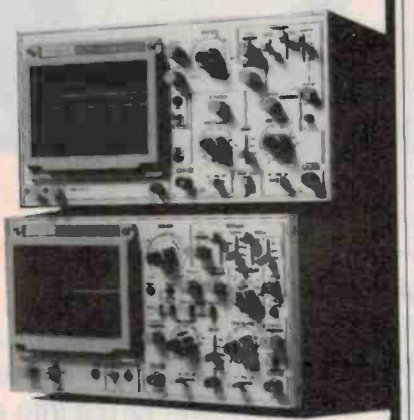
35MHz MO-1252
2 CHANNEL WITH TRIGGER DELAY

$849.00 REVIEWED E.A.Sept

INCLUDING TWO (1:1/1:10) PROBES

- Sensitivity: 5MV/div - 10V/div; 1mV/div at x5 MAG • Bandwidth: DC or 10Hz - 35 MHz
- Sweep Mode: NORMAL, AUTO, SINGLE, DELAY • Trigger Delay: INTEN'D, DELAY'D; 1us - 100mS • Trigger Source: INT, LINE, EXT, EXT/10 • X-Y Operation; & X-Axis modulation

BONUS FREE COVER WORTH $20.00



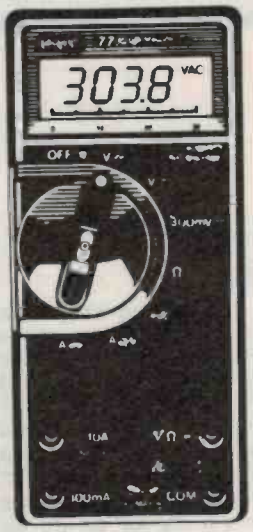
SPECIALS

TIC246D 16Amp 400V Triac	$1.96	10 off $1.30
TIC106A 5Amp 100V SCR	.99	.60
MM5740AAF-N Keyboard Encoder	$10.00	
2N3349	$1.00	.75
2N2904	.50	.35
LM311H TO-5	$1.00	.88

A-TEK BREADBOARDS

Ideal for circuit development and experimenters since you don't need to solder and un-solder components. Nickel plated contacts accept all DIP IC's and component leads from 22 to 30AWG. Will soon save its cost in time and elimination of damage to components.
We stock a wide range but the B-147 is our most popular with 512 groups of 5 Tie Points, 28 busses of 25 Tie Points and 4 supply terminals.
Toss out those rats nests and get on with the job!

$53.40

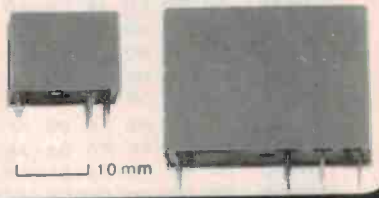


Fluke 77 $201.00

- Analog/digital display
- Volts, ohms, 10A, mA, diode test
- Audible continuity
- "Touch Hold" function
- Autorange/range hold
- 0.3% basic dc accuracy
- 2000 + hour battery life
- 3-year warranty
- Multipurpose holster

12V DC MINIATURE RELAYS

OUASS112D SPDT rated at 3A. 400ohm coil	$2.20
OUDESS112D SPDT rated at 5A. 320ohm coil	$2.50
OMISS112 SPDT rated at 10A. 270ohm coil	$4.10
OMISS212 DPDT rated at 5A. 270ohm coil	$4.33



MINIATURE METALLISED POLYESTER CAPACITORS

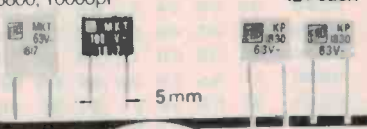
- Rated at 100V/63V dc • Extremely small (0.22uF is 2.5x6x7 .2mm) • 5mm lead spacing • MKT1817 and MKT1826

0.01uF, 0.015, 0.022, 0.033, 0.047, 0.068, 0.1uF **38¢ each**
0.15uF **44¢**, 0.22 **48¢**, 0.33 **58¢**, 0.47 **60¢**, 0.68 **$1.20**, 1uF **$1.40**

MINIATURE POLYPROPYLENE CAPACITORS

- Rated at 63V dc • Extremely small (4.5x6x7 .2mm!!) • 5mm lead spacing • KP1830

100pF, 150, 229, 339, 470, 680, 1000pF **36¢ each**
1500pF, 2200, 3300, 4700, 5600, 6800, 10000pF **42¢ each**



8.30 to 5 Monday to Friday. 8.30 to 12 Sat.
Mail Orders add $3.00 to cover postal charges.
Next day delivery in Sydney add $5.00.
All prices INCLUDE sales tax.
Tax exemption certificates accepted if line value exceeds $10.00.

GEOFF WOOD ELECTRONICS

GEOFF WOOD ELECTRONICS PTY LTD
Incorporated in N.S.W.
656A Darling St, Rozelle 2039
(One door from National Street)
Tel: 810 6845

bankcard
$10.00 minimum

specialising in electronic components for the professional and hobbyist.

Another application of the ETI-660 learners micro. With a bit of programming and some hardware you can turn it into a music tutorial to teach yourself the basics of musical notation.

See it, play it. The chord notation is shown on the screen (above) and the LEDs above the notes light up (right). The LEDs are mounted in a strip board positioned above the keyboard and driven by a decoder from the computer's output port.

Chris Darling


```
0C00- 1E 62 00 FF 00 FF 00 FF
0C08- 61 08 62 08 AC 2A D1 21
0C10- 72 04 32 1C 1C 0E 71 07
0C18- 31 16 1C 0A 62 00 61 16
0C20- AC 40 D1 21 72 04 32 24
0C28- 1C 22 FE 0A 4E 06 1C F4
0C30- 61 00 62 06 AF D0 D1 2F
0C38- 62 15 AF E0 D1 27 FB 0A
0C40- C0 0F 1D EE C5 01 A6 88
0C48- F0 55 AD 00 35 00 AD 20
0C50- F0 1E FA 65 81 30 82 70
0C58- 83 A0 87 40 64 03 65 07
0C60- 66 0A 4B 02 1E D8 4B 04
0C68- 1E D8 81 70 64 04 1E D8
0C70- F3 65 84 00 85 10 86 20
0C78- 87 30 69 F0 80 92 81 92
0C80- 82 92 83 92 69 0F 84 92
0C88- 85 92 86 92 87 92 6C 08
0C90- A6 60 F7 55 2D 50 1D 90
0C98- 1C B4 6A 20 68 00 A6 70
0CA0- F8 1E F4 65 AE 00 F4 1E
0CA8- DA 05 78 01 7A 06 98 D0
0CB0- 1C D8 1C 9E 68 00 6C 19
0CB8- 6A 19 A6 70 F8 1E F0 65
0CC0- 7C 06 00 FF 1F BA AE 0F
0CC8- DA 01 7A 02 9A C0 1C D2
0CD0- 1C C8 98 D0 1C 9A 1C B8
0CD8- A6 70 F3 65 A6 74 F3 55
0CE0- 00 FF 00 FF 6C 08 2D 50
0CE8- 0F A6 0F A6 1E 10 5F 1F
0CF0- 9F FD 06 3A EC D4 61 00
0CF8- 62 08 AF F2 D1 2D 1C 3E
0D00- F0 E5 E0 D0 C5 C0 B5 B0
0D08- A0 95 90 85 80 75 70 60
0D10- 55 50 45 40 30 25 4F FB
0D18- FF 5D 8D FC 08 AD 30 36
0D20- F0 FA E0 D0 DA C0 CA B0
0D28- A0 AA 90 9A 80 8A 70 60
0D30- 6A 50 5A 40 30 3A FD BB
0D38- 3A 16 D4 04 B2 C0 00 03
0D40- F8 05 BF F8 83 AF F8 00
0D48- 5F 1F 9F FD 06 3A 46 D4
0D50- 68 00 A6 60 F8 1E F0 65
0D58- 69 10 6A 00 80 95 8A C4
0D60- 30 00 1D 5C A6 70 F8 1E
0D68- 80 A0 F0 55 78 01 38 04
0D70- 1D 52 00 EE 70 04 A6 B0
0D78- F0 55 A6 88 F0 65 80 45
0D80- 00 FF 00 FF A6 B0 F0 65
0D88- 4F 00 80 65 AE 0F 1F C4
0D90- 6D 04 4B 00 6D 01 4B 01
0D98- 6D 03 4B 02 6D 03 A6 E3
0DA0- FD 55 A6 64 F3 65 A6 74
0DA8- F3 55 3B 00 1F 3A 1F 56
0DB0- 00 09 02 00 04 05 02 07
0DB8- 05 09 04 07 A6 64 F0 65
0DC0- 77 03 40 00 1D CE 74 06
0DC8- AE 00 F0 1E D4 75 74 06
0DD0- 1F 56 F8 06 BF F8 AF AF
0DD8- 0F FA 1F FC 01 5F 4F FF
0DE0- 10 33 E7 0F FF 0E 5F D4
0DE8- A6 B0 F0 65 1E F6 4B 00
0DF0- 1C 44 62 0B 82 05 3F 01
0DF8- 1C 40 1E 42 1C 40 1C 44
0E00- 00
```

```
0E00- 00 E0 A0 E0 00 80 80 E0
0E08- A0 E0 50 F8 50 F8 50 80
0E10- 6A 20 68 00 7A 06 A6 70
0E18- F8 1E F4 65 74 05 66 38
0E20- 85 00 85 65 4F 01 80 65
0E28- AE 90 F0 1E DA 47 78 01
0E30- 98 D0 1E 36 1E 14 0F A6
0E38- 0F 00 0F 76 0D 40 0F 9A
0E40- 1C 40 C5 01 35 01 1E 50
0E48- AD B0 F0 1E F0 65 1C 46
0E50- 40 02 60 01 40 05 60 03
0E58- 40 07 60 04 40 00 60 09
0E60- 1C 46 0E 6E F0 0A A6 A0
0E68- F0 55 00 E0 1C 02 F8 04
0E70- BF BD AD F8 80 AF F8 FF
0E78- 5F 1F 9F FD 06 3A 76 F8
0E80- 0F BF F8 D0 AF F8 05 BD
0E88- F8 03 AD C0 0D 16 04 07
0E90- E0 D0 D0 E0 D0 D0 E0 C0
0E98- F0 90 90 F0 90 90 90 90
0EA0- F0 90 80 80 B0 A0 E0 F0
0EA8- F0 80 80 E0 80 80 80 80
0EB0- F0 80 80 E0 80 80 F0 F0
0EB8- C0 A0 90 90 90 A0 C0 C0
0EC0- F0 90 80 80 80 90 F0 F0
0EC8- E0 D0 D0 E0 D0 D0 E0 C0
0ED0- F0 90 90 F0 90 90 90 90
0ED8- A6 50 F3 55 A6 88 F0 65
0EE0- 70 10 81 00 82 00 83 00
0EE8- 81 44 82 54 83 64 A6 88
0EF0- F3 55 A6 50 1C 70 A6 70
0EF8- F8 1E F0 55 78 01 1C C6
0F00- F8 06 BE BC 1D 1D 1D F8
```

PROGRAM LISTING

CHORD TUTOR

HUMAN NATURE is a funny thing. It's easy to get involved in a video game, but difficult to spend some time educating yourself, even though both processes may involve being in the same place and doing substantially the same thing, i.e: entering data into a terminal. The makers of some video software have recognised this fact and responded by making their educational packages more and more like games. This is such a package.

The problem is to develop a good method of teaching musical notation, i.e: the relationship between the note as it sounds and appears on the keyboad, and as it is written in a page of music. This is the first step that everyone must overcome if they wish to learn music properly. There is only a certain amount you can do by listening to records and trying to get the same sound on your guitar!

In this configuration the '660 will present you with a note or chord displayed in the correct notational form. The object of the exercise is then to predict the LEDs that will light a few seconds later. The LEDs are located in position over the keys you should operate in order to play the note. We developed a prototype to operate on a piano, but the applications to a guitar or other instrument should be obvious, and we leave it to your imagination.

It is possible to choose to learn about the individual notes, major and minor chords and major and minor sevenths. In either case it is possible to select the speed with which the LEDs indicate the chords, and whether in bass or treble clef.

Chords are presented in a purely random fashion, to avoid any possibility of the operator predicting them. If you persevere with it, you will wind up in a position where, just like a touch typist, you don't even need to think about reading the notes. When you see the appropriate symbols, your fingers will move to the correct place. Then you'll be able to concentrate on learning the music, not the notes!

Construction

Since the printed circuit board carries only a single resistor and two ICs, it should be pos- ▶

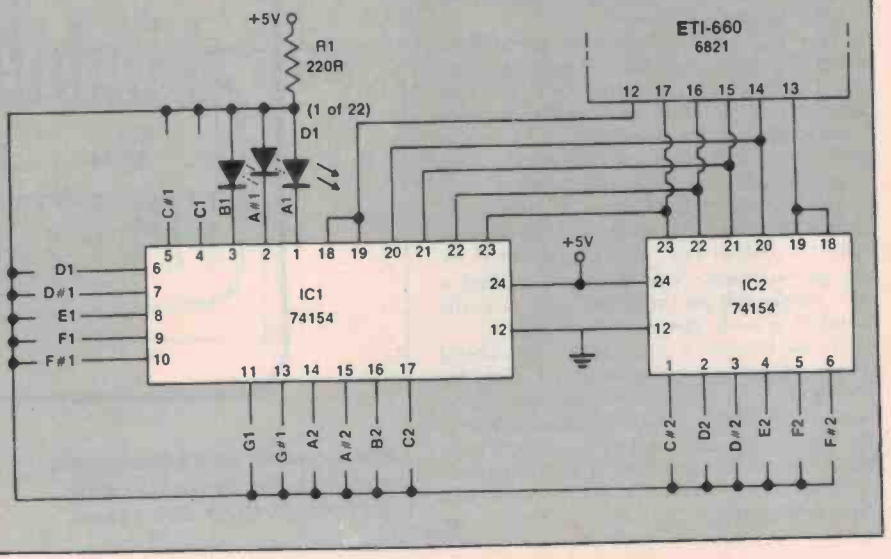
```
0F08- 88 AE F8 F0 AC 0C 2C 5C
0F10- 2D 9D 3A 15 D4 F8 06 BF
0F18- F8 83 AF EF F8 00 5F 62
0F20- 2F 2F F8 FF 5F 62 F8 2D
0F28- 5F 62 2F 2F 4E 5F 62 0C
0F30- FF 01 5C 32 07 30 10 10
0F38- 09 10 A6 70 F0 65 66 38
0F40- 85 00 6F 00 85 65 4F 01
0F48- 80 65 AE 90 F0 1E 64 00
0F50- 67 24 D4 77 1D BC 6C 02
0F58- 2D 50 4B 00 1C 98 4B 01
0F60- 1F 72 AF E7 4B 03 AF EC
0F68- D4 75 74 08 AF EC 4B 04
0F70- D4 75 0F A6 1C 98 F8 04
0F78- BF F8 83 AF 8F FA 0F AE
0F80- FD 02 3B 8C 8F FB 82 32
0F88- 14 1F 30 7C 8E FA 0F FF
0F90- 08 AE 33 7F F8 00 5F 30
0F98- 89 5F EF F8 07 BF F8 02
0FA0- AF F8 F0 5F 62 D4 F8 06
0FA8- BF F8 A0 AF 0F FC 01 FE
0FB0- BD FE FE FE BF 2F 9F 3A
0FB8- B5 D4 64 13 66 0E 70 02
0FC0- 4E 06 1D 74 3B 00 1E F6
0FC8- A6 B0 F0 55 0D D2 1D E8
0FD0- 04 0A 0A 0A 0A 0A 0A 0C
0FD8- 08 18 28 48 9C AA AA 8A
0FE0- 8A 4A 3C 08 08 28 30 C6
0FE8- AA 92 82 00 F0 10 10 10
0FF0- 10 10 78 8C 8D CC CC 0C
0FF8- 0D 0C 08 08 10 20 40 C0
```

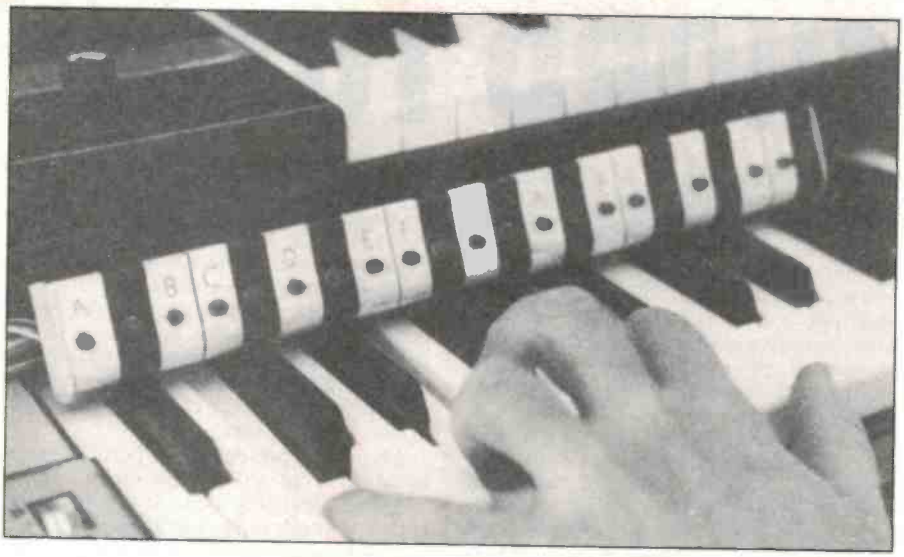
HOW IT WORKS ETI 661

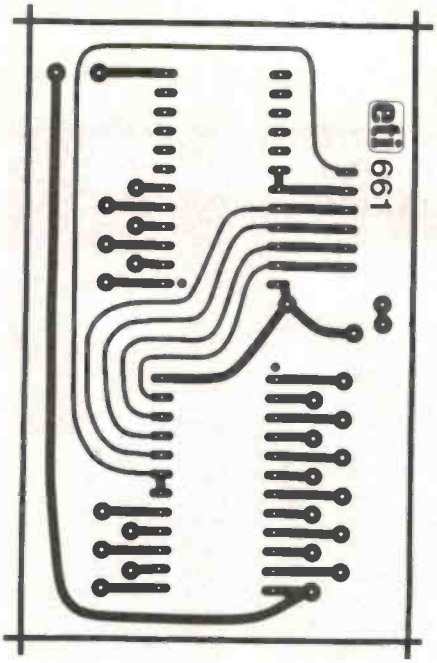
Most of the work is done by the software in the '660. After a random number has been generated and the appropriate information presented to the VDU, it is also sent to the unused half of the 6821 I/O chip on the '660. The other half of this chip is used for decoding the keyboard and so is not available for interfacing to the outside world.

To activate a particular LED it is necessary to put its address on pins 14, 15, 16 and 17 of the 6821. This is then decoded by the 74154 to pull one of the sixteen output pins low. In order to enable the unit to distinguish between the two chips pins 12 and 13 function as chip select lines, selecting one of the two available chips to read the information on the address bus.

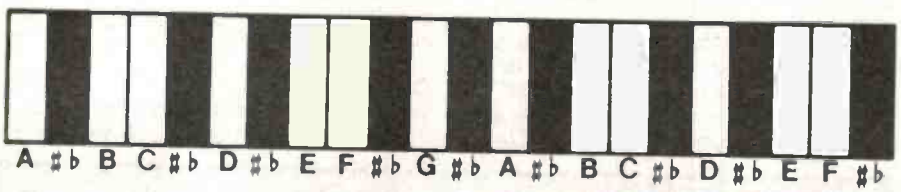
R1 functions to limit the current through the LEDs. Notice that even when indicating chords only one LED is on at a time. Thus only a ¼ W resistor is necessary.







Play it, Sam. Close-up shot of the keyboard and Chord Tutor in action. Below is a diagram of how the strip board holding the LEDs is organised.



PARTS LIST — ETI 661

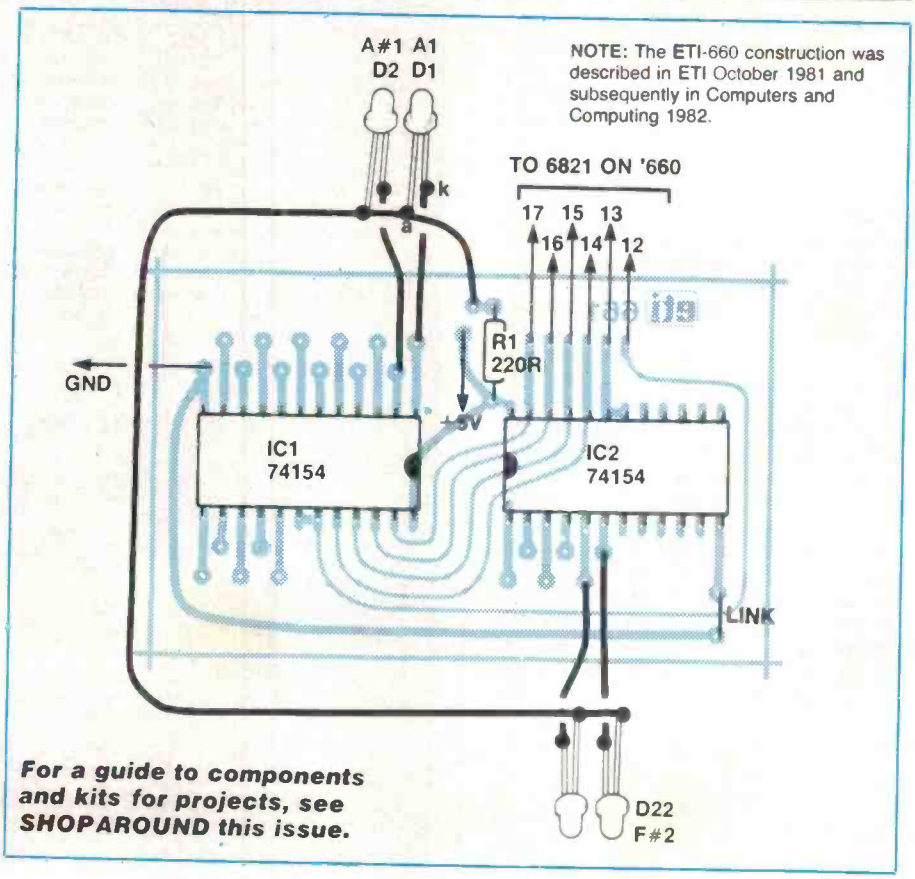
R1.....220R
LED1-LED22.....Red LEDs
IC1, IC2.....74154
Suitable length of computer ribbon, circuit board, jiffy box if required, plugs and sockets if required.

sible to build up the circuit board in a few minutes without any trouble. The keyboard display will take a little longer and requires a bit more ingenuity. Our prototype was designed for piano operation and consisted of a bit of square conduit with some Scotchcal labelling wrapped around it. We dimensioned it such that it would sit across a piano keyboard quite nicely to give direct feedback above the keys. If you have a different instrument in mind you will need to think about different ways to mount the LEDs such that they are located in the same spots as your fingers should be.

You will need to drill out twenty-two holes at 6.5 mm diameter to accommodate the LEDs plus retaining bezel. All the anodes can be soldered together to give them some further stability, and of course there needs to be some provision for a strip of ribbon cable 23 conductors wide.

On the input side you need a cable eight connectors wide. Six of these are soldered onto the output port tracks as dictated by the pin numbers. You also need to find a 5 V supply rail on the board and an earth point to provide power to the unit.

If you foresee a long life for the Chord Tutor and some moving around it might be worth while mounting it in a small jiffy box, with plugs on the outside for connection of the cables. We didn't go to this length with the prototype, however, contenting ourselves with a hard wired rig that could just sit on the piano. ●



For a guide to components and kits for projects, see SHOPAROUND this issue.

IMO ELECTRONICS LTD

Bringing you the latest in U.K. technology

C&K are proud to present these outstanding new products from IMO Electronics Ltd., London, UK.

01 SERIES

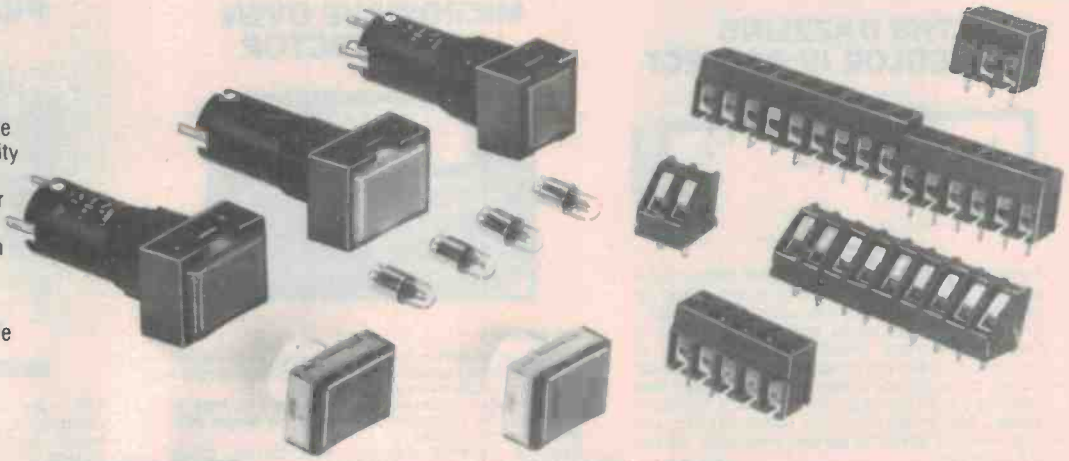
Illuminated push-button switches and indicators combine reliable switching, attractive design and ease of operation.

Features include . . . Wide range of button colours — High reliability 6-60V and neon lamps-Rear connections soldered, push-on or PCB-Low profile bezel-Negligible contact bounce and much, much more.

20 SERIES

PCB terminal blocks available in 2 or 3 way, dove-tail slide locking to enable 2 to 12 way configurations.

Features include . . . High solderability — 13A rating — Probe testing facility — Meet ICEL Specifications — Conform to VDE 0110 and available in 45°, 90° and standard terminal screw angles.



C&K COMPONENTS

C & K Electronics (Aust.) Pty Limited
15 Cowper Street, Parramatta, NSW 2150
PO Box 229 Parramatta, NSW 2150
Telephone (02) 635 0799 Telex AA23404

Agents Melb 598 2333 Adel 277 3288 Bris 369 1277
Perth 275 5522 Hobart 34 2233 Launceston 31 6533

Phone now for free, comprehensive technical literature!

LOW COST SWITCHERS

Here is a range of switching power supplies for the budget conscious user. They are designed especially for micro to medium computer system and use a series flyback design to provide multiple outputs.

Features
- ★ Short circuit protection.
- ★ Overpower protection.
- ★ Input surge protection.
- ★ Overvoltage protection.
- ★ User selectable input: 90-130V or 180-260 V AC
- ★ Input frequency 40-440 Hz

MODEL	OUTPUTS +5V	−5V	+12V	+12V	−12V	24V	MAX POWER	DIMENSIONS	PRICE
HSC 30-21	3A		1.2A				30W	100 x 160 x 34mm Open frame	$50
HSC 40-20	3A		2.5A				40W	100 x 160 x 50mm Open frame	$60
HSC 40-31	2.5A		2A		0.25A		40W	100 x 160 x 50mm Open frame	$60
HSC 55-41	6A	0.5A	2.5A		0.5A		55W	113 x 204 x 59mm Enclosed	$80
HSC 75-32	3A				0.2A	2.2A	75W	160 x 200 x 56mm Open frame	$95
HSC 125-40	10A		3A	2.5A	1.A		125W	127 x 267 x 66mm Enclosed	$150

ALL PRICES PLUS SALES TAX AND FREIGHT
DELIVERY FROM STOCK

36 LISBON STREET
FAIRFIELD, NSW 2165
AUSTRALIA

TELEPHONE (02) 728-2121, 727-5444
TELEX AA27922 ATTN AMTEX

AMTEX ELECTRONICS

A DIVISION OF TELCON AUSTRALIA PTY. LIMITED
(Incorporated in New South Wales)

● PHONE YOUR ORDER — ALTRONICS TOLL FREE 008 • 999 • 007 ●

BANKCARD HOLDERS—PHONE ALTRONICS TOLL FREE 008 • 999 • 007 FOR NEXT DAY JETSERVICE DELIVERY

BANKCARD HOLDERS—PHONE ALTRONICS TOLL FREE 008 • 999 • 007 FOR NEXT DAY JETSERVICE DELIVERY

ALTRONICS
★ MONEY BACK PLUS $5.00 GUARANTEE

Dear Customer, At Altronics we are continually trying out methods of improving our range of quality products and the high standard of service we offer our Shop, Mail and Phone order customers. I believe our future prosperity will be a direct reflection of the standards of service we have adopted. So for November and December 84 we pledge that if you find our products and/or service is not as we claim you may return your purchase to us for a **full refund plus $5.00** for your inconvenience (mail/phone order customers please allow transportation costs)

Regards

Jack O'Donnell

THE DAZZLING MUSICOLOR IV PROJECT

Combination Colour Organ and Light Chaser. Four channel colour organ. Internal micro-phone or connect to speakers for colour organ operation. (The lights connected to each channel pulse in beat to the music proportional to portion of frequency spectrum concerned.) Four chaser modes forward and reverse. Output lamp load capacity a massive 2400 watts — that's 100 party globes. Full instructions and every last nut and bolt included. Great for parties, shop signs, display windows etc.

K5800 ..... **$89.50**

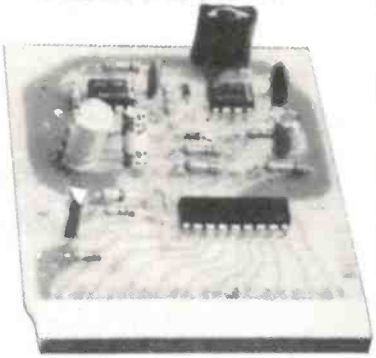
MICROWAVE OVEN LEAK DETECTOR

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**

LED BARGRAPH PEAK DISPLAY



This easy to build level meter uses our exclusively imported LED bargraph module which gives it a very professional finish indeed. Indicates from —21dB to + 6dB using a logarithmic scale. **Great Value!**

K 5412..... **$16.50**

★ KIT SUPPORT FOR THE MICROBEE ★

MICROBEE IS A REGISTERED TRADEMARK OF APPLIED TECHNOLOGY PTY LTD

MULTIPROM INTERFACE

44K OF PROGRAM STORAGE

A sensational new kit for the MICROBEE, requires no modification to the computer except for the fitting of a 50 pin 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 MICROBEE® KIT OF 1984

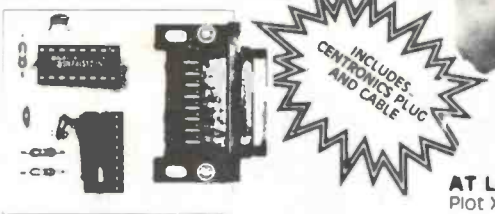
K9673..... **$99.50**

PARALLEL INTERFACE

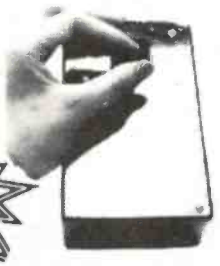
BUILD YOUR OWN INTERFACE AND SAVE $$$

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**



PROPORTIONAL JOYSTICK



SELF CENTERING

K9674

$32.50

(ETI DEC '83)

FOR THE BEE!

AT LAST AN ANALOGUE JOYSTICK

Plot X-Y co-ordinates on the screen, sign your name. A great graphics aid. Complete kit **including case**, software example.

EPROM PROGRAMMER

(ETI JAN '83)

K9668 **$55.00**

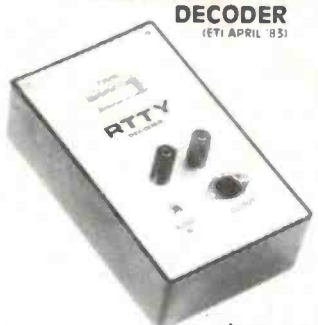
Versatile, low cost and easy to build. Plugs straight into the microbee ! 0 port. Suitable for 2716 2732 2532 27524 and 2764 Eproms. Burn your games programmes and eliminate cassette loading time.

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! DB 15 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.

MICROBEE LIGHT PEN

NEW

(ETI AUGUST 83)

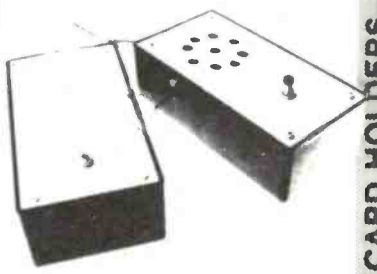
PROVIDES DIRECT PERSONAL CONTACT WITH YOUR BEE!

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 ! 0 port. • Complete kit including DB15 2m CORD. • Fully documented with software example.

FAX-DECODER

(ETI SEPT '83)



K 9763 ..... **$24.50**

This project allows you to decode the signals of shortwave stations transmitting radio facsimile weather maps satellite 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 99 ●

PHONE YOUR ORDER — ALTRONICS TOLL FREE 008 • 999 • 007 •

7 DIGIT FREQUENCY COUNTER

UNBELIEVABLE 0.005% ACCURACY

☆ **Frequency and Period measurement to 500 MHz (with optional prescaler) ☆ High input sensitivity. Professional unit at a fraction of the cost of built up units.**
☆ IC sockets provided throughout ☆ Low age rate 10.000 MHz XTAL ☆ Quality ABS plastic case with deluxe Front panel ☆ Specified LSI.

K2500..... **$119.50**

PRESCALER
K2501..... **$26.00**

DECIMAL POINT
K2502..... **$7.50**

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.

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**

VIDEO AMPLIFIER

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

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**

VIDEO RF MODULATOR

(SEE ETI OCT 1981)

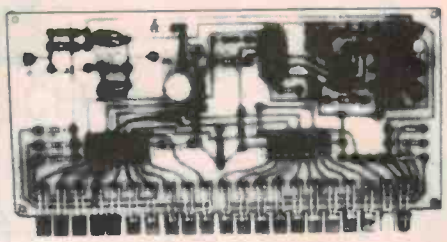
If you cannot afford a Video Monitor for your computer this is the kit for you. Super stable oscillator design and very low modulation distortion ★ Works with both B & W and Colour TV sets ★ Suitable for computers, TV games, TV pattern generators or what have you. Deluxe kit featuring heavy duty diecast box for RF shielding ★ Input and output sockets

K9760 $17.50

MONITOR AND IMPROVE VEHICLE PERFORMANCE

TWIN RANGE LED TACHO

(SEE ETI AUGUST 1980)



Unit suitable for 1, 2, 3, 4, 6 and 8 cylinder vehicles, 2 stroke or 4 stroke ★ fully compatible with conventional, CDI and transistorized ignition systems ★ includes protection circuitry to prevent noise and high voltage spikes from the points and coil circuit damaging the electronics. ★

Display flashes when over-revving occurs ★ only 3 connections required to electrical system.

Check The Performance of Your Vehicle At A Glance!

K4324..... **$24.50**

TRANSISTOR ASSISTED IGNITION WITH DWELL EXTENSION

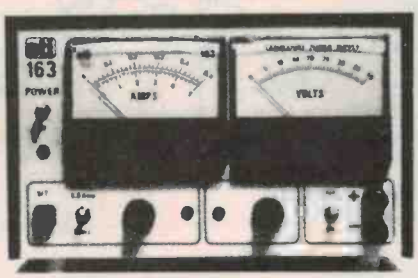
The Altronics Kit includes all components for the modifications, detailed by Electronics Australia Feb. 1983.

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**

0-40 VOLT/5 AMP LAB SUPPLY

(SEE ETI MAY & JUNE 1983)



FEATURING: VARIABLE CURRENT LIMIT- DUAL METERING

A Laboratory Supply requires specifications second to none. **This Supply has them!**

Output voltage	0-40 V variable
Output current	0-0 5 A variable limiting
	0-5 A variable limiting
Output regulation	<50 mV at up to 2 5 A
	<100 mV up to 5 A
Maximum output power	200 watts
Metering Voltage	0-40 V in 1 V divisions
Current	0-0 5 A in 20 mA divisions
	0-5 A in 200 mA divisions

Series regulator design enables design and development of sensitive high gain audio and RF circuitry free from hum and noise sometimes associated with other techniques.

K3325..... **$175.00**

BANKCARD HOLDERS—PHONE ALTRONICS TOLL FREE 008 • 999 • 007 FOR NEXT DAY JETSERVICE DELIVERY

PHONE YOUR ORDER — ALTRONICS TOLL FREE 008 • 999 • 007 •

IDEAS FOR EXPERIMENTERS

NiCad monitor

This circuit was designed specifically for the NiCad float charger (ETI-268) by **I. Davies of Cheltenham, Vic.** However, the general idea is useful for other applications.

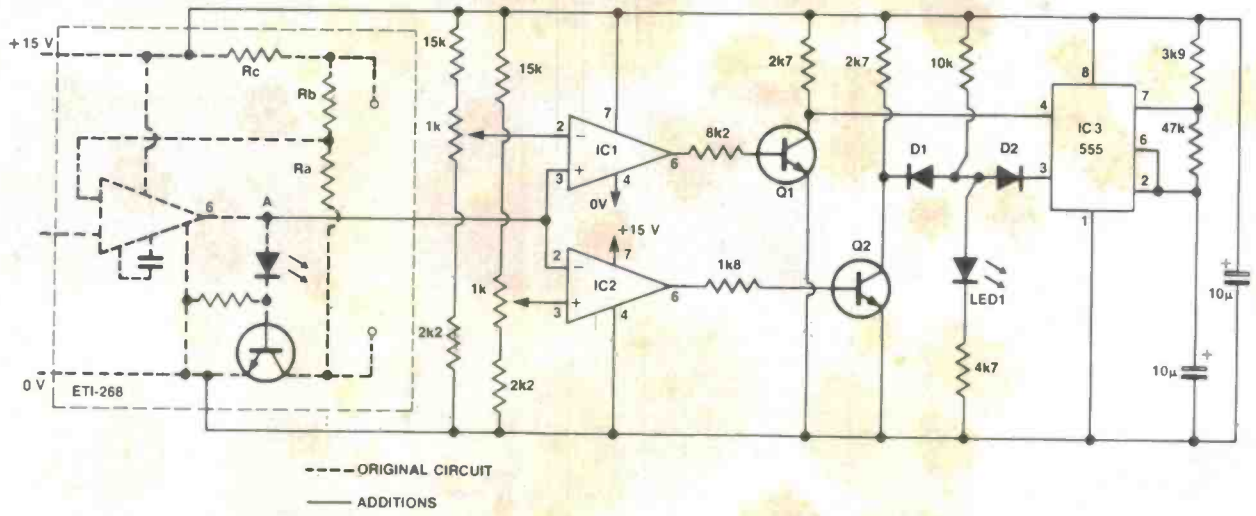
I wanted something that would indicate the state of the cells, whether in trickle charge or not, and indeed, whether they were being charged at all.

Although the circuit could be simplified by using several LEDs as indicators, I felt a single LED was more appropriate as it is so easy to understand and requires little work to install in an existing panel.

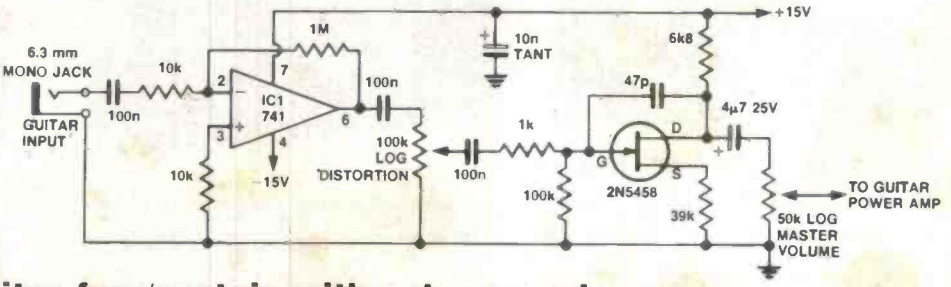
This circuit monitors the output of the op amp as this indicates the state of the cells, and whether charging is occurring. Voltage is taken from the original supply and is about 15 V using the recommended transformer.

With the charger unloaded there is about 2.3 V at point A. 2.4 V indicates a trickle charge while voltages greater than that indicate a full charge.

The voltage divider networks provide reference voltages over a fairly narrow range. IC1 detects the charge rate by having the reference voltage set to about 2.4 V.



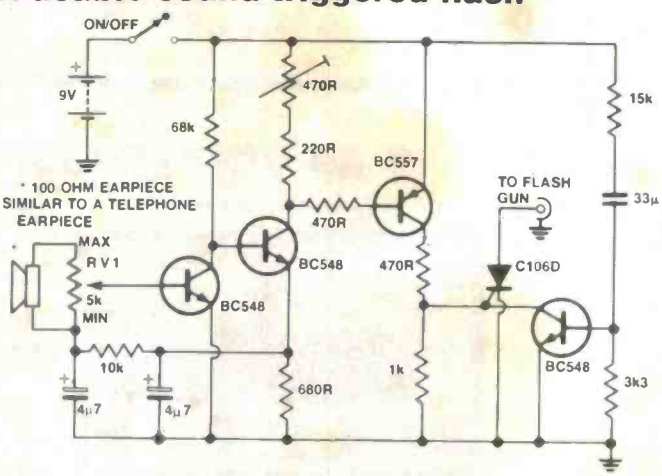
Guitar fuzz/sustain with valve sound



The heart of this circuit from **G. Condick of Yarraville, Vic,** is the FET, which is overdriven by IC1 so that a large amount of distortion occurs. Sustain is increased by compressing the initial waveform amplitude while the decaying note is amplified by a large amount. The distortion produced is fundamentally third harmonic, hence it sounds like one of the popular but expensive valve amps.

Screened leads must be used between jacks and circuit boards and the unit should be placed inside a metal box to minimise mains hum. In practice, the distortion control will be used to give maximum distortion. The output of the circuit is quite high, about 2 V p-p, therefore it may be connected directly to a power amplifier with a sensitivity of approximately one volt.

A usable sound-triggered flash



When he constructed a sound-triggered flash, **Donald Kay of Lockleys, SA, found** that it drew excessive amounts of current and the usable area of the sensitivity control was very small. The circuit described has overcome all these problems with only a few more components. It also has a section that stops triggering when switched on.

The pot, RV1, adjusts the sensitivity from a point where it will never trigger to a point where it is hard not to trigger. It is preferable that the pot be logarithmic, although a linear pot will work. It should be adjusted to get a sensible range of sensitivity. The lower it is set the harder it is to trigger.

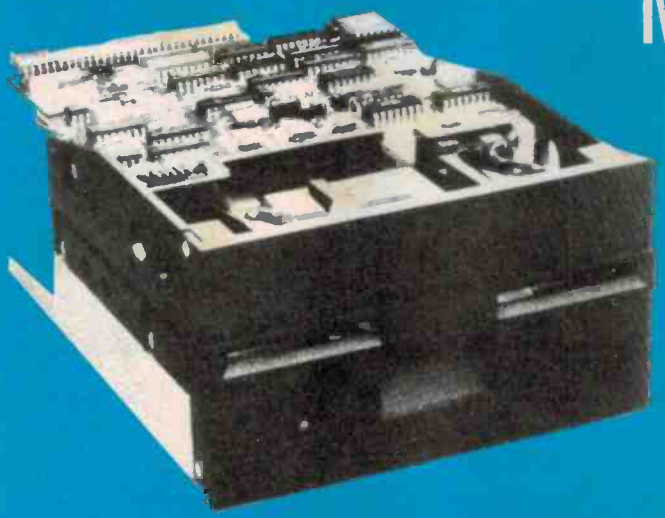
ELLISTRONICS

PTY LTD

797 SPRINGVALE RD. MULGRAVE, MELBOURNE, VIC. 3170. PH:(03)561 5844 TELEX AA37758 LSTRON

ANOTHER SHIPMENT

Top Quality 5¼" Floppy Disk Drives
Model 51 Full Height



Famous M P I brand full height, single side 40 track 250K capacity (double density) Standard interface suit Dick Smith System 80, Tandy TRS 80 Colour Computer Microbee Acorn, etc. Tested and in original boxes

$150

Full 1 Year Warranty

+ SALES TAX IF APPLICABLE

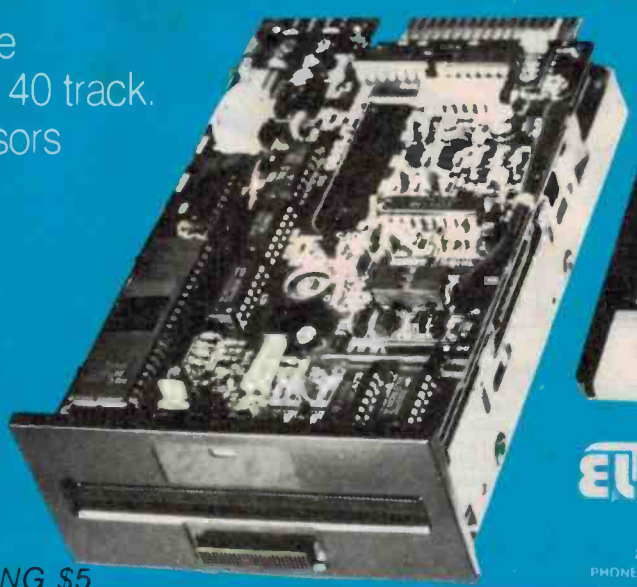
PLUS POST & PACKAGING $5

3" DRIVES LATEST MODEL CHINON

MODEL CF301

5¼" plug compatible
250 K-byte capacity, 40 track.
Suit all major processors

FREE
Sample hard jacket Media with every drive



Full 1 Year Warranty

$147·50

+ SALES TAX IF APPLICABLE

PLUS POST & PACKAGING $5

ELLISTRONICS

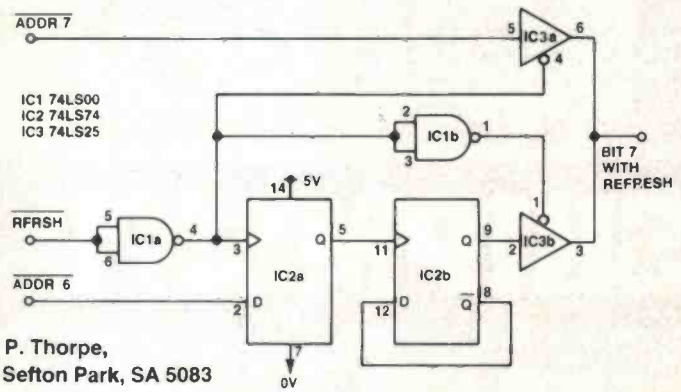
ELLISTRONICS PTY. LTD.

797 SPRINGVALE RD MULGRAVE VIC 3170

PHONE VICTORIA (03) 561 5844 N.S.W. (02)922 3220

IDEA OF THE MONTH

64K Refresh



P. Thorpe,
Sefton Park, SA 5083

This circuit was designed to overcome the problems associated with the new 64K RAMs — the 4164. This comes in three packages: 7-bit refresh, 8-bit refresh and auto-refresh. If you try to use the 8-bit refresh on a Z80-based system you will have problems as the Z80 only uses the seven least significant bits in the refresh register.

To alleviate this problem the circuit divides bit 6 of the refresh register in two and gates it back onto the address buss as refresh bit 7 during refresh. This enables a full 8 bit refresh to occur.

Gates 1a and 1b can be any 'LS' inverters. IC2a gates and latches address bit 6 during refresh, which is used to clock IC2b. IC2b is a divide-by-two flip-flop whose output is sent to OUT as address bit 7 during refresh.

A prime example of this circuit's application would be on the Little Big Board (as published in ETI), which uses the Z80's internal refresh register for refresh.

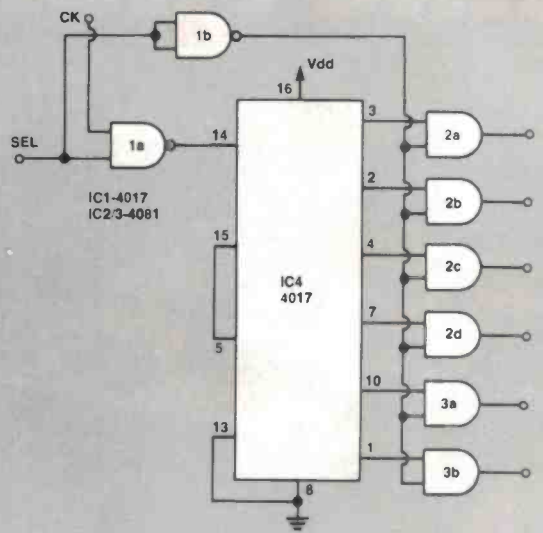
IDEAS FOR EXPERIMENTERS

Multiple output

With some extra parts, this circuit from **M Bennetts of Corowa, NSW**, could form the basis of a remote control or an addition to units like the ETI-484 Ultrasonic Switch.

The circuit works like this: Apply clock pulses to CK and hold SEL high. This allows the clock pulses to reach the clock input of the 4017 decade counter, causing the appropriate count pin to go high.

The AND gates on the outputs of the 4017 are held low by the inverted SEL line. When SEL is taken low, counting in the 4017 is halted and the AND gates pass the output of the 4017. This high could be used to switch other circuits as required.



'IDEA OF THE MONTH' CONTEST

COUPON

Cut and send to: **Scope/ETI 'Idea of the Month' Contest, ETI Magazine, P.O. Box 227, Waterloo NSW 2017.**

"I agree to the above terms and grant *Electronics Today International* all rights to publish my idea in ETI Magazine or other publications produced by it. I declare that the attached idea is my own original material, that it has not previously been published and that its publication does not violate any other copyright."*

* Breach of copyright is now a criminal offence.

Title of Idea .....

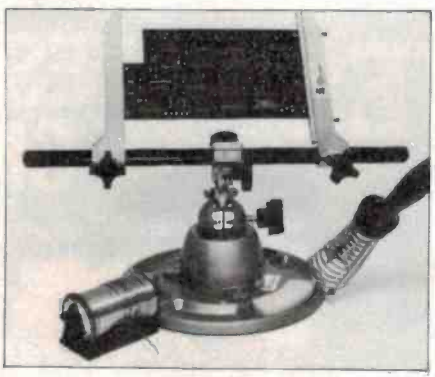
Signature .....

Name .....

Date .....

Address .....

..... **Postcode** .....



PRIZE WORTH $123!

Scope pc board Work Centre

Scope Laboratories, which manufactures and distributes soldering irons and accessory tools, is sponsoring this contest with a prize given away every month for the best item submitted for publication in the 'Ideas for Experimenters' column — one of the most consistently popular features in ETI Magazine. Each month we will be giving away a pc board Work Centre consisting of the Model 315 adjustable pc board holder with capacity to accept 300 mm boards, Model 300 180° swivel and lock base which can be attached to the Model 312 tray base with wet sponge receptacle, Model 371 solder spool holder and Model STS 3 soldering iron safety stand. Please note prize does not include solder or scope TC60 temperature controlled iron shown above. The prize is worth $123!

Selections will be made at the sole discretion of the editorial staff of ETI Magazine. Apart from the prize, each winner will be paid $10 for the item published. You must submit original ideas of circuits which have not previously been published. You may send as many entries as you wish.

RULES

This contest is open to all persons normally resident in Australia, with the exception of members of the staff of Scope Laboratories, The Federal Publishing Company Pty Limited, ESN, The Litho Centre and/or associated companies.

Closing date for each issue is the last day of the month. Entries received within seven days of that date will be accepted if postmarked prior to and including the date of the last day of the month.

The winning entry will be judged by the Editor of ETI Magazine, whose decision will be final. No correspondence can be entered into regarding the decision.

The winner will be advised by telegram the same day the result is declared. The name of the winner, together with the winning idea, will be published in the next possible issue of ETI Magazine.

Contestants must enter their names and addresses where indicated on each entry form. Photostats or clearly written copies will be accepted but if sending copies you must cut out and include with each entry the month and page number from the bottom of the page of the contest. In other words, you can send in multiple entries but you will need extra copies of the magazine so that you send an original page number with each entry.

This contest is invalid in states where local laws prohibit entries. Entrants must sign the declaration on the coupon that they have read the above rules and agree to abide by their conditions.

E. & J. Truscott's

ELECTRONIC WORLD

Kits, Tools, Components, Books, etc.

Products from Dick Smith's and Altronics

Everything for the Electronic Hobbyist

Now Open Friday Night till 9 p.m.
Mail Orders Welcome

Cnr. of Windsor Rd. and Lacey St., Croydon, Vic. 3136.
Phone (03) 72-33860

David Hall Electronics

Phone:
(07) 208-8808

For all your electronic needs on the southside of **BRISBANE**

Projects & Kits
Components
Books — Tools — etc.

Shop 5
376 Kingston Road,
Slacks Creek Qld 4127
(07) 208-8808

Exciting & SOUND Lighting

(03) 429-3711

- IMPORTERS
- MANUFACTURERS
- DISTRIBUTORS
- ENTERTAINMENT
- DISPLAY
- ADVERTISING

DISCO & BAND LIGHTING • HIRE & SALES

—NOW OPEN—

(Great Opening Specials)
Our New Show Room is Now Completed—Call In At
267–269 Victoria Street
Nth Richmond 3067 Vic. 1–6 p.m.
(All correspondence to P.O. Box 634 Dandenong 3175)

ROPE SNAKE LIGHTING · POLYCARBONATE TUBELIGHT · BUD LIGHT RIBBON · SPECIAL EFFECTS LIGHTING · BUBBLE MACHINES · EFFECTS PROJECTORS · SMOKE MACHINES · PINSPOTS · PAR 36, 46, 56 AND 64 CANS AND LAMPS · FLASHING BEACONS · SCANNERS · HELICOPTERS · BUBBLE LAMPS · STROBES · MIRROR BALLS · PRISMS · LONG LIFE ENERGY SAVING LAMPS AND GLOBES · STARLIGHT AND INFINITY PANELS · ULTRAVIOLET TUBES AND LAMPS · SPECIALISED LAMP REPLACEMENTS · REFLECTIVE PANELS AND TAPE · ELECTRONIC LIGHTING CONTROLLERS—CHASERS, MUSICOLOUR MATRIX STARBURST · NEON LIGHTING EFFECTS WITH "NEOLIGHT" AND "LINE LITE" OR "LUMEN LINE" ILLUMINATED SIGNS & GRAPHIC DESIGNS MADE TO ORDER Factory & A/H (03) 729 6337

—WRITE FOR FREE CATALOGUE—

We Are Wholesale Agents For The Popular Range of "CITRONIC" Lighting and Sound Equipment.

DAMAGED STOCK....
DISCONTINUED LINES....
SUPERCEDED MODELS...

30 DAYS ONLY

GENUINE STOCK

LIQUIDATION

DISCOUNTS UP TO 75%

Hurry in for.....

PLUG-IN 240V TIME-SWITCHES.....$5.00
MULTIMETERS, 2K/v and 20K/v from $7.50
ELECTRONIC TOOLS from 0.75
BURGLAR ALARMS, CAR or HOME from $8.00
AC-DC 240V ADAPTERS 6v, 9v, 12v..$5.00
NI-CAD BATTERY CHARGERS, ...$15.00
12V DC-DC CONVERTERS $4.00
VARIOUS SPEAKERS, from $2.00
TV AERIAL PARTS and ACCESS from .$1.00
DE-LUXE INDOOR TV AERIALS $12.50
VIDEO LEADS and ACCESS from $3.00
HI-FI and RECORD ACCESSORIES from 0.50
STEREO HEADPHONES, many types at $5.00
QUALITY MICROPHONES from.....$6.00

PLUS

A large assortment of electronic parts for beginners, hobbyists, service-men.
BRING YOUR MONEY AND HURRY IN SOON!

MUST BE SOLD! OFFERS WILL BE TAKEN! NO MAIL ORDERS - ENDS NOV 30TH

THIS MONTH'S SPECIAL OFFERS!

CAPACITORS

100pf ceramic	15 for $1.00
0.001uf ceramic	15 for $1.00
0.01uf 50v cer	15 for $1.00
0.01uf 500v cer	8 for $1.00
0.047uf ceramic	12 for $1.00
0.1uf ceramic	12 for $1.00
0.001uf 630v poly	8 for $1.00
0.001uf 1kv styro	5 for $1.00
0.0068uf 600v styro	6 for $1.00
0.01uf 400v poly	10 for $1.00
0.015uf 200v poly	12 for $1.00
0.022uf 250v poly	9 for $1.00
0.047uf 200v poly	8 for $1.00
0.056uf 1kv poly	7 for $1.00
0.068uf 100v poly	7 for $1.00
0.068uf 400v poly	5 for $1.00
0.1uf 100v poly	5 for $1.00
0.1uf 630v GC poly	3 for $1.00
0.15uf 100v poly	6 for $1.00
0.15uf 250v poly	5 for $1.00
0.22uf 100v poly	5 for $1.00
0.22uf 250v poly	5 for $1.00
0.27uf 250v GC poly	5 for $1.00
0.33uf 100v poly	4 for $1.00
0.33uf 250v poly	4 for $1.00

TAKE YOUR PICK!

LUCKY-DIP PACKS $2 ea
- 500 1/4WATT RESISTORS
- 200 1/4WATT RESISTORS
- 20 MIXED POTENTIOMETERS
- 25 PRESET POTS ASST.
- 50 POLY. GREENCAPS
- 100 CERAMIC CAPACITORS
- 25 ELECTROLYTIC CAPS
- 25 VARIOUS SWITCHES
- 20 RADIO/TV KNOBS
- 50 ASST. TAGSTRIPS

$2

Transformers

9-7V x2 20A
MAINS INPUT: 0, 240V, 265V
OUTPUT: 2 windings 8V-10V depending on primary tap.
WERE $69
135x110x110mm
$39

ELECTROS

220uf	25v	pcb	10 for $2
220uf	25v	ax	12 for $2
330uf	63v	ax	6 for $2
400uf	40v	ax	6 for $2
470uf	25v	pcb	8 for $2
470uf	25v	ax	10 for $2
470uf	63v	ax	4 for $2
640uf	16v	pcb	9 for $2
1000uf	16v	ax	6 for $2
1000uf	25v	pcb	5 for $2
2200uf	16v	pcb	4 for $2
2500uf	25v	ax	2 for $2
3300uf	6.3v	ax	4 for $2
2000uf	64v	can	2 for $4
5500uf	25v	can	2 for $8
15000uf	75v	can	1 for $12

PAKS OF ASSORTED
POTS

20 MIXED VALUES $3
Linear, log, our choice!
100 MIXED VALUES $10
Dual, switched, all no.
250 MIXED VALUES $20
Bonus bulk package!

SEMIS

DIODES, RECTIFIERS

0A90, 0A91, 0A95			0.20
1N914, 1N4148			0.05
1N4001 - 1N4004			0.10
1N5401 - 1N5404			0.30
400PIV 6Amp			0.75

BRIDGE RECTIFIERS

1.5A	400	PIV	0.40
2A	400	PIV	0.70
6A	400	PIV	1.50
10A	400	PIV	2.00
25A	400	PIV	3.95
25A	1000	PIV	5.50
35A	400	PIV	4.50

GREENCAPS

GREENCAPS 100V POLYESTER

0.001uf, 0.0022uf, 0.0033uf, 0.0047uf, 0.0068uf	25 for $2.00
0.01uf, 0.022uf	20 for $2.00
0.033uf, 0.047uf	14 for $2.00
0.056uf, 0.068uf	13 for $2.00
0.082uf	15 for $2.00
0.1uf	10 for $2.00
0.22uf	9 for $2.00
0.39uf	8 for $2.00
0.47uf	6 for $2.00

TRANSISTORS

BC107, 108, 109	0.30
BC547, 548, 549	0.15
BC177, 178, 179	0.30
BC557, 558, 559	0.15
BC182, 183, 186	0.35
BC637, 638, 639	0.33
BD139, BD140	0.50
BD681, BD682	0.75
2N3055 metal can	0.80

INTEGRATED CIRCUITS

7400 Series, from	0.40
74LS from	0.40
4000 Series, from	0.50

ZENER DIODES

400mW Series	0.15
1 Watt Series	0.25
5 Watt Series	0.60

LED's

RED 3mm and 5mm	0.10
GRN, YELL and AMBER, 3mm and 5mm	0.20
Flashing RED	0.35

PACK AND POST: $2
PLUS 5% OF ORDER.

PRE-PAK electronics p/l

1a WEST ST, LEWISHAM, NSW

569-9797
24 HR PHONE ORDER SERVICE

Phone or mail order BANKCARD accepted

New sophisticated receiver from Icom

The IC-R71A from Icom includes some sophisticated features rarely seen on communications receivers outside those aimed at the professional/military market.

This new receiver covers 100 kHz to 30 MHz continuously. It can be manually tuned or frequencies may be 'punched-up' on its numeric keyboard. It features a 32-channel memory as well as scanning facilities for searching across a band of frequencies or amongst the memory channels.

It can be controlled from a handheld infrared control unit (RV-11) and/or remotely controlled via a computer interface/terminal unit (CT-10). This latter option gives you the ability to operate the receiver at a remote site, close to a conveniently located antenna sited in a noise and interference-free area.

The IC-R71A is equipped to resolve all the currently popular transmission modes — CW/AM/SSB/RTTY. An optional FM detector can be fitted. Three IF filters are provided for optimum selectivity on the various modes.

The digital frequency readout provides a six-digit display to 100 Hz. The frequency control is a CPU-based, 10 Hz step digital PLL synthesiser that includes a dual VFO system.

Sensitivity is quoted as less than 0.15 μV for 10 dB S+N/N ratio above 1.6 MHz on SSB/CW/RTTY, less than 0.5 μV on AM.

Frequency stability is quoted as less than 200 Hz drift after switch-on — one min to one hour, less than 30 Hz thereafter.

Drift over the temperature range 10°C to 50°C is quoted as less than 500 Hz. A high-stability crystal option (CR-64) can reduce those figures substantially.

The unit measures 111 mm high by 286 mm wide by 276 mm deep and weighs 7.5 kg. It can be operated from 235 Vac (50-60 Hz) or from 12 Vdc with the CK-70 optional dc cable kit.

Overall, the IC-R71A looks like quite an interesting unit so we've obtained one for review. Look for it in a coming issue! Meanwhile, further details may be obtained from **Icom, 7 Duke St, Windsor Vic 2182. (03)51-2284.**

WORLD RECORD PACKET RADIO CONTACT

Back on May 6 this year (these guys don't like to brag), Paul Huntington VK2AQG in Sydney, Australia, contacted Tom Clark W3IWI in Clarkesville, Maryland, USA, via AMSAT OSCAR 10. (For the record, the time was 1600 UTC).

The AMSAT satellite was, at that time, located at an orbital height of about 35 000 km. Total radio path distance was around 70 000 km; distance over the Earth's surface about 15 700 km. The uplink frequency was 435.17 MHz, downlink 145.83 MHz.

VK2AQG used a VADCG (Canadian — Vancouver packet group) terminal node controller (TNC) and an Avtek Multi-Modem. W3IWI used a TAPR (USA — Tucson amateur packet radio group) terminal node controller with an in-built modem. They used the AX.25 protocol at 1200 bauds with Bell 202 standard tones.

Paul VK2AQG reports a 'full connect' contact was made with W3IWI and error-free information exchanged. The satellite was at an elevation of 1° for W3IWI and at 12° for VK2AQG. Recovered signals were very noisy, with S/N ratios of less than 10 dB. Congratulations, fellas!

Tell them you read it in ETI

Satellite scrambling systems to be investigated

An investigation will be undertaken by the Department of Communications to determine guidelines for transmission and scrambling systems to be used in conjunction with satellite-transmitted television services.

"The Government decided last year to allow commercial television stations to distribute their programs via the satellite on the basis that their signals would be scrambled," the Minister for Communications, Mr Duffy said.

"Scrambling is necessary to prevent unauthorised reception of signals which could adversely affect regional television stations and the important local service that they provide."

The scrambling decision does not apply to the Homestead and Community Broadcasting Satellite Service (HACBSS) which would extend ABC programs via the satellite directly to households in isolated areas of Australia.

Conference on ionospheric physics and radio wave propagation

The Ionospheric Prediction Service of the Department of Science and Technology will be conducting a symposium on ionospheric physics and radio wave propagation over the week 11-15 February 1985.

The venue will be the School of Electrical Engineering, University of Sydney. Accommodation, for those requiring it, can be arranged at Sydney University's Wesley College.

There are eight separate symposia planned, described by two letters. Symposium MP, on Monday 11th, covers 'Ionospheric models and their application to the prediction of communication conditions'. It occupies the whole day.

Symposium FS occupies a half day on Tuesday the 12th and covers 'The short-term forecasting and real-time specification of the ionospheric and propagation conditions'. Symposium HL occupies the other half of Tuesday and covers 'The high latitude ionosphere and communications'.

Symposium NT occupies a half day on the Wednesday and covers 'New techniques in ionospheric sounding and studies'.

Symposium ET (. . . no connection with this journal) covers 'Experimental and theoretical studies of the ionsophere' and occupies 1⅓ days over the Wednesday and Thursday. Symposium FI completes Thursday and covers 'The future of ionospheric physics'.

'Practical applications involving the ionosphere', symposium PA, occupies ⅔ of the Friday, completing the symposium sessions.

Registration costs A$50 if sent before 30 November, A$60 if sent after that date; students can register for A$20. Full details can be obtained from **The Assistant Secretary, IPS, PO Box 702, Darlinghurst 2010 NSW. (02)267-6791 ext. 628 or 631.**

BEACON CHANGES FOR WEST AUSTRALIA

Bruce Willlams, VK6CX, Secretary of the W.A. VHF Group, advises that the Perth six and two metre VK6RTV beacons have changed callsign.

ex-VK6RTV on 52.300 MHz
and on 145.000 MHz are now VK6RPH

Two additional beacons, also located in Perth, are to be added to the list — one on 432 MHz and one on 1.2 GHz.

VK6RPR will go on 432.140 MHz
and on 1296.420 MHz

All enquiries, reports, etc., should be directed to the W.A. VHF **Group (Inc.), P.O. Box 189, Applecross, W.A. 6153**

High speed 14 MHz data gateway link tests successful!

On September 1, VK2BVD and ZL1AOX maintained a fully 'connected' 1200 baud datalink between Sydney and Auckland over a four-hour period, starting at 2000Z, on 20m SSB.

Using VADCG (Canadian) and TAPR (USA) terminal node controllers (TNCs) with excellent propagation conditions, this 2650 km one-hop path exhibited minimal multipath effects over this period. An interactive QSO co-ordinated substantial file transfers in both directions with only minimal re-tries.

The following day at the same times, an HF/VHF packet data gateway was established using store-and-forward techniques with link-level adknowledgements. A total of five TNCs and two computers were linked in the arrangement shown here with all data rates at 1200 baud.

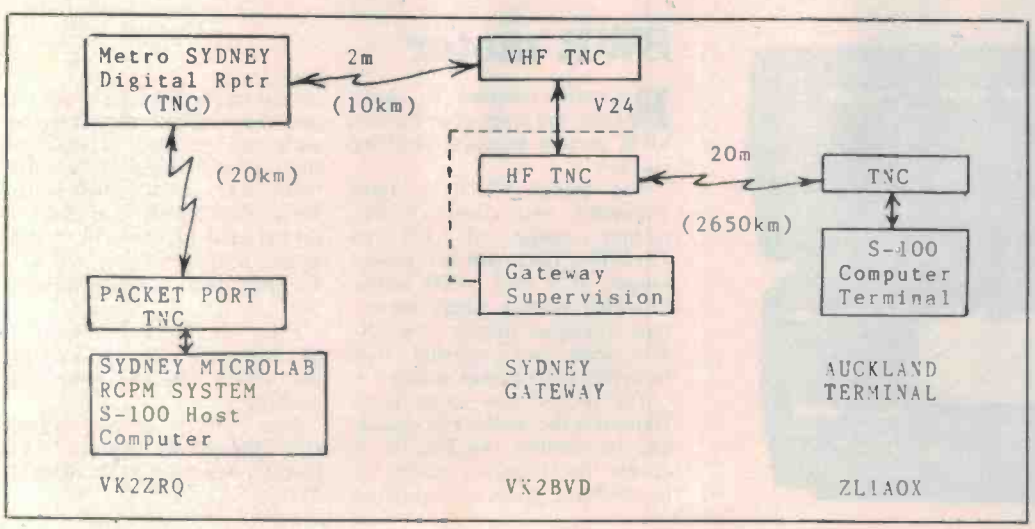
Both ZL1AOX and ZL3QL (Christchurch) were able to access the VHF local area network (LAN) and establish connections, trigger repeater functions, and monitor the network.

The following day (Sept. 3) at the same time, and with a VHF beam orientation problem resolved, ZL1AOX was able to connect to the host computer, at VK2ZRQ, and inter-actively operate the machine for over an hour.

Both HF and VHF link-level acknowledgements operated asynchronously as expected, and other non-connected traffic on the LAN digital repeater was ignored by the gateway.

This success was followed up by similar operation on both the 4th and 5th of September. Stations monitoring activities over this period were ZL3THJ, VK2AQG, VK2AYC, VK2XY, VK2ZXQ, and VK2KFJ.

— Jim Swetlikoe, VK2BVD



6UP

The Australasian journal for those interested in the amateur bands six metres and up!

The third revival issue, *Spring '84*, will cover the subject of *DX* (working long distances). Articles lined-up cover such topics as *A Tropospheric DX Primer, Quick & Simple UHF Preamp, Success with Sporadic-E, A 5-over-5 for Six Metres*, and maybe more!

For a **Taste Test**, just send $5 to the publishers and we will send you, post paid, a sample issue (Autumn, Winter or Spring — depends on what's in stock).

Subscribe! — and avoid disappointment. (We don't know why — but avoid it anyway!). It's only $15 for a year's subscription (four issues) for the down-to-earth VHF/UHF magazine. Send cheques or money orders to:

Teknidata, PO Box 844
NORTH SYDNEY NSW 2060

26 MHz still usable

Some years ago, Radio HCJB, in Quito, Ecuador, commenced testing with a 100 watt transmitter on 26 000 kHz, and later 26 020 kHz, operating 24 hours a day in an attempt to plot the propagation characteristics.

Some four years ago the results were "somewhat amazing" and the Director of Engineering has indicated that, despite the low sunspot count, these tests will continue. Apparently, even now, there are a few hours of useful transmissions via the ionosphere each day, even with a sunspot number of 10.

HCJB plans to relocate the 11 metre transmitter from Pifo to Quito at the FM site on Mt. Pichincha.

This frequency is clear of the congested bands and will enable listeners throughout the world to locate the signal free from interference. In Australia, reception has been possible during the daylight hours.

There could be a reduction in signal strength in the South Pacific when this change of transmitting site takes place, due to blockage by the mountain. On the other hand, it is expected that the height of the FM transmitter site will improve signals in Europe and North America.

— **Arthur Cushen**

Packet radio handbook

For those getting into digital radio communications, Northern Digital has available *Synchronous Packet Radio — The Software Approach*, Volume 1, by Robert Richardson, W4UCH/2.

This soft cover, spiral-bound 220-page book is written in a tutorial format with fully complemented Z80 source code for TRS-80 Model I or Model III computers.

It is easily adapted for other Z80-based computers. It covers the Vancouver Group protocol with reduced hardware — down to seven ICs. Volumes II and III are now in preparation and will cover the Tucson/ARRL/AX.25 approach.

The Var80 interface unit for packet radio is no longer in production in the US and arrangements have been made to produce the pc board and manual in Australia. It is quite a simple unit with five TTL ICs. Vol I of Richardson's book has circuits for simple modulators and demodulators using Exar ICs.

The book (Vol I) costs $28 plus $3 post and handling. Disks to go with it (two off — double-sided, double density, 35-track types) cost $15 each, postage included. A TRS-80 Model III disk is in preparation.

Contact **Northern Digital, P.O. Box 333, Charlestown 2290 NSW. (049)43-8981.**

Marine transceiver

The SMR Sea Lab 9000 FM Marine Transceiver is being marketed in Australia by Imark.

The Sea Lab 9000 is a processor-controlled transceiver that uses a PPL frequency synthesiser to transmit and receive on the marine VHF band.

Output power from the portable unit is either one or three watts RF.

Further details can be obtained from **Imark, 167 Roden Street, West Melbourne Vic. 3003. (03)329-5433.**

Asian radio battle

India is pressing Sri Lanka to rescind its agreement with the Voice of America permitting the US Government station to upgrade its ageing transmission facilities on the island.

Sri Lanka is standing firm so far on the agreement, which was signed in December, 1983.

The VOA is to replace its relatively small transmitters with three 500 kW and two 250 kW transmitters. These will be used for both VOA broadcasts and for relaying American diplomatic messages.

A verbal protest from the Soviet Ambassador to Sri Lanka last year was countered by an offer to lease land to the Soviet Union for identical facilities on identical terms.

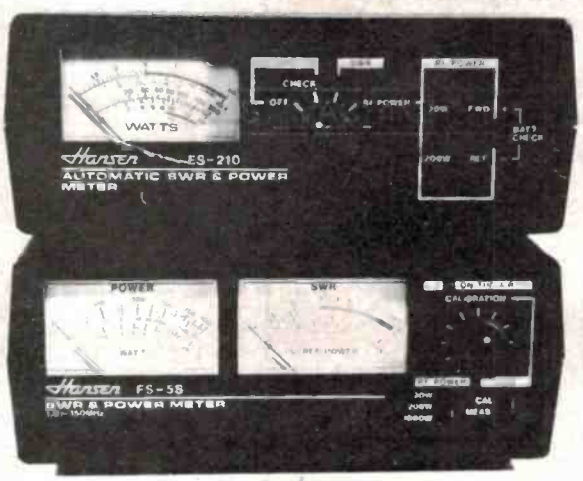
India has chosen to expand its transmitting facilities to counter the expansion of American broadcasting from Sri Lanka. The external services of All India Radio currently use one 100 kW transmitter at Delhi and four 250 kW transmitters at Aligarh.

The Indian Government is now taking bids for two new 500 kW shortwave transmitters to be installed at Bangalore. The new transmitter station is to be operational by March, 1986.

Meanwhile, medium-wave facilities are being upgraded in southern India, near Sri Lanka. the present 20 kW transmitter in Madras is to be replaced by a 200 kW transmitter by December, 1984. A new 10 kW transmitter is also to be installed in Madurai.

This increase in transmitter power from the State of Tamil Nadu may also reflect Indian concern over the treatment of the minority Tamil community in Sri Lanka.

— **Arthur Cushen**



SWR meter

Recently released in Australia are two new Power-SWR meters manufactured by Hansen.

The model FS-210 is fully automatic and covers a frequency range of 1.8 to 150 MHz. There are two power ranges, 0-20 and 0-200 watts. Provided with a single meter-type analogue display, the FS-210 uses two internal 9 V batteries as its power source.

The second new meter from Hansen is the model FS-5S and, like its brother the FS-210, it covers the frequency range 1.8 to 150 MHz. It does not provide an automatic SWR readout but uses the standard manual system with two meters. It contains three power ranges, 0-20 watts, 0-200 watts and 0-2000 watts. Meter illumination is available if an external 12 volts AC or DC power source is connected to a rear mounted socket on the FS-5S.

Price of the new meters is $173 for the FS-210 and $106 for the FS-5S plus $3 post and packing.

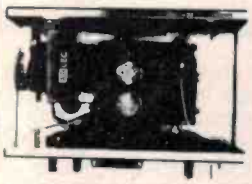
For further details contact **GFS Electronic Imports, P.O. Box 97, Mitcham 3132. (03)873-3777.**

Rod Irving TOP 20 Kits

PHONE MINDER

Dubbed the Phone Minder, this handy gadget functions as both a bell extender and paging unit, or it can perform either function separately. (EA Feb. '84).

84TP2 **$24.00**



DUAL TRACKING POWER SUPPLY

Built around positive and negative 3-Terminal Regulators, this versatile dual tracking Power Supply can provide voltages from ±1.3V to ±22V at currents up to 2A. In addition, the Supply features a fixed +5V 0.9A output and is completely protected against short circuits, overloads and thermal runaway. (EA March '82)

82PS2 **$87.50**

MODEL ENGINE IGNITION SYSTEM

Get sure starts every time and no more glow plug burnouts on your model engines. (ETI June '83)

ETI-1516 **$41.50**

TEMP PROBE

Can measure temperature from −50° to +150°C. It simply plugs into your multimeter — great for digital multimeters. Accuracy of 0.1°C resolution of 0.1°C. (ETI June '83).

ETI-153 **$22.50**

ZENER TESTER

A simple low cost add-on for your multimeter. This checks zeners and reads out the zener voltage directly on your multimeter. It can also check LEDs and ordinary diodes. (ETI May '83).

ETI-164 **$9.50**

PUSHBUTTON-PROGRAMMABLE WIPER CONTROLLER

No more fiddling with knobs and not getting the delay between wipes that you want — this windscreen wiper controller is simply programmed with two pushbuttons to provide the wiping delay you need. (ETI Mar. '83).

ETI-335 **$28.50**

RADIOTELETYPE CONVERTER FOR THE MICROBEE

Have your computer print the latest news from the international shortwave news service. Just hook up this project between your shortwave receiver's audio output and the MicroBee parallel port. A simple bit of software does the decoding. Can be hooked up to other computers too. (ETI Apr. '83)

ET733 **$20.00**

30 V/1 A FULLY PROTECTED POWER SUPPLY

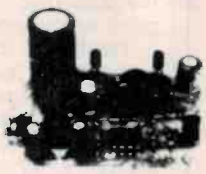
The last power supply we did was the phenomenally popular ETI-131. This low cost supply features full protection, output variation from 0V to 30V and selectable current limit. Both voltage and current metering is provided. (ETI Dec. '83).

ETI-162 **$49.50**

INVERTER

This 12 240V inverter can be used to power mains appliances rated up to 40W, or to vary the speed of a turntable. As a bonus, it will also work backwards as a trickle charger to top up the battery when the power is on. (EA May '82)

82IV5 **$49.50**



PARABOLIC MICROPHONE

Build a low cost parabola, along with a high gain headphone amplifier to help when listening to those natural activities such as babbling brooks, singing birds of perhaps even more sinister noises. The current cost of components for this project is around $15 including sales tax, but not the cost of batteries or headphones. (EA Nov. '83)

83MA11 **$15.00**

FUNCTION GENERATOR

This Function Generator with digital readout produces Sine, Triangle and Square waves over a frequency range from below 20Hz to above 160Hz with low distortion and good envelope stability. It has an inbuilt four-digit frequency counter for ease and accuracy of frequency setting. (EA April '82)

82AO3A/B **$79.50**

SLIDE CROSS-FADER

Want to put on a really professional slide show? This slide cross-fader can provide smooth dissolves from one projector to another, initiate slide changing automatically from an in-built variable timer, and synchronise slide changes to pre-recorded commentary or music on a tape recorder. All this at a cost far less than comparable commercial units. (EA Nov. '81).

81SS11 **$85.00**

TV PATTERN GENERATOR

Anyone wishing to obtain the maximum performance from a colour TV receiver needs a pattern generator. Why not build this completely new design which provides five separate patterns, dot, crosshatch, checker-board, grey scale and white raster. (EA June '80)

80PG6 **$67.50**

TRANSISTOR TESTER

1000's SOLD

Have you ever desoldered a suspect transistor, only to find that it checks OK? Trouble-shooting 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 Sept. '83)

83TT8 **$15.00**

MUSICOLOR IV

Add excitement to parties, card nights and discos with EAs Musicolor IV light show. This is the latest in the famous line of musicolors and it offers features such as four channel "color organ" plus four channel light chaser, front panel LED display, internal microphone, single sensitivity control plus opto-coupled switching for increased safety. (EA Aug. '81).

81MC8 **$84.00**

ELECTRIC FENCE

Mains or battery powered, this electric fence controller is both inexpensive and versatile. Based on an automotive ignition coil, it should prove an adequate deterrent to all manner of livestock. Additionally, its operation comforms to the relevant clauses of Australian Standard 3129. (EA Sept. '82)

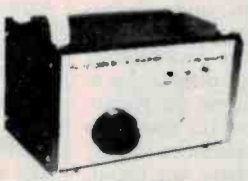
82EF9 **$19.50**

MOTORCYCLE INTERCOM

OVER 500 SOLD!

Motorcycling is fun, but the conversation between rider and passenger is usually just not possible. But build this intercom and you can converse with your passenger at any time while you are on the move. There are no "push-to-talk" buttons, adjustable volume and it's easy to build! (EA Feb. '84).

84CM5 **$36.50**



12-230V DC-AC INVERTER

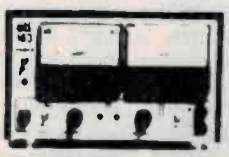
INCLUDING TRANSFORMER 300 WATTS

This EA Inverter is capable of driving mains appliances rated up to 300VA and features voltage regulation and full over load protection. (EA June '82).

Nominal Supply Voltage	12V DC
Output Voltage	see table
Frequency	50Hz± .005%
Regulation	see table
Maximum Load	300VA
Current Limiting	30A (primary)
Efficiency	see table

P & P $10.00. Anywhere in Australia.

82IV6 **$195.00**



LAB SUPPLY

Fully variable 0-40V current limited 0-5A supply with both voltage and current metering (two ranges: 0-0.5A/0-5A). This employs a conventional series-pass regulator, not a switchmode type with its attendant problems, but dissipation is reduced by a unique relay switching system switching between taps on the transformer secondary. (ETI May '83).

ETI-163 **$175.00**

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 '83)

83PS5 **$140.00**

Errors and Ommissions Excepted

Rod Irving Electronics

425 HIGH STREET,
NORTHCOTE VICTORIA.
Ph:(03)489 8866 489 8131
48-50 A'BECKETT STREET,
MELBOURNE VICTORIA.
PH:(03)347 9251
Mail Order and correspondance:
P.O. Box 235
NORTHCOTE 3070

★ NEW LOOK
★ NEW PRICES
★ NEW PEOPLE
★ NEW PRODUCTS
★ NEW IDEAS

Mail Order Hotline

(03) 481 1436

POSTAGE RATES

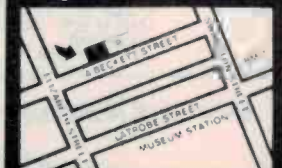
$1-$9.99	$1.50
$10-$24.99	$2.00
$25-$49.99	$3.00
$50-$99.99	$3.50
$100-$199	$5.00
$200-$499	$7.50
$500 plus	$10.00

Certified Post for orders over $100 included "free"! Registered Post for orders over $200 included "free"! Account orders from schools Govt. Depts., Public Cos., gratefully accepted. Min. order of $20. (or a min. $5 accounting fee will apply.) Comet Road Freight, Airmail etc. are extra.

welcome here

HAVE YOU BEEN INTO OUR CITY STORE???

Conveniently located on the edge of the city where parking is easy! Over 4,000sq. ft. of an extensive range of products and great "in store" bargains . . for those interested in computers we have a wide range on display upstairs. For good advice and a good price, see Rod Irving Electronics.



Hey, good lookin'! The ETI lab (thanks to Geoff Nicholls) housed the project in a good looking plastic case. The inputs and outputs are all on the rear. Note the bargraph tuning indicators. The RFE indicator shows when corrupt copy is being received.

COMPUTER RADIO-TELETYPE

RADIOTELETYPE, or RTTY, has become one of the fastest-growing facets of the amateur radio hobby, and quite a few computer enthusiasts have developed an interest in it, at least on a receive-only basis. The ETI-730 series of projects, presented in 1979 as "Get Going on Radioteletype", has become one of the standards among amateur RTTY operators. Many '730 and '731 project kits have been sold, especially through RTTY groups, and most of these are still in daily use. The ETI-733 project, using a computer to receive RTTY, has been one of the most popular kits published over the past few years.

In this series of articles I will combine the use of a computer with a transmit/receive capability to produce the ETI-755 radioteletype transceiver. ETI has received hundreds of letters asking for this project, and I've got quite a few myself. So this one is 'by request'.

What I've done is resurrect the ETI-730 RTTY demodulator and ETI-731 AFSK modulator circuits. After a few minor changes they've been combined onto one circuit board, along with a new serial/parallel converter design, to produce the '755 project.

You may ask why we are using 1979 technology instead of designing something entirely new. The answer is that the technology works, and so far nobody has come up with anything better. (All disputes of this claim to the Editor, please . . .) The hardware system has been used, fiddled with, tweaked, abused, sworn at, and loved over the past five years, so it would be fair to say it is well and truly "developed".

Software highlights

The software for the project has been written for the Microbee. It will be fully described next month, but briefly it's a split-screen system that seems to be all the rage these days. Figure 1 is a direct print-out of the Microbee's screen, excactly as you will see it. The area above the horizontal line is the 'receiving screen' and the area below, the 'sending screen'.

The receiving screen can display 16 lines of text (same as a normal Microbee), and the sending screen shows a further eight. You'll notice the characters are a bit smaller than normal; they come from a special character set included with the program.

While the receiving screen is busy displaying incoming text in the normal way (in this case the VK2TTY Sunday broadcast), you can be preparing your outgoing traffic, in advance, on the lower screen. When it's your turn to send, you hit <CONTROL — A>, the computer switches your transmitter on, and away she goes at peak 'machine speed'.

```
AMTOR, UNTIL 21 MAY.  KEEP AN EYE OPEN IF YOU NEED THAT
ONE.... 5R8AL, MALAGASY REPUBLIC, APPEARED ON SCHEDULE ON 18
TH MAY, AND STATES THAT HE WILL BE ON 14090 KHZ EVERY THURSDAY
AT 1400Z FOR THE PACIFIC AND ASIAN COUNTRIES.... 5N7CHC,
NIGERIA. HAS A VERY GOOD SIGNAL ON AMTOR MODE B AND USUALLY
APPEARS AROUND 0630Z ON 14075 KHZ, BUT HAS TO QRT AROUND 0715Z
FOR WORK.

SATELLITE REPORT FOR MONDAY 14TH MAY 1984 DE 'ALAN' VK2RX

SAT   EQX DG.W  UTC   ACQ SYD.   SAT   EQX DG.W  UTC   ACQ SYD.
                      U.T.C.                      U.T.C.
U09     180     0332    0455     RS5     160     0559    0733
        203     0507    0627             190     0759    0935
        ---     ----    ----             220     0958

VK2TTY VK2TTY VK2TTY DE VK7TM VK7TM VK7TM
BROADCAST RECEIVED MOSTLY INTACT IN SOUTHERN TASMANIA ALTHOUGH
THE SIGNAL WAS PRETTY WEAK, FADING AWAY TO VIRTUALLY NOTHING AT
TIMES. STILL, GOT MOST OF IT, THANKS VERY MUCH.
VK2TTY  DE VK7TM, FERN TREE, TASMANIA
SK SK SK
```

Figure 1.

As the earlier lines are being sent you can still be preparing more text further down. When the transmitter finally catches up with you (there's a special cursor to show you where it is), you can keep sending but the transmission will then be at your 'hunt and peck' speed.

The software includes an automatically repeating test message generator, one-key station identification, a 'brag tape' facility, a printer output, and much more. In fact there's enough waffle about the software to fill another whole article, so we'll save the rest until the next instalment.

First steps

If you contemplate building this project, your first step, I think, would be to get a copy of ETI's *Radio Experimenter's Handbook Vol. 1*, which should be available at just about any newsagent. As well as lots of other goodies, it contains reprints of the entire *Get Going on Radioteletype* series from which this project was developed. There's a discussion of how teletype works, and you can read in detail the philosophy behind this design.

The system

A radioteletype signal consists of a carrier that jumps back and forth between two frequencies . . . one for a 'mark', or logic 1, and the other for 'space', or logic 0. The frequencies can shift up and down many times a second to represent serial data, much like the data that could flow from your computer to a printer.

The RTTY transceiver must do two jobs . . . it must take the radio frequencies, already converted to audio frequencies in a receiver, and change them into logic 1s and 0s. It must also take logic 1s and 0s from a computer and convert them back into audio frequencies for feeding to a transmitter. (Some of the later amateur transceiver designs accept the logic levels directly, and this has been allowed for in the '755 design).

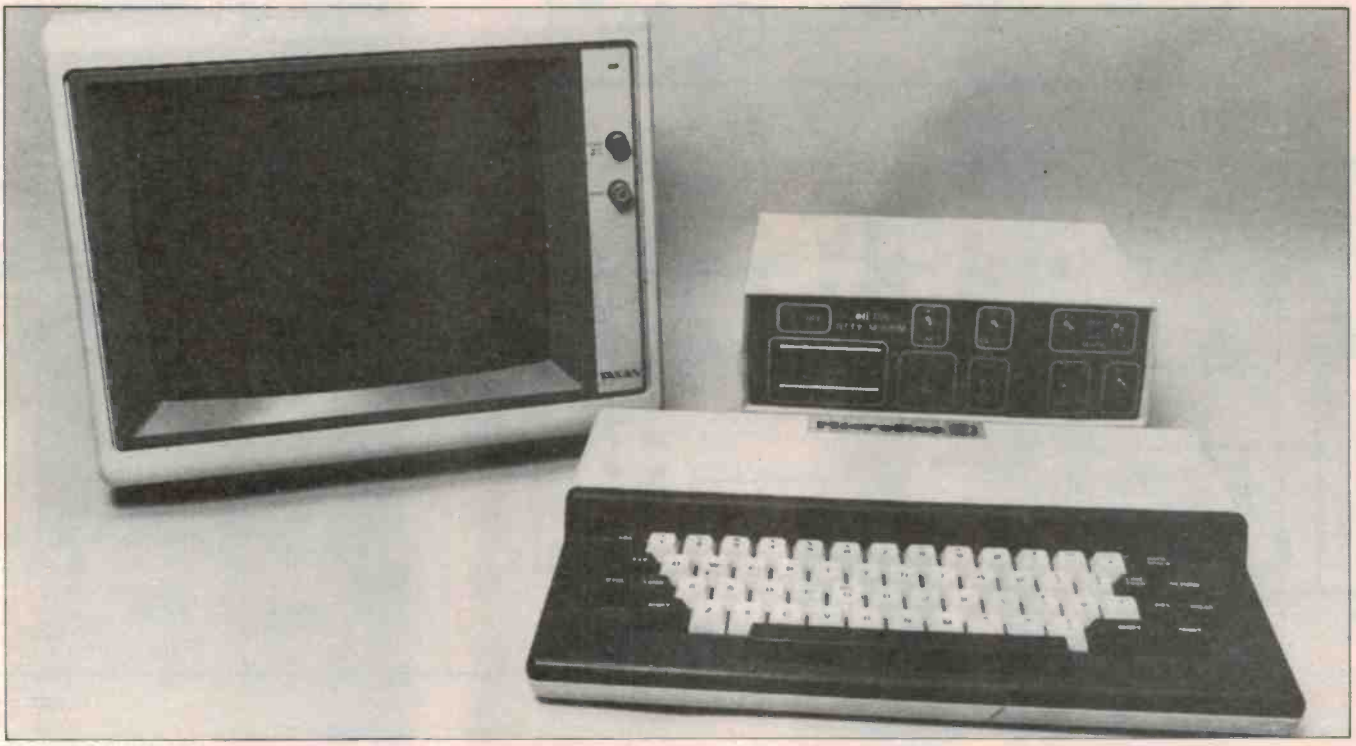
The third, and newest part of the '755, is a circuit that takes parallel data from a com-

▶

-DRIVEN TRANSCEIVER

Part 1 Here's what you've all been asking for — a full transmit/receive system for a computer-driven radioteletype station. The software provides all the latest 'whizz-bangs' like split-screen operation, automatically repeating test message, printer output and more. The hardware uses tried and proven techniques. While designed to team with the popular Microbee, tips are given on interfacing the unit to other computers.

39 Pillinger Drive, Fern Tree Tas. 7101
Tom Moffat VK7TM



RADIOTELETYPE GROUP

There exists a national organisation of amateurs interested in radioteletype techniques, called **The Australian National Amateur Radio Teleprinter Society (ANARTS).** They have local chapters who conduct meetings at regular intervals where you can meet and exchange ideas, etc. and learn from the experiences of others. For further information, write to:

The Secretary,
ANARTS
PO Box 860
Crows Nest NSW 2065

HOW IT WORKS — ETI-755a

There are four sections to the circuitry on the main pc board: the demodulator, the modulator, the transmit control and the UART. Let's take them one at a time.

THE DEMODULATOR

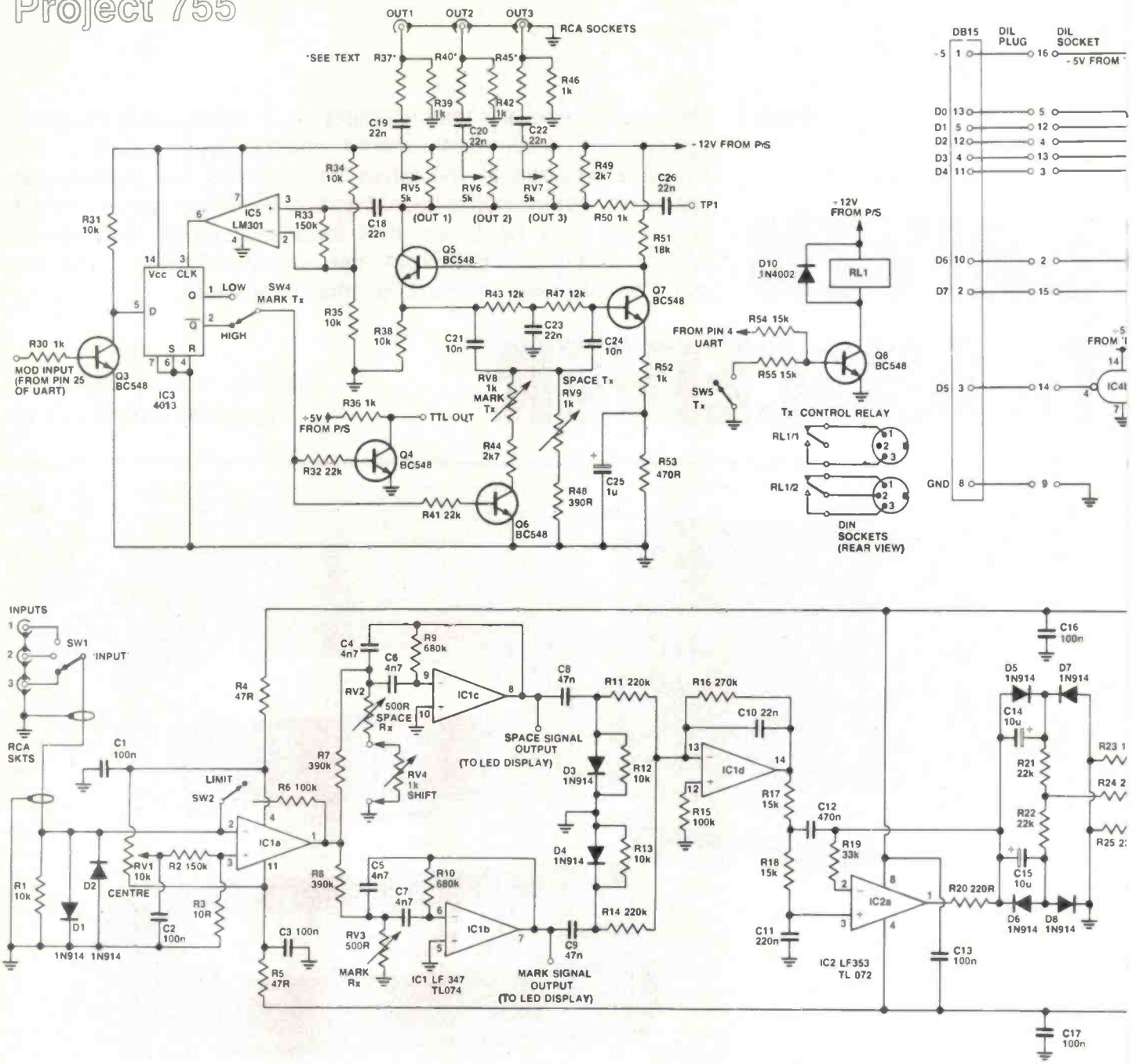
The input is derived from your transceiver's receiver audio output, as selected by SW1. This is clipped by the two diodes, D1-D2, and goes to the inverting input of the op-amp IC1a. This acts either as a buffer (SW2 closed) or as a limiter (SW2 open). The trimpot RV1 serves to set this stage's output swinging about 0 V. The output of IC1a passes to two active filters which have their inputs paralleled.

The 'space' signal filter comprises IC1c and surrounding components. The trimpot RV2 sets the minimum centre frequency of the space filter, while the front panel pot RV4 permits varying the filter's frequency over the desired range, so that the 'shift' can be selected.

The 'mark' signal filter comprises IC1b and surrounding components. The trimpot RV3 sets the mark centre frequency.

The output of the two filter op-amps each goes to the input of a bargraph LED display which serves as a tuning indicator.

The filter outputs are rectified by D3 and D4 ('demodulated') and then combined into a dc level that swings positive and negative with the incoming tones. IC1d and IC2a form a ▶



lowpass filter that restricts transitions from the demodulated filter outputs to the 70 baud rate or less. This effectively reduces the noise bandwidth of the system. The output of IC2a drives D5-D8 and associated components, which cancel some of the bias distortion caused by selective fading of the transmitted tones.

This part of the circuit averages the mark and space transitions and sets one side of the comparator IC2b half way between them. IC2b 'squares up' the swinging waveform from the anti-distortion circuit, driving Q1 on and off as the incoming tones swing from mark to space. Diode D9 clamps the negative excursions of the output of IC2b to prevent damaging Q1. The base of Q2 is driven from the collector of Q1 so that its collector provides the inverse of the signal on the collector of Q2. SW3 switches between the collectors of Q1 and Q2 to provide 'mark low' and 'mark high' signals, respectively, for the UART.

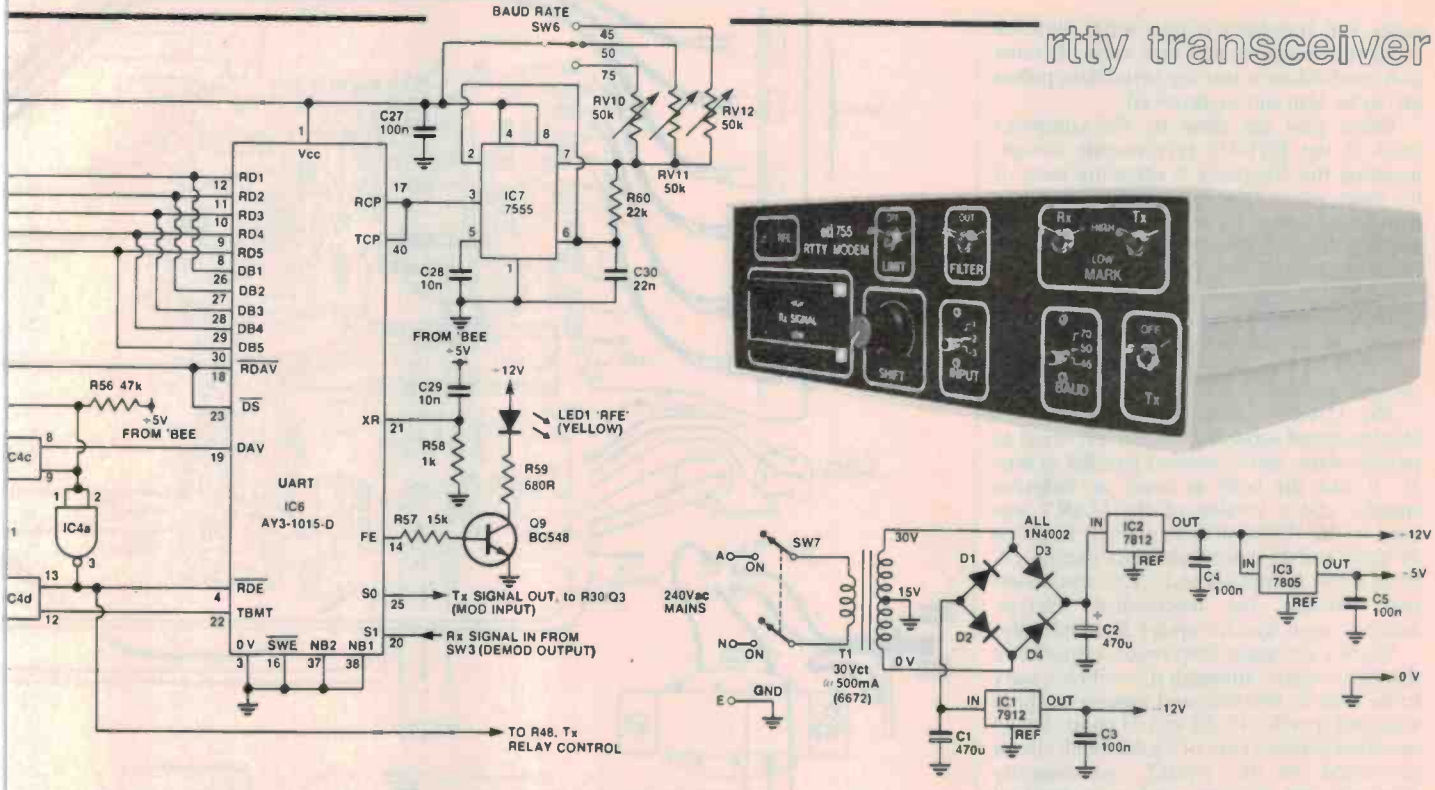
Note that dual supply rails are employed. The supply to IC1a is decoupled from the rails via R4-R5 and C1-C3.

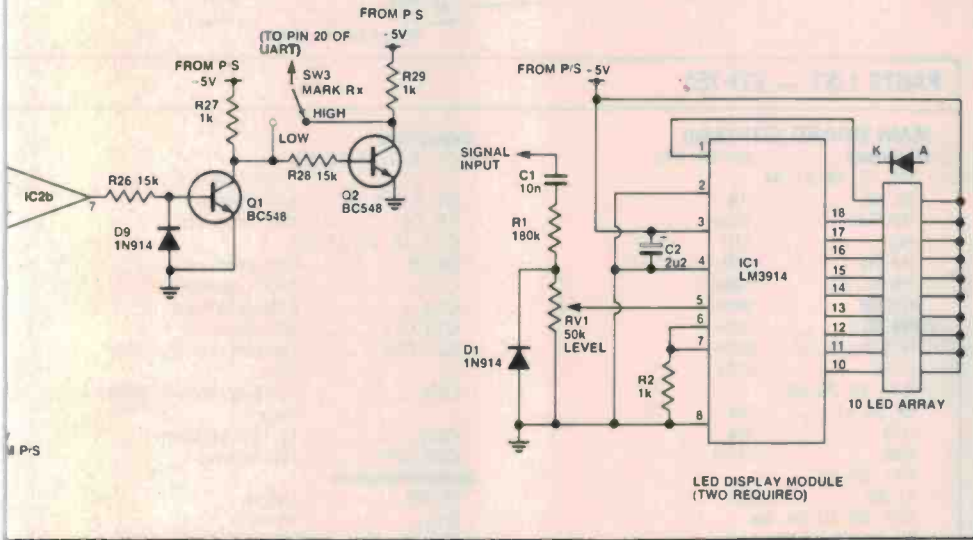
THE MODULATOR

The heart of this section is the 'Twin-T' oscillator formed by the two transistors Q5-Q7 and the R-C network between the emitter of Q5 and the base of Q7. Basically, R43-R47, C21-23-24 and the resistance from the junction of C21-C24 determine the frequency of oscillation. If Q6 is turned off, the exact frequency of oscillation is set by RV9. When Q6 is turned on, it is set by the parallel combination of RV8-R44 and RV9-R48, adjustable via RV8.

When digital pulses are fed to the base of Q3, its collector toggles the Q outputs of the flip-flop, IC3. One of these will be connected to the base of Q6, which will toggle RV8-R44 across RV9-R48. When Q6 turns on, the Twin-T oscillator's frequency rises. Thus, RV8 basically sets the upper shift frequency (the 'high' tone) and RV9 sets the lower shift frequency (the 'low' tone). Either can be defined as 'mark' or 'space'. SW4 determines whether the mark tone is low or high.

For phase-coherent operation, an output from the oscillator is taken from Q5's collector to the non-inverting input of the op-amp IC5. This is run at 'flat out' gain, forming a





limiter amplifier. Its output is a squarewave of about 10 V peak-to-peak and this becomes the clock frequency for the flip-flop IC3. The Q outputs cannot change state to follow the input until IC3 receives a positive-going clock pulse, which only occurs at the start of each oscillator cycle. Hence, the oscillator can't 'switch' except at the start of a cycle, preserving phase coherence.

Three outputs are available. Trimpots RV5, RV6 and RV7, in conjunction with R49, form the collector load of Q5. The outputs are accoupled via C19, C20 and C22. The overall output level can be set to your requirements by selecting the value of R37, R40 and R45. An extra output, for test purposes, is provided at TP1.

Note that, for best stability, C21, C23 and C24 should be either styroseal, silver mica or close tolerance poly capacitors.

TRANSMIT CONTROL

A relay, switched by transistor Q8, is used to control your transmitter. The UART provides a high on R54 to turn on Q8 and operate the relay. Alternatively, SW5, a front panel switch, can over-ride this. Note that the relay has a pair of changeover contacts, brought out to two DIN sockets, to provide a number of control options.

THE UART

This does all the 'inputting' and 'outputting' between the modem and the computer. Most of this part of the circuitry is powered from the +5 V rail from the Microbee (or whatever you might be using). IC7 provides a baud rate 'clock'. This is a CMOS timer, a 7555. The clock frequency, and thus the baud rate, is selected by varying the oscillation frequency of the 7555. SW5 selects a trimpot which is preset to the appropriate speed.

The S0 pin of the UART provides the digital modulator drive signal (Tx), while the S1 pin takes the digital signals from the demodulator output (Rx). The UART's RDE output goes high when you are in the transmit mode, and it turns on Q8, which operates the transmit relay.

During receive, an incorrectly received 'frame' of baudot code will cause the FE output of the UART to go high, thus turning on Q9 and the 'frame error' (or RFE) indicator LED.

Communications to and from the computer are via the 8-bit data buss, D0-D7.

HOW IT WORKS — ETI-755b

The display is quite straightforward. Note that two are used, one for the 'high' tone, one for the 'low' tone (since the 'mark' signal may be either).

The display is based on the LM3914 bargraph driver IC. The input is ac-coupled, negative excursions over half a volt being clamped by D1. Input level is preset via trimpot RV1. The LM3914 is set to operate in the 'bar' mode. The 10-LED array provides the signal strength indication.

HOW IT WORKS — ETI-755c

This board is quite conventional. Three supply rails are required: +12 V, −12 V and +5 V. A bridge rectifier, D1 to D4, provides the positive and negative rails from the centre-tapped secondary of T1. A 7912 provides the regulated −12 V rail, a 7812 the +12 V rail, and a 7805 derives the +5 V rail from the regulated +12 V rail. Capacitors C1 and C2 are the rectifier smoothing capacitors.

puter and translates it into serial data for radio transmission, and vice versa. It must also establish how fast the serial data pulses are to be sent out or received.

These jobs are done by the computer itself in the ETI-733 receive-only design, meaning the computer is spending most of its time generating time delays, waiting while each serial bit is received. As you'll realise, the '755 system has a lot more for the computer to do, and it can't waste its time sitting around in time delay loops. So we've employed an external circuit called a 'universal asynchronous receiver-tansmitter' (UART) to do the waiting while the computer attends to other matters.

The UART (pronounced *you-art*) is a chip designed especially to convert serial to parallel data, and to convert parallel to serial. It can do both at once at different speeds, and a version of the UART was used in the '730 system to convert between 50 baud and 45 baud serial data speeds. (A baud is one bit per second.) This was necessary because the mechanical teletype machine used was set up for 50 baud only.

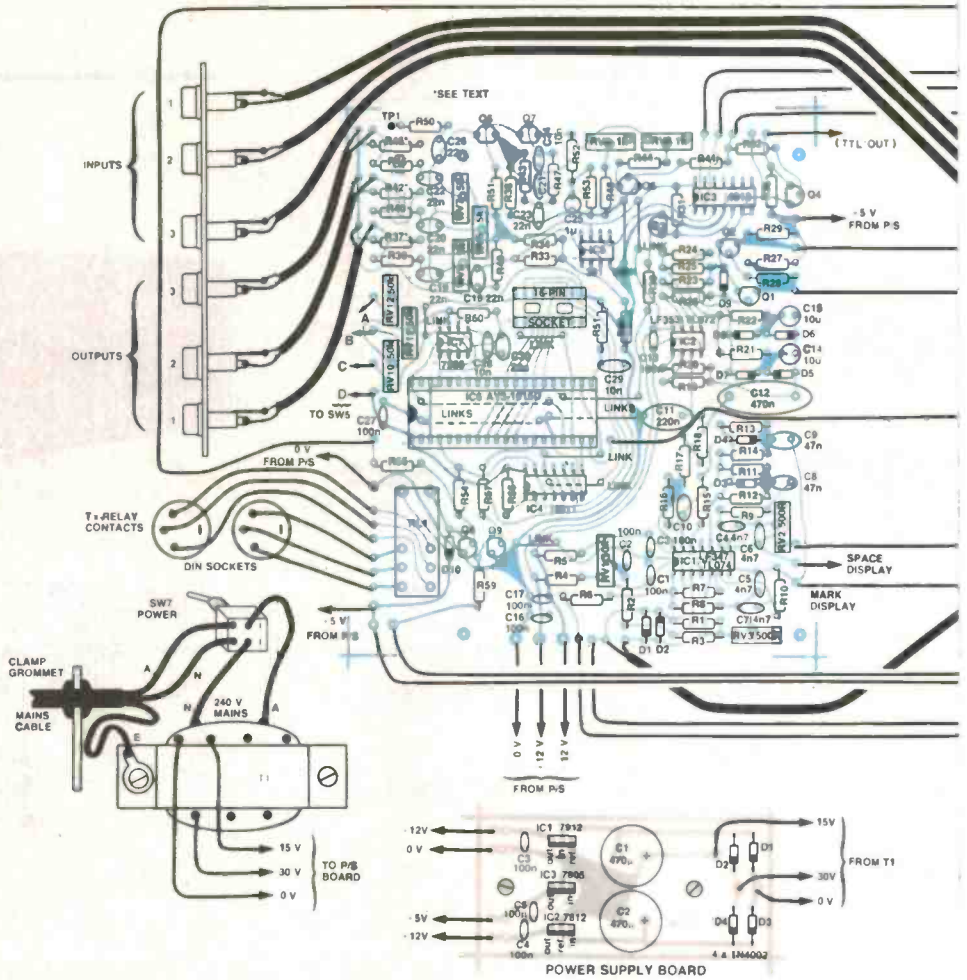
There's no speed conversion required in this new design, although it's still necessary to be able to transmit and receive at three standard speeds, 45, 50 and 75 baud. Speed selection is taken care of by the clock circuit connected to the UART, conveniently avoiding the varying and non-standard clock speeds available in various computers.

We had a real hassle with the ETI-733 project, which was originally written for the first Microbees with 2 MHz clocks. Soon after publication the Microbee's clock speed was changed to 3.375 MHz, so the program's 'software UART' for the old speed ran fast with the new speed. There are now two versions of the program, one for each clock speed. But with the '755's clock being external to and independent from the computer, the computer's clock speed is of absolutely no importance.

Enough of UARTs! Let's look at sending the highs and lows on your radios. There are two general methods of decoding RTTY signals. The older method involves establishing two separate channels through the system using filters, one for the higher audio frequency and the other for the lower. Each filter's job is to recover as much of the desired signal as possible, in the presence of noise, other undesired RTTY signals, and radio frequency rubbish generated by your computer. The outputs of both channels are then compared, and the one with the strongest signal determines whether the decoder will claim it's receiving a logic 1 or logic 0. This is the method used in the ETI-730 and the current '755 design.

The other method of detection uses a phase-locked loop, which locks on to the incoming signal and then follows it up and down, producing a dc voltage (logic level) describing the state of the audio signal locked onto. This is the method used in the ETI-733 system. It's simple, it's good, and it works. But it suffers when there's more than one signal audible, because the loop will lock onto the strongest signal, even if it's not the one you're trying to receive.

The filter system is a little harder to use, because each of the two audio channels must be tuned to its assigned frequency. ▶



PARTS LIST — ETI-755

MAIN BOARD (ETI-755a)

Resistors ..... all ¼W, 5%

R1, 12, 13, 31, 34, 35, 38	10k
R2, R33	150k
R3	10R
R4, R5	47R
R6, 15, 23	100k
R7, R8	390k
R9, R10	680k
R11, 14, 24, 25	220k
R16	270k
R17, 18, 26, 28, 54, 55, 57	15k
R19	33k
R20	220R
R21, 22, 32, 41, 60	22k
R27, 29, 30, 36, 39, 42, 46, 50, 52, 58	1k
R37, 40, 45	see text
R43, 47	12k
R44, R49	2k7
R48	390R
R51	18k
R53	470R
R56	47k
R59	680R
RV1	10k miniature vert. mount trimpot
RV2, RV3	500R miniature vert. mount trimpot
RV4	1k/A rotary pot.
RV5, 6, 7	5k miniature vert. mount trimpot
RV8, RV9	1k miniature vert. mount trimpot
RV10, 11, 12	50k trimpot vert. mount trimpot

Capacitors

C1, 2, 3, 13, 16, 17, 27	100n ceramic
C4, 5, 6, 7	4n7 greencap
C8, C9	47n greencap
C10, 18, 19, 22, 23, 26, 30	22n greencap
C11	220n greencap
C12	470n greencap
C14, C15	10n tantalum
C21, C24	10n poly, styro or silver mica
C23	22n poly, styro or silver mica
C25	1µ/10 V tantalum
C28, C29	10n ceramic

Semiconductors

D1-D9	1N914
D10	1N4002
IC1	LF347, TL074, µA774
IC2	LF353, TL072, µA772
IC3	4013
IC4	4011
IC5	LM301, µA301
IC6	AY3-1015D G.I. UART
IC7	7555
LEAD1	TIL220Y yellow LED
Q1-Q9	BC548, BC108

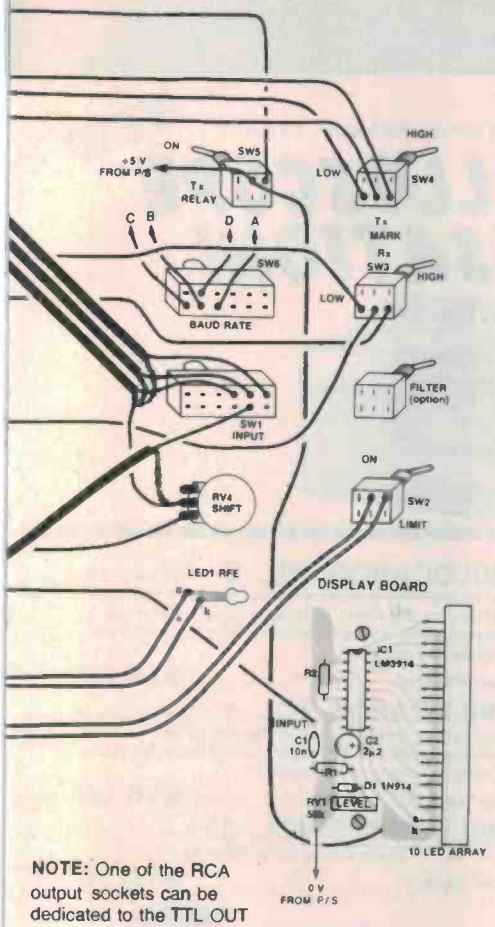
DISPLAY BOARD (ETI-755b — two off)

Resistors ..... ¼W, 5%

R1	180k
R2	1k
RV1	50k min. vert. mount trimpot

Capacitors

C1	10n ceramic
C2	2µ2/10V tantalum



NOTE: One of the RCA output sockets can be dedicated to the TTL OUT If you have a transceiver that accepts TTL level signals for RTTY operation.

Semiconductors

D1 ..... 1N914
IC1 ..... LM3914
LED array ..... Z0180 (Altronics) or similar

POWER SUPPLY BOARD (ETI-755c)

Capacitors

C1, C2 ..... 470µ/25 V mount electros.
C3, 4, 5 ..... 100n ceramic

Semiconductors

IC1 7912
IC2 7812
IC3 7805

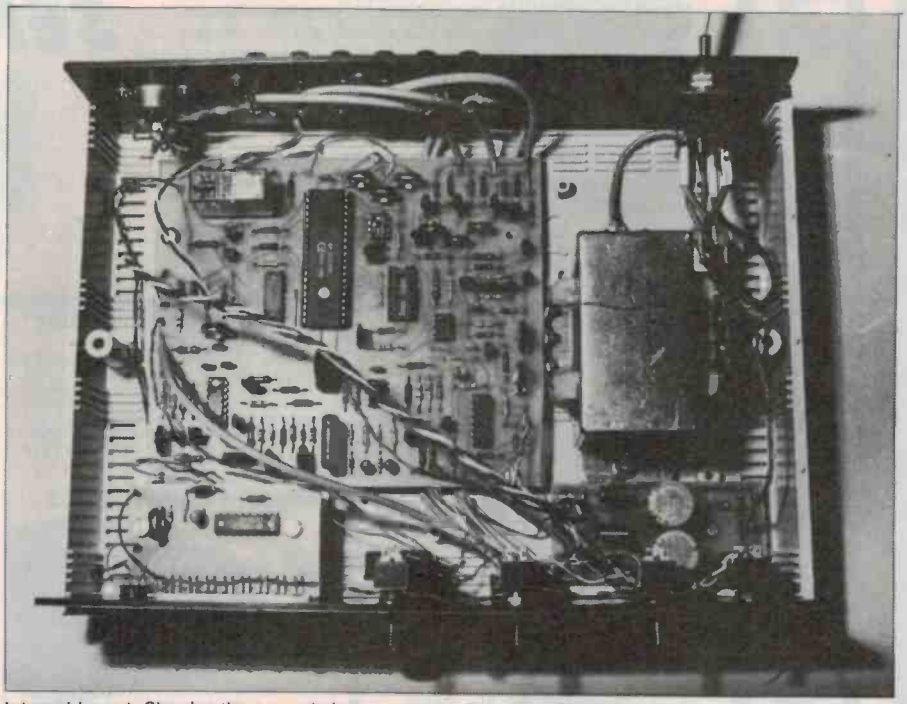
HARDWARE — COMPLETE UNIT

Miscellaneous

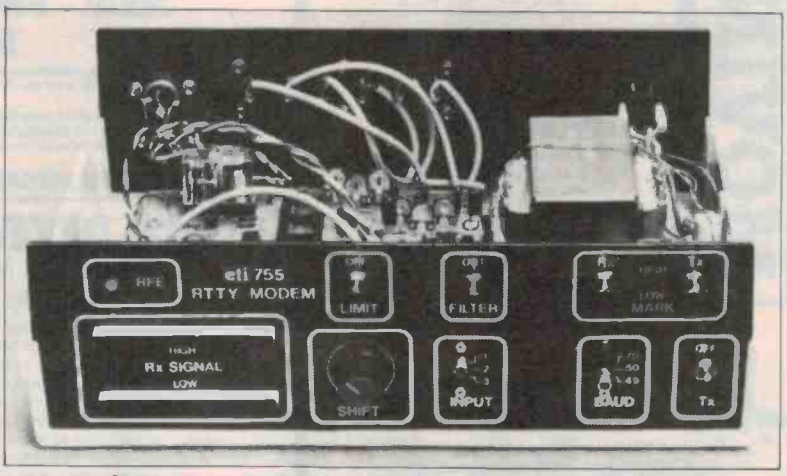
RL1 ..... 12 V pc mount relay, DPDT contacts
SW1, SW6 ..... single pole, 3-pos. slide switches
SW2, 3, 4, 5 ..... SPDT miniature toggle switches
SW7 ..... DPDT 240 Vac/1 A toggle switch
T1 ..... 240 Vac/30 V C.T. @ 500 mA or similar, (e.g: type 6672)

Printed circuit boards — ETI-755a, ETI-755b (two off), ETI-755c; case — Altronics no. H0482; Scotchcal front and rear panels; two 6-way RCA socket strip; two 3-pin DIN sockets; mains cable, plug and clamp grommet; 5 mm LED bezel; 40-pin IC socket; 16-pin IC socket; knob to suit 'shift' pot., 16-pin IDC DIL plug (see note); DB15 IDC plug; 16-way ribbon cable; screened cable; light duty hookup wire; eight PK screws; 2 x 20 mm tapped standoffs and four bolts to suit; one solder lug.

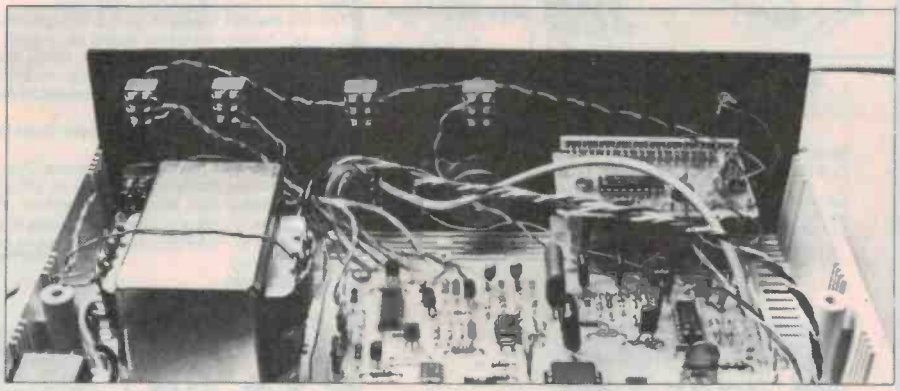
Price estimate: $105-$120



Internal layout. Showing the general placement of the boards and hardware and general wiring routing.



Inside rear. Showing the rear panel layout and wiring arrangements.



Inside front. Showing the mounting arrangements for the two tuning indicator boards and the general wiring layout.

MOVING WAREHOUSE SALE

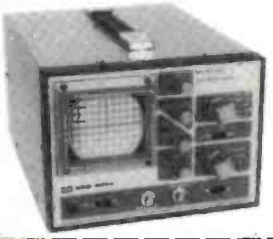
Ref: EA October 1984

Jaycar and EA have come up with the best value Oscilloscope on the market today - **IN A KIT. . .**

NEW

OSCILLOSCOPE SENSATION!

Over the years many people have asked, "Do you have a CRO kit?" Our answer - up until now - has been that built and tested units were no dearer than kits, if you could get a kit at all.
The Jaycar KJ-7050 Cathode Ray Oscilloscope kit has a guaranteed 5MHz bandwidth but should go to around 6.5MHz. It also features 75mm (3") CRT Blue Phosphor with accurate graticule, separate vertical and horizontal BNC type input sockets etc. Remember, a 5MHz 'scope is usually adequate to troubleshoot most micro processor and other digital circuitry as well!
This is a wonderful opportunity to learn electronics AND end up with a valuable piece of test equipment as well.
The Jaycar KJ-7050 kit is absolutely complete. The chassis is pre-punched and every component including nuts and screws are provided, along with instructions.
Cat. KJ-7050



ONLY $229

ELECTRONIC BELT DRIVE TURNTABLE - BSR QUALITY

Jaycar has made a sensational SCOOP PURCHASE of B.S.R. belt drive turntables from England at below manufacturers cost!
Two models available AA-0290 works from 9-12V DC and the AA-0292 from 240V AC (includes 12V 400mA adaptor). The DC motor drive is electronically controlled.
SPECIFICATIONS: ★ Dimensions 330(W) x 285(D) x 60(H)mm overall ★ Platter diameter 280mm ★ 2 speed - 33 & 45 rpm (internally adjustable) ★ Pick-up arm counterbalanced type with cueing facility ★ Pick-up ceramic (stereo) with diamond stylus ★ Turntable operation - auto stop, will return to rest automatically, turntable chassis is sprung on all corners with transit screws and clips. ★ Weight 1.5kg ★ Output stereo RCA sockets underneath unit

CHECK THE PRICE! Cat. AA-0290
(requires 9-12V DC @ 400mA)

$24.95 ~~$29.95~~

240V VERSION Cat. AA-0292
(includes 12V 400mA adaptor)

$34.95 ~~$39.95~~

NOVEMBER ONLY SAVE $5.00 PER UNIT

(Post and Packing this item $5 not $4.50)

JAYCAR VIDEO ENHANCER

A service to the Professional

Designed by a staff member of a well known Australian University and made in Australia. It is the only 625 line 50 frame PAL-D Australian designed and made unit that we know of. The unit features enhance, core/gamma control and by-pass switch. It will drive up to 3 VCR's at once with no degradation and works well as a video distribution amp as well. This is NOT A KIT and is guaranteed for 3 months.
Cat. AV-6501

NOT $69.95 ONLY $59.95

SAVE $10

WILDCARDS VOL. 3 - Another in the series of Wildcard books with even more in Vol. 3. Large section on assembly language using a game as an example with an assortment of business programs, utilities and graphics.

Cat. XB-9012 ..... **$16.00**

WILDCARDS VOL. 1 - A potpourri of application notes and tips for the Microbee. This book has received rave reviews from all computer publications. A must for all Microbee owners.

Cat. XB-9010 ..... **$15.00**

WILDCARDS VOL. 2 - A continuation from Vol. 1 - again a must for all Microbee owners.

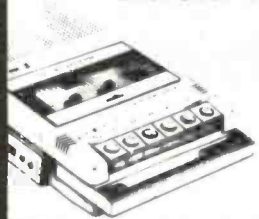
Cat. XB-9011 ..... **$16.00**

NEW - PROGRAMMABLE MOBILE ROBOT

Low-cost fun learning with this sophisticated robot! Have hours of educational fun programming this fun device to do what you command through the 25-key keyboard on its head!!
FEATURES: ★ 4 bit microprocessor controlled ★ 3 speed gears selected by programming thru' micro ★ Can travel in 4 directions plus angles and curves ★ Has lights and audio ★ Complex routines can be easily programmed (up to 48 commands long).
Cat. XR-1024

SAVE WITH JAYCAR - ONLY $49.95

LOW-COST COMPUTER CASSETTE



★ Mains/Battery operated
★ Tape counter - absolutely necessary for a data recorder.
★ Works as an audio recorder/player as well.
★ Inbuilt condenser microphone
★ LED recording indicator!
Sold earlier this year for $39.95

Special purchase price

$34.95 SAVE $5 HURRY!
Cat. XC-4905

4½ DIGIT LCD DPM 60

☆ 200mV fsd ☆ Digital Hold ☆ Bandgap Reference ☆ 10uV Resolution

Fantastic bargain - for full details on this device see our catalogue page 52. **SPECIFICATIONS:** ★ Accuracy −0.01% ± 1 digit ★ Linearity ± 1 digit ★ Samples/sec - 1.6 ★ Temperature stability 50ppm/°C typical ★ Temperature range 0-35°C ★ Supply voltage 7.5 - 15V ★ Supply current 1mA typical ★ Maximum DC input voltage ±20V.
Cat. QP-5520

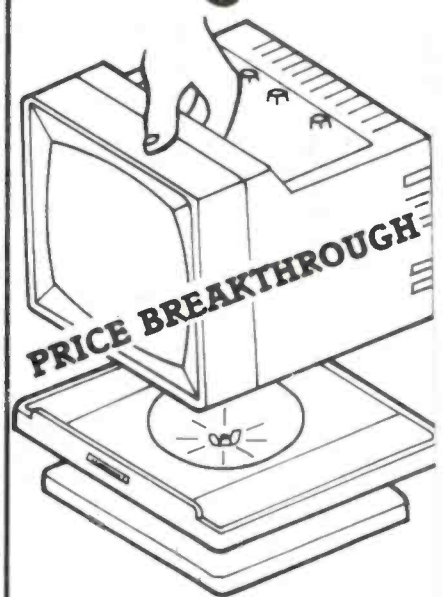
NOVEMBER ONLY SAVE $10
ONLY $79.95

SMOKE DETECTORS

The consumer flop that should never have flopped!

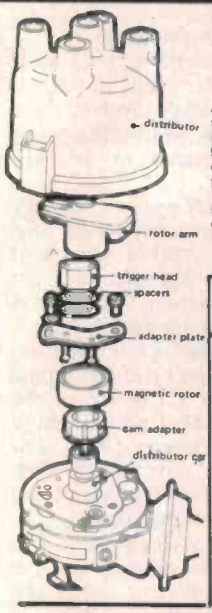
One of the greatest consumer flops of the last decade was the ionization-type smoke detector.
Even though it was a brilliant product is reliable, compact, easy installation, fail safe etc., it just did not sell. Apparently human nature being what it is finds safety-oriented products just not worth the investment however modest. We all know, for example, that accidents and fires never happen to US!!
We all know also, that smoke is the greatest killer in a fire. Many fires smoulder for hours before catching alight and causing physical damage.
The US market research gurus thought that a cheap, compact smoke detector would be a mass consumer item. But boy, were they wrong! When they sold for $49.50 no one wanted them. The price fell to a very reasonable $29.99 and still they stayed on the supplier's shelves. Jaycar was called in.
We have now been instructed to sell them for less than ½ this amount!!
Now no-one, no-one has an excuse. You owe it to yourself, your children and family to afford them this simple, reliable and low cost protection. If you are a Hotel, Motel or Lodge operator don't miss this wonderful opportunity to install smoke detectors at a never-to-be-repeated price.
Cat LA-5090

ONLY $14.98



Now you can mount your monitor on a swivel/tilt base to maximise the viewing angle (and reduce glare) of your computer monitor.
Until now tilt bases were expensive or only fitted to expensive monitors. Now you can have one in your home for under $30!!
Cat. XM-4540

NORMALLY $29.95 SAVE $5
NOW ONLY $24.95



CONTACTLESS HALL EFFECT "BREAKER POINTS"

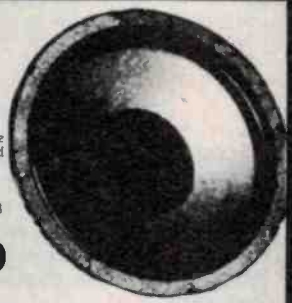
REF. EA DECEMBER 1983

A professionally engineered electronic ("breakerless") contact breaker system. Jaycar has the complete Hall Effect triggerhead assembly designed to adapt to an extensive number of cars. Each kit contains the following: ★ Hall Effect triggerhead ★ Magnetic rotors for both 4 and 6 cylinder cars ★ Over 6 cam-lobe adaptors ★ Over 12 different adaptor plates for your particular distributor ★ Other hardware (i.e. screws etc) ★ As easy to install as a set of points ★ Simple instructions for fitting included.

Cat. KJ-6655

ONLY $29.95

LAST CHANCE! PHILIPS SPEAKER KITS



The fabulous Philips/ETI 4000 series speakers are becoming impossible to get. We have a limited quantity of both sets available, but you had better be quick.

ETI 4000/2 3-WAY KIT

Incorporating: 2 x AD12250/W8 woofers; 2 x AD02160/SQ8 midrange; 2 x AD01610/T8 tweeters; 2 x crossover kits

Cat. CK-2440

$397.00

ETI 4000/1 4-WAY KIT

Incorporating: 2 x AD12250/W8 woofers; 2 x AD02160/SQ8 midrange; 2 x AD70620/M8 lower midrange; 2 x AD01610/T8 tweeters; 2 x crossover kits.

Cat. CK-2430

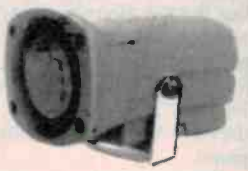
$549.00 SAVE $50

NEW 116dB of 'TWEETIE PIE'

This incredible little Piezo screamer (measuring 57(L) x 33(H) - less bracket) emits a 116dB wail. It sounds like a very loud canary. The sound at close range is almost unbearable! If you mount it inside your car and your alarm fires, a would be thief would probably be scared half out of his wits!

Ideal for any compact high noise alarm application.

Cat. LA-5255



ONLY **$24.95**

ANOTHER BARGAIN

CHEAPER THAN ELECTRETS

Quality West German made dynamic mic inserts. You can feel the quality by the weight of one in your hand! Not too much in the specification dept. except that we know that they are GOOD!!

Cat AM-4015

$1.50 ea

NOVEMBER ONLY 99¢

NEW 12 VOLT 2 AMP DC POWER SUPPLY

This regulated power pack is ideal for CB radio and workshop use where large amounts of power are required. DC connections by means of banana plugs or screw terminals.

Cat. MP-3017

$47.50

NEW - "GRIPMATE"

The ideal tool for holding small components when assembling. This simple - low cost "3rd Hand" consists of a base, clamp and two simple grippers attached to flexible arms. The concept is old but this new approach is brilliant and inexpensive! We all know how difficult it can be to solder very small components. This solves the problem.

You can fit up to 4 flexible arms to each "Gripmate" base or alternatively up to 3 arms and a magnifying glass - also on a flexible arm.

BASIC GRIPMATE (Base, bench clamp & 2 flexible arms)

Cat. TH-1980

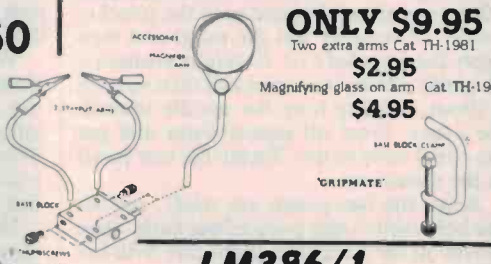
ONLY $9.95

Two extra arms Cat. TH-1981

$2.95

Magnifying glass on arm Cat. TH-1982

$4.95



LM386/1

This device is a 1 watt low voltage Audio Power Amp suited for battery use. We've got too many of them.

Cat. ZL-3386

ONLY $1.40 each
SAVE $1.00

DIRECT CONNECT MODEM

Cat. XC-4800

NORMALLY $399 NOVEMBER ONLY

SAVE $40 NOW $359

BOOK SENSATIONS

MOTOROLA CMOS DATA

862 pages crammed with up-to-the-minute information on 4000, 4400 and 4500 devices. A complete product index is included along with comprehensive data on every device (almost 200 described). As the CMOS part numbering system is standard, you can use this reference for other manufacturer's products with the same generic numbers.

Cat. BM-4210

SAVE $4.50
ONLY $10.00

TV ANTENNAS AND SIGNAL DISTRIBUTION SYSTEMS

An aid in selection and installation of TV antennas and signal distribution systems, and how to implement these systems for high-quality TV reception. Includes valuable performance data based on actual measurements made by the author.

256 Pages. 5½ x 8½. soft.

Cat. BS-0542

SAVE $2.00
ONLY $11.95

16-BIT MICROPROCESSORS

Carefully steps you through the complex process of programming and designing with the new and powerful 16-bit microprocessors. The major advantages and disadvantages of these state-of-the-art devices are discussed and numerous benchmarks are provided to help you in your comparison of the chips. The book begins with a simple, straightforward review of the basics of microprocessor design and construction, and then takes an in-depth look at each of the most popular 16-bit microprocessors on the market today, including the 68000, 8086, Z8001/2, 9900 and NS16000.

352 Pages. 5½ x 8½. soft.

Cat. BS-0588

SAVE $5.00
ONLY $19.95

IC TIMER COOKBOOK

Gives you a look at the hundreds of ways IC timers are used in electronic instrumentation. This cookbook provides a collection of numerous recipes for using the IC timer, including a 555 monostable circuit with auxiliary output, a touch switch, a programmable monostable circuit, and hundreds of others.

288 Pages. 5½ x 8½. soft.

Cat. BS-0556

SAVE $5.00
ONLY $18.95

MOSTLY BASIC: APPLICATIONS FOR YOUR APPLE® II, Book 2

Provides you with 28 ready-to-use BASIC language programs which have been completely tested and debugged for use on your Apple II. Includes a telephone dialler, digital stop watch, spelling test, a house buying guide, a gas mileage calculator, and many others useful to businessmen, hobbyists, scientists, and computer enthusiasts.

160 Pages. 8½ x 11½. comb.

cat. BS-0600

SAVE $3.00
ONLY $14.95

THE COMPLETE HOME VIDEO BOOK VOLUMES I and II

by Peter Utz

Starts with elementary concepts, builds to more complex video activities, and ends with semi-professional techniques. Graphics, copying a video tape, editing a video tape, planning and scripting, and more.

BOOK 1 - Cat. BS-0648 — **SAVE $3.00**

BOOK 2 - Cat. BS-0649 — **ONLY $19.95**

Jaycar ELECTRONICS

Incorporating ELECTRONIC AGENCIES

NUMBER 1 FOR KITS

SHOWROOMS

SYDNEY: 117 York Street. Tel: (02) 267 1614.

CARLINGFORD: Cnr. Carlingford & Pennant Hills Road. Tel: (02) 872 4444

CONCORD: 115/117 Parramatta Road. Tel: (02) 745 3077

HURSTVILLE: 121 Forest Road. Tel: (02) 570 7000

MAIL ORDERS: P.O. Box 480, AUBURN 2144. Tel: (02) 643 2000

HEAD OFFICE: 7/9 Rawson Street, AUBURN 2144.

Tel: (02) 643 2000 Telex: 72293

SHOP HOURS

Carlingford, Hurstville & Gore Hill
Mon-Fri 9am - 5.30pm. Thurs 8.30pm. Sat 1.2pm

Sydney
Mon-Fri 8.30am - 5.30pm. Thurs 8.30pm. Sat 4pm

Concord
Mon-Fri 9am - 5.30pm. Sat 4pm

POST & PACKING

$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	$10.00

COMET ROAD FREIGHT ANYWHERE IN AUSTRALIA ONLY $12

MasterCard

VISA

MAIL ORDER VIA YOUR PHONE

Trouble is, the frequencies can be spaced between about 50 Hz and 1000 Hz apart, depending on the whim of the particular transmitting station. So the ETI-755 transceiver has a control to let you vary the frequency of one filter channel in relation to the other.

You must obviously know when both channels are tuned properly, so we've provided a signal strength indicator connected to each one. They are 'bar LED' displays probably much like the one on the front of your FM tuner. The ETI-730 project used a small oscilloscope for this, and it was nicer to use; it provided more information about such problems as noise and selective fading. But it's just about impossible to get the parts for things like that nowadays, so it's bar LEDs or nothing!

There are a few other changes from the ETI-730 series. Because they're becoming hard to get, the 709 op-amp at the input of the receiver has been changed to ¼LF347 (TL074). The method of mark-high/mark-low switching has been changed to prevent switching of high impedance audio circuits.

A couple of 10k resistors have been added as loads for the filter rectifiers. They provide a small but important increase in performance. We have removed their loop driver circuit so those diehards (like me) who still like to work with a mechanical teleprinter sometimes will have to add an external circuit.

The transmitter circuit stays pretty well as it was in the ETI-731 project. The only addition is a *TTL logic level output* running in step with the audio output, to drive those 'new fangled' transceivers.

The transmitter has been arranged to supply an audio version of everything that goes through the transceiver, both during transmit and receive. As it has three outputs, you can connect one to your HF transceiver in the normal way, another to a VHF transceiver, and the third to a cassette recorder.

If you key your VHF transmitter while the main system is receiving, it will act as a repeater, re-broadcasting a cleaned-up version of the incoming signal. And you can record everything that takes place on your cassette machine, providing a good mass storage medium for such things as picture tapes.

There's an *optional* receiving feature that amateurs operating on the HF bands may want to use . . . a bandpass input filter with a transmission peak about 200 Hz wide. Such a filter allows amateur standard signals of 170 Hz shift to pass through, but cuts back other audio signals coming from the receiver. With this gadget it's possible to select one RTTY signal from a whole clutter and receive it perfectly. (Coming . . . Ed.)

It's a bit disconcerting, though, to be receiving a station as you hear his audio making the characteristic 'deedle-deedle' sound when the station will stop transmitting, but you continue receiving as before. It's then you realise you're not working the one you were listening to, but one you couldn't even hear! This option we hope to get around to at a later date.

Building and aligning the unit

The project circuitry is contained on four pc boards. The main pc board contains the modulator, demodulator, UART and transmitter control circuitry. There are two tuning display boards (one for mark, one for space) and a small power supply board. The project has been housed in a professional-looking plastic case from Altronics, no. H0482. The frong and rear panels were dressed up with an aluminium Scotchcal panel.

There's nothing specially difficult about the construction. Any enthusiast with a little experience should be able to successfully tackle this project without difficulty.

First place to start is with the mechanical bits. The front and rear panels should be marked out and all the holes drilled or cut first. Clean up any rough edges. The front panel can be marked using the Scotchcal as a template. To apply the Scotchcal, peel off the paper backing and soak the panel in water. Thoroughly wet the panel and then apply the Scotchal to it. Carefully position it by gently sliding it around and then smooth it down, rubbing from the middle towards the edges. Wipe off excess water and put the panel aside to dry. Tackle the rear panel in the same way.

When the two panels are ready, cut out the holes with a sharp modelling knife, then mount all the hardware. Take care with the switches and the pot that you don't scratch the Scotchal when tightening the securing nuts.

The two bargraph display modules are mounted one above the other, separated by two 20 mm tapped spacers. You'll find two 'posts' in the case bottom, just behind the panel where the displays mount. Drill out the holes in these to take two 4 BA bolts. These pass up through the case bottom and the LOW ('space') display, which is secured with the two spacers. The HIGH ('mark') display mounts on top.

Assemble the pc boards once the case is prepared. No particular order of assembly is required, just watch the orientation of the polarised components — semiconductors, tantalums, electrolytics etc. Check each *thoroughly* upon completion.

Temporarily place the main board in position (see the photographs) and work out the lengths of hookup wire and screened cable required to run from the board to the various hardware items and the other boards. Do the same for the power supply board.

Then attach the leads running between each board and screw them in place using PK screws. Hook up all the remaining leads. Note that the 'Filter' switch is not connected — that's an option to come later.

Mount the power transformer next and hook up the secondary connections. Wire in the mains cable and power switch last of all. Shroud the switch terminals for safety.

Set all your trimpots to the vertical (mid-track) position and you're ready to roll!

Alignment of the project involves measuring some frequencies, and for this you'll need a frequency counter or a well-calibrated oscilloscope.

Microbee users already own a frequency counter. You'll find a program to turn your 'Bee into a counter in the July 1983 issue of ETI p.56 (see, I told you that program would be good for something . . .). If you have a later model 'Bee with the 3.375 clock speed, change the number in line 190 from 6985 to 0B210. If you don't feel like typing it all in you can order a cassette of the 'FREAK' program for $12.70 postpaid from *Hi-Tech Tasmania, 39 Pillinger Drive, Fern Tree 7101*. Be sure to state which clock speed the program is for. Enough of the commercial, now on with the show!

These adjustments are performed with the RTTY transceiver not plugged into the computer. Your first job is to set up the tones in the AFSK modulator. Connect a frequency counter or CRO to TP1 and switch on. Note the frequency as you operate the TX Mark switch and leave it in the *lowest frequency* position. Now adjust RV9 to obtain a frequency of 2125 Hz. Toggle the TX Mark switch and adjust RV8 to get 2295 Hz. Now go back and repeat the two adjustments a few times since they interact slightly.

While you're in the modulator area it's a good time to set up the audio levels from the three outputs. These will depend entirely on what you're feeding them into. Select R37, R40 and R45 to get near the levels required. The trimpots then provide a fine adjustment.

Next come the clock speeds. Hook your counter or CRO to pin 40 of the UART. Select 45 baud. Adjust RV12 for 720 Hz, or 1389 µs. Select 50 baud and set RV11 for 800 Hz or 1250 µs. Select 75 baud and set RV10 for 1200 Hz or 833 µs. This completes the clock adjustments.

Now for the receiver circuit. First, the setting of RV1. Short the demodulator input (across R1) and set SW2 to non-limit (R6 in circuit). Using a CRO or sensitive voltmeter, adjust RV1 so that the output from pin 1 of IC1 is centred about zero volts. It will jump around a bit so go for an average reading. That done, remove the input short.

Now select transmit mark high and check TP1 once again to ensure the output is on 2295 Hz. Next run a jumper wire between TP1 and the audio input of the receiver. This provides a signal input of known frequency.

Set the shift control for "zero shift" (minimum resistance). Adjust RV2 for a peak indication on the 'mark' bar LED tuning indicator. Adjust RV1 ('space' display board) for a peak on the 'space' bar LED. Now operate the shift control and observe that the 'space' bar LED decreases in level, while 'mark' stays the same. This completes the adjustment of the receiver.

Your RTTY transceiver should be ready for action once you get your software sorted out.

To be continued . . . ●

CMOS IC SPECIALS

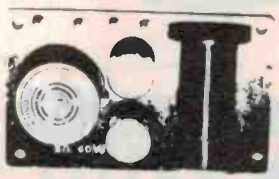
They haven't been this cheap for years! Stock up now!

	1-9	10-99	100+
4000	$0.40	$0.37	$0.35
4001	$0.40	$0.37	$0.35
4011	$0.40	$0.37	$0.35
4013	$0.50	$0.45	$0.40
4016	$0.50	$0.45	$0.40
4071	$0.40	$0.37	$0.35
4081	$0.40	$0.37	$0.35

CROSSOVER NETWORKS

2 way, 60 watts, 6 dB crossover at 3,500 Hz, impedance 8 ohms.

Cat. A16001 $3.95



3 way, 60 watts, 6 dB crossover at 800 and 5,000 Hz, impedance 8 ohms.

Cat. A16003 $8.95

3 way, 100 watts, 12 dB crossover at 800 and 5,000 Hz, impedance 8 ohms.

Cat. A16005 $22.95

P.A. SPEAKERS

Dual cone, wide range, 200mm (8 in.) 10 W ideal for public address, background music etc.

	1-9	10+
Cat. 1200	$9.50	$8.50

LOGIC PROBE 3800A

Features 20MHz. memory, TTL/CMOS operation. Normally $29.50 now only...

	1-9	10+
Cat. O11272	$19.50	$17.50

VERBATIM DISKS

"Lowest" price possible for "Highest" quality.

	10-99	100+
MD525-01	$3.25	$3.00
MD550-01	$4.75	$4.00

SWIVEL BASE

Makes life easier, normally $29.50.

Cat. D11100 $22.50

HORN CRAZY!!

8W, aluminium or plastic. Normally $9.50.

1-9	10-99	100+
Cat. C12010 (Aluminium)		
$6.50	$5.95	$5.50
Cat. C12010 (Plastic)		
$6.50	$5.95	$5.50

TAPERED REAMER

Great for enlarging holes that are a bit too small. Enlarges from 5mm to 20mm.

Cat. T12370 $6.95

ADD ON DISK DRIVES FOR 6502 SYSTEM

1-9	10+
$195	$189

LOCO GRAPHIC EQUALISER

Designed for tonal control of any audio signal. 6 octave bands with control range ±dB on each band, centre click stops denote 0dB and features master level control.

Cat. A12045 $89.50

LOCO PHASER

Shifts the phase of the original instrument 720 and combines this signal with the original creating a sound similar to that of a rotating speaker, adding clarity, brilliance and depth. Separate controls for speed, 1-10Hz. and depth.

Cat. A12043 $69.50

LOCO STEREO CHORUS

For increasing the presence and tonal characteristics, wide variety of applications, guitars, keyboards, wind and brass instruments. 2 phone plug outputs. 1 for the processed sound and the other for unprocessed sound, simulate stereo chorus effect.

Cat. A12041 $84.50

MONITOR MADNESS ONE MONTH ONLY ... offer ends 30th November.

Our most popular model in a steel cabinet to minimise R.F.I. interference. Prices include tax. Make sure you get in early.

1-4	5-9	10+
Cat. X14500 (Green)		
$149	$145	$139
Cat. X14500 (Amber)		
$159	$155	$149

RITRON II

Swivel base monitor in stylish case.

1-9	10+
Cat. X14506 Green	
$179	$169
Cat. X14508 Amber	
$189	$179

RITRON III

Great resolution, swivel base. Amber only. Prices include tax. Buy now for Xmas.

	1-4	5+
Cat. X14510	$179	$169

COLOUR IS HERE IN A BIG WAY!!

PHOENIX IV

Suits 'IBM' R.G.B. input

- ★ R.G.B., TTL
- ★ High Resolution
- ★ 13" CRT Dot Pitch 0.31mm
- ★ Horiz. Resolution 720 dots
- ★ Vert. Resol. 240 T.V. Lines
- ★ Display Characters 2000 Ch. (80 x 25)
- ★ Display Colours 8 Colours and Intensity
- ★ Green Text Display

Cat. X14520 $690

PHOENIX V

Available late November. Order now for Xmas!

Pal. Suits Apple, Commodore even your V.C.R.!

- ★ Pal and R.G.B.
- ★ Normal Res.
- ★ 13" CRT Dot Pitch 0.65mm
- ★ Horiz. Resol. 320 TV Lines
- ★ Vert. Resol. 560 TV Lines
- ★ Display Characters 1000 Ch. (40 x 25)
- ★ 16 Colours (Pal)
- ★ Green Text Display

Cat. X14522 $449

WE HAVE DONE IT AGAIN!!

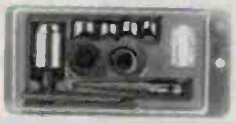
New multimeter at unbeatable value for under $40! The new YU FONG YFE-1030C will be arriving late November and features:

- ★ Large 3½ digit display. (½ inch high).
- ★ Autopolarity, "-" display for Negative input.
- ★ High over-load protection for all ranges.
- ★ Over-load display, highest figure "1" or "-1" alone glows.
- ★ Power consumption 20mW approx.

Order now and you won't be disappointed.

Cat. $39.95

CHASIS PUNCH



Absolutely essential for an enthusiast, prototyping technician or serviceman. Cuts holes in metal up to 16 gauge or 1.6mm. Essential for building kits. Punch Sizes: 16mm, 18mm, 20mm, 25mm and 30mm. Normally $18.95 — Save $3

Cat. T12360 $15.95

SHEET METAL BENDER

How often have you wished that you could afford a Pan Brake Bender. Well this unit is a close second for your workshop. Your own chassis boxes, brackets, are all possible with the unique slotted clamping bar that allows complex corner bends. Handles up to 16 gauge metal and up to 445mm wide.

Cat. T12400 $89.50

COMPUTER PAPER!!

A4 now in stock for the professional user! 2,000 sheets. 60gsm quality paper.

Cat. C21003 $44.50

DIRECT IMPORT FLAT RIBBON CABLE

The big boys will eat their hearts out at this one! Flat grey 100 ft rolls.

1-29m	30-59m	60+m
Cat. W12616 16 way		
$1.20	$1.00	$0.90
Cat. W12615 25 way		
$1.90	$1.70	$1.60
Cat. W12625 26 way		
$2.20	$1.90	$1.80
Cat. W12626 34 way		
$2.50	$2.20	$1.90
Cat. W12634 40 way		
$2.70	$2.50	$2.40
Cat. W12640 50 way		
$3.50	$3.20	3.00
Cat. W12650 50 way		

Buy a roll and save even more! For tax free prices, please phone 489 7099.

Errors and Ommissions Excepted

Rod Irving Electronics

425 HIGH STREET,
NORTHCOTE VICTORIA.
Ph:(03)489 8866 489 8131
48-50 A'BECKETT STREET,
MELBOURNE VICTORIA.
PH:(03)347 9251
Mail Order and correspondance:
P.O. Box 235
NORTHCOTE 3070

- ★ NEW LOOK
- ★ NEW PRICES
- ★ NEW PEOPLE
- ★ NEW PRODUCTS
- ★ NEW IDEAS

Mail Order Hotline

(03) 481 1436

POSTAGE RATES

$1-$9.99	$1.50
$10-$24.99	$2.00
$25-$49.99	$3.00
$50-$99.99	$3.50
$100-$199	$5.00
$200-$499	$7.50
$500 plus	$10.00

Certified Post for orders over $100 included "free"! Registered Post for orders over $200 included "free"! Account orders from schools Govt. Depts., Public Cos., gratefully accepted. Min. order of $20. (or a min. $5 accounting fee will apply.) Comet Road Freight, Airmail etc. are extra.

HAVE YOU BEEN INTO OUR CITY STORE???

Conveniently located on the edge of the city where parking is easy! Over 4,000sq. ft. of an extensive range of products and great "in store" bargains . . for those interested in computers we have a wide range on display upstairs. For good advice and a good price, see Rod Irving Electronics.

THE C-90 TALKMAN COMMUNICATOR

When you need crystal-clear communications over distances up to one kilometre, and you also need your hands free, the C-900 Talkman does the job. It is a *voice-operated* (VOX) FM transceiver that slips on your belt or in your pocket, operated from an unobtrusive headset with integral antenna. All you need to do to operate the transceiver is *talk normally, even when the background noise is deafening!* The Talkman C-900 transceiver features a special *noise-cancelling* microphone which prevents transmitter 'lockup' in the presence of surrounding noise, so you get clear transmissions every time you talk.

The C-900 is a single-channel unit that operates on the 55 MHz band, It uses a standard No. 216 9 V battery. The transceiver unit measures 115 mm high by 63 mm wide by 24 mm deep and weighs just 250 grams with the battery included. The receiver has a rated sensitivity of 0.5 μV for 20 dB quieting. The transmitter is rated to deliver 10 mV/m at three metres and has ±4 kHz max. deviation. Battery current drain is given as 13.5 mA on standby, 70 mA on receive and 80 mA when transmitting. Retail price is $158.00 each.

WIN A PAIR OF TALKMAN COMMUNICATORS

GFS Electronic Imports, in conjunction with Electronics Today, is offering a pair of these 'Talkman' transceivers as a prize in this simple contest. These transceivers have dozens of applications around the home, outdoors, around the office or warehouse, in theatres and halls, etc, etc.

eti

COUPON **GFS/ETI Talkman Contest**

All you have to do to enter the contest is answer these simple questions and tell us in 30 words or less the sort of application(s) in which you would use a pair of Talkman transceivers.

1) Sir Ambrose Fleming discovered the diode properties of the two-electrode vacuum tube, making possible very sensitive detectors for radio receivers. But it was the invention of the triode that really accelerated the development of radio. The American physicist Lee de Forest modified Fleming's valve, calling it the 'audion'. Who else invented the triode?

.....

2) Amplitude modulation (AM) was the first method employed for transmitting natural sounds. Carson, a US engineer, dealt with the subject of FM way back in 1922, concluding that FM was inferior to AM. However, not daunted, another engineer set down the fundamental requirements for successful FM transmission and reception in 1936, following a classic series of experiments. Who was he?

.....

Now tell us in 30 words or less the sort of applications in which you would use a pair of C-900 Talkman transceivers

.....

.....

.....

.....

Name .....

Address .....

..... **Postcode** .....

Send your entry to: **GFS/ETI Talkman Contest**
PO Box 227, Waterloo NSW 2017

I have read the rules of the contest and agree to abide by their conditions:

Signed .....

DON'T DELAY — ENTER NOW!

You may enter as many times as you wish, but you must use a separate entry form for each entry and include the month and page number cut from the bottom right hand portion of this page. You must put your name and address on the entry form and sign it where indicated.

Please read the contest rules carefully, especially if sending multiple entries.

This contest is open to all persons normally resident in Australia, with the exception of members of the staff of GFS Electronic Imports, The Federal Publishing Company and/or associated companies.

CLOSING DATE OF THE CONTEST IS 30 NOVEMBER 1984
Entries received within seven days of that date will be accepted if postmarked prior to and including November 1984.

The winning entry will be drawn by the Managing Editor of ETI, whose decision is final. No correspondence will be entered into regarding the decision.

The winners will be notified by telegram the same day the result is declared. The name of the winner, together with the winning answers, will be published in the next possible issue of 'Electronics Today International'.

Contestants must enter their names and addresses where indicated on each entry form. Photostats or clearly written copies will be accepted, but if sending copies you must cut out and include with each entry form the month and page number from the bottom of the page of the contest. In other words, you can send in multiple entries but you will need extra copies of the magazine so that you can send an original page number with each entry form.

This contest is invalid in states where local laws prohibit entries.

Entrants must sign the declaration, accompanying the contest, that they have read the above rules and agree to abide by their conditions.

PHONE YOUR ORDER — ALTRONICS TOLL FREE 008 • 999 • 007

BANKCARD HOLDERS—PHONE ALTRONICS TOLL FREE 008 • 999 • 007 FOR NEXT DAY JETSERVICE DELIVERY

ALTRONICS
MONEY BACK ★ PLUS $5.00 GUARANTEE

Dear Customer, At Altronics we are continually trying out methods of improving our range of quality products and the high standard of service we offer our Shop, Mail and Phone order customers. I believe our future prosperity will be a direct reflection of the standards of service we have adopted. So for November and December 84 we pledge that if you find our products and/or service is not as we claim you may return your purchase to us for a **full refund plus $5.00** for your inconvenience (mail/phone order customers please allow transportation costs)

Regards

Jack O'Donnell

Save power: build these Heat Controllers

Ref: EA July 1984

Features
- Continuously variable heat setting
- Massive 1200 watt load capacity
- Employs zero voltage switching design to min. RF interference.

Heat Controller
Manual dial controller—great for room radiators, vertical grills, electric blankets and 100 and 1 power/heat applications.

K 6010 ..... only **$29.50**

Temperature Controller
Dial controller with auto temperature sensing. Ideal for sensing ambient temperature in conjunction with appliance control e.g.can be used to automatically turn on your Electric Blanket when room temperature drops to relevant temperature. Another application could be with, say solar heating of Swimming Pool,Spa etc.

K 6011 ..... value **$32.50**

Every last component,mains connectors etc.supplied.

GO ANYWHERE 12-240V POWER

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 fuss ☆ Low age rate XTAL ☆ Sockets for all IC's ☆ High Efficiency Transformer.

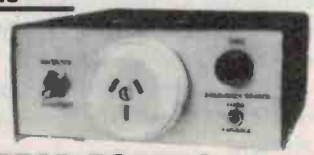
K6750..... (EA JUNE '82) ... **$199.50**

($10 DELIVERY AUSTRALIA WIDE)

40 WATT MODEL

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**



✳ PANBRAKE SHEET METAL BENDER

Our Panbrake Sheet Metal bender continues to be so incredibly popular that we seem to continually run out of stock. So this time we've bought a veritable mountain of them. **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.

DIRECT IMPORT PRICE

T 2400 ..... only**$79.95**

☆ PROTOTYPE SOLDERLESS BREAD BOARDS ☆

MINI STRIP 100 HOLES

P 1000 ..... ~~$2.50~~ **$1.95**

640 HOLES

P 1005 ..... ~~$9.80~~ **$8.50**

640 + 100 HOLES

P 1007 ..... ~~$11.85~~ **$10.00**

640 + 200 HOLES

P 1009 ..... ~~$13.98~~ **$12.00**

NON CORROSIVE NICKEL ALLOY CONTACTS RELIABLE FOR 50,000 INSERTIONS

There's a limit to just how many times you can resolder components while prototyping before you either destroy the component or lift a track from the vero. These solderless breadboards enable circuits to be literally thrown together in an instant, yet all components remain reusable.
A necessity in all research laboratories to save on expensive development costs.

Standard 0.1 inch spacings
Accepts all LSI/S semis transistors, diodes, leds and passives
22-30 gauge solid hook up wire for interconnections
Boards are keyed to enable easy expansion

400 + 1280 HOLES

ACCEPTS UP TO 16 x 16 pin DIL ICS

SCREW TERMINALS FOR PS CONNECTIONS

P 1012

~~$29.50~~ **$26.00**

500 + 1920 HOLES

ACCEPTS UP TO 24 x 16 pin DIL ICS

METAL BACKING PLATE FOR SHIELDING OF SENSITIVE CIRCUITRY

P 1015

~~$45.00~~ **$38.00**

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

PACKING AND DELIVERY CHARGES

$3.00 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

$5.00 Overnight Jetservice - We process your order the day received and despatch via overnight Jetservice Courier for delivery next day. Country areas please allow additional 24-48 hours. Weight limit 3kgs

$10.00 Heavy Heavy Service - All orders of 10kgs or more must travel express Road - Please allow 7 days for delivery

Insurance - As with virtually every other Australian supplier, we send goods at consignees risk. Should you require comprehensive insurance cover against loss or damage please add 1% to order value (minimum charge $1). When phone ordering please request "Insurance"

Toll Free Phone Order - Bankcard Holders can phone order toll free up to 6pm Eastern Standard Time. Remember with our Overnight Jetservice we deliver next day

WA
COUNTRY
ALBANY
BP Electronics 41 2681
ESPERANCE
Esperance Communications 71 3344
GERALDTON
K.B.Electronics & Marine 21 2176
KALGOORLIE
Today's Electronics 21 2777
MANDURAH
Kentronics 35 3227
WALKATCHEM
D. J. Pease 81 1132
NT
DARWIN
Ventronics 81 3497
ALICE SPRINGS
Ascom Electronics 52 1793
Farmer Electronics 52 2967
ACT
CITY
Electronic Components 80 4854
Scientronics 54 8334
Australis 47 5172

SA
SA
CITY
Protronics 2123111
Gerald & Goodman 223222
Force Electronic 212 2672
SUBURBAN
BRIGHTON
Brighton Electronics 296 3531
CHRISTIES BEACH
Force Electronics 382x3366
KESWICK
Freeway Electric Wholesalers 297 2033
Jensen Electronics 269 4744
PROSPECT
REYNELLA
Force Electronics 381 2822
COUNTRY
PT LINCOLN
West Coast Electronics sply 824 346
TASMANIA
CITY
D & I Agencies 34 7877
GEORGE HARVEY
Hobart 34 2233
Launceston 31 8533

VICTORIA
CITY
All Electronic Components 662 3506
Elnstronics 602 3499
MaGrath Electronics 347 1122
SUBURBAN
BENTLEIGH
Absolute Electronics 557 3971
BOX HILL SOUTH
Eastern Communication 288 3107
CHELTENHAM
Talang Electronics 550 2366
FOOTSCRAY
Acrian Electronics 689 1911
SOUTH CROYDEN
Truscott Electronics 723 3080
COUNTRY
BENDIGO
Lindrea & Johnson 41 1411
MILDURA
Electronic and Digital Services 23 3380
SHEPPARTON
GV Electronics 21 8866

NSW
NSW
CITY
David Reid Electronics 267 1385
Javcar 264 6688
Radio Despatch 211 0191
SUBURBAN
CARLINGFORD
Javcar 745 3077
DEE WHY
David Reid Electronics 982 7500
HURSTVILLE
Javcar 570 7000
LEWISHAM
PreMax Electronics 569 9770
MATTRAVILLE
Greatwal Electronics 666 4000
COUNTRY
ALBURY
Weego Electronics 25 4066
BATHURST
The Electronics Shop 31 4421
BROKEN HILL
Crystal TV 4803
COFFS HARBOUR
Coffs Harbour Electronics 52 5684
GOSFORD
Tomorrows Electronics 247246
KURRI KURRI
Kurri Electronics 37 2141
NEWCASTLE
D.G.E Systems 69 1625
George Brown & Company 69 6399
NOWRA
Vimcom Electronics 21 4011
PENRITH
Acorn Electronics 21 2409
Hall of Electronics 83 7440
PORT MACQUARIE
Aldach Electronics 87 3419
RICHMOND
Vector Electronics 78 4277
TAMWORTH
Landma Communications 65 4622
TOUKLEY
TES Electronics 96 4144
WINDANG
Madens Electronics 95 5086
WINDSOR
M & E Electronics Communications 77 5935

QUEENSLAND
CITY
Deksound P/L 2296156
deSUBURBAN
OFFORTITUDE VALLEY
McGrath Electronics 832 3944
Stanic Electronics 523547
PADDINGTON
ECO Technics 3693474
SALISBURY
Countrywide Wholesale 2753188
SLACKS CREEK
David Mail Electronics 2088809
COUNTRY
CAIRNS
Thompson Instrument Services 512404
GLADSTONE
Purley Electronics 724321
NAMBOUR
Nambour Electronics 411604
PALM BEACH
The Electronic Centre 341248
ROCKHAMPTON
Purley Electronics 21058
TOOWOOMBA
Hunts Electronics 329677
TOWNSVILLE
Solex 722015

Altronics Resellers wanted in all States of Australia (inc.WA). Phone Steve Wroblewski 09 3817233 for Details. **OEM's** for bulk rates Ph 09 3817233 for super competitive rates.

NEW FULL DEALERSHIP IN ADELAIDE
FORCE ELECTRONICS 203 WRIGHT ST
PHONE 212 2672

BANKCARD HOLDERS—PHONE ALTRONICS TOLL FREE 008 • 999 • 007 FOR NEXT DAY JETSERVICE DELIVERY

WIRELESS INSTITUTE OF AUSTRALIA

FOUNDED 1910

The W.I.A. represents the Radio Amateur at Local, National and International level and offers following services:

- ★ Monthly "AMATEUR RADIO" Magazine, included in membership fee.
- ★ Most REPEATERS have their licence, power and site cost paid by the institute.
- ★ World wide QSL-service.
- ★ Assistance to members in legal problems arising out of the pursuit of their hobby.
- ★ A Weekly Sunday Broadcast to Amateurs and Short Wave Listeners.
- ★ Assistance in dealing with Interference Problems (TVI-RFI etc.)
- ★ Novice and full call courses.
- ★ Trial Novice and AOCP theory exam papers.
- ★ Advice on Radio Mast approvals
- ★ The ONLY representation of the RADIO AMATEUR in legislative matters.

Join the 8,600 Amateur members in the W.I.A. by forwarding this coupon to:
W.I.A. P.O. BOX 300, CAULFIELD SOUTH, VIC. 3162

Please forward a membership application form and further details to:

Mr, Mrs, Miss, Ms .....

Address .....

.....

Callsign .....

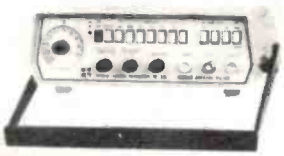
Postcode .....

PERFORMANCE PLUS MIC-6800LM DIGITAL MULTIMETER

$65.00#
$74.75#
tax paid
Carry Case $6.00
$6.90
tax paid

FEATURES
- *32 Range
- *Audible Continuity Check
- *10 Amp AC/DC Capability
- *Built in Logic Probe
- *Conductance Test
- *Basic Accuracy 0.5%

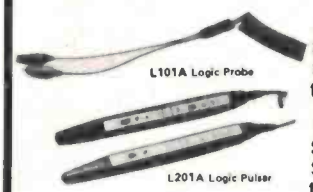
PERFORMANCE PLUS Topward TFG-462 2MHz FUNCTION GENERATOR



$216.00# **$250.56# tax paid**

Waveform	Sine, Square, Triangle, Pulse, Ramp
Frequency	0.1Hz – 2MHz, 7 Ranges
Output	5mVp-p – 20Vp-p Continuously Variable
DC Level	+10V – —10V Variable with Zero Switch
Duty Cycle	20% – 80% Variable with 50-50 Calibrated Switch
Pulse Output	> 3Vp-p, Tr < 25nS
VCF	0 – 10V Control Freq. to 1000:1

PERFORMANCE PLUS MIC L-101A LOGIC PROBE & MIC L-201A LOGIC PULSER PROBE



L-101A
$25.50*
$29.58*
tax paid

L-201A
$30.00*
$34.00*
tax paid

L101A Logic Probe
Features:
- *4 LED display shows —Logic "1", "0" and high impedance —Pulse or pulse train —Over-voltage or minus voltage
- *Pulse memory capability
- *CMOS or TTL level selectable

L201A Logic Pulser
Features:
- *Heavy 100mA current, with low duty cycle pulser output
- *External synchronous capability

#Plus $3.00 Post & Pack *P/P Included

PACIFIC ELECTRONICS

Phone (03) 534 3601
Postal: G.P.O. 1899R Melbourne 3001
Address: Suite 4 96 St. Kilda Road St. Kilda 3182

AMERICAN EXPRESS, BANKCARD WELCOME

PROGRAMMABLE POCKET SCANNER

—MICROCOMM—
SX-150

PROFESSIONAL POCKET SCANNER WITH OVER 45,000 CHANNELS & 160 MEMORIES

26 to 32, 68 to 88, 138 to 176 and 380 to 514 MHz

The Microcomm SX-150 represents the latest developments in State-of-the-art LSI CMOS technology as applied to scanning monitor receivers. It incorporates many features, a lot of which are not even found in today's larger base scanners.
For example the SX-150 has 160 memory channels which can be programmed in either of two modes. The first allows you to manually program the entire 160 channels. The second mode provides for manual programming of the first 40 channels with the top 120 reserved for use by the SX-150 while in its SEARCH mode. It uses these channels to automatically store frequencies on which it has found signals during the search phase.
The SX-150 also features a Priority Channel (for that important frequency). An LCD display providing readout of all receiver functions including an accurate crystal controlled 24 hour clock.
Supplied complete with rechargeable Nicad batteries, charger, and rubber duck antenna, the SX-150 is a must for anybody with an interest in monitoring.

PRICE $499
+ $12 P&P

AUSTRALIAN DISTRIBUTOR
GFS ELECTRONIC IMPORTS
Division of GD & JA WHITER PTY. LTD.
17 McKeon Road, Mitcham, Vic. 3132
PO Box 97, Mitcham, Vic. 3132
Telex: AA 38053 GFS
Phone: (03) 873 3777 3 Lines

UP-DATING THE ETI-733 RTTY

Even with the release of the new ETI-755 RTTY project, the earlier '733 system (April '83) is still alive and well. There are now literally hundreds of people using the '733 for eavesdropping . . . er . . . RTTY experimentation . . . on a receive-only basis. Some developments have taken place which will interest present and future users.

Tom Moffat
39 Pillinger Drive, Fern Tree 7101 Tas.

FIRST, I must admit to a minor blunder (it is really hard to be perfect all the time . . .). The time delay value for 3.375 MHz Microbee must be 14 hex, not 12. The effect of this is a ten per cent error in the selected baud rate, which degrades the performance of the system under marginal conditions. The problem can be easily fixed with the Microbee's monitor. You load the program, correct the byte, and re-record the tape. In the IC model software cassette, the offending byte is at 04AC hex. In the 'universal' tape it is at 050A hex.

I'm not sure how the gremlin crept into the system, but thanks to Bill Mather of Bribie Island who first pointed it out.

The RTTY corner. The original '733 sits, naked, on the bench behind the 'Bee

Bells and whistles

Now the good news: the "bells and whistles" ETI-733 software has now been completely re-written, mostly to take advantage of some features available in the latest Microbees.

It is possible to use the RTTY program with an 80x24 screen. You fire up the 80-column screen under BASIC, following your computer's instructions (the Telecom EPROM must be in place). You can then LOAD the tape, or EXEC the program if it's already in the computer.

Many teletype stations assume they are sending to a mechanical printer with a line width of 68 or 72 characters, so you get a lot of wrap-arounds on a 64-character screen. The 80-column screen looks much nicer, with the added benefit of 24 instead of 16 lines displayed at once. If you're using a really crummy converted TV for a monitor, 80 columns might not be for you, but my K-Mart special "General" set works well.

The new version now senses which model of Microbee it's running in and adjusts its time delays accordingly. It can also accept commands in both upper and lower case. The new program *in no way supersedes* the original version. It simply makes it a bit easier to drive, and opens up the use of the 80-column screen.

The "enhanced" '733 program will be one of the stars of the new TOOLKIT ROM-Pak being produced for the Series III Microbee. The package is in an EPROM that resides at C000 hex. It can be called from BASIC with a PAK(n) command, and the programs within can then be ordered up by name. The ROM Pak will also contain such goodies as the disassembler and debugger that feature in the current Toolkit EPROM for the earlier-model Microbees. ▶

The Toolkit EPROMs, and the RTTY program cassettes, are available as usual from *Hi-Tech Tasmania, 39 Pillinger Drive, Fern Tree, 7101*. Cassettes are $13.50 and EPROMs are $35, postpaid. For EPROMs, be sure to specify the Microbee's model and preferably the clock speed.

More points

While we're talking about the '733 software, here are some more points that have been raised:

This particular program has been written only for the Microbee. It uses subroutine calls to within the Bee's BASIC, so can't possibly run on some other system. Many people have asked for tapes to run on such computers as Commodore, Apple, BBC, Kaypro, Tandy, etc., but there's no way RTTY will run without severe modifications, or more likely a complete re-write.

However, there are other programs about for the various computers that do much the same thing. Or maybe some keen enthusiast out there will decide to get the ETI-733 circuit board going on a Commodore or something. Go for it! But be sure to tell us about it.

But it still won't . . .

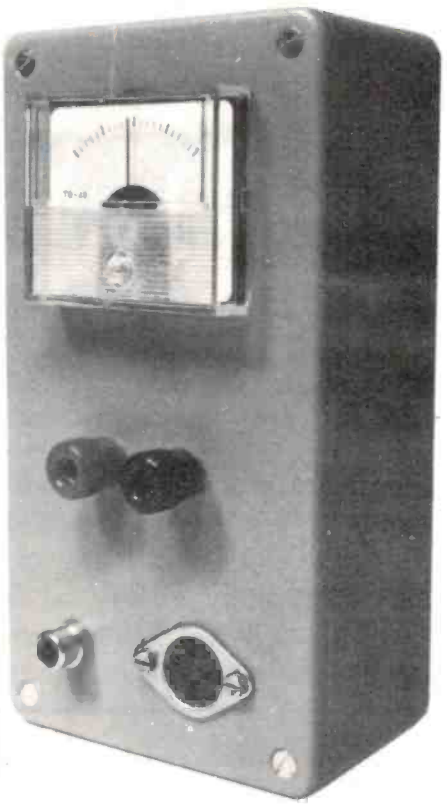
Radio noise is the most common reason for "why won't it work"? The Microbee is a very noisy computer and if you're not careful it will play merry hell with the teletype signal you're trying to receive.

The solution is to shield your aerial leads, as well as the audio and data circuits. The idea is to get as much signal as possible out of the ether and into your receiver, while minimizing the Microbee's contribution of shrieks and plops. You *must* use an outside aerial.

I use a couple of ham aerials, an 80 metre dipole for the lower frequencies and a small rotatable beam for the higher bands. All leads are properly shielded, although the ETI-733 circuit itself is still flopping about the workbench where it's sat since it was first built. It's never yet rated a proper case; that's a bit radical for the stuff I build!

Nevertheless, it delivers the goods. Only this morning I sat there watching a weak signal from the other side of the world via the long path. It was the Voice of America, running at 75 bauds, complaining loudly that someone had bombed their Embassy in Beirut the day before.

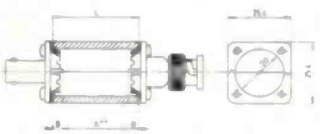
That's the thing about this RTTY. Many people (like me) get bored with a project once it's going properly, so it just sits there, unused. But RTTY snooping grows on you. I always seem to be going back for more!●



The proper thing. ETI's prototype '733, properly housed in an all-plastic zippy box with real connectors, in case you haven't seen one.

Component Container «Sucobox»

The Suhner «Sucobox» is a versatile component container with coaxial input and output connectors. Various systems such as filters, impedance transformers, power dividers, attenuators, resistor terminations etc. can be housed, protected and screened.



AVAILABLE CONNECTOR SERIES
BNC, N, C, TNC, UHF SMB, SMC.

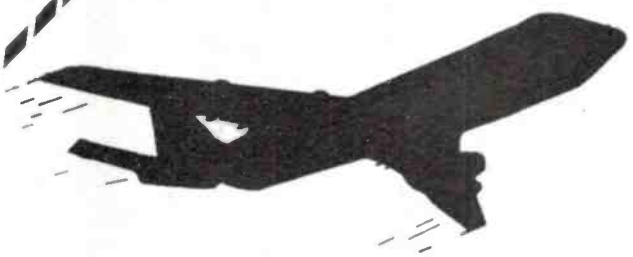
HUBER + SUHNER

(Australia) Pty Limited
384 Pittwater Road, North Manly NSW 2100
PO Box 591, Dee Why, NSW 2099
Telephone: (02) 93 5577

Melbourne (03) 754 3231
Brisbane (07) 376 5677
Adelaide (08) 212 6235
Perth (09) 381 4155

ANNOUNCING A NEW SERVICE!
For manufacturers, R & D and large service contractors, we now provide a comprehensive search, costing, sourcing and buying service both here and overseas for complete projects. You tell us what you want for a specific project and we'll come back to you with the lowest possible prices for you to evaluate. Insert 1800 on your Information Feedback Card.

Can't get your parts?
Can't get them in time?
Want better pricing?



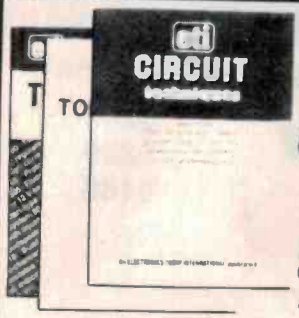
When the crunch comes for brand name components, assemblies, computers, peripherals, connectors, motors, etc call

Micro Analog General
(02) 398 8601

Telex AA135042 "Attn Micangen"

Our access to international inventories will fix your headaches . . . FAST!

Trade Enquiries Welcome



ETI BOOKS

A must for any electronic enthusiasts!

Scanner's World	$5.95
Computer Projects Vol 1	$5.95
Lab Notes and Data	$7.95
Electronics It's Easy Vol 1	$5.95
Electronics It's Easy Vol 2	$5.95
Test Gear Vol 1	$3.00
Test Gear Vol 2	$3.95
Test Gear Vol 3	$4.95
Top Projects Vol 5	$3.00
Top Projects Vol 6	$4.95
Top Projects Vol 7	$3.95
Top Projects Vol 8	$4.95
Top Projects Vol 9	$4.95
Top Projects Vol 10	$5.95
ETI Circuits Vol 1	$2.95
ETI Circuits Vol 2	$2.95
ETI Circuits Vol 3	$2.95
ETI Circuits Vol 4	$2.95
Computers & Computing Year Book	$4.95
Computers & Computing Vol 3	$4.95
Computers & Computing Vol 4	$5.95
30 Audio Projects	$3.95
Audio Projects from ETI	$5.00
Simple Projects Vol 2	$2.95
Simple Projects Vol 3	$5.95
Circuit Techniques Vol 1	$4.75
Circuit Techniques Vol 2	$4.75
Circuit Techniques Vol 3	$4.95
Circuit Techniques Vol 4	$5.95
How to Build Electronic Games	$3.95
Electronic Projects for Cars	$3.95
Project Electronics	$4.75
Electronic Projects for Young Scientists	$3.95
Radio Experimenters Handbook	$7.95
How to Build Gold & Treasure Detectors	$3.95
Electronics & Music	$5.95

TEST LEAD SET

normally $5.95

Cat. P10190

on special $3.95

EFFECTS UNIT

An "effects unit" that can create phasing, flanging, echo, reverb and vibrato effects. (EA June '83).

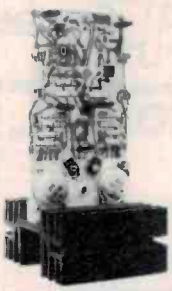
83GA6 $65.00

HUMIDITY METER

This project can be built to give a readout of relative humidity either on a LED dot-mode display or a conventional meter. In addition it can be used with another project as a controller to turn on and off a water mist spray in a hothouse, for example. (ETI May '81).

(Includes humidity sensor. $19.50).

Cat. K42560 ETI256 $29.50



50 W AMPLIFIER MODULE

Cat. K44800 $24.50

100 W AMPLIFIER MODULE

Cat. K44801 $27.50

EPROM PROGRAMMER

If you have ever wanted to rewrite or extend the operating system of your microcomputer or if you're interested in dedicated microprocessor applications then this EPROM Programmer is just the thing. It is an inexpensive unit that uses readily available IC's, interfaces directly to the expansion bus on the back of all the popular 8080/Z80 microcomputers and programs 2708s, 2716s, 2758s, and 2732s. (EA July '80).

80PP71 $79.50

PREAMP FOR PAGING AMP

A versatile preamp with separate bass, treble and volume

Cat. ETI1421 $20.00

PROJECT ELECTRONICS

Here are 11 great projects for the beginners from the ETI Project Electronics publication (5th Edition).

043 Heads of Tails	$3.90
044 Two tone doorbell	$4.90
047 Morse practice set	$3.90
048 Buzz board	$4.50
061 Basic Amplifier	$5.90
065 Electronic siren	$5.90
066 Temperature alarm	$5.50
067 Singing moisture meter	$7.95
068 LED dice	$6.90
072 Two octave organ	$9.50
084 Car alarm	$13.50

All these Kits are available from us, at Rod Irving Electronics!!

Cat. B11185 $4.75

OR "FREE!" with every order for 10 or more Kits!!!

PH METER KIT

Build this pH meter for the swimming pool season is here again!
From swimming pools to fish tanks to gardening, this pH meter has many applications around the home. This unit features a large 3½ digit liquid crystal display and resolution to .01 pH units, making it suitable for use in the laboratory as well. (EA Dec '82).

Cat. 82PH12 $139.00

VDK1 VIDEO DUBBING KIT

For European and Japanese machines.
Contains
Audio Video 6 pin DIN plug to 6 pin DIN plus 1.5 metres
Audio Video 6 pin DIN socket to (a) Video RCA plus (b) Audio 5 pin DIN plug (Both 16cm in length)
Video 1 each plug adaptor (PA21) RCA socket to PL259 plug (PA23) RCA socket to BNC plug
Audio 5 pin DIN socket to 2 RCA plugs 16cm length 2 plug adaptors (PA60) RCA socket to 3.5mm phone plug

Cat. VDK1 $16.95

VDK2 VIDEO DUBBING KIT

Contains
Video RCA plug to RCA plug 1.5m 75 ohm 2 plug adaptors (PA23) RCA socket to BNC plug
2 plug adaptors (PA21) RCA socket to PL259 plug
Audio RCA plug to RCA plug 1.5m shielded cable 2 pcs 5 pin DIN plug to 2 RCA sockets (in out) 16cm 2 plug adaptors (PA60) RCA socket to 3.5mm phone plug

Cat. VDK2 $19.95

PIN VICE

It's infuriating when all you need to do is drill one hole a little bigger and haven't got a drill that fits in your tool box. Buy one of these for drilling circuit boards. Will hold drill bits, taps, files, etc. up to 3mm.

Cat. T12352 $7.95

FLOPPY DISK DRIVE SERVICING

We give free quotes on all disk drives that need servicing!

COMPUTER AND DISK DRIVE CASES AND POWER SUPPLIES

5¼" DRIVES

1 x 5¼" Slimline Drive Case
X11001 Bare Case $49
X11011 Case and Pwr. Sup. $79

2 x 5¼" Slimline Drive Case
X11001 Bare Case $69
X11012 Case and Pwr. Sup. $119

1 x 5¼" Standard Drive Case
X11003 Bare Case $39
X11013 Case and Pwr. Sup. $79

2 x 5¼" Standard Drive Case
X11004 Bare Case $59
X11014 Case and Pwr. Sup. $99

8" DRIVES

1 x 8" Standard or 2 x 8" Slimline and Computer Case (BB1)
X11006 Bare Case $99
X11016 Case and Pwr. Sup. $395

2 x 8" Slimline Drives and Computer Case (BB1 and BB2 etc.)
X11007 Bare Case $145
X11017 Case and Pwr. Sup. $395

(Doesn't include drives)

2 x 8" Standard Drives and Computer Case (BB1 and BB2 etc.)
X11008 Bare Case $145
X11018 Case and Pwr. Sup. $395

1 x 8" Slimline Drive Case
X11020 Bare Case $95
Dual 8" Slimline Drive Case
X11025 Bare Case $99
X11026 Case and Pwr. Sup. $245

1 x 8" Standard Drive Case
X11009 Bare Case $99
X11019 Case and Pwr. Sup. $139

5" Hard Disk Drive Case
X11030 Bare Case $139
X11032 with Pwr. Sup. Fan $475

5" Dual Slimline
Room for BB2 etc. under drives
X11005 Bare Case $149
X11015 Case and Pwr. Sup. $399

rie

Rod Irving Electronics

425 HIGH STREET,
NORTHCOTE VICTORIA.
Ph:(03)489 8866 489 8131
48-50 A'BECKETT STREET,
MELBOURNE VICTORIA.
PH:(03)347 9251
Mail Order and correspondance:
P.O. Box 235
NORTHCOTE 3070

- ★ NEW LOOK
- ★ NEW PRICES
- ★ NEW PEOPLE
- ★ NEW PRODUCTS
- ★ NEW IDEAS

Mail Order Hotline

(03) 481 1436

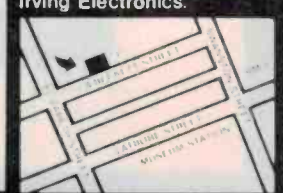
POSTAGE RATES

$1-$9.99	$1.50
$10-$24.99	$2.00
$25-$49.99	$3.00
$50-$99.99	$3.50
$100-$199	$5.00
$200-$499	$7.50
$500 plus	$10.00

Certified Post for orders over $100 included "free"! Registered Post for orders over $200 included "free"! Account orders from schools Govt. Depts., Public Cos., gratefully accepted. Min. order of $20. (or a min. $5 accounting fee will apply.) Comet Road Freight, Airmail etc. are extra.

HAVE YOU BEEN INTO OUR CITY STORE???

Conveniently located on the edge of the city where parking is easy! Over 4,000sq. ft. of an extensive range of products and great "in store" bargains . . . for those interested in computers we have a wide range on display upstairs. For good advice and a good price, see Rod Irving Electronics.



MOVING WAREHOUSE SALE

SCOOP PURCHASE of 4 COLOUR PRINTER/ PLOTTERS!!

Jaycar has done it again! We have made a scoop purchase of 4 colour printer/plotters at a never-to-be repeated price!! The SAME printer has sold elsewhere for up to **$299** but currently sells for as low as $169. At $169 it is an absolute bargain! (See specs). Now Jaycar can offer you the SAME printer for $149!!How do we do it? We have bought BELOW IMPORTERS COST and have passed the SAVINGS on to you!

QUANTITIES STRICTLY LIMITED. We have less than 80 pcs in stock at the time of going to press. To avoid disappointment, we suggest that you ACT QUICKLY.

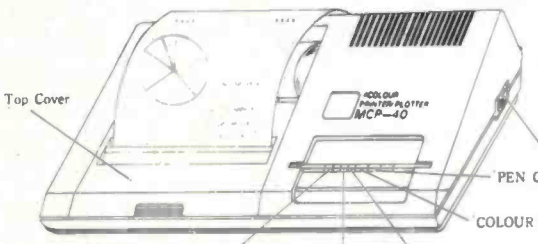
The printer/plotter is supplied with mains lead, a roll of paper 114mm x 55m long (4.5" x 180') and a set of 4 pens (black, blue, red & green). Spare rolls and pens are available from other major electronic suppliers and for a short time, us

Cat. XP-4605

Cat. XP-4606 Spare Paper Rolls $3.30
Cat. XP-4607 Set of 4 Pens $7.50

SENSATION!

DON'T PAY
~~$289~~
~~$229~~
~~$169~~



$149

BARGAIN OF THE CENTURY!!

How do we do it? Another BARGAIN!!

Once again, Jaycar has secured a massive below-cost scoop purchase. This time a nifty combination VHF/UHF television tuner assembly! We DARE NOT MENTION the FAMOUS JAPANESE BRAND of this quality assembly!

- ★ Brand, spanking new
- ★ Separate VHF rotary tuner
- ★ Separate UHF rotary tuner
- ★ All knobs and wiring INCLUDED!
- ★ Attractive front panel fascia included!
- ★ Circuit diagram included!

Be quick to secure one of these as we only have limited stocks.
Cat. DM-9004

ONLY ~~$69.95~~ - HURRY!!
SAVE $10 NOVEMBER
NOW $59.95

AMAZING SUPA SOLDER

SOLDER PASTE IN A TUBE!

Extremely versatile solder compound that contains tin, silver and non-toxic chemicals. Quick low temperature soldering (222°C) with bonds 8 times stronger than lead solder. Joins ferrous and non ferrous metals with the heat from a cigarette lighter. Suitable for use on brass, bronze, nickel, stainless steel, copper base metals and steel.
Cat. NS-3000

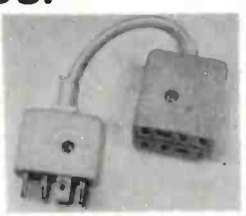
$7.95

AT LAST! LOW COST TELEPHONE EXTENSION CORDS!

20 metre extension cord
Cat. YT-6014 **$24.95**

10 metre extension cord
Cat. YT-6012 **$19.95**

5 metre extension cord
Cat. YT-6010 **$14.95**



Telephone socket double adaptor
Cat. YT-6020 **$19.95**

10 METRE SUITABLE FOR PABX

SCOOP PURCHASE!!

600 ohm line transformers slashed!

Another amazing below-cost buy. An Australian made chassis mount 600 to 600 ohm line isolating (or matching) transformer at a bargain price! Both primary and secondary windings are an identical 600 ohms. The transformer measures 27(W)x20(D)-x21(H)mm & features a grain-oriented silicon steel for Hi Fi. There is no doubt that the unit would pass line level, even +4dBm without trouble. Probably more. We have nearly 1½ thousand of them & they are offered on a first come, first served basis. Prices include tax. Cat. MT-4725

1-9 $2.95 ea: 10-24 $2.50 ea: 25+ $2.25 ea

HOUSE ALARM KIT - ETI 582

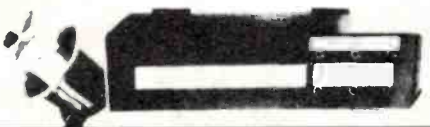
This great kit was released by ETI back in 1977. To make it easier for the constructor we have joined the two PCB's together and added a power supply on the one board.

SPECIFICATIONS

Types of inputs Silent entry, perimeter circuits, internal circuits, emergency circuits.
Silent entry Single circuit. 30 second exit delay, 30 second entry delay.
Perimeter circuits 7 circuits, N/C contacts can be expanded in units of 4.
Internal circuits 4 circuits, N/C contacts, can be expanded in units of 4. Any number of N/O circuits.
Emergency circuits Any number of N/O circuits. These circuits are active even if perimeter and internal circuits are switched off.
Current drain and battery life (type 732) Emergency only 2.5mA (4000 hours); Alarm active 9mA (2000 hours); Alarm sounding 500mA (10 hours)
Alarm time 12 minutes

All components are supplied including mains transformer, lead, terminal strip, nuts and bolts, but no case. See ETI July/August, 1977
Cat. KE-4032

ONLY $59.95

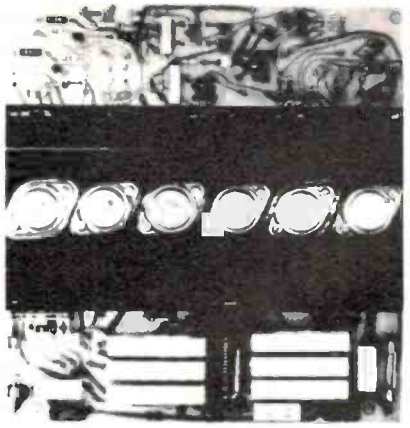


300 WATTS OF MUSIC POWER!

Limited Stock Be Quick
(Kit Form)

For professional sound reinforcement, musician or home hi-fi, this one really delivers the power. A superbly designed power amp module that only needs a simple power supply, case, connectors and hardware to be up and running - at a fraction of the price of commercial units. See EA June 1980.

This kit includes all parts to build the module. Additional kits below provide the power supply and speaker protector. Team this with one of our 19" rack cases, a Sprite fan and some hardware, and you've got a high performance 300W mono amp ideal for any use. Specs are: Output power 300W rms into 4 ohms (200W into 8 ohms) - Frequency response 20Hz - 20kHz -1dB - Hum and noise 95dB below 100W - Distortion below 0.2% at full output.



Module Kit complete ..... Cat. KA-1115 **$89.95**
Power Supply/Transformer ..... Cat. KA-1116 **$69.95**
Speaker Protector ..... Cat. KA-1117 **$12.95**

NEW - XR2240 IC

Programmable Timer/Counter chip as used in ETI's experimenters corner.
Cat. ZK-8832

$4.25

NEW - EZI CLIPS

3 for the price of 2

These have a syringe action and are ideal for working with small components. These are larger than usual 90mm long. They are normally worth $1.50 each.

THIS MONTH ONLY 99¢ each
Buy one red + one black and we'll give you a black one FREE.
Cat. HM-3042 RED Cat. HM-3043 BLACK
NOVEMBER ONLY 99¢ each

8" WOOFER

This superb Pioneer woofer will handle about 20 watts rms. Frequency response is 50 - 3kHz. These are usually worth $15 each.
Cat. CW-2112

ONLY $7.50 each
SAVE $7.50 each (50%!!!)

TWEETER

Add this tweeter to the 8" woofer and you've got a great small speaker system for $21.00.

UNBELIEVABLE

Tweeter handles 20 watts in a system. Frequency response up to about 18kHz.
Cat. CT-2002

ONLY $2.95
SAVE $3.00 - 50%!!

For a crossover between the 8" woofer & tweeter use a 2.5uF Bipolar capacitor. Cat. RY-6804 55¢ each

Twetter supplied could vary from one pictured.

PIONEER 10" GUITAR SPEAKER

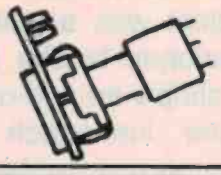
Quality Pioneer brand - check the specs! Check the price!
★ **Impedance 8 ohms** ★ **Voice coil diameter 1½"** ★ **Power rating 60 watts rms** ★ **Resonant frequency 80Hz** ★ **Sensitivity 98dB(dB/W)** ★ **Response 80Hz - 7kHz** ★ **Total flux 61,100 Maxwell** ★ **Flux density 8,300 Gauss** ★ **Net weight 1.54kg.**

ONLY $29.95
CATALOGUE PRICE $39.95

C&K PUSHBUTTON SWITCHES

These great pushbutton C&K quality switches have a built-in black panel which houses the actuator and a hole for a 5mm LED (not supplied). Switches are SPDT momentary changeover.
YOU WOULD NORMALLY EXPECT TO PAY BETWEEN $5 AND $6 FOR THIS TYPE OF UNIT
Cat. SP-0786 YELLOW ACTUATOR
Cat. SP-0785 RED ACTUATOR

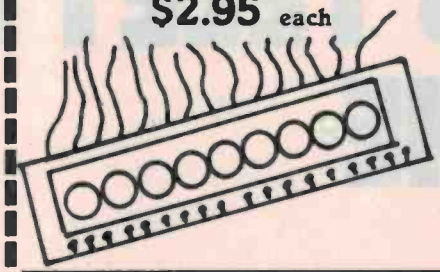
ONLY $2.95 each



EXPERIMENTERS LED DISPLAY

7 segment display similar to those used on early type pocket calculators, with a built-in magnifier. Where else can you get a 7 segment display for this price.
Cat. ZD-1896

$2.95 each



MICROCOMPUTER POWER SUPPLY

A handy supply for those into microcomputers. Unit is built and tested and includes a gold anodised heatsink, wiring instructions and schematic diagram. Transformers are not supplied.
Cat. MP-3024

Output voltages: +5V 6A; −5V 0.5A; +12V 1.5A; −12V 0.5A.

SAVE $5.00
NOW ONLY $34.95

SENSATIONAL DEALS ON 3-WAY SPEAKER SYSTEMS!!

A massive scoop purchase of factory distress stock has enabled us to pass on unbelievable prices on quality speaker systems. The component speakers in these systems are normally incorporated into cabinets for many well known national brand Hi Fi companies.
Each speaker is factory guaranteed for 90 days, however we doubt whether you will ever need to worry about it.

8" 3-WAY SYSTEM

Superb 8" woofer with foam surround suspension and heavy magnet assembly with sealed back midrange and tweeter. System impedance 8 ohms. Power handling 40 watts rms. Crossover capacitors and connecting diagram and recommended 8" cabinet detail drawing supplied.
Cat. CS-2453 (2 required for stereo)

SAVE $5.00
NOVEMBER ONLY
$24.95 set

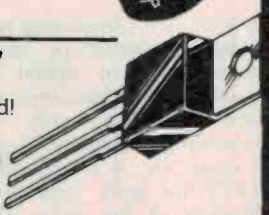
10"3-WAY SYSTEM

Once again, a high quality 10" woofer with high power, sealed back midrange and tweeter. System impedance 8 ohms. In addition a quality Pioneer 3-way crossover is provided at no extra charge. Connection instructions are also provided as well as recommended 10" cabinet plans.
Cat. CS-2454 (2 required for stereo)
INCLUDES PIONEER 3-WAY CROSSOVER

SAVE $5.00
NOVEMBER ONLY
$34.95 set

VN88AF

We're overstocked!
$2.95 each
SAVE $2.00
Cat. ZT-2294



FULL 90 DAY WARRANTY
★ NEW IMPROVED MODEL ★
As reviewed in Electronics Australia Oct 1982 & Electronics Today International Nov 1982
Cat. XC-2010

At $199 the Voyager Car Computer represented outstanding value for money. The Voyager is the only low-cost unit that will give you full consumption (the most important feature in a car computer) in both metric litres/100km AND good old MPG! At $199 many, many hundreds have been sold. NOW you can grab one absolutely complete for only $125 - a saving of 37% or $74! The Voyager comes complete with all fitting hardware - even down to a roll of insulation tape! Installation generally takes between 4 and 6 hours depending on vehicle.
SPARE FLOW SENSORS To avoid problems when changing cars, why not buy a spare fuel flow sensor? They are about the only thing that can wear out.
Cat. XC-2036 ONLY **$29.50**

The Voyager is available from the following dealers at your convenience.
★ ALL JAYCAR STORES AND BY MAIL ORDER: JAYCAR P.O. Box 480 Auburn 2144 ★ ZAP ELECTRONICS (all stores) ★ ROD IRVING (Melbourne 347 9257 or Northcote 489 8131 ★ ALTRONICS (Perth 328 1599)

ONLY
$125
COMPLETE
MASSIVE SAVING OF $74

BELOW MANUFACTURER'S COST!!

5000 POWER AMPLIFIER

"BLACK MONOLITH"

REF: ETI JAN/MARCH 1981

COMPLETE "BLACK MONOLITH" KIT ONLY
Cat. KE-4200 **$319.00**

"BLUEPRINT"

REF: ETI JUNE/OCTOBER 1981

5000 CONTROL PREAMPLIFIER $299

FOR THE COMPLETE KIT
Cat. KE-4202

SEE OUR OTHER ADS FOR ADDRESS PANEL AND OTHER INFORMATION

Project 756

As radioteletype (RTTY) is an increasingly popular transmission mode amongst radio amateurs, and as we've done a few RTTY projects in the past, we thought this project was a suitable addition to the series. Designed and developed by the R&D Department of Dick Smith Electronics, it is simply an add-on for their popular low-cost VZ200 home computer. Just attach your transceiver and type "CQ DX"!

Neat and simple. The project just plugs into the back of the VZ200. It must be the 'Mini Moke' of modems!

A 'GLASS TELETYPE' USING THE VZ200

IF YOU'RE considering venturing into the world of radioteletype, an ancient and venerable form of digital communications (comparatively speaking), but would like to take the modern route — which means employing a computer — then this project is ideal. Or, if you've been playing with RTTY for some time, but have a combination of the older electromechanical technology and earlier electronic interfaces, and want to update, then this project represents a good 'stepping stone'.

If you're entirely new to radioteletype, then we recommend "*Radioteletype: It's finger-lickin' good*", in the October '84 issue.

The system

The Dick Smith VZ200 is a low-cost home computer but not lacking in features. One useful feature is a full expansion buss accessible via an edge connector on the main pc board, projecting through the rear of the case. Using this buss, one can attach a variety of peripherals and communicate in and out of the computer by decoding any of the Z80 CPU's ports suitable for the purpose. This project makes use of that facility.

One of the lesser-known features of the VZ200 is its internal RF radiation shielding. If you've ever had an HF receiver near a computer, you'll know just how much and how strong is the 'crud' they radiate from one end of the spectrum to the other!

The VZ200 tackles this computer quirk with the inclusion of extensive tinplate shielding over sections of the circuitry prone to radiation — particularly the memory circuitry. Hence the VZ200 can be sited near sensitive HF receiving equipment without the problems that plague many other computers. It's not entirely free from 'birdies' but, in general, they're out of harm's way. The VZ200 RTTY adaptor was developed by Ian Lindquist, VK2CA and Rex Callaghan, both of Dick Smith Electronics.

The project itself comprises two boards housed in a plastic peripheral box made by the VZ200 manufacturer. One board is the 'decoder' board, which contains the port decoding and RTTY terminal software in an EPROM, while the other board is the modulator/demodulator (or modem) board, containing the tone generator for driving the transmitter and the receiver converter for converting the incoming audio from the receiver and turning it into pulses for the computer to work on.

The idea is that the VZ200's keyboard becomes your erstwhile 'teletype' keyboard, and the video screen becomes your 'printout' — hence the term 'glass teletype'. A printer can be attached to the VZ200's printer port to give you 'hard copy' on paper, if you so desire.

The receiving converter features two cascaded active bandpass filters. These have a steeply rolling-off response to reduce noise and interference; their adjacent 'skirts' coincide, providing an essentially 'flat' bandpass response across the 2100 Hz to 2300 Hz band, neatly enclosing the 'amateur standard' 2125/2295 Hz tones (170 Hz shift) with a little leeway to cope with variations. An XR2211 phase-locked loop is used to generate 'mark' and 'space' pulses from the incoming tones. This chip conveniently provides a 'lock detect' output pin and this is used to drive a LED which lights when you have a signal correctly tuned.

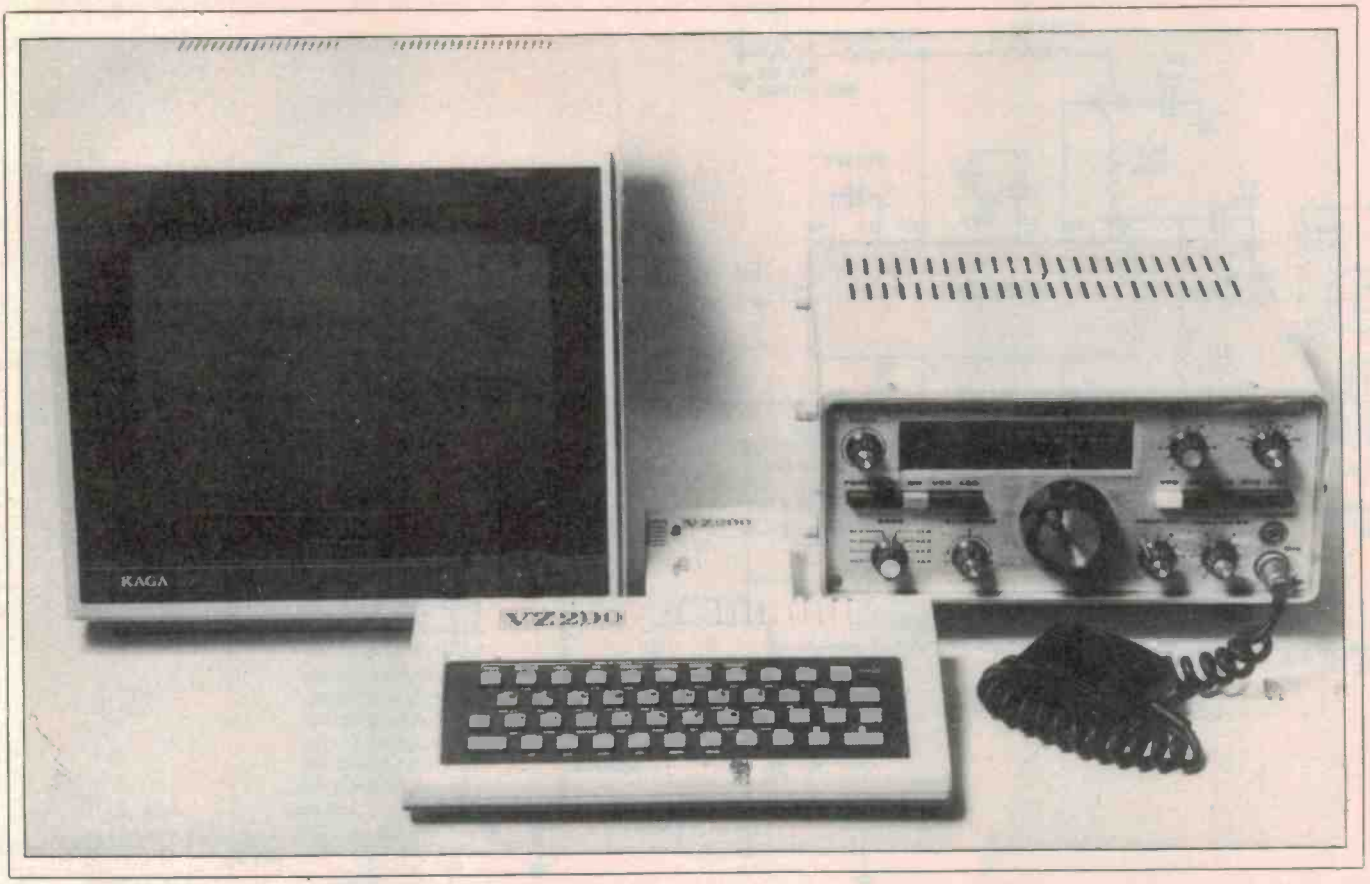
There is one special point worth noting about the PLL. The main VCO frequency determining component is C10, a 22n/400 V metallised polyester capacitor. This was chosen because it has a low temperature coefficient of capacitance around normal room temperatures (25° C). Substitutions may cause problems with excessive temperature drift and uncertain operation.

The transmitter section comprises a simple but reliable 'Walsh Function' pseudo-sinewave generator that generates, digitally, the two tones. This is followed by a filter, the output of which is fed to your transceiver's mic input.

Relay control of your transmitter is effected by a relay on the decoder board, the contacts of which go to the push-to-talk contacts (PTT) on your transceiver. This relay, and the transmitter section of the modem board, are each controlled by one of the decoded computer ports.

The project is powered from the VZ200 supply rail, via the expansion connector. The only interconnection required is to your transceiver's mic input, the PTT input and the audio output.

The software provides you with the two 'screens'. The upper screen is used to dis-



play the text you type, while the lower screen displays the received text. Each screen has independent scrolling. You can type and receive simultaneously. In other words, you can begin typing a reply while receiving text from another station.

You have a 'type ahead' buffer which can contain up to 1024 characters (1K). Apart from that, the software gives you a total of six transmit buffers, one of which is reserved as a 'who are you?' (or WRU) buffer. This versatile feature alerts you when another station calls you by your callsign or some other identification, and the unit will send a response. For example: say VK2ETI wishes to activate your WRU mode. He would send

VK2XYZ WRU VK2ETI

and your unit would respond with something like

STATION IDENTIFICATION
DE VK2XYZ (PETER)

and, if you had put a message in the WRU buffer, your unit could add

STAND BY
++ OPERATOR ALERTED ++

or whatever you had inserted. It is considered impolite to insert messages in the WRU buffer like

RACK OFF HAIRY LEGS!

There are various ways of using this feature, explained later.

There are seven pre-programmed messages stored in the unit's EPROM. Many are designed to insert your callsign automatically when called, saving you time and effort. You can send a string of CQs along with your callsign; a row of RYs (the accepted 'test' signal'; it contains the highest data density); the 'quick brown fox' message along with the numerals 0 to 9 (full alphanumeric series); the 'send — over' terminator; station identification; send your callsign; and send DE followed by your callsign.

There is a total of fourteen 'transmit' commands and nine 'immediate' commands, all called using the SHIFT key. The immediate commands control the overall operation of the 'glass teletype'. One toggles the current mode — i.e: from transmit to receive or from receive to transmit; one exits from the current operating mode to the menu; one controls the WRU mode; one gives you backspace; one changes the baud rate; one returns you to the 'callsign entry' — a sort of 'begin again' command, and two control the printer operation.

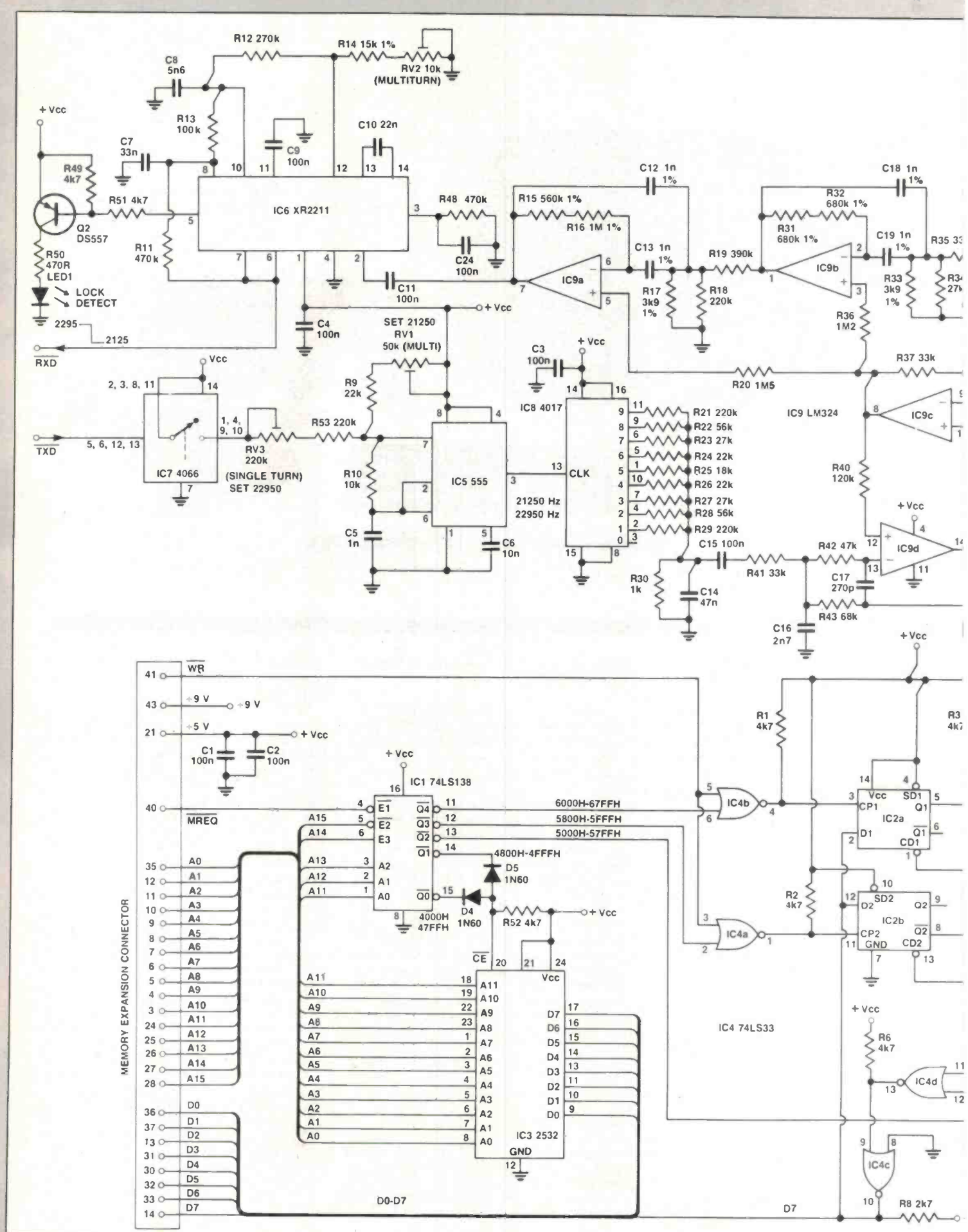
Construction

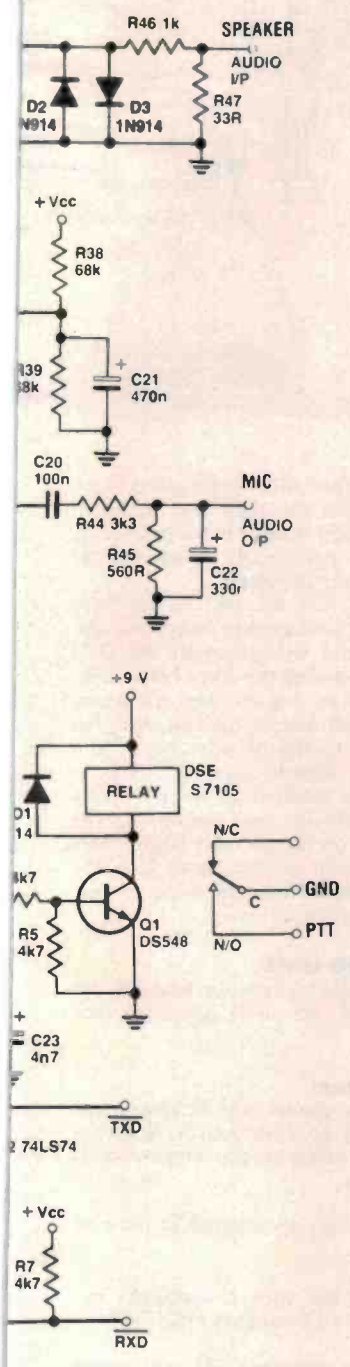
Before commencing any of the electronic assembly, carefully check the track side of each pc board. See that all the holes are drilled and of the correct size. Check that there are no solder 'bridges' between closely-spaced tracks, particularly between IC pads. See that there are no obvious breaks in any tracks.

Probably the best place to start is with the case. It comes in two halves. Mark out positions for the DIN socket and the LOCK DETECT indicator LED on the case lid (the larger piece). See the accompanying photograph. Drill them to size and then insert the DIN socket and screw it in place. The LED mounts on the pc board on the ends of its leads and protrudes through the hole in the case lid. The length of its leads will permit some variation in the exact hole position in the case lid.

Once that's out of the way, you can tackle the board assembly. It's easiest to start with the decoder board. It's marked ETI-756a/ZA1694. There are eight links required on this board; install them first. Use 22g tinned copper wire. Next, install the resistors and capacitors. Make sure you get C23 the right way round. Solder ICs 1, 2 and 4 in place next, ensuring they are correctly oriented. Install a socket for IC3 next, but don't insert the EPROM yet. Now solder in the three diodes, followed by the relay. Check that the diodes are inserted the right way round. Now solder Q1 in place, then the 44-pin right-angle socket. Last of all, plug in the EPROM.

Put the decoder board aside and tackle the modem board next. As before, start by soldering in the links. There are only two (contrary to what you can see in the pictures — a prototype, later modified). One is ▶


R12 270k
R14 15k 1%
RV2 10k (MULTITURN)
C8 5n6
+ Vcc
R13 100k
C10 22n
C7 33n
C9 100n
R49 4k7
R51 4k7
IC6 XR2211
R48 470k
C12 1n 1%
R15 560k 1%
R16 1M 1%
C18 1n 1%
R32 680k 1%
R31 680k 1%
Q2 DS557
R11 470k
C24 100n
C13 1n 1%
R19 390k
C19 1n 1%
R50 470R LED1
LOCK DETECT
IC9a
IC9b
R17 3k9 1%
R18 220k
R33 3k9 1%
R36 1M2
2295
2125
RXD
C11 100n
C4 100n
SET 21250 RV1 50k (MULTI)
C3 100n
R37 33k
R20 1M5
IC8 4017
IC9 LM324
IC9c
R21 220k
R22 56k
R23 27k
R24 22k
R25 18k
R26 22k
R27 27k
R28 56k
R29 220k
R40 120k
TXD
2, 3, 8, 11
1, 4, 9, 10
5, 6, 12, 13
IC7 4066
RV3 220k (SINGLE TURN) SET 22950
R53 220k
R9 22k
R10 10k
IC5 555
CLK
21250 Hz
22950 Hz
C5 1n
C6 10n
C15 100n
R42 47k
IC9d
R30 1k
C14 47n
R41 33k
C17 270p
R43 68k
C16 2n7
MEMORY EXPANSION CONNECTOR
WR
+9 V
+5 V
C1 100n
C2 100n
IC1 74LS138
MREQ
6000H-67FFH
5800H-5FFFH
5000H-57FFH
4800H-4FFFH
4000H 47FFH
D5 1N60
D4 1N60
R52 4k7
IC4b
IC4a
IC2a
IC2b
R1 4k7
R2 4k7
R3 4k7
IC3 2532
IC4 74LS33
IC4d
IC4c
R6 4k7
R8 2k7
D0-D7
D7
A0
A1
A2
A3
A4
A5
A6
A7
A8
A9
A10
A11
A12
A13
A14
A15
D0
D1
D2
D3
D4
D5
D6
D7
GND



HOW IT WORKS — ETI-756

There are two sections to the project, each contained on separate boards: the 'decoder' (or decoder/control) board and the 'modem' board. They are powered from the +9 V and +5 V supply rails of the VZ200. Let's take each section separately.

DECODER BOARD

This decodes five ports and contains the software in EPROM plus the transmitter control relay. IC1 decodes address lines A11-A13, five of its Q outputs selecting the EPROM, transmit control and receive control circuitry as required. The outputs are 'enabled' when 1-1-0 appears on A14, A15 and the MREQ line.

Serial baudot data for transmit and receive goes in and out on bit seven of the VZ200's data buss (D7).

When you select transmit operation from the VZ200, the relay closes the push-to-talk (PTT) contacts, turning on your transmitter. When you send text, the data is sent via D7 and to the modulator board via the flip-flop IC2b and the $\overline{\text{TXD}}$ line.

When you select receive operation, the pulses from the demodulator on the modern board come in via the $\overline{\text{RXD}}$ line, and are gated onto D7 via IC4d and c. Note that, on selecting receive operation, Q1 gets turned off and the relay PTT contacts open, turning off your transmitter.

Diodes D4 and D5 make a simple OR gate, allowing the 'chip enable' pin of the EPROM to be activated when either the lower or upper 1K block of the EPROM is selected.

IC2 is a flip-flop that sets up the transmit control. Its outputs must be preset on power-up, hence the two 'clear' pins (CD1 and CD2) are initially clamped to 0 V on power-up because C23 is initially uncharged. It will charge via R3, by which time the Q outputs of IC2 will be correctly set.

MODEM BOARD

The receiver portion comprises two op-amps from IC9 (a and b), and IC6, an XR2211 PLL chip.

The two op-amps are set up as bandpass filters, each with the centre frequency offset so that their adjacent skirts just overlap. The filter Qs were chosen to provide good skirt selectively so that noise and interference in the received channel do not adversely affect the demodulator's operation. The lower roll-off is at about 2070 Hz, the upper roll-off at about 2350 Hz, neatly encompassing the standard mark and space tones used in amateur RTTY of 2125 and 2295 Hz. Note that 1% components are used for the critical filter components.

The filter output, from pin 7 of IC9, couples to the PLL input via C11. The PLL centre frequency is determined by C10 (chosen for its low temperature coefficient — see main text) and R14/RV2. The latter sets the PLL on frequency.

The PLL's dc 'error' signal toggles from high to low as the incoming audio switches from 2295 Hz to 2125 Hz. This output is the $\overline{\text{RXD}}$ line, sending the baudot bit stream to the VZ200 via the decoder board.

The XR2211 provides a 'lock detect' pin and this is used to drive a LED indicator via a transistor buffer (Q2).

The audio input to the demodulator is taken from the receiver's speaker. The level is first attenuated and then clipped with back-to-back diodes, D2 and D3. The 500 mV pk-pk level here is further attenuated (via R34/R35) before being applied to the input of the filter stages.

The modulator comprises a 'Walsh Function' generator, which digitally generates a pseudo-sinewave, followed by a buffer filter. The Walsh Function generator consists of IC5, a 555 timer running at ten times the required output frequency, followed by a 4017 decade counter. The 555 is toggled between the two required frequencies (21 250 Hz and 22 950 Hz) by switching extra resistance across the 555's timing resistor, thus raising its frequency of oscillation. This is done using a 4066 CMOS switch to switch RV3-R53 in parallel with RV1-R9. The $\overline{\text{TXD}}$ line toggles the 4066.

The output of the 555 drives the clock input of the 4017. The decade counter's outputs are all 'chained' via resistors R21-R29 so that the voltage across R30 'steps' up and down, depending on the ratio of high-to-low outputs of the 4017. The CR network of C14-R30 provides some high frequency roll-off.

One op-amp from IC9 (d) provides a buffer/filter, 'rounding off' the digitally generated sinewave before it is passed to the transmitter's mic input. C15 provides ac coupling to the op-amp input. C17 prevents RF from creating havoc in the mic line.

The op-amps require a half-supply rail for their non-inverting inputs and this is provided by IC9c and the divider R38-R39. C21 bypasses the half-supply divider.

Trimpot RV1 sets the low tone, while RV3 sets the high tone of the modulator. Note that RV3 is only a single-turn trimpot, while RV1 is a multi-turn type.

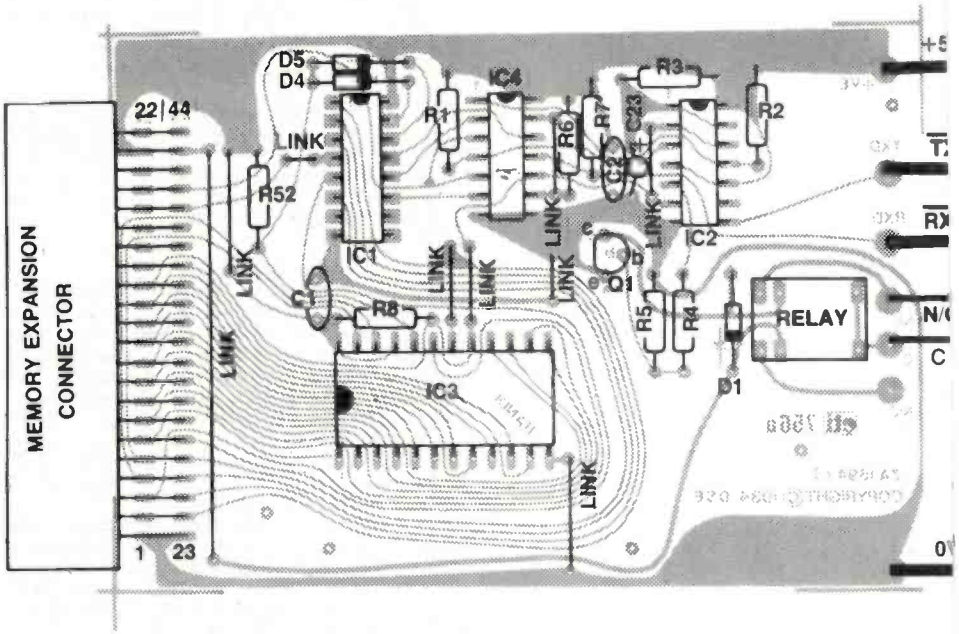
located between R9 and R10, the other between R17 and R46. Use 22g tinned copper wire. Insert all the resistors next. Follow with the two diodes, Q2 and LED1 — making sure you get them all the right way round. Now solder all the ICs in place, seeing that you have them correctly oriented before soldering. With IC6, IC7 and IC8, solder the ground pins first, followed by the Vcc pin, and then all the remaining pins. This prevents any static or leakage current failure problems with the CMOS during construction.

The trimpots can be soldered in place next. Note that RV3 (SET 22 950) is a signal turn, vertical-mounting type, not a 10-turn trimpot like the others (and as seen in the pictures).

All the capacitors are soldered in place last. See that the two tantalums (C22 and C23) are correctly oriented.

Before proceeding further, *give each board a thorough check*. See that all the semiconductors and other polarised components are around the right way and that there are no solder bridges between closely-spaced pads — particularly around the IC pins. Remedy any problems.

If all's well, link the two boards with short lengths of hookup wire, as per the wiring diagram, and wire them to the DIN socket. Colour-coding the wires helps identify them, now as well as later when you may need to fault-find on the unit. Bolt the plastic spacers to the decoder board and screw the two boards together 'back-to-back'. If you're satisfied all is well, screw the assembly into the case bottom via the holes provided on the decoder board. This board faces down (components face the case). Leave the lid hanging loose so that the trimpots may be adjusted.



The following is a summary of the commands for this system:

TRANSMIT COMMANDS

When called, the following commands are inserted into the type — ahead buffer ready for transmission.

• SHIFT Q	Transmit buffer #1.
• SHIFT W	Transmit buffer #2.
• SHIFT E	Transmit buffer #3.
• SHIFT R	Transmit buffer #4.
• SHIFT T	Transmit buffer #5.
• SHIFT 0	Transmit buffer #0 (WRU buffer).
• SHIFT A	Transmit a row of RYs (32 characters).
• SHIFT I	Transmit "STATION IDENTIFICATION" along with your callsign.
• SHIFT P	Transmit "PLEASE KK KK KK" to terminate a call.
• SHIFT D	Transmit "DE" along with your callsign.
• SHIFT F	Transmit "THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG 0123456789".
• SHIFT C	Transmit a row of CQs (32 characters) along with your callsign.
• SHIFT 0	Transmit your callsign only.
• SHIFT 3	Terminate the transmission at this point and exit to receive mode. (SHIFT 3 produces a #).

IMMEDIATE COMMANDS

These commands operate in both transmit and receive modes.

• SHIFT Z	Toggle from the current mode to the alternative mode; i.e.: from TX to RX or from RX to TX.
• SHIFT	Exit from the current mode to the menu.
• SHIFT U	Enable/disable the WRU mode. The current status is displayed on the command line at the top of the screen.
• SHIFT H	Enable/disable the PRINTER mode. The current status is displayed on the command line at the top of the screen.
• SHIFT M	Backspace key. Deletes the last character typed.
• SHIFT S	Change the BAUD RATE.
• SHIFT B	Clears the internal printer buffer.
• SHIFT G	Exits the current mode and restarts at the callsign entry mode.
• SHIFT (RET)	Inserts a CR/LF into the internal printer buffer, forcing it to dump its contents to the printer.

Aligning the unit

We will align the transmitter first, as the transmitter will be used to align the receiver.

Transmit alignment.

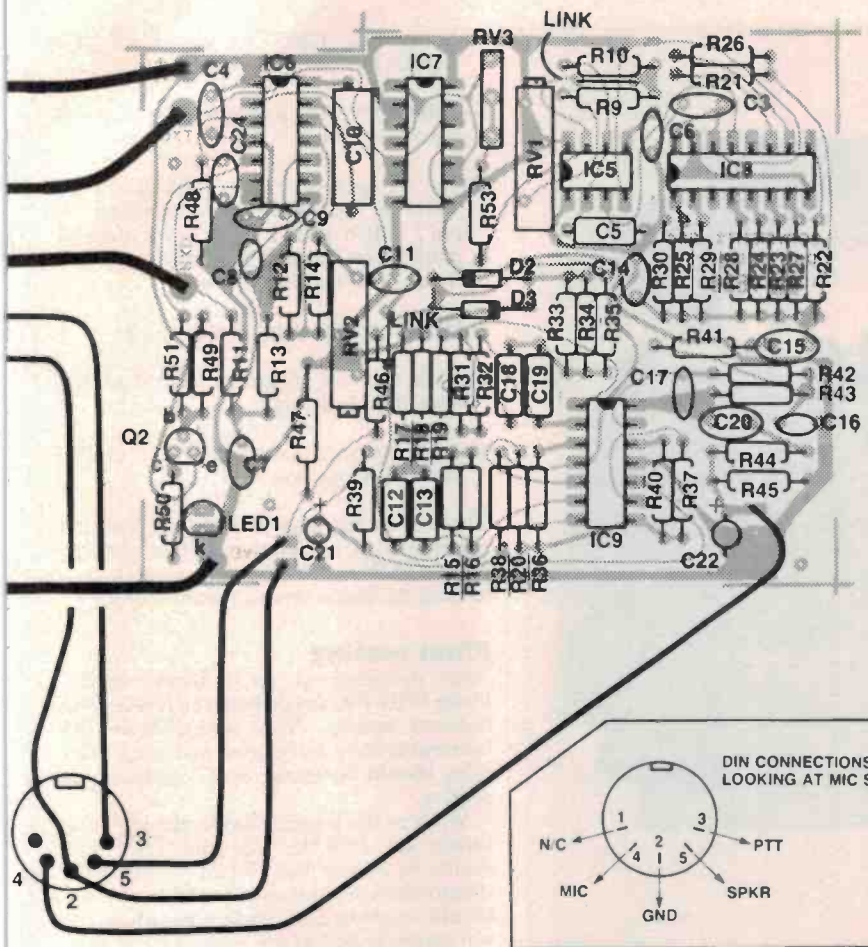
1) Cut the link connecting the two pads marked TXD on both boards. Solder a 10 cm length of wire to the modem board TXD pad.

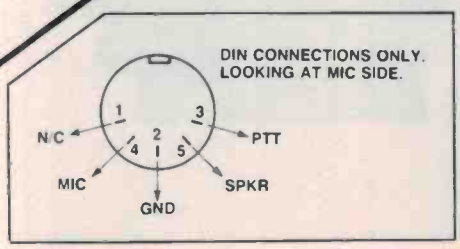
2) Connect a frequency counter to pin 3 of IC5 (555).

3) Link the 10 cm wire to ground, and adjust RV1 for a frequency of 21 250 Hz.

4) Now link the wire to +5 V, and adjust RV3 for a frequency of 22 950 Hz.

5) Repeat steps 3 and 4 several times as necessary to ensure frequencies remain accurate when the wire is toggled between ground and +5 V.





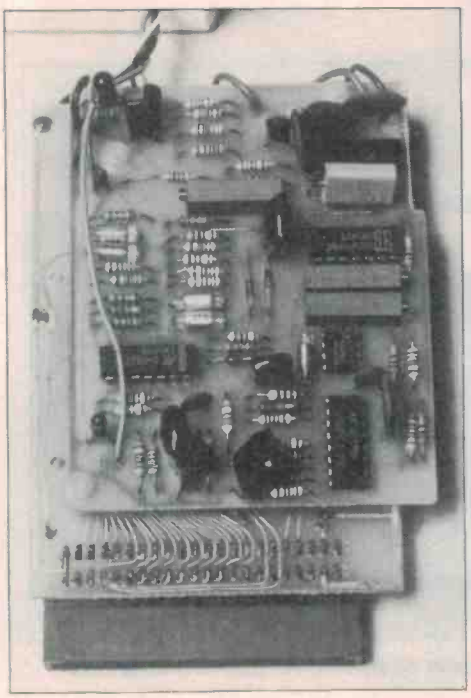
PC BOARD
The printed circuit artwork was done by Dick Smith Electronics and copyright is held by them. Hence, we have not reproduced the board pattern. Complete kits are available from Dick Smith stores.

Receiver alignment.

1) Wire a link connecting TX audio output to RX audio input.

2) Connect an audio generator to the wire used in the transmitter alignment.

3) Set the generator for a square wave, 0 dB attenuation, maximum amplitude, and a frequency of about 22 Hz. (This simulates a speed of approximately 45 baud).



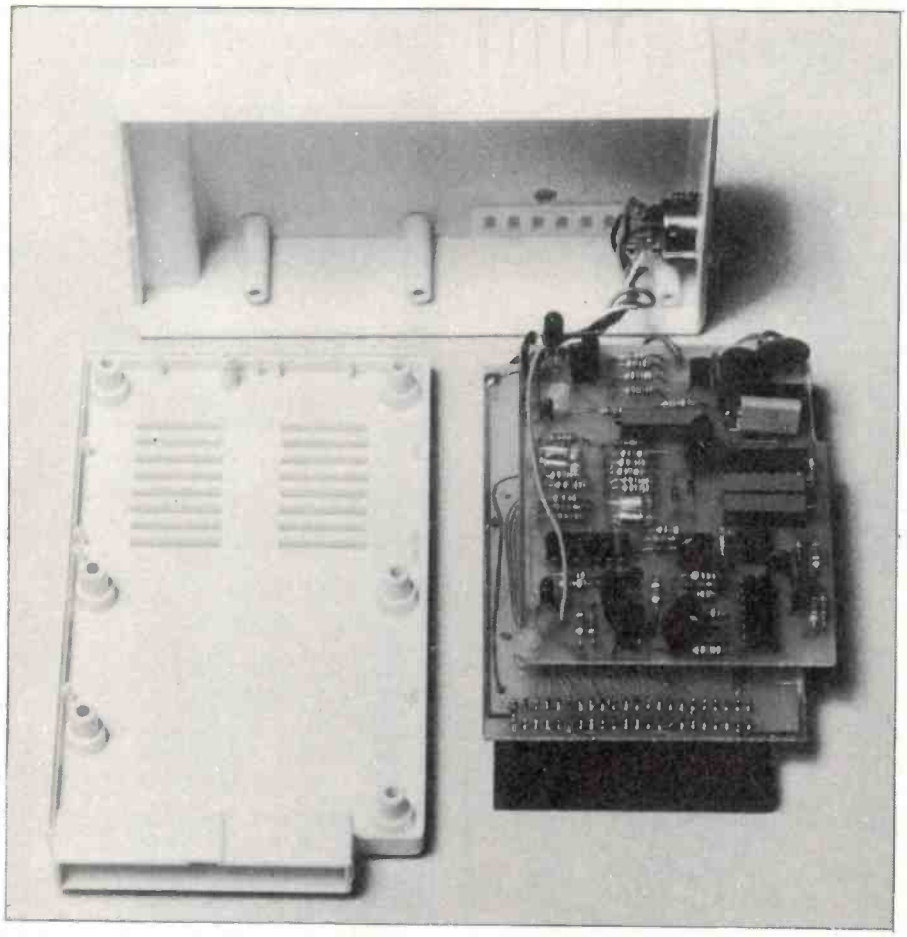
Modem board. The receiver demodulator and transmitter modulator are contained on this board, mounted on the rear of the decoder board. Note the indicator LED.

PARTS LIST — ETI-756

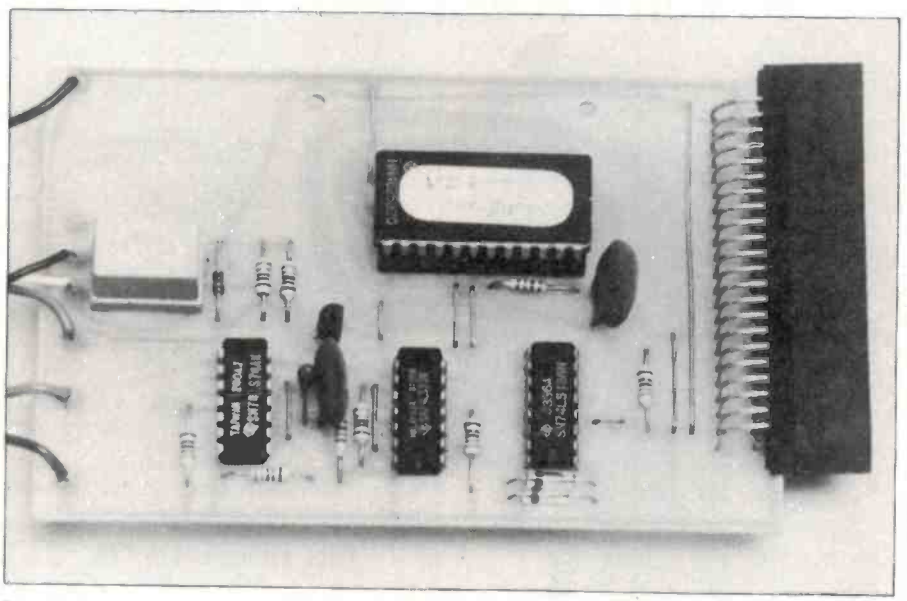
Resistors	all ¼W, 5% unless noted
R1-6,49,51,52	4k7
R7, R8	2k7
R9,24,26	22k
R10	10k
R11, R48	470k
R12	270k
R13	100k
R14	15k, 1%
R15	560k, 1%
R16	1M, 1%
R17, R33	3k9, 1%
R18,21,29,53	220k
R19	390k
R20	1M5
R22, R28	56k
R23,27,34	27k
R25	18k
R30, R46	1k
R31, R32	680k, 1%
R35	330k
R36	1M2
R37, R41	33k
R38, 39, 43	68k
R40	120k
R42	47k
R44	3k3
R45	560R
R47	33R
R50	470R
RV1	50k multiturn trimpot
RV2	10k multiturn trimpot
RV3	200k vert. mount trimpot
Capacitors	
C1-4,9,24	100n ceramic
C5,12,13,18.19	1n, 1% styro
C6	10n ceramic
C7	33n greencap
C8	5n6 greencap
C10	22n/400 V metallised poly cap. (mpc)
C11,15,20	100n greencap
C14	47n greencap
C16	2n7 greencap
C17	270p, 1% styro
C21	470n electro (pc mount)
C22	330n/10 V tant.
C23	470n/10 V tant.
Semiconductors	
D1,2,3	1N914, 1N4148
D4, D5	1N60
LED1	5 mm red LED
Q1	DS548
Q2	DS557
IC1	74LS138
IC2	74LS74
IC3	2532 EPROM, "VZRTTY"
IC4	74LS33
IC5	DS555
IC6	XR2211
IC7	4066
IC8	4017
IC9	LM324, µA324

Miscellaneous
ETI-756 a and b pc boards (D.S.E. ZA1694 and ZA1695); 44-way edge connector (D.S.E. ZA 4107); case — Vitec RAM PAK case (D.S.E. ZA4663); Relay — mini 12 V DPDT type (D.S.E. S 7112); 5-pin DIN socket (D.S.E. P1552); three plastic spacers; nuts, bolts, hookup wire, etc.

Price estimate: $70-$75



Insides out. The two boards mount inside a case from the VZ200's manufacturer. The bottom of the case is shown at left. The decoder board mounts to this, the modem board being mounted to the decoder board. Note the hole for the indicator in the case top.



Decoder board. There's not much to it. This unit interfaces the project to the VZ200 and contains the software in EPROM.

4) Connect a CRO to pin 7 of IC6 (XR2211).

5) Adjust RV2 for a squarewave of equal mark/space ratio.

6) Set the generator for a frequency of about 50 Hz. Check that the signal on pin 7 of IC6 is still a squarewave of equal mark/space ratio. If not, readjust RV2, then check again on 22 Hz.

7) Disconnect the generator.

8) Link the wire to ground. Pin 7 of IC6 should go logic high.

9) Link the wire to +5 V. Pin 7 of IC6 should go logic low.

That covers the alignment details. All that remains is to reconnect the two pads labelled $\overline{\text{TXD}}$ and disconnect the link connecting the audio input to audio output.

Final testing

After powering up, go to receive mode. Using SHIFT Z, toggle between receive and transmit modes. You should hear the transmit/receive relay open and close. The relay should be in the open condition on receive.

While in the transmit mode, the idle tone should be 2125 Hz, and the $\overline{\text{TXD}}$ pad should be a logic high. When typing, $\overline{\text{TXD}}$ should show low-going data, and the tone should toggle to 2295 Hz in sync. This tone will probably be too low in level to be read by a counter at the audio output pin, but it can be read on pin 3 of IC5 (555). (NOTE: This reading is 10 times the final frequency, so don't be fooled.)

Try out

Plug the project into the VZ200 expansion slot with the decoder board components facing *down*. Failure to observe this could result in the unit being damaged.

Once the module is fitted, turn your VZ200 on. If your VZ200 has Version 2.1 BASIC, you should hold down the CTRL key as you turn on, or else the display will contain inverse characters. If all is well, the VZ-200 should display

★ VZ-200 RTTY ★
★ TERMINAL PACK ★

followed by a copyright message. If not, power down immediately, and check the project for errors.

If all is well, you are ready to align the receive and transmit sections.

Before starting the alignment procedure, however, run through the general operation to ensure the software decoding is working fully.

PART 2: In the next instalment, we cover the overall operation of the unit, plus a listing of the software and a guide to its workings. ●

Christmas comes but once a year!

but you'll think all your Christmasses have come at once if you buy your new Yaesu from Dick Smith Electronics before Christmas! Why?

Dick Smith Electronics GUARANTEES to match any genuine, advertised price* on Yaesu amateur equipment between now and Christmas.

So why take chances elsewhere with 'backyarders' when you can get the same — or better — price from Dick Smith Electronics and get all the Dick Smith Electronics advantages:

- Genuine authorised Yaesu distributor/importer for Australia
- Genuine equipment, intended for Australia, with Australian cables, manuals, etc
- Stocks held in our central warehouse and available at all stores
- Full 12 month parts and labour guarantee
- Full service back-up with huge spare parts inventory and trained technicians
- And there's a Dick Smith store near you (or you can use our famous — reliable — DSXpress order service!)

exclusive to

DICK SMITH ELECTRONICS

- 51 stores throughout Australia
- Credit terms to approved applicants through Custom Credit
- Bankcard, Visa, personal cheque . . . and yes, we still accept cash!

*This offer does not apply where the advertiser does not have the goods in stock or to other sellers of Yaesu equipment, their employees or agents and only applies to Australian advertisements. Where an advertisement appears offering a low price and the advertiser has no intention to supply goods at that price, we suggest you lodge a complaint to the Trade Practices Commission under section 56(1) or 56(2) of the Trade Practices Act.

NEW!

'GLASS' RTTY FOR THE VZ-200 COMPUTER

Get into RTTY the low cost, easy way. With the ultra-quiet VZ-200 computer and our new VZ-RTTY kit, you'll be on the air with RTTY quicker than you can say quick brown fox jumps . . . As described in Electronics Today October and November; kits due in all Dick Smith Electronics stores mid October.
Cat K-6318

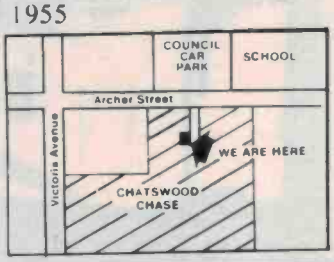
ONLY **$69.50**

Don't miss out! Order yours today!

Another Ham Shack

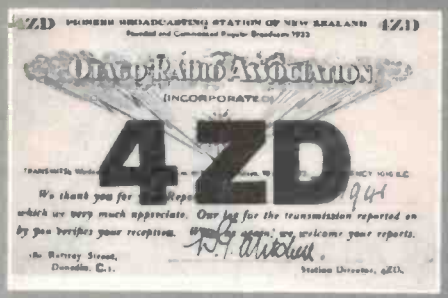
at our new Chatswood Chase (NSW) store . . . Archer St Mall — Phone 411 1955

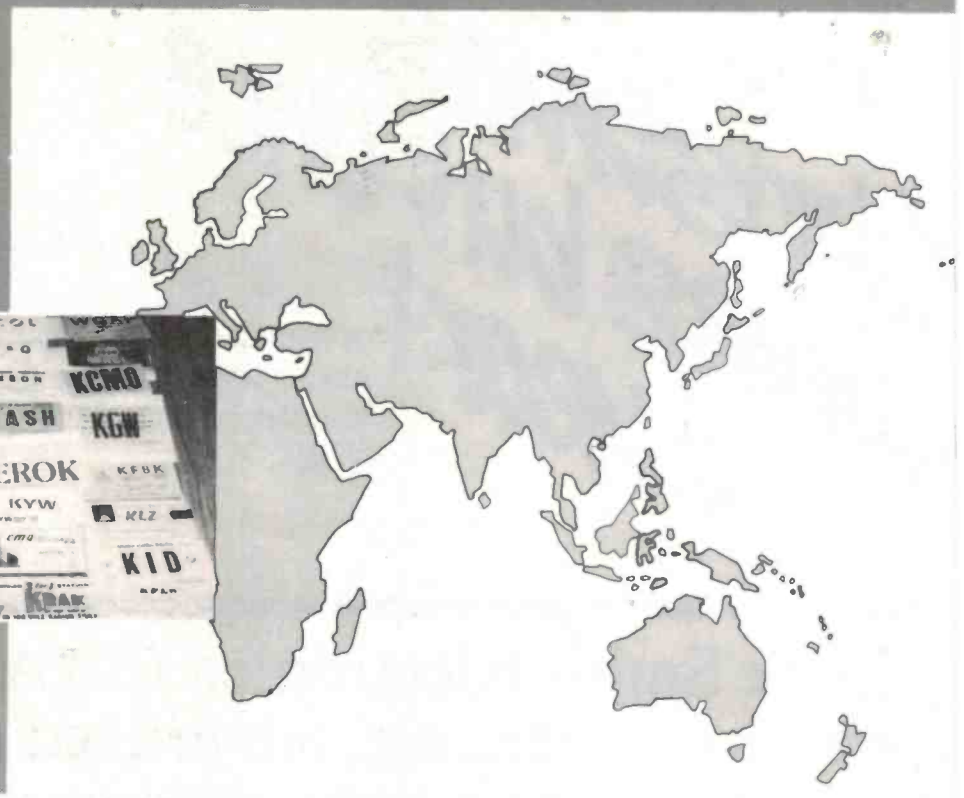
Say hello to
Chris VK2YUS
Martin VK2PJW



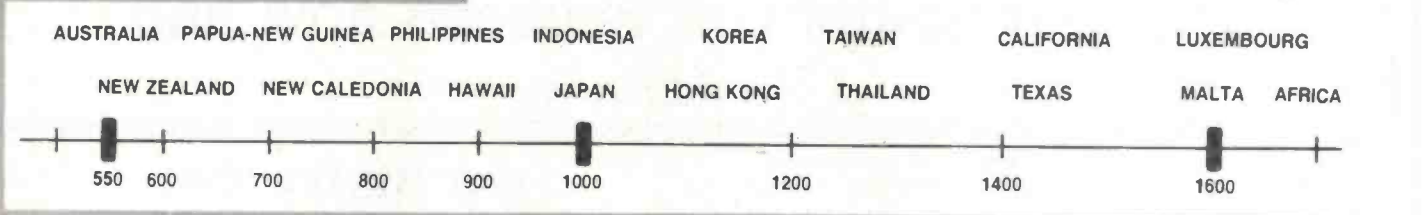
See Insert for Store Addresses.

A855/JL



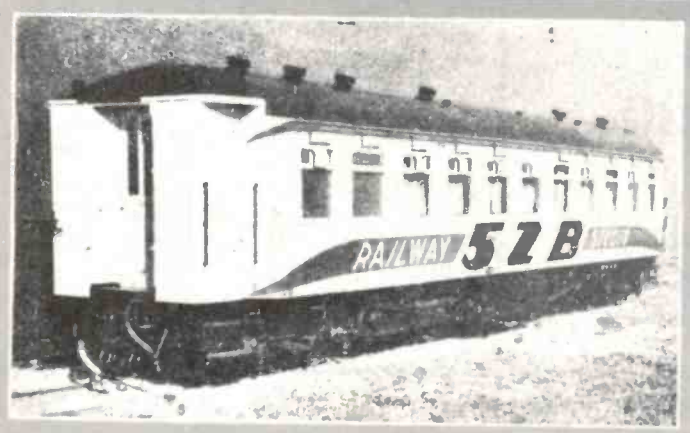


Top. NZ's Pioneer broadcaster is operated by the Otago Radio Association, and began operating in 1922. The station is now 4XD Dunedin on 1431 kHz.
Above. Typical verifications from North American mediumwave stations with powers ranging from 100 to 50 000 watts.



Tiwai listening post. Located near Invercargill, this listening post is a 'Mecca' for mediumwave listeners as it gives outstanding reception.

Off the beaten track. Unusual broadcasters have been heard on mediumwave including off-shore stations. Both in Australia and New Zealand, radio stations have at times been housed in a railway carriage. 5ZB was in operation in 1939 when it travelled throughout the North Island of NZ, stopping overnight in small centres and providing a radio service of a local nature.



THE WORLD OF MEDIUMWAVE

Arthur Cushen

Travel the world — hear strange voices — listen to the sounds of planet earth! It's possible without an airline ticket. All you need is your trusty old AM radio, a good aerial and a bit of patience.

MANY READERS would be sceptical if told that it is possible to hear all the continents on earth using nothing more than an old valve radio. The mediumwave band from 531 kHz up to 1602 kHz is used worldwide for local broadcast services.

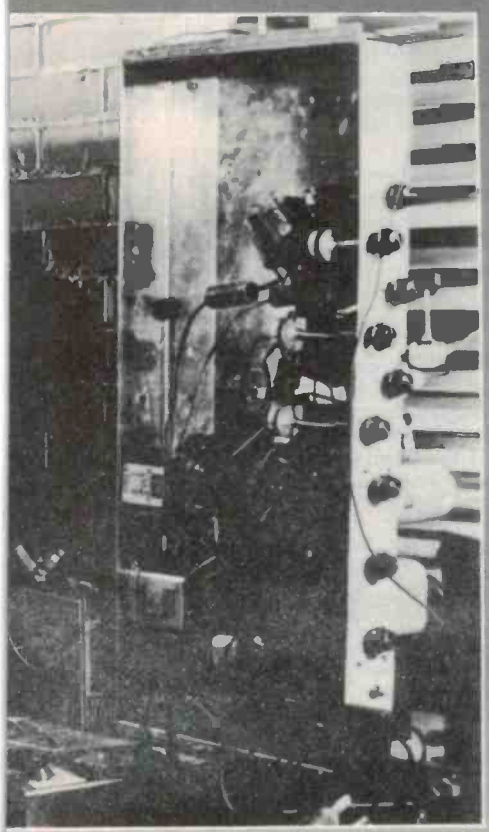
Reception is restricted to the hours of darkness. This can be extended a little after dawn and before dusk, at either the receiving or transmitting location, but darkness must cover the majority of the transmission path.

The radio stations in Australia are separated by 9 kHz spacing, having moved to this new frequency allocation system in 1978 following the World Administrative Radio Conference, and except for North and South America these are the common channels of operation. The Americas still retain the 10 kHz separation.

The use of the 9 kHz separation often means that listeners without digital frequency readout find it difficult to assess the exact frequency of a station. But if the stations are 9 kHz apart you can work it out quite easily, since the sum of the digits in the frequency must equal 9 or 18. A station therefore might be on 720 kHz as these two figures add to 9, or 864 kHz as these three figures add to 18, but not 863 or 866 as neither of these totals 18, and the true frequency can be calculated by this system.

The location of the receiver plays a vital role in determining the signals that can be received. In city locations, the use of a loop aerial (frame aerial) helps to overcome interference. If it is tuned it enables the reduction of noise and interference from nearby radio stations.

In the 1930s and 40s simple aerials were sufficient for reception of signals from all continents, but for the city dweller this is not possible today. In many cases radio listeners have moved to country locations to set up their listening equipment. Here the outdoors provides an ideal setting for long wire aerials. The Beveridge aerial has proved to be the major listening device in pulling in the elusive signals from all over the world.



Typical listening post

The reception pattern in Southern New Zealand (where the writer is located) is that signals can be heard up to two hours before local sunset from South America, then signals are heard from North America, and after dark from the Pacific, Australia and Asia. Towards dawn Europe and Africa come into their own.

During winter months — May to July — signals are heard as early as 2.30 pm local time, 0230 UTC. In mid-summer, signals are being heard at 8.00 pm or 0800 UTC. The equinox period (March and September) is the best time for listening to Europe and Africa just on dawn. South Pacific, Australian and Asian signals are heard all the year round.

Australian listeners will find signals following the same pattern, with American signals followed by New Zealand just before dark, and then reception continues through Asia, Europe and finally to Africa at dawn.

Listening by the sea, both in Australia and New Zealand, has proved to be successful. An ocean path separates the listener from the broadcasting station on the other side of the Pacific, and aerials beamed in given directions accentuate the signal level. There are some famous listening posts in Australia which have produced outstanding reception such as Coolum in Queensland, Marlo and Torquay in Victoria, and Lake Albert in South Australia.

In New Zealand at the East Cape, the first land in the country to get the new day, some oustanding reception has been reported. In Southern New Zealand, Long Beach near Dunedin was the scene of some outstanding listening during the 1950s. Today a specially constructed listening post on Tiwai Peninsula near Invercargill is a 'mecca' for mediumwave listening.

Tiwai is 40 km south-east of Invercargill on the shore of Foveaux Strait. There is no electric power. It can only be reached via an 8 km bush road through an area owned by New Zealand Aluminium Smelters. A typical afternoon's listening will find enthusiasts arriving at the listening post around ▶

2.00 pm during winter. The radio house is set behind tall trees. Fanning out from it in eight directions like the spokes of a wheel are the long wire Beveridge antennae. These are planned to cover all the continents, with three covering the Americas.

The house has three listening rooms, each equipped with a long listening bench in which up to five receivers can be housed. Each receiver has a selection of aerials available to it. Power for the receivers is provided from a solar panel in the roof which gives 12 V supply to the listening rooms.

Mediumwave reception is so unpredictable that one never knows what signals will be received on a particular day. Often North American signals at the lower end of the band are dominant, but on other occasions it is Caribbean and Central American stations. Part of the thrill of mediumwave listening is not knowing in advance what you will hear.

During the night the Australian stations dominate with many operating a 24 hour schedule. New Zealand's 80 radio stations also operate for 24 hours (except for the Concert Program — on 657, 882, 900 and 963 kHz, and the non-commercial stations, Radio Rhema 810 and 1502 kHz, and 4XD 1431.) The Japanese and Asian signals are peaking at 3.00 am, 1500 UTC, when the Japanese NHK stations close down. The Middle East (Saudi Arabia on 1440 kHz) is often heard as early as 3.00 am. At dawn, Europe and Africa come into their own.

The Pacific

Australian mediumwave listeners find the AM band offers excellent reception of interstate and New Zealand signals after dark. Reception of broadcasts from the South Pacific is also possible in areas where there is no local station sharing the same frequency. New Caledonia (666 kHz) is heard particularly well in Victoria and Queensland, and later listeners will discover the Fiji Broadcasting Commission on many frequencies, including 558 kHz (English) and 774 kHz Fiji (Hindi). Tonga (1017 kHz) and Tahiti (738 kHz) should also be audible as well as the Solomons on 1035 kHz.

To the North, Papua New Guinea is best received on 585 kHz. The Philippine signals are audible on many channels with the VOA station on 1143 kHz. This latter broadcasts with a power of 1000 kW.

North American signals

In the late 1920s and early 1930s there were thousands of Australian and New Zealand listeners who nightly tuned to signals from North America on the mediumwave band. There will be many who can recall such stations as KFI Los Angeles (640 kHz), KOA Denver (850 kHz), WBZ Boston (1030 kHz), KNX Hollywood (1070 kHz), WOAI San Antonia (1200 kHz), frequencies on which they still operate today.

It was in 1920 that broadcasting stations began to be authorised in the United States, and on December 7, 1921, the 10th station KWG Stockton, was licensed. Stations rapidly increased in number and to put order in a somewhat chaotic frequency assignment, on November 11, 1928, new frequencies were allocated in three categories — clear channel, regional and local, with the latter stations being restricted to 100 watts.

The next major frequency change took place on March 20, 1941, when the mediumwave band was extended to 1600 kHz and stations at the top end of the broadcast band were then allocated new frequencies. The local stations were increased in power to 250 W and 1230, 1240, 1400, 1450 and 1490 kHz were then the major channels of low-powered stations.

Entertainment was provided by many stations from Hawaii and the North American West Coast during the evening when New Zealand stations had a 'silent night'. Australian listeners also enjoyed this type of reception, particularly those on the East Coast, and reception from as far away as New York was not uncommon.

Another phase of North American reception during our summer months became evident when stations were heard opening their broadcast day at 1100 UTC (9.00 pm Sydney, which was equal to 6.00 am in New York). These signals were received until daylight cut the transmission path at the North American end. Listeners were able to follow sunrise across North America with Central Standard Time stations opening at 1200, Mountain at 1300 and Pacific at 1400 UTC. Signals from the Pacific were noted at 1600 when broadcasts from Hawaii were received.

Asia

Indonesian stations are increasing in numbers on mediumwave. On the low frequency end of the band, Bandung (540 kHz) and Surabaya (585 kHz), operated by Radio Republic Indonesia, are two of the best signals received. Singapore on 792 kHz also provides good reception, with English news at 1600 UTC. Several stations in Malaysia provides good reception, with English news that country.

Undoubtedly a major source of interest when listening to Asia is the many Japanese stations audible. The Broadcasting Corporation of Japan, Nippon Hoso Kyokai (NHK) has two major networks both closing at 1500 UTC. The key station for Network 1 is JOAK Tokyo on 594 kHz while the originating station for Network 2 is JOAB Tokyo on 693 kHz.

There are many private commercial stations which operate 24 hours a day and those using 50 kW or over are JONR (1008), JOAR (1053), JOQR (1134), JOLF (1242), JOFR (1278), JOHR (1287), JOUF (1314), JOSF (1332), JOIF (1413), JORF (1442) and JOWF (1440).

Korea is divided by the 38th parallel with South Korean stations either operated by the Government Korean Broadcasting System (KBS) or private commercial operators. Transmitter power used includes 250 and 500 kW stations, operating on 558, 603, 711 and 891 kHz.

Two gospel stations also operate from Korea, HLKX on 1188 and HLAZ on 1566.

The People's Republic of Korea broadcasts from Pyongyang and due to the late sign-off, many frequencies are well received up to 1800 UTC. These include 657, 684, 730 and 855 kHz.

"Taiwan is received with programs of the Broadcasting Corporation of China on many frequencies, while the Voice of Asia 621 kHz using 600 kW is heard at 1800 with a service in Mandarin. On the Chinese mainland, Radio Beijing uses many frequencies throughout the night including 639, 927 and 1028 kHz.

In nearby Thailand the million watt transmitter which is shared between the Thai Government and VOA for broadcasting is heard on 1575 kHz. The Voice of Free Asia is the slogan and English programs are heard 1030-1100 with sign-off at 1700 UTC.

All India Radio has several networks on mediumwave and identification is easy as many stations carry a news bulletin in English at 1530 UTC. AIR operates three transmitters of a million watts using 594, 1071 and 1134 kHz. Many stations also have a short English news bulletin at 1730 prior to closedown.

Radio Pakistan at Islamabad also uses a million watts with English at 1700 UTC on 585 kHz. Radio Iran, in common with many Middle East countries, operates transmitters of more than 1000 kW and reception is noted around dawn on 558, 765, 1080 and 1449 kHz. Baghdad is received at the same time. The most powerful signal in this area is from Saudi Arabia, 1440 kHz, heard as early as 1530 UTC. Dubai (1481 kHz) is heard at the same time. The BBC operates two 750 kW transmitters on Masarih in the Persian Gulf, with the Asian Service on 702 and the World Service on 1413 kHz well received at 1800.

Europe — Africa

European signals are received on common frequencies with that of Australia and are best heard in March and September at dawn, during the equinox period. There are many high-powered transmitters and listeners should hear Luxembourg (1440 kHz), Monte Carlo (1467 kHz), Malta (1557 kHz), Germany (1593 kHz) and the Vatican (1611 kHz).

Signals from Africa are generally confined to the Northern area, with Egypt (621 kHz) and Libya (1125 kHz), while listeners in South Australia report the best from Southern Africa as Pietersburg (1115 kHz).

The Indian Ocean islands received include Seychelles (1368 kHz), Reunion (729 kHz) and Mauritius (684 kHz).

This article is contributed by Arthur Cushen, who has confirmed 2620 stations in 153 countries on mediumwave. Further information on listening is available by writing to Arthur Cushen, 212 Earn St., Invercargill, New Zealand. All times are UTC, 10 hours behind Eastern Australian Standard Time.

PROFESSIONAL QUALITY ELECTRONIC COMPONENTS

Preh

DIN Connectors: Metal housed. Available in lock and non locking 3–8 pin.

ROE

High capacitive electrolytic capacitors for PCB mounting with especially small and flat dimensions

Preh

Commander. Fully enclosed ASC11 keyboards serial or parallel output.

OKW

Uni-mess Box

Hand held enclosure with battery compartment and digital or analog readout panel

Preh

D Sub-min. 9-50 pin D Connectors, gold contacts, solder cup or PCB mount.

MAYER KRIEG & CO.

248 ANGAS ST., ADELAIDE, S.A. 5000.

For further information and data sheets contact your local distributor.

NSW: Mayer Krieg (02) 684 1900; M. Rutty (02) 476 4066.
NEWCASTLE: DGE Systems (049) 69 1625.
QLD: E.C.Q. Electronics (07) 376 5677; Fred Hoe (07) 277 4311.
SA: Anelco Electronics (08) 294 2600.
VIC: Mayer Krieg (03) 579 5722.
WA: Pro-Spec Distributors (09) 362 5011.
NZ: Channelmaster (9) 59 9003.

AR2001 WORLD'S FIRST

- CONTINUOUS COVERAGE
- THREE MODE SCANNER
- COMMUNICATIONS RECEIVER

NOW ONLY $499 INCL. TAX

FEATURES:

- 25-550 MHz continuous
- NBFM — for communication
- WBFM — for BC & TV monitoring
- AM — for Air band monitoring
- 20 CH memory
- Priority Channel
- Clock

WRITE FOR FULL SPECIFICATIONS

ONLY $399

NEW Personal 2-way radio here at last!

"EMTRON ACE"

A QUALITY 40-CH HIGH POWER UHF CB HAND-HELD TRANSCEIVER ● DESIGNED FOR AUSTRALIA DOC APPROVED

FEATURES:

- 40 CHANNEL OPERATION
- HIGH (2.5W)-LOW (0.5W) RF OUTPUT
- OFFSET FOR REPEATER OPERATION
- NICAD RECHARGEABLE BATTERIES
- ILLUMINATED DIAL FOR NIGHT OPERATION
- SMALL IN SIZE — BIG IN PERFORMANCE

APPLICATIONS:

- FARMING
- FISHING, BOATING, HUNTING, BUSHWALKING
- BUSH FIRE CONTROL
- AG SHOWS
- SECURITY
- CONSTRUCTION SITES
- CAR RALLIES
- CROWD CONTROL AND MANY OTHERS

DEALER INQUIRIES WELCOME

EMTRONICS

Retail Division of EMONA ELECTRONICS P/L

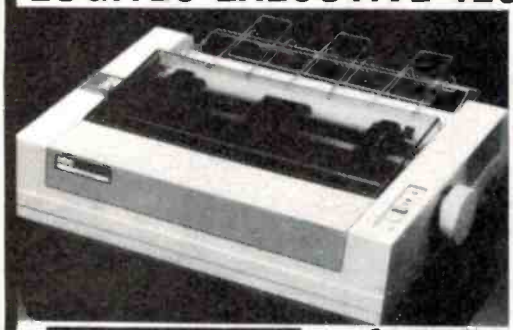
All Mail to: PO Box K21, Haymarket, NSW 2000
Ph: (02) 211 0531 Ph: (02) 211 0988
94 Wenthworth Ave, Sydney, 2000.

PORCHESTER Computers

DELIVERY AUSTRALIA WIDE

• MAIL ORDER • PHONE ORDER • CALL-IN

LOGITEC EXECUTIVE 120 PRINTER



Note: Some people have been selling this printer for $490, and even over $500. We import direct, so we sell it for $409 . . .

$409 inc

$375 ex

NEW MODEL **OUR INSTANT BEST SELLER . . . with NLQ**

NLQ means Near Letter Quality, almost the same as a Daisywheel. Seeing is believing with this printer.
Also: 120 CPS, Epson MX80 compatible, IBM matrix and graphics compatible, 1.6K buffer, proportional spacing, 10 pitch, 12 pitch, fabric or carbon ribbons.

NEW MODEL! 100 DT PRINTER.

Many more features than 80DT/BX80! Now has 100 CPS, 10 Pitch, 12 Pitch, Proportional Spacing, 8 Character Sets, etc., etc.

$325 inc.
$289 ex.

XMAS SPECIAL FOR COMMODORE 64.

Xetec Interface and 100 DT Printer. Together for only **$399 inc.**

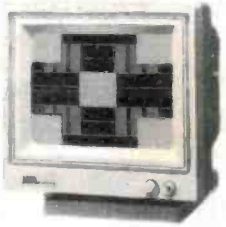
TWO GREAT HIGH QUALITY MONITORS!

HI-RES AMBER & GREEN

. . . for Apple, Microbee, Executive, Kaypro, Osborne, etc.

$149 inc. XMAS SPECIALS

VERY HI-RES AMBER



. . . for IBM PC/XT, Tilt/Swivel IBM Connec.

$249 inc.

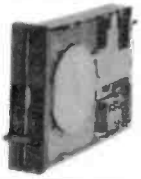
DISC DRIVES

ATLAS 8 FOR YOUR APPLE

$245 inc.
$209 ex.

NATIONAL

FOR: IBM PC, Challenger, Columbia, Tandy, Eagle, Kaypro, Osborne, etc.



40 TK DSDD

$219 ex.

FOR: Apricot, Excalibur, Executive, Kaypro 4, etc.

80 TK DSDD

$239 ex.

IC's FOR OEM's/MANUFACTURERS

2764 EPROMS
$5.90 ex.

We can supply quantities of IC's from several sources in Asia/Japan. Contact us . . .

- **LOWEST PRICES**
- **FAST DELIVERY**

First Floor
169 Victoria Parade, Fitzroy, Vic 3065

NEW LOCATION
68 Punt Road, Windsor, Vic 3181

PHONE ORDERS • Ring (03) 417 6999
MAIL ORDERS • Send cheque/Postal Order, or Bankcard details.

• DEALER ENQUIRIES WELCOME •

6 MONTHS WARRANTY ON ALL PRODUCTS

bankcard MasterCard

The MSX invasion

Still waiting for business to settle in the US, Japanese home computer manufacturers are focusing nearly all their 1984 efforts on cultivating steady sales in smaller but less volatile markets in their own country and Europe.

All the 8-bit models are based on the emerging MSX operating system standard, created by Microsoft Corp and initially supported by 14 Japanese manufacturers.

Already, Sony has begun exporting home computers to the UK, while Matsushita has begun sending samples there. The MSX standard is expanding geographically as well as technically, says Scott Oki, vice president of Microsoft's international activities.

MSX, created as a standard to run read-only-memory-based software, is now ready in a disk-cooperating-system version. Designed for use with 8-bit Z80 microprocessors, MSX-DOS emulates CP/M-80 calls and contains MS-DOS file formats. "It's kind of the best of both worlds (8-bit Digital Research's CP/M and Microsoft's 16-bit MS-DOS)," says Oki.

In Japan, Vendors have increased the memory capacity of MSX systems from 16K bytes to 64K bytes. Software is being built into machines, and a range of features is in the works to create several MSX segments, including a high end infringement on office automation markets.

Moreover, MSX is on its way across the world. "MSX is more than a Japanese standard. It can be called a world standard," claims Oki. "The list of firms backing MSX is growing almost daily — three Korean companies have licensed it as well as Philips in Europe." In addition, Microsoft is negotiating with more European firms along with a few in Brazil, he says.

It is estimated that Japanese manufacturers shipped 250,000 MSX computers in Japan before the end of June, and that 500,000 of the projected 1.5 million personal computers shipped in Japan altogether this year will be MSX systems. Already about 500 MSX software titles are on the market, and the total is expected to double by year's end. Today, 70% of all Japanese personal computers shipped are finding their way into the home, says NEC's Hamada. Just as in the USA, games account for the majority of software used in Japanese home computers.

DIL oscillators

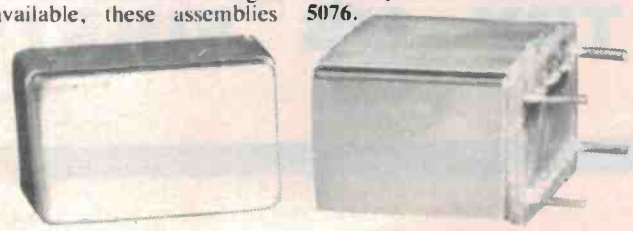
Bright Star Crystals can provide what they claim is a unique service for the supply of those hard-to-get, non-standard dual-in-line packaged crystal oscillator clocks.

They can supply TTL (5 V supply) versions with output frequencies between 50 Hz and 50 MHz or CMOS versions (10-15 V supply) with outputs over the range 50 Hz to 10 MHz.

Provided that 18 mm of height is available, these assemblies will replace standard hybrid-type clocks, Bright Star say.

Despatch of short-run, non-standard units can usually be made within three working days of receipt of order, according to Bright Star.

Standard hybrid types with standard frequency outputs will shortly be held in stock. Write for a catalogue and prices to: **Bright Star Crystals, 35 Eileen Rd, Clayton, Vic 3169. (03)546-5076.**



Accord pc

The Accord ACC-8000 computer is a newcomer to the Australian market. It is a Z80-based computer that runs under the improved CP/M operating system (CP/M 3.0). This optimises the use of the machines 128K memory, and its 'hashed' directory structures speed up the loading of programs and data. The optional hard disk (10, 20 and 40 M) is also a networking node which allows an ACC-8000 to become a file server and print spooler for up to 255 other computers.

For the user interested in the 6502 or the 6809 the ACC-8000 includes both these processors and will run FLEX as well as Apple DOS 3.3.

The ACC-8000 features an ergonomically designed screen which swivels and tilts. The keyboard is fully detachable, allowing lap-top operation.

Other standard features include software-selectable 40 or 80-column mode, 240 by 192 graphics, RS-232 serial port, a parallel port and two 140K disks. A time of day clock is also included.

The ACC-8000 is priced at less than $2500 for the system. This consists of a screen, keyboard CPU and two disk drives.

The ACC-8000 is imported and distributed in Australia by **Datatree Computing Systems, 3/5 Wongala Cr, Beecroft NSW 2119. (02)875-2696.**

Club call

Compucolor Users Group, "CUVIC", Box 420, Camberwell, 3124, Victoria. Communications to The Secretary/Treasurer, Ted Stuckey. President Ken Winder, Editor Barry Holt.

A newsletter, 'CUVIC', is published monthly. Meetings are on the second Wednesday of the month at the Community Centre, Surrey Hills, Vic. A library of about 150 disks is available to members. Affiliations with other CC groups in Australia, UK, and USA. Present dues $10 per full year, January to December.

Hello systems, goodbye independence

Even though the US microcomputer peripheral market will grow almost 300% to US$17.6 billion by 1994, most of the sales will be to computer manufacturers rather than to retailers. The days of independence for micro peripheral independents will have gone, according to a new 221-page report published by International Resource Development, a US-based independent market research and consulting firm.

In the long run, microcomputer makers are going to exercise increasing control over which peripherals are available for their computers, according to IRD analyst Maureen Fleming. Even worse for peripheral makers, the computer manufacturers may begin to make peripherals in-house, circumventing any need for third-party suppliers.

The desktop computer of 1994 will be at least as powerful as mini-computers are today and will be based on multi-user systems. Local area networks and standalone workstations will be antiquated issues. End users will have become extremely sophisticated in using computers and will be discriminating buyers of equipment, deciding on purchases based on utility rather than brand name. IBM and AT&T have an equal likelihood of dominating the 1994 market, according to Fleming.

The 1994 desktop computer will be linked to all other computers in the office and will share peripherals, Fleming added. Each office will come equipped with a draft quality printer and a high-end, letter quality printer. The computer will access data from a shared hard disk. Modems will be built into the computer by 1994, although with digital phones gaining prominence in the late 1980s, the modems won't be necessary and that market will stagnate.

What this means for peripheral suppliers at the retail level is that customers will want fewer peripherals of higher quality. What this means at the OEM level is that micro manufacturers will want many peripherals, but at rock-bottom prices, Fleming said.

Oz made 16-bit

The Universe Supercomputer range has been further enhanced by the availability of the extremely high-performance 80286 processor. The Universe Supercomputer can now directly address in excess of 16M of RAM. This puts the Universe range well and truly into the sub-mini class.

Wayne Wilson of AED, the Australian film which designs and builds the Universe, is delighted with its performance. He says: "The processor's architecture lends itself to high speed, multitasking and multiuser applications. We are now able to give our clients more performance than they would get from a small minicomputer — at a fraction of the price."

Compatibility with existing software is essential, states Wilson "The 80286 conversion still maintains compatibility with our existing concurrent MP/M 8-16 operating system and paves the way for more advanced operating systems such as UNIX and XENIX 286."

These more advanced operating systems will allow for larger memory sizes and greater protection to the operating system kernel, leading to secure systems with larger numbers of users.

To support the 80286, AED is committed to implementation of UNIX, and possibly XENIX 286.

For further details contact: **AED, Unit 3, Prospect Industrial Estate, 2 Stoddart Road, Prospect, NSW 2150. (02) 636-7677.**

Future belongs to inkjets

The recent widespread adoption of colour monitors and colour-capable software will drive colour printer sales to US$4.1 billion in 1993, far beyond the 1984 market of about US$750 million.

According to a new 190-page report from International Resource Development, a US market research firm, this 18% annual growth will be fueled mostly by sales of pen plotters to the scientific/engineering and business communities.

IRD concludes that new software packages will take advantage of increasingly popular colour monitors to accentuate both business graphs and children's home computer 'art'.

Users of inexpensive microcomputers have always wanted to print out what they've done on the screen, but a black-and-white reproduction of a multicoloured display is really disappointing. Only recently has colour printing technology been able to come to their rescue, and in 10 years a good-quality ink jet printer should cost only about $320 — well within the means of the domestic market.

DELSOUND PTY. LTD.
1 Wickham Terrace,
(Corner Wharf Street)
BRISBANE, QLD. 4000
Phone: (07) 229-6155
Telex: AA44442

★ SEMI CONDUCTORS & PASSIVES
★ SWITCHES & INDICATORS
★ CABLES & CONNECTORS
★ MARINE & COMMERCIAL TRANSCEIVERS
★ COMPUTERS & PERIPHERALS
OEM's Government Dept's resellers
TRY US FIRST!

com Approved
/37/1173

ng just $199.00, MiniModem
ers state-of-the-art performance
e price of the 'cheapies'. We
built you a modem with
bility and sensitivity previously
d only in modems costing
ral times the price. MiniModem
analogue to digital conversion
hiques to remove problems that
now have limited low cost
em performance.

are the ways MiniModem is
er

gh sensitivity and digital
correction. On a poor line,
modems just won't go.
Modem uses advanced error
ction techniques and digital
essing to get around the
lem. Its VLSI chip can work
a level of –43dBM and a signal
ise ratio of 6dB with an error
of 10^{-5} – that's one letter wrong
y 5 pages on a line where you
d have trouble hearing!

ever needs alignment

ems have to be very accurately
ed if they are to work properly.
'cheapy' modems the filters can
y drift out of alignment. When this happens the modem won't go. This can't happen with MiniModem. The filters are crystal locked and never need alignment.

☐ **Multistandard.** Cheap modems can only work to one standard (usually 300 baud full duplex CCITT) if you need a different standard, too bad. Minimodem can be internally rewired to provide all the currently available world standards.

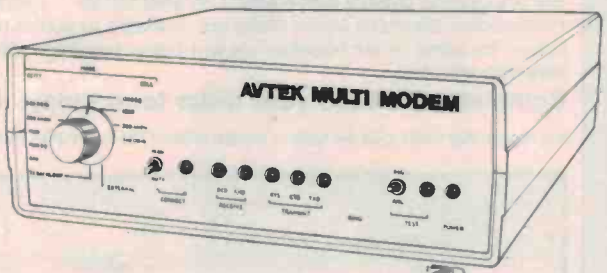
☐ **MiniModem is complete.** MiniModem is complete with a pushbutton phone and plug wired in. You just disconnect you old phone and plug MiniModem straight in.

MultiModem. only $349.00

Like the MiniModem, the MultiModem uses the latest VLSI technology to provide digital signal processing for the most reliable data transfer.

If you need high speeds or use more than one standard, MultiModem provides 300 baud full duplex, 1200 baud half duplex or 600 duplex, both CCITT and Bell standards at the flick of a switch. Autoanswer and auto connect facility allow MultiModem to receive or send when you're not there.

Telecom Approval C84/37/1135



AVTEK
(Electronics Pty Ltd)

Avtek Has Moved out of York Street

Due to the terrific response to the MultiModem, Avtek has decided to specialise in manufacturing of data communications products. We are still selling direct –:

Call us on our new hotline, 427 6688 or write to us C/O Lane Cove Post Office (no spare PO boxes at the moment).

HE AVTEK DEALER NETWORK

e following dealers stock and demonstrate the full range of TEK data communications products.

lbourne

d Irving
ctronics (03) 489 8866

rth (008) 999 007 (Orders)
ronics (09) 328 1599 (Enquiries)

Sydney

Paris Radio, Kingsford	344 9111
Jaycar City	267 1614
Jaycar, Hurstville	570 7000
Jaycar, Carlingford	872 4444
Jaycar, Concord	745 3077

A special opportunity for our readers to save at least 20% on the regular price of Professional Magnetic Media disks by

Plastic library case included in purchase price

Nashua

Could you ever place a value on the information you store on your computer disks . . . let alone the time it took to put it there? With so much at stake, don't settle for anything less than the very best disks available — **Nashua Professional Magnetic Media.**

What is the Nashua difference? Simply this: their disks are strictly monitored during every stage of production. They **don't** rely solely on an inspection of the finished product to detect flaws. Nashua build their product right **in the first place.** If a disk doesn't stay within narrowly defined quality margins . . . well, it's just not good enough to carry the Nashua name!

Nashua disks offer you quality with **unequalled** consistency. And by special arrangement, we proudly offer our readers an opportunity to save on this superb product.

We are dealing directly with Nashua on your behalf . . . so their superb Professional Magnetic Media disks are available to you at prices **at least 20%** (more, for some of the varieties shown) below recommended retail. **Don't miss this opportunity!**

Complete and send your order form today!

We regret that disks can be sold in boxes of ten ONLY. Smaller quantities cannot be supplied.

CODE	DESCRIPTION	PRICE *per box*
MD1	5¼" single sided single density	**$30.00**
MD1D	5¼" single sided double density	**$33.00**
MD2D	5¼" double sided double density	**$43.20**
MD2F	5¼" double sided 96 tracks per inch	**$49.80**
FD1	8" single sided single density	**$45.00**
FD1D	8" single sided double density	**$51.00**
FD2D	8" double sided double density	**$52.80**

FEDERAL MARKETING MAIL ORDER FORM

Nashua Floppy Disk Offer

Name .....

Address .....

..... **Postcode** .....

Signature .....

American Express ☐ **Bankcard** ☐ **Cheque*** ☐

** Please make cheques payable to the Federal Publishing Company Pty Ltd*

Credit Card No:

Card Expiry Date: ..... **Allow 14 days for delivery.**

Send completed coupon to: Federal Marketing. PO Box 227 Waterloo NSW 2017.

CODE	QUANTITY	PRICE

Plus $2.50 postage & handling per box _____

TOTAL _____

New NEC distributor

Datatel has been appointed a distributor for the NEC range of printers and allied paper handling equipment.

NEC produces a wide range of printers covering high-density dot-matrix and solid impact designs. The paper handling mechanisms include single sheet feeders, single/dual bin feeders, unidirectional/bidirectional tractors, friction feed and envelope feeders.

Datatel fully supports NEC printers with in-warranty service and maintenance. Technical assistance interfacing these printers to existing equipment can be provided if required.

For further information please contact **Datatel in Melbourne on (03)690-4000 and Sydney (02)439-4211.**

Pinwriter P3. One of the NEC range of printers now being handled by Datatel.

Advanced speech synthesiser

The Melbourne company, Robotron, has just released its latest product, the Easy-Talker.

It is built around the new allophone-based General Instrument SP0256-AL2 integrated circuit and features a sophisticated text-to-speech conversion algorithm, automatic inflection, inbuilt speaker and remote volume control.

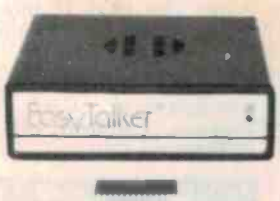
Direct access to allophones is provided. They are flexible enough to enable generation of even some non-speech sounds, such as laughter, cough, etc. Laughter commands are included in the standard command set.

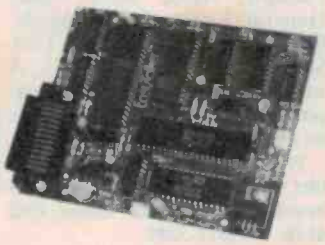
EasyTalker is based on the Z80 microprocessor and the inbuilt RS232C interface makes it compatible with most types of computers.

The unit comes with a comprehensive user's manual explaining the principles of allophone-based speech generation and providing many practical examples of the use of the text-to-speech conversion algorithm and inflection control.

In addition to the stand-alone version of EasyTalker, Robotron also markets board only versions for direct interfacing to microprocessor systems. The SP0256-AL2 integrated circuit with detailed data sheet is also available.

For further information contact **Robotron, P.O. Box 232, Mooroolbark Vic. 3138. (03)720-2173.**





Hero junior

The Heath Company introduced its new personal robot, Hero jr, at the Consumer Electronics Show in Chicago, June 3-6. It should be on sale in Australia soon.

Hero jr, unlike other robots, requires no programming skills to operate. It has a number of unique pre-programmed activities which shape its personality. It roams, explores, sings songs, recites poetry, and speaks English and his native 'Roblish', a robot's version of English. He will wake you up in the morning, guard your home with a coded security system and even play games.

Hero jr wakes up his owners with a personalised alarm and can sense whether or not they awaken. Friend and companion that he is, Hero jr permits a 10-minute snooze.

The Hero jr can use its senses to seek out its owners while moving about. The robot's ability to locate humans can be enhanced with the optional infrared motion detector. It guards your home against intruders when the security mode is selected by issuing a verbal warning and requesting a password.

Using Hero jr's wireless remote control, its owner can drive the robot from place to place. Otherwise, Hero jr's normal mode allows him to move about at random with a goal to remain near humans.

For more information contact **Warburton Franki, P.O. Box 117, Lidcombe NSW 2141. (02)647-2266.**

New IBM PC family

As the IBM PC approaches its third birthday, the time has come for a changing of the guard. An announcement of the next generation of IBM's PC family, based on the Intel 80286 microprocessor, is expected in the very near future.

The PC was never a technical marvel. Its shortcomings are becoming an increasing embarrassment as IBM's competitors take advantage of its slow processor speed, memory limitations, limited expansion capabilities, antiquated graphics.

Numerous competitors are selling products that address all of these deficiencies, as well as offering additional features that the rather bland PC doesn't possess.

The pivotal element in IBM's pursuit of its competitors is the 80286 16/32-bit microprocessor from Intel, IBM's adopted nephew. Intel has only recently achieved the volume and mass production quality that are prerequisites to IBM employing the chip in its next mainline desktop system. The 80286 is almost four times faster and smarter than the 8088 that drives the PC family today. Its most valuable attribute is protected *virtual memory*.

Virtual memory is RAM storage that can be partitioned and accessed in an interactive and flexible manner. This differs from standard RAM storage, with present storage registers and predefined access routines. The ability of virtual memory to be managed dynamically allows for very fast and specialized application throughput.

For example, when running WordStar, performing certain functions demands accessing the diskette to pull down additional command sequences. When running on a desktop computer with virtual memory, the program will be partitioned in a similar manner but the various ancillary command sequences will reside in the virtual memory. This means that when they are accessed the response time will be a matter of nanoseconds rather than seconds.

IBM will position the low end of the new line so that its price and functionality are roughly equivalent to the high end of the PC family. This will allow room for the PC family to coexist with it for a short period of time, before the PCjr family grows up, and the 80286 family comes down (in price) to provide a smooth path from diskless DTC's to sophisticated multi-user, multi-tasking networked systems.

For more information on the new IBM products, contact **The Yankee Group, 158 Avoca St, Randwick NSW 2031. (02)399-8200.**

Tell them you read it in ETI

Personality plus!

Microtek International has released another personality card for the MICE II series of in-circuit emulators.

This card supports the single-chip microprocessors 8048, 8049 and 8050, providing real-time trace and emulation in static port mode or external program mode.

In common with the other 8- and 16-bit microprocessors already supported by MICE II, this unit has a full range of commands for efficient hardware and software debugging. The firmware also contains a line assembler and two-pass disassembler.

Communication with the MICE is via a dumb terminal or host system from which programs may be downloaded or uploaded.

Details from **Macro Dynamics, 66 Barry St., Bayswater, Vic. 3153. (03) 762-6800.**

Blame the victims?

The microcomputer software market will grow 100% this year to sales of US$2.55 billion, and that figure would be substantially higher if software publishers would protect themselves against piracy. Software publishers can only blame themselves for 90% of the illegal copies of software that currently exist, according to 'Download', a newsletter published by International Resource Development, a US-based market research firm.

Software publishers are attempting to get rid of piracy by shaking their fists at customers and calling them thieves or whining about lost sales at user trade shows. Download editor Maureen Fleming suggests to these publishers that they grow up and learn how to defend themselves.

While protection devices can all be cracked eventually, common sense indicates that a typical business micro user wouldn't have or take the time to figure out how to break the various methods of protection.

For example, Microsoft put hidden counter files in its latest product, Word, and in order to delete the counters, someone would have to know machine or assembly language. Experienced programmers have a difficult enough time with this, much less a novice user who doesn't even know BASIC, according to Fleming, and she said she was willing to bet that there aren't too many pirated copies of Word in existence.

Another area of piracy that is neglected is at the retail level. Download editors have witnessed one instance where a salesperson, about to clinch a $50 000 hardware deal, suggested to the customer that he buy only one copy of a word processing package and make copies for the rest of the computers. When hardware is so much more expensive than software, and software so easy to copy, there's no incentive for a salesperson to talk morality to a customer.

It isn't even clear that publishers are willing to abide by the same code of ethics as their customers, either. For example, MicroPro International developed Wordstar for the Franklin computer — the same Franklin that was found by the courts to be using software based on a pirated operating system!

Queensland computer show

The second annual computer expo will be held at the Crest International Hotel, Brisbane, November 8-11.

Computer Expo provides an ideal opportunity for the business community and public to see the latest advances in mini-computers, personal computers, peripherals and software.

The success of Expo '83 prompted a change to the more spacious environment of Brisbane's Crest International Hotel. This has allowed organisers to cater for a more comprehensive range of computer exhibits.

Of particular interest will be displays from IBM, Hewlett-Packard, NEC, Wicat, Data General, Epson, Sanyo, Apple, Commodore, Atari, Dick Smith, Microbee and others. A wide range of software and computer publications will also be on display.

For further information contact **Robert Woodland, 50 Sherbrooke Rd, Acacia Ridge Qld 4110. (07)372-3380.**

Commodore disk drives

Interfaceware will be introducing a new range of disk drives for the Commodore 64. The MSD drives are available in single and dual configurations.

The single disk drive is compatible with the Commodore 64, VIC 20, and Pet computers.

A 4K double-capacity buffer memory allows the operator to open more files at any one time. It can format disks in 17 seconds, and execute utility commands in a minimum amount of time. There is both a serial and parallel buss. Serial speed can be increased three times by adding a MSD IEEE488 interface.

The super disk 2 is a true dual disk drive. This means that the two drive mechanisms share a common controller and have available a common internal buss for high-speed communication. The MSD 2 is an intelligent drive. The DOS is completely contained in 16 kilobytes of ROM.

For more information contact **Interfaceware, 1/303 Pacific Highway, Lindfield NSW 2070. (02)46-4374.**

Tell them you read it in ETI

Engineers!

Help is at hand with a Sharp Pocket Computer.

Small enough to fit in a shirt pocket, Sharp Pocket Computers are real computers, with attachments such as printers and cassette tape drives for program and data storage. But no programming is required: pre-programmed software for these machines includes:

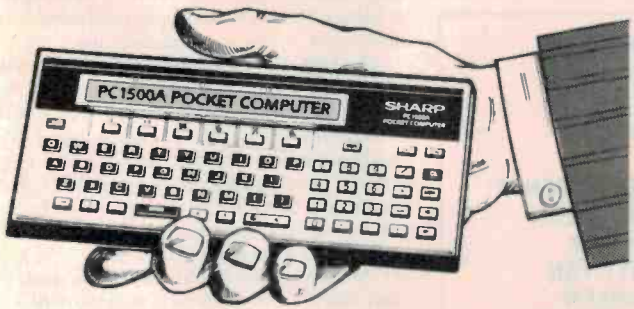
- Electrical Engineering: transistor parameter conversions, complex functions, Fourier analysis, reactance chart, star/delta transformation and others.
- Mechanical Engineering: points of intersection of circles, circle tangent to two lines, involute, inverse involute and others.
- Structural Engineering: girder load terms for reinforced concrete construction, stress calculation of three-hinged point gabled roof and others.
- Civil Engineering: Coulomb's coefficient of earth pressure, stability of a slope (by method of slices) section, dead load and centroid of a polygon and others.

For more involved calculations, you can go back to first principles with a mathematics pack covering matrix algebra, vector calculations, determination of roots and more. Plus statistics and other handy calculations like days between dates.

Of course, these compact machines can also be used for other calculations, or even as a text editor or executive reminder for appointments. And because these are computers, not calculators, you can use the standard programming language BASIC to provide solutions to your most frequently encountered problems.

Sharp Pocket Computers are small enough and light enough to take with your everywhere. They don't just fit inside your briefcase: they fit inside your pocket.

To see the range of models available, phone Sharp today for your nearest dealer.



SHARP

Simply the best in pocket computers.

Sydney 728 9111, Melbourne 763 9444, Brisbane 343 9144, Adelaide 294 7166, Perth 277 7477, Canberra 805 288.

Advertising Partners 81-4

NEW SERVICE FROM PLESSEY COMPONENTS

MEMORY

- *Orders over $100 deduct 5%.* • *Add $3.00 for postage.*
- *Please phone for quantity discounts.*
- *All prices include Sales Tax.*

		PRICE EACH	QUANTITY
S RAM			
6264P	150ns	$39.50	_____
6116P4	200ns	$ 6.80	_____
6116LP4	200ns	$ 9.00	_____
D RAM			
4164	150ns	$ 7.50	_____
50256	150ns	$66.00	_____
EPROM			
2716	450ns	$ 7.00	_____
2532	450ns	$ 8.00	
2732	450ns	$ 6.80	_____
2764	250ns	$10.00	_____
27128	300ns	$25.00	_____

PLESSEY Components

Mail to
PLESSEY COMPONENTS PTY. LTD.
P.O. BOX 2 VILLAWOOD NSW 2163

Enclosed is cheque/postal order valued at $ .....

Name: _____

Address: _____

_____

Phone: _____

LOGIC TEST KIT

Student Price

Reg. Price ~~$130.00~~
$104
[inc. postage & handling]

DIGITAL VOLTMETER
0.8% ACCURACY
h_{FE}

LOGIC PROBE
TTL/CMOS
Latch function

LOGIC PULSER
.5 Hz/500 Hz

Bankcard No. or Cheque
Signed
Value $
Expiry Date / /
(Includes Postage)

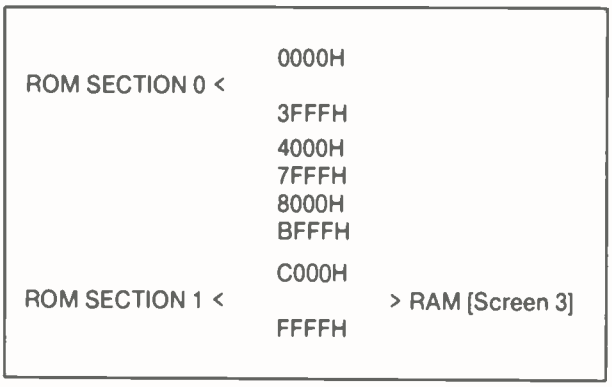
Name
Address

minitool
AUSTRALIA PTY. LTD.
134A AYR STREET,
DONCASTER, VIC. 3108
Tel. (03) 850 9887

Just another new name in an already crowded arena, or a positive new step in a lacklustre marketplace? Only time will tell, but the Amstrad seems well-placed, well-packaged and well-priced to give a few of the market 'big guys' a run for their money.

Jamye Harrison

AMSTRAD CPC46



Memory map. User memory starts from 0000 hex (H). Note that part of the ROM overlays the screen RAM, giving you maximum free RAM during BASIC operations.

Mode	Number of Inks	Vert dots	Horiz dots	Horiz chars
Normal	4	200	320	40
High Res	2	200	640	80
Multi Colour	16	200	160	20

Screen modes. The three screen modes and the resolution available with each.

GREY LEVEL	COLOUR	GREY LEVEL	COLOUR
0	BLACK	13	WHITE
1	BLUE	14	PASTEL BLUE
2	BRIGHT BLUE	15	ORANGE
3	RED	16	PINK
4	MAGENTA	17	PASTEL MAGENTA
5	MAUVE	18	BRIGHT GREEN
6	BRIGHT RED	19	SEA GREEN
7	PURPLE	20	BRIGHT CYAN
8	BRIGHT MAGENTA	21	LIME GREEN
9	GREEN	22	PASTEL GREEN
10	CYAN	23	PASTEL CYAN
11	SKY BLUE	24	BRIGHT YELLOW
12	YELLOW	25	PASTEL YELLOW
		26	BRIGHT WHITE

Colour and mono. This shows the range of colours available.

THE AMSTRAD CPC464 is a British-designed, Korean-made microcomputer that has made quite a splash on the overcrowded UK market this year, judging by the coverage it has received in the hobby computer press over there. The Amstrad is imported and marketed here by AWA-Thorn, through their large chain of electrical retail outlets around the country, and some specialty stores. They're no small-time concern hoping to cash in on the personal computer boom (if it's still alive). They have the advertising and distribution 'clout' to take on major names, like Atari and Commodore. But it's 'what's in the can' that will count in the skirmish.

The CPC464 is an interesting package. It is available as two 'systems'. System 1, for $499, comprises a keyboard/processor unit and a 12-inch green-screen monitor (GT64). System 2, for $749, comprises the processor unit and a 12-inch RGB colour monitor (CTM640). The processor unit incorporates the 56-key 'standard' QWERTY' layout keypad plus numeric and cursor keypads, making 73 keys in all. Also included is a data cassette recorder that can save or load at either 1K or 2K baud, considerably faster than most other systems available.

The CPC464 features a Z80A microprocessor, the one most widely used in both home and 'professional' microcomputers throughout the world. It comes with 64K of random access memory (RAM) and a 32K BASIC in read-only memory (ROM). It has expansion capabilities that make it very attractive if you want to 'move up' later. According to Amstrad, you can attach extra ROMs and extra RAM. A disk system that runs the CP/M operating system will later be available — a big plus as this gives access to thousands of software packages.

The processor unit is powered from the video monitor. Two curly-cord cables (one for power supply, one for video) link the two units. This is a good move as it saves all the messy cables that trail everywhere with just about every other home computer I've seen.

A Centronics printer interface is provided by means of an edge-connector on the rear of the processor unit. I didn't have the opportunity to try this out as a suitable socket could not be found in time (should have thought of it earlier). The manual indicates that the 'busy' line is used for handshaking between the printer and the computer.

Joysticks are available as an option, along with a TV modulator/power supply.

Video

The Amstrad has three basic screen handling modes. These are:

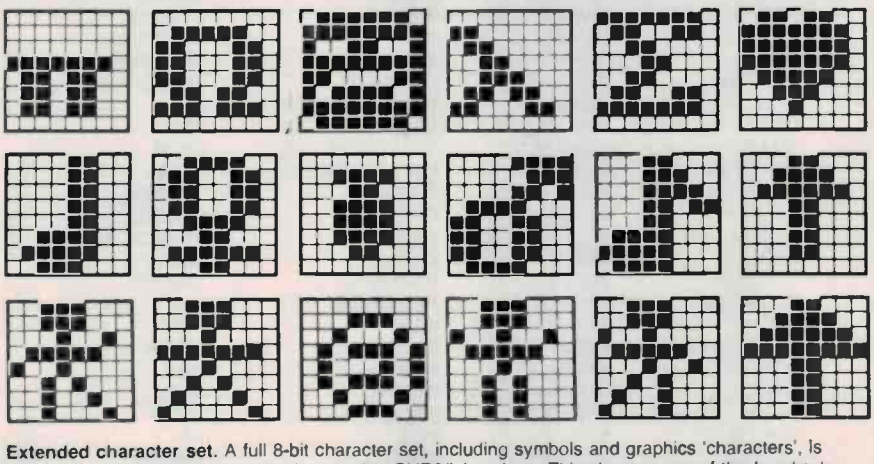
NORMAL: 40 columns x 25 lines; four 'ink' (colour) text modes of 320 x 200 pixels, all addressable individually in four colours.

MULTICOLOUR: 20 columns x 25 lines; 16 ink text modes of 160 x 200 pixels, addressable in 16 colours.

HI-RES MODE: 80 columns x 25 lines; two ink text modes of 640 x 200 pixels, addressable in two colours.

When in hi-res mode, the resolution is 640 x 200 pixels, considerably more than the Apple, for example, and many others.

The 'ink' referred to above is a colouring facility. The number of inks you get to play with depends on the screen mode you're in. You can set an 'ink' to a steady colour or to flash between two colours (including black, or nil luminance, which is considered a 'colour'). You have three other definable screen features — text 'paper', text 'pen' and 'graphics pen'. These can all be set to an available ink in the screen mode selected. Thus, you can colour the background (the 'paper') or the foreground text or graphics. Neat and useful!



Extended character set. A full 8-bit character set, including symbols and graphics 'characters', is accessible largely via the keyboard and using CHR$() functions. This shows some of the *hundreds* available (all listed, with their codes, in the handbook). There are Greek symbols, male and female symbols (!), blocks of all sorts, arrows, musical note symbols, games characters (bombs, faces, gunships etc) and little 'person' characters in various attitudes.

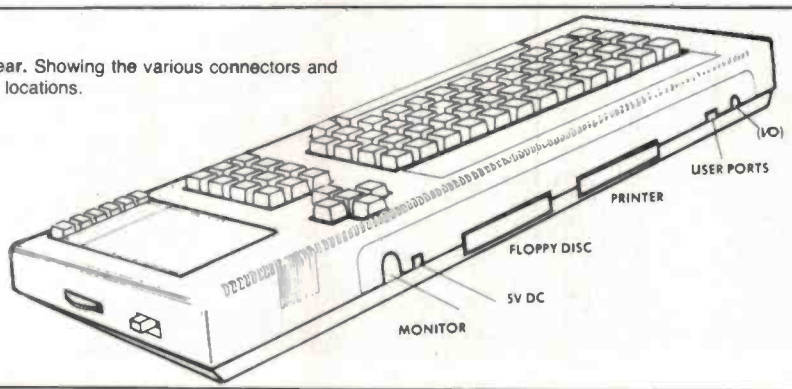
The Amstrad's character set is nothing short of fantastic. It not only has a full 96-character ASCII set but a Green alphabet and other special symbols for games, etc. Every character is re-definable.

The green-screen monitor provided with System 1 has a case that tilts the screen up at an angle for easier viewing. This was about the only thing in its favour. When text or graphics are displayed the characters have a rather hazy edge and become hard to see without squinting. The adjustments could not reduce it. This may have been an individual problem with the unit supplied.

Another extremely annoying feature of the green-screen monitor was the rather loud 'buzzing' sound it made during use. This, I think, was caused by the plastic case vibrating due to a 'loose' mains transformer and could only be stopped by putting a few books on the top.

The colour monitor had none of these vices, however, and produced good, clear colour in both text and graphics modes. A pity it didn't have the screen tilted up, like the green-screen monitor. It's heaps better than using your colour TV set and worth the ▶

Keyboard unit. Top down view of the main unit, showing the keyboard, numeric keypad and cursor keys, with the cassette data recorder to the right. Note the counter above the cassette well.



At the rear. Showing the various connectors and interface locations.

CPC464 BASIC COMMANDS AND FUNCTIONS

ABS	ERR	MODE	SGN
AFTER	ERL	MOVE	SIN
ASC	ERROR	MOVER	SOUND
ATN	EVERY	NEW	SPACE$
AUTO	EVERY	NEXT	SPEED INK
BIN$	EXP	ON GOSUB	SPEED KEY
BORDER	FIX	ON GOTO	SPEED WRITE
CALL	FOR	ON BREAK GOSUB	SQ
CAT	FRE	IN BREAK STOP	SQR
CHAIN	GOSUB	ON ERROR GOTO	STOP
CHAIN MERGE	GOTO	ON SQ GOSUB	STR$
CHR$	HEX$	OPENIN	STRING$
CINT	HIMEM	OPENOUT	SYMBOL
CLEAR	IF	ORIGIN	SYMBOL AFTER
CLG	INK	OUT	TAG
CLOSEIN	INKEY	PAPER	TAGOFF
CLOSEOUT	INKEY$	PEEK	TAN
CLS	INP	PEN	TEST
CONT	INPUT	PI	TESTR
COS	INSTR	PLOT	TIME
CREAL	INT	PLOTR	TRON
DATA	JOY	POKE	TROFF
DEF FN	KEY	POS	UNT
DEFINT	KEY DEF	PRINT	UPPER$
DEFSTR	LEFT$	RAD	VAL
DEFREAL	LEN	RANDOMIZE	VPOS
DEG	LET	READ	WAIT
DELETE	LINE INPUT	RELEASE	WEND
DI	LIST	REM	WHILE
DIM	LOAD	REMAIN	WIDTH
DRAW	LOCATE	RENUM	WINDOW
DRAWR	LOG	RESTORE	WINDOW SWAP
EDIT	LOG10	RESUME	WRITE
EI	LOWER$	RETURN	XPOS
END	MAX	RIGHT$	YPOS
ENT	MEMORY	RND	ZONE
ENV	MERGE	ROUND	PRINT
EOF	MID$	RUN	PRINT USING
ERASE	MIN	SAVE	

Note that, apart from the features mentioned in the article, the BASIC includes cassette file handling commands (e.g: CLOSEIN, CLOSEOUT, OPENIN, OPENOUT), printer operating commands (e.g: WIDTH) and a useful set of interrupt handling commands (unique to the CPC464?) — AFTER, EVERY and REMAIN.

extra (I didn't have Amstrad's modulator to try out that option, but direct video is invariably better).

The keyboard

The keyboard, while sticking more or less to the 'standard' layout, has a number of unique features. Firstly, the inclusion of the numeric keypad to the right of the main keyboard. Few computers in this price range included such a thing until very recently. Then there's the cross-pattern cursor movement keys. Any other arrangement is second best. The COPY key in the centre of these calls up a special editing cursor that speeds up line editing on-screen. It would take a bit of practice to get used to, though.

The large ENTER key on the main keyboard is colour-coded blue — and is the size of 4½ keys. This is a real boon and sets the Amstrad apart from its rivals in routine use. The numeric pad's ENTER key is also blue. The various control keys (DEL, CTRL, SHIFT, CAPS LOCK and TAB) are all green. The ESC key is sensibly colour-coded *red*. On the cassette recorder, the RECORD button is also red. All very sensible.

In use, the keyboard has a good, positive 'feel' and the space bar operates reliably no matter where along its length you happen to hit it; all the keytops are slightly concave, following the usual practice.

The BASIC

The BASIC is an extended Microsoft-type, according to Amstrad (unfortunately missing the 'circle' and 'square' commands). They say it is a 'locomotive' language, but fail to explain what they mean. It does, however, include extensive commands and functions for sound and graphics as well as file handling. The commands are simple to use and are fairly well explained in the manual (with some useful examples).

'Window' commands are provided. There are up to eight text windows available plus one graphics window. When the screen mode is set these are set again to defaults. If the text window is equal to the entire screen, then scrolling is produced by the hardware. If the text window is less, scrolling is produced via software. (The latter is considerably slower, though).

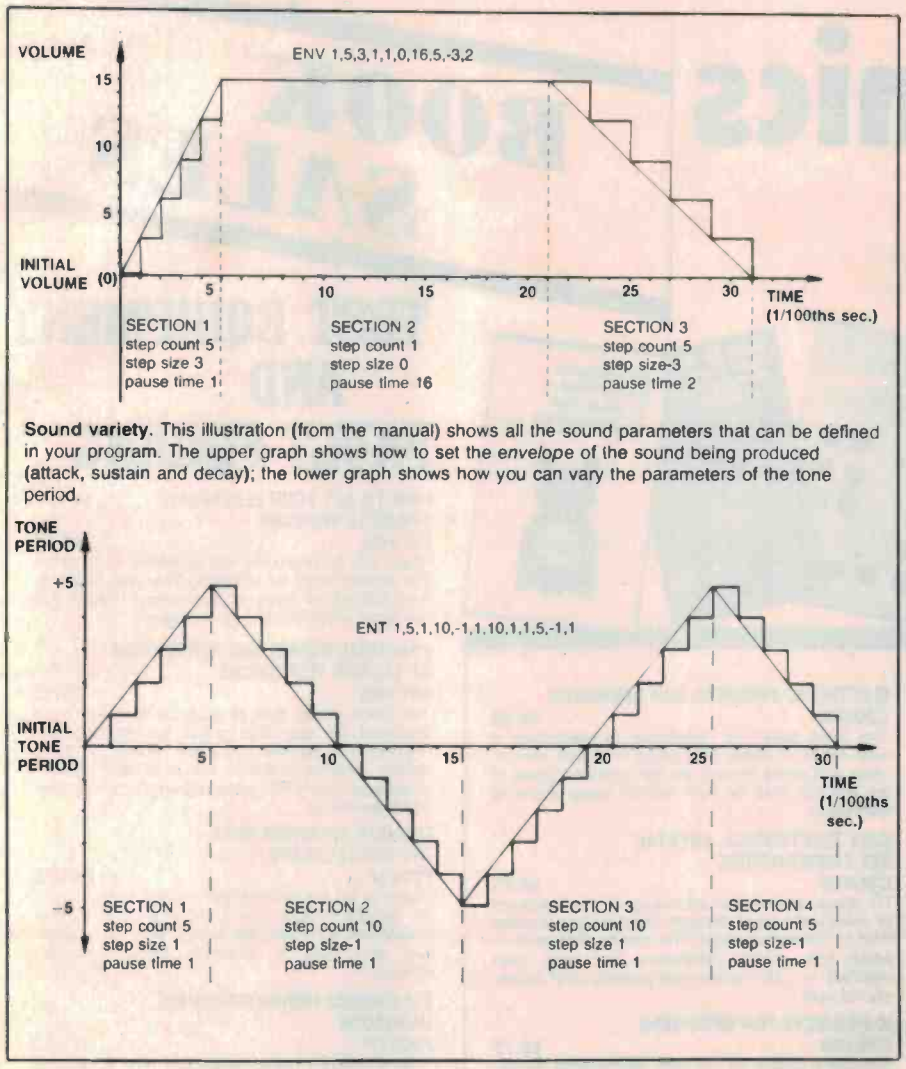
The SAVE command has three interesting aspects. When saving a program you put in the following:

SAVE "program name"

followed by one of three characters: an A, a B or a P. If followed by an A, the computer accepts a normal ASCII program; if a B appears, the computer saves a binary set of codes (allowing a screen dump, etc.). If a P precedes the command, the program is automatically protected, preventing the program being listed; and when run, the BREAK function is disabled.

Up to 32 keys are redefinable, with up to 32 character strings, according to the manual (including repeat parameters). However, I found that *all* but the control keys could be redefined. Both the cursor keys and the numeric keypad's characters are re-definable, too.

When using a joystick with the computer



Sound variety. This illustration (from the manual) shows all the sound parameters that can be defined in your program. The upper graph shows how to set the *envelope* of the sound being produced (attack, sustain and decay); the lower graph shows how you can vary the parameters of the tone period.

the cursor key values are used for the quad-directional joystick.

The manual makes mention of the fact that many assembler subroutines are available to the user and can be called from BASIC. Although I didn't try this out, I can see it could certainly come in handy (saves 're-inventing the wheel' in your programs).

Sound

The sound features of the CPC-464 are excellent, and incorporate rather 'professional' features, not found on most other computers. The sound is polyphonic and envelope shaping features are provided. However, the most interesting feature is the provision of stereo output via a jack socket on the rear.

Three sound output channels are actually provided by the internal complex sound generator chip, an AY-3-8912; channels A, B and C. The three are mixed to provide a mono output for the CPC464's internal speaker. The stereo output is made up by mixing channel A with half channel C for the left output, and mixing channel B with half channel C for the right.

The main commands used for the sound functions are; ENV (envelope), ENT (tone envelope), and SOUND. The sound facilities on the Amstrad are probably the most sophisticated I've encountered.

The data cassette recorder

The data cassette recorder on the Amstrad is built into the main unit and is extremely reliable (I *never* got a 'bad load' during the review).

The recorder operates at either 1K or 2K baud (software selectable). When loading, say, a program saved at 2K baud, there is no need to define this; the computer automatically recognises it.

To load a pre-recorded cassette you have to hold down the CONTROL and ENTER keys simultaneously, release, then press PLAY and any key; a bit more complex than most other systems, but that's only a minor criticism.

Programs are loaded in blocks comprising 2000 characters in each block.

Software

Software back-up is excellent. Upon release, some 60-70 titles will be available, with more to follow. The Logo language is available on disk, I understand. We got about six games and educational programs, plus a demonstration cassette and two software tutorials to review along with the CPC464.

The graphics and sound features incorporated in the games programs are excellent. Text and graphics are quite clear on the colour monitor.

The educational side of things is really only aimed at two groups, the infants and the HSC levels. The primary and lower secondary levels are left somewhat out in the cold.

The tutorials provided with our machine were great. They were to teach the user BASIC and just generally how to use the machine, and they were well-written and easy to use.

Summary

Overall, the Amstrad is a beaut all-in-one package, comparable in many ways to the Microbee, Memotech, Commodore 64 and similar beasts. There are obvious differences between these machines, but the lesson Amstrad seems to have taken from its predecessors is to provide that all-in-one yet flexible package. It seems a pity it doesn't have in-built word processing and communications, but these could clearly be add-on ROM packages.

Software support, right at the outset, is another lesson Amstrad appears to have learned from the others' past experiences. AWA/Thorn say they are actively seeking local software authors to develop suitable packages for Australian applications.

The computer's emphasis is on ease of use and expandability. Although I found the manual lacking in some areas — no proper index, failure to explain some detailed aspects of the BASIC, etc — in general it is adequate and certainly better than many I've seen. It is, at least, written in English — not Honda English or Computer Jargonese.

I'm afraid this review is a little too brief to go into the many exciting aspects and attributes of the Amstrad CPC464, but if you need further convincing you're only going to get it by first-hand experience. I recommend you get your hands on one as soon as possible. ●

Cassettes. Some of the cassette software available.

Electronics Today

BOOK SALES

ELECTRONICS FOR BEGINNERS

HI-FI LOUDSPEAKER ENCLOSURES
C0028B **$4.95**
Data for building corner reflex, bass reflex, exponential horn, folded horn, tuned port, Klipschorn labyrinth, tuned column, loaded port and multi speaker panoramics. Clear dimensioned diagrams included.

BEGINNER'S GUIDE TO DIGITAL ELECTRONICS
C0029B **$4.95**
Covers all essential areas including number systems, codes, constructional and sequential logic, analogue/digital/analogue conversion.

BEGINNER'S GUIDE TO BUILDING ELECTRONIC PROJECTS
C0030B **$6.95**
Enables total beginners to tackle electronic projects. Includes component identification, tools, soldering, building methods, cases, legends, etc, etc. Practical basic projects are included.

RADIO CONTROL FOR BEGINNERS
C0034B **$5.95**
How complete systems work with constructional details of solid-state transmitters and receivers. Also included — antennas, field strength meter, crystal controlled superhet, electro-mechanical controls. Section dealing with licensing, etc, is not applicable to Australia.

HOW TO BUILD YOUR OWN METAL AND TREASURE LOCATORS
C0036B **$6.95**
Electronic and practical details on the simple and inexpensive construction of heterodyne metal locators.

ELECTRONIC PROJECTS FOR BEGINNERS
C0038B **$6.95**
This book gives the newcomer to electronics a wide range of easily built projects. Actual components and wiring layouts aid the beginner. Some of the projects may be built without using soldering techniques.

EASY ELECTRONICS: CRYSTAL SET CONSTRUCTION
C0041B **$6.75**
For those who wish to participate in the intricacies of electronics more through practical construction than by theoretical study. The circuits are based on those from earlier publications but have been modified to use modern components and home-wound coils.

IC PROJECTS FOR BEGINNERS
C0042B **$6.75**
Especially written for the less experienced hobbyist, and offers a range of fairly simple projects based around a number of popular and inexpensive linear and digital ICs. Complete layout and point-to-point wiring diagrams.

SOLID-STATE SHORTWAVE RECEIVERS FOR BEGINNERS
C0044B **$5.95**
Design and construction of several solid-state shortwave receivers giving high level of performance yet utilising few components.

SIMPLE PROJECTS — VOL 2
C0256E **$2.95**
Contains easy projects plus chapters on construction techniques and useful information on components.

ETI PROJECT ELECTRONICS
C0269E **$4.95**
Twenty-six projects for beginners, including battery saver, electronic siren, Morse practice set, FM antenna, etc, etc. Fifth edition.

SIMPLE PROJECTS — VOL 3
C0416E **$5.95**
Popular projects for cars, music, around the home and special hobby affects. A valuable addition to the library of all those interested in electronics.

TEST EQUIPMENT AND FAULT-FINDING

HOW TO GET YOUR ELECTRONIC PROJECTS WORKING
F0114B **$6.95**
Helps you to overcome the problems of a circuit that doesn't work' by indicating how and where to start looking for many of the common faults that can occur when building up a project.

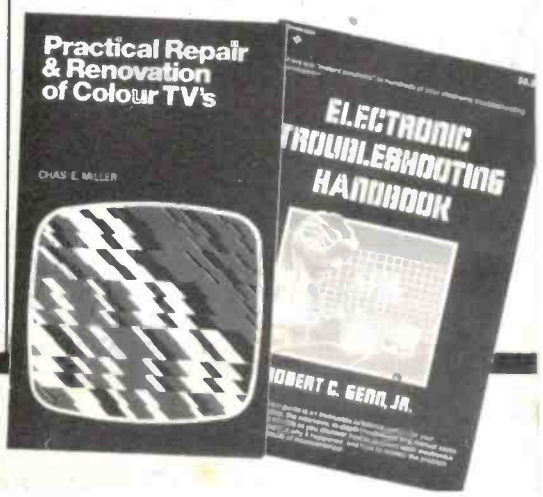
PRACTICAL REPAIR AND RENOVATION OF COLOUR TELEVISIONS
F0116B **$6.55**
This book shows how to obtain a working colour television for very little outlay by repairing and renovating a set that has been 'written off' by a dealer. Includes practical details of how to construct your own CRT tester/rejuvenator and cross-hatch generator.

TROUBLE SHOOTING WITH THE OSCILLOSCOPE
F0121P **$16.95**
Excellent for the professional service technician or the serious hobbyist, as it combines step-by-step procedures for using the scope with the specific nuts and bolts of television receiver trouble-shooting.

ELECTRONIC TROUBLESHOOTING HANDBOOK
F0257P **$11.50**
This workbench guide shows you how to pinpoint transistor troubles in minutes, how to test almost everything electronic and how to get the most out of low-cost test equipment.

USE OF THE DUAL-TRACE OSCILLOSCOPE
F0259P **$33.25**
This programmed text breaks down the process of operating a scope into a series of logical steps, starting with the deflection of the electron beam and continuing through proper use of the triggering controls to measure the phase difference between two waveforms.

HOW TO BUILD YOUR OWN SOLID-STATE OSCILLOSCOPE
F0282B **$6.95**
This book comprises a project divided into sections for builder to individually construct and test — then assemble into complete instrument. Includes short section on scope usage.



Prices subject to change without notice.

Simply fill out the reply-paid card insert and send to:

ETI BOOK SALES,
140 Joynton Ave., Waterloo NSW 2017

All phone enquiries:
(02) 663-9999

ETI Book Sales Order Form

Allow four weeks for delivery

Please supply:

BOOK TITLE	BOOK NO.	QTY	TOTAL PRICE

POSTAGE AND HANDLING CHARGES

ORDER VALUE	ADD
Up to $9.99	$1.75
$10 to $19.99	$3.75
$20 to $39.99	$4.75
$40 to $99.99	$5.75
$100 and over	$6.75

For airmail to Papua New Guinea, New Zealand, Oceania and Southeast Asia, add A$5.00 to these charges.

Total price of books $ .....

Add postage and handling $ .....

TOTAL $ .....

Name _____

Address _____ **Postcode** _____

Signature _____ Unsigned orders cannot be accepted

Tick box to indicate payment:

American Express ☐ **Bankcard** ☐ **Cheque*** ☐

*Please make cheques payable to the Federal Publishing Company Pty Ltd.

Credit Card No:

Card Expiry Date: _____

eti BOOK SALES

No postage stamp required
if posted in Australia

FREEPOST No 4
The Federal Publishing Company
PO Box 227
WATERLOO, NSW 2017

BOOK SALES

Electronics Today

ELECTRONIC MUSIC AND AUDIO/VIDEO

MOBILE DISCOTHEQUE HANDBOOK
G0093B **$4.95**
Most people who start mobile discos know little about equipment or what to buy. This book assumes no preliminary knowledge and gives enough info to enable you to have a reasonable understanding of disco gear.

AN INTRODUCTION TO VIDEO
G0124B **$6.95**
This book is written in layman's language and is for anyone who is thinking about buying or renting or who has just bought or rented a video recorder and wants to get the best out of the machine.

MODERN RECORDING TECHNIQUES
G0128P **$21.95**
Explains the equipment controls and techniques found in a modern recording studio and how to use them creatively and correctly to produce a desired result. Numerous photographs, diagrams and charts.

SOUND-SYSTEM ENGINEERING
G0129P **$35.50**
Dealing with audio systems as a whole, it includes installing and equalising the sound system and interfacing the electrical and acoustic systems, instrumentation, the acoustic environment and designing for acoustic gain.

TUBE SUBSTITUTION HANDBOOK
G0130P **$8.75**
Complete, accurate, up-to-date guide to direct substitutes for receiving and picture tubes. Contains more than 6000 receiving tube substitutes, 4000 monochrome and colour picture tube substitutes, and 600 communications substitutes. Also includes pinouts for quick operational checks.

HOW TO BUILD SPEAKER ENCLOSURES
G0131P **$9.50**
A guide to the 'whys' and 'hows' of constructing top-performance loudspeaker enclosures.

ELECTRONIC MUSIC PROJECTS
G0135B **$5.95**
Provides constructors with practical circuits for the less complex music equipment including fuzz box, waa-waa pedal, sustain unit, reverb and phaser, tremolo generator, etc. Text covers guitar effects, general effects, sound generators, accessories.

ELECTRONIC MUSIC AND CREATIVE TAPE-RECORDING
G0136B **$6.95**
Shows how electronic music can be made at home with the simplest and most inexpensive of equipment. Describes how the sounds are generated and how these may be recorded to build up the final composition.

SINGLE-CAMERA VIDEO PRODUCTION
G0379P **$25.75**
Step-by-step diagrams and illustrations show you how to produce low-budget, high-quality video programs. Chapters on audio, lighting, shooting, editing, graphics and set design.

COMPUTING SOFTWARE

USING THE UNIX SYSTEM
K0185P **$24.95**
This book by Richard Gauthier, of RGL, has been written for people with some knowledge of computers, but with no specific knowledge of Unix. It is also of value to current Unix users.

PROGRAMMING IN BASIC FOR PERSONAL COMPUTERS
K0186P **$18.95**
Simple instructions show how to give BASIC commands and statements a wide range of applications, from programming video games to developing business or scientific programs.

BASIC FOR EVERYONE
K0187P **$22.40**
Some 350 pages of BASIC information for all purposes.

APPLE FILES
K0190P **$21.95**
This book is for people who know some BASIC and would like to expand and apply this knowledge by using the capabilities of the Apple. Includes programs for the stock market, inventories, grades and medical records.

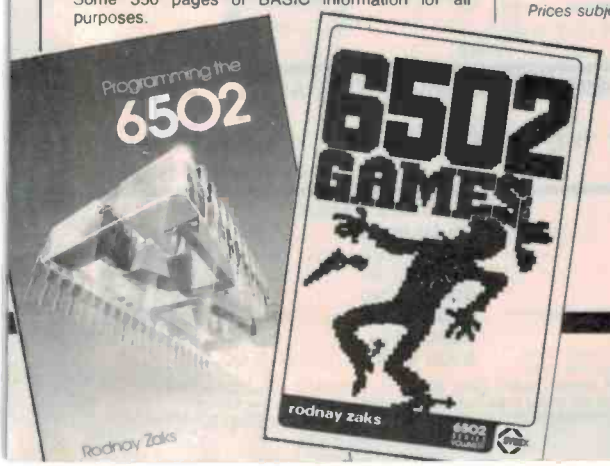
COMPUTER PROGRAMS IN BASIC
K0192P **$18.25**
Fully indexed guide to more than 1600 BASIC computer programs published in personal computer magazines for microcomputers, minicomputers and mainframe computers. Compiled by Paul Friedmann, first published in 1981.

Prices subject to change without notice.

32 BASIC PROGRAMS FOR THE APPLE COMPUTER
K0218A **$29.50**
Full of programs with practical applications, educational uses, games and graphics.

PROGRAMMING THE 6502
K0227A **$22.95**
Principles of assembly-language programming for the 6502 microprocessor are taught in this introductory text. Includes a discussion of trade-offs between hardware and software and detailed explanations of the 6502's internal registers and buss operation. Third edition.

6502 GAMES
K0229A **$21.95**
You learn how to play 10 sophisticated games and also learn assembly language programming. Also learn the techniques of algorithm design and data structures.



Simply fill out the reply-paid card insert and send to:

ETI BOOK SALES,
140 Joynton Ave., Waterloo NSW 2017

All phone enquiries:
(02) 663-9999

rie Rod Irving Electronics

SERIES 5000

PRICES SLASHED

As designed by ETI

INDIVIDUAL COMPONENTS TO MAKE UP A SUPERB HI-FI SYSTEM. BY DIRECTLY IMPORTING AND A MORE TECHNICALLY ORIENTED ORGANISATION BRING THESE PRODUCTS TO YOU AT LOWER PRICES THAN OUR COMPETITORS.

EXTRA FEATURES OF OUR KITS

POWER AMPLIFIER **Only $449**

KIT PRICE $319 P&P $12.00

• 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 400 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. four weeks after placement.

PREAMPLIFIER **Only $449**

KIT PRICE $289 P&P $12.00

• 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 PA.

PREAMPLIFIER Kit Price $289, P&P $12.00

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.

On Special at $259
Normally $289

**All parts available separately for both kits.*

POWER AMPLIFIER Kit Price $319, P&P $12.00

SPECIFICATIONS 150W RMS into 40hms

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.

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.

On Special at $299
Normally $319

MX-1200 MICROPHONE/AUDIO MIXER

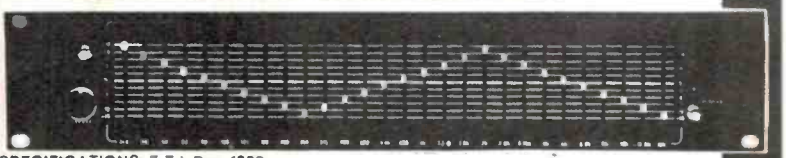
This unit features 12 microphone line inputs with pan, bass, treble, effect and fold back controls for each channel • LED peak indicators for each channel • 2 turntable inputs with cross-fade and individual output controls • master equaliser for bass, midrange and treble • variable headphone output etc. etc. • complete with carrying case.

SPECIFICATIONS

INPUTS
Level/Impedance Mic 46 db/1K
Line 22 db/16K x 12
Phono 52 db/50K STEREO = 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
1 F.B Master level, 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 0.1%
METER 2 illuminated VU Meters 0db = 0.775V
PEAK INDICATOR 12 LED Peak Indicators
VOLTAGE 240 VAL 50Hz
POWER CONSUMPTION 7.2 watts
DIMENSIONS 620 (W) x 386 (D) x 108 (H) mm (supplied complete with carrying case)

THIRD OCTAVE GRAPHIC EQUALIZER



SPECIFICATIONS E.T.I. Dec. 1982

Bands:	28 Bands from 31.5 Hz to 16 kHz
Noise: 20 kHz bandwidth	<0.008 mV, sliders at 0, gain at 0 (−102 dB).
Distortion:	0.007% at 300 mV signal, sliders at 0, gain at 0; max. 0.01%, sliders at minimum.
Frequency Response:	12 Hz-105 kHz, +0, −1 dB, all controls flat.
Boost & Cut:	14 dB

$195.00 1 Unit
$379.00 2 Units

SERIES 4000 SPEAKERS.

- 8 Speakers only $295
- 8 speakers with crossovers $499
- Speaker boxes (assembled with grill and speaker cutout) $299
- Crossover kits $199
- Complete kit of parts (speakers, crossovers, screws, inner-band boxes) $799
- Assembled, tested, ready to be hooked up to your system $849

WE BELIEVE THAT WE ARE NOW THE ONLY ONES TO SUPPLY COMPLETE SPEAKER KITS ASSEMBLED AND TESTED FOR THOSE WHO HAVEN'T GOT TIME $849 EX STOCK.

PLEASE WRITE FOR CONSTRUCTION NOTES, THESE COMPLIMENT THE SERIES 5000 AMP RANGE AND ADD THE FINAL TOUCH.

Errors and Ommissions Excepted

ROD IRVING ELECTRONICS

425 High St., Northcote 3070 (03) 489 8866 (03) 489 8131
48-50 A'Beckett St., Melbourne (03) 347 9251

Mail Order and Correspondence
P.O. Box 235 Northcote 3070

To Order By Phone

Mail Order Hotline (03) 481 1436

(All above charges are for surface mail and some heavy items will vary from these rates.)

Cert. post for orders over $100 included "free".
Reg. post for orders over $200 included "free".
Account orders from schools, govt. depts., public co's., gratefully accepted. Min order amount $20.00 (or a min. $5.00 accounting charge will apply.) Comet Road Freight, Airmail etc. are extra.

POSTAGE RATES

$1-$9.99	$1.50
$10-$24.99	$2.00
$25-$49.99	$3.00
$50-$99.99	$3.50
$100-$199	$5.00
$200-$499	$7.50
$500 plus	$10.00

bankcard welcome here

Readers-only Offer: A Bargain Price for the PB-100

CASIO®

Pocket Computer

Business people, technicians, scientists — and many other people who have to work on the run — know that sometimes, a computer in the hand is worth two on the desk! The people at Casio couldn't agree more . . . and that's why they've come up with the brilliant new **PB-100 Pocket Computer.** It's not a toy! It supplies genuine computing power, plus an excellent range of mathematical functions. Pretty amazing, when you consider that the **PB-100** is not much bigger than your pocket calculator. (In fact, it's a good deal easier to operate than some programmable calculators on the market — because the **PB-100** speaks the easy-to-learn BASIC computer language.)

Because we're dealing directly with Casio, we're able to offer our readers a chance to purchase this great little machine at the very competitive price of **$69.95.** (That's around $10 below the average retail price!) The PB-100 comes with two manuals, lithium batteries and protective case — and postage is included.

Don't miss your chance! Complete and mail the order form today!

It's tiny! At just 165 x 71 x 9.6 mm, the PB-100 is truly pocket-sized. Weight: 116g with batteries.

It speaks your language! the PB-100's program language is BASIC — one of the easiest to learn and use. (And certainly more manageable than the off-beat lingos used by some 'programmable calculators')!

Its programming power is sure to surprise you. At a maximum of 544 steps each, the PB-100 can store up to 10 separate programs! Within your programs, you can utilise 8 levels of subroutine and 4 levels of FOR-NEXT loops.

It supplies super calculating power! As well as the fundamental functions (negative numbers, exponentials, parenthetical addition, subtraction, multiplication and division), built-in features include trigonometry, logarithms, exponentiation, square roots, powers, absolute value, random numbers, and much more!

It's got power to spare! The PB-100 runs on 2 lithium batteries (included in purchase price). Drawing just 0.02W maximum power, it will provide around 360 hours of continuous use. You can't accidentally leave it on, either — about 7 mins after last operation, the PB-100 switches itself off automatically.

$69-95

Federal Marketing Mail Order Form

Send completed coupon to:
Federal Marketing. PO Box 227 Waterloo NSW 2017.

Yes! I don't want to miss this opportunity! Please rush me ..... Casio PB-100 Pocket Computer/s — complete with batteries, two manuals and case — at the low price of $69.95 each (postage and handling included).

Name .....

Address .....

..... **Postcode** .....

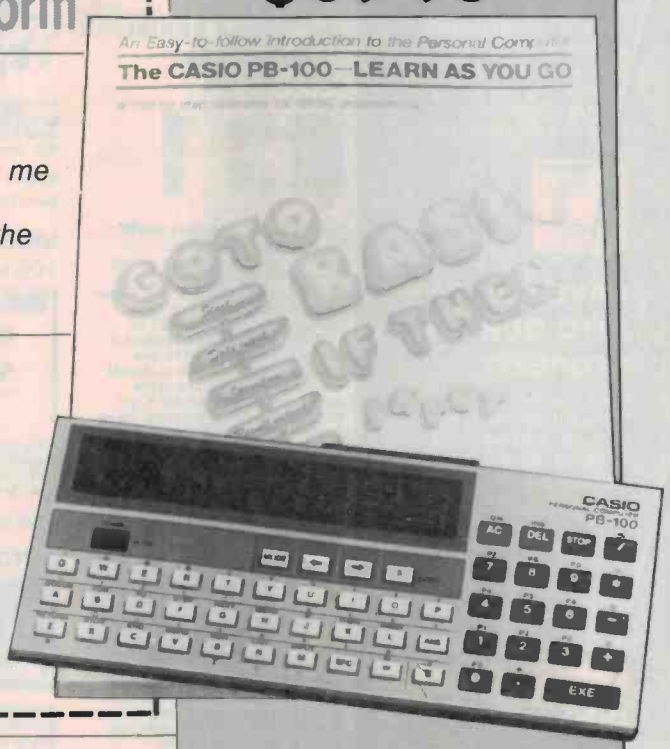
Signature .....

American Express ☐ **Bankcard** ☐ **Cheque*** ☐

** Please make cheques payable to the Federal Publishing Company Pty Ltd*

Credit Card No:

Card Expiry Date: .....



Allow four weeks for delivery

Rod Irving Electronics

425 HIGH STREET,
NORTHCOTE VICTORIA.
Ph:(03)489 8866 489 8131
48-50 A'BECKETT STREET,
MELBOURNE VICTORIA.
PH:(03)347 9251
Mail Order and
correspondance:
P.O. Box 235
NORTHCOTE 3070

★ **95% of our mail orders leave the same day**

★ **This month only, all orders over $100 and under 3kg freight free! (doesn't apply to account customers)**

Mail Order Hotline

(03) 481 1436

POSTAGE RATES

$1-$9.99	$1.50
$10-$24.99	$2.00
$25-$49.99	$3.00
$50-$99.99	$3.50
$100-$199	$5.00
$200-$499	$7.50
$500 plus	$10.00

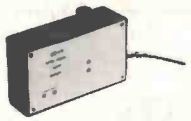
Certified Post for orders over $100 included "free"! Registered Post for orders over $200 included "free"! Account orders from schools Govt. Depts., Public Cos., gratefully accepted. Min. order of $20. (or a min. $5 accounting fee will apply.) Comet Road Freight, Airmail etc. are extra.

HAVE YOU BEEN INTO OUR CITY STORE???

Conveniently located on the edge of the city where parking is easy! Over 4,000sq. ft. of an extensive range of products and great "in store" bargains . . for those interested in computers we have a wide range on display upstairs. For good advice and a good price, see Rod Irving Electronics.

THIS MONTHS NEW KITS!

THIS MONTHS NEW KITS!



DIRECTIONAL DOOR MINDER

Sounds a buzzer, operates a relay etc. through the beam one way but not the other. Use it as a "door minder" to turn lights on or off, etc.

ETI 278

CHORD TUTOR

An attachment for the ETI-660 learner's micro, this project teaches you how to play chords on any keyboard instrument.

ETI 661

COMPUTER-DRIVEN RADIOTELETYPE MODEM

A complete transmit/receive modem that can be attached to a microbee or other computers. Many sophisticated features.

ETI 755

★ ★ ★ ★ ★ ★ Please phone (03) 481 1436 for availability and price of new kits. ★ ★ ★ ★ ★ ★

APPLE II ANALOGUE/ DIGITAL INTERFACE

This project will give your Apple a set of 8-bit digital inputs and outputs plus one analogue imput and one analogue output. Applications include: driving a robot, recording science experiment results, etc. (digital only shown). (ETI Mar. '83).

ETI-654 **$159.00**

CAR IGNITION KILLER

Most car burglar alarms are easily circumvented, but not this cunning "Ignition Killer". This sneaky antitheft device uses a 555 timer to place an intermittent short circuit across the points. Until disabled by its hidden switch the circuit effectively makes the car undrivable — a sure deterent to thieves! (EA Feb. '84).

84AU1 **$16.95**
(Our kit includes the box!)

MICROBEE SERIAL-TO-PARALLEL INTERFACE

Most Microcomputers worth owning have an 'RS232' connector, or port, through which serial communications (input/output) is conducted. It is a convention that, for listing on a printer, the BASIC LLIST or LPRINT command assumes a printer is connected to the RS232 port. Problem is, serial interface printers are more expensive than parallel 'Centronics' interface printers. Save money by building this interface. (ETI Jan. '84).

ETI-675 **$55.00**

BIPOLAR PROM PROGRAMMER

Every digital workshop should have one! Can be used to program the popular fusible-link PROMS like the 74S188/288, 82S23 and 82S123 etc. (ETI June '83).

ETI-688 **$47.50**

ELECTRONIC MOUSETRAP

This clever electronic mousetrap disposes of mice instantly and mercifully, without fail, and resets itself automatically. They'll never get away with the cheese again! (ETI Aug. '84).

Cat. ETI 1524 **$29.95**

MOSFET POWER AMPLIFIER

Employing Hitachi Mosfets, this power amplifier features a 'no compromise' design, and is rated to deliver 150½ W RMS maximum and features extremely low harmonic, transient and intermodulation distortion. (ETI Jan. '81).

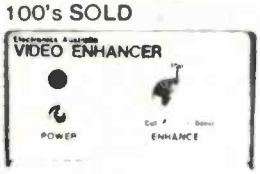
Cat. ETI 477 **$63.00**

EPROM PROGRAMMER EP1

No need for a Micro with EA's great Eprom Programmer suitable for 2716/2758 Eproms. (EA Jan. '82).

82EP1 **$47.50**
With Textool Sockets **$59.95**

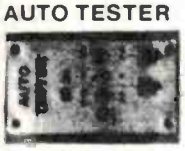
VIDEO ENHANCER 100's SOLD



Like tone controls in a hi-fi amplifier, touch up the signal with this Video Enhancer. (EA Oct. '83).

83VE10 **$35.00**

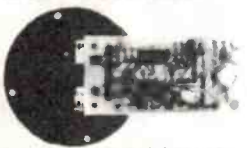
AUTO TESTER



Just the thing to keep in the glovebox or toolkit to find those nasty electrical 'bugaboos' that occur at awkward times. Simple to build, simple to use. (ETI Jan. '83).

ETI-334 **$17.00**

EA SUPER SIREN



Ever wanted to build an ear-splitting alarm which would be compact and not draw much current? This is just the circuit for you. It uses a piezo electric tweeter in a pulsed mode to form an arresting and very efficient alarm. (EA Nov. '82).

82AL17 **$21.00**
(battery extra)

100 W SUB-WOOFER AMPLIFIER

Capable of up to 120 watts RMS into 4 ohm loads and up to 80 watts RMS into 8 ohm loads, this power amplifier module has been specifically designed for use as a sub-woofer driver amplifier in a tri-amped hi-fi system. It uses four power Mosfets for rugged, reliable operation. (EA July '82).

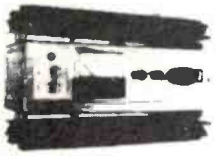
Cat. 82PA7 **$85.00**

DRIVEWAY SENTRY

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 5 minutes, it will automatically turn the light off again. (EA Dec. '82).

82PC11 **$32.00**

ELECTRIC DUMMY LOAD



With this unit you can test power supplies at currents up to 15 Amps and Voltage up to 60 Volts. It can "sink" up to 200 Watts on a static test and you can modulate the load to perform dynamic tests. (ETI Oct. '80).

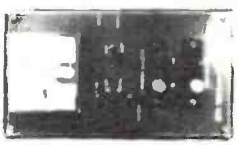
ETI-147 **$99.00**

VIDEO AMPLIFIER

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 plugback supply. (EA Aug. '83).

83VA8 **$15.00**

LOW OHMS METER



How many times have you cursed your Multimeter when you had to measure a low-value resistance? Well with the "Low Ohms Meter" you can solve those old problems and in fact measure resistance from 100 Ohms down to 0.005 Ohms. (ETI Nov. '81).

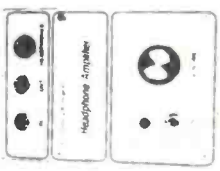
ETI-158 **$34.50**

GENERAL PURPOSE BALANCED INPUT PREAMP

This project can be used as a balanced mic amp. with low impedance input, a low or high impedance input differential amplifier or a balanced input instrumentation amplifier. (ETI Dec. '83).

ETI-461 **$20.00**

HEADPHONE AMPLIFIER

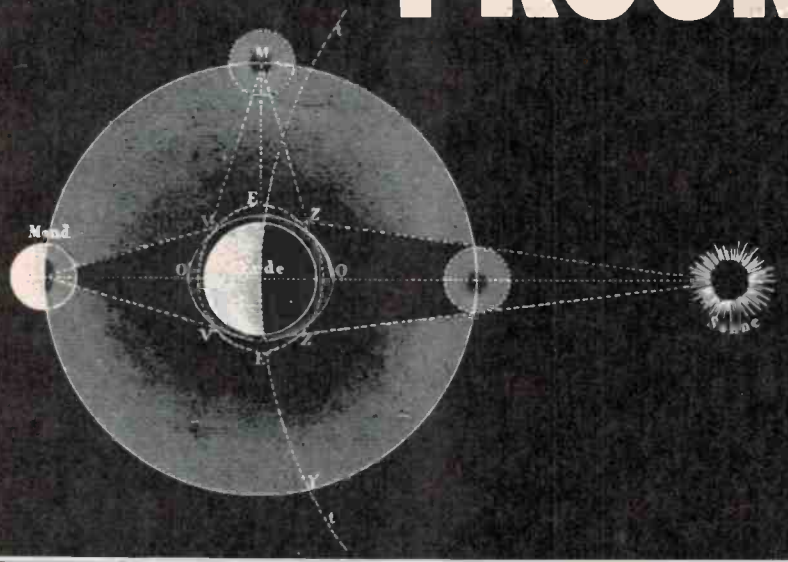


PRACTISE WITHOUT ANNOYING THE FAMILY!
If you play any type of electronic instrument, this headphone amplifier will surely interest you. It will let you practise for hours without upsetting the household, or you can use it to monitor your own instrument in the midst of a rowdy jam session. (EA Feb. '84).

83MA11 **$28.00**

Errors and Ommissions Excepted

PROGRAMMING FOR THE ECLIPSE



D. Currie and R. Walters

THE ZONE of totality of the eclipse (the region of the earth's surface from which the total eclipse can be seen) will begin at dawn in Papua New Guinea and move in a narrow strip across the Pacific. The zone over which a partial eclipse will be visible is far wider, extending many thousands of miles north and south of the zone of totality.

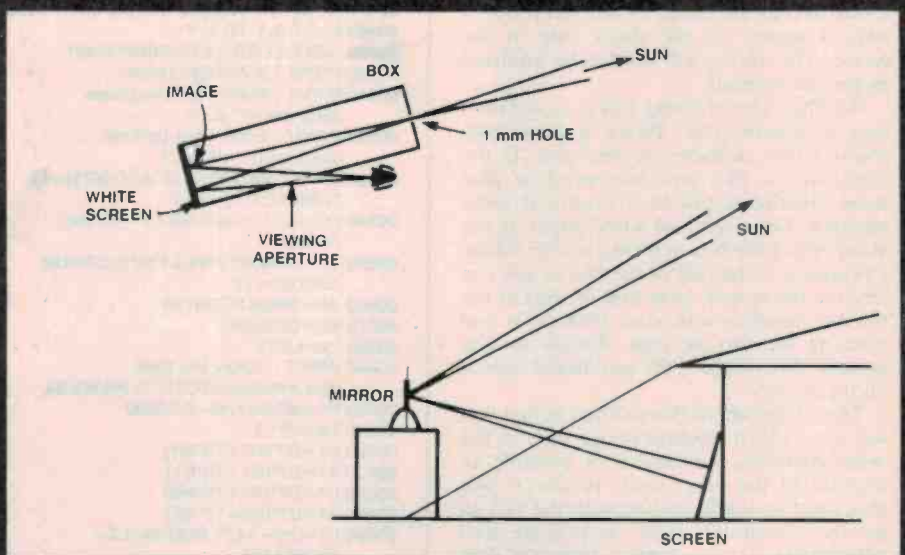
This program allows you to determine the degree of totality given the time and position of the observation. Time is measured with reference to Australian Eastern Standard Time, so you will have to adjust for daylight saving or other time zones as applicable. Position is measured in latitude and longitude.

The program gives a readout of the Ecliptic longitude (Lambda) of the sun and moon. The sun's latitude is always zero. It also gives the ecliptic latitude (Beta) of the moon and the percentage of the sun covered at any given time. Some other terms used in the program are:

- First contact: The last time before maximum when the magnitude is zero (to three decimal places). Physically it is the time when the limb of the moon crossed the limb of the sun.
- Maximum: The time when the degree of coverage reaches its greatest value.
- Last contact: The time after maximum when the magnitude reaches zero for the first time. Physically it is the time when the sun and moon first appear completely separate again in the sky.

Test figures

To ensure that you have the program entered correctly, consider this example. From Bourke NSW, 30°06'S, 145°57.5'E (enter as



Safety viewing. Two methods of viewing the eclipse. The top drawing shows how to use a cardboard box with a pinhole in one end. The lower method shows how to use a shaving mirror to project a large image on a white board screen. The stand steadies the mirror.

−30,06 and 145,57.5) we find that first contact occurs at 0655.20 hrs, when the program will give the following details:

Time:	6,55,20
Lambda sun	240.7475
Lambda moon	240.34727
Beta moon	0.335904161
Magnitude	7.09058912E-03

As you enter later and later times you will find magnitude increasing and Beta moon decreasing until maximum when Beta reaches 0.08144528 and magnitude reaches 5.4017438E-03. Last contact will occur at 7.51 am.

By pressing 'Y' for graphics after any selected read out, the aspect of the eclipse will be presented on the screen. This part of the program takes a few minutes to complete so it is better to determine the phase of the eclipse first and then select your times for graphics.

Safety

If you value your eyes, NEVER LOOK AT THE SUN DIRECTLY. It is possible, but not recommended, to use thick welders' goggles, but never try to use sunglasses, smoked glass or exposed film. Burnt retina is permanent.

The approved method of viewing the sun is to project the image through a small refracting telescope onto a piece of white cardboard. You can use this method quite comfortably during normal times to observe sunspots and the state of the solar photosphere generally.

If you don't have access to a telescope another alternative is to use a small shaving mirror on a swivel stand.

Cover the flat side with a piece of cardboard into which you have cut a hole about the size of a one cent piece. Position this on a box so that the image of the sun projects onto a screen on the shady side of the house. The mirror will need to be adjusted as the sun ascends.

Another way of doing this is to obtain a long cardboard box. Pierce a clean hole about 1 mm diameter in one end. If the cardboard is thin you may need to glue some aluminium foil to it to give it some strength. Fix a piece of white paper at the other end of the box to form a screen. Make a peephole in the side of the box so you can observe the screen. Now aim the box at the sun by standing with your back to it and pointing the box at your shadow on the ground. The image of the sun should appear on the screen.

The advantage of this method is that you will get a much brighter image than in the other methods, because it is possible to exclude all the other light. However, you may need to fiddle around with the box to get the dimensions right, so prepare well beforehand. It also suffers from the fact that only one person at a time can view the eclipse. With the projection method it should be possible for many people to view it. Have an eclipse party! ●

```
00100 HIRES:GOTO 170
00110 REM * Machine language subroutine
      for displaying sun *
00120 DATA 33,0,0,17,0,48,1,255,4,237,176,
      33,0,248,17,0,53,1
00130 DATA 255,7,237,176,33,0,240,17,0,244,
      1,255,1,237,176,201
00140 DATA 33,0,48,17,0,0,1,255,4,237,176,
      33,0,53,17,0,248,1
00150 DATA 255,7,237,176,33,0,244,17,0,240,
      24,220
00160 DATA 33,0,242,17,0,246,24,212,33,0,
      246,17,0,242,24,204
00170 FOR Z=12192 TO 12271:READ
      Y:POKE Z, Y:NEXT Z
00180 Z=USR(12256)
00190 CURS 1,9
00200 PRINT " Solar Eclipse for 23
      November 1984 "
00210 PRINT " by D. Currie and R. Walters ;
00220 PRINT " of The Bundaberg
      Astronomical Society of Qld. "
00230 CURS 1,13:PRINT TAB 20;"—
      W A R N I N G — "/" D O N O T
      observe this eclipse with the Naked
      Eye."/" Refer to the article for
      methods of observation."
00240 FN1=SIN(#)/COS(#)
00250 SD 12:P1=3.14159265
00260 D7=.01745329252
00270 R7=57.2957795131
00280 REM * Elements of the eclipse *
00290 O1=.409128913
00300 T1=9.065
00310 R1=238.69125
00320 R2=238.69125
00330 M1=.0439625
00340 M2=.61921667
00350 D1=−20.328544
00360 N1=−.008711
00370 D2=−20.6557139
00380 N2=−.17946389
00390 P0=.998186
00400 S1=.269972
00410 S2=.271972
00420 R0=57.402807
00430 REM * Draws sun on screen *
00440 SD 4:W1=S1*300:W2=S2*300
00450 FOR Z1=1.58 TO 4.71 STEP .018
00460 A1=Q1*COS(Z1):Y=INT(W1*SIN(Z1)*3/
      5+190)
00470 A=INT(A1+256):X=INT(ABS(A1)+256)
00480 PLOT A,Y TO X,Y
00490 NEXT Z1:SD 12:Z=USR(12192)
00500 CURS 1,9:Z=USR(12264)
00510 INPUT "Enter your longitude
      (degr,min)?";L,L6
00520 INPUT "Enter your latitude
      (degr,min)?";M7$,L7
00530 M=INT(VAL(M7$)):IF ASC(M7$)=45
      THEN LET L7=−L7
00540 L0=FLT(L)+(L6/60):L1=FLT(M)+
      (L7/60)
00550 T7=(.996647*FN1(L1*D7)):GOSUB
      1070:Q0=T7
00560 J0=.996647*SIN(Q0)
00570 K0=COS(Q0)
00580 L2=L0/15
00590 INPUT " Enter the time
      (Hrs,min,sec(AEST)? "; H5,M5,S5
00600 H5=M5/60+H5+S5/3600
00610 T0=H5−T1
00620 U1=D7*(R1+T0*M1)
00630 E1=D7*(D1+T0*N1)
00640 U4=D7*(R2+T0*M2)
00650 E4=D7*(D2+T0*N2)
00660 L3=(H5+14)*1.002738+L2−
      19.9223162
00670 H1=D7*L3*15-U4
00680 T7=(K0*SIN(H1)/(R0*COS(E4)−K0*
      COS(H1))):GOSUB 1070:S0=T7
00690 H2=H1+S0
00700 U5=U4−S0
00710 T7=COS(H2)*(R0*SIN(E4)−J0)/(R0*
      COS(E4)*COS(H1)−K0):GOSUB
      1070:E5=T7
00720 GOSUB [U1,E1] 960
00730 I1=F0
00740 GOSUB [U5,E5] 960
00750 I2=F0
00760 W0=SIN(C0)*COS(01)−COS(CO)*SIN
      (0 1)*SIN(A0)
00770 S7=W0:GOSUB 1130:B1=R7*S7
00780 REM
00790 S4=SQR(((I1-I2)*(I1-I2))+B1*B1)
00800 M4=(S1−S4+S2)/(2*S1)
00810 SD 8
00820 PRINT "Lambda of the Sun ";I1,
      "Beta of the Sun 0 "
00830 PRINT "Lambda of the Moon";I2,"
      Beta of the Moon ";B1
00840 PRINT "Magnitude of Eclipse ";M4
00850 SD 12
00860 PRINT " Do you require graphics (Y
      for Yes) ?";:CURS 1, 15
00870 A7$=KEY:IF A7$=" " THEN 870
00880 IF A7$="y" OR A7$="Y" THEN
      GOSUB 1200
00890 PRINT "Do you want the same
      location (Y for Yes)?"
00900 A7$=KEY:IF A7$=" " THEN 900
00910 IF A7$="Y" OR A7$="y" THEN 1150
00920 PRINT "Do you want to enter new
      location (Y for Yes)?";
00930 A7$=KEY:IF A7$=" " THEN 930
00940 IF A7$="Y" OR A7$="y" THEN LET
      Z=USR(12226):GOTO 500
00950 END
00960 VAR (A0,C0)
00970 Y0=SIN(A0)*COS(01)+FN1(C0)*SIN
      (01 )
00980 X0=COS(A0)
00990 T7=Y0/X0:GOSUB 1070:F0=T7
01000 IF X0<0 THEN 1020
01010 IF YO<0 THEN 1040 ELSE 1050
01020 F0=(F0+P1)*R7:RETURN
01030 REM
01040 F0=F0+2*P1
01050 F0=F0*R7:RETURN
01060 REM * ATAN and ASIN formulae *
01070 IF T7<0.1 AND T7>−0.1 THEN 1090
01080 T7=ATAN(T7):RETURN
01090 Y7=5:Z7=0:FOR Z=1 TO 5
01100 Z7=(Y7*Y7*T7*T7)/((Y7*2)+1+Z7)
01110 Y7=Y7−1:NEXT Z
01120 T7=T7/(1+Z7):RETURN
01130 IF S7=>1 THEN LET
      S7=1.5707964:RETURN
01140 T7=S7/SQR(1−S7*S7):GOSUB
      1070:S7=T7:RETURN
01150 Z=USR(12226):Z=USR(12264):CURS
      1,9
01160 PRINT " At longitude ";L;",";L6
01170 PRINT "At latitude ";M;",";ABS(L7)
01180 GOTO 590
01190 REM * Prints Moon onto Sun *
01200 B=INT(ABS(B1*180-190))
01210 I7=(I2−I1)*300+256
01220 IF B<92 OR B>282 OR 17<93 OR
      17>420 THEN 1310
01230 FOR Z1=1.58 TO 4.71 STEP .018
01240 Y=INT(W2*SIN(Z1)*3/5)+B:IF Y>255
      THEN NEXT Z1
01250 A1=W2*COS(Z1):A=INT(A1+17):X=
      INT(ABS(A1)+I7)
01260 IF A<160 THEN LET A=160
01270 IF X>350 THEN LET X=350
01280 IF Y<140 THEN NEXT*Z1 1310
01290 PLOTR A,Y TO X,Y
01300 NEXT Z1
01310 SD 12:RETURN
```

8 PEN MULTI COLOR PLOTTER

at an affordable price

NEW

National A-3 Type Digital Plotter VP 6802A

1. MULTICOLOR HIGH SPEED PLOTTING

EIGHT COLOR GRAPHICS AT 450mm/sec (18 inch/sec)

The high plotting speed of 450mm/sec (18 inch/sec), the variety of pens (fibre, ball point, plastic tip) and colors allows great versatility in the creation of graphs.

2. SIMPLE PROGRAMMING

A VARIETY OF INTELLIGENT FUNCTIONS

The high level of intelligence built into this Digital Plotter greatly simplifies the programming required to generate the complicated engineering drawings or business charts.

3. RELIABLE PAPER SECURITY

ELECTROSTATIC PAPER HOLDING

The highly reliable, electrostatic paper-holding method guarantees secure paper holding, which is applied by simple switch operation.

4. QUIET MOVEMENT AND SAFETY

DESIGN CONSIDERATION ON MECHANICAL CONSTRUCTION AND SOFTWARE PLUS PROTECTIVE COVER

The detachable plastic cover assures durability and safety while suppressing the movement noise substantially.

5. CONTINUOUS PLOTTING

AUTOMATIC CHART ADVANCE "OPTION"

By combining the automatic chart advance option, this plotter can function in a totally unattended mode. This makes it possible to build up fully automatic drawing system which does not need any human care.

6. COMPUTER INTERFACES

THREE TYPES

Eight bit parallel, RS-232-C and GP-IB interfaces are able with VP-6802A. The above interfaces allow the plotter to be used as a computer graphics device as well as an instrumentation graphics device.

Scientific Devices Australia Pty. Ltd.

2 Jacks Road. South Oakleigh Vic. 3167 Phone: (03) 579 3622
31 Halsey Road. Elizabeth East. S.A. 5112 Phone: (08) 255 6575
559A Willoughby Road. Willoughby N.S.W. 2068 Phone: (02) 95 2064

JUST POPPING O/S FOR A BIT!

Yes, it's that time again — I'm off to see the World to pick up more special deals on the best electronic gear at prices you can't afford to miss.

WHILE I'M GONE DON'T FORGET...

Promark carries a huge range of premium grade electronic items;

Connectors — Bridges,
IC Sockets — Displays
Pots, Trimmers, Dials
Disk Drives — Chokes
Transistors — Ferrites
Voltmeter chips;

and most other kinds of general usage or kit equipment needs.

See you when I return and watch for the super specials in ETI Jan. '85.

Regards,

Clive Chamberlain

Promark Distributors

• MAIL ORDER • MAIL ORDER •
P.O. Box 381
Crows Nest N.S.W. 2065
Phone: (02) 439-6477
• MAIL ORDER • MAIL ORDER •

Vic-20

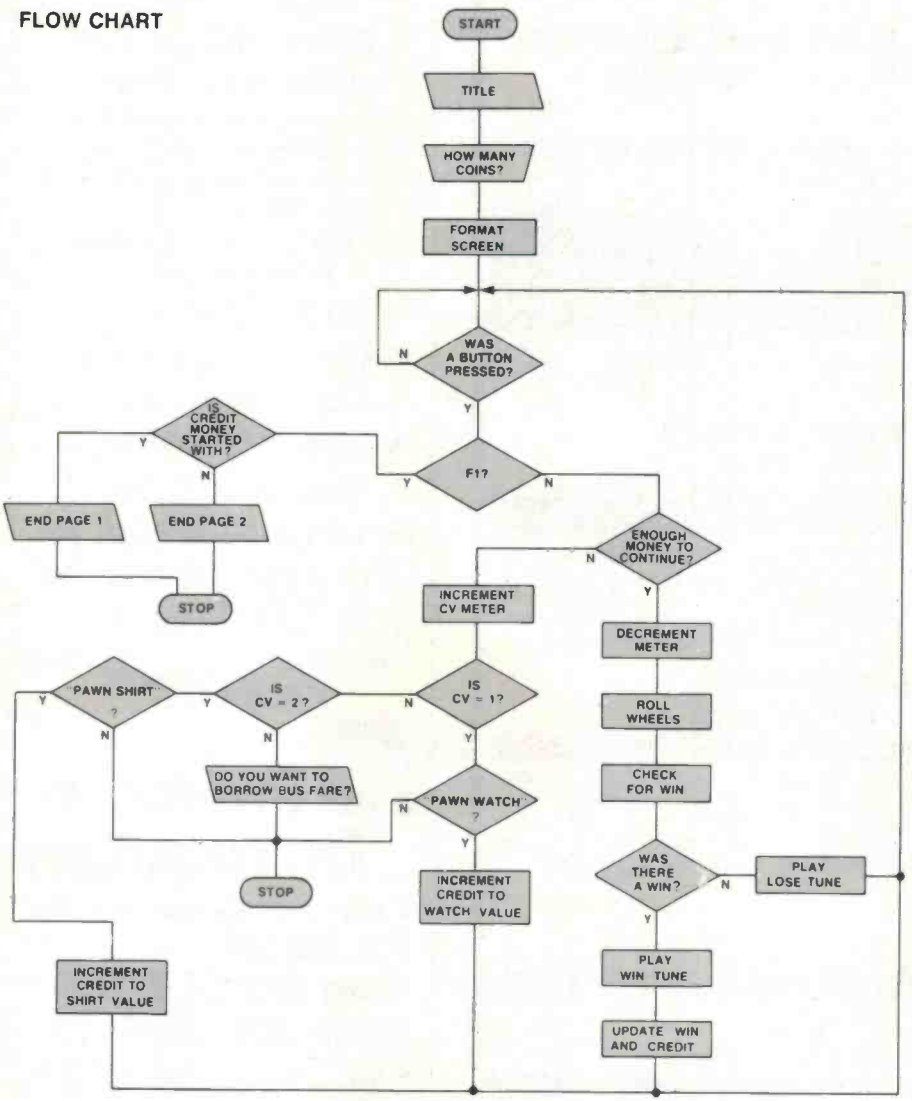
THREE REEL POKER

If you can't get enough of the pokies down at the club you might like to consider using your VIC 20 for the same function. It doesn't strain the arm muscles as much as the real thing, and you can cheat when it's your turn to put up the money!

Figure 1. The 'title page'.

Andrew Macdonald

FLOW CHART



THIS POKER MACHINE PROGRAM started out fairly small, but (like Topsy) got larger and larger. It now takes just over 5.3K of memory to load and run the program. So extra memory is required to augment of 3K normally carried by the VIC 20.

When the program is run a title page will be printed up on the screen. It's made up by using a number of characters of the character generator to spell out "POKER MACHINE" (Figure 1). This remains on the screen for approximately 5 seconds. It will then be scrolled up the screen one line at a time. This continues until the screen is full of $ signs. This stays on the screen for approximately three seconds and is then replaced by the second title page, which gives the instructions to continue on with the program.

This page is replaced by another which gives the conditions that apply to all winnings. The computer will then ask how many coins you are starting with. When this is input the computer will display the screen format of the poker machine. The screen format includes a credit meter which

Figure 2. Winning and credit conditions.

PROGRAM LINE DESCRIPTION

10	Dimension Array A to 20;
20-190	Six subroutines for each wheel to poke the first random character in the top position of each reel.
200-390	Prints opening pages.
400	Time delay loop.
410	Computer asks you to input how many coins you are starting with.
420-520	Prints part of screen format.
530	Array to read and poke all the screen data into screen locations to produce the rest of screen format.
540	Array to read data for win tune. Data then to be poked into the Sound Generator every time there is a win.
550	Prints initial values for win and credit meters.
560-640	Pokes "$" signs for initial value in all reel locations.
650-730	Pokes initial values of numbers in bonus multiplier.
740	String of numbers for bonus multiplier.
750	Time delay loop.
760	Turns volume off on Sound Generator.
770	Time delay loop.
780	Test to see if enough coins to continue.
790	Waits for any button to be pressed to start reels rolling.
810	Decrements credit meter, zeros win meter, prints updated values for win and credit meters on the screen.
820	FOR-NEXT loop sets amount of times the reels will roll.
830	Turns volume on.
840	Shifts bonus multiplier along one number.
850-880	Gets new number to be poked into first location of bonus multiplier.
890	Pokes sound for reels rolling in Sound Generator.
900	Time delay loop.
910	Turns volume off.
920-950	Gets three random numbers.
1020	Time delay loop.
1030-1100	Shift all numbers in bonus multiplier along one.
1110-1170	Puts a new number in first location of bonus multiplier.
1180-1230	Checks to see if a winning combination was obtained.
1240	Turns volume on.
1250	Pokes losing sound value into Sound Generator.
1280-1320	Updates win register.
1330-1370	Pokes data in Sound Generator to play win tune.
1380-1440	Update win and credit meters.
1450-1460	Increments CV register and sends program to appropriate line.
1470-1610	Routines to choose restarts.
1610-1650	Prints closing pages.
1660-1740	Data for printing screen format used in conjunction with Lines 530-540.

shows the amount of coins you have left, a win meter which shows the amount that is won when a winning combination comes up on the centre line, and it also has a bonus multiplier (see Figure 2). This bonus multiplier is like a big wheel that spins around but we only see a few of the numbers on it. When you get a winning combination the amount that is won is multiplied by the ▶

PROGRAM LISTING

```
10 DIMA(20):GOTO200
20 POKE7755,90:RETURN
30 POKE7755,83:RETURN
40 POKE7755,86:RETURN
50 POKE7755,81:RETURN
60 POKE7755,65:RETURN
70 POKE7755,1:RETURN
80 POKE7757,90:RETURN
90 POKE7757,83:RETURN
100 POKE7757,86:RETURN
110 POKE7757,81:RETURN
120 POKE7757,65:RETURN
130 POKE7757,1:RETURN
140 POKE7759,90:RETURN
150 POKE7759,83:RETURN
160 POKE7759,86:RETURN
170 POKE7759,81:RETURN
180 POKE7759,65:RETURN
190 POKE7759,1:RETURN
200 PRINT"
210 PRINT"
220 PRINT"
230 PRINT"
240 PRINT"
250 PRINT"
260 PRINT"
270 PRINT"
280 FORT=1TO1500:NEXT:PRINT"
290 FORS=1TO155:PRINT"$ ";:FORT=1TO250:NEXT:NEXT
300 FORT=1TO900:NEXT:PRINT"
310 PRINT"2.WHEN YOU WISH TO      STOP PLAYING, PRESS    THE 'F1' KEY.":PRINT
320 PRINT"
330 FORT=1TO5000:GETA$:IFA$<>""THEN340
340 NEXT:GOTO200
350 PRINT"
360 PRINT"
370 PRINT"
380 PRINT"
390 PRINT"
400 FORX=1TO6000:NEXT
410 PRINT"
420 PRINT"
430 PRINT"
440 PRINT"
450 PRINT"
460 PRINT"
470 PRINT"
480 PRINT"
490 PRINT"
500 PRINT"
510 RESTORE
520
530 P=0:S=0:FORV=1TO78:READP,S:POKEP+1,S:POKEP+30721,0:NEXT
540 FORX=1TO11:READA(X):NEXT
550 PRINT"
560 POKE7755,36:POKE7755+30720,0
570 POKE7777,36:POKE7777+30720,0
580 POKE7799,36:POKE7799+30720,0
590 POKE7757,36:POKE7757+30720,0
600 POKE7779,36:POKE7779+30720,0
610 POKE7801,36:POKE7801+30720,0
620 POKE7759,36:POKE7759+30720,0
630 POKE7781,36:POKE7781+30720,0
640 POKE7803,36:POKE7803+30720,0
650 POKE7925,49:POKE7925+30720,0
660 POKE7927,49:POKE7927+30720,0
670 POKE7929,49:POKE7929+30720,0
680 POKE7931,50:POKE7931+30720,0
690 POKE7933,49:POKE7933+30720,0
700 POKE7935,49:POKE7935+30720,0
710 POKE7937,49:POKE7937+30720,0
720 POKE7939,51:POKE7939+30720,0
730 POKE7941,49:POKE7941+30720,0
740 D$="11211131121":E$="1":C$=D$
750 FORT=1TO500:NEXT
760 POKE36875,0
770 FORX=1TO500:NEXT
780 IFCR<1THEN1450
790 GETA$:IFA$=""THEN790
800 IFASC(A$)=13THEN1600
810 CR=CR-1:WI=0:PRINT"
820 FORZ=1TO10
830 POKE36878,15
840 C$=RIGHT$(C$,LEN(C$)-1)+LEFT$(C$,1)
850 B$=LEFT$(C$,1)
860 IFB$="1"THENK=49:GOTO892
870 IFB$="2"THENK=50:GOTO892
880 IFB$="3"THENK=51
890 POKE36877,250
900 FORT=1TO12:NEXT
910 POKE36877,0
920 A=INT(RND(1)*20)+1:B=INT(RND(1)*6)+1:C=INT(RND(1)*6)+1
930 ONAGOSUB40,42,20,22,30,30,40,40,42,52,52,72,60,62,60,60,22,32,42,52,62
940 ONBGOSUB82,92,102,112,122,132,12,11,11,12
950 ONCGOSUB142,152,162,172,182,192,142,142,152,172
```

PROGRAM LISTING

```
960 POKE7799,PEEK(7777)
970 POKE7801 PEEK(7779)
980 POKE7803,PEEK(7781)
990 POKE7777 PEEK(7755)
1000 POKE7779,PEEK(7757)
1010 POKE7781,PEEK(7759)
1020 FORT=1TO10 NEXT
1030 POKE7941 PEEK(7939)
1040 POKE7939,PEEK(7937)
1050 POKE7937,PEEK(7935)
1060 POKE7935 PEEK(7933)
1070 POKE7933,PEEK(7931)
1080 POKE7931,PEEK(7929)
1090 POKE7929,PEEK(7927)
1100 POKE7927,PEEK(7925)
1110 POKE7925,K
1120 B=RND(1)
1130 IFB<0.6THENE$="1" GOTO1170
1140 IFB<0.3THENE$="2" GOTO1170
1150 E$="3" GOTO1170
1160 C$=C$+E$
1170 NEXT
1180 D=PEEK(7777) E=PEEK(7779) F=PEEK(7781)
1190 IFD=EANDE=FANDF=1THEN1280
1200 IFD=EANDE=FTHEN1290
1210 IFD=EANDF=1THEN1300
1220 IFE=FTHEN1310
1230 IFD=1THEN1320
1240 POKE36878 15
1250 POKE36875 135
1260 IFLEN(C$)=30THENC$=D$
1270 GOTO750
1280 WI=25 GOTO1330
1290 WI=10 GOTO1330
1300 WI=5 GOTO1330
1310 WI=2 GOTO1330
1320 WI=1
1330 FOR =1TO11
1340 POKE36876,1
1350 POKE36875 P*X)
1360 FORT=1TO100 NE-T
1370 )EXT
1380 D=PEEK(7933)
1390 IFD=4STHENQ=1 GOTO1420
1400 IFD=5STHENQ=2 GOTO1420
1410 IFD=5ITHENQ=3
1420 WI=WI*
1430 DR=DR+.1
1440 PRINT [illegible] IF W ' PRINT [illegible] 'WI'M ' GOTO750
1450 C =C -1 IFC =0THEN1480
1460 IFC =0THEN1470
1470 PRINT [illegible] -OU ARE OUT OF PRINT [illegible]ONE-' FORX=1TO1000 NEXT
1480 PRINT [illegible]LIKE TO PA.) PRINT"[illegible]CLE WATCH' FOR =1TO2000 NEXT GOTO15
10
1490 PRINT [illegible]COST BOBIN E- FORX=1TO1200 NEXT
1500 PRINT [illegible]LIKE TO PA.) PRINT [illegible]CLE SHIRT' FOR =1TO2000 NEXT GOTO
1510
1520 GET$ IF$= THEN1520
1530 IF$="Y"THEN1610
1540 IFC =1THENPRINT [illegible]LL GIVE YOU $2.00' PRINT [illegible]FOR IT' FORX=1TO200
0 NEXT
1550 IFC =1THENC=10 GOTO1420
1560 IFC=2THENPRINT [illegible]LL GIVE YOU $3.00" PRINT"[illegible]FOR IT" FORX=1TO2000
NEXT
1570 IFC =2THENC=15 GOTO1420
1580 PRINT [illegible]I'VE JUST ABOUT HAD '' [illegible]ENOUGH OF YOU" PRINT"[illegible]LIKE ME TO L
END -OU
1590 PRINT [illegible]THE BUS FARE HOME
1600 FORX=1TO1000 NEXT RUN
1610 IFWI<DTHEN1630
1620 PRINT"[illegible]YOU LOST -I-E"COINS' PRINT [illegible]BETTER LUCK NEXT[illegible]
NTIME'
1630 FORX=1TO2000 NEAT RUN
1640 PRINT"[illegible]CONGRATULATIONS " [illegible]YOU WON "OR-M"COINS"
1650 FORX=1TO1000 NEXT RUN
1660 END
1670 DATA"31 112 7732 64 7733,114 7734,64,7735,114,7736,64 7737,112,7753,93,775
5 93,7757
1680 DATA93 7759 93 7775,93 7777 93 7779 93,7781,93,7797,93,7799,93,7801,93,7803
 93 7819
1690 DATA109,7820,64 7821 113 7822,64,7823,113,7824,64,7825 125 7774,62,7782,60
1692 DATA7857 112 7858,64 7859,64 7860 64,7861,64,7862 64,7863,64,7864,64,7865,6
4 7866 64
 - [illegible]
1710 DATA7879 93 7881 93 7883 93 7941 103 7945 64 7947 64 7948 64 7949 64 7950 6
- 7951 64
1720 DATA7952 64 7953 113 7954 64 7955 64 7942 64 7956 64 7957 64 7958 64 7959 6
4 7960 64
1730 DATA7962 64 7963 125 7941 90 7919 93 7897 93 7961 64 7955 113 7909 112 7911
 112
1740 DATA7931 93 7933 93 240 232 237 235 232 228,232 235 237 240 0


READY.
```

number in the box when the reels stop. The screen format also includes a list of all winning combinations.

To start the reels rolling all you have to do is push a key. Immediately the key is pressed the reels will start to roll and the bonus multiplier will move around. The reels will continue to roll for approximately five seconds. When the reels stop rolling, the computer then compares the three symbols on the centre line. If they do not compare to any of the winning combinations the 'lost' sound will be played and the computer will wait for you to press a key to roll the reels again.

If the three symbols on the centre line do compare to one of the winning combinations the 'win' tune will be played. This is a series of 10 notes played one after another going from low frequency to high frequency and back to low again and sounds very similar to the win tunes played on real poker machines. The win amount is multiplied by the bonus multiplier and the win and credit meters will be updated accordingly. The computer will then wait for you to press another key to roll the reels again.

This will continue till you have one coin left. If you press a key once more and you lose again the computer will see that you have no coins left and will clear the screen and ask you if you want to "pawn your watch". If you don't wish to continue you press any key other than "Y" and the computer will then print up the last page telling you how you fared. If you do want to continue, press the "Y" key. The computer will then print up how much it will give you for your watch.

The screen format will now be printed up again on the screen with the credit meter showing how much you got for your watch. You can now continue to play as before, pushing any key to roll the reels. If you happen to lose again the computer will see that you have no coins left and will then ask you if you want to"pawn your shirt".

If you don't want to continue, press any other key except the "Y" key and the final page will be printed up on the screen telling you how you fared, but if you do want to pawn your shirt press the "Y" key.

The computer will now tell you how much you got for your shirt and will then print up the screen format again. The credit meter will be updated to your shirt's value and you can continue to play by pressing any key to roll the reels. If you happen to lose once more the computer will not pawn anything else but will lend you the bus fare home.

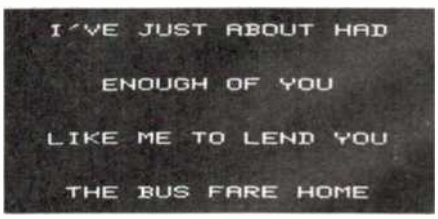


Figure 3. You're finished, buddy!

If at any time during the program you wish to exit, all you do is press the "F1" key; this will print up one of two pages depending on whether you won or lost. ●

BENELEC

SITUATION VACANT
SALES REPRESENTATIVE

BENELEC Pty. Ltd., is an importer, manufacturer and distributor of a wide range of Electrical and Electronic products with particular emphasis in the Communications and Security Industries.

This new position requires an energetic individual with a successful sales record, having the aggressiveness and enthusiasm to expand our market in the manufacturing and trade sectors.

The successful applicant will be well presented, 25-35 years, and have some proven sales experience; preferably in the electronics industry; and be prepared to work with minimum supervision in a highly competitive sales environment. We offer a competitive salary with a fully maintained company vehicle.

A written resume with relevant details will be treated in strictest confidence and should be addressed to:

The Marketing Manager,
BENELEC PTY. LTD.,
PO BOX 21,
BONDI BEACH. 2026 NSW

DISK DRIVE PRICES SLASHED

TEC FB 503

$186.30 (25+) $207.00 (1+)

★ 40 Track double sided 500KByte
★ 6 mSec track to track

TEC FB 504

$220.50 (25+) $245.00 (1+)

★ 80 Track double sided 1MByte
★ 3 mSec track to track

Plus pack, post and Tax.

energy CONTROL

P.O. Box 6502, Goodna Q4300
BRISBANE — AUSTRALIA
Phone: (07) 288-2455
Telex: AA43778 ENECON

P.O. Box 12153
Wellington North,
Wellington, New Zealand

COBOL

COBOL FOR M6809 FLEX (TM)

At last an (affordable) COBOL compiler for the FLEX9 (TM) Operating System!

- most level 1 & some level 2 features,
-full 18 digit BCD arithmetic,
-supports RANDOM (up to 65,536 records) and SEQUENTIAL files,
-supports calls to FLEX9 (TM)
-one pass compiler allows overlays, program linkage and independant compilation of DATA and PROCEDURE DIVISIONS (for really BIG programs),
-local support, upgrade and maintenance to registered users.

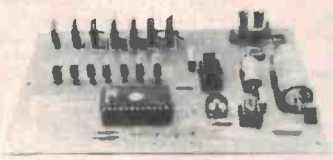
Requires FLEX9(TM), 56k and 1 disk drive.
COBOL, MANUAL and demonstration programs, postage paid.....$245.00.
Write to : "COBOL FOR FLEX9"
C/- J.Delforno,
Lot 2, McGeorge Rd.,
Gisborne South,
Victoria. 3437.

VELLEMAN KITS

HIGH QUALITY KITS AND MODULES FOR AMATEUR AND PROFESSIONAL APPLICATIONS

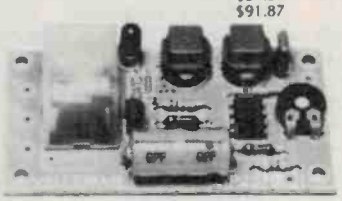
Light effects:	
K1874 — 4 channel running light	$39.24
K2588 — 3 channel sound to light with pre-amp	$51.68
K2590 — 7 channel light computer	$80.39
K2601 — strobe light	$31.58
K2602 — 4 channel running light and modulator	$47.85
Audio:	
K611 — 7 watt amplifier	$21.53
K1771 — FM oscillator	$21.53
K1798 — stereo VU using LED's	$44.98
K1804 — 60 watt amplifier	$49.76
K2572 — stereo pre-amplifier	$23.93
K2582 — stereo audio input selector	$39.72
K2606 — LED audio power meter	$33.50

Controllers:	
K2557 — 3 digit precision thermometer	$59.33
K2574 — 4 digit up/down counter	$87.23
K2577 — universal AC motor control	$29.70
K2579 — start/stop timer	$21.34
K2585 — code-lock (40 x 6 digit numbers)	$127.60
K2594 — zero cross programmable timer	$29.67
K2623 — lab power supply 0-24V DC @ 3A	$73.69
K2565 — auto slide/cassette controller	$30.15
K2567 — 20cm display, common anode	$47.85
K2584 — 4 digit precision timer	$124.35
K2591 — programmable control module	$108.58
K2625 — digital rev counter	$57.54
K2595 — precision timer module	$91.87



LIGHT COMPUTER

AND NOW YOU CAN TURN YOUR COMPUTER INTO A PRACTICAL AND USEFUL INSTRUMENT WITH THE VELLEMAN INTERFACE SYSTEM FOR THE COMMODORE 64, SINCLAIR ZX81 AND ZX SPECTRUM.



START/STOP TIMER

INTERFACE CARDS NOW AVAILABLE IN KIT FORM

K2629 — CMOS real time clock and RAM	$72.38
K2615 — motherboard for ZX81	$64.96
K2616 — motherboard for ZX Spectrum	$64.96
K2628 — motherboard for Commodore 64	$76.10

*SALES TAX INCLUDED. Add $3.50 Freight charge per order.

K2609 — DC output board	$48.26
K2610 — A/D converter, 8 bit precision	$64.96
K2611 — opto input board	$51.97
K2614 — Centronics interface board	$72.24
K2618 — D/A converter, 8 bit precision	$64.96

CATALOGUE DETAILING FULL RANGE AVAILABLE ON REQUEST

BANKCARD AND AMERICAN EXPRESS WELCOME.

FRED HOE AND SONS

Fred Hoe and Sons
246 Evans Road, Salisbury, Brisbane, Qld. 4107
Telephone: (07) 277-4311 Telex: AA 42319

bankcard welcome here

AMERICAN EXPRESS

DISTRIBUTORS WANTED

PRINTER CONTROL

A. Solomon, Bungaree Vic

I do a considerable amount of writing, and for the most part, I use Wordbee, but have always been irritated by its inability to insert a variety of printing modes into the text; hence I was much helped by Michael Dunbar's article on this very subject in ETI, February last. So I decided to take up his suggestion to write a machine code program to do the job along the lines he showed.

The program is loaded into Wordbee Monitor at 0400H, the appropriate double markers are placed at each end of the word or phrase selected in the Wordbee file, then we go back to the monitor and execute the programme with G 0400 — and the job is done! It works like a charm.

```
ADDR   CODE    LINE   LABEL   MNEM    OPERAND

                00100 ;MARKER PROGRAMME TO INSERT PRINTER CODES IN WORDBEE FILE
                00110 ;Written by Arthur Solomon,Bungaree.Vic. 5/5/84.
                00120 ;Programme inserts into Wordbee files italic, emphasized,
                00130 ;expanded,or compressed print.Selected words are preceded
                00140 ;and followed closely by marker pairs.Program replaces
                00150 ;these marker pairs by the appropriate printer codes. It
                00160 ;uses as markers,(!!)for italics,(^^)for emphasized,
                00170 ;,(\\)for expanded,and ('')for compressed print.
                00180 ;Example: !!first!! would print word "first" in italics.
                00190 ;Programme is based on Michael Dunbar's article,"Putting
                00200 ; Control Characters In A Wordbee File",ETI,Feb.1984.
                00210 ;
                00220 ;       SETTING UP AND TESTING FOR END OF WORDBEE FILE.
0400            00230         ORG     0400H           ;begin here in memory
0400 0600       00240         LD      B,00H           ;set counter1 to zero
0402 0E00       00250         LD      C,00H           ;set counter2 to zero
0404 1600       00260         LD      D,00H           ;set counter3 to zero
0406 1E00       00270         LD      E,00H           ;set counter4 to zero
0408 210009     00280 START   LD      HL,0900H        ;pointer at file orig.
040B 7C         00290 COME    LD      A,H             ;fetch MSB for testing
040C FE7F       00300         CP      07FH            ;test for end WB file
040E CA03C0     00310         JP      Z,0C003H        ;if end,return to monitor
0411 7E         00320         LD      A,(HL)          ;fetch 1st byte to accum.
                00330 ;
                00340 ;             ITALIC PRINT SUB-PROGRAMME
0412 FE7C       00350         CP      7CH             ;test for marker (!)
0414 2011       00360         JR      NZ,EMPHAS       ;if nonp,to next section
0416 361B       00370         LD      (HL),01BH       ;replace marker with code
0418 04         00380         INC     B               ;increment counter
0419 23         00390         INC     HL              ;increment pointer
041A CB40       00400         BIT     0,B             ;test if cycle odd/even
041C 2804       00410         JR      Z,ITALIC        ;if even cycle then jump
041E 3634       00420         LD      (HL),034H       ;replace marker with code
0420 1802       00430         JR      ADVAN1          ;jump over next instruct.
0422 3635       00440 ITALIC  LD      (HL),035H       ;replace marker with code
0424 23         00450 ADVAN1  INC     HL              ;increment pointer
0425 18E4       00460         JR      COME            ;continue process
                00470 ;
                00480 ;       EMPHASIZED  PRINT  SUB-PROGRAMME.
0427 FE5E       00490 EMPHAS  CP      05EH            ;test for marker  (^)
0429 2011       00500         JR      NZ,EXPAND       ;if not,to next section
042B 361B       00510         LD      (HL),01BH       ;replace marker with code
042D 0C         00520         INC     C               ;increment counter
042E 23         00530         INC     HL              ;increment pointer
042F CB41       00540         BIT     0,C             ;test if cycle odd/even
0431 2804       00550         JR      Z,EMPOFF        ;if even cycle then jump
0433 3645       00560         LD      (HL),045H       ;replace marker with code
0435 1802       00570         JR      ADVAN2          ;jump over next instruct.
0437 3646       00580 EMPOFF  LD      (HL),046H       ;replace marker with code
0439 23         00590 ADVAN2  INC     HL              ;increment pointer
043A 18CF       00600         JR      COME            ;continue process
                00610 ;
                00620 ;        EXPANDED  PRINT  SUB-PROGRAMME.
043C FE5C       00630 EXPAND  CP      05CH            ;test for marker (\)
043E 2011       00640         JR      NZ,COMPRS       ;if not,to next section
0440 361B       00650         LD      (HL),01BH       ;replace marker with code
0442 14         00660         INC     D               ;increment counter
0443 23         00670         INC     HL              ;increment pointer


ADDR   CODE    LINE   LABEL   MNEM    OPERAND

0444 CB42       00680         BIT     0,D             ;test if cycle odd/even
0446 2804       00690         JR      Z,EXPOFF        ;if cycle even, jump
0448 360E       00700         LD      (HL),0EH        ;replace marker with code
044A 1802       00710         JR      ADVAN3          ;jump over next instruct.
044C 3614       00720 EXPOFF  LD      (HL),014H       ;replace marker with code
044E 23         00730 ADVAN3  INC     HL              ;increment pointer
044F 18BA       00740         JR      COME            ;continue process
                00750 ;
                00760 ;       COMPRESSED  PRINT  SUB-PROGRAMME.
0451 FE60       00770 COMPRS  CP      060H            ;test for marker('')...
0453 200E       00780         JR      NZ,ADVAN4       ;if not,continue
0455 361B       00790         LD      (HL),01BH       ;replace marker with code
0457 1C         00800         INC     E               ;increment counter
0458 23         00810         INC     HL              ;increment pointer
0459 CB43       00820         BIT     0,E             ;test if cycle odd/even
045B 2804       00830         JR      Z,COMPOF        ;if cycle even,jump
045D 360F       00840         LD      (HL),0FH        ;replace marker with code
045F 1802       00850         JR      ADVAN4          ;jump over next instruct.
0461 3612       00860 COMPOF  LD      (HL),012H       ;replace marker with code
0463 23         00870 ADVAN4  INC     HL              ;increment pointer
0464 18A5       00880         JR      COME            ;back to base!
0000            00890         END
00000 Total errors

COMPOF  0461    ADVAN4  0463    ADVAN3  044E    EXPOFF  044C
COMPRS  0451    ADVAN2  0439    EMPOFF  0437    EXPAND  043C
ADVAN1  0424    ITALIC  0422    EMPHAS  0427    COME    040B
START   0408
```

Mini typing tutor

Gary Hegedus, Greensborough 3088

The problem with most typing tutor programs is they take so long to actually type into your computer. They have elaborate displays and 'space invaders' sound effects. Which is all very well once you've debugged your program (typing errors?) and got the thing up and running. Well the mini typing tutor is just that. It has just twenty four lines of program and the ability to increase your typing speed. The program still holds some niceties such as being able to change speed as your typing ability improves. You can continue typing after wrong or late entry by simply hitting the space bar. For ease of programing the speed number increases as the actual typing speed decreases, (i.e: 15: slow, 3: fast) numbers larger than 20 may be used, but ten is a good starting speed.

```
00100 REM MINI TYPING TUTOR
      By Gary Hegedus.
00110 CLS:POKE 257,1:REM Switch to
 upper case
00120 CURS 10,8:INPUT"ENTER SPEED
20(slow) TO 1(fast)"B
00130 A=0:REM Reset conter
00140 A1$=CHR$(INT(RND*(60)+33))
00150 CLS:CURS 30,8:PRINT A1$
00160 Y1$=KEY$:IF Y1$="" THEN 230
00170 IF Y1$=A1$ THEN 130
00180 CURS 28,11:PRINT"WRONG":
GOTO 190
00190 CURS 18,14:PRINT"strike space
bar to continue."
00200 CURS 21,15:PRINT"or S to
change speed"
00210 X1$=KEY$:IF X1$=" " THEN 130
00220 IF X1$="S" THEN 110 ELSE 210
00230 A=A+1:IF A=B*10 THEN 250:REM
Speed formulae
00240 GOTO 160
00250 CURS 27,11:PRINT"TOO LATE":
GOTO 190
```

MASTER MIND

Peter Collins, Springvale South Vic.

This is a BASIC program of Master Mind.
The game is menu controlled to provide access to the four options . . .

1. Basic game, no duplicated 'colours'.
2. Duplicated 'colours', no blanks
3. Duplicated colours and blanks
4. Two players, opponent enters 'colours'.

High score, game type, 'colours available', and high score are provided on screen at all times.

```
00100 REM  ////////////////////////////////////////////////
00110 REM :        Computer MASTER-MIND.                   :
00120 REM :        Origonal program for microbee.          :
00130 REM :        By P.Collins. OCT'83.                   :
00140 REM  \\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\
00150 DIM C(5),E(5),P(5):G=1:S=0
00160 POKE 257,1:REM Upper case.
00170 CLS:PRINT TAB 18"<< COMPUTER MASTER-MIND >>"
00180 FOR Z=1 TO 500:NEXT Z
00190 PRINT\\ TAB 18"There are six colors.."
00200 PRINT TAB 18"RED, YELLOW, GREEN, BLUE,"
00210 PRINT TAB 18"VIOLET AND WHITE."
00220 PRINT TAB 18"To enter your choice press"
00230 PRINT TAB 18"(R) for RED (B) for BLUE"
00240 PRINT TAB 18"(SPACE) for BLANK etc."
00250 PRINT\\TAB 18"HIT ANY KEY TO CONTINUE."
00260 K1$=KEY$:IF K1$="" THEN 260
00270 FOR Y=4 TO 10
00280 FOR X=18 TO 45
00290 CURS X,Y:PRINT "  "
00300 NEXT X:NEXT Y
00310 CLS:PRINT [A1 7];TAB 18 "THERE ARE FOUR OPTIONS ....."
00320 PRINT\\\ TAB 18 "1. Four colors all different."
00330 PRINT TAB 18 "2. Random or multiple colors."
00340 PRINT TAB 18 "3. Random, multiple and blanks."
00350 PRINT TAB 18 "4. Opponent enters colors."
00360 CURS 18,10:PRINT "Select option 1,2,3,4";:INPUT"....."10
00370 IF O<1 OR O>4 THEN 360
00380 A=0:ON O GOTO 400,500,560,580
00390 REM 4 Different numbers.
00400 GOSUB 480:C(1)=X
00410 GOSUB 480
00420 C(2)=X:IF C(2)=C(1) THEN 410
00430 GOSUB 480
00440 C(3)=X:IF C(3)=C(1) OR C(3)=C(2) THEN 430
00450 GOSUB 480
00460 C(4)=X:IF C(4)=C(1) OR C(4)=C(2) OR C(4)=C(3) THEN 450
00470 FOR I=1 TO 4:E(I)=C(I):NEXT I:GOTO 760
00480 X=INT(RND#6)+1:RETURN
00490 REM 4 Rnd numbers and multiples.
00500 FOR I=1 TO 4
00510 X=INT(RND#7)+1
00520 IF X>6 THEN 510
00530 C(I)=X:E(I)=X
00540 NEXT I:GOTO 760
00550 REM 4 Rnd numbers and blanks.
00560 FOR I=1 TO 4:X=INT(RND#7)+1:C(I)=X:E(I)=X:NEXT I:GOTO760
00570 REM Opponent picks colors.
00580 A=0:CLS:PRINT\ "PLAYER..Please don't peek while your
opponent picks four colors."
00590 PRINT "From...    Red, Blue, Violet, White, Yellow,
Green & Blank."
00600 PRINT
00610 FOR I=1 TO 4
00620 GOSUB 1400
00630 IF K1$="R" THEN LET C(I)=1
00640 IF K1$="Y" THEN LET C(I)=2
00650 IF K1$="B" THEN LET C(I)=3
00660 IF K1$="G" THEN LET C(I)=4
00670 IF K1$="W" THEN LET C(I)=5
00680 IF K1$="V" THEN LET C(I)=6
00690 IF K1$=" " THEN LET C(I)=7
00700 NEXT I
00710 PRINT "Colors ok?  (Y/N)";
00720 FOR I=1 TO 4:E(I)=C(I):NEXT I
00730 K1$=KEY$:IF K1$="" THEN 730
00740 IF K1$="N" THEN 600 ELSE IF K1$="Y" THEN 780 ELSE 730
00750 REM Rnd numbers=colors.. 1=R,2=Y,3=B,4=G,5=W,6=V,
00760 CLS:PRINT "  Please wait while the computer selects
four colors."
00770 FOR Z=1 TO 1000:NEXT Z:CLS:PRINT [A1 7];
00780 CLS:PRINT "Enter your colors...    Option.."O"
Game.."G"  Best score..";:IF S=0 THEN PRINT ELSE PRINT;S
00790 CURS 50,3:PRINT CHR$(239)" = No color"
00800 CURS 54,4:PRINT "or place."
00810 CURS 50,6:PRINT CHR$(149)" = Color ok"
00820 CURS 53,7:PRINT "wrong place."
00830 CURS 50,9:PRINT CHR$(134)" = Color ok"
00840 CURS 54,10:PRINT "place ok."
00850 CURS 51,12:PRINT "Red, yellow,"
00860 CURS 51,13:PRINT "blue, green,"
00870 CURS 51,14:PRINT "violet,white,"
00880 CURS 51,15:PRINT "blank.":CURS 1,3
00890 PRINT:FOR I=1 TO 4
00900 GOSUB 1400:REM Print colors.
00910 IF K1$="R" THEN LET P(I)=1
00920 IF K1$="Y" THEN LET P(I)=2
00930 IF K1$="B" THEN LET P(I)=3
00940 IF K1$="G" THEN LET P(I)=4
00950 IF K1$="W" THEN LET P(I)=5
00960 IF K1$="V" THEN LET P(I)=6
00970 IF K1$=" " THEN LET P(I)=7
00980 NEXT I
00990 A=A+1:B=0:D=0
01000 REM Check for correct places.
01010 FOR I=1 TO 4
01020 IF P(I)=C(I) THEN 1040
01030 GOTO 1050
01040 P(I)=8:C(I)=9:D=D+1
01050 NEXT I
01060 REM Check for correct color.
01070 FOR Z=1 TO 4
01080 FOR I=1 TO 4
01090 IF P(I)=C(Z) THEN NEXT# I 1110
01100 NEXT I:GOTO 1120
01110 B=B+1:P(I)=10:C(Z)=11
01120 NEXT Z
01130 REM Print out results.
01140 PRINT CHR$(160);:IF D=0 THEN 1160
01150 FOR I=1 TO D:PRINT CHR(134);CHR(160);:NEXTI
01160 IF B=0 THEN 1180
01170 FOR I=1 TO B:PRINT CHR$(149);CHR$(160);:NEXT I
01180 X=4-(B+D):IF X=0 THEN 1210
01190 FOR I=1 TO X:PRINT CHR$(239);CHR$(160);:NEXT I
01200 REM Restore values.
01210 FORI=1 TO 4:C(I)=E(I):NEXT I
01220 IF D<>4 THEN 890
01230 PRINT\\"YOU TOOK"A" TRIES."
01240 IF S=0 THEN 1260
01250 IF A<S THEN 1260 ELSE 1280
01260 PRINT\ [A5 7];"THIS IS THE BEST SCORE !!!"
01270 PRINT "ENTER YOUR NAME CHAMP";:INPUT"...";N1$:LET S=A
01280 INVERSE:PRINT\" ## ";N1$;" ## HAS THE BEST
SCORE .."S" ":NORMAL
01290 PRINT\\"DO YOU WANT TO PLAY ANOTHER GAME.  (Y/N)?";
01300 K1$=KEY$:IF K1$="" THEN 1300
01310 IF K1$="Y" THEN 1320 ELSE IF K1$="N" THEN END
01320 G=G+1:GOTO 380
01400 REM Key print subroutine.
01410 K1$=KEY$:IF K1$="" THEN 1410
01420 IF K1$="R" THEN PRINT"RED      ";
01430 IF K1$="Y" THEN PRINT"YELLOW   ";
01440 IF K1$="B" THEN PRINT"BLUE     ";
01450 IF K1$="G" THEN PRINT"GREEN    ";
01460 IF K1$="W" THEN PRINT"WHITE    ";
01470 IF K1$="V" THEN PRINT"VIOLET   ";
01480 IF K1$=" " THEN PRINT"BLANK    ";
01490 IF K1$="R" OR K1$="Y" OR K1$="B" OR K1$="G" OR K1$="W"
OR K1$=" " THEN RETURN ELSE 1410
OR K1$="V"
```

ETI-278 door minder

Now you can tell which way the customers are going! This versatile, not to mention handy little project uses pretty well all 'bog standard' components. What's more, it won't bend the budget to build it. We purchased type AL12 light-dependent resistors (LDRs) for the sensor. These are available from **Jaycar** (cat. no. ZD-1692). **Altronics** stock the AD12, which looks to be the same thing, cat. no. Z 1620. The 2851 transformer is a common type with a 12.6 V centre-tapped secondary rated at 150 mA.

Ready-made printed circuit boards and Scotchcal panels for this project may be obtained from the suppliers listed on page 144 of the October issue.

It seems that **Rod Irving** may kit up for this one, but we have received no advice from other firms at time of going to press.

ETI-661 chord tutor

This simple little attachment for our '660 Learners' Microcomputer (see October 1981) makes it a great music teaching aid for keyboard players. The 74154 ICs are not carried generally as a stock line by the general run of electronics retail stores. However, in Sydney, try **Geoff Wood Electronics** in Rozelle. In Melbourne try **Stewart Electronics** in South Melbourne or **Ellistronics** out at Mulgrave. **All Electronic Components** in the city might also be able to help.

Printed circuit boards may be obtained from the suppliers listed on page 144 last month. **All Electronic Components** may have kits of the '660 Learners' Micro if you haven't already got one.

ETI-755 RTTY transceiver

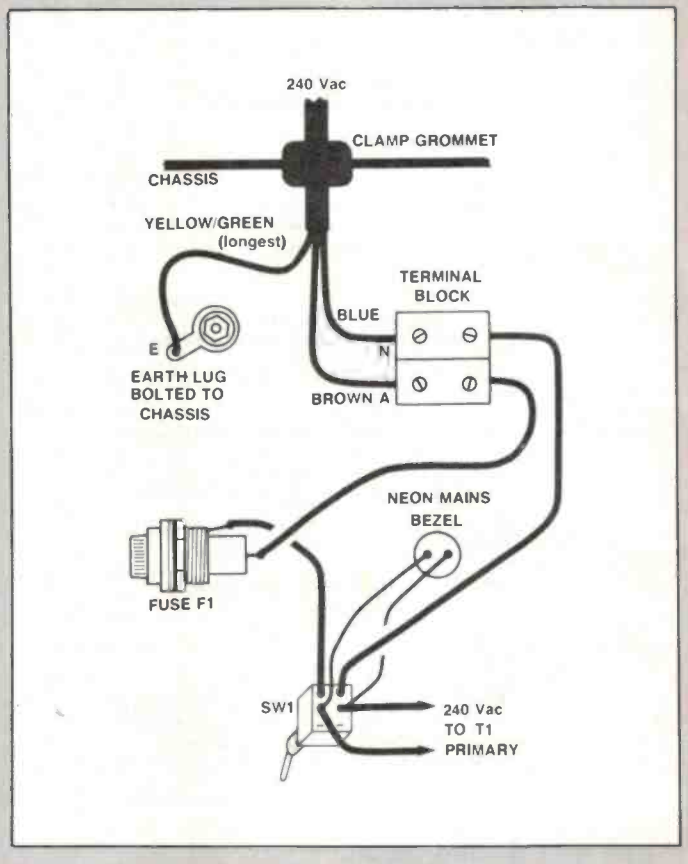
The one you've all been waiting for! This versatile unit was designed to be hooked onto a Microbee but it should be adaptable to other machines.

Most of the components are carried as stock lines by virtually every electronics retailer worthy of the description. There are one or two components not commonly found, though. The 10-LED bargraph displays used in the tuning indicators are imported and distributed by **Altronics**, cat. no. Z 0180. The AY-3-1015D is made by G.I., imported and distributed by **Daneva, PO Box 114, Sandringham Vic 3191. (03)598-5622.**

The case we used to house this project is from **Altronics**, cat. no. H-0482. The 6672 transformer is a common item.

We understand kits may be stocked by **Altronics** and possibly **Jaycar**. In Melbourne, try **All Electronic Components** and **Rod Irving Electronics.**

Ready-made pc boards and Scotchcal front panels may be obtained from the suppliers listed on page 144 of the October issue.



NOTES & ERRATA

Sept. 1984, ETI-1410 Bass Guitar Amp. There were two errors in the mains wiring diagram. Firstly, the active wire should come from the terminal block to the back pin of the fuse holder and not the ring as shown.

The other error is that the mains switch should be wired with the input on the mains side connected to the throw terminals of the switch and not the pole terminal as shown. This is to ensure that with the switch in the off position the only terminals which will be live will be the two inputs, and not the spare set of throw terminals as well.

Neither of these errors will cause the unit to function incorrectly, but the changes should be made for safety reasons.

JAYCAR MOVES — CHINATOWN REGRETS

Jaycar has moved its offices from 380 Sussex Street near Sydney's Chinatown. And combined with a move of the mail order department from 117 Parramatta Road, Concord, they're now in a new, *all-under-one-roof* address at:

7 Rawson Street,
AUBURN NSW 2114

Jaycar's new Mail Order address is:

PO Box 480,
AUBURN NSW 2114

Just in case you might want to phone them (gotta get in quick for those bargains), they're on:

(02)643-2000

The Shark Fin Review reports that profits from the Chinatown restaurant and games complex (checkers, dominoes) has dropped sharply in the past few weeks. The Criterion Hotel, birthplace of the Masterplay Stereo, has been declared a national monument by the Heritage Council.

ETI-756 glass RTTY for the VZ-200

This project was designed and produced by the R&D Department at Dick Smith Electronics. Hence, the pc artwork is copyright to them and we have not reproduced it in the magazine. Kits will be available through **Dick Smith** stores Australia-wide and in New Zealand.

Artwork

If you wish to make your own pc boards and/or front panels, we can supply same-size film transparencies of the artwork, positives or negatives as you require. From the list given here, select what you want and address your request/order to:

ETI-XXX Artwork
ETI Magazine
PO Box 227
Waterloo NSW 2017

When ordering, make sure you specify positives or negatives, according to the process you use. Please make your cheque or money order payable to 'ETI Artwork Sales'. Here's this month's prices:

ETI-278 (board)	**$2.40**
ETI-278 (front panel) .	**$3.40**
ETI-661 (board)	**$1.60**
ETI-755 (boards)	**$5.50**
ETI-755 (front panel) .	**$4.40**

MINI MART

COMMUNICATIONS

WANTED: VALVE type communciations receivers, also SW radio any conditions for rebuilding (002)94-4126. G. Bray, P.O. Exeter, West Tamar, Tas 7251.

FOR SALE: BEARCAT 150FB scanner 66-88, 144-174, 406-470 to sell for $185. Funway kit ($15) solar kit ($24) Nino Paradiso 12-12 De Murska St, Windsor Vic 3181. (03)51-5937.

FOR SALE: SCANNER LISTING of Australian civil/military VHF/UHF aeronautical frequencies. Approx. 500 sorted freq/location/service format, $5 D. Vale VK3CD1, P.O. Box 2395 Mildura Vic. 3500.

VIDEO

FOR SALE: GRASS VALLEY video processor, colour burst amplifier, sync generator, dual power supply. Improve the quality of dubbed videos. IVC 871P 1" video recorder, insert and assemble editing, including tapes $1500 the lot (will negotiate separate price) ITC B/W video special effects mixes, wipes, fades etc. Suit parts or mod. $100 Gary Cohen (03)233-5510.

COMPUTERS

FOR SALE: VIC-20 program library. High quality games, utilities, educational and misc. programs available. Send SAE to Chris Groenhout, 25 Kerferd St., Watson ACT 2602 for list.

FOR SALE: OSBORNE EXECUTIVE Computer. Perf. Cond. Full software bundle. Full specs see March-July '84 APC. $2500. H. W. Gilbert, 65 Wilks St, Cairns, Qld. 4870. (070)54-5861.

FOR SALE: MICROBEE PC 32K. Hi-Res Monitor. Data cassette deck. ASR33 Teletype printer with papertape punch and reader. Software, books and technical manual. $600. (03)379-3221 ah. Strathmore.

FOR SALE: ETI660 computer, 3K RAM, colour, metal case, software. $60. (03)379-3221 ah.

FOR SALE: ACT VIC-20: bimonthly magazine. Many interesting articles and programs. October issue $2. Bimonthly $12 per year. Write to Chris Groenhout, 25 Kerferd St, Watson ACT 2602.

SELL: EPSOM HX20 lap computer with BASIC, internal screen, printer and microcassette recorder, in briefcase, as new, plus software and tapes. Only $990. Ward (02)747-4780.

FOR SALE: SUPERMON is an all Australian ROM-based monitor which includes a complete disassembler as well as a revision "B" operating system. It allows COMPLETE control at ALL times, even when Reset has been trapped. Functions include FIND, MOVE, CHANGE, ASCII, DISASSEMBLE to screen and Printer, VERIFY, STEP, TRACE, HEX/DEC, DEC/HEX and FULL disk functions. Most powerful monitor marketed anywhere. In XL machines allows running without translator disk. For full details P.O. Box 507, Beenleigh, Qld. 4207 (07) 209-7891.

AUDIO

WANTED: TO LISTEN to ETI transmission line speakers. Phone Peter Baxter. (02)55-5137.

FOR SALE: THORENS TD150 belt drive turntable, fair condition $70, G. Dowse, 39 Towradgi Rd., Towradji, NSW 2518. (042)83-3623.

FOR SALE: MITCHELL FOCUS ONE turntable, belt drive SME 111 clamped arm, top of the line Stanton 881S cartridge, mint condition, new price $1200, sacrifice $575. (02)869-1840.

FOR SALE: AMPLIFIER Yamaha A 960 110 Watts per channel. MM/MC phono input, superb sounding amplifier, 6 months old, only $440. (02)869-1840.

MISCELLANEOUS

FOR SALE: SWITCHMODE POWER SUPPLY 5V, 17V, 20V, x 100A compact size 280 x 125 x $70 ono. DEC M9312 boot and cons emulator module $100. Norm Crainie (03)534-1192.

FOR SALE: MAGAZINE COLLECTION. EA and ETI from 1975 to 1980 inclusive in binders. Also BYTE from September 1979 to October 1981. $100 the lot. (03)544-2126.

FOR SALE: SIEMENS #100 Teleprinter to print out your computer programs, from $65. Frank Rees, 27 King St, Boort Vic 3537.

FOR SALE: PAPER TIGER IDS-440 printer $300 ono. TermiNet 1200 baud printer, 120 cps w/keyboard, $300 ono. Model 100 teleprinter w/keyboard, 20 mA loop interface, $75 ono. Adam Webb. (08)356-1241.

LONELY COMMODORE 64 seeks genuine relationship with reliable 1541 disk drive. Will swap 18 inch Philips CTV for perfect partner. Michael Grebert (049)67-2644.

FOR SALE: HISOFT PASCAL 4T VI.5 for Spectrum 48K. Full PASCAL plus large manual $50. Greg Ziegler (03)938-4281.

FOR SALE: ATARI 400 datasette 1010, Star raiders, Airstrike, missile command and four other games, 16K full-expansion buss, with original boxes $570 ono. Eric Uduste (091)72-2616.

FOR SALE: TANDY MC10 colour computer, excellent condition $75. Tandy basketball game $5. Hesmon cartridge for Commodore 64 $45. Tiny BASIC Compiler $15. (08)31-0310.

FOR SALE: UNITRON V2200 64K, Green monitor, keyboard, d/d disk drive, 80 column card, joystick, runs Apple and CP/M programs. D. Ball, 10 Tracy St, Kenmore Qld 4069. (07)378-2785.

FOR SALE: DISK DRIVES Siemens 8" ss/dd Shugart 801R compatible, with manual and connectors, brand new in factory box. $395 each. B. Billett 17/28-34 Bent St, North Sydney NSW 2060. (02)926-6497.

Attention Technical Authors

Have you just written what you believe is the best-ever book on computers, or electronics theory/practice? If so, you're no doubt eager to see your work in print and published, as soon as possible.

As well as publishing monthly magazines like Electronics Today and Your Computer, Federal Publishing Company also publishes technical books. We have the resources to edit, typeset, lay out, assemble, print and distribute almost any kind of book in the computing, electronic and related fields. So why not send your typescript to us, for an obligation-free evaluation and proposal? If we like what we see, you'll get a generous proposal for publishing rights. We're not stingy when it comes to your advance on royalties, either.

Interested?
Send your typescript to:
Jamieson Rowe,
Managing Editor,
Electronics Group,
Federal Publishing Company,
140 Joynton Avenue,
WATERLOO, NSW 2017

Learn how to Program and Use PERSONAL COMPUTERS

Now at Home in Spare Time, you can learn everything you always wanted to know about personal computers. How to program in BASIC. How to understand and use more than 80 BASIC commands and functions. How to write and run your own programs . . . for both personal and business applications. How to use pre-packaged software and change it to meet your special needs. How to make sense of the overwhelming maze of books, information and advice available at your local computer store.

More Than Just A Computer Manual

This is more than just another programming manual. It's an entire comprehensive course written by experts. Yet, because it was especially developed for home study, you learn everything right in your own home, without changing your job or lifestyle, without attending a single class.

Plus You Get Your Own Computer

To give you practical hands on experience, this course includes your own personal colour computer—The VZ 200 with 24K of memory . . . yours to keep!

SEND FOR FREE FACTS!

ICS Since 1890 International Correspondence Schools 1086
Department of Computer Training (PC)
400 Pacific Highway, Crows Nest, NSW 2065 009

Mr/Mrs/Ms _____ Age _____

Address _____

P/code _____ Phone _____

Sydney 43 2121 or Austwide (TOLL FREE) (008) 22 6903

THE ELECTRONIC ASTROLOGER

It never ceases to amaze, but not really surprise us that so many people we meet in the course of plying our profession (. . . no correspondence will be entered into regarding this definition) either wholeheartedly embrace, or at least begrudgingly admit, a belief in the cosmological influence of the stars. Or astrology to the proletariat.

Now, to put aside judgemental considerations for the moment, and to examine this sentient sentimentality in a cold, analytical light, one can see a certain *raison d'etre* buried in the pious platitudes promulgated by the picayune practitioners of this prehistoric pictography. What we mean to say is, if you're born between certain dates you'll have certain psychological characteristics common to others born during the same annual period. Or so the theory goes.

You've all read the astrological charts in the popular press at some time or another (go on, admit it). You know what they say in general terms — Gemenis have split personalities, Leos dominate their peers etc, etc. Well, after some considerable research (three hours and a cask of Renmark Shiraz) and a wide-ranging survey (asking around the 20 other people in the office) we've come up with a specialised astrological profile for electronics types. Are you ready for it? Too bad, here it is anyway.

Aries (Mar. 21-Apr. 20)

The RAM. Aries types have phenomenal memory, ranging from 6Kbytes (at 6 am) to 10Mbytes (after the tenth glass). Funny though, they can never remember anything the next morning. They enjoy convoluted technical jokes and *risque* songs. Their hair tends to be woolly and unkempt and may be found to contain spare resistors from last December's project. Aries types mistake printed circuit lacquer for deodorant and exhibit ferric chloride stains on their underwear. They howl at the full moon.

Taurus (Apr. 21-May 21)

Taurans make good word processor operators; but never make the mistake of believing anything they say. They are often associated with complex dilemmas (c.f. 'horns of') but always deny being the cause of software bugs. Taurans are heavy-handed with the soldering iron and show distinct disliking for red LEDs. Never buy any equipment recommended by a Tauran. They'll never buy such things for themselves.

Gemini (May 22-June 21)

Geminis exhibit behaviour not unlike dual op-amps. Unless you get the bias right, each half behaves entirely differently. They like amplifiers with balanced, differential inputs but despise dual power supplies. They are ambidextrous and can solder equally badly with the iron in either hand. They bet each-way on electronic pinball games.

Cancer (June 22-July 22)

Cancer personalities eat ferric chloride for breakfast and drill pc boards with their canines. They have halitosis and make jokes about cold joints. They twist wires together instead of soldering them or using connectors. Their Scottish ancestry makes them do it for reasons of frugality.

Leo (July 24-Aug. 23)

Leos like to edit magazines (*New Scientist* survey, 1978). Leos like to play with microprocessor-controlled model trains and drive heavily oxidised Holdens of indeterminate vintage and colour. They are renowned for their sense of humour and keep a tight rein on their emotions — which is why you rarely see their hands.

Virgo (Aug. 24-Sept. 23)

Virgo types like mathematical puzzles and aspire to owning a HP-15C calculator but could never learn Reverse Polish notation. Virgos keep a length of knotted string in their pocket for calculating the change from goods priced at $XX.95. Virgos don't understand *risque* jokes and wear thongs in the shower.

Libra (Sept. 24-Oct. 23)

Librans are studious types but never get degrees as they are afraid to take examinations. Librans are incapable of memorising the resistor colour code and always put electrolytic capacitors in back to front. When asked to aid in making a decision they give a carefully considered, balanced judgement that leaves you more confused than when you started. Most Librans are deaf in one ear, but you never know which.

Scorpio (Oct. 24-Nov. 22)

Scorpios sniff thermal paste and hot solder resin. They can calculate the input admittance of any solid-state device more swiftly than an IBM PC but are given to flatulence on public transport.

Sagittarius (Nov. 23-Dec. 22)

Sagittarians like recording the sound of steam engines and quartz clocks. They write articles which are published in magazines edited by Leos and they read them aloud in taxis. They dress up as Santa Claus at Easter and distribute battery-operated LED flashers which are subsequently confiscated by the Church Mothers' Club.

Capricorn (Dec. 23-Jan. 20)

Capricorn types complain of the cold and keep their soldering irons permanently on. They rave over Japanese electronic gear, food and women, but are seen to frequently leave the room at cocktail parties. Capricorns like to save money by buying all the bargains offered by electronics stores but have never been on a holiday in their lives.

Aquarius (Jan. 21-Feb. 19)

Aquarians make homebrew beer employing a microprocessor fermentation controller of their own design but prefer to drink Guinness. They have unstable personalities and fall over a lot. Their amplifiers invariably oscillate and their oscillators invariably have parasitics. TV sets and VDUs refuse to work in their presence.

Pisces (Feb. 20-Mar. 20)

Pisceans eat caviar and have rank BO. Printed circuit boards oxidise in their presence, but etching solutions speed up five-fold. Resistors change their colour codes and electrolytics spontaneously reverse polarity in the vicinity of Pisceans, but traffic lights always change from red to green for them. Pisceans floss their teeth with hookup wire and wear conductive foam socks to bed.

SONY

DIGITAL DAWN.

ES
APM
COMPACT disc DIGITAL AUDIO

It's a Sony

The world is waking up to the ultimate sound experience that only digital perfection can deliver.

And Sony's ES Series are the top of the range digital components.

The CDP-501ES Compact Disc Player with multi-function cordless remote control, featuring volume control.

The TA-F444ES integrated amplifier gives you the outstanding dynamic range of over 120dB and the channel separation of over 100dB (at 1KHZ) that digital audio demands.

The ST-S444ES FM stereo/AM tuner, the original direct comparator quartz frequency synthesis tuning for striking S/N ratio of 88dB (stereo).

The TC-K555ES-MkII cassette deck, with three head laseramorphous record and playback heads plus closed loop dual capstan tape transport, assure the wide dynamic range and reduced modulation noise.

The SEQ-555ES programme equaliser automatically customises music to suit the room and the full function wireless remote commander adds convenience.

APM-55W speakers, (from the APM range), with flat square diaphragms for clean, powerful sound.

For the best in sound it has to be digital and it has to be the Sony ES series.

SONY DIGITAL AUDIO DEALERS: BRISBANE, Reg Mills Stereo 391 5606; MACKAY, Mackay Stereo Sales (079) 57 7512; SYDNEY, Berny's Radio 969 3830, Chatswood Colour TV 411 2090; Sydney Hi-Fi Centre 29 1082, CANBERRA, Kent Hi-Fi (062) 82 2874; MELBOURNE, Beta Audio Video Pty. Ltd. 509 6846, Encel Electronics Pty. Ltd. 428 3761; Intercape Video Centre 63 3086, ADELAIDE, Grenfell Plaza Hi-Fi 51 5017; PERTH, Audio Equip 330 3397, Vince Ross Audio World Pty. Ltd. 321 2644.

AUD 0515

How to invest in Yamaha, without living beyond your means.

Yamaha's new top-of-the-range Cassette decks, the K-1000 and K-2000, incorporate the most advanced, state-of-the-art studio component technology at prices $200 to $300 less than comparable equipment.

Indeed, they compare favourably in significant performance areas with any cassette decks at any price.

Both decks have been painstakingly designed and uncompromisingly engineered for optimum functionality and reproduction performance.

Each employs a specially designed two-motor, direct drive transport mechanism for smooth, silent precision, and three low-impedance heads which features a unique Sendust formulation to ensure superb, long lasting reproduction quality. Plus the heads have a lifetime warranty.

The two decks utilise Yamaha's unique Linear Electromagnetic Transduction system which extends linearity to the point where the signal is transferred from the head to the tape–a previously uncontrollable area in the recording chain.

High performance features on both decks also include dbx and Dolby-B* noise reduction, ORBiT (Optimum Record Bias Tuning), a microcomputer controlled Linear Counter, expanded range level meters and a number of auto memory functions.

For Yamaha the K-1000 and K-2000 cassette decks are a natural progression in 95 years of outstanding accomplishments in musical instruments and audio componentry.

For you they represent the finest natural sound recording and reproduction at a surprisingly affordable cost.

Your Yamaha dealer can show you the full range of Yamaha Cassette decks starting at around $200. If you'd like further information just complete and post the coupon below.

K-1000

K-2000

*Dolby is the registered trade mark of Dolby Laboratories

I'd like further technical information on the new K-1000 and K-2000 cassette decks.

Name_____

Address_____

_____

_____ Postcode_____

Send to: Yamaha Hi-Fi Division,
Rose Music Pty. Ltd.,
17-33 Market Street, South Melbourne,
Victoria 3205.