

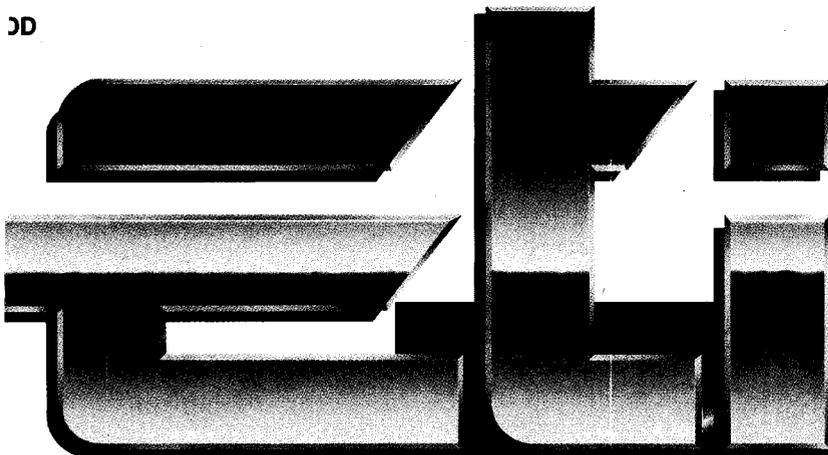
Electronics Today

INTERNATIONAL



DECEMBER 1988
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DD



HANDS ON:

- MIDI SWITCH
- MODEM
- 1/4-WAVE LOADED SPEAKERS
- TELEPHONE RECORDER

ELECTRONICS
INNO

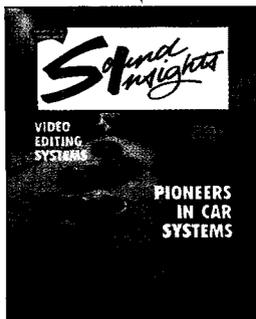
AIRBORNE RADAR

RAAF ponders
the options

ELECTRONIC EVIDENCE

Greenhouse effect
on sealevels

LASER LIGHT Projection for the



LATEST CAR CD

Stops thieves,
doesn't stop you

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CELLULAR PHONE!



When you're out scouting for business you've got to be prepared. Everyone wants answers and they want them now! Price lists, schedules, inventory, facts and figures, names and addresses. Carrying hard copy data stuffed into a brief case used to be your only option. A slow, heavy, clumsy option.

Now, there's the PSION ORGANISER II computer, a handheld power of information storage which clearly displays the confidence that you know what you are doing. Packed with up to 320K of memory the ORGANISER II easily carries vital office intelligence into the field. User programs and databases can be copied and stored permanently on plug-in Datapaks, and the Comms-Link, with 32K of communications software built-in, enables connection to modern, printer or desk-bound PC allowing the simple transfer of data to and from the ORGANISER II.

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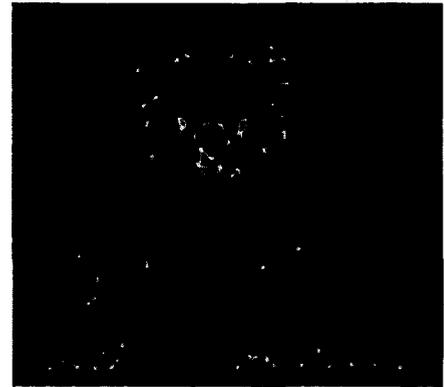
Page 22

INNOVATION

The Sarich Engine	26
Home run for the little Aussie battler	
Teletex	38
The new babel fish	
Sea level changes	42
Gathering evidence for the greenhouse effect	
TSI Vibration meter	118
Measuring shake rattle and roll	

TECHNOLOGY

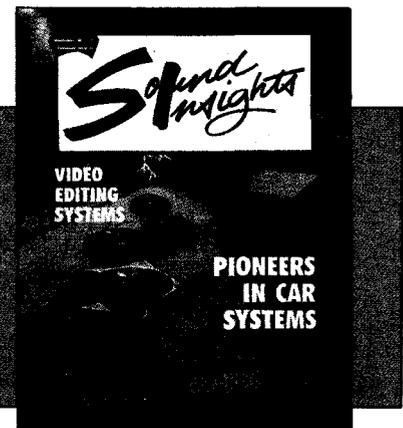
Airborne Early Warning	22
Can Australia join the big boys	
Laser Show	30
A new entertainment medium	
Space telescopes	48
Covering the complete spectrum	



Page 30

SOUND INSIGHTS

Sound by Sound	3
Sound by Sound	8
CD Reviews	14
Reviews: CD Collections	20
Sound of Industry	24

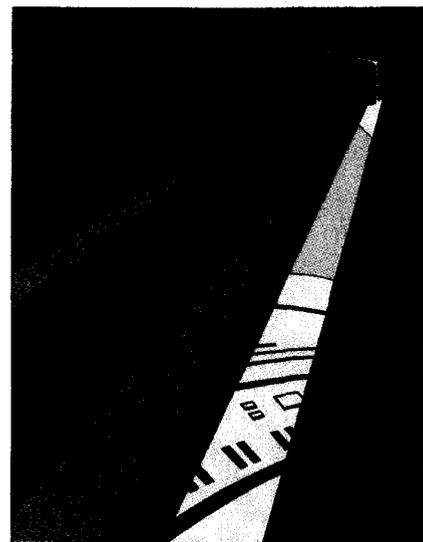


ELECTRONICS

ETI-1618: Modem	100
ETI-615: Midi switch. Part 2	104
ETI-1426: Speakers	110
ETI-1537: Phone recorder	114
Feed Forward	122

DEPARTMENTS

Editorial	5
News Digest	6
Kilohertz Comment	18
Communications News	12
Videtex News	16
Politics	19
Finance	20
Comment	54
Product News	83



Page 104

Cover: Laser generated
pattern at Expo 88

Higher contrast with wider viewing angle.
Another step ahead from Sharp.

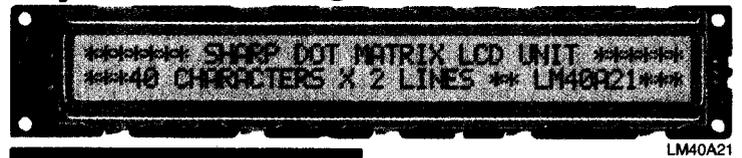


Sharp, the leading LCD manufacturer.

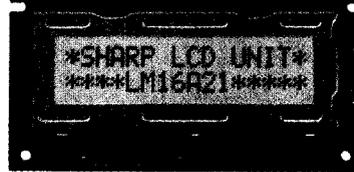
Our wide range of character type LCD units has received a further boost with the addition of new STHC (Super Twisted High Contrast) LCD units.

The "easy-to-view" and "clear" features of the STHC type—with nearly three times higher contrast and twice wider viewing angle than the TN-FEM (Twisted Nematic) type—have already been thoroughly proven in large graphic displays for personal computers, word processors and other types of equipment. Take advantage of the STHC LCD unit, to upgrade your equipment to an unprecedented level of visibility. Furthermore, a single power supply has been first applied to Sharp's character type STHC LCD units. It enables STHC LCD units to replace TN-FEM types easily.

Super Twisted High Contrast LCD Units



LM40A21



Clearer and even easier to use...

LM16A21

STHC LCD Units

Number of characters	Model No.	Type	Dot color/ background color	Supply voltage
16×2	LM16A21	Reflective, Posi.	Dark blue/Gray	+5V (typ.)
	LM16X21A	Transmissive, Posi. LED backlight is built in.	Dark blue/Yellow-green	
	LM16X21B	Transmissive, Nega. LED backlight is built in.	Yellow-green/Dark blue	
40×2	LM40A21	Reflective, Posi.	Dark blue/Gray	
	LM40X21A	Transmissive, Posi. LED backlight is built in.	Dark blue/Yellow-green	
	LM40X21B	Transmissive, Nega. LED backlight is built in.	Yellow-green/Dark blue	

A wide range of types covers a wide range of applications.

Line-up of character type LCD units

(The followings are the representative models)

Number of characters	Type	Reflective	Transmissive/ Transmissive LED backlight is built in.	Reflective Wide temperature*1 (Topr: -10~+70°C) (Tstg: -40~+80°C)	Transmissive EL backlight can be installed. (Option)
16 × 1		LM16155	LM16152D*2	LM16155S	LM16155M
16 × 2		LM16A21 LM16255	LM16X21A*3 LM162A02*3	LM16255S	LM16255M
20 × 2		LM20256	LM202A02*4	LM20255S	LM20255M
24 × 2		LM24255			
40 × 2		LM40A21 LM40255	LM40X21A*3 LM402A01*3	LM40255S	LM40255M

Note) ■: STHC LCD units, others: TN-FEM LCD units.
*1 Ordinary type... Topr: 0~+50°C, Tstg: -25~+70°C
*2 Background color... D: Red, E: Yellow-green, H: Yellow
*3 Posi. type. Nega. type is also available.

READER INFO No. 2



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JON FAIRALL

CoCom the clown

NEC, the Japanese electronics giant, has just finalised a \$9m order to supply computers to communist China. The move is possible because the CoCom rules have been relaxed for China, but not for the Soviet Union or other Eastern bloc countries. The news will be cold comfort to Mr Don Dryden of Labtam, the Melbourne based instrument company, smarting under a \$75k fine from the US government for doing the same thing in 1986.

The Co-ordinating Committee for multilateral export controls (CoCom) is a broad grouping of NATO nations which agreed, under pressure from President Reagan's administration, to restrict the sale of technologically advanced products to the Eastern Bloc. Japan is also a member, but Australia is not, although the Hawke Ministry has said that Australian export controls will mirror CoCom regulations.

CoCom is a far from happy alliance. Its only real supporters appear to be President Reagan and Mrs Margaret Thatcher. Other countries have been cajoled or bullied into supporting the US line. It's not hard to see why. CoCom was born in the darkest days of Reagan's "evil empire" view of the world, not the most rational framework from which to discuss world issues. CoCom, in both principle and practice, bears the same marks of irrationality.

The avowed aim of CoCom is to slow the spread of Western technology to the Soviets. It is argued that historically the East has lagged a few years behind the West, that the West innovates and the East then copies. In fact, if this is true of anyone, it's true of the Japanese, not the Russians, and their economy is not at all like the Russian one.

The differences in the performance of Eastern and Western economies in the commercial and industrial fields have nothing to do with knowledge, and everything to do with social and economic organisation. CoCom in this context is just unnecessary. The reason Russian kids don't have computers is because their parents lack the marketing or manufacturing system to make them, not because they don't know how. The same factors apply much less in the defence industries. Russian weapons are just as good as American ones as a result.

... not the most rational framework from which to discuss world issues.'

This is not to say that CoCom is ineffectual. It certainly accomplishes certain things. It makes it possible, for instance, for the US government to know, and control, companies world wide that are doing business with the East. There is no direct evidence that this translates into commercial advantage for the US, but certainly the potential is there, and allegations of inpropriety abound as a result.

Even more thorny: the issue of extra-territoriality. The US government can fine an Australian company without raising more than a ripple on the smug disposition of this country. In nations where they take themselves more seriously, things are otherwise. When Norwegian and Japanese companies sold milling systems to the Russians, the US government prevented both companies from tendering for US government contracts. At CoCom meetings, the French have voiced 'sharp irritation' over the anti-Norwegian legislation. Does it create a precedent that could see a French company in a US court? If it does, the anti-US feeling it engenders may do far more to reduce US power in the world than any amount of Russian technology.

If you want to be an international bully boy, it's a good idea to ensure your victims lack self-esteem first.

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Industry News



Bill Spencer

Racal-Guardata claims to be the world's largest data security specialist company. They have just got around to opening a branch in Melbourne. Bill Spencer has been appointed branch manager. He was previously with CPE Australia.

★ ★ ★

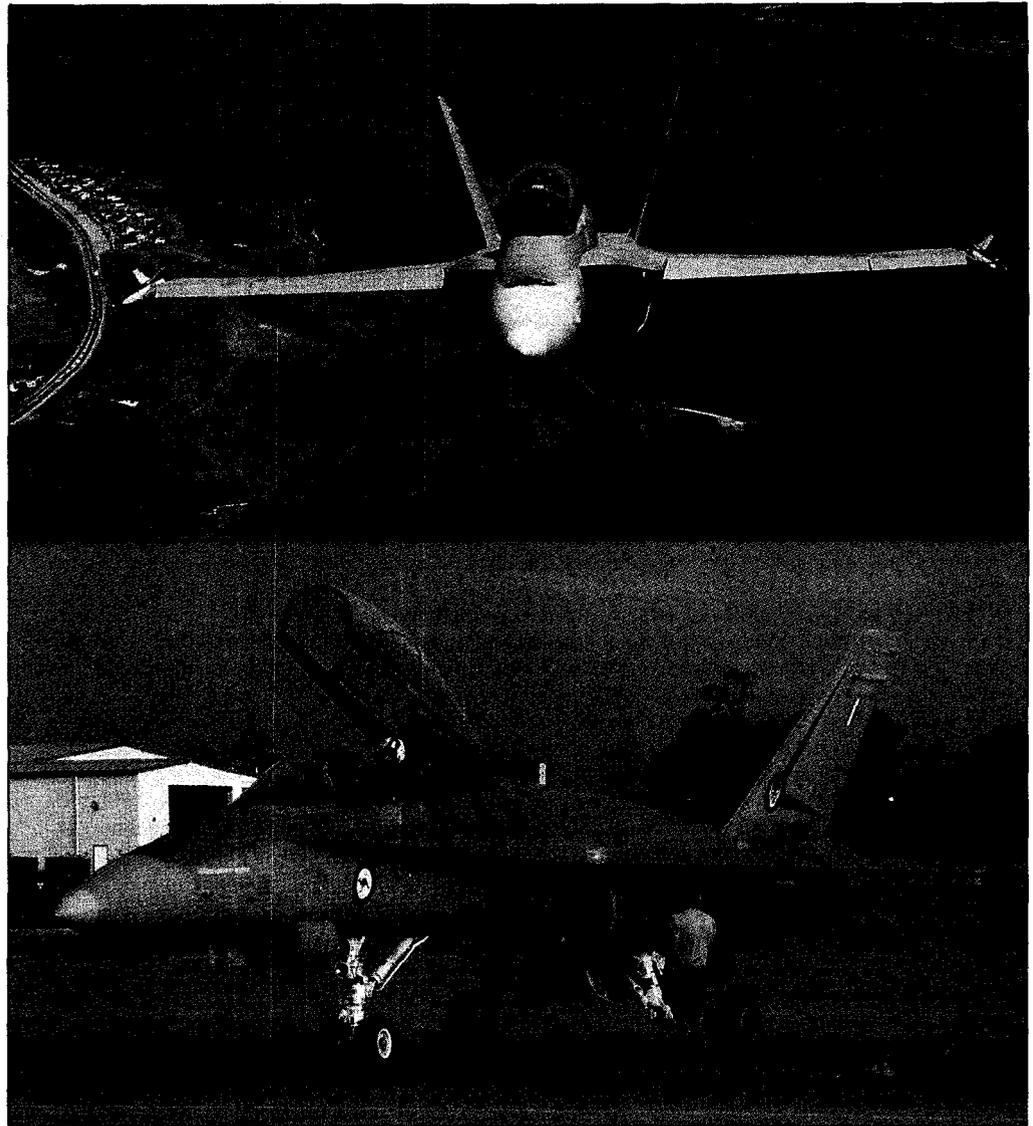
NEC information services have appointed Phillip Armstrong as National Marketing Manager. He was previously with Apple, Unilever and IBM.

★ ★ ★

Dennis Cooper has been appointed chief of the CSIRO's division of Radiophysics, replacing Bob Frater, who has been pushed up to head the CSIRO institute of Information and Communications Technologies. Cooper has been with Radiophysics since 1968, and laterly has been working as design and construction manager on the Australia Telescope.

★ ★ ★

Amber technology is moving to 200 Rouse St, Port Melbourne ☎ 03 646 5811.



Fast power supplies

French owned Alcatel's Sydney based subsidiary, Alcatel STC, has just won a contract to supply more than 525 power supplies for the flight control computers of all the foreign owned FA18 jets produced by General Electric. The aircraft is in service with the USAF, RAAF, RCAF, and the Spanish Airforce.

The power supply is a switch mode type, with an output of 28 Vdc and 8 Vac. They are powered by batteries charged by the jet engines. Each aircraft carries four power supplies in a fault tolerant configuration for redundancy. The flight control computer is essential to keep

the aircraft in the air. The deal, which will keep the production lines in Liverpool, NSW, flowing for quite some time, is an offset one. As part of the contract to supply the aircraft to the RAAF, GE was required to throw some work to local companies.

Philips distributes Fluke

Philips has at long last taken over the Australian distribution of the Fluke range of test equipment. The move has

been rumoured for some time, and follows similar agreements overseas. According to Philips, the new

group is now the third biggest supplier of test and measuring equipment in Australia, following H-P and Tektronix.



Industry News



Philippa Stewart

Hypertec, who have made a name for themselves building and selling enhancement boards for PCs, has appointed Philippa Stewart Marketing Manager. In a company reshuffle, David Evans is now commercial director, Bishu Bojdak is financial controller, Andrew Carroll is senior sales rep, and Andrew Farkas is software engineer.

★ ★ ★

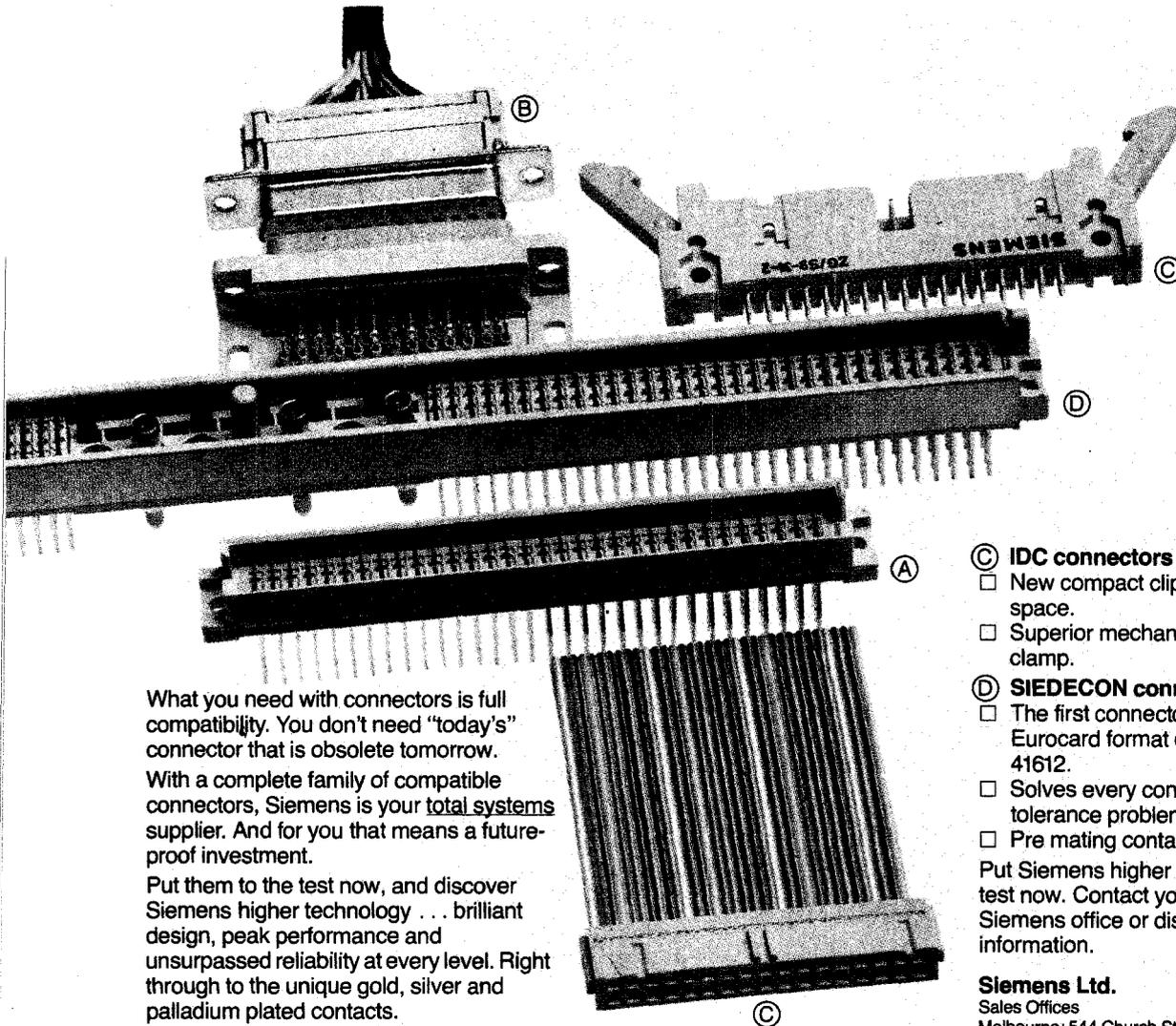
Amicron, which claims to be the biggest NEC dealer in Australia, is expanding its operations to the Pacific, with offices in Port Vila, Vanuatu and Honiara. According to spokesmen, there are a number of large corporations trading in the Pacific, and they will provide a ready market for NEC products.

★ ★ ★

Energy Control, Ken Curry's Brisbane based distribution house, has been appointed local agents for Forth Inc of California. Most significant products are based around Polyforth, a sophisticated operating system running on Forth. Its primary use is in industrial control applications.

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What you need with connectors is full compatibility. You don't need "today's" connector that is obsolete tomorrow.

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- Protection against static charge through pre mating contacts.
- Available in surface mounted devices.

(B) D connectors

- Huge range
- Wide variety of functions in the one housing design.
- Time and space saving installation.
- Screw locking available.
- Pre mating contacts.

(C) IDC connectors

- New compact clip-on head saves space.
- Superior mechanical strain relief clamp.

(D) SIEDECON connectors

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142-146 Wakefield Street, Wellington, N.Z.
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Siemens. A higher technology

Industry News



Wendy Stubbs

Wendy Stubbs has been appointed National Support manager for Apscore, the Sydney company that developed Cue-Bic software.

★ ★ ★

Emulex from the US and Webster Corp from Melbourne have signed a co-operative marketing, sales and service agreement. Both companies are big performers in the DEC compatible marketplace.

★ ★ ★

Hardcopy, the technical writing firm run by Phil Cohen, has relocated to sumptuous new offices just a hair's breadth from Lauries Folly in Kent Street Sydney. ☎ 02 27 3437.

★ ★ ★

Philips Components has relocated to the Tally-Ho technology park in Burwood East. ☎ (03) 235 3677

★ ★ ★

Barry Harrison has been appointed Professor of Microelectronics at Griffith University. Formerly he was with Philips at Eindhoven in the Netherlands, where he worked in the R and D labs. His academic posting have included Preston Institute of Technology, and RMIT. He will teach the first Australian degree course in microelectronics in 1990.

Mitec in space

Mitec, the Queensland University inspired microwave company, will become the first Australian owned group to fly products in space when the Aussat B series satellites are launched in 1991.

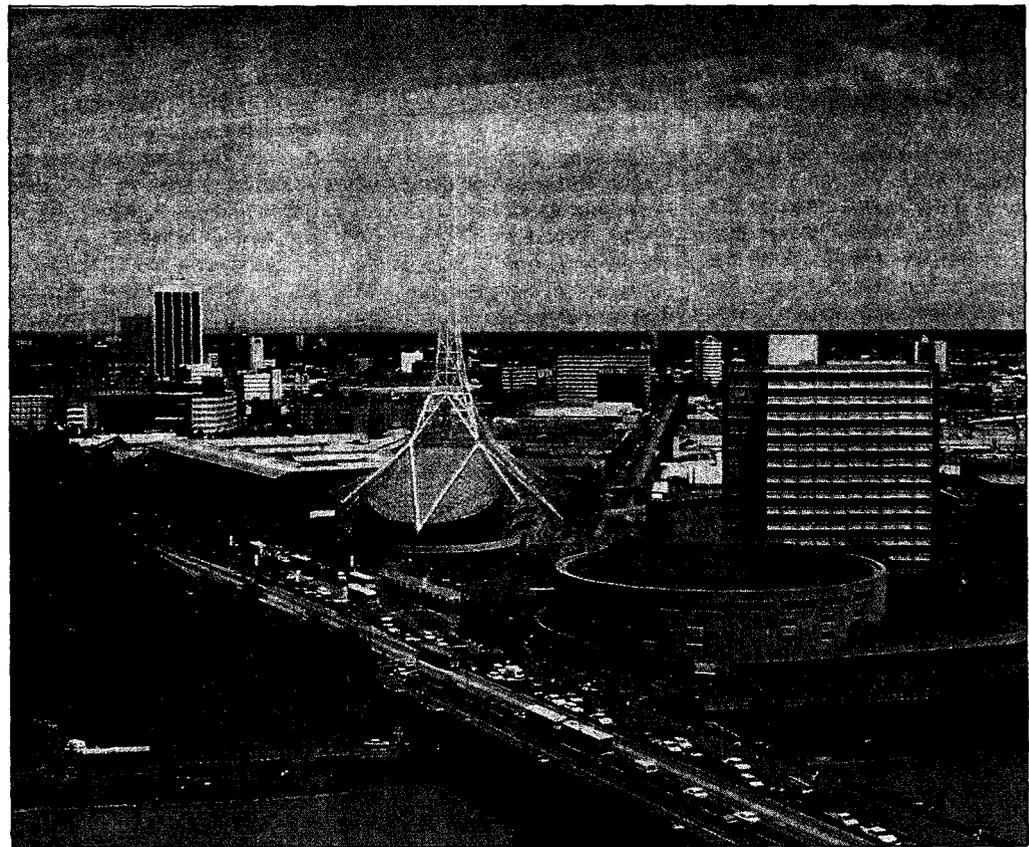
The Aussat B series satellites will all be Hughes HS 376 types. Under the terms of the contract, Hughes is obliged to give a significant

percentage of the work to Australian industry. However, most of it has gone to the usual big overseas owned electronics giants. NEC (Japan), BAeA (UK), STC (France), Philips (Netherlands) and HdH(UK) are dividing up most of the \$150m spoils between them.

Mitec, on the other hand, was formed less than a year

ago with venture capital from First MIC, one of several management Investment Companies set up within the last few years.

The company supplies waveguides, shortwave communication systems, low noise satellite receivers and Earth station equipment at L,C,X and Ku frequencies.



Arts centre gets light link

Optical fibre is being used to link the closed circuit television cameras of two buildings occupied by the Victoria Arts Centre Trust.

Administration areas in the theatre building and the Melbourne concert hall will receive off-air programmes and closed circuit television from the four main venues at the centre.

(ASC) supplied 300 m of cable which contains six multi-mode optical fibres for the project.

VACT sound master, Rod Brown, expects the cable to perform three main functions: full audio bandwidth transmission of audio, control and data transmission for stage sound and lighting and closed circuit TV.

would be used at only a fraction of its capacity at the outset, due to the limitations of the interface equipment. It is expected that this situation will change during the next decade. The capacity for expansion is enormous. Brown says that within ten years they will probably be sending 30 channels down a single fibre.

Austral Standard Cables The optical fibre cable

Industry News



John Owens

John Owens has been appointed to the board of directors of Hypertec. Mr Owens, formerly Hypertec's National Sales Manager, assumes the role of National Sales Director.

In other appointments, Shirley Reid, former travel consultant for AWA Travel becomes Hypertec's Client Service Manager and Jim Torosian has been promoted from Senior Hardware Engineer to R&D Manager.

★ ★ ★



John Button

Britain's International Computers Limited has joined the Commonwealth and Participating State Government's Partnership for Development program, committing \$80 million to research and development of Australian technology throughout the seven-year life of the Partnership.

ICL expects this investment to boost export sales by \$300 million.

The agreement was signed in Canberra by the Minister for Industry, Technology and Commerce, Senator John Button, and ICL's International President, Mr Ninian Eadie.

AutoCAD Expo '88

A high level of delegate participation is a prominent feature of this year's AutoCAD Expo, to be held in Sydney at Centrepoint, from November 21-23 inclusive.

Building on last year's National AutoCAD Users Conference, the '88 event includes a substantial proportion of interactive workshops and product/skill - specific tutorials, in addition to addresses by a variety of speakers as well as an exhibition designed with window shoppers and 'hands-on' dabblers in mind.

Opening addresses will be delivered by senior executives from Autodesk Inc.

Dr Malcolm Davies, VP Marketing, has a PhD in Architectural Science and will talk about where AutoCAD is being used today. Dr George Kruick, Director of Software Development is a practising medic one day a week and spends the rest of his time

with Autodesk. His talk will cover future developments in AutoCAD.

Other speakers, from commercial organisations and educational institutions, will cover theoretical and practical applications of CAD for a wide range of industries, from shipping to sewer design.

All papers will be available to delegates on disk.

Professionalism is of paramount importance in the complex but vitally important areas of CAD. Content of the participatory workshops will accordingly be comprehensive and the pace intense. It is anticipated, however, that delegates will be satisfied the effort was worthwhile.

Topics covered in the workshops include power drawing techniques, architecture, mapping, drawing standards, reinforced concrete, facilities management, network applications, solids modelling, movie graphics, bills of ma-

terial and structural and electronic and civil engineering.

There will be ample opportunity to review and evaluate different products and see demonstrations of the latest releases.

Exhibits include a hardware showcase featuring autoCAD-supported systems and peripherals for display, plotting and colour graphics output.

AutoCAD applications software from Australia and overseas includes CAM, engineering, mapping, construction front ends, graphics and utilities.

Details of all sessions, accommodation and costs are available on registration forms obtainable from Autodesk Australia at: PO Box 458, Richmond, Vic. 3121 or the AutoCAD Expo Hotline ☎ (008) 331 453 or 696 4446 if in the Melbourne Metropolitan area.

Times on time

Tandy is offering newsagents a unique new PC based service: a personalised card called the Birthday Times. Each consists of a database with information which can be matched against your birthday. For instance, the top story in the year you were born, the top story in the month you were born, a list of personalities who share your birthday, sporting heroes of the time, as well as hit songs.

There is even a list of the prices of things then and now. A three bedroomed house for instance, a car, an average income, petrol, bread and milk. It also records the population.

The production is something of a promotional drive for Tandy. It has put its computers into 100 card shops and newsagents across the



JOHN CITIZER
Was born on Wednesday, July 6, 1949

The Year's Top Story

North Atlantic Treaty Organisation comes into being. Communist regime - China.

News of the Month

DC 3 aircraft crashes at Guildford, WA, claiming 18 lives.
North Atlantic Treaty Organization approved by the United States Senate.
Soviets close all crossing zones into Berlin.

People Who Share Your Birthday

- 1925 Ruth Cracknell
Actress
- 1915 Elisabeth Durack
Artist, writer
- 1747 John Paul Jones
American Naval Hero
- 1921 Nancy Reagan
First Lady of the U.S.
- 1932 Della Reese
Singer
- 1946 Sylvester Stallone
Actor, director

MONARCH
PRIME MINISTER
George VI
Ben Chifley

And the Winner Is...

- Best Movie All the King's Men
- Best Actor Broderick Crawford
- Best Actress Olivia de Havilland
- Radio Blue Hills
- Australian Grand Prix John Crouch
- Melbourne Cup W. Fellows
- Australian Open Golf FOXAH!
- Boxing (Heavyweight) Eric Cremin
Exzard Charles

Tunes of the Times

- Jessica Lange..... Caravan ... Dear Hearts and Gentle People ...
- Bruce Springsteen..... Diamonds Are a Girl's Best Friend ... Far
- Meryl Straep..... Away Places ... Younger Than Springtime ...
- Dennis Lillie..... Mule Train ... Ghost Riders in the Sky ...
- That Lucky Old Sun ... Again

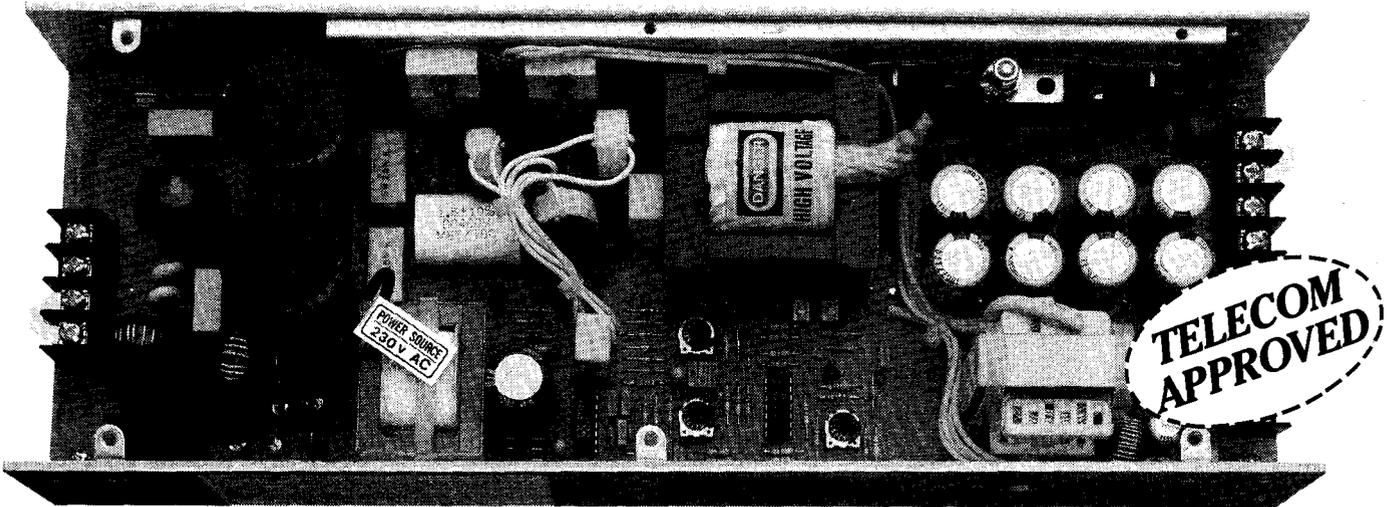
Famous Firsts

Cake mixes introduced ... Chrysler
Co. offered disc brakes ... RCA

Life in Australia - Then & Now

1949 1988

country, and trained up the shopkeeper in the art of operating the machines. The service costs the customer \$5.



Shown with cover removed

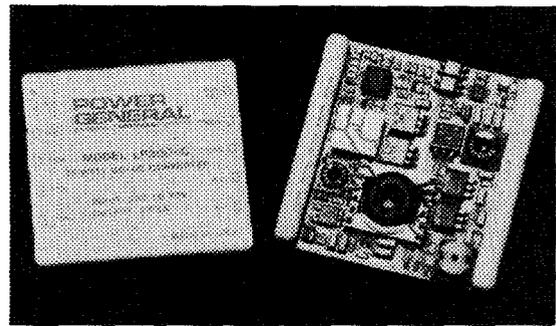
They've already met tougher specifications than yours. VDE, UL, FCC and CSA.

Our 15-300 watt power supplies meet every important safety and performance standard in the world, including VDE, UL, FCC and CSA.

And some have TELECOM Australia approval, one of the most stringent standards in the world. Surprisingly, the cost of all this quality and performance is very low.

Most needs can be met from our large range of standard models. If you have special needs, we can meet them quickly and easily by custom designing to your specification.

Shown above is model UNI300-48ABC. This is a 300W single output supply with 48V @ 6.5A from a 90-132V/180-264V, 47-440Hz AC input. Full overvoltage, overcurrent, short circuit and thermal protection is built in. It is approved by Telecom (No. RA87/112)



Shown above LP Series DC/DC Converters. Features: • 0.375" max. ht. • 7.7 watts/cub. in. • isolated triple outlets • 25 watt output power • 500kHz MOSFET switching • Surface Mount Technology • high MTBF 300,000 hours • 5 year warranty • internal π input filter is standard to minimise reflected ripple on input buslines • continuous 6-sided shielding virtually eliminates radiated emissions

If you need DC/DC converters, we can help you there too, with a range of low profile units from 1 to 100 watt ... the compact answer for just about any design need.

Whatever your requirements in power supplies or converters, talk to our engineers. They'll be glad to help you find the simplest, surest, most cost-effective answer.

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Tel: (03) 575 0222
Fax: (03) 579 0622

PERTH:
106 Howe Street
Osborne Park 6017
Tel: (09) 242 2000
Fax: (09) 242 2150

PARAMETERS
PERFECTION IN MEASUREMENT



STUART CORNER

ATUG OF WAR

Locally made content argument hots up

Communications roundsman Stuart Corner foreshadows troubles in the future of the telecommunications equipment industry . . .

Attempts to foster the local telecommunications equipment industry by regulations requiring minimum local content could be counter productive and a disincentive to increased efficiency, according to the Australian Telecommunications User Group (ATUG).

ATUG claimed that without a viable component industry, Australian content requirement was detrimental to industry growth. ATUG said that, in at least one instance, a manufacturer of mobile telephones was maintaining the labour component at an unnecessarily high level because it was unable to achieve the required local content in any other way.

The claim was made in ATUG's submission to the Department of Industry Technology and Commerce (DITAC) on the proposed telecommunications industry development arrangements. Submissions have also been made by the Australian Information Industry Association (AIIA), the Trade Unions, and the Australian Electronic and Electrical Manufacturers' Association (AEEMA).

DITAC is now considering these submissions and is scheduled to announce the new arrangements by the end of the year.

Scheme replaced

The arrangements were fore-

shadowed in the Department of Transport and Communications May 25 policy statement setting out its plans to re-organise the telecommunications environment in Australia. They will be administered by the Australian Telecommunications Authority, Austel, due to be set up in July 1989. They will replace the present regulatory scheme administered by Telecom.

Last September, DITAC announced its Information Industries Strategy (IIS) for the computer industry. In the long term, the Government is aiming for a single information industries policy embracing computer and communications equipment. Such an approach has been advocated by the Australian Information Industry Association (AIIA) and ATUG.

In its submission, the AIIA argues that policy "must focus on a consistent approach to the underlying technology, not the particular use to which it is put." The AIIA represents predominantly those companies in the computer industry already operating under the IIS.

However, suppliers of PABX and small business telephone systems have made considerable investment on market projections based on the present Telecom administered arrangements. They are now lobbying for a gradual transition to any new arrangements so as to allow them time to recoup investments and to restructure for any new arrangements.

Uncertainty

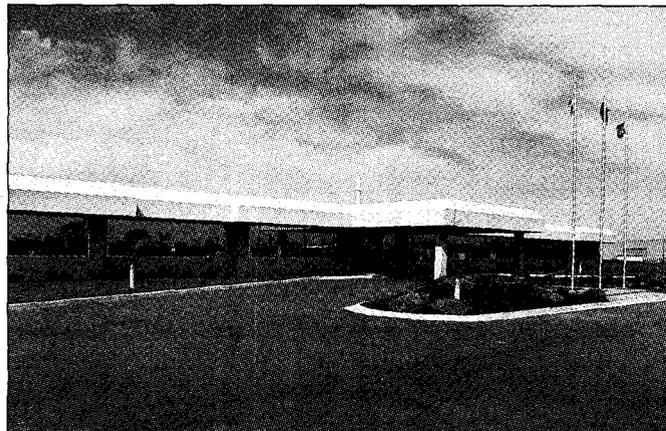
There appears to be a considerable divergence of views in the various submissions. Although the Government has pledged that the new arrangements for telecommunications equipment will be consistent with the information industries strategy, there seems to be some uncertainty as to whether it will be able to achieve this aim.

John Button, DITAC Minister has, perhaps, hinted at

the problems of reconciling the telecommunications industry's vested interest with the aims of the IIS. Speaking at the opening of Fujitsu's new Dandenong factory recently, Button omitted in the delivered version of his speech a reference to the new arrangements contained in the written copy. This reference said that the IDA would be "consistent with the objectives of the Information Industries Strategy and the thrust of the Partnership Programme."

Telecom in its submission advocates a gradual transition from its present preference scheme for PABX, small business telephone systems, the first telephone and cellular mobile telephone terminals. Under the present scheme, suppliers must gain 550 out of 1000 possible local content points allocated to different attributes such as: employment, investment, local production and sourcing, distribution and support, and export.

Telecom envisages this scheme undergoing two stages of modification each bringing changes in the weighting of the various attributes of local content. Telecom claims these would bring the scheme closer to the IIS, i.e: export R&D and value added content." This, Telecom claims, would create



John Button, Minister for Industry Technology and Commerce (4th from left) mixing Sake with pleasure at the recent Sake barrel opening ceremony performed during the inauguration of the new Fujitsu factory complex, Dandenong, Victoria.

◀ **Dandenong's gain . . . the new Fujitsu factory.**

consistency with other areas of the information industry.

Telecom also says it is concerned that it does not acquire a role as de facto industry policeman, ferreting out the connection of unapproved equipment to the network. Accordingly, Telecom calls for customs controls over the import of telecommunications equipment. At present, for example it is not illegal to either import or sell a modem which is not approved for connection to the Telecom network, it is only illegal to use it.

The AIIA claims, however, that the Telecom proposal would result in the status quo being maintained. Telecom, in turn says that the AIIA proposals do not take into account the need for a gradual transition to new arrangements, but focus instead on what the end result should be.

The submission prepared by the Electrical, Electronic and Information Industries Trade Projects Group (EEIITPG), a group of seven trade unions, also advocates a modification of the present points scheme to include allowance for exports. It recommends that the new points

scheme be phased in over three years and that it continue to be the means by which the industry is administered.

The EEIITPG claims that the present points scheme for PABX manufacture and supply, administered by Telecom, has been extremely effective in creating considerable local content without the burden of additional costs to users. All that is needed, according to the unions, is a modification of the scheme to achieve the goal of developing an export oriented industry.

In a hard hitting statement, the EEIITPG claims that "Australia's performance in international trade in communications equipment is abysmally poor in absolute terms." But, it claims trends are more worrying. "Australia now has a communications equipment export/import ratio of only 0.07, the lowest in the OECD." About half of our communications equipment exports are re-exports, the submission claims.

"The International Telecommunications Union established that the world market for communications equipment would double over the ten years from 1982 to 1992

... since 1982, Australia's communications equipment industry has continued to decline in real output, real investment and employment. This has meant that Australia is unlikely to be able to take advantage of any international opportunities."

And elsewhere . . .

One-stop shopping

OTC is preparing to offer a single point of access to over 800 databases. The service, due to be launched in October, will give users one common command set and one account. Many database systems today have quite different user interfaces, and many require users to pay an upfront subscription fee in addition to usage charges.

The service, under the

'... a modification of the present points scheme'

name Intelnet, will be provided using the Telebase software from Telebase Systems Inc. OTC has purchased a 21 per cent shareholding in the company for \$US3 million through its subsidiary OTC International.

Intelnet is only the first of many value added services which OTC, newly freed by government policy, is likely to operate in the future. The Commission is to become a corporation, 100 per cent owned by the Commonwealth Government, on January 1, '89.

Protection needed

Australia should adopt stand-



ards for the degree of protection from electromagnetic interference (EMI) built into electronic products manufactured in or imported into Australia. According to Ian Macfarlane, head of the electromagnetic compatibility section at Telecom Research Laboratories, international standards exist and are enforced throughout Europe. In an article in the Laboratories' newsletter Telecom Researcher, Macfarlane claimed that the adoption of such standards could go a long way to reducing Telecom's costs in combating EMI.

A particular problem which his section was called upon to solve is interference from the PABX system, on radio services piped into hotel and motel bedrooms. The laboratories' solution comprised a special mains filter for the radio system and the installation of a copper reference plate within the PABX to provide an alternative route for the signals.

The laboratories are now producing kits for distribution to customers who experience problems with EMI. 

Stuart Corner is a former editor of C in C News, and a regular writer on computers and communications.





XT* TURBO MOTHERBOARD

- 8MHz
- 8088 Processor
- Expandable to 640K on board.
- Provisions for up to 6 x 2732 EPROMs on board
- Keyboard connector
- 8 Expansion slots

X18030 (excl. RAM) \$169
 X18031 (incl. 640K RAM) \$699



10 MHz XT* TURBO MOTHERBOARD

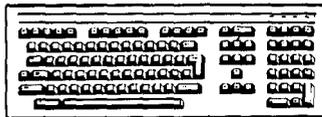
- Increase the performance of your sluggish XT* approximately four times with this super fast motherboard.
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 - 4 Channel DMA
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- 256K, 512K, 640K, or 1,024K RAM
- 64K ROM
- Phoenix BIOS
- 8 Expansion slots

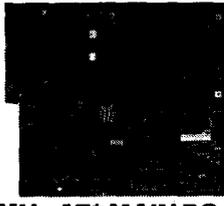
X18200 (excl. RAM) \$689
 X18201 (incl. 640K RAM) \$1,299



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Cat. X12022. only \$109



6/10 MHz AT* MAIN BOARD

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X18100 (Excl. RAM) \$689

386 MAIN BOARD

- Intel 80386 CPU (16MHz)
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MULTI I/O & DISK CONTROLLER CARD

This card will control 2 x double sided, double density drives, and features a serial port, a parallel port, and a joystick port or games port. It also has a clock/calendar generator with battery backup.

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(Includes cable but not 41256 RAM)

- Serial port
- Parallel port
- Games port
- Clock/Calendar with battery backup
- provision for second serial port

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MULTI SERIAL CARD

- 4 RS232C asynchronous communication serial ports. One fitted 3 optional.
- 450 Asynchronous communication ports (ACE)
- COM/AND/COMPATIBLE
- DTE/DCE compatible
- Drive support for XT* XENIX*
- Interactive installation procedure available.

X18154 \$139



FLOPPY DISK DRIVE CONTROLLER CARD

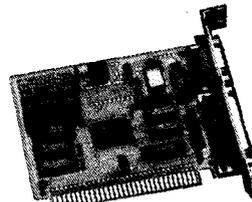
These cards will control up to 2 or 4 double sided 360K IBM* compatible disk drives.

X18005 (2 Drives)...\$52

FLOPPY DISK DRIVE CONTROLLER CARD

- Supports 1-44MB, 1:2MB, 720K, 360K
- PC*/XT*/AT* compatible
- 5 1/4" and 3 1/2" drives

X18009 \$139



GRAPHICS CARD

- Hercules compatible
- Interface to TTL monochrome monitor
- One Centronics parallel printer port
- 2K-Static RAM, 64K Dynamic RAM
- Display Mode: 720 dots x 348 lines

Cat. X18003 \$139

COLOUR GRAPHICS CARD

This card plugs straight into I/O slot and gives RGB or composite video in monochrome to a monitor.

Colour graphics: 320 dots x 200 lines.
 Mono graphics: 640 dots x 200 lines.

Cat. X18002 \$99

ENHANCED GRAPHICS ADAPTOR CARD

- 256K display RAM
- Handles monochrome, CGA Hercules and E.G.A.
- Paradise* compatible
- Up to 16 colours
- Standards: 320 x 200, 640 x 200, 640 x 348, and 720 x 348.

X18070 \$330

COLOUR GRAPHICS & PRINTER CARD

This combination card features printer and monitor interface. It has 1 parallel printer port, RGB CTTC outputs.

- Colour:
 Text Mode: 40 columns x 25 rows.
 Graphics: 320 x 200
- Monochrome:
 Text Mode: 80 columns x 25 rows.
 Graphics: 640 x 200

Cat. X18010 \$99

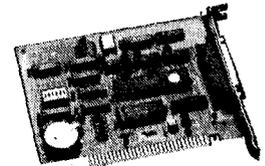
PRINTER CARD

This card features a parallel interface for Centronics printers. Included is printer data port, printer control port, and printer status port.

Cat. X18017 \$29

DTC HARD DISK CONTROLLER CARDS

X18060 (XT) \$190
 X18140 (AT) \$290



RS232 & CLOCK CARD (WITHOUT CABLE)

This RS232 card supports 2 asynchronous communication ports. Programmable baud rate generator allows operation from 50 baud to 9600 baud. Fully buffered. Clock includes battery back-up and software.

Cat. X18028 \$89

RS232 (SERIAL) CARD (WITHOUT CABLE)

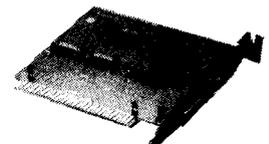
This RS232 card supports 2 asynchronous communication ports. Programmable baud rate generator allows operation from 50 baud to 9600 baud. Fully buffered. Second serial port is optional.

Cat. X18026 \$49

CLOCK CARD

Complete clock card including battery back-up and software.

Cat. X18024 \$55



GAMES I/O CARD

Features two joystick ports. (DB15).

Cat. X18019 \$29

I/O PLUS CARD

Provides a serial port, a parallel port and a joystick port, and even a clock/calendar with battery backup!

Cat. X18045 \$119



512K RAM CARD (SHORT SLOT)

- 512K memory
- User selectable from 64K to 512K
- DIP switches to start address

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 X18014 With RAM \$459

2 M/BYTE RAM CARD

Plugs straight into BUS ports on motherboard. XT* compatible. RAM not included.

X18052 (Excluding RAM)..... \$194



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- Fast 8MHz TURBO Motherboard
- AT* style keyboard
- Tested by us for 24 hours prior to delivery!
- 8 Slot motherboard
- 12 months warranty!
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256K RAM Single Drive, Graphics and Disk Controller Card. **\$895**

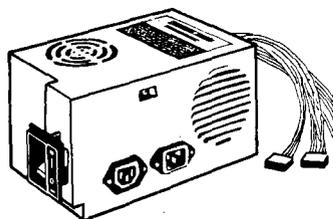
640K RAM TURBO COMPATIBLE COMPUTER

2 x 360K Disk Drives, Multifunction Card, Colour Graphics, Disk Controller, 1 Serial, Parallel Port. (Includes Timer Disk). **\$1,095**

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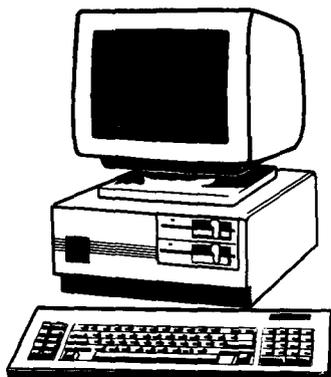
DC OUTPUT: +5/13A, -5V/0.5A
+12V/4.5A -12V/0.5A

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200W SWITCH MODE POWER SUPPLY FOR IBM* AT* & COMPATIBLE

DC OUTPUT: +5/16A, -5V/0.5A
+12V/5A -12V/0.5A

Cat. X11097 **\$199**

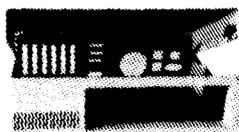


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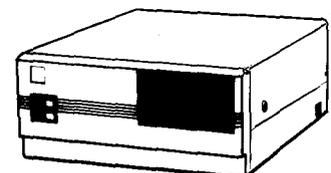
XT* size and styling. Features security key switch, 8 slots, and mounting accessories. Size: 490(W) x 390(D) x 140(H)

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IBM* XT* COMPATIBLE CASE AT* STYLING

Now you can have the latest AT* styling in a XT* size case. Features security key switch, 8 slots, and mounting accessories. Size: 490(W) x 145(H) x 400(D)

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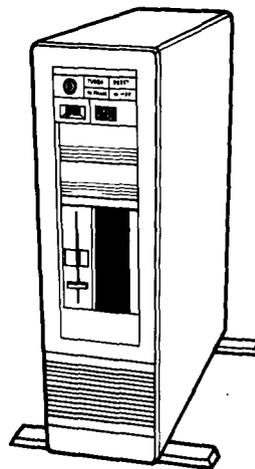


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Our latest computer casing, featuring security key switch, 8 slots, and mounting accessories etc.

Size: 360(W) x 175(H) x 405(D)
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386 TOWER PC

The 386 Tower PC is a high performance system that is functionally and mechanically compatible with the IBM* AT*. However, the 386 Tower PC contains a 80386 microprocessor, 32-bit memory access, and other features, giving it 2-5 times the performance.

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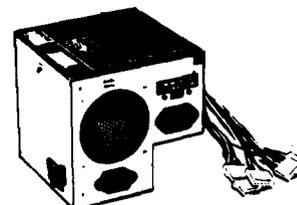
- Intel 80386-16MHz microprocessor
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- One 32 bit memory slot with 0 wait state.
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- Up to 2 M/Byte or 8 M/Byte RAM modules on system board or on RAM card
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- Option for 80287 & 80387 co-processor socket
- Operates in page mode with interleaved memory subsystem
- Shadow RAM supported to allow system BIOS to be executed on system memory instead of slower EPROM
- Real time clock with on board rechargeable battery or external battery
- Four 16-bit I/O slot. Three 8-bit I/O slot, and one 32-bit memory slot.
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- Seven direct memory access (DMA) channels
- 16 interrupts
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PAUL BUDDÉ

PUBLIC SERVICE NETWORK

Expansion to public sector envisaged

A new network from the Public Service Board will initially link 160 locations around NSW and will be progressively expanded to provide a service available to the entire state public sector. The network between departments will not only improve the efficiency of the State's administration but will also result in considerable cost savings through the sharing of hardware. It will reduce

the duplication of equipment, reduce data processing costs and improve communications to remote areas. It will also complement the State Government's planning for its telecommunications strategies.

Initially the Network will be used by the Department of Youth and Community Services (YACS) for their Client Information System, and the State Land Information Coun-

cil for the state's integrated land information system. The system will also form the basis of the NSW Tourism Commission's NEWTRACS system linking booking and information offices with transport, accommodation and tour operators across the State.

The three Australian companies who won contracts are Computer Protocol Pty Ltd (supply network interface devices and switches), General Technology Pty Ltd (supply terminals), and JN Almgren Pty Ltd (supply multiplexes).

Ausinet

A new on-line bibliographical reference system is available on Ausinet, the Australian data base network. This data base includes all Australian publications on work and la-

bour, employment, education and training, industrial relations and wages, job creation, equal employment and industrial democracy.

The system will provide a current reference service and an historical research tool, which covers Australian and overseas monographs and journal articles from last century to the present and a complement to such Australian social sciences data bases as Australian Education Index, Australian Public Affairs Information Service and Australian Family Studies Data Base. There is also a complement to international data bases like Labordoc (International Labour Organisation) and Eric (US Department of Education).

Understandascope

It sounds just like last generation's sci-fi fantasy come true — programming the delicate nuances of human relationships onto microchip.

The Understandascope service (edited by the writer of this column and created by clinical psychologist Warwick

Bubb) is based on Dr Carl Jung's theory of personality. This represents state-of-the-art third generation videotex use.

The Service will provide a unique opportunity for relating to other people. The two dimensions of this uniqueness are:

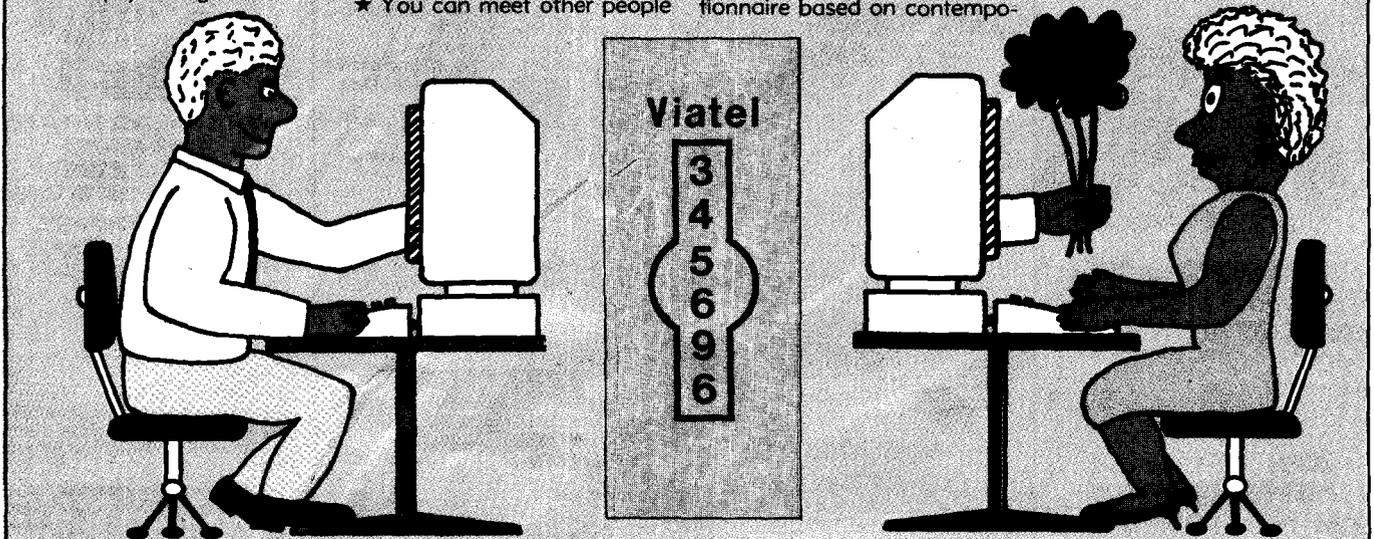
★ You can meet other people

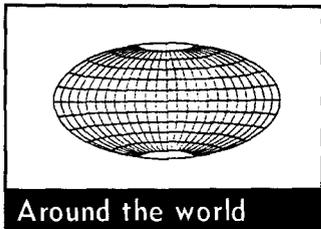
and find out a great deal about what kind of person you are without ever actually moving from your videotex screen;

★ A users' club will exist so you can actually meet people at social occasions.

The Understandascope Service is, together with a questionnaire based on contempo-

rary scientific research, linked with Node 345696 on Viatel and, once completed, can provide you with 15,000 words about yourself, your interests and the occupational habits, the kind of people you will be best suited to live and work with — a huge amount of data about yourself.





Free trial success

The Austrian PTT has been actively promoting the national videotex service with a six months free trial, offering new subscribers free access to services. Since its start, SCH600 million has been invested in the national service which to date has about 8000 users, 59 per cent of which use Mupid intelligent terminals.

Since the start of this "free trial" programme in October '86, the number of subscriptions has increased by 3000. However, there are still only 8000 subscribers, which probably reflects the fact that the Austrian system did not reach a stable performance before 1986. In the meantime, the Austrian PTT itself continues to lease Mupid terminals for SCH130 per month, plus SCH70 per month for the modem. In addition, users pay SCH40 per month, a local telephone charge plus a subscription charge of about \$5 per month.

News service on-line

The joint UK Observer Prestel News Service, which went live last year, fills the gap as an on-line source for international news and news analysis, at the proverbial touch of a button, for videotex users.

News reports are compiled by *Observer* newspaper journalists with direct access to exclusive stories from foreign correspondents as well as the news coming through the normal international agencies.

An overnight round up of UK news is available on screen each morning and augmented throughout the working day with the headline news stories as they occur, and with in-

depth analysis and comment where appropriate. As well as a review of the news and comment from the national press, daily coverage also includes TV programme news and previews with a special 'What's on' and 'What's new' in the arts section.

Videotex demise?

British Telecom (BT) has just restructured its value added data service into an enlarged Dialcom Group, which is now fully operational. It combines Dialcom Inc (available in 17 countries) and includes Dialcom 400 (a X.400 messaging service), Telecom Gold (including gold 400, based on Dialcom software), and BT's value added business services which include Prestel.

BT's computer network services division which provides technical support for the UK, is also part of the Dialcom group. The idea is to integrate the marketing of what BT calls value added businesses, and separating developing work.

Transpotel opts out

Transpotel is one of the first true blue European videotex services now seeing the limitations of that technology.

Since 1982, Transpotel offers services in a transport capacity in West Germany, the UK, The Netherlands, France, Norway, Austria, Sweden and Switzerland.

The new trend is PC based services with VAS communication options for EDI — Email and centralised information.

With the inflexibility of the Prestel technology used in these countries the need to look for other solutions has emerged.

Integration

The German videotex service Bildschirmtext (Btx) will be integrated into the national ISDN network. A Btx access point will open in November 1988 in the USA; by mid-1990, eight Btx access points will be installed. Users will pay

a maximum of 65 US cents per minute to access the service.

Integration of Btx with ISDN means that sophisticated Btx graphic frames will only take 0.5 sec to be transmitted compared to 20 seconds currently. It will also provide enhanced features such as having a light flicker on the user's terminal whenever a message is sent to his individual mailbox, or display the telephone number of someone who is calling, while the line is being used to access the Btx service.

The German Bundespost will also introduce a kiosk type charging method as an option for Bildschirmtext IPs by the end of this year.

Electronic school

Publishers McGraw-Hill in the USA developed an electronic service, MIX for schools and teachers with exchange pro-

'Understandascope will provide a unique opportunity for relating to other people'

grammes for overseas contacts.

Students in Australia, the USA, Germany and Puerto Rico can communicate with each other through MIX. This service has an electronic mail facility, computer conference service, file transfer facilities and a news service.

Subscription to MIX is \$US149.50 p.a. A similar service is also in operation in the UK under the name 'The Times Network for Schools'.

Ask and you shall . . .

The USA publisher Grollier was able to generate \$US5 million revenue with their electronic publisher's division. Their major product is the Academic American Encyclopedia. This product is published in several different ways.

There are the on-line versions on 17 different data bases. The service is profitable but this money is 'swallowed up' by the CD-ROM and the CD-I versions. CD-ROM is used in schools but strangely enough, Grollier does not see a great future for this product. They are more optimistic over the CD-I version, combining text, pictures and audio.

Bell rings up victory

Regional Bell Operating Companies (RBOC) in the USA can offer information transmission and gateway services as long as they don't control the "generation or manipulation" of information content, according to Judge Harold Greene's long-awaited clarification of his RBOC information activities ruling.

The decision grants "wide flexibility to RBOCs for transmission systems and voice storage application" — significantly expanding RBOC's ability to offer information services.

Green's ruling — a remarkably conciliatory and sympathetic document — is the first official permission for RBOCs to plunge into the ventures outlined in his September 10 decision. The RBOCs have now been authorised to:

- ★ Set up gateways;
- ★ create and manage "introductory information content" (menu frames) on gateways;
- ★ provide "kiosk" billing and collection services;
- ★ offer protocol conversions;
- ★ operate voice storage and retrieval systems, including audiotex services;
- ★ support electronic mail development;
- ★ provide data transmission services, including address translation.

eti

Paul Budde specialises in the marketing and management of electronic services and communication networks.



ARTHUR CUSHEN

A FOREIGN AFFAIR

New Zealand's Shortwave Service assured

Our man in New Zealand reports on the successful bid for funding which will ensure the future of the Radio New Zealand shortwave service.

One of the outcomes of the recent change of policy for broadcasting and television in New Zealand which went almost unnoticed was the fact that the Shortwave Service of Radio New Zealand is assured of funding in the future from the taxpayers through the Ministry of Foreign Affairs.

The Shortwave Service celebrated 40 years of operation on September 26, and has over that long period used the same transmitting equipment.

The service continued with its programme to the South Pacific until May 1, 1976. On that date the Government terminated the support and the station was off the air for five weeks.

'The Broadcasting Tribunal is to be disbanded . . .'

Worldwide protests were such that the Government restored funding and broadcasts continued to May, 1982. At this point the funding was again cut and since then the shortwave service has been funded from licence fees by the Broadcasting Corporation of New Zealand.

It is not expected that the changeover to the Ministry of Foreign Affairs will occur before July 1 next year and in the meantime plans for upgrading the technical facilities are expected to be released shortly.

The present schedule is

1830-2115 hrs on 12045 kHz 15150 kHz; 2345-0145 and 0345-0730 on 15150, 17705; 1000-1215 on 6100, 9850. On Saturday and Sunday there is continuous transmission from 0145-0345 carrying the Sporting Service.

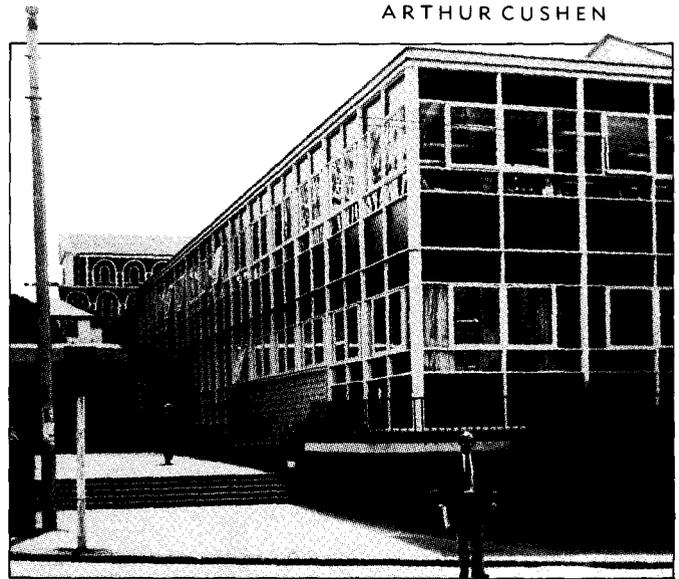
From October 30, New Zealand has been on Daylight Time, and these broadcasts are heard one hour earlier, up to the return to standard time on the first Sunday of March, 1989.

By tender

The Broadcasting Corporation of New Zealand is to be disbanded, while Radio New Zealand and Television New Zealand become state owned enterprises, and will be in competition with private operators.

The Broadcasting Tribunal is also to be disbanded and as from April next year the allocation of frequencies will be by tender under the control of a Broadcasting Commission. At the same time, the present stations will not be effected by a change in policy, while there is to be the introduction of Sunday commercials after 1 pm local time.

National and Concert programmes can have sponsored programming, while a Broadcasting Standards Authority will allow public and private broadcasting to draw up their own rules and thus safeguard the standards of radio and television in the future. A



Broadcasting House, Wellington from where Radio New Zealand Shortwave Service originates.

threat of taking a station off the air for 24 hours is one of the major planks in the role of the new authority, while for all broadcasting and television stations, membership is compulsory.

World waves

COSTA RICA: Radio for Peace International, PO Box 88, Santa Ana verified with letter, card and history of the station. The present schedule is weekdays 1800-0000 21555; 0200-1000 13660; 1400-1700 7375, with all transmissions in English except 1400-1700 which is in Spanish, and transmitter power is 2 kW.

PHILIPPINES: FEBC Manila, on 11995 kHz opens at 0900 in the Japanese and Indonesian languages, till 0930. English to the South Pacific 0830-0930 is now on 11850 and 15100 kHz.

UNITED KINGDOM: The title *BBC World Service* now covers all language broadcasts not just English as in the past and the name *External Service* which was used for the 36 languages carried by the BBC, has been dropped.

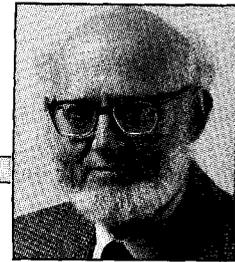
The World Service to Australia is carried on several channels, but the best reception 1800-2000 is on 9410, 9740, 11750; 2000-2200 7145, 9570; 0600-0815 7150, 9640, 11955, 15360 and 0900-1130 9740, 11750, 15070, 15360.

USA: Voice of America to the Pacific has altered frequencies, and now operates 2200-2400 15185, 15305, 17735 and 1100-1200 5985, 6110, 11715, 15420 kHz.

The latest schedule of KUSW Salt Lake City is 1600-1900 on 15225; 1900-2200 17715; 2200-0100 15580; 0100-0300 11695; 0300-0500 9815; 0500-0700 6175; 0700-1100 6135; 1100-1600 9850 kHz.

eti

This item was contributed by Arthur Cushen, 212 Earn Street, Invercargill, New Zealand who would be pleased to supply additional information on medium and shortwave listening. All times are quoted in UTC (GMT) which is 11 hours behind Australian Eastern Daylight Time.



JOHN COULTER

LEARNING THE HARD WAY

Whither science and education!

John Coulter expresses concern at the gradual demise of R & D funding and warns what may happen to our industry should this trend continue . . .

Despite protestations from Senator Button, and particularly the Minister for Science, Barry Jones, that science, science education and research are important, especially to Australian industry, funding for these activities is not faring well.

Direct Commonwealth expenditure on research and development for 1987-8 of \$1179 million compares with \$1178.5 million in 1986-7, a real decrease of almost 6%.

Compared with 22 OECD countries Australia is 15th on the proportion of Gross Domestic Product spent on R & D. The US, Japan and Sweden each spend almost two and a half times as much of their GDP as Australia (see Table). As their per capita GDP is higher than ours the absolute amount spent is much greater. In expenditure on higher education we rank 11th, spending less than half that of Sweden.

In comparison with other OECD countries business enterprises in Australia do not support R & D as vigorously as those in other countries. We are equal 16th with Ireland spending only one fifth as much as a proportion of GDP as Japan.

Over the past 20 years we have spent an almost con-

stant proportion of GDP on higher education while the percentage spent on R & D fell from 1.3% in 1968-9 to 1% in 1981-2 and has now recovered to 1.16%.

Pyramid

In many respects, however, the situation is worse than these figures would suggest. Research, development and higher education perch atop a pyramid of community awareness and positive orientation toward science.

These depend upon broad, quality education at the lower levels which interest students in science and the interaction of science and society. In such an education, science comes to be seen as an exciting creative activity of relevance to most social decisions; science valued for its own sake and as an aid to understanding and influencing the world around us. (For example, being excited by understanding of the processes of human reproduction and being able intelligently to enter the debate over in-vitro fertilisation).

What we have seen, however, has been a narrowing of perspective toward those aspects of education and R & D which are thought to be useful and profitable in the

short run. This will work for a while, for we can draw on the people, attitudes and skills produced over previous decades. But in the end it will fail.

Scientific enterprise cannot exist in isolation or in a strait-jacket. The driving force of scientific inquiry is curiosity in a creative mind. Newtonian physics guided our rockets into space and allowed us to land on the moon.

Understanding the structure of DNA has allowed us to manipulate genes and genetic sequences, yet neither inquiry was motivated by immediate applicability, and indeed, was not immediately applied. And so it was with the investigations that led to the transistor, and through it, to the development and spread of cheap computers.

But there is another fault in the Government's narrow orientation. An information society is more than one which develops ever faster and cheaper ways of processing words, figures or pictures. A society with this narrow technical focus (Australia, if we don't quickly lift our sights) merely increases the noise to signal ratio.

Dressed garbage

Compare the words-and-pictures-rated present with 50 years ago. How much of

what now washes past us is information, how much is garbage dressed in the guise of information which clutters our input, our memory, our analytic and integrating functions? Who controls the use of this technology and to what purpose is this control directed? Who funds research into these sociological questions? Certainly not the companies currently exercising control! And who opens these data to democratic discussion and political choice? Certainly not the present governments or bureaucracies of Australia with their narrow utilitarian orientation.

Yes, we do need to spend a great deal on education including science and technical education. Our research effort needs to be boosted substantially. But we must also relearn the intrinsic value of these activities. These pursuits are their own justification; they are a social benefit, not an economic cost.

For if the beautiful and the elegant are forever shouldered aside by the pragmatic and the utilitarian we shall steadily become slaves rather than masters of the industrial system and we shall certainly lose our humanity. **eti**

Senator John Coulter is the spokesman for the Australian Democrats on Science and Technology.

Comparison Table

Country	R. & D. as % of G.D.P.	% in Higher Education
USA	2.88	0.39
Japan	2.81	0.57
Sweden	2.79	0.69
Germany	2.60	0.40
UK	2.33	0.32
Australia	1.16	0.32
New Zealand	0.95	0.14
Spain	0.44	0.08
Portugal	0.40	0.10
Greece	0.32	0.06



JOHN COWARD

THE ART OF SURVIVAL

An eye on the danger signs in business

More than half of all small businesses fail soon after launching. Some survive a little longer. In this article John Coward helps you find the clues which might spell doom.

The entrepreneur with a good technology who sets up a business often fails due to poor financial management. In fact, it's the major reason why 65 per cent of small businesses fail in the first seven years.

The scenario is something like this: The technology is good, so all goes well. But the business is undercapitalised, so it's necessary to borrow to finance production. Sales go through the roof, but costs go up to match. The result: our entrepreneur can't get ahead — and worse, he can't understand why.

Proper management

As small businesses face a more difficult economic climate, greater complexities and paperwork due to changes in tax and other government regulations, the problem of lack of proper management assumes more and more importance.

What are the danger signs that a creditor concerned about a customer's business looks for?

- Payments delayed from 30 to 60 days and beyond.
- Paying rounded amounts indicating part-payment of

debts because the full amounts cannot be met.

- Not paying tax regularly.
- The chief executive is never available and doesn't return your phone calls — in other words, he's hiding.

For the business person who is heading for trouble, the early warning signs are:

- Chronic liquidity problems, like writing cheques but not posting them because they'll bust the overdraft.
- Never enough stock to meet production line needs.
- Constantly increasing borrowings or the overdraft limit to cover costs.

The important thing for a business person in this position to do, is to look at the monthly balance sheet. This should show the early warning signs. With the good business programmes available for computers this is not difficult. Each month's costs should be offset against the month's income.

It's more important to interpret trends in a business than look at the position at any one time. This is where the owner needs to see a financial adviser. Too many entrepreneurs go on borrowing making the situation go from bad to worse

So how does a business go about pulling itself out of this ever-deepening hole?

Look at your resources and analyse the contribution each activity makes. If, for example, the return a product makes towards recovery of fixed costs is below the cost of production it may be appropriate for the product to be discarded.

Not the answer

Borrowing more may not be the answer. A better solution may be to look at the structure of the business and reorganise, cut out unprofitable activities and concentrate on areas which are contributing. It may be that the company itself cannot be saved, but the resources it has, the people, the plant, the product, can be re-directed to better use.

It may be possible to put in place long-term finance instead of just pushing up the overdraft every time there is a crisis.

One of the big problems for small business in Australia is

the lack of suitable venture capital for emerging businesses, such as is available in the US and UK. However, there are various sources of venture capital that can be approached and this area has been covered in previous articles.

What about one of the constant complaints of small business — the slow payers? The key is to decide how much you need the customer — and if you are prepared to finance the relationship. You may be better off discarding it.

Proper credit control systems, along with checks on monthly cash flow, are an important part of a system of financial management that is essential to a well-run business.

Basically, the message is: don't wait until the worst happens. Put in proper financial controls from the beginning. **ETI**

John Coward is the National Technology Partner of Coopers & Lybrand, management Consultants.



Regular monitoring of outstanding debts constitutes a must for survival in any business, large or small.

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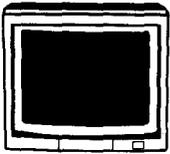
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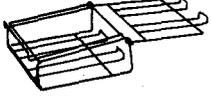
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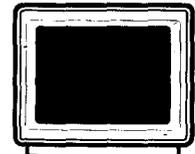
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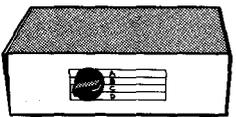


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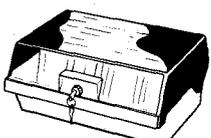
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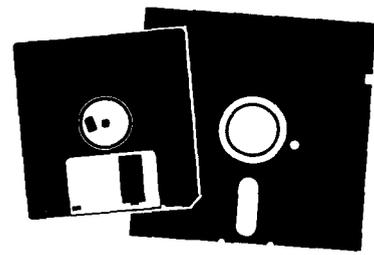
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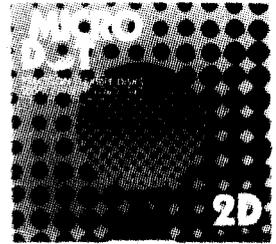
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ANNA GRUTZNER

The Minister for Defence, Kim Beazley, had just stepped from the cockpit of a United States Air Force (USAF) E-3 Sentry aircraft — in Darwin mid-year for Operation Pitch Black — when he announced Australia would acquire an Airborne Early Warning (AEW) capability.

He summed up his own final conversion to the cause with the words: "The contribution made to air defence using AWACS (Airborne Warning And Control System) and not using AWACS is like chalk and cheese. If you use AWACS you win, if you don't use it you lose."

It was rather like someone test-driving a Ferrari saying they were so impressed with its performance that they would go out and purchase a Mini-Minor. Having seen the best and most expensive "eye in the sky" in action, Mr Beazley may find it difficult to tailor his tastes in AEW to a model that fits his somewhat more modest budget.

The options for our RAAF to get into the AEW business are, however, far more realistic with the advent of cheaper versions of the original AWACS concept, which are being marketed by AWACS' competitors in the defence industry. Many are, in fact, better-suited to our regional air defence requirements.

BEYOND THE HORIZON

The airborne early warning system

Defence writer Anna Grutzner reports on government plans to equip its RAAF aircraft with the latest early warning capability.



Kim Beazley.

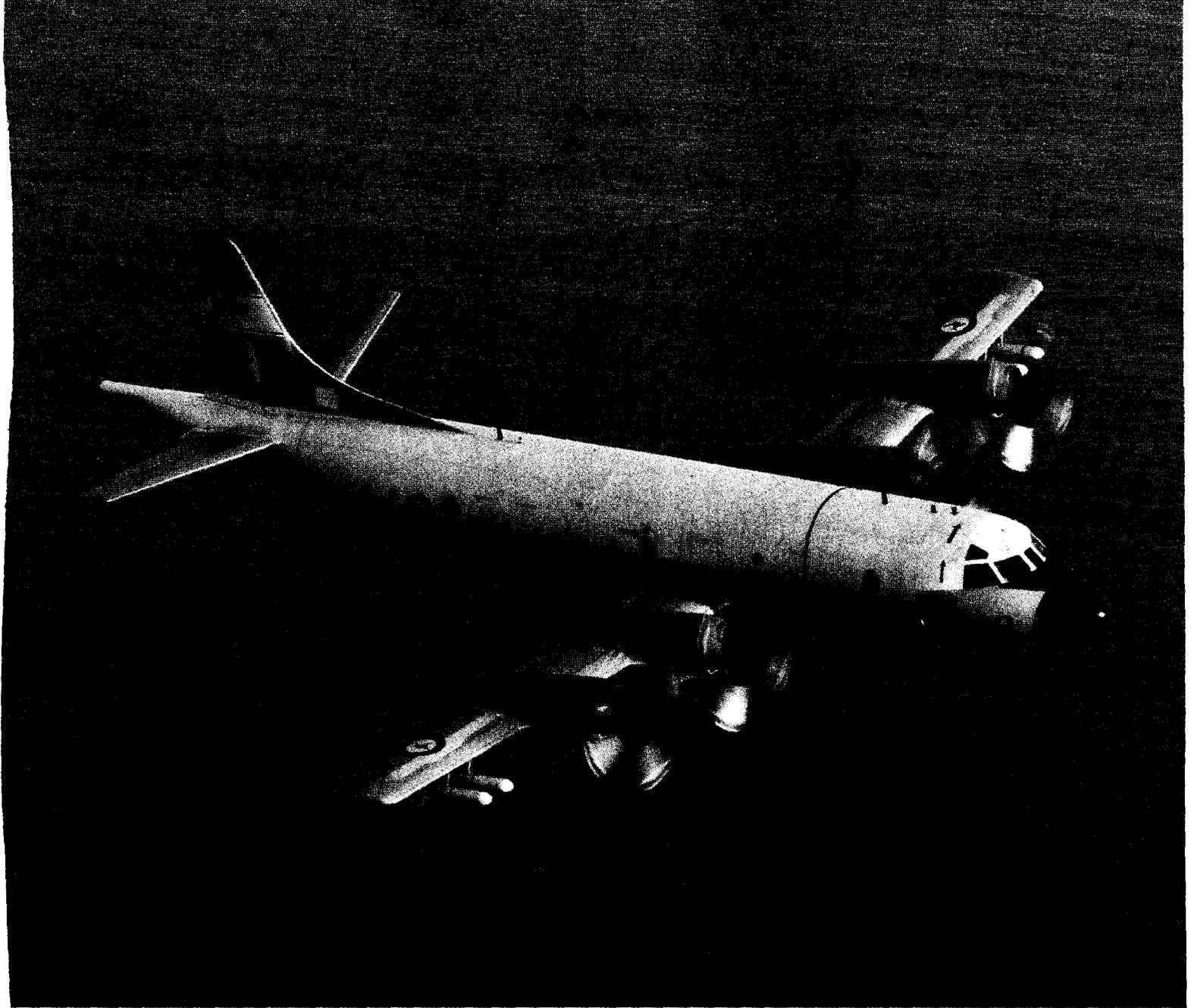
Australia will probably fit AEW to three or even four of its existing types of aircraft, possibly the P-3C Orion, the 707, or the C130 Hercules transport plane, for which there are specific systems developed and in operation elsewhere. The project has a five-year span, with a view to having the aircraft fully-fitted by the mid-1990s. However, the RAAF and Defence Department are somewhat at odds over how fast the tendering process should proceed, with the former being anxious to see AEW in its aircraft as quickly as possible. The Government is in the process of drawing up a tentative shortlist of tenderers.

More pressing

The fact that our regional neighbours have modernised their air defence systems, and in some cases bought AEW, has made the case for Australian AEW more pressing. Singapore, Malaysia, Indonesia and Thailand are acquiring F16 aircraft and range extenders, such as aerial refuelling capabilities. The fiercely competitive manufacturers are, moreover, ever-watchful of opportunities to sell improved technology to middle and Third World powers.

Mr Beazley says he has up to \$400 million to spend on AEW. It is an outlay he is quick to point out would save the RAAF \$800 million in buying extra FA-18 Hornet fighters to perform the early-warning role. The cost of a single AWACS (brand) is about more than \$100 million, just beyond our price range if the sensible option of purchasing four remains on target.

Given the Government's awareness of the potential spin-offs for Australian industry in re-equipping and modernising the defence forces, the ability of prospective tenderers to offer attractive off-sets or industry participation may be a



An RAAF P3C Orion. These aircraft could be converted for AEW functions.

base-level requirement for the AEW fit. The successful Boeing deal in Britain, for instance, involved offsets of 130 per cent to UK industry. Initially Boeing, who teamed with Plessey, Ferranti and Racal for the project, had only offered 35 per cent offsets. Moreover, while the failure of the Nimrod AEW3 tender was a major disappointment to British Aerospace, there is usually industry work that comes the way of the loser. BA has been awarded the \$20 million contract to instal the American AWACS in the RAF aircraft.

The Government is keeping an open mind on whether it buys the AEW system to fit into existing aircraft or purchases a couple more aircraft complete with AEW capability. In the event of the

latter, new P-3 Orions, already used in the anti-submarine role, are strong contenders. If the 707 is chosen, the AEW will almost certainly be fitted to the three being equipped with aerial refuelling capacity. The AEW-gearred fleet would be based at Richmond or Edinburgh airbase, depending on which airframe is selected.

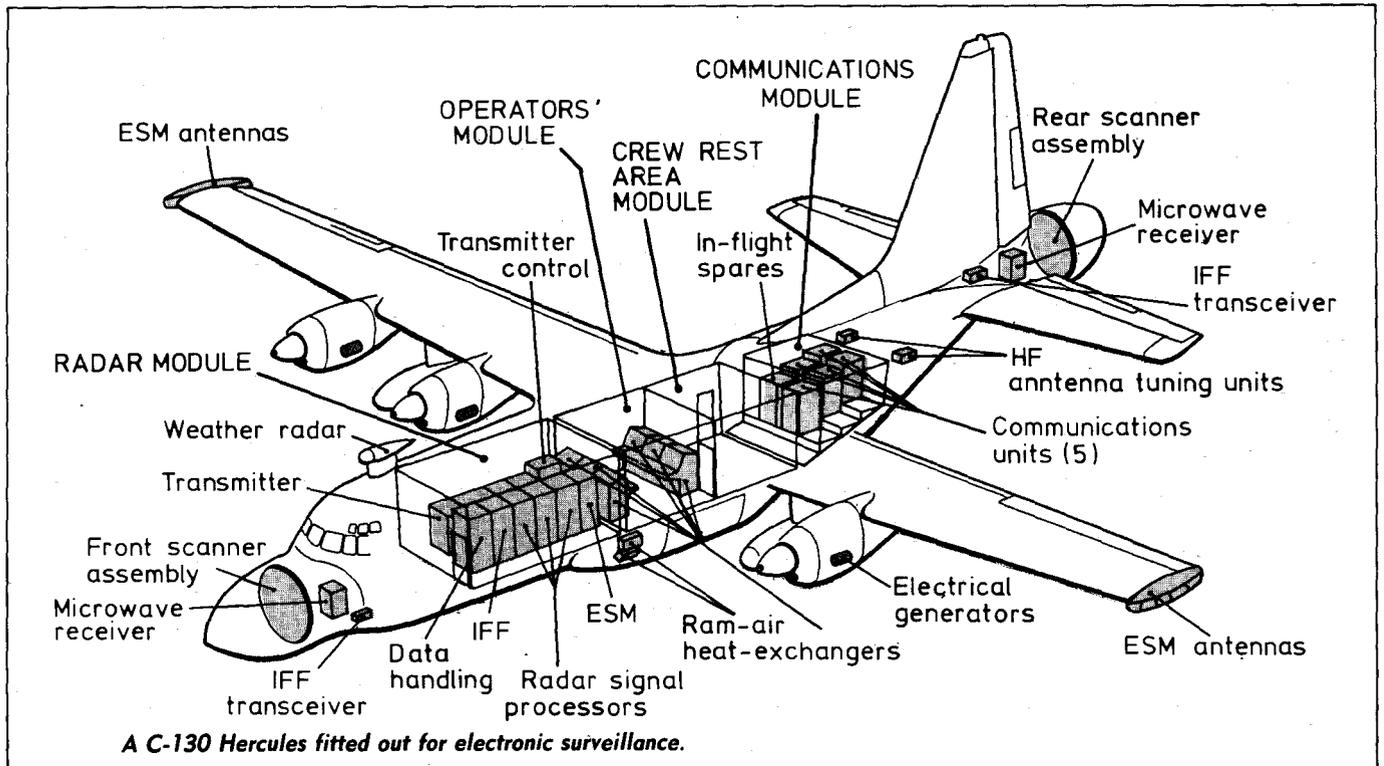
It may seem an extravagance when the Government is set to spend \$500 million on the Jindalee over-the-horizon radar to be getting into AEW. But it has long been an item on the RAAF shopping list. The limitations of Jindalee and the FA-18 Hornets as an air defence system were recently acknowledged by Mr Beazley. Over-the-horizon radar uses radar frequencies in the HF shortwave

band, which bounce the beam off the E-layer in the earth's ionosphere. It is an extremely cost-efficient approach to surveillance of a large area. However, the system is susceptible to climatic changes producing variations in the reflectivity of the ionosphere, no matter how much the system itself tries to compensate.

Examining concept

While Australia cannot afford the original Boeing E3 AWACS, it is worth examining the concept and capability as a measure of how advanced AEW is. The E3 airframe has been modified from the commercial Boeing 707. From a height of 10,000 metres, the E3 AWACS can identify attacking aircraft more than

Airborne warning and control



500 km away. The AWACS is a Westinghouse Electric Corporation design, the AN/APY-2, chosen specially as a surveillance and early warning radar over a Hughes radar design for the USAF in 1973. Boeing built the system for 34 aircraft, the first having been delivered in 1977.

It operates on the S-band 10 cm frequency in seven modes: a Pulse-Doppler Non-Elevation Scan (PDNES), enabling detection and attack of aircraft to ground level, a pulse-Doppler elevation scan (PDES), using vertical electronic beam to measure a target's elevation, beyond-the-horizon (BTH) pulse radar for range surveillance when the horizon is obscured by ground clutter, passive mode, in which the transmitter is shut down while receivers continue to monitor electronic countermeasures, short-pulse maritime surveillance to reduce sea clutter effects and to detect surface vessels, test maintenance for servicing by the radar technician, and standby, in which the receivers are shut down but ready for instant re-use.

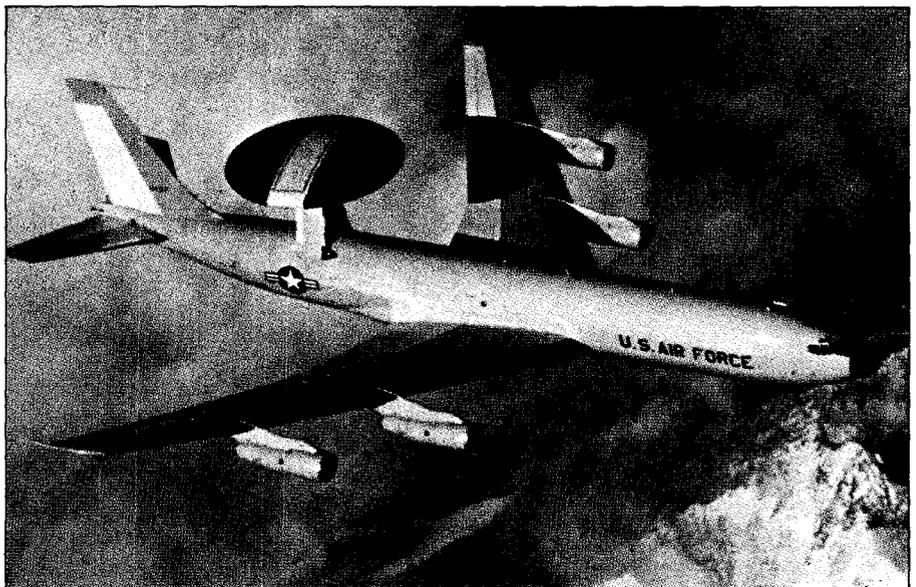
The immense nine-metre rotodome is in the rear fuselage, and the radar has a very large aperture. Its size, and the added endurance capability are key reasons why an aircraft as large as the 707 is a suitable airframe for the AWACS system. The aperture size produces a very narrow beam width that gives it good horizontal and vertical plane resolution.

Training unit on loan

Besides the USAF, for whom the AWACS was developed, NATO and Saudi Arabia are major purchasers of the top-notch airborne early warning. France has ordered three. Britain has on order six E-3As for the Royal Air Force, to be delivered progressively from next year. Boeing won the lucrative contract at the last minute from the British Aerospace Nimrod AEW3, when it became

apparent that there were serious problems with its General Electric Company avionics, not the least of them being its unfortunate ability to track motorway traffic. While awaiting delivery of the AWACS, the airforce has on interim lease three E-3s from the USAF to begin training crews.

The American Lockheed-Georgia P-3 AEW is an option our Government will consider seriously. Bought by the US Customs Service with AEW, Australia



The grandfather of AWACS, the Boeing E-3 Sentry. Essentially it's a Boeing 707 with a radar on top.

already operates 20 of the P-3 Orions in an antisubmarine role. As part of a worldwide promotion drive, Lockheed earlier this year made an unsolicited ap-

proach to the RAAF to provide four upgraded models. The company is facing the prospect of being unable to keep its P-3 production line going if it does not win new contracts.

'... to see over the horizon or behind mountains'

proach to the RAAF to provide four upgraded models. The company is facing the prospect of being unable to keep its P-3 production line going if it does not win new contracts.

The P-3 with AEW capability would make a very suitable coastal patrol aircraft along the northern coastline. Its radar is the General Electric Company's UHF AN/APS-145, which is undergoing constant revamp to improve its scanning and detection performance. In 1986, the US Navy began evaluating the AN/APS-145 radar, which is able to track more targets simultaneously at greater ranges, minimise the effects of jamming and produce sharper overland vision. While the GEC radar is used in both the P-3 and E-2C Hawkeye, it

shows significant performance differences in the different aircraft. After the E-3 AWACS, Gruman's E-2C Hawkeye is considered top-of-the-range. It has GEC radar, beginning with the AN/APS-120 and later updated with the AN/APS-125 and AN/APS-138. The first generation AN/APS-120 had automatic over-water target detection but manual over land.

The second generation AN/APS-125 with fully-automated tracking and detection, and improved the Electronic Counter-Counter Measures (ECCM) and electromagnetic interference filters. The new APS-138 has a new antenna, the Total Radiation Aperture Control Antenna, or TRAC-A with further improvements against interference.

The US Navy placed contracts with Gruman and GEC in 1972 to develop an advanced radar-processing system that would be more sensitive to noise and

clutter and more resistant to false alarms. On commercial grounds, the system is tried and true. Israel ordered four E-2Cs in 1977, Japan has eight and is planning to buy more, Egypt took five in 1987, and Singapore has some on order.

The Hercules C-130, of which Australia has 24, is an ideal airframe for AEW. The Lockheed group teamed up with GEC to fit AN/APS-125 surveillance radar to the aircraft for less than half the cost of Boeing's E-3A. The company has done some aggressive marketing to promote the product to dozens of countries, and has probably secured sales of 15 Hercules AEW to four nations.

Another 11 countries in need of 52 aircraft have been targeted. The Royal Malaysian Air Force is interested in the project, as is the US Coast Guard, which already operates some 30 C-130s for maritime patrol. The fact that so many countries already possess the transport planes is an added bonus in selling its AEW.

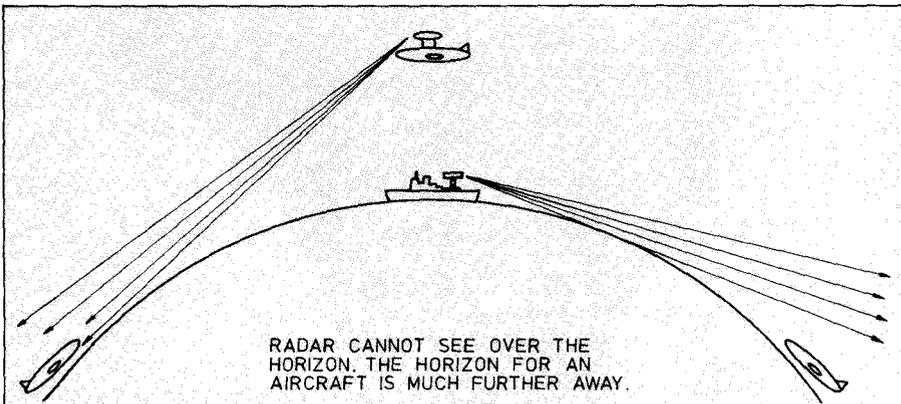
Affordable

One of the more affordable AEW systems is the Skymaster in the AEW Turbine Defender aircraft, a military version of the Pilatus Britten-Norman Islander. Its radar is a Thorn-EMI development of the Searchwater maritime surveillance radar installed in the British Royal Navy's Sea King helicopters after the Falklands War loss of several ships to Argentinian Exocet missiles.

Thorn-EMI claims it can offer its radar at just \$15 million, compared with about \$60 million for comparable systems. The AEW Defender's main attraction is its multi-mode capability. Skymaster can automatically track and detect high and low altitude fast-moving targets, be they aircraft, helicopters, missiles, ships or submarines.

It has a high-powered 30 mm transmitter operating in the I-band and a 360° rotational narrow-beam antenna in look-down mode to a range of 185 km and look up mode to 125 km. The aircraft itself can remain on station for long periods at 15,000 m, though it is not envisaged as a long-endurance plane. Nor is it particularly suitable for environments like Northern Europe, with heavy electronic countermeasures (ECM), nor for use without tactical fighter cover. **ETI**

Anna Grutzner is the Canberra based Defence correspondent for The Australian.



HOW IT WORKS

Airborne early warning is a system that enables an aircraft to "see" over the horizon or behind mountains and other ground obstacles. By flying with surveillance sensor on board towards a potential threat, identification and subsequent contingency plans can be put in place much earlier. The AEW-fitted aircraft can loiter over a target at a much-reduced altitude and provide positive visual identification.

The AWACS system using an EC-3 aircraft flying at 10,000 metres altitude and a speed of 860 km/hr would, for example, put the visible horizon within 360 km. The aircraft could fly the entire 5600 km length of Australia's northern coastline in under seven hours. Four AWACS would do the job of a sophisticated

ground-based radar network in less than two hours.

Unlike ground radar, it does not have fixed co-ordinates and therefore cannot be pre-targeted and attacked, making it less vulnerable. Airborne radar can "hide" from the enemy by ceasing transmission and fleeing in the ensuing silence.

Some systems do so without even transmitting active radar signals. However, the AEW could be easily shot down using an anti-radiation missile, which homes in on the radar. Unless protection was given, the airforce would be reluctant to send out alone its expensive AEW capability in times of high threat, making fighter plane support and the accompanying costs an essential part of employing the system.

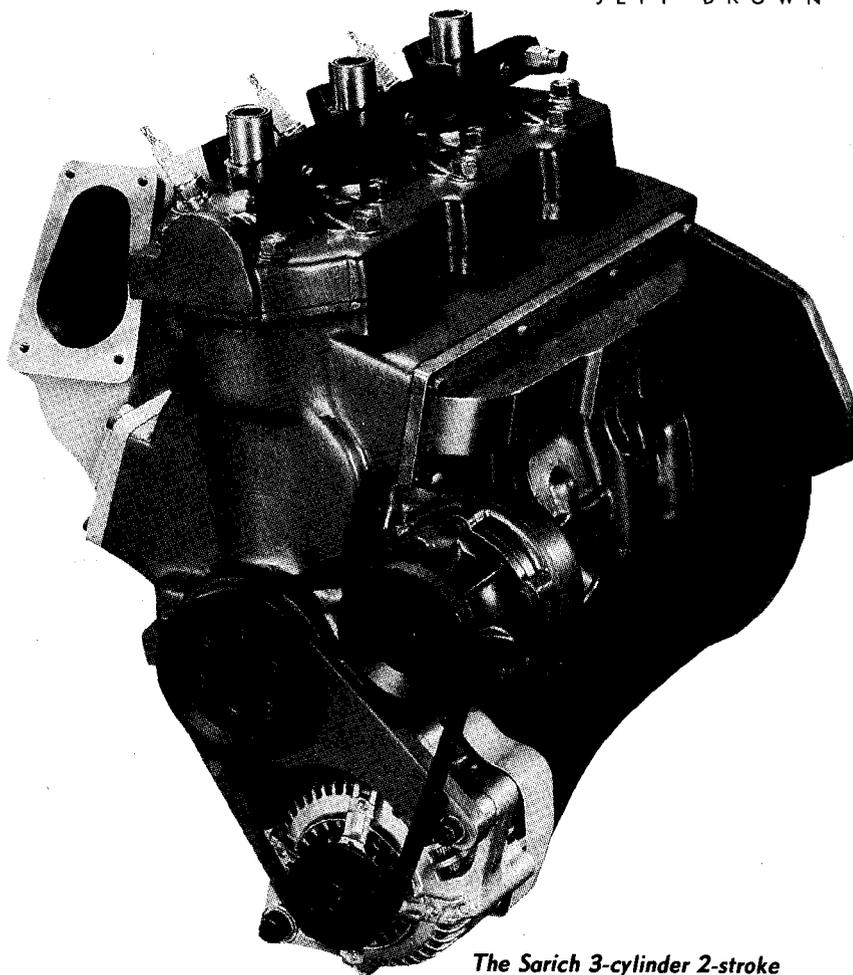


JEFF BROWN

THE SARICH SAGA

Orbital combustion process engine takes off

Ralph Sarich's Orbital Combustion Process engine is here to stay and could be powering two-thirds of the world's cars within the next two decades.



*The Sarich 3-cylinder 2-stroke
Orbital Combustion Process engine.*

About 16 years ago Ralph Sarich thought the size and weight of car engines was out of step with the modern world; he began with a blank sheet of paper aiming to design a very compact engine with good fuel economy, low exhaust emissions and low production costs.

Today, the Orbital Engine Company, a private company owned by BHP and Sarich Technologies Trust (both public companies) has achieved its founder's original aims. With the signing of a manufacturing agreement with the Ford Motor Company in America, those ideas will transform the performance and economy of not only automobiles, but also marine, motorcycle, aircraft, power tool and stationary engines.

On the way, his engines have made

him a very rich man, and caught the imagination of the Australian public. If he can get a major manufacturer to back his design, it will be a victory for the traditional Aussie battler.

The OCP engine

The major features of the Orbital Combustion Process (OCP) engine are that it is less than half the size and weight of an equivalent conventional engine, with independently verified fuel consumption savings of 25 to 30 per cent achieved in vehicles tested to international standards.

Most significantly, these improvements have been achieved while satisfying current US exhaust emissions standards, without penalising drivability or performance.

Other benefits include the elimination of some 250 moving parts, which translates to production cost savings of about \$200 per engine. A reduction in necessary engine ancillaries and the deletion of items such as power steering (which are unnecessary because of the OCP engine's light weight) and the elimination of rhodium from the OCP engine's exhaust catalyser contribute to a further cost reduction of about \$600 for each complete vehicle fitted with the

'... remarkable reductions in volume, weight and production costs'

OCP engine.

These remarkable reductions in volume, weight and production costs are mainly the result of using the two-stroke engine principle instead of the conventional four-stroke principle, and this was only achieved by applying the Sarich technology to eliminate the failings of two-stroke engines in modern applications: massive emissions of hydrocarbons and carbon monoxide, and fuel consumption levels nearly twice as high as those of conventional four-stroke engines. That the OCP engine not only overcomes these problems but also improves fuel consumption to levels below those achievable in four-stroke engines, is a remarkable achievement.

Scavenge fuel loss eliminated

One of the major innovations which led to these results is an electronically controlled fuel system which allows direct injection into the combustion chamber. Proper timing eliminates the loss of fuel from the exhaust port which occurs during the scavenging process of a conventional two-stroke engine. Electronic control of the inlet and exhaust scavenge flow, combustion chamber geometry, and fuel spray characteristics control the hydrocarbon and NOX emissions in the stratified combustion process, which result from the use of the direct injector to eliminate the scavenge fuel loss.

Lower friction levels, reduced pumping work and a small thermodynamic advantage from increased compression ratios, and the ability of the engine to run very lean, contribute to the fuel consumption improvement.

The OCP engine features a turbulent combustion chamber which allows high dilution rates and encourages rapid mixing at high and low loads. Another feature is an exhaust port scavenge flow control valve (controlled by the engine's



Ralph Sarich.

electronic control unit, designed in conjunction with a semiconductor company, with custom chips made in-house), to increase low-speed torque and help emission control.

'He began with a blank sheet of paper'

As NOX is not treated catalytically with the OCP engine, only an oxidation catalyst is necessary to speed the light-off process and lower its thermal inertia. The catalyser unit only uses platinum and paladium therefore, and the elimination of the need for rhodium reduces the cost considerably. A tuned exhaust system overcomes the losses caused by the two-stage catalyser.

Electronic lubrication

Other features include an electronic lu-

brication system to control and reduce the amount of oil required by the engine, and a new scavenging system reduces engine length and also lowers production costs.

One of the main components of the OCP engine is the direct injector, which is able to deliver very small droplet sizes and controlled spray configurations directly into the combustion chamber. Using compressed air to effect the injection and atomisation of the fuel mixture means that current low-cost, high-production-volume fuel pumps and fuel lines can be used.

Until the advent of the OCP the most efficient fuel injectors were diesel injectors, which allow a mean droplet size distribution of about 40 mm. Reduction of hole size and increasing pressure can drop this mean to about 20 mm. The OCP system maintains a mean droplet size of less than 10 mm and analysis of the spray with a laser particle sizer

The Sarich saga

shows the droplet size distribution remains much the same throughout the spray. This indicates little coalescence of the droplets towards the end of the survey plume — one of the factors which helps the system control light-load hydrocarbon and medium-load NOX emissions.

The very rapid mixture preparation made possible by the high surface-to-volume ratio of the finely atomised droplets still allows the OCP engine to achieve the high power density which has always been a property of two-stroke engines.

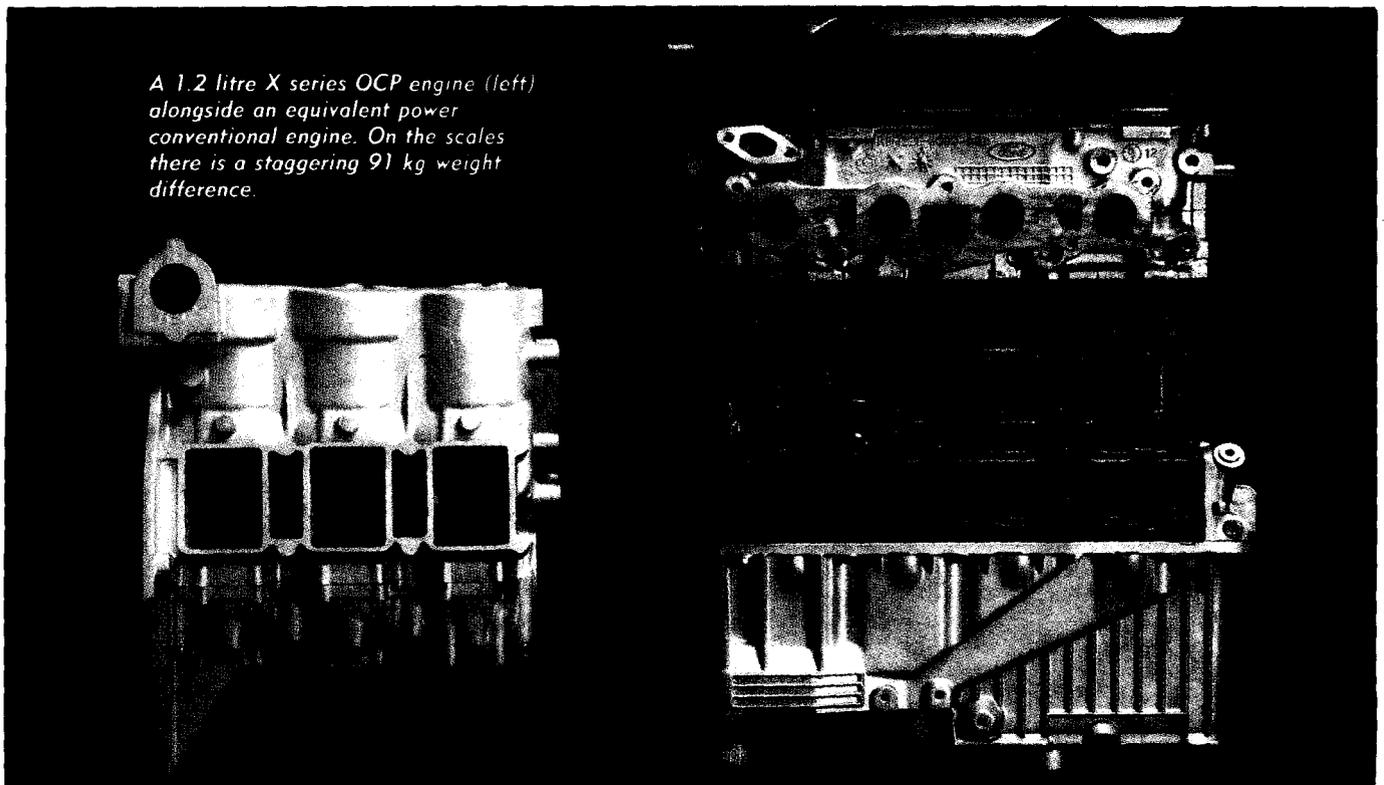
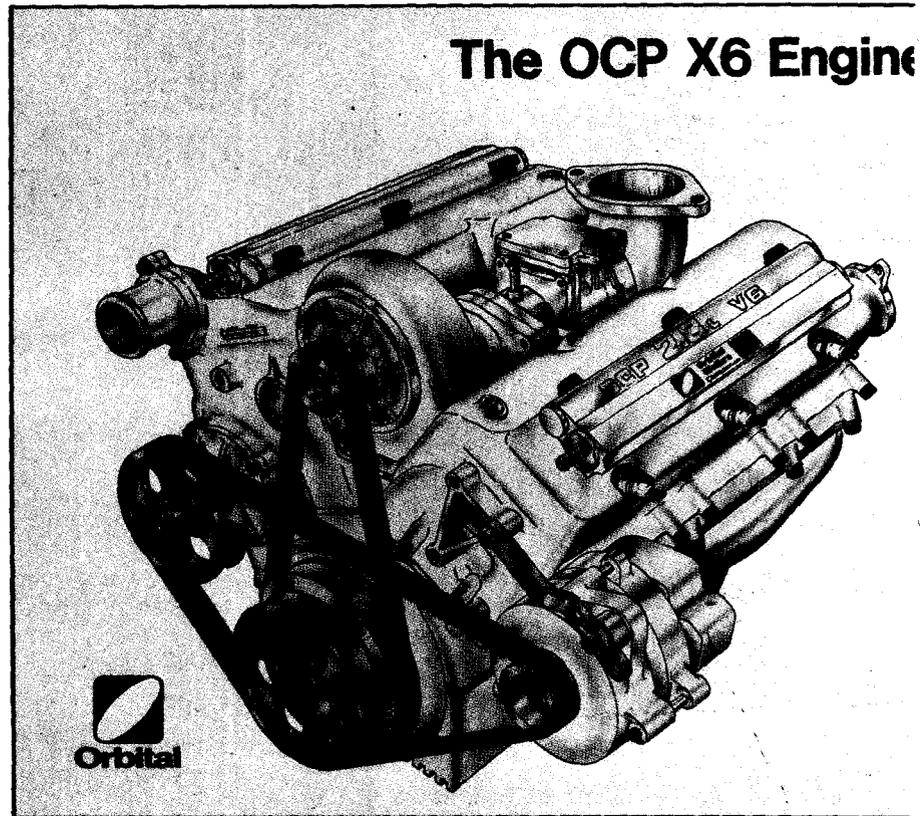
Testing

The OCP engines fitted to the Ford Escort and Chevrolet Spectrum cars the Orbital Engine Company is using for testing, are 1.2 litre three-cylinder engines weighing 41 kg and producing 67 kW at 5500 rpm and 135 Nm at 4000 rpm. This means a specific power output nearly 50 per cent greater than modern equivalent capacity four-stroke engines.

Until the OCP engine, stratified-charge engines compromised their maximum power output to achieve light-load fuel economy benefits; in four-stroke engines this was (and still is) achieved by long, winding induction tracts which help the mixing of fuel and air. This limits the actual air consumption, and

thus also maximum power. Another limitation on power, in both two and four-stroke engines, is the ability to adequately mix fuel and air in the short time available at high engine speeds

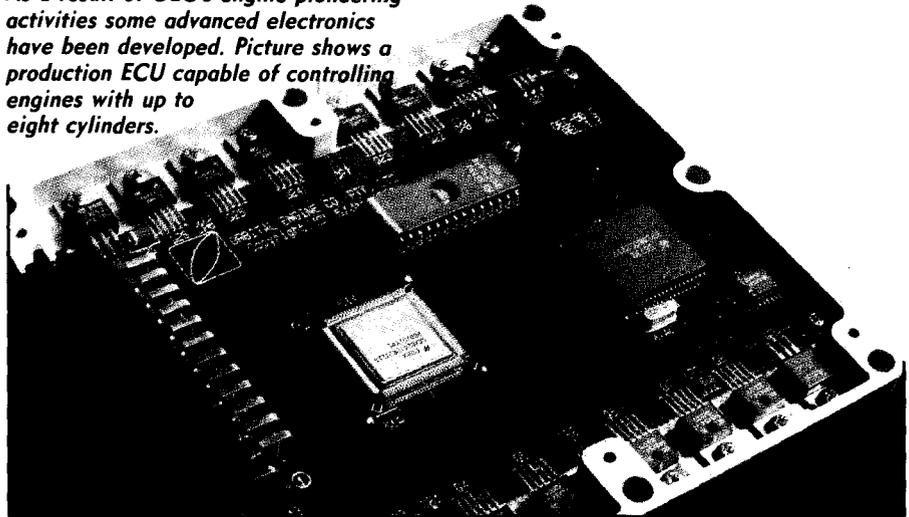
when maximum power is produced. The OCP engine overcomes these problems by not requiring induction swirl, by the fine control of injector spray penetration and fuel distribution, and the very fine



A 1.2 litre X series OCP engine (left) alongside an equivalent power conventional engine. On the scales there is a staggering 91 kg weight difference.

Length 435 mm
 Width 480 mm
 Height 470 mm
 Power 145 kW (194 hp)
 Weight 89 kg (196 lb)
 Displacement 2.8 L
 (Ø 86 x 80 mm)

As a result of OEC's engine pioneering activities some advanced electronics have been developed. Picture shows a production ECU capable of controlling engines with up to eight cylinders.



atomisation provided by the air-assisted injection.

Another problem associated with two-stroke engines — that of narrow power bands and peaky performance, which is a product of the influence of exhaust timing on engine power output — is overcome in the OCP engine mainly be-

cause of its three-cylinder configuration, which optimises exhaust timing effects over a wide engine speed range. The use of exhaust port valves also enhances low-rpm torque by modifying exhaust port timing.

Improved pumping

Improvements in fuel consumption of the OCP engine over conventional engines is a direct result of the sheer efficiency of its design. One of the aspects which contribute to its efficiency is the fact that there are two pumping cycles in two-stroke engines for every one in a four-stroke engine, which means an actual improvement in pumping work by a factor of three. The pumping work also decreases as the engine speed in-

creases, the reverse of the effect in a four-stroke engine. This means economy is improved and NOX emissions lowered while at the same time raising exhaust gas temperatures, which improves the performance of the exhaust catalyser.

Another advantage is a reduction in friction losses, mainly from the lack of a valve train, reduced piston friction (due to the lack of a need for oil scraper piston rings) and the use of roller bearings rather than pressure-lubricated shell bearings. There is a small improvement in thermal efficiency because of the increased ratio of specific heats occurring during the expansion stroke, and the slightly higher compression ratio.

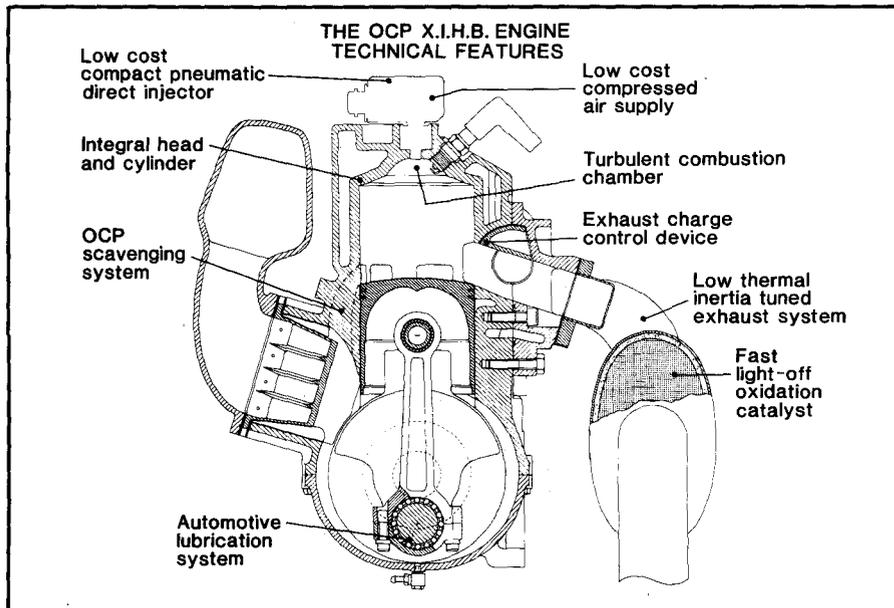
These factors all help improve the economy and efficiency of the OCP engine itself; other advantages in the efficiency of a complete vehicle powered by the engine come from the weight reduction of the vehicle which the engine allows, and also from a considerable reduction in aerodynamic drag, because the engine allows designers to use short, low bonnet lines, and minimise frontal areas.

In fact it was probably no coincidence that Ford's latest show car raised eyebrows because of its tiny bonnet area and miniscule engine compartment, when it was first shown in Europe earlier this year. It was assumed then that the car was purely a showpiece with no chance of production, because there was no engine small enough to fit in the car and provide anything like adequate power to propel it.

Now there is, and Ford was the first to sign a manufacturing rights agreement ...

eti

Jeff Brown is a freelance journalist specialising in the motoring industry.



Section through a typical OCP engine showing the key technical features, including the exhaust port valve.



TECHNOLOGY

From Expo 88, Derek Powell reports that although lasers have been with us for some time there is still fascination in these incredibly pure, powerful beams of light.

While they are now a commonplace tool for levelling, measuring, communications, and even surgery, it is always startling to watch the magic interplay of beams in a professional laser entertainment show.

The recent World Expo in Brisbane gave Australians the opportunity to experience the full range of imagery that modern laser technology can produce, both indoors, as part of a total Audio-Visual experience, and outdoors, set to music, as pure spectacle.

Laser entertainment technology has come a long way since the simple bluish green fans of light which so enthralled rock and roll devotees at the wild concerts of the 70s. Today's images are created by a unique marriage of science and art and brought to fruition by a breed of people who seem to be part physicist, part artist and part entertainer.

Fitting the bill as the quintessential laser impresario is Laurie Plainer, who created the dynamic laser shows at Expo 88. Laurie, graduated in Music from Colorado but was drawn to the rapidly emerging new technology of laser entertainment. While working on

the laser spectacular for the LA Olympics, she met and later married, Ric Birch who was to become Expo 88 Entertainment Director. Laurie drew together an international staff of animators, engineers, designers and technicians to create the spectacular open air displays in Brisbane.

State of the art laser effects can be divided into two main categories: projected images and beam effects.

Projected laser images are created by rapidly sweeping beams of coherent light back and forth across a screen surface. The beam traces the same pattern repeatedly and its movement is so fast that persistence of vision (the phenomenon that makes film and TV projection possible) causes the images to appear.

Currently it is difficult to modulate the intensity of a laser beam rapidly, so most projections consist of "Wire frame" models, text, cartoons or Lissajous patterns which can be created and moved in real time. Simple animation is possible by changing the pattern slightly each time it is traced.

Billboards

Text can also be created and a "Laser

RAYS OF FUNSHINE

The Expo 88 laser show



Billboard" was projected onto the wall of the Queensland Performing Arts Complex adjacent to the Expo 88 site. Each night, animated messages such as 'Welcome' in 56 languages, announcements, "Expo Oz" (the Expo 88 Mascot), and Expo Symbols, appeared 10 by 15 metres in size, towering above the spectator.

Quite beautiful interference patterns can be created by passing a beam through transparent plastic or textured glass. Combining an interference pattern "cloud" background with geometric shapes can give vivid, multi-coloured projection effects.

The real three dimensional effects, like darting rays and translucent "fans" of light over and around the audience rely on smoke or mist in the atmosphere to make the beams visible. Normally, the beam is invisible until it strikes an opaque surface but smoke or small atmospheric particles scatters some of the light and enables the beam to be seen.

Indoors, smoke machines are used to rapidly fog the atmosphere to a suitable density but outdoors this is much more difficult. The Expo laser displays made use of smoke from the synchronised fireworks display, mist from the river, and even low cloud to produce long

range, outdoor beam effects.

Let's look in detail at two of the laser systems developed for Expo to see exactly how these effects are created.

Auditorium systems

"The Pavilion of Promise" utilised a quite separate system from the open air laser shows as part of its feature presentation of "the scroll". Highly advanced laser animation sequences were projected onto the screen in exact synchronisation with multiple 35mm movie projectors. As well, multi coloured beam effects enveloped the audience within the theatre.

Laser show

Producer Bruce Stacey envisioned the laser effects as part of the total A/V experience from the beginning and the system was developed and programmed by Laser Media of Los Angeles.

The laser system consists of three main sections: the gas lasers and their power supplies; the optical bench; and the computer control system.

Two laser units, built by Spectra Physics, are used in the display. An argon gas laser produces Cyan (Blue/Green) light at a number of discrete wavelengths between 0.5145 μm and 0.4880 μm . A Krypton laser produces predominantly red lights at 0.6741 μm . Combining the outputs of the two lasers gives a white light (red plus green and blue) which can be filtered to produce a number of colours.

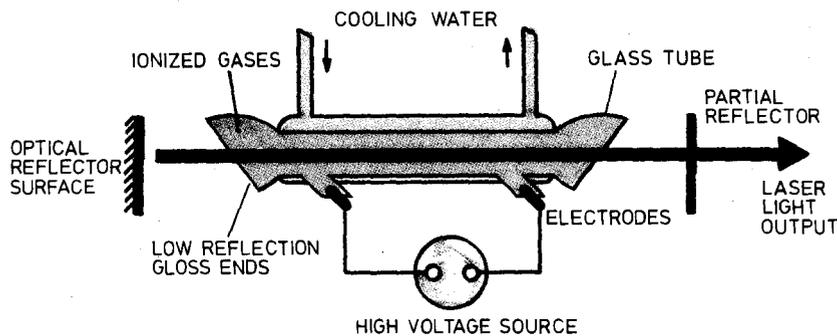
The lasers are quite inefficient and require a large regulated high voltage supply provided by an "exciter". These units use a total of 159 of the ubiquitous 2N3055 power transistors (all direct coupled) in the regulating circuitry. With such a large number of components it can be quite a chore to track down the particular offender should one transistor go faulty.

The dangers

The laser tubes also generate vast quantities of heat and around 30 litres of water per minute must be pumped through the water jacket of the tube itself to keep it cool. The Pavilion Technical Director, Neville Symons explained that guaranteeing a stable water pressure is more difficult in practice than regulating the power source. If the flow ever stopped, the water in the cooling jacket would vaporise in seconds so a special gravity feed tank was installed in the roof with an automatic change over valve to cope with such an emergency.

The lasers run at between seven and ten watts output power which is quite considerable. Technical Manager Eddie Smith demonstrated the potential of the beam by holding a business card at the output of the laser. In seconds, it punched a hole cleanly through the cardboard.

Such a beam could cause serious eye damage and the laser optical systems are aligned each day to ensure that none of the beams can sweep across the audience area. Even so the beams can be instantly cut off by a "kill" switch at the attendants' position



HOW IT WORKS

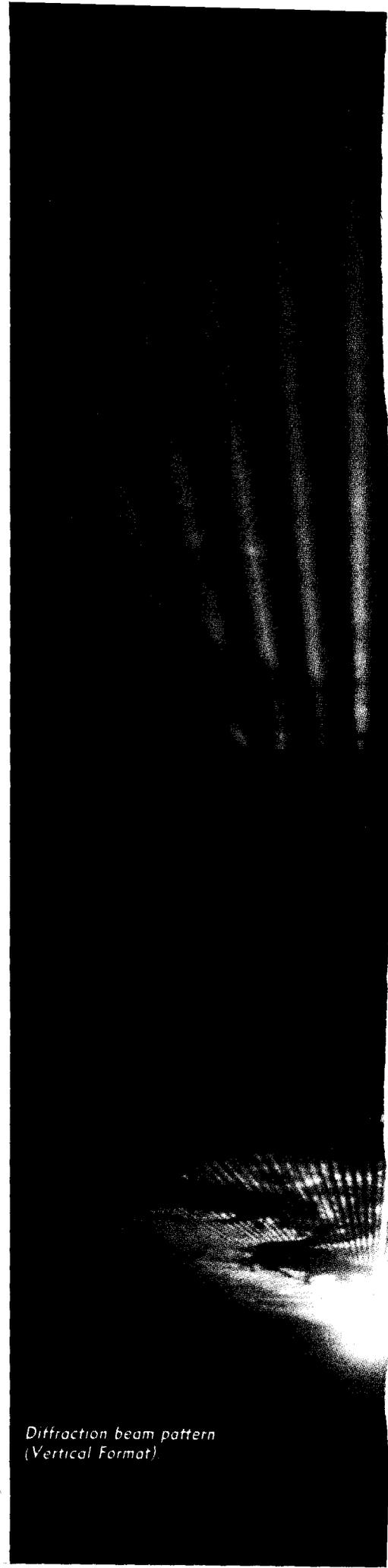
A laser produces *Coherent* light, i.e.: light of a single frequency and phase. In a Gas laser, photons are produced by applying a high voltage electrical discharge across a glass tube filled with gas.

The discharge causes some of the atoms to jump temporarily to a higher *metastable* energy level. As the atoms fall back to the *ground* state, photons of a specific frequency are emitted.

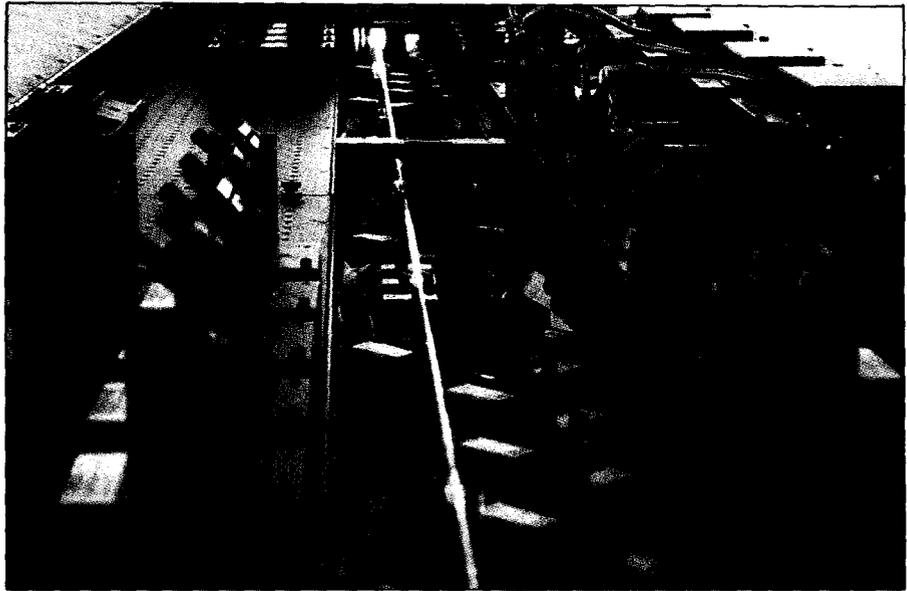
The tube starts to glow like a neon sign as most of the photons escape through the sides. However, some photons strike other excited atoms

which cause them to return to the ground state and in the process emit another photon which strikes other atoms in a chain reaction. The population of excited atoms is constantly replenished by the discharge.

A small amount of light begins to cycle back and forth between the two reflectors, which are set, with great precision, to be an exact number of wavelengths apart. A "standing wave" of single frequency, phase coherent light builds up, reinforcing itself until it exits through the semi reflective surface as a continuous beam of laser light.



Diffraction beam pattern
(Vertical Format)



Derek Powell photo

The River Stage optical bench. The beam passes along the optical axis from the filter box at the top. The actuators divert the beam to the fibre rays on the left or the scan pairs on the right.

should someone blunder into a potentially dangerous area.

Optical bench

Aligned to the output of the lasers is the optical bench which is a high precision "breadboard" on which are positioned the various beam combiners, splitters, mirrors and scan pairs which direct the beam into the auditorium. These electro-mechanical devices are all controlled via interface circuits from the computer containing the show programme.

The red and blue-green beams from the two lasers are first combined and then passed through the colour box, where, by positioning filters in the light path, the colour of the beam can be varied.

The beam exits the box and passes along the optical axis of the bench. From this point the optical bench resembles a miniature railway marshalling yard. Arranged along the axis are a number of remotely actuated mirrors which act like railway "points" to switch the beam off in different directions.

The beam switching "actuators" operate at high speed (up to 3,000 operations per second) so that a number of beams, which are actually switched on and off sequentially, can appear to be present at the same time.

From here the beam can be reflected straight out into the auditorium, collected by a "Fibre-Ray" to be routed via optical fibre to form a beam at a remote point, or it may be sent to a "scan pair".

The scan pair consists of two tiny mirrors, driven by small motors. The beam bounces from one mirror to the other and then out to the theatre screen. The mirrors are arranged so that driving one motor changes the angle of its mirror to make the beam scan vertically, while the other mirror causes the beam to move horizontally.

If both mirrors are cycled back and forth at the same rate, the beam will trace a circle on the screen. The principle is exactly the same as that employed in an oscilloscope, where Lissa-

'... movement so fast that persistence of vision causes images to appear'

ious figures are traced by applying varying frequencies to the X and Y deflection plates. Like the actuators, the movement of the scan pairs can be extremely rapid so that images can be traced many times a second.

Control system

The movement of the actuators and scan pairs is controlled by interface circuits which receive instructions from a computer via an RS-232 bus. The laser effects are programmed frame by frame and the instructions to the actuators and scan pairs are stored in the computer software.

The soundtrack for the movie is replayed from a multi-track sprocketed

Derek Powell photo

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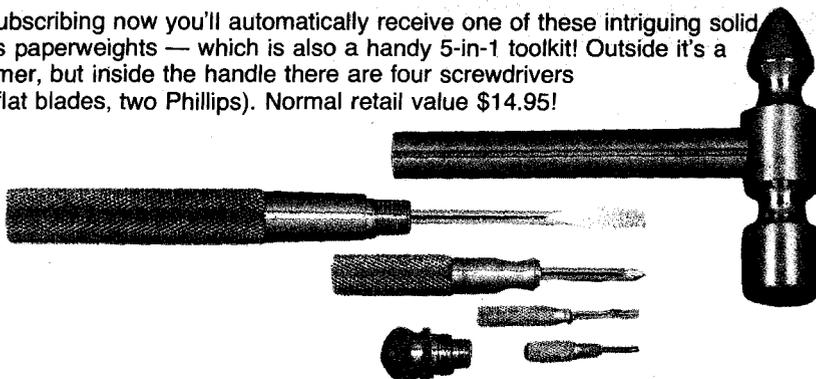
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CONDITIONS OF ENTRY

1. The competition is open only to Australian Residents authorising a new/renewal subscription before last mail January 23, 1988. Entries received after closing date will not be included. Employees of the Federal Publishing Company, Samsung and Pearce Simpson and their families are not eligible to enter. To be valid for drawing, subscription must be signed against a nominated valid credit card, or, if paid by cheque, cleared for payment.
2. South Australian residents need not purchase a subscription to enter, but may enter only once by submitting their name, address, and a hand-draw facsimile of the subscription coupon to The Federal Publishing Company, PO Box 227, Waterloo, NSW 2017.
3. Prizes are not transferable or exchangeable and may not be converted to cash.
4. The judges decision is final and no correspondence will be entered in to.
5. Description of the competition and instructions on how to enter form a part of the competition conditions.
6. The competition commences on October 17, 1988 and closes with last mail on January 23, 1988. The draw will take place in Sydney on January 23, 1988 and the winner will be notified by telephone and letter. The winner will also be announced in The Australian on January 25, 1988 and a later issue of this magazine.
7. The prize is: A Pearce-Simpson by Samsung Cellular Mobile telephone complete with hand set, cradle, transceiver, installation and all cables. Total value \$3500.
8. The promoter is The Federal Publishing Company, 180 Bourke Road, Alexandria, NSW 2015. Permit No. TC88/2844 issued under the Lotteries and Art Unions Act 1901; Raffles and Bingo Permits Board Permit No. 88/1688 issued on 20/9/88; ACT Permit No. TP88/992 issued under the Lotteries Ordinance, 1964.

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Laser show

tape player which is synchronised to the film. SMPTE time code is recorded on one track of the audio tape and this is routed to the computer. The computer reads the code, which assigns a unique number to each frame of the film, and executes the instructions to the laser systems in the correct sequence.

Outdoors

In contrast to the Pavilion of Promise, the main entertainment systems used a total of five laser projectors at three positions on the site. Laser displays are usually purchased as a complete hardware and software package from one of a dozen or so specialist hardware companies worldwide. However in designing this system, Laurie Plainer took a different approach.

"I wanted to be able to display both our own in-house custom programming, as well as present a forum where the best graphics from laser companies all over the world could be displayed and integrated into our shows," she explained.

Precision Projection Systems of Los Angeles developed custom interfacing hardware for the Expo Entertainment system. The interfaces accepted the output from a number of different manufacturers' laser graphics systems and converted them to a common standard for recording and subsequent display. The graphic information (which is principally X,Y co-ordinates for the scanning pairs and actuator instructions) was then modulated onto a NTSC video signal and recorded on 3/4 inch U/Matic tape.

This allowed all of the programming to be carried out on a small system, with the instructions for the scan systems of the optical bench recorded on U/Matic tape. Existing graphics sequences from other display companies could be converted into the U/Matic recording format and then inserted into the show programme tape using a Sony BVE-900 videotape editing controller.

Technically, the Laser/Fireworks display was probably the most synchronised and integrated show yet devised, so it is interesting to examine the control system used.

The show combined laser imagery projected onto the River Stage screen, a fireworks show fired from barges moored in the river, lighting effects (including the Skytrackers, two clusters of four moving searchlights) and 35 mm film projection.

Quality

Audio quality was an important factor and the decision was taken to use PCM



Red Frill Neck Lizard: This image was projected by rapidly scanning the filtered light from a Krypton laser.

digital recording on video tape which gave results comparable with compact disc reproduction. The stereo soundtrack was played on the superb concert sound system installed at the River Stage and over the site PA so that spectators all along the river bank could hear the show as well as see it.

The laser projectors themselves were broadly similar to the system we have just seen, though somewhat more powerful and elaborate. Two Spectra Physics lasers were employed, a powerful 25 watt Argon unit matched with a 7 watt Krypton laser.

Four scan pairs are used on the optical bench, each working totally independent of the others. This made it possible to have up to four different animation sequences playing simultaneously which allowed denser, more complex sequences to be constructed.

Instructions for two scan pairs can be recorded (via the interface) on each U/Matic tape. To replay a sequence involving all four scan pairs, two tapes must be played in synchronisation, plus the third which carries the PCM encoded soundtrack.

The soundtrack U/Matic tape, the two other U/Matics carrying the command

signals for the laser projectors and a 35 mm film projector were all synchronised using SMPTE time code. A four track 1/4 inch tape deck was also tied into the system via time code on one track. The other tracks carried instructions for the computer which triggered the pyrotechnic shells plus a back up mono soundtrack.

Future development

The colour, purity and brilliance of laser light will ensure that they remain an exciting lighting tool for theatre and concert performances. Laser professionals are eagerly watching for the development of high powered solid state lasers which will be more efficient and cheaper than the currently employed gas lasers.

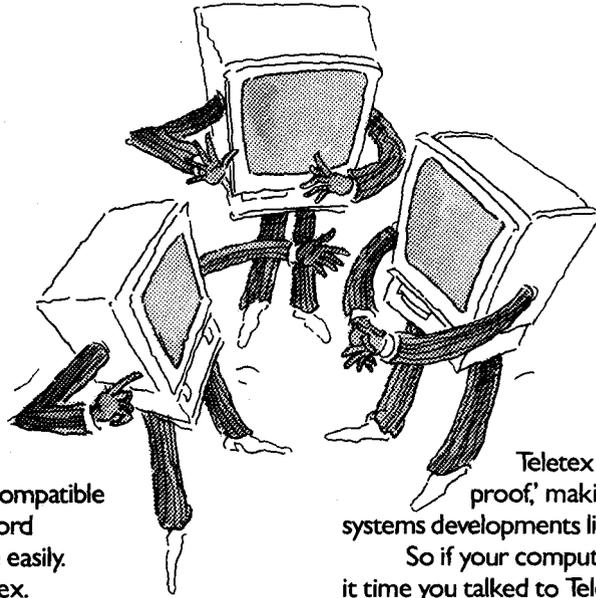
Several companies have been working on the development of raster scanning techniques to use lasers to project video images and indeed some systems have been demonstrated, but the technical problems in achieving good reliability have been formidable.

The costs of using currently available laser sources for projection is also formidable.

As Plainer commented: "A laser is an awfully expensive lightbulb." 

Laurie Plainer photo

IBM, WANG AND APPLE ARE TALKING.



They aren't the only ones*
Virtually all previously non-compatible
mainframe computers, PC's or word
processors can now communicate easily.

The reason is Telecom Teletex.

With it you can edit and transfer documents and
computer files effortlessly between not only your own
office systems, but those of your business associates.

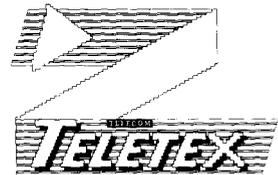
Even telex messages can be sent and received through
your computer or WP system.

Teletex is also designed to be 'future
proof,' making it compatible with new
systems developments like ISDN.

So if your computer is only talking to itself, isn't
it time you talked to Telecom?

Phone 008 033 682 now
for more information on the
remarkable abilities of Teletex.

*Other systems include Sigma Data, Unisys, Hewlett-Packard, Remington, and Wordplex. A complete list of current and proposed systems can be obtained from Telecom.



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READER INFO No. 33

ETI DECEMBER '88

37



TECHNOLOGY

THE BABEL FISH FOR COMPUTERS

Teletex marries the hardware

A new electronic data transfer service has been introduced by Telecom. It's designed to take the problems out of communications.

Telecom's newest text communication service is called Teletex — a service so new that most people have not even heard of it or, worse, they confuse it with the TV broadcast service Teletext which used to be called Seventext.

'You just come along with me and have a good time. The Galaxy's a fun place. You'll need to have this fish in your ear.'

'I beg your pardon?' asked Arthur, rather politely he thought.

Ford was holding up a small glass jar which quite clearly had a small yellow fish wriggling around in it. Arthur blinked at him. He wished there was something simple and recognizable he could grasp hold of. He would have felt safe if alongside the Dentrassi underwear, the piles of Sqornsellous mattresses and the man from Betelgeuse holding up a small yellow fish and offering to put it in his ear he had been able to see just a small packet of corn flakes. but he couldn't, and he didn't feel safe.

Suddenly a violent noise leapt at them from no source that he could identify. He gasped in terror at what sounded like a man trying to gargle whilst fighting off a pack of wolves.

'Shush!' said Ford. 'Listen, it might be important.'

'Im . . . important?'

'It's the Vogon captain making an announcement on the Tannoy.'

'You mean that's how the Vogons talk?'

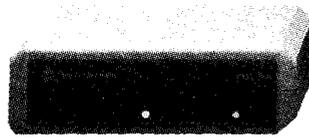
'Listen!'

'But I can't speak Vogon!'

'You don't need to. Just put this fish in your ear.'

Ford, with a lightning movement, clapped his hand to Arthur's ear, and he had the sudden sickening sensation of the fish slithering deep into his aural tract. Gasping with horror he scrabbled at his ear for a second or so, but then slowly turned goggle-eyed with wonder.

The Hitch Hiker's Guide to the Galaxy by Douglas Adams. Pan Books (1979)



It's a confusing situation, one that Telecom's Public Relations people are only now starting to clear up.

This article is intended to give a brief overview of Teletex. It's a big step forward from the humble file-transfer program used by computer buffs who oper-

ate over the telephone network with a couple of modems and lots of patience.

Teletex offers immediate communications between computers as unlike as IBM PCs, Apple Macs, Unisys and Wang. Not only may the computer systems be different, but also the word pro-

cessor packages running on the two systems. In other words, a document created under Wordstar can be sent to Teletex and merged into a Displaywrite III document.

Teletex - what is it?

Teletex is defined as a high-speed memory-to-memory text communication service that permits automatic exchange of documents over the Teletex network. Many have described the service as "Super Telex", since it started in West Germany as a replacement for the Telex service there.

Today, Teletex provides the opportunity to transfer documents between dedicated Teletex terminals, PCs, and main-frames anywhere in the world.

By using an optional "Private mode" facility, it can extend beyond the standardised Teletex document format to support automatic binary file transfer between PCs and mainframes. This also opens the way to automatic transfer of electronically generated forms such as EBDI (Electronic Business Document Interchange), application programmes, spreadsheets, in fact, any binary file.

The terminal

The structure of the typical dedicated Teletex terminal is no surprise. It consists of communications control software, with associated memory, and a printer, keyboard and local control software. The exact structure will depend on the manufacturer.

The local part has a striking resemblance to the structure of a PC, while the communication part resembles an intelligent modem. This similarity has not been lost on some manufacturers who have designed a special Universal Teletex Controller (UTC) to work with computer systems.

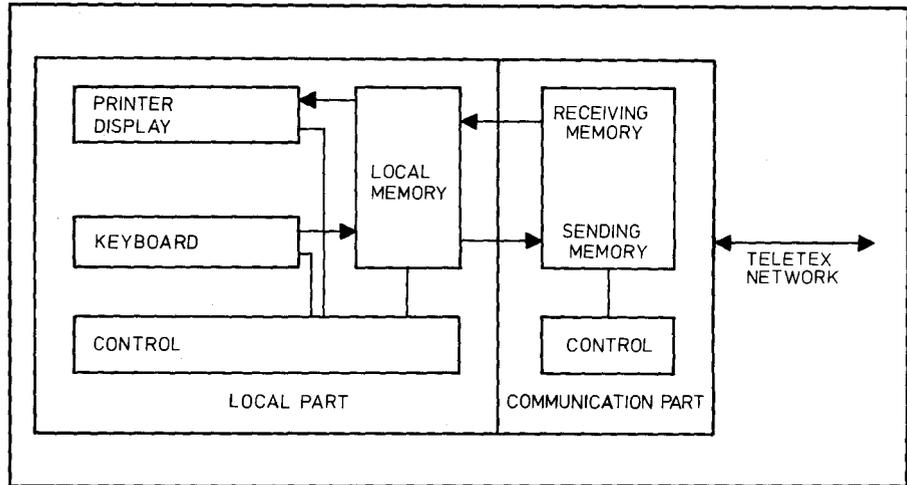
The UTC is, however, much more than a modem — it looks after the complete Teletex communication protocol and the automatic sending, receiving (including error control) and management of messages — even if the PC is busy, switched off or removed.

The UTC approach is the one taken by Telecom, the major equipment supplier here. The UTC is manufactured locally by STC-Alcatel, who also developed the special Australian version of the software.

Dedicated Teletex terminals are also available from Siemens and from NEC.

The ant's pants.

In West Germany, the birthplace of Telex, there is a saying that "Teletex — ist das Gelbe vom Ei". I am told the



best idiomatic translation is "Teletex — is the Ant's Pants".

Teletex started as a service on the West German Data network in 1980 and has now grown to over 18,000 subscribers. It is also operational in 17 other countries including Australia, most European countries, USA, Canada, Japan, Malaysia, S. Africa and the Middle East. Many other countries have services planned. It started in Australia as a trial service late in 1986, then with full international access, in conjunction with OTC, in July 1988.

Teletex is an internationally standardised service defined by a series of recommendations issued by the CCITT (Consultative Council for International Telephony and Telegraphy), located in Geneva. It is defined in a series of 12 international standards and is the first commercial service to fully comply with the OSI model for communications software. (See box). It is also fully compatible with the forthcoming X.400 message handling services.

1. Inspect receive log.
2. Inspect transmit log.
3. Send a document or file.
4. Inspect transmit awaiting log.
5. Print message logs.
6. Other functions —
 - a. Process received Teletex
 - b. Set UTC date and time.
 - c. Check a Teletex to be sent.
 - d. Check a Telex to be sent.
 - e. Change directories.

In addition, utility programmes are available to assist in setting up short-dialling codes, setting help levels, and reconfiguring the UTC.

SUMMARY OF LAYER FUNCTIONS

The OSI Reference Model

Teletex is the first commercially available communication product to fully conform with the OSI Reference Model for computer communication architecture.

Teletex offers immediate communication between computers'

Teletex software

The specialised software written for the host is called the Teletex Pack. It is menu driven and looks after all the operator interaction. All the user need do is specify the document or file to be sent and the destination number. The pack bundles it up and passes it to the UTC which handles all the error-protecting Teletex protocol.

The UTC also maintains logs of all the sent and received messages, and the PC software is able to extract this information and assemble it in tabular form for viewing or printing.

Teletex Pack software in the PC looks after the following functions: —

The Open Systems Interconnection (OSI) model is concerned with the exchange of information between systems. It is a structure of seven discrete, yet interlinked layers of communication protocols, each looking after a different aspect of the information transfer.

Layer 1 looks after the physical connection of the system to the line and the transfer of data, bit-by-bit, to and from the line. In the Teletex case layer 1 also specifies the V.24 modem interface and the V.22 bis modem.

As you work your way up through the model you progressively gain a higher "level" of control, until above layer 7 you reach the user application program.

Teletex — the Babel fish

The user is considered to be above the application program.

1 — Physical layer

Controls the data bit stream to and from the physical communications medium.

2 — Link layer

Controls any special techniques for error control and line disturbances. Commonly known as data link control.

3 — Network layer

Controls any routing or switching of the data. Handles any network oriented protocols.

The commonly used and familiar X.25 Packet transmission protocols are defined to fit layers 1 to 3.

4 — Transport layer

This layer co-ordinates the end-to-end data integrity and quality of service. It guarantees a good transport service to the higher layers.

5 — Session layer

Organises and synchronises the end-to-end interaction between end application processes. In the case of Teletex it oversees the transfer of each whole document between end users. The session control may change ends when a document is successfully sent.

6 — Presentation layer

Provides any code conversation or data reformatting for the application service.

7 — Application layer

Selects the appropriate communication service for the application program above. May also include negotiation of parameters, passwords, overall call control.

The OSI reference model is a conceptual and functional framework for the development of protocols so that they may interconnect and exchange information in an intelligent manner.

Costs

The most technically advanced item required for Teletex is the UTC itself which is available on rental from Telecom at \$80 per month — little more than the cost of an intelligent modem. In fact a modem is included in the integrated unit. PC Software is included in the price.

Telex line rental is set at \$50 per month which is little more than a standard business phone, while call costs will

allow the user to send an A4 page across Australia for only 38 cents plus 10 cents for each additional page. That's even cheaper than by fax, as well as being faster!

Teletex summary

- Fast simple text transfer.
- Fully automatic sending and receiving of messages.
- Guaranteed international compatibility.
- Unique Terminal Identity on all correspondence.
- 309 different printable characters.
- Format of the document guaranteed.
- Transmission rate 2400 Bps duplex.
- Error free documents.
- Automatic message control and storage.
- Simple interworking to Telex and fax.
- Simple access to international Teletex, Telex and fax.
- Can re-edit and forward without rekeying.
- Low installation and operating costs.
- Full technical support.
- Transfer text between incompatible computers and word processors.
- Will transfer binary files, with error control.
- Encryption of documents available.
- Electronic signatures available.

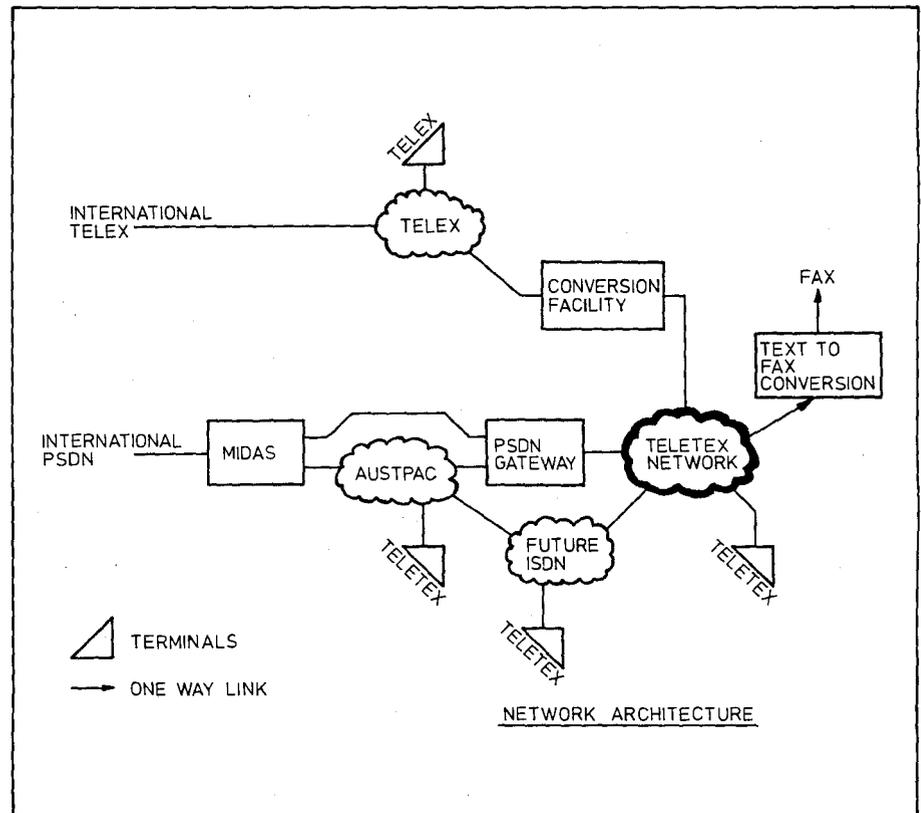
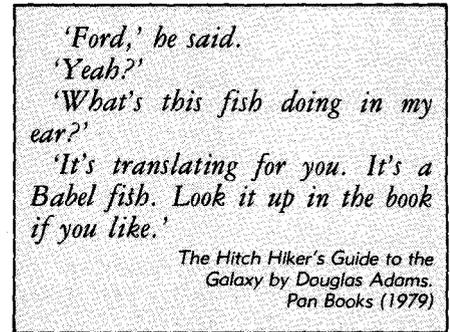
APPLICATIONS

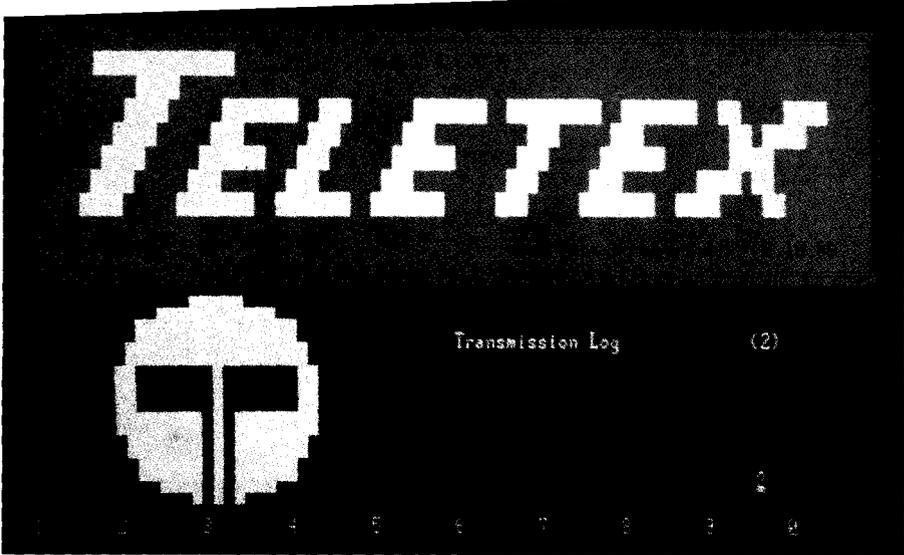
One of the most convenient aspects of the PC Teletex software is its ability to be integrated into the application software normally used in a PC. This feature allows direct access to Teletex Pack software from the normal PC application. Some typical examples are as follow:

Word processor interworking

Conversion software is available as part of Teletex Pack for most popular word processor packages. This allows simple conversion from the word processor file format to a Teletex file, which can be sent in the normal way as a Teletex document.

However, by redefining a function key in the word processor itself to mean "TRANSMIT DOCUMENT AS TELE-





TEX", a document can be automatically transmitted as a background task, from within the application software. Ready-made batch files are available for many of the popular word processor packages.

File transfer

By using the private mode facility in the UTC, a binary file can be transferred over the error-protected Teletex network. By using batch files and available application utilities, this file transfer can take place from within the application programme. For example, the transmission of a file by Teletex to a given number can be initiated from within Lotus as if it were a new Lotus command.

Forms handling

Extending the file transfer idea one step further, a screen "form" can be displayed, for example a material or service order. On completion of the form, pressing F10 could initiate the transmis-

sion of that form to the required central point. There are several such applications in use on the Teletex network today.

sion of that form to the required central point. There are several such applications in use on the Teletex network today.

Encryption

By using the same electronic keys as above, but in the reverse order, it is possible to encrypt a document prior to transmitting it, in such a way that only the intended recipient, with his secret key, can read the document. This is

signed interworking unit. This IWU also allows access to Teletex users on Austpac, the Australian packet switching data network (PSDN).

Telex is another important text service, with 35,000 services in Australia and 1.6 million worldwide. Interworking to and from the Telex network is provided via a "Conversion Facility".

Interworking to facsimile has not been overlooked either. A Teletex to fax interworking facility handles conversion and delivery to national and international facsimile. Conversion from fax to Teletex is not envisaged for some time as this is still technically difficult and only research prototypes are available.

Future developments

Much has been said and published about X.400 message handling services. Using the techniques specified in the X.430 recommendations, Teletex will interwork with the future messaging services. The conversion facility and inter-network gateways described above are already the beginnings of these interworking services.

Integration of fax and Teletex into a so-called multi-mode Teletex service is already under development by terminal manufacturers. The development of the ISDN (Integrated Services Digital Network) with its inherent 64 Kbit/sec transmission rate, will further enhance the possibilities for Teletex. Imagine a page of this magazine, with combined graphics and re-editable text, being transmitted as a single document in as little as 5 seconds!

The bit-rate availability of ISDN is sure to lead terminal designers to offer higher resolution graphics, colour and even voice annotation of documents. The possibilities for Teletex on ISDN are unlimited.

ETI

'... in the UTC, a binary file can be transferred over the error-protected Teletex network'

done by encrypting (scrambling) the document by combining it with the readily available public key of the recipient. Only the appropriate public key can decrypt the document.

By using both the above techniques it is quite easy to first "sign", then encrypt a document before transmitting it.

Electronic signature

There are many applications, such as legal transactions or taxation returns, where a document must be accompanied by a signature. Until now, this was not possible. Even facsimile was not acceptable because of the ease of "cutting and pasting" a signature onto the document before faxing it.

This has now changed with the introduction of a new facility called TELETEXT CRYPT, available through STC-AI-catel.

By clever application of the properties of Public/secret key pairs, an author of a document can use his secret key to

Network access

The Teletex network in Australia is a dedicated network — a partitioned portion of Telecom's newest digital AXE telephone exchanges. To all appearances, the Teletex network operates as a freestanding, separate network accessible from virtually anywhere in Australia.

Access to international networks is via OTC's Data Gateway (previously called MIDAS) through a specially de-

The practical upshot of all this is if you stick a Babel fish in your ear you can instantly understand anything said to you in any form of language.

The Hitch Hiker's Guide to the Galaxy by Douglas Adams. Pan Books (1979)

Acknowledgement — The author would like to thank the Manager, Text services, Telecom Headquarters, for his assistance during the preparation of this article.

World wide changes are happening to the environment. The atmosphere is warming, the composition of the upper atmosphere is changing. One of the most sensitive indicators to the health or otherwise of the planet is the sea level.

The first problem however, is to establish an accurate measurement of sea level. New electronic methods of data taking and data storage are making a huge difference to the amount of information we have available. Computer power too, promises the eventual prediction of global ocean circulation and, from that, global climate for ten years ahead.

Along the coasts of continents it is relatively easy to measure sea level, for plenty of instruments are available. They include float gauges, pneumatic systems, pressure sensors, acoustic recorders and capacitance probes.

Whatever approach is adopted, the sea level signal is converted to an electrical signal, smoothed and sampled electronically from a highly stable clock and stored in a data logger for subsequent processing and computer analysis. This is the interesting stage, when measurements from several instruments at different locations can be compared and correlated so that the physical processes can be described.

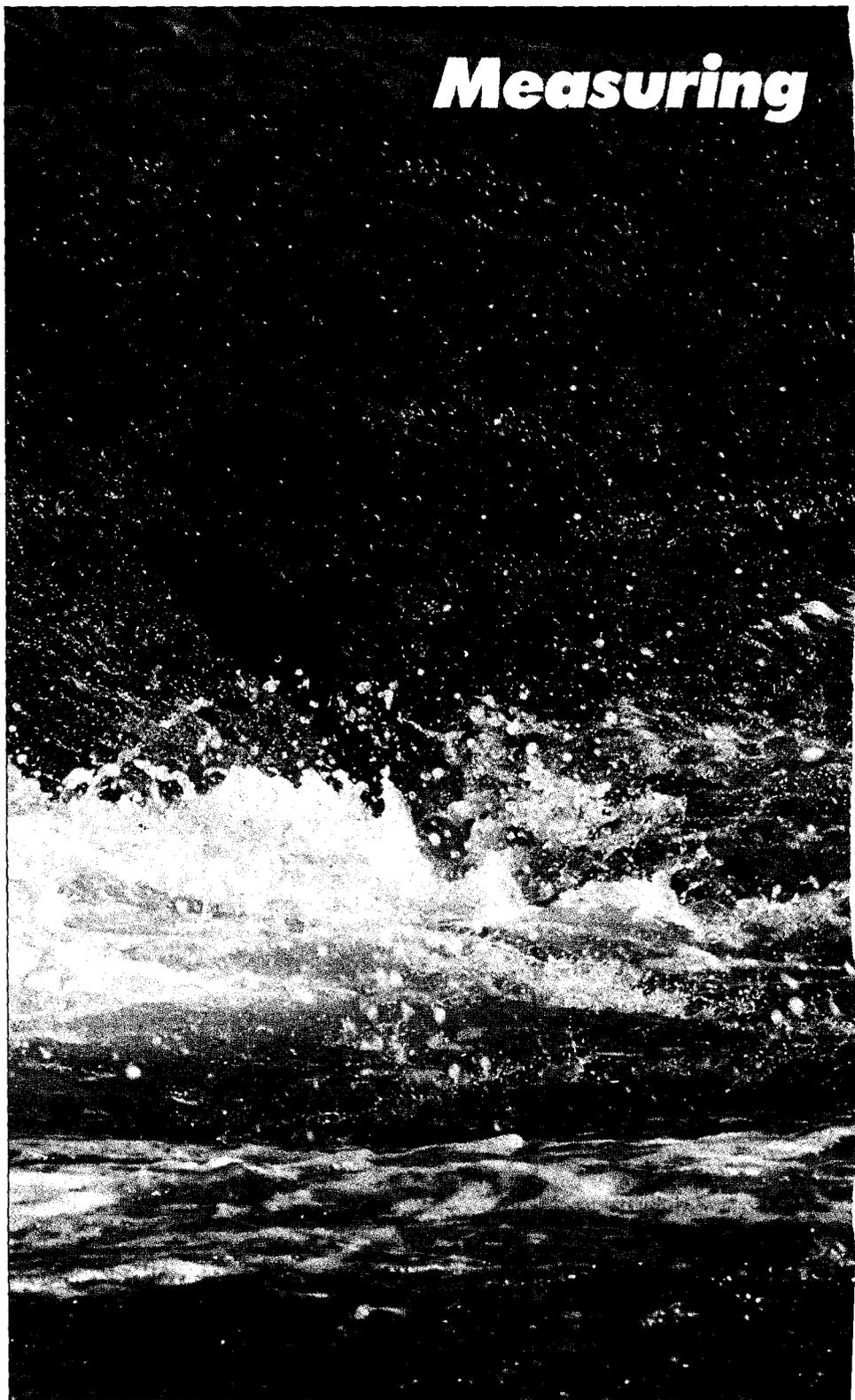
Today, the geographical areas that concern the oceanographer most are not conveniently situated along the continental coastlines: Interest has moved into deeper waters, to the shelf break and to areas such as the Southern Oceans. There are oceanic islands on which we can install instruments but many are remote and inhospitable; it may not be practical to man such stations, so instruments then have to be automatic, reliable and capable of operating in a harsh environment for up to perhaps two years. For example, on the islands of Tristan da Cunha and St Helena we have installed pressure sensors in the sea, remotely connected by armoured cable to shore installations where the data is stored. The system also records atmospheric pressure and sea temperature. A microprocessor at each station collates the data and transmits it daily by satellite link. This allows us immediate access to the data and enables us to monitor the reliability of the network.

Depths of 6000 m

In the open ocean the main method of inferring sea level changes is to measure variations in hydrostatic pressure near the sea bed caused by changes in the surface level. But most of the oceans have depths of more than 4000 m, and

THE TIDES OF CHANGE

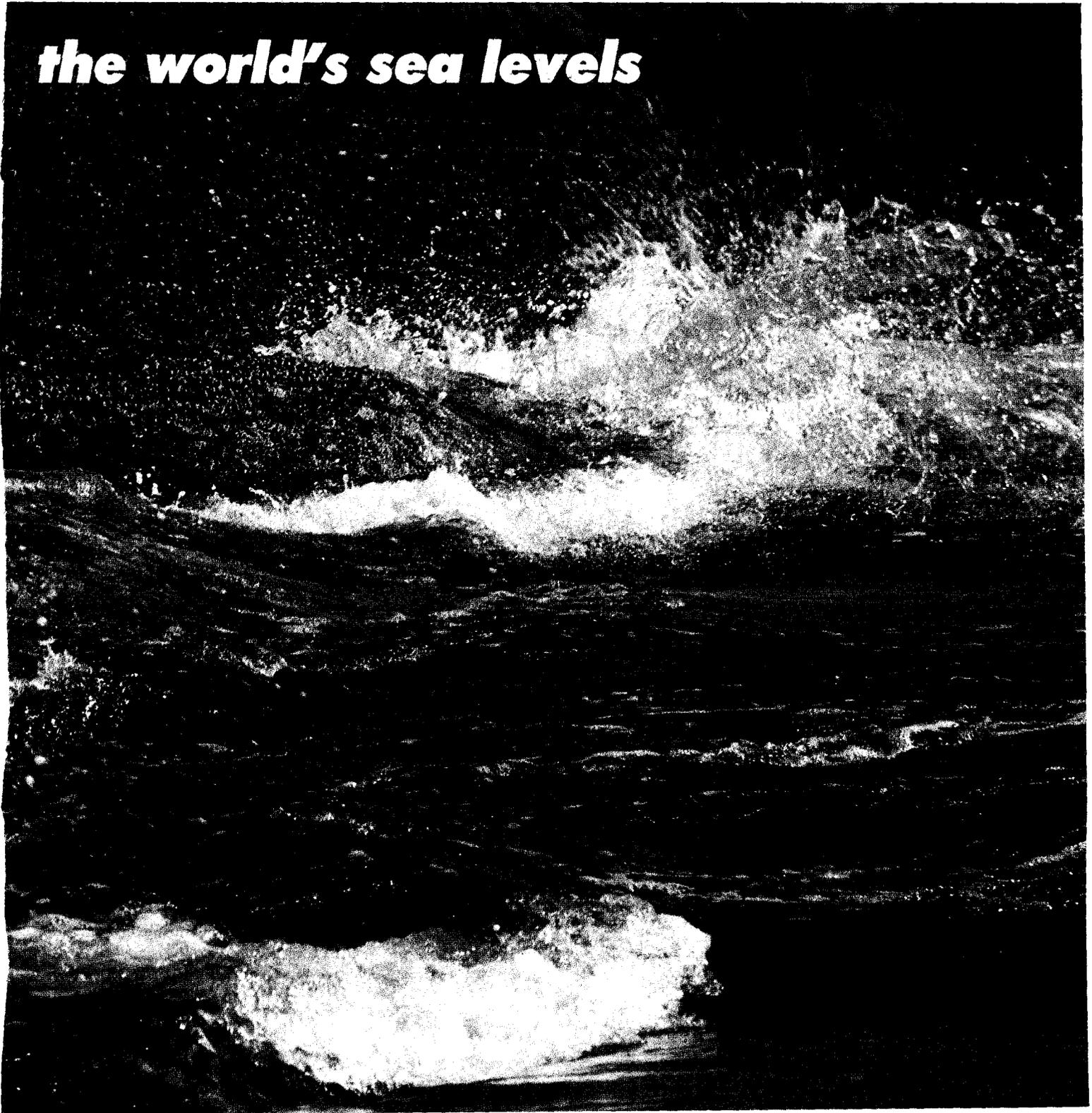
Measuring



Predicting changing sea levels is a traditional area of research important for navigation and for planning defences against the sea itself. Now, advances in oceanographic and satellite technology enable levels to be measured in the deepest oceans.



the world's sea levels



Sea level measurement

to measure sea level to a precision of one centimetre requires highly stable instruments. Nevertheless, we have been working in this field for over ten years and have instruments capable of operating to depths of 6000 m. Such equipment is self-contained, is deployed from a research ship and falls to the ocean bed. Once in place, it measures and logs pressure and sea temperature for up to two years. To retrieve the equipment, the ship uses acoustic telemetry to locate it precisely and to release a heavy ballast frame from underneath the capsule. The main frame, containing buoyancy, acoustics and the instrument package, then rises to the surface.

Variations in sea level can be caused by changes in the thermal structure of

'In most sea level records the tidal signal is the dominant feature'

the water column, so we monitor such conditions with a device called an inverted echo sounder. It sends acoustic pulses from the sea-bed and detects their reflections when they return from the surface. The return travel time contains information about sea level and the thermal structure of the water.

Although there are thousands of coastal sea level recorders and several bottom pressure recorders operating around the world, large areas of ocean are inadequately covered. Satellites carrying radar altimeters can give better global coverage, especially if there are several operating simultaneously.

Altimetric method

A satellite is placed in an approximately circular orbit above the Earth with a nadir-pointing radar altimeter on board. Several times a second the altimeter transmits a radar pulse to the sea surface which is then reflected and received back at the satellite by the altimeter dish. Half the travel time of the radar pulse tells us the height of the satellite above the sea surface, provided that the refractive index of the intervening atmosphere can be well modelled. Modern altimeters can measure the distance from the satellite to the sea surface with a precision of the order of several tens of millimetres for data averaged over one second. In that time the satellite travels approximately seven kilometres along its surface track, so the sea surface height is not sampled at just one point but is averaged over a short distance: the altimeter 'footprint', which is due to the transmitted pulse having a finite width and to spreading of the ef-

fective illuminated surface by the state of the sea, is of similar size.

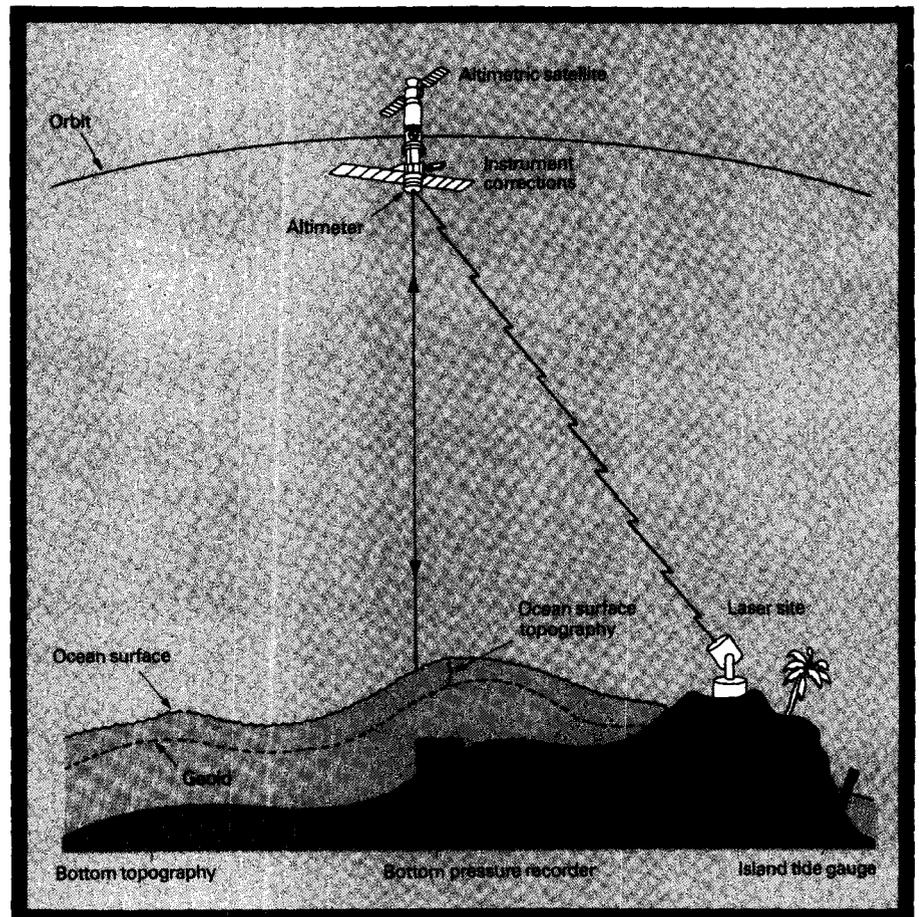
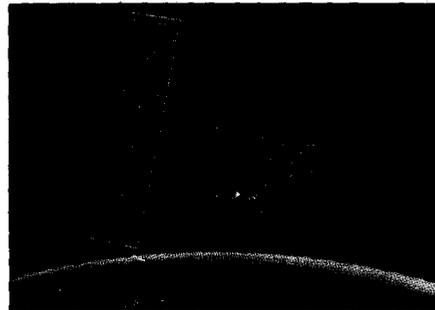
An altimetric satellite is usually placed in an orbit approximately 1000 km above the ocean at which height it circles the Earth in about 100 minutes. If one can accurately measure the radial distance of the satellite from the centre of the Earth, then one can calculate the height of the sea surface in a geocentric frame from the altimeter-sea surface measurement. The ephemeris of the

satellite is computed from knowledge of the Earth's gravity field, lunar and solar gravitational effects, solar radiation pressure, atmospheric drag and tidal forces at that altitude and from various range measurements taken by laser.

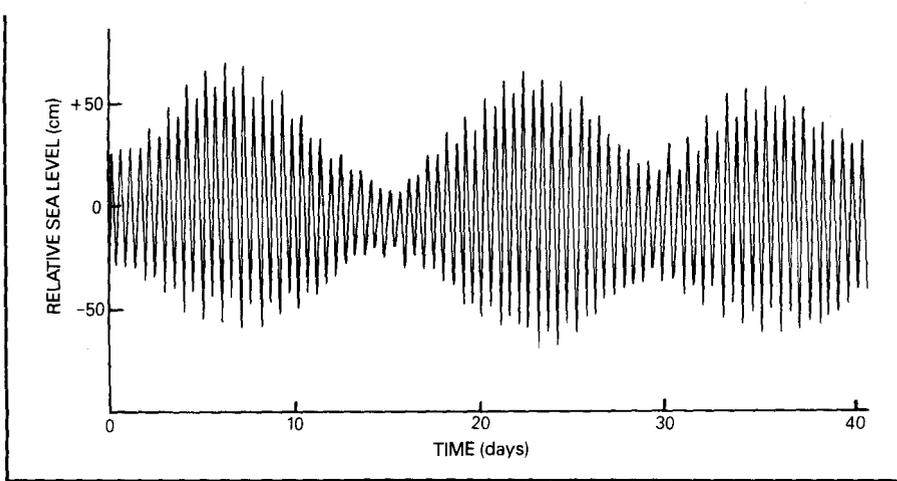
In practice, the radial distance of the satellite orbit can be calculated to only several decimetres. However, the dominant wavelength of this orbit error is of the order of one revolution or more and the computed error in sea-level slope, which for oceanographic purposes is usually more important than sea level itself, is typically around one decimetre per 1000 km, which is acceptable accuracy for many applications.

Apart from the early proving experiments of Skylab (1974), the first altimeter missions which yielded adequate information for scientific analyses were those of Geo-3 (1975-78) and Seasat (1978), both US satellites. There was a gap of several years, however, between the demise of Seasat and the launch of the US Navy's Geosat in March 1985. Fortunately, this situation will change

An artist's impression of the ERS-1 satellite.



How it works. The distance between the centre of the earth and the satellite is calculated by bouncing laser beams off the satellite. A radar on the spacecraft then measures the distance down to the sea immediately below.



The tides at St Helena in the South Atlantic. Sea level is monitored continuously and transmitted each day by satellite link.

within the next few years with the launch of ERS-1, the first European altimeter satellite, in 1990. This unit will fly with an Australian designed instrument, and will be a major source of data for Australian scientists.

Topex/Poseidon, a joint project between France and the USA is planned for 1991 and NROSS, another US Navy satellite, should enter service soon afterwards, will also add significantly to the data available.

Altimetry measurements are used to find the global (time-invariant) mean sea surface (MSS). To first order, this is the geoid, which is simply the surface of equal gravitational potential of the Earth; that is a measure of the surface of the ocean in the absence of tides and currents. The geoid is approximately an ellipsoid, with geographical variations of up to 100 metres caused by lateral differences of density within the Earth. The mean sea surface consists of the geoid plus the time-invariant ocean topography, of the order ± 1 metre, due to the time-averaged global ocean circulation. Variations of ocean currents then give variations with time of up to a few decimetres with respect to this MSS. The Proudman Oceanographic Laboratory is using altimetry to measure the global ocean tides and to investigate sea level variability associated with fluctuations in ocean currents.

The tides

In most sea level records the tidal signal is the dominant feature. The chief influences in our better understanding of global tidal processes have been, firstly, the development of global hydrodynamic computer models and, secondly, our ability to measure tides in the open ocean instead of being restricted to coastal margins. As well as being of geophysical interest in themselves, the ocean tides must be accurately known if we are to investigate other sea level variations by means of satellite altimet-

ric measurements.

Sir Isaac Newton in his *Principia Mathematica* (1687) showed that the gravitational forces due to the Moon and the monthly motion of the Earth around the common centre of mass of the Earth-Moon system produce two tidal bulges which are on opposite sides of the Earth. The rotation of the Earth on its axis then produces two tides per day, as the diagram shows. Similarly, the Sun produces two tides per day but their amplitudes are slightly less than half of those raised by the Moon. The ocean tides are really far more complicated than this simple picture suggests.

The first complication arises with the astronomy. The relative orbital motions of the Earth-Moon-Sun system are well known from astronomical observations and must be taken into account when describing the tides. As well as periods near half a day, the orbital motions give tides with periods near one day, a fortnight, one month, six months, one year, 8.8 years, 18.6 years and 20,940 years.

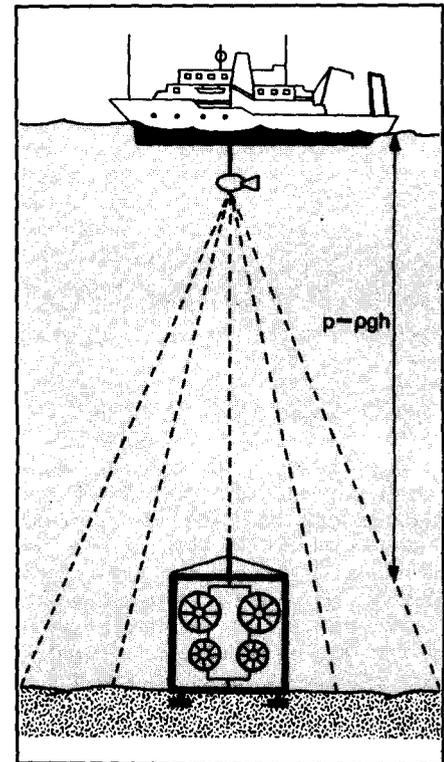
Second, the dynamic response of the oceans themselves must be taken into account. They are not deep enough to allow the water to react instantly to tidal forces. Ocean basins are also constrained by continental land boundaries, chiefly along the North-South direction, that effectively block the natural westward propagation of the tides. The oceanic bathymetry is complex and varies substantially, especially at the shelf break; bottom friction, especially in continental-shelf seas, plays an important modifying role. Currents are induced, which move on a rotating frame of reference: the Coriolis force causes a deflection of the flow to the right in the northern hemisphere and to the left in the southern hemisphere. These factors cause the real tide to lag, on average, behind the gravitational forcing, and to move round the ocean basins about a series of null points or amphidromes, where the amplitude is zero. There may

be several amphidromes in an ocean basin and their positions will be different for the various tidal periods.

Computer models now solve hydrodynamic equations based on a spherical Earth with increasingly realistic ocean basin geometry. Many of the models contain measured data as boundary conditions and for interior calibration points. To a large extent the accuracy of the solutions depends upon the density of measurements available in specific areas.

Ocean currents

In recent years interest has been growing in the use of sea level measurements to find changes in the main ocean currents. For spatial scales greater than about 50 km and time scales longer than about one day, the surface height is directly related to the surface current. This is because on such scales oceanic motions are mainly governed by the forces acting on the water particles. The Coriolis force due to the Earth's rotation is balanced by the horizontal pressure gradient (these forces are both at right angles to the direction of flow). At the surface, the pressure gradient can be calculated from the



Deep ocean pressure recorders measure the change in hydrostatic pressure near the bottom caused by fluctuations in sea level. They record automatically and are recalled to the surface by acoustic signals.

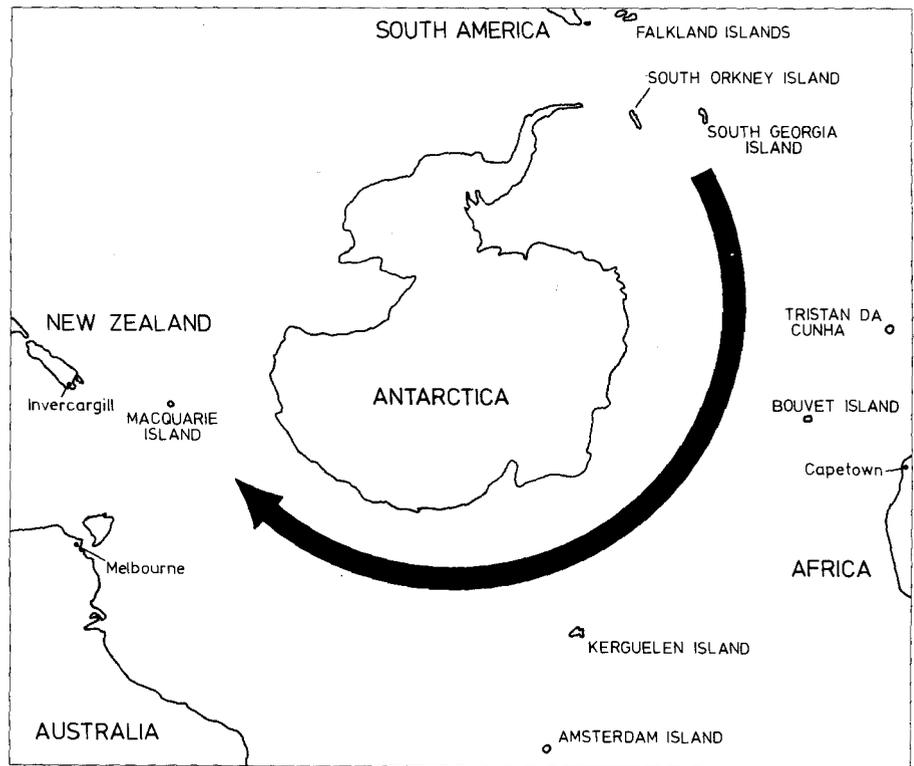
Sea level measurement

sea-level height. The direction of the surface current is along contours of surface topography. This is directly analogous to the circulation of atmospheric winds around systems of high and low pressure.

A current of one metre per second at mid-latitudes is associated with a surface slope of one metre in 100 km (a slope of $1 \text{ in } 10^5$). This figure is typical of currents such as the Gulf Stream. The surface topography of the oceans is superimposed on the topography of the ocean surface due to the geoid (up to 100 m), mentioned earlier. Unfortunately the global geoid is, so far, not known to better about ± 1 metre. So tide gauge measurements or altimetric measurements cannot be used to determine the mean currents until the model of the geoid is improved using better gravity measurements from either satellites or surface gravimeters. Nevertheless, there are very important large variations in current (typically up to ± 20 per cent); they can be worked out from the time variations of tide gauge and altimetry measurements.

Our laboratory has started a programme of sea-level measurements in the Southern Ocean with the objective of determining the variability with time of the Antarctic Circumpolar Current (ACC) and its geographical variations. This is part of the World Ocean Circulation Experiment (WOCE), which is an international collaborative project that aims to measure the large-scale aspects of the circulation of the oceans to test numerical models of the circulation. Such models are needed for predicting variations in climate over the order of decades; they depend critically upon an understanding of the way the oceans behave.

The ACC is a major current system (mean transport $125 \times 10^6 \text{ m}^3 \text{ s}^{-1}$) which is important to climate because it transfers momentum, heat and water masses between the Indian, Pacific and Atlantic Oceans. So the Southern Ocean is of special interest and has been defined as one of the core projects of WOCE. Fortunately, there are several oceanic islands at strategic points around the ACC that can be used in pairs to look at the time variations in sea-level differences of up to 20 cm across the ACC. We plan to use observations from four pairs of islands, namely Falklands and South Orkney; Falklands and South Georgia; Tristan da Cunha and Bouvet, and Kerguelen and Amsterdam. In areas devoid of islands we plan to install bottom-pressure and inverted echo sounder instruments. All



Fluctuations in the Antarctic Circumpolar Current affect the weather in our region, and show themselves as variations in sea level. Instruments can be sited at remote islands and then telemetry can be uplinked to satellites.

the measurements will be used to verify the data from satellite altimetry measurements obtained with Geosat, ERS-1 and Topex/Poseidon. The altimetry will then be used to find the sea surface height variations in areas where no *in situ* measurements are available.

As well as the tidal and ocean circulation signals discussed above, coastal tide gauges also give important information on secular changes of mean sea level relative to the land. These are changes that are extremely slow, so at least 20 years of data are needed to evaluate the secular trend in sea level at any given place.

A rise in global mean sea level would be one expected outcome of the global warming of our planet by about 0.5°C which has been going on over the past 100 years. The consensus of opinion from the global tide gauge data set is that global sea level has indeed risen in the past century by approximately 100 to 150 mm, though in many places the rise is obscured in the data by vertical movements of the land upon which the gauges are fixed.

Melting

As far as we can tell, the decimetric rise in sea level during the past century has been caused by two main processes, thermal expansion of the upper layers of the ocean and the melting of mounting

glaciers at low latitudes. The polar ice caps are not thought to be a large net contributor to global sea level change, though the data from this area is not as complete as one would wish.

Estimates of the rise of global sea level to be expected in the next century vary widely because the projected 'greenhouse gas forcing' (from carbon dioxide, chlorofluorocarbons and so on) is uncertain, and the potential role of the polar ice caps, in particular the West Antarctic Ice Sheet, is unclear. Predictions of the rise in sea level by the year 2100 vary between several decimetres, at about the present rate, to several metres. Obviously, more research is needed if we are to understand the various climatic processes at work that influence global sea levels.

The recent technological advances in global measurements of sea level are beginning to make contributions in areas ranging from the study of crustal movements to research in ocean circulation and climate change. International programs have been set up to co-ordinate the work.

ETI

ETI acknowledges the British Central Office of Information and the research by Dr Trevor Baker, Dr Ian Vassie and Dr Philip Woodworth, carried out at Proudman Oceanographic Laboratory, Birkenhead.

INSIDE THE DESIGN COUNCIL

Catering for marketplace needs

In the past few years, both State and Federal Governments have established a host of organisations to aid would-be entrepreneurs with information and advice. Here, Tina Ali looks at the first, and still most widely respected, of these groups — the Australian Design Council (ADC).



INNOVATION

Established in 1957 as a non-profit making information and educational body, the ADC actively promotes design as fundamental to the production of competitive goods. The Council is constantly upgrading its services in response to the changing needs of the market place. Currently a wide range of information and advisory services is offered, from counselling and diagnostic services through to product screening, and development, information sourcing, designer referral and project management.

In 1988 the council launched two new action-learning programmes aimed at senior management. Integrated Product Management (IPM) and Japan Exporters Program (JEP) seek to develop the in-house expertise required for successful product development, and expansion of exports, to Japan, respectively.

Workshops

The programme brings together key management personnel in a series of structured workshops supported

by internal team meetings. These are opportunities for participating companies to address issues and activities of specific industry or company relevance. These programs provide access to new ideas, techniques and information networks. In the year 1987/88, ADC worked with over 60 manufacturers including Datacraft, Image Software (computer hardware and software), and Toledo (electronics scales)

IPM is recommended for manufacturers who wish to maximise market opportunities, to improve the efficiency of their product development procedures or integrate product development with marketing and production activities.

JEP is applicable to both first time exporters and those seeking to expand activity. This programme looks at economic and cultural factors, varying business practices and consumer demands. Special attention is given to design, quality and packaging requirements of products, as well as promotional and other point-of-sale literature.

Award

In addition to these services and programs, the council is responsible for the administration of the Australian Design Awards (ADA). The Awards are the most significant recognition of product excellence in Australia and signify, to both local and international markets, an Australian designed and manufactured product of international quality.

Criteria for selection to the ADA programme include, among other things: innovation, performance, quality, ergonomics, durability, safety, aesthetics and value for money. Currently recipients include a cordless electronic kettle and cordless iron, from Kambrook, voice logging recorders from Electrodata, an ergonomic arm from Unisys, a computerised weighing system from Scales and Systems, a laser contour motion system from Laser Lab and a coal slurry analysis system from Amdel.

Fees

The ADC utilises its own staff and a network of consultants, both local and international. Fees for services and programs are structured to attract companies who would not normally be able to access the high calibre of expertise offered. In addition, some companies may be eligible for NIES subsidies.

There are other projects as well. 1988 saw two new publications, for instance. One was a training manual on product development targeted at small to medium sized manufacturers. *Competing through product innovation* is a clearly set out, step-by-step guide to the principles of design and product develop-

ment.

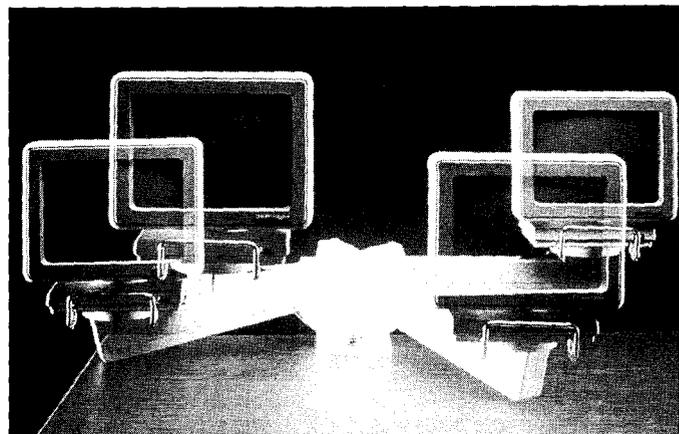
At World Expo 88, ADC, as a joint venture with the Advance Australia Foundation, launched a buyers' guide to Australian products called *Australia's Best*. It is a compendium of Australia's best products presented in an interesting cultural context.

Shows

Then there are the shows. The ADC participated in the first international design forum in Singapore during 1988, as well as the world retailers' conference and exposition in Sydney.

ADC, in conjunction with Austrade, also organised a meeting between Australian designers and members of the Electronics Industries Association of Japan, as part of their Design Tour of Australia in October, 1988. Member delegates, representative of the top echelons of design management in the most authoritative electronics companies of Japan, (e.g. Toshiba, Sanyo, Sharp, Sony and Pioneer) were particularly interested in the application of electronic products to the leisure industry.

Tina Ali works as a media and publications officer for the Victorian division of the Australian Design Council.



The award-winning ergonomic arm from Unisys.



INNOVATION

On the thirty one years since the advent of the space era, more has been learnt in the field of astronomy than in the previous five thousand years. Outside the Earth's restrictive atmosphere, astronomers now and in the future will be participating in true space age astronomy.

Apart from the traditional means of viewing the heavens with the naked eye, binoculars and telescopes, newer forms of astronomy have now entered the realm of professional and amateur astronomers. Terms like infra-red, gamma-ray, ultraviolet and x-ray are now a familiar feature in an everchanging science.

The American contribution to space observing is contained within the Great Observatories programme. NASA is concentrating on four main areas of astronomy: the Advanced X Ray Astrophysics Facility (AXAF) which will be dedicated to x-ray astronomy, the Space Infrared Telescope Facility (SIRTF) which will be dedicated to infrared astronomy, the Gamma Ray Observatory (GRO) which will be looking at gamma ray astronomy and the Hubble Space Telescope (HST) which will be a visible light telescope (See ETI June 88). Other telescopes and facilities that will tie in with the Great Observatories program include the Solar Optical Telescope (SOT), the Infra-red Space Observatory (ISO) and the Extreme Ultraviolet Explorer (EUVE). Australia will also be contributing to Lyman, a project of the European Space Agency.

Earlier Earth orbit observatories have included the Orbiting Astronomical Observatories (OAO), the High energy Astronomical Observatories (HEAO), and the fabulously successful Infra-red Astronomical Satellite (IRAS). Launched in 1959, the OAO was a series of four flights. Even though only two were successful they were responsible for detection of the first ultra-violet emissions from the planet Uranus, new insights into the composition and structure of the Earth's upper atmosphere and the study of young hot stars which emit most of their energy at ultra-violet wavelengths that are not visible to ground observatories because of the Earth's atmosphere.

Conceived in the early 60s and finally launched in 1977, 1978 and 1979, the

three High Energy Astronomical Observatories are credited with dramatically changing scientific views of the universe. The instruments of the three observatories were developed in a series of balloon flights which reached a height of 19 miles in 1974-75. Scientific investigations of the data returned by the HEAOs suggested that the concept of rotating galaxies evolving gently over billions of years was wrong. It has been replaced by a dynamic and explosive universe in constant turmoil.

The Infra-red Astronomical Satellite was launched in 1983 and was a joint collaborative effort between The Netherlands, United Kingdom and the United States. From its first day in a polar orbit IRAS viewed approximately two thousand celestial objects a day in the infra-red. During the satellite's short lifespan of approximately three hundred days it was able to pinpoint the positions and intensities of more than two hundred thousand cosmic objects. One of those observations led to the discovery of a cumstellar disk around the star Beta Pic-

*'... the dramatically
changing scientific views
of the universe'*

toris which could indicate a possible solar system.

The future

Turning towards the future: the Advanced X-Ray Astrophysics Facility is an observatory that will be carried into orbit by the Space Shuttle in the mid 1990s. Orbiting the Earth at an altitude of approximately 288 miles, the "eye" of ASAF is a large area, high resolution x-ray telescope, which will be equipped with instruments for detection, spectral analysis and imaging. Primarily used for studying various properties of x-ray emissions, AXAF is a significant advance over the earlier HEAOs. It will have sensitivity 100 times greater than the earlier observatories with greater improvement in resolution, which will mean a larger region of the spectrum will be accessible for x-ray imaging. With a design life of ten to fifteen years,

Early next decade, space based observatories will provide complete coverage of the electromagnetic spectrum, all the way from energetic gamma rays through to the deep infra-red.

AN EYE IN THE SKY

The great observatories

The Lyman spacecraft will investigate for ultra violet emissions. Until the 1988 Budget, Australia was destined to play a great part in this venture. Now, for want of \$50m, our scientists will watch from the sidelines as NASA and ESA divide the spoils.



Great observatories

AXAF is a shuttle shaped craft. It will be regularly serviced by shuttle crews which will allow for the replacement and repairing of instruments. Among the areas studied by AXAF will be black holes, supernova remnants, pulsars, quasars as well as faint hot stars.

The Space Infrared Telescope Facility will be placed in a nine hundred kilometre orbit by the Space Shuttle and NASA's Orbital Manoeuvring Vehicle (OMV).

SIRFT will perform the same function as IRAS, but with 1000 times greater photometric accuracy. SIRTF has an 850 mm mirror which will be cooled to a very low temperature — as close to zero degrees as possible — by a liquid helium coolant which can be replaced by Space Shuttle crews to extend its lifetime over the five year design limit.

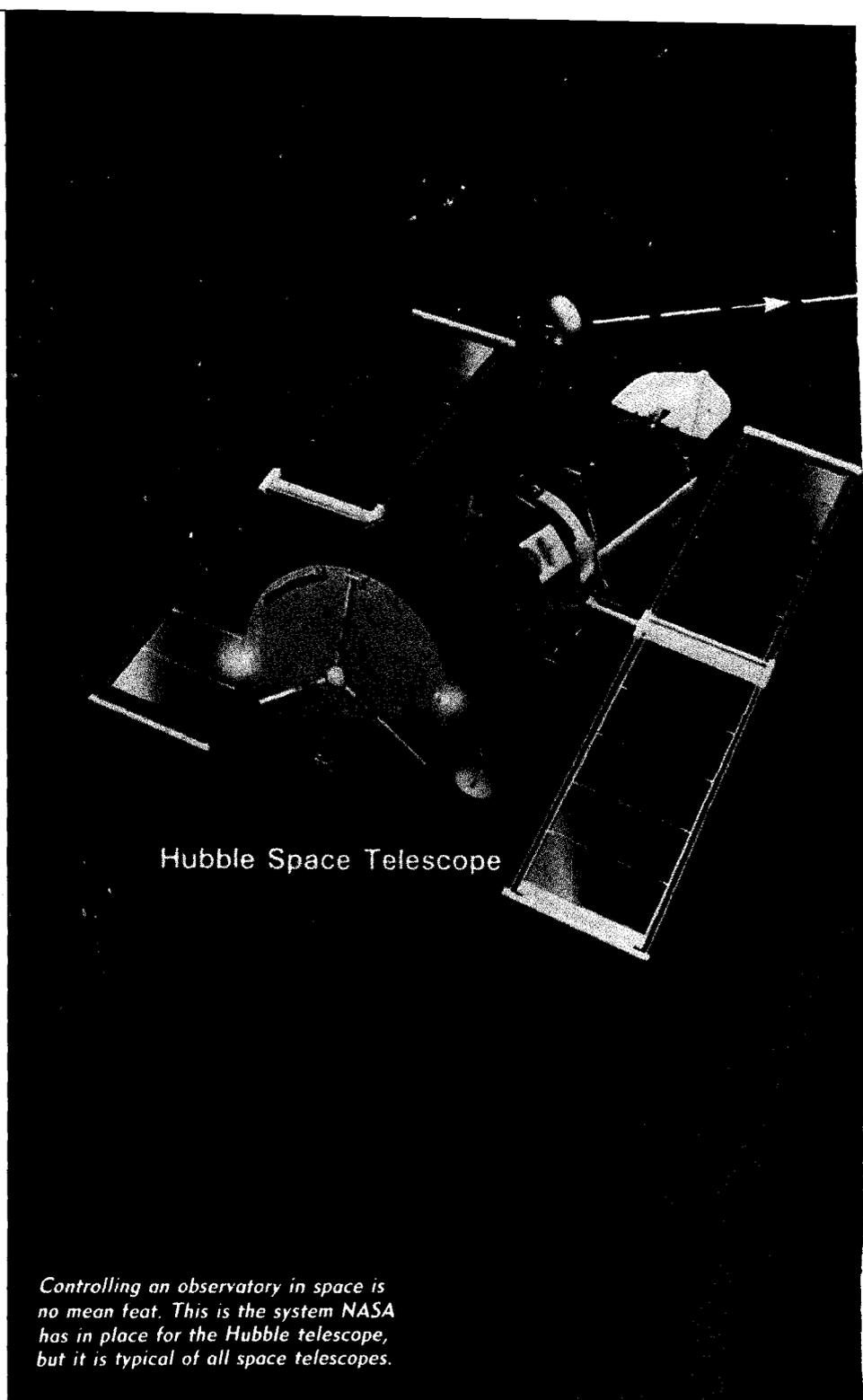
The Hubble Space Telescope is scheduled to be launched by the Space Shuttle Discovery in the middle of next year. Originally due to launch in 1985, then delayed until 1986, the Hubble has been sitting idle since the Challenger tragedy two years ago. The first of the Great Observatories to commence operation, the HST will be used for visible light observations of exceptional resolution and sensitivity.

The Gamma Ray Observatory will be launched into low Earth orbit by the shuttle in 1990. At a weight of 15 tons the GRO must be orbited by the shuttle and has been designed for in-flight refuelling and repair.

GRO may well prove the most valuable of the space observatories, Gamma Rays betray high energy events and thus matter in extreme states of heat, density or acceleration.

For instance, GRO should tell scientists much more about the centre of our galaxy where millions of stars are crowded into a very small space. In a similar vein, other topics under investigation from GRO will include supernovas, pulsars, quasars, and radio galaxies and it is hoped to gain some insight into the character of the universe shortly after its creation. Another possible area for investigation will be a search for the existence of anti matter in the universe.

Although not an official part of the Great Observatories program, other observatories and telescopes will be tied in to the program. These will be used in follow-up and separate investigations. All are due for launch in the 1990s and it is hoped a combination of the different observatories and telescopes in orbit will cover all of the electromagnetic spectrum from gamma rays to the far infra-red.



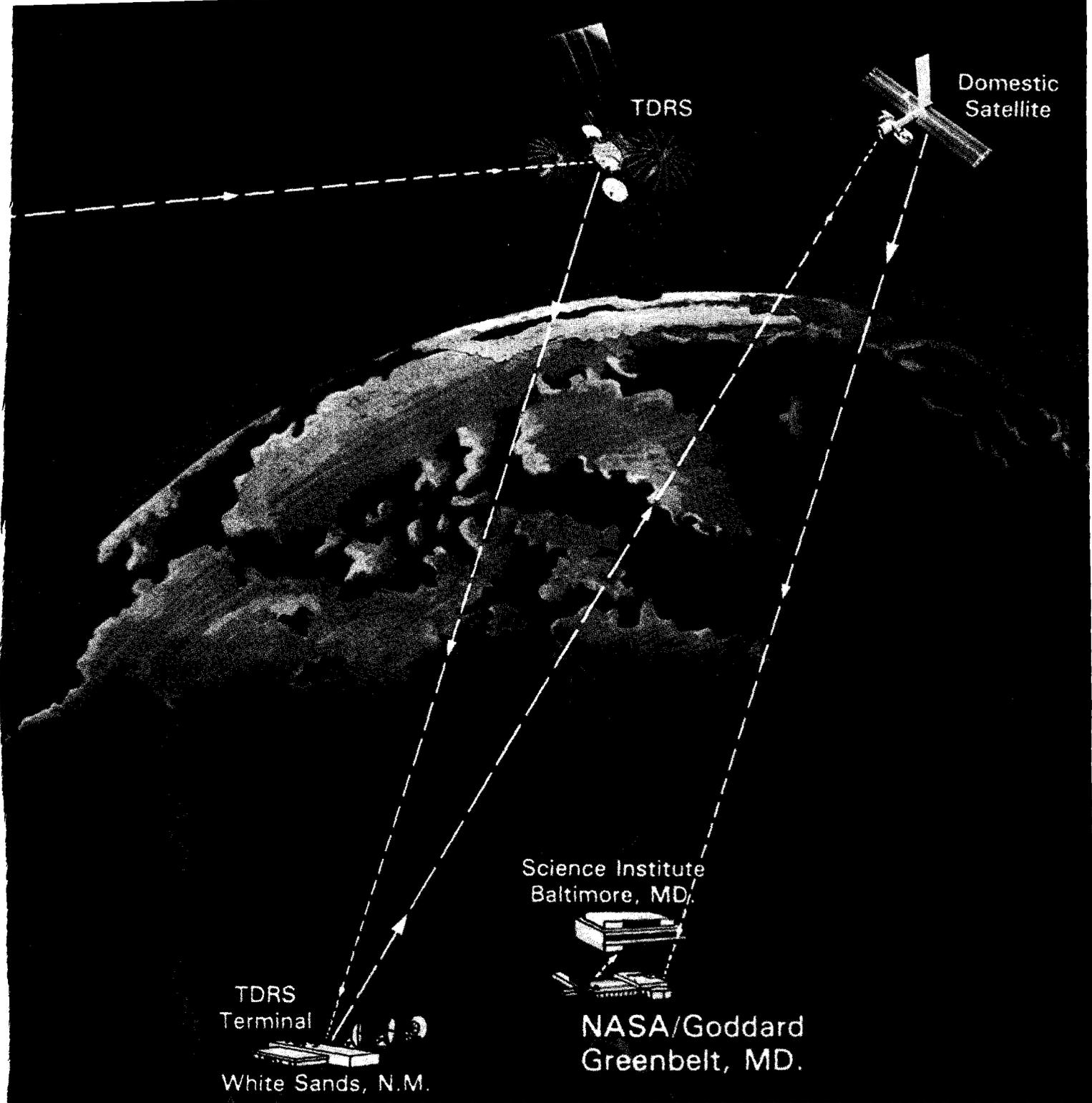
Hubble Space Telescope

Controlling an observatory in space is no mean feat. This is the system NASA has in place for the Hubble telescope, but it is typical of all space telescopes.

The Infra-red Space Observatory is the main European Space Agency's contribution. Approved in 1983 for launch by an Ariane rocket in 1992, the ISO will make detailed observations of selected galaxies and star formations that are within large clouds of gas and dust. It is hoped that the ISO will complement the Hubble Space Telescope, and within the solar system both will be used to study the gas giant planets — Jupiter, Saturn, Uranus and Neptune, as well as asteroids and comets.

Extreme ultraviolet

The Extreme Ultraviolet Explorer (EUVE) is expected to be launched in the early 1990s. Weighing in at 1,200 pounds it will carry five scientific instruments — a spectrometer and four telescopes. EUVE has been designed to investigate the last area of unexplored radiation — the extreme ultraviolet which lies between x-ray and ultraviolet. The extreme ultraviolet is invisible from the Earth's surface because of the atmosphere. Less



'... a shuttle shaped craft regularly serviced by shuttle crews'

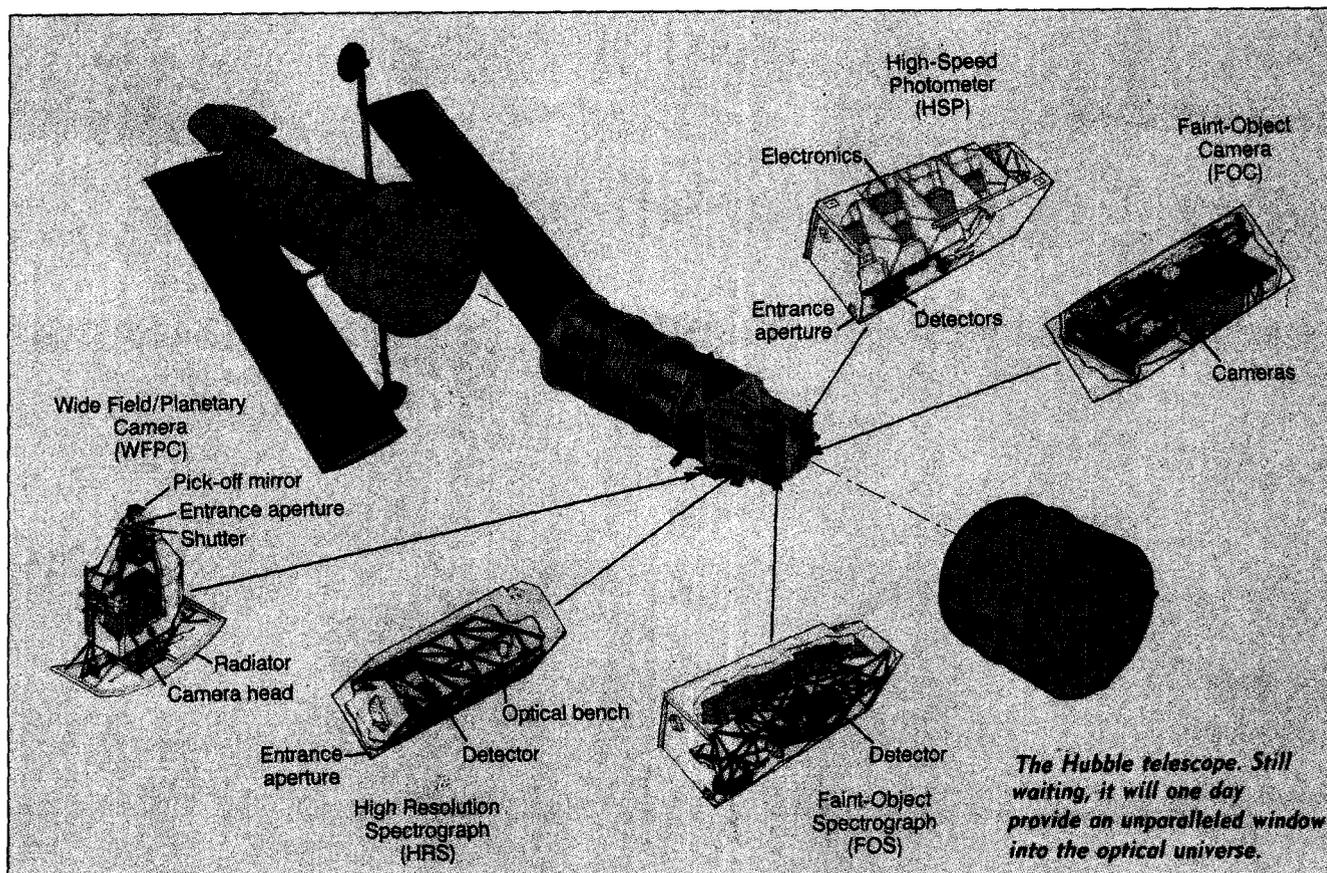
than two dozen sources of extreme ultraviolet have been discovered. In the solar system there are four of them — Jupiter, Saturn, the Sun and Saturn's moon Titan.

The other sources come from white dwarf stars and double stars that are

undergoing a constant gravitational tug of war. The EUVE is expected to complete an all sky survey of extreme ultraviolet sources and scientists are hoping that the white dwarf population will expand rapidly with some surprise discoveries.

The Solar Optical Telescope (SOT) is a successor to the Apollo Telescope Mount (ATM) which was used on Skylab missions to make the first serious observations of our nearest star—the Sun. SOT will be flown into orbit aboard the space shuttle in a series of Spacelab missions starting in the early 1990s. In several missions lasting up to ten days the SOT will make observations of the Sun through optical filters in the visible, near infra-red and ultraviolet regions of the spectrum.

Great observatories



SPACE UPDATES

NASA have released a Space Shuttle manifest outlining the flights to take place in 1988 and 1989.

In the next 11 flights scheduled, four flights will be dedicated (and classified) Department of Defence missions. Other missions will see the long-awaited deployments of the Galileo, Magellan and the Hubble Space Telescope. Another mission will hopefully see the retrieval of the Long Duration Exposure Facility (LDEF) before it is scheduled to re-enter the Earth's atmosphere.

The current missions of the manifest are as follows:

STS 27: A dedicated Department of Defence mission will take place on orbiter Atlantis. The crew consists of Commander Robert "Hoot" Gibson, pilot Guy Gardner and mission specialists Mike Mul-lane, Jerry Ross and Bill Shepherd. It has not been announced whether a Department of Defence payload specialist will be assigned to the flight.

STS 29: Scheduled to fly before STS 28, STS 29 will see the deployment of the fourth Tracking and Data Relay Satellite (TDRS D). Other payloads include an IMAX camera and Space Station experiments. The crew is commanded by Mike Coats, pilot John Blaha and mission specialists Jim Buchli, Bob Springer and Jim Bagian. Launch at this time is to be February 1989.

STS 28: Another Department of Defence mission. Commanded by Brewster Shaw, pilot Dick Richards and mission specialists Dave Leetsma, Jim Adamson and Mark Brown. April 1989 looks to be the launch date with Columbia making its eighth trip into space.

STS 30: One of the long-awaited deployments for space scientists will be the Magellan Radar Mapper to the planet Venus. Magellan was origin-

ally due to launch in 1987 and will be used to map Venus in greater detail than has been done in the past. Due for launch from orbiter Atlantis in April 1989, the mission will be commanded by Dave Walker, piloted by Ron Grabe with mission specialists Norm Thagard, Mark Cleave and Mark Lee.

STS 31: Probably one of the most awaited spaceflights of all time will be one that will finally get the Hubble Space Telescope into orbit. The mission has been delayed several years during which time there has been one major change to the crew — Astronaut John Young who was expected to command the mission on his last flight into space has been replaced by Loren Shriver. The pilot of the mission will be Charlie Bolden and mission specialists are Kathy Sullivan, Steve Hawley and Bruce McCand-

In all of this there is an Australian contribution—Lyman. Lyman is an astronomical mission which is aiming to exploit the rich and largely unexplored ultraviolet spectral regions, of the universe. Lyman is managed by the European Space Agency, but is a collaborative between ESA, Australia, Canada, and possibly the United States. Ex-

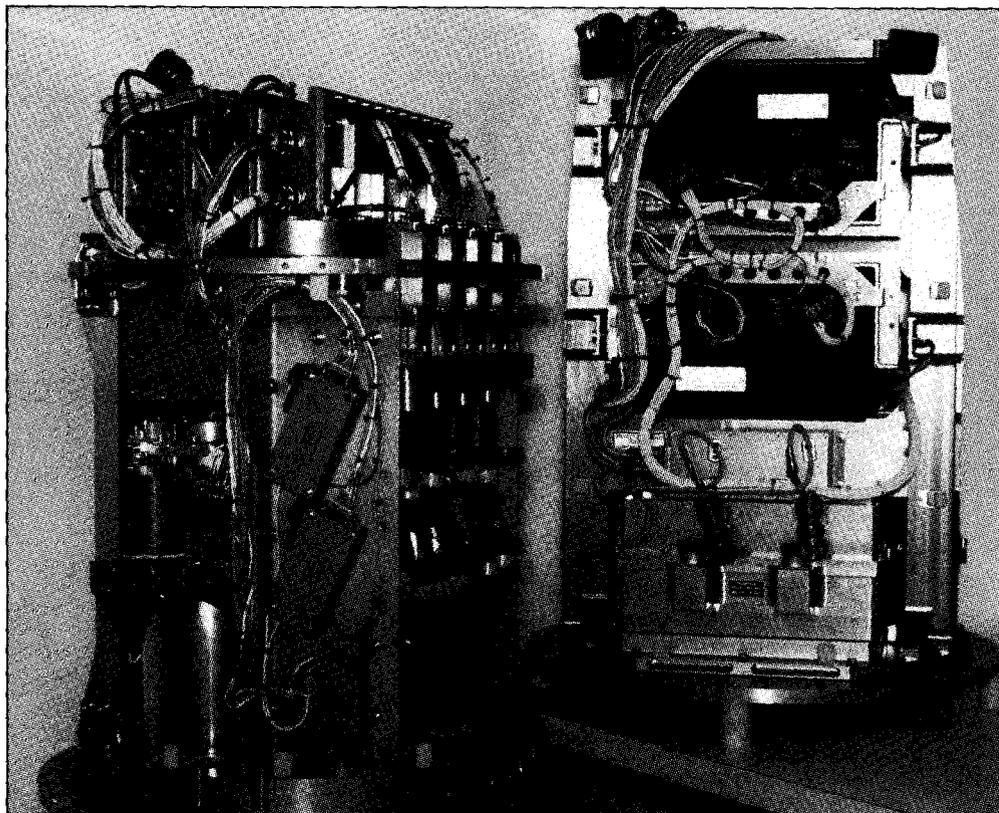
'... answers on the character of the universe shortly after its creation'

pected to be launched by Ariane, Lyman is not part of the Great Observatories programme, but in conjunction with that will help scientists in answering the unanswered questions about our universe.

A decade from now, for the first time in astronomical history, scientists will have continuous coverage of the spectrum in most forms of celestial observations and in the words of H G Wells "shall laugh and reach out their hands amid the stars".

ETI

Kathryn M. Doolan is a regular contributor to ETI on space science and technology.



Close up details of the two parts of Project Endeavour. Built at the ANU as a prototype of the Lyman detectors, it is now the most significant space observatory being planned in Australia.

less. Due for launch from the shuttle Discovery in June 1989, the Hubble will be one space science mission that should help overshadow the continuing malaise that is dominating the civilian space program.

At this stage no other crews have been named. They will be named after the STS 26 mission. The other flights for 1989 are:

STS 32: The expected retrieval of the Long Duration Exposure Facility (LDEF) and deployment of the Synclin IV-5 communications satellite will take place in August 89 aboard the orbiter Columbia.

STS 33: Another classified Department of Defence mission will take place in September 89 aboard orbiter Atlantis.

STS 34: Yet another long awaited space science mission. The deployment of Galileo probe to Jupiter will take place aboard the orbiter Discovery in October 1989.

STS 35: The long delayed ASTRO-1 mission. Originally due to fly in March 86 to observe Halley's Comet, Astro will now be used as an astronomical Spacelab to take place in late November 89 aboard Columbia.

STS 36: The last scheduled mission for 1989 is a dedicated Department of Defence mission due to fly in December 89 aboard Atlantis.

Trouble and resignations

Other American news includes two more astronaut resignations. Tony England who became an astronaut in 1967 and flew aboard Spacelab 2 in 1985 has resigned to become Professor of Geology at the University of Michigan. Astronaut Woody Spring who became an astronaut in 1980 and flew aboard 61B in 1985 has also resigned. Spring participated in the EASE-ACCESS space station construction activities on the flight. Spring is going to be assigned to Army Space Command from August.

The much troubled American Space Station has been christened "Freedom", White House spokesman Marlin Fitzwater said the name was taken from a quote a speech given by President Reagan during the 1984 speech announcing the Space Station. Currently the Space Station has enough money to last until the first week of the new presidential administration, ensuring that a decision will have to be made soon after the '88 election.

★ ★ ★

Pioneer 10 has celebrated five years outside the known solar system. The 570 pound probe is now 4.1 billion miles from the Sun. Because of the distance involved it takes a radio signal 12 hours and twenty six minutes to reach the probe and return. NASA expect ten more years of service from Pioneer 10. It is being used to search for Planet X which is said to be disrupting the orbits of Neptune and Uranus. Current NASA predictions place Planet X at approximately 90 to 100 billion miles from the Sun.



BARRY JONES

SCIENCE, POLITICS AND THE STARS

Commissioning of the Australia Telescope

Barry Jones reflects on the significance of the Australia Telescope. Would it ever have been built in the current climate?

The commissioning of the Australia Telescope is the scientific highlight of our Bicentennial year and an important milestone in CSIRO's 62 year history.

The project was conceived and nurtured, during the Fraser years, approved by Cabinet in August 1982 and formally endorsed by the Parliamentary Public Works Committee in November 1983. No Australian scientific project of such magnitude has been initiated since then. Its total cost has been \$50 m, one twentieth of the cost of New Parliament House.

Radio astronomy is one of the four major areas where Australia has been regarded historically as a world leader — the others being agriculture, mining and medical research.

All of the four owe something to special Australian characteristics, our problems of climate, soil and water in the case of agriculture, the richness and remoteness of our mineral domains, the tyranny of distance forcing us to develop our own skills for medical diagnosis and treatment, and our unequalled vantage point in the Southern Hemisphere, close to the celestial axis and observing a range of extraordinary phenomena invisible to telescopes in the North. In three of the four cases there were obvious clients,

Australian content

The Australia Telescope has more than 80% Australian content. Among the major Australian firms involved in the project have been Evans Deakin Industries, who built the antennae, Macdonald Wagner the consulting engineers and Barclay Brothers, civil engineers, as well as many new and developing enterprises, including Austek Microsystems, who collaborated in the design of 4000 custom chips for the Tel-

scope's digital correlator. The spinoffs for Australian industry will be considerable.

The Australia Telescope is not just a scientific triumph, it is an engineering one as well. The skills and accomplishment in micro-engineering carried out on a vast scale — if that doesn't sound a bit Irish — will pay off handsomely, as it has already with prospects for exporting the world's best receiving dishes.

I don't doubt that the Australia Telescope will have a

major impact on our industries, proving to the world that they are 'space qualified'. They have a lot to be proud of. Nevertheless, there is an object lesson for Government in the story of the Australia Telescope.

In such a project, which comes first — the vision of a research organisation combined with an appropriate response from government?, or does it begin with a demand from industry, which puts its money up front? In this case, the project would never have happened without CSIRO taking the leading role: it is inconceivable that Australian industry would have formed a consortium, then approached CSIRO and said: "We want to build a telescope. Please help us". And yet, industry is certainly a beneficiary of this great project.

But so are we all beneficiaries — and the benefits, both direct and indirect, will not be confined to our fellow citizens.

Astronomy is an international undertaking. Although we haven't been winning too many gold medals recently in other areas, we may well qualify in this one.

I said that historically Australia was in the forefront in four areas — agriculture, mining, medical research and radio astronomy. They are all essential, and I will fight to

Personalities

During the opening of the telescope, Jones paid tribute to the people who made the telescope a reality:

Dr Paul Wild, the former Chairman of CSIRO, who from 1967 set up 96 antennae to constitute the Culgoora Radioheliograph, and is honoured by the naming of the Paul Wild Observatory.

David Thomson the former science minister, was an early enthusiast who infected others in his government. Getting the Parkes Telescope, the heliograph and CSIRO on the \$50 note in 1973 may have constituted a moral commitment from Treasury!

Dr Bob Frater, now Director of the Institute of Infor-

mation and Communications Technologies and **Dr Dennis Cooper**, his successor as Chief of the Division of Radiophysics, have been virtuosos, showing great skills in planning, organising and persuading, in addition to their scientific skills.

Dr Keith Boardman, Chief Executive of CSIRO, has been a strong supporter. It is a measure of the importance of this great project that we have been able to persuade **Dr Ron Ekers** to return from the United States, to become foundation director. Formerly he was directing the Very Large Array (VLA) in New Mexico, one of the few installations in the Northern Hemisphere to rival the Australia Telescope.

ensure that our national capacity is maintained in these four areas. But they are all areas of very long standing — agriculture, mining and medicine for more than 60 years, and radio astronomy for more than 40 years, even before the Parkes Observatory was commissioned in 1961.

On their own, they will not solve our balance of payments crisis or create the infrastructure we need for the 21st Century.

Scientific change

Science doesn't stand still. We are passing through one of the two most revolutionary periods of scientific change in history.

My concern is — where are

the new areas for development which can stand with agriculture, mining, medicine and radio astronomy? Where are the industries which have evolved in the 1960s, 70s and 80s.

'... the project would never have happened without CSIRO taking the leading role'

Biotechnology seems to be well placed, but again, the work of CSIRO and the universities in this area has been far in advance of market demand, or even understanding. In superconductivity, new ma-

terials, artificial intelligence, Australia is starting a long way behind scratch.

Must we wait for the industrial sleepers to wake? We need to have the basis for some billion dollar export industries in high technology and services.

I am an enthusiast for greater interaction between research and industry — but it must be a two way process. It is essential that industry recognise the importance of science, and that long term research — perhaps with a 20 year payback — is central to our future.

It is also essential to remind the research community that some of the most exciting science internationally is carried out in industry. I point out

that Bell Labs and IBM have each had more Nobel Prizes in the sciences than Australia. But if Australian industry is sluggish and poorly informed, it would be recklessly short-sighted to insist, as many Canberra trained economists do, that it must be left to industry and industrial funding to call the shots. We need a partnership — but the government partner cannot be allowed to wither on the vine.

Not political

Science is not part of our political culture and we tend to downgrade the importance of things we don't understand or think about.

Galileo, one of the pioneers of astronomy, faced intense hostility from the College of

ELECTRONICS TODAY



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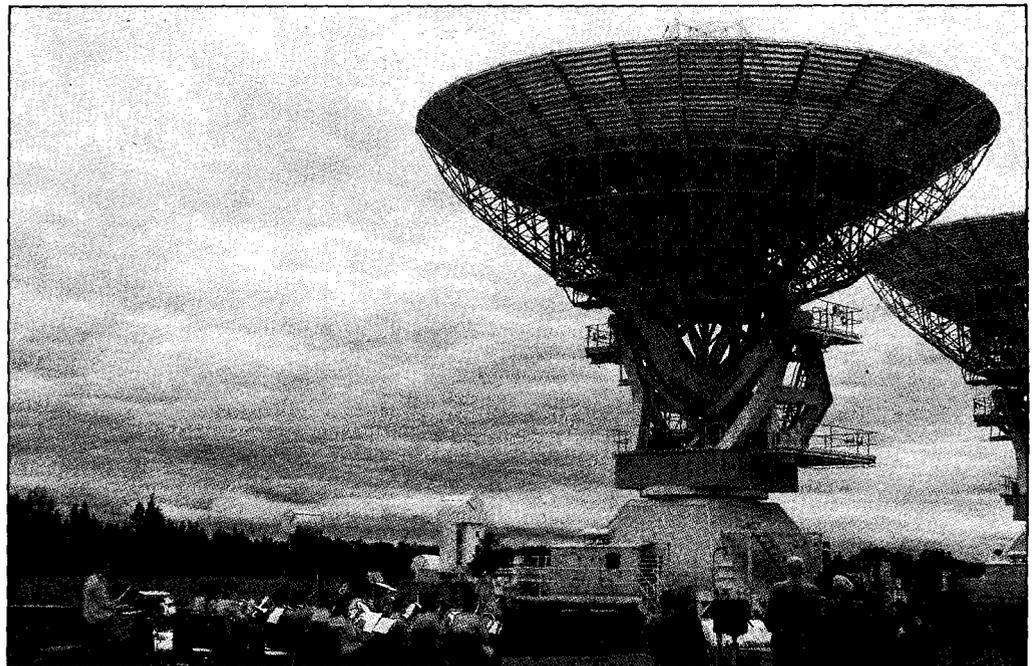
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Comment

Cardinals. When Galileo said he could see moons on Jupiter, his critics said: "We can't see anything through his telescope". Most didn't want to look. They said: "Where's the relevance?" They may even have said, "Who's paying for all this?"

'... not just a scientific triumph'

Galileo was silenced. He became a martyr. His teaching that the earth went round the sun was anthematized and he had to repudiate it. But he is supposed to have muttered: "But it still does move". From Galileo's teaching, which changed our view of the universe and man's role in it, came Newton's laws of motion and the scientific laws that evolved from him led directly to the Industrial Revolution which has shaped all our lives, and continues to do so. 369 years later the Church admitted at



Opening day at Culgoora

last that Galileo was right. We won't have 369 months, or perhaps even 369 days, to rethink our scientific future. It is just not enough to say

"We have had a glorious ing, or destroying, our future scientific past". We are creat- right now. **eti**

The Hon Barry Jones is the Minister for Science, Customs and Small Business and a long-time supporter of the telescope.



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8	33	58	83	108	133	158	183	208	233	258	283	308	333
9	34	59	84	109	134	159	184	209	234	259	284	309	334
10	35	60	85	110	135	160	185	210	235	260	285	310	335
11	36	61	86	111	136	161	186	211	236	261	286	311	336
12	37	62	87	112	137	162	187	212	237	262	287	312	337
13	38	63	88	113	138	163	188	213	238	263	288	313	338
14	39	64	89	114	139	164	189	214	239	264	289	314	339
15	40	65	90	115	140	165	190	215	240	265	290	315	340
16	41	66	91	116	141	166	191	216	241	266	291	316	341
17	42	67	92	117	142	167	192	217	242	267	292	317	342
18	43	68	93	118	143	168	193	218	243	268	293	318	343
19	44	69	94	119	144	169	194	219	244	269	294	319	344
20	45	70	95	120	145	170	195	220	245	270	295	320	345
21	46	71	96	121	146	171	196	221	246	271	296	321	346
22	47	72	97	122	147	172	197	222	247	272	297	322	347
23	48	73	98	123	148	173	198	223	248	273	298	323	348
24	49	74	99	124	149	174	199	224	249	274	299	324	349
25	50	75	100	125	150	175	200	225	250	275	300	325	350

For a prompt reply

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DEC '88

Sounded insights

**VIDEO
EDITING
SYSTEMS**

**PIONEERS
IN CAR
SYSTEMS**

PIONEER



PIONEER



BOSE

The Bose 601™ Series III Direct/Reflecting Loudspeaker System

Bose engineers have invested more than 25 years of ongoing research seeking one goal—re-creating the realism of a live performance.

The next best thing to hearing music live is hearing it through a Bose Direct/Reflecting speaker.

Drawing on the heritage of the internationally acclaimed Bose 901® speaker, the 601™ speaker gives you the best seat in the house—wherever you sit or stand.

The research: three dimensional sound.

Through our extensive acoustical research into live sound, we learned that focusing on only one musical parameter such as frequency response and expecting realistic sound is like trying to create a lifelike painting by concentrating solely on colour. As with visual images, live sound has perspective, clarity and proportion.

We designed our speakers based on the natural combination of direct and reflected sound. The difference between listening to conventional speakers and Bose Direct/Reflecting™ speakers is like the difference between viewing a movie on a television versus experiencing it in a theatre.

The 601 system brings a three-dimensional sensation to music—giving the sound depth, height and width. In short, it seems to come alive!

In a live performance, the majority of sound reaches your ears after being reflected off the walls, floors and ceiling. With conventional speakers, you mainly hear only direct sound. Bose Direct/Reflecting™ speakers add the missing elements of music by bringing you the natural combination of direct and reflected sound (see diagrams at right). The result is a lifelike soundstage that's practically like being there.

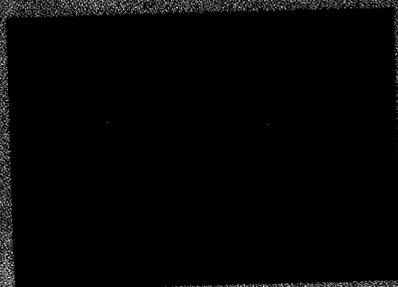
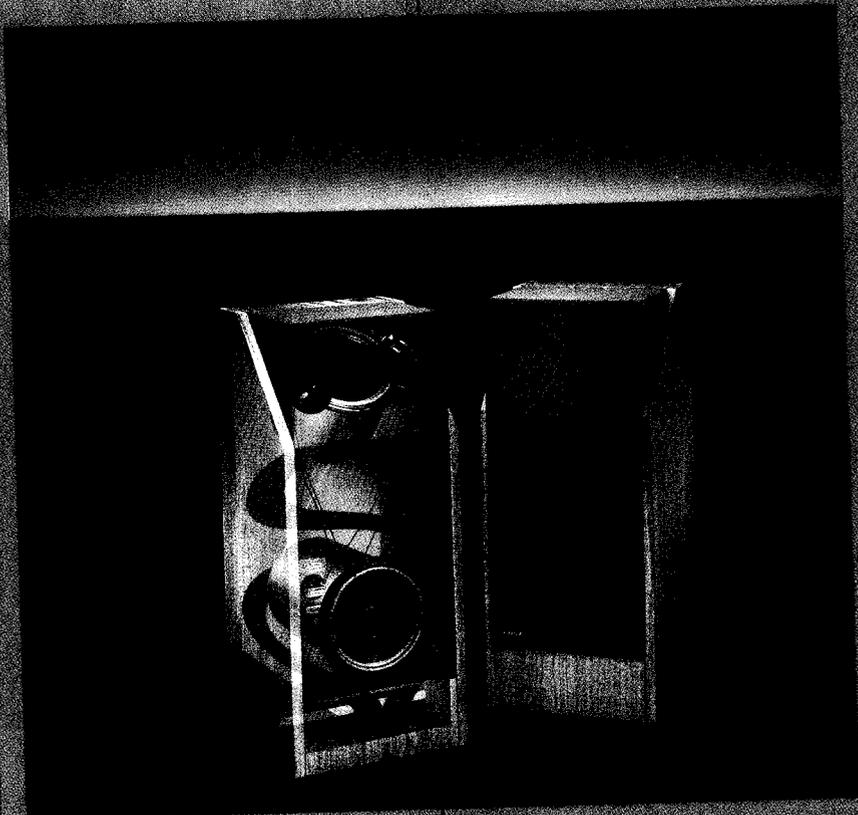
The performance: ideal for audio, video and digital.

With most conventional speakers, you hear stereo in one or two parts of the room. Everywhere else, you hear primarily one speaker. The 601 system allows you to hear true stereo

everywhere in the room—even when you are directly in front of one of the speakers.

The 601 system is the ideal cornerstone for a complete home entertainment system. It unleashes the full potential of your sound system, efficiently produces excellent sound and easily handles high power. This rare performance combination allows you to enjoy today's power-demanding sound sources such as digital audio at true-to-life volume levels.

The Bose 601 system also makes it possible to use your stereo system in a new way, as part of a total audio/video system. It is designed to produce greater realism with all video sound sources—especially stereo televisions, hi-fi VCRs and video disc players.



Bose 601 Direct/Reflecting™ system.



Conventional speaker system.

Bose Australia Inc., 11 Murrill Avenue, Rydalmere, NSW 2116 Telephone: (02) 884 1022, 684 1255

Bose Distributors:

NSW and VIC: Bose Australia (Reverse charge) (02) 884 1022; QLD: Stereo Supplies (07) 229 7930
WA: Prosound (09) 325 1066; SA: Blackwood Sound (08) 278 1291; TAS: Chessman Distributors
(003) 26 4622

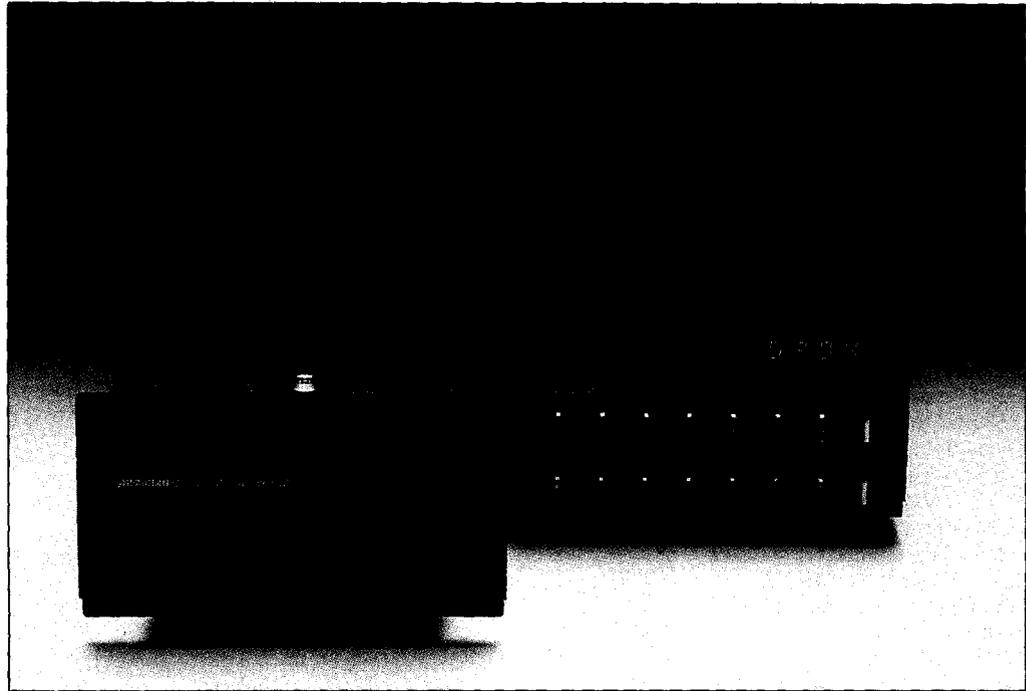


Two cases, three awards

A British-made CD player which won two awards in Japan last year and the British Design Award for 1988, has recently been released on to the Australian market.

Like the Accuphase CD player, the Meridian 207-Pro compact disc player consists of two cases, one housing the CD transport system, the single-beam laser pick-up assembly, and the power supply, the other housing the electronics. The lower half of this latter case houses the digital decoding and filtering circuits, which process the output of the laser mechanism. A metal screen separates the digital section from the digital-to-analogue converters and audio sections, which sit on the upper half. Also placed here are the input switches and an electronic volume control.

While this two-case arrangement is still relatively unusual, the Meridian has another interesting feature: a built-in preamplifier. This



means the unit can be directly connected to a tape recorder and a line input such as a radio, for example.

Some of the CD player's

specifications are: less than 0.004% distortion; less than 90 dB noise, four times oversampling at 16 bits with such features as open/close, re-

play, pause, repeat, next/previous, store/cancel, volume, standby, direct track numbering etc. For information ☎ (02) 819 6499.

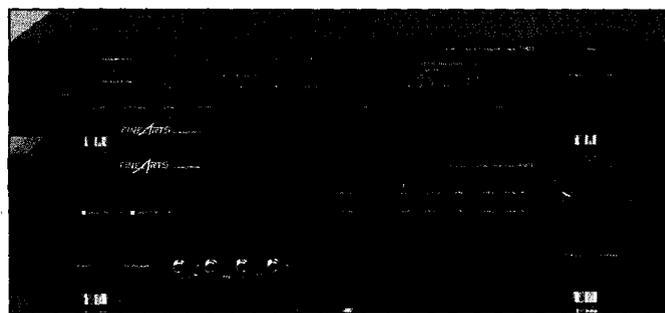
READER INFO No. 257

Tuner and amplifier

West Germany's Grundig has released its Fine Arts range of hi-fi products which in Europe includes a tuner for the European Radio Data System attached to FM transmission (see SI July p6) and a DAT player.

However, in Australia, not having RDS yet and still not allowed to play with DAT, we will be content to welcome the T-903 tuner and A-903 integrated amplifier.

The A-903 FM stereo/AM mono tuner features an automatic and manual FM station



search (manual search on AM), 19-station memory which can also, for example, memorise which are mono and which are stereo stations,

and absolute channel separation by ceramic resonators in the stereo decoder.

The A-903 Integrated Stereo Amplifier has rated

power of 100 watts per channel RMS and incorporates a protection circuit for speakers, has a dubbing facility, connections for two loud-speaker groups and seven inputs.

All products in the Fine Arts range are characterised by a shiny black and gold look, gold plated plugs and large metal feet. Grundig products are distributed in Australia by Southern Cross Electronics, 26 Kent St, Belfmore 3192. ☎ (02) 750 3166.

READER INFO No. 258

British speakers

UK-based company, Rogers, which works closely with the BBC in producing broadcast speakers, has released two new models in Australia that replace the Rogers Studio 1a (broadcast) and LS7t (domestic) models.

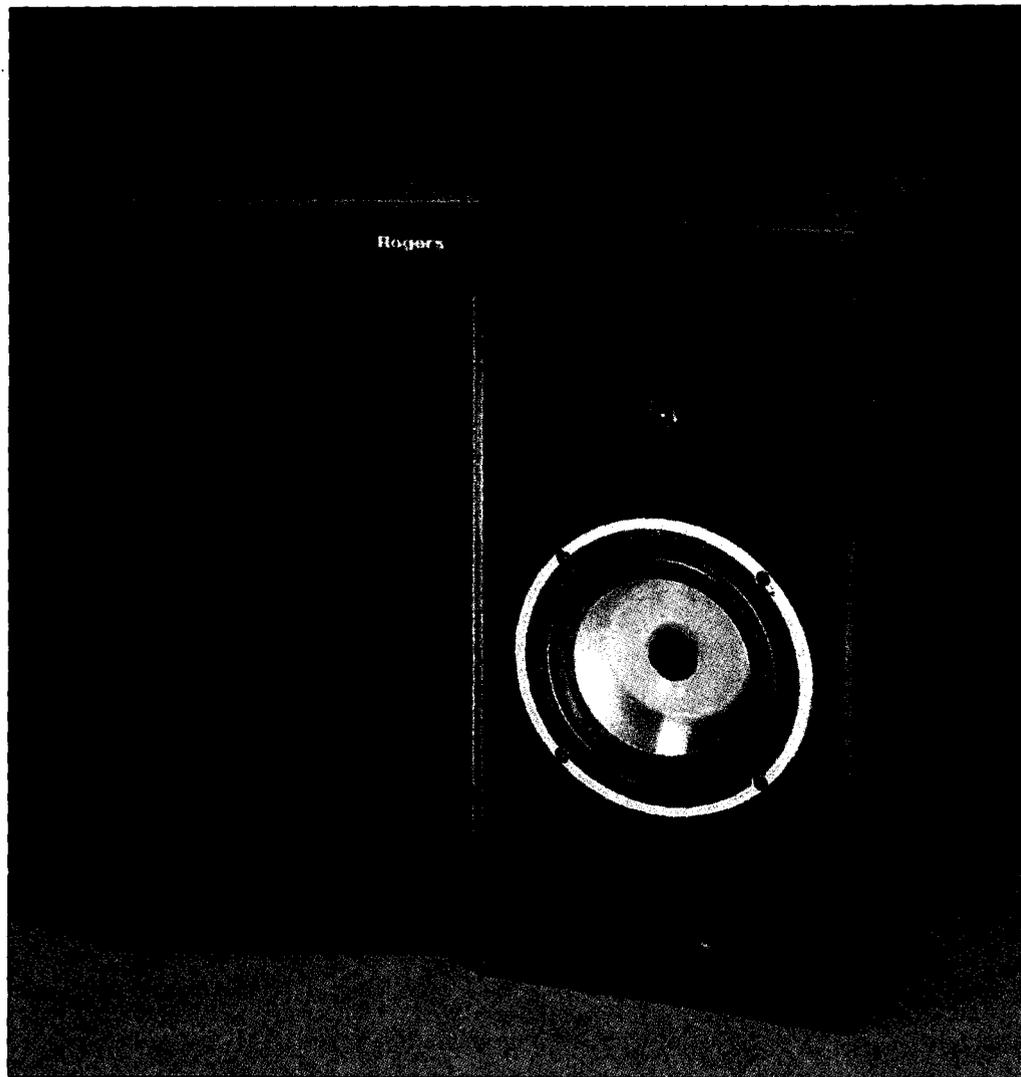
The new Studio 1a is a two-way system using a 205 mm bass-midrange driver. The diaphragm is made of polypropylene. The dome tweeter is fitted with a light, rigid aluminium diaphragm.

The speaker enclosure is constructed from timber-veneered Medite, a compressed fibre-board similar to Customwood and Craftwood, and damped to reduced delayed resonance.

Manufacturer's specifications are 45 Hz to 20 kHz ± 2 dB frequency response; 8 ohms nominal impedance; sensitivity of 89 dB at 1 metre. The speaker is suitable for use with amplifiers 10-2000 watts per channel into 8 ohms.

The LS7t is a two-way system, using a polypropylene main drive unit and a titanium dome tweeter. Manufacturer's specifications for this model are 50 Hz to 22 kHz ± 2 dB frequency response; 8 ohms nominal impedance; 88 dB at 1 metre sensitivity; and is suitable for amplifiers rated 10-200 watts per channel into 8 ohms.

Both models have flared reflex ports to prevent distur-



tion due to air turbulence. They also incorporate a feature called "bi-wiring" which makes use of separate cable runs to low and high fre-

quency sections of the system. This technique is devised to reduce interference between each crossover section through the elimination

of common earthing. As supplied, both models have their terminals bridged for connection via a conventional single cable run.

READER INFO No. 259

New diaphragm material

Mitsubishi has announced in Japan its intention to market a speaker unit using a new boron carbide diaphragm. According to Japanese reports, the new material has a specific elasticity factor five times greater than titanium diaphragms and 2.2 times higher than boronide models.

Unlike metallic single ele-

ment materials and ceramic diaphragms the new diaphragm realises a large internal loss with a sound velocity of 11,000 m/s.

The one-piece diaphragm connects with the voice coil directly and produces a reported wide band 129 kHz with a 23 cm dome tweeter.

READER INFO No. 260

Affordable Aussie speaker

The Marquis PCL 500 is Duntech Audio's new release, aiming to be an affordable high-performance speaker.

Duntech is an Australian company which has competed successfully world-wide in the top-end of the home loudspeaker market since the release of the Sovereign 2001 in 1986.

Each oak timber veneered box uses 25 mm thick Customwood and is reinforced and braced in the woofer chambers. Each contains two 210 mm (diameter) bass drivers, two 100 mm mid-range drivers and a 26 mm tweeter.

Each driver is in a separate, sealed enclosure. All drivers

are rated to withstand 500 watts for 10 milliseconds, and need at least 500 watts per channel to drive them; ideally the power amplifier should have a rating exceeding 200 watts rms continuous per channel. For your local Dun-
tech retailer ☎ (08) 349 5188.

READER INFO No. 261

Kid stuff



Kids as young as 4 now have a selection of Sony products to call their own. The product line includes a 2 unit walkie-talkie headset (\$99), a cassette-recorder with microphone for children's home recording (\$89), a radio cassette recorder with AM/FM tuner (\$109), and a child's version of the one and only Sony Walkman (\$69). Or

should it now be called "Toddleman"?

The Walkman comes with a volume limiter switch that, when turned on by Mum or Dad, restricts the volume level to protect tiny ears even though the child may have the normal volume control turned to maximum. It also has a see-through back panel with colourful working parts.

READER INFO No. 262

IN BRIEF

Multi-band

Sony has released a compact multi-band receiver, the ICF-SW1S. In a cassette-sized battery-powered package it enables reception in FM stereo, medium-wave (MW band), long-wave (LW band) and shortwave (SW band). Tuning is via 10 push-button keys which can be pre-programmed to recall favourite

frequencies.

It has an automatic scanning facility which will monitor the width of a complete band, with a 1.5 second hold at each broadcasting frequency, displaying the frequency on the LCD display. Its active antenna can amplify weak signals.

READER INFO No. 263

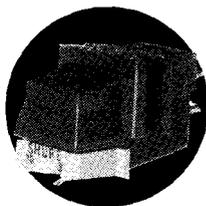
Challenge

John Laverick of Sydney's Prodigm Acoustics has an interesting challenge for those in the market for reference monitors. Claiming that his Prodigm 1 loudspeakers offer

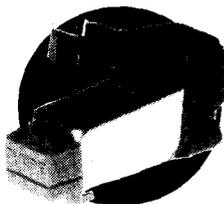
superior performance to imports costing two or three times as much, he invites an A/B comparison. ☎ (02) 449 2268.

READER INFO No. 264

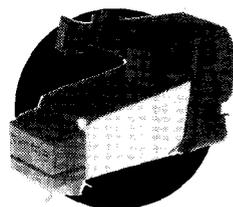
CARTRIDGE OF THE MONTH



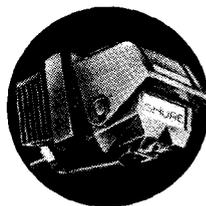
ME70B



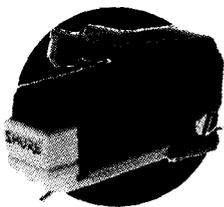
ME92E



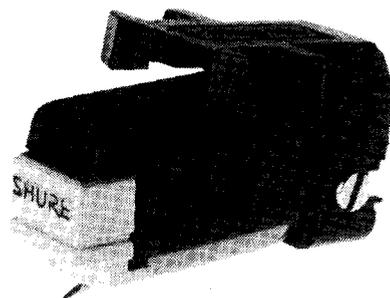
ME99E



ME95E



M104E



M104E

The M104E is ideally suited for the person who needs outstanding sound performance and wants to upgrade their system on a limited budget.

This cartridge captures and recreates sound with elliptical shaped diamond stylus tip and an aluminium alloy shank to faithfully reproduce your favourite music.

The M104E cartridge is compatible with ½" mount tone arms or most P-mount tone arm systems.

The M104E features a slide-on stylus guard plus a screwdriver and mounting hardware.

You'll find no other cartridge offers so much for so little as the M104E

SPECIFICATIONS

Tracking Force at the Stylus Tip:

Optimum: 12.5 mN (1.25 grams)

Maximum: 15.0 mN (1.5 grams)

Trackability at 12.5 mN (1.25 grams) Tracking Force (Typical in cm/sec peak velocity):

M104E: 400 Hz: 24 cm/sec

Frequency Response: Essentially flat 20-20,000 Hz

Channel Balance: Within 2.0 dB

Channel Separation: 1 kHz: 25 dB typical

Output Voltage (Typical):

M104E: 5.0 mV RMS at 1 kHz at

5 cm/sec peak velocity

Net Weight (with mounting adapter, screw and nut):

M104E: 7.3 grams; also P-mount compatible

SHURE

AUDIO ENGINEERS PTY. LTD.
342 Kent St, Sydney, NSW. 2000
Ph: (02) 29-6731

MARKETEC PTY. LTD.
51 Scarborough Beach Rd,
North Perth, WA. 6000
Ph: (09) 242-1119

AUDIO ENGINEERS (VIC)
Ph: (03) 879-0320
AUDIO ENGINEERS (QLD)
Ph: (02) 29-6731

ShcCt 4

AE08

READER INFO No. 6

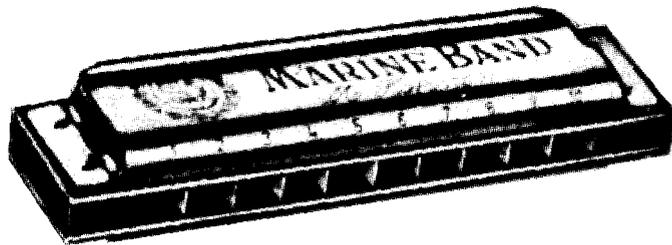


STOCKING STOCKING

Gifts for granny or grandchild

It's that what-can-we-buy-for-whom time of the year again and Mary Rennie compiles a handy guide for ETI readers.

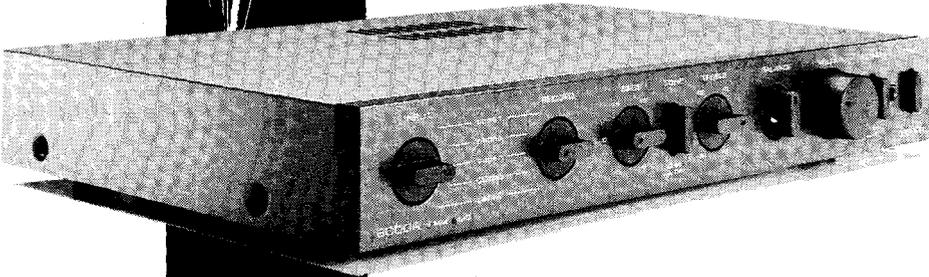
Some of the items suggested are low-priced, small, handy items, suitable to put under the work tree (if that's de rigueur at your coal face), and some closer to the \$100 mark might be just what the spouse, lover, best friend, etc, always wanted. Prices quoted are frequently recommended retail so are possibly available cheaper from various retail outlets. Don't forget the products mentioned are available in many brands and from many outlets. The following list is merely a sample.



For the musically inclined **metronomes**, either Nikko brand or Metrina are available for \$59 from Pro Audio, Canberra based mail order specialist.

Also from Pro Audio you can buy **harmonicas** from \$10 to \$21 and **tuning forks** in A or E are \$5.99 to \$9.50. ☎ (062) 49 7766.

AUDIOLAB



8000A Integrated Amplifier

MUSICAL
AFFORDABLE
... LOGICAL

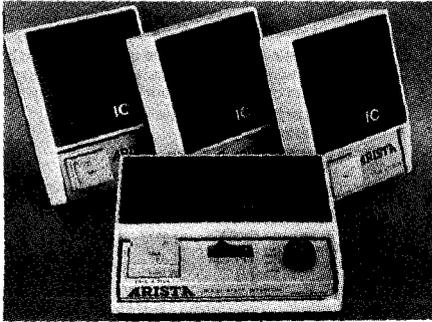
For full data, and details of your nearest Audiolab dealer call or write to:

M&G Hoskins
PTY. LTD. (Inc. in NSW)

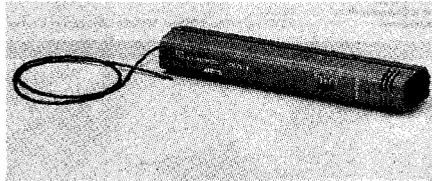
268 Princes Highway, Arncliffe,
NSW 2205, Sydney, Australia.
Tel: (02) 597 3683. Facsimile: (02) 597 7241



5 YEARS GUARANTEE



Back to Arista. Other ideas are an **FM wireless microphone** which can be received on any FM radio or tuner for \$19.95, a **four station intercom** which



will operate for a 1000 metres through cable at \$74.95. Speaking of cable, Christmas '88 could be the time for you to get into the black magic world of audiophile **speaker cable**. Studio Line oxygen-free copper cable is \$7.95 per metre. Most of these products are available from hi-fi stores or Arista ☎ (02) 648 3488.

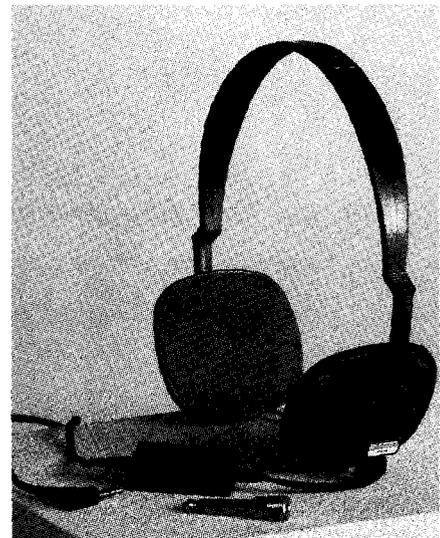
A **nickel cadmium battery recharger** is an idea that beats throwing the expensive little things out. Don't forget portable/stereo/cassette/walkperson things which are pretty snazzy and cheap — under a \$100. For example, the Sony Sportsband FM radio can be acquired for \$99. For a bit less — \$79 — Panasonic has a SW radio (RF1630), or a **headphone radio/cassette (RXSA60)** for \$69.95. The Aiwa headphone cassette with 3-band graphic equaliser and auto reverse is \$99 RRP. Sanyo's new Sportster models start with the RP-42, an FM stereo/AM mono radio at \$49.95. The MGR-75 has in addition a non-recordable cassette player and 3-band equaliser for \$89.95.



Another intercom is the **FM automatic intercom** from Rod Irving Electronics, which automatically selects "transmit" and "receive". It's made by Arlec and costs \$99. A handy tool for anyone with a cassette recorder is a **head demagnetiser**. RIE has a slimline torch-like demagnetiser with cord and plug for \$13.95. **Extension speakers** for surround sound, the workshop, etc, are available for about \$50.

Some esoteric devices still from RIE are **speaker controllers** which allow up to five pairs of speakers to be switched on or off in any combination, or two amplifiers and four pairs of speakers (both \$59.95).

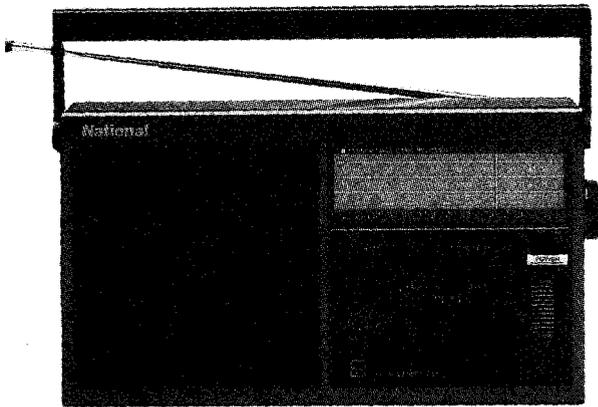
Tired of those *kathumps* through the speakers when the refrigerator turns off or on? A **surge suppression/line conditioning device** such as the Spikemaster P-1000 from Discwasher or the Button spike protector from Wagner Electronics are designed to overcome this problem.



Headphones are great for accurate sound reproduction. The Koss Porta Lite are an inexpensive example at \$49 RRP.

All in all the hifi store/electronics store/mailorder catalogue may be one of the most likely sources of inspiration for that hard to find gift.

And last but not least, a Merry Christmas from the Sound Insights team. 



The Shure Prologue 10 **microphones**, a probe style, hand-held, dynamic unidirectional low or high impedance microphone, is available from Audio Engi-



neers in Sydney and Melbourne and Marketec in Perth for \$89. Mics come in all shapes and types these days but there is still a role for this classic.

PROTON'S PERFECT PACKAGE

The AI-3000 integrated hi-fi system

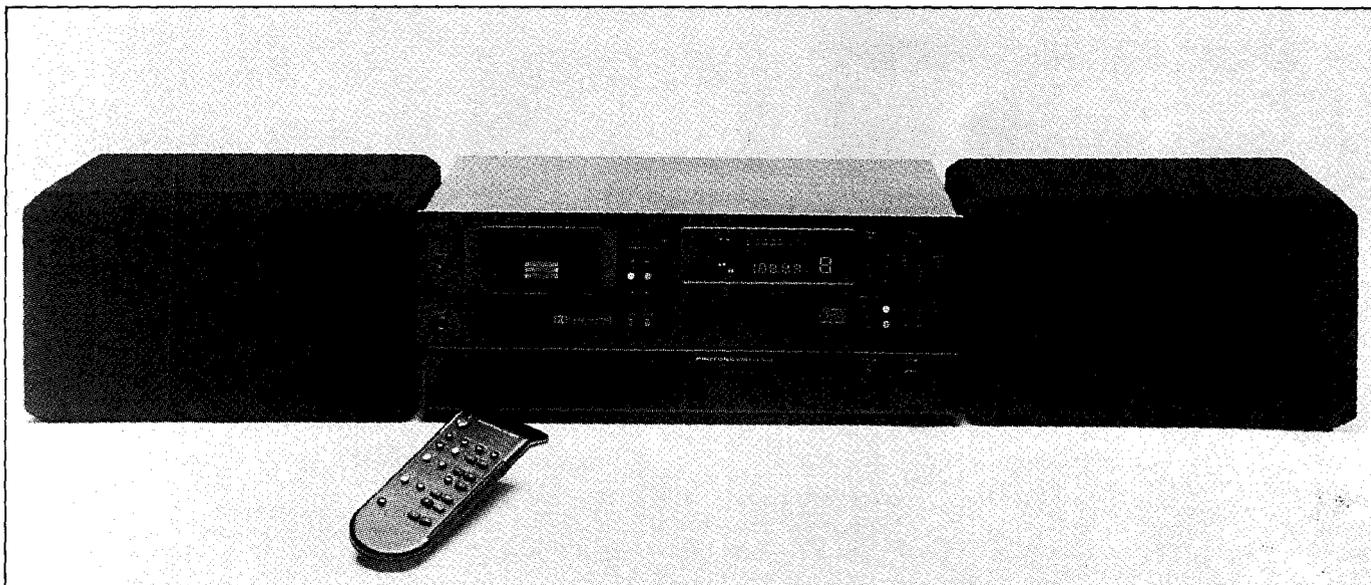
Audio engineer Louis Challis discovers
a winner in the integrated hi-fi field.

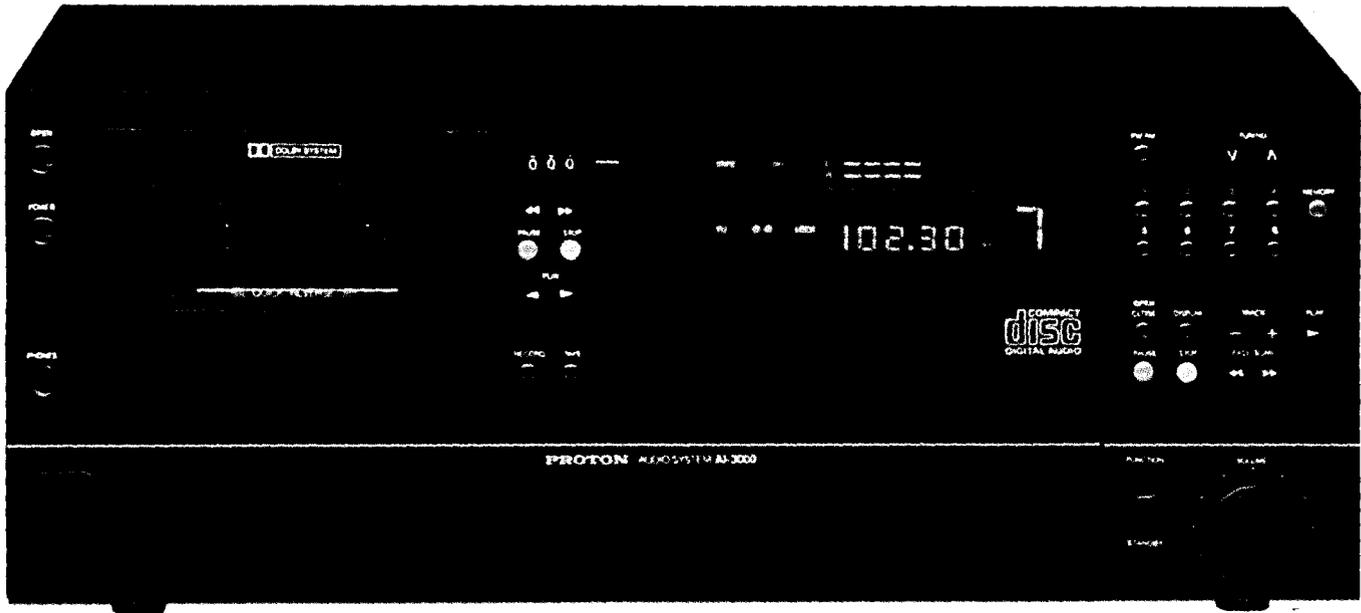


Space is often a problem in using a hi-fi system. By the time one has placed the amp, the tuner, CD player and the turntable and so on, there is little left over for the pot plants and that picture of aunty Flo. You could of course buy a GhettoBlaster or, alternatively, something a little more stylish.

The Proton Corporation in California USA realised that there was an obvious need to offer an integrated hi-fi package with all the main features the marketplace was seeking and with an eye-catching appearance and functionality to match.

The Proton AI-3000 system with AM/FM tuner, amplifier, cassette player, CD player and a pair of small external matching speakers, was thus nurtured by demand and appropriately specified to meet it.





Controls

It was no easy matter for the designers to 'shoehorn' so much electronics into a package that is only slightly larger than most conventional receivers. They also had to provide a frontal appearance which would not be 'off-putting' to the user and yet still provide simple controls that little old ladies and other non-juveniles could cope with.

The designers adopted the approach of placing the three major functional groups of controls in the upper two-thirds of the front panel with the minor controls behind a neat little drop-down lid at the bottom.

The cassette player, which incorporates automatic selection of bias and equalisation for type 1, type 2 and type 4 tapes, is located in the upper left-hand quadrant of the front panel. Its controls, and very small colour-coded buttons, are located immediately to the right, surmounted by a conventional three-digit mechanical tape counter.

On the right-hand side of the panel is a large escutcheon which incorporates the multi-functional digital display for the AM/FM tuner's frequency selection, a relatively small light emitting peak level display for the cassette player, which provides level indication at -20, -10, -6 and -3 dB with green light emitting diodes and displays levels of zero, +3 and +6 dB with red light emitting diodes. To the right of this, is a large plasma type numerical display for 8 AM and 8 FM station frequency presets, while on the left-hand side of the panel an array of small green LED displays indicate whether the CD player, tuner, phono input, video input or tape player have been selected by means of a single function button located adja-

cent to the volume control.

To the right of the multi-function display, a series of small black push buttons, with even smaller silk screen lettering above, indicate the functions provided by the 12 buttons associated with the tuner. The top right button is an AM/FM switch, adjacent are a pair of tuning buttons with which you can automatically search for stations with sufficient signal strength to activate the phase-locked loop circuitry and below these controls are eight black station preset buttons and a grey memory activation button.

Immediately below this array of displays and controls, is the CD player which incorporates a single beam laser tracking system to 'read' the CD discs. The mechanical disc tray system is very lightly fabricated in plastic, and can be manually closed without the use of a sensitive microswitch touch control that many other CD players now incorporate.

The CD player's functional controls are neatly arranged on the right-hand side of the CD disc drive, with a small

grey OPEN/CLOSE button, a yellow PAUSE button, and a white STOP button. The black DISPLAY button, which changes the frequency display of the tuner into a minutes and seconds display or a track number, and index number display, does not provide additional information as to how many tracks are on the disc or on total elapsed or total remaining time. The functional controls for indexing upwards or downwards by track number, and the fast forward and reverse controls, although small, work effectively, while the PLAY button at the extreme right-hand side of the escutcheon, although matching the size of the other controls, is unquestionably far too small.

At the bottom right-hand corner of the panel, a usefully sized rotary VOLUME control is flanked by small FUNCTION button which allows the user to select which function is going to be amplified. Below this is a small green STAND-BY LED to indicate that although power is connected, the unit is not switched on.

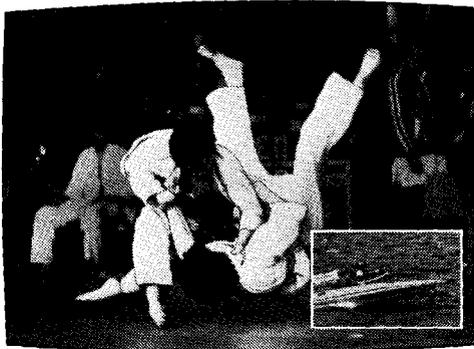
Size, weight and price

Dimensions:	Main unit	420 mm wide x 165 mm high x 368 mm deep
	Speakers	178 mm wide x 286 mm high x 240 mm deep
Weight:	Main unit	13.6 kg
	Speakers	8 kg each
R.R.P.:	Main unit	\$1,695
	Speakers	\$495 per pair cloth covered

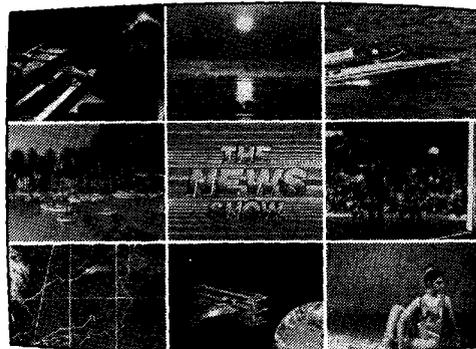
Manufactured in Taiwan for the Proton Corporation.

Seeing is believing!

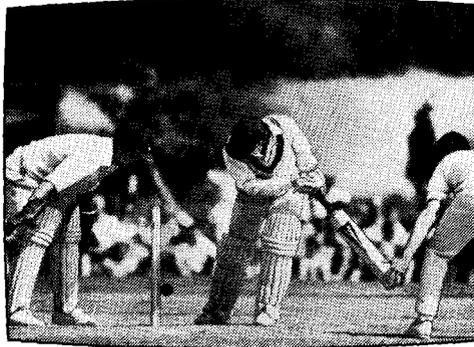
Watch a video and TV at the same time!



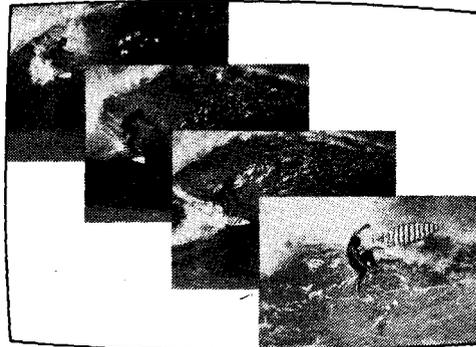
Scan every TV station at a touch!



Freeze live TV shows!



Strobe special effects on TV and video!



Sharp Digital **FX** Video

Sharp Digital FX brings Digital Special Effects to home video. It's capabilities are astounding.

Sharp have built-in a Digital Memory. With Sharp's Command Control remote in your hands, you become



the TV director. Freeze, Strobe or Create Multiple Images from TV and Video Tape.

For instance, you can watch a tape and still see your favourite TV show. A second screen shows you live TV while the main screen plays the tape - great for keeping an eye on the cricket!

What's on TV? Your Sharp Digital FX Video's Channel Search will tell

you, placing a still frame from every TV channel on your screen.

Then there's the incredible "Strobe" function - it actually lets you add Digital Special Effects to live telecasts!

Note: Copyright may exist on material you wish to record. TV screens show simulated pictures.



SHARP®

Simply the best.

Proton integrated hi-fi

MEASURED PERFORMANCE OF PROTON AMPLIFIER
MODEL NO. AI-3000
SERIAL NO.

<u>INPUT to VIDEO</u>	0.5V	Left Channel
<u>OUTPUT 1 WATT IN 8 OHMS</u>	Lin	80.0 dB
	A-wtd	88.0 dB
<u>POWER OUTPUT</u>	22 watts with 3dB head room	
	THD Distortion @ Rated Power 0.04%	

F.M. SECTION

MAXIMUM SIGNAL TO NOISE RATION (@ 55dBf)

Mono	74 dB(A)
Stereo	69 dB(A)

USABLE SENSITIVITY 40 kHz Deviation)

Mono for 26dB Signal to noise ratio	0 dBf
Stereo for 46dB signal to noise ratio	15 dBf

FREQUENCY RESPONSE 20 Hz to 20 kHz \pm 0.3dB

LINEARITY

Test Disc TECHNICS SH-CD001 @ 1kHz

<u>NOMINAL LEVEL</u>	<u>L. OUTPUT</u>
0dB	0.0
-1.0	-1
-3.0	-3.0
-6.0	-6.0
-10.0	-10.0
-20.0	-20.0
-30.0	-30.0
-40.0	-40.0
-50.0	-50.0
-60.0	-59.9
-70.0	-69.7
-80.0	-79.2
-90.0	-87.2

Signal to Noise Ratio (includes Amplifier) (@ 1 w)

Without emphasis	80.6	Lin 91dB(A)
With emphasis	80.6	74.0 Lin 91dB(A)

Extras

At the bottom edge of the front panel, a very neat pneumatically damped spring-loaded drop-down escutcheon covers various secondary controls and inputs. These include from left to right a microphone socket, whose signal is fed into the pre-amplifier circuits using a mix level control which is located next to it. A three-way rotary switch selects the bi-directional sequence controls for the cassette player, allowing it to play one cycle forward and reverse, or one cycle forward or one cycle reverse, or automatically (and continuously re-cycle forward and reverse). Adjacent are two separate level controls for the left and right channels of the cassette player and three similar rotary controls are provided for preamplifier BASS, TREBLE and channel BALANCE. On the right-hand side of the escutcheon are six small push buttons for DOLBY on-off, AUTO-MANUAL, (the function of which I still don't understand), a MONO-stereo control, a LOUDNESS control, a REPEAT control for the CD player and a programme control, which provides a reset control for the wireless remote control. Three other controls are provided on the left-hand side of the front panel, with a large black OPEN button for the cassette deck, a green power ON-OFF switch and a headphone socket.

On the back panel external inputs are provided for video (audio), a pair of RAI A equalised phono-sockets, a pair of pre-amplifier outputs, two pairs of large and sensibly sized red and black universal terminals for connecting the loudspeakers and AM aerial sockets (for bared wires) plus a co-axial PM antenna socket.

With so many parameters capable of being measured, I had to restrict the extent of our laboratory testing to evaluate the most significant performance characteristics of this integrated system.

Tuner

I started with the tuner and quickly discovered that the FM response was ruler flat from 10 Hz to 10 kHz, dropping only by 1 dB at 15 kHz after which the stereo filter dropped output by 20 dB to the 19 kHz. The tuner sensitivity provided its maximum signal to noise ratio at a modest 65 dBf with a mono-signal and a signal noise ratio of 74 dB(A). The stereo signal to noise ratio was 69 dB(A) (both of which figures are excellent). The FM signal sensitivity for 26 dB signal to noise ratio was 0 dBf, which was also good whilst the sensitivity for 46 dB signal to noise ratio on

Proton integrated hi-fi

stereo was 15 dBf which are also reasonably good. The FM mid band channel separation was better than 42 dB at 1 kHz whilst the distortion figures (measured at the pre-amp output) were typically -55 dB which, again, was good.

Regrettably the AM tuner frequency response is typical of most American, Japanese and Taiwanese tuners. As the curves reveal the response is inferior to most telephones with 6 dB points of 50 Hz and 2.6 kHz. Whilst the AM tuner produces sound, it will never be able to do credit to the quality of the local AM stereo transmissions, which do warrant a better quality and wider band width for the tuner response.

Cassette

The cassette player provides a wide band and very effective record to replay frequency response on both type 1 and type 2 tapes. The frequency response achievable at -20 extends from 3 Hz to 14 kHz with type 1 tape (TDK AD), and 13 Hz to 15 kHz with type 2 tape (Sony UCX S60). The bias settings for both type 1 and type 2 tapes result in a significant but not unacceptable rise in the frequency response between 1 kHz and 15 kHz. The level recordings display a 2 dB typical rise for the type 1 tape and a 3 to 4 dB rise with the type 2 tape.

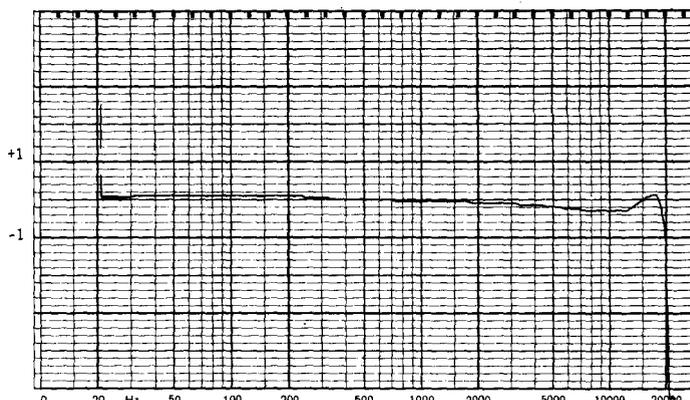
This characteristic is a function of the bias selected by the designers to broaden the unit's frequency response. The wow and flutter is commendably low and the distortion figures are moderately low, being less than 1% for the type 1 tape at standard Dolby recording level.

'... well designed, providing adequate performance with a touch of panache'

CD player

Most users will make maximum use of the CD player which provides a very smooth frequency response, with the merest trace of droop from 1 kHz down to 12 kHz, a very small rise of less than 0.5 dB back to 18 kHz and then a rapid drop of 5 dB down to 22 kHz. This frequency response is typical of the ICs in the latest generation of CD players. These are now all capable of achieving extremely smooth linearities. The digital to analogue decoding system in this player is ruler flat down to -50 dB, and then exhibits low non-linearity deviations from -60 down to -90 dB, at which point the transfer characteristic is still within 2.8 dB of true linearity.

The CD player's response with a 10 dB pot in place. (20 Hz to 20 kHz).



The signal to noise ratio was measured with the amplifier output set at the 1 watt level and was 91 dB(A) both with, and without, pre-amphasis.

The performance testing up to this point of time, displayed good objective performance characteristics and certainly quite adequate considering the cost and intended market of the unit.

As my testing showed however, the amplifier was not up to the same standard as the rest of the system. Whilst the frequency response was almost ruler flat from 10 Hz to 50 kHz, and the tone controls provided a smooth and precisely controlled response, the distortion characteristics were not up to expectations. The IEC high frequency total difference frequency distortion measurements revealed figures which were more typical of what I would have measured, ten years ago, as opposed to what I ex-

Subjective

I decided not to carry out a laboratory evaluation of the speakers supplied with the unit, because of their modest size, and picked up the whole box and dice and carted it home for my subjective assessment. Neither the weight, nor the size of the boxes created any problems in their cartage.

I connected the Proton A1-3000 to my B & W 801F monitor speakers to see how much power I could extract before audible distortion became disturbing. Much to my surprise I found that the amplifier section can deliver extremely high levels of power before the onset of gross audible distortion. I found that I had no difficulty in filling my listening room with sound, at peak sound pressure levels well in excess of 105 dB. I then proceeded to evaluate the system's own speakers, but after a few minutes of listening, I decided to revert to my monitor speakers. The optional Proton speakers produced reasonable sound, but not with a comparable quality to the main electronic sections of the system.

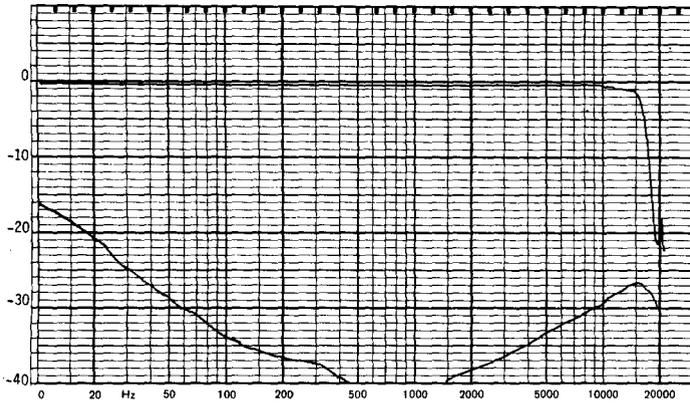
The FM tuner functioned extremely well, particularly with an appropriate aerial connected. The FM sound is clean, but the amplifier's cross-over and inter-modulation distortion was just audible 'like a haze in the background'. The tuner's sensitivity was more than adequate on each of the major and minor FM transmitters. Even those stations located in Sydney's Western Suburbs, at distances of greater than 40 kilometres, came in well.

The AM tuner was really nondescript, because of its miserly bandwidth, which will always degrade the quality of the signal.

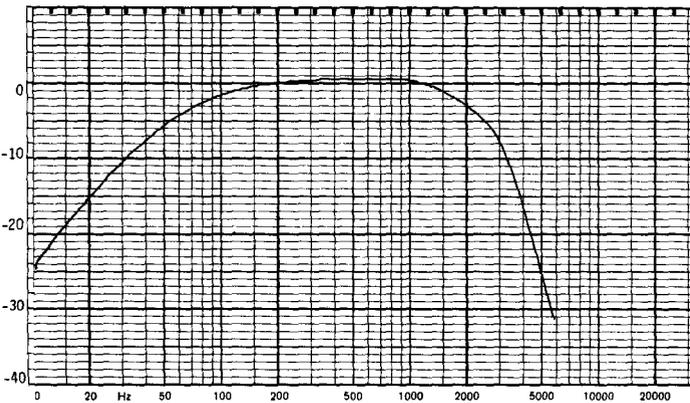
The cassette player worked really well and the incorporation of bi-directional play, auto-reverse functions, excellent bandwidth, modest distortion and the

pect today. While the distortion level at 20 watts output, and even at 40 watts output were reasonably good, the distortion at 2 watts output was only .04%, which was not quite good enough. As most people normally listen to their music with output levels ranging between 0.2 watts and 2 watts peak, this increase in distortion warranted a closer inspection.

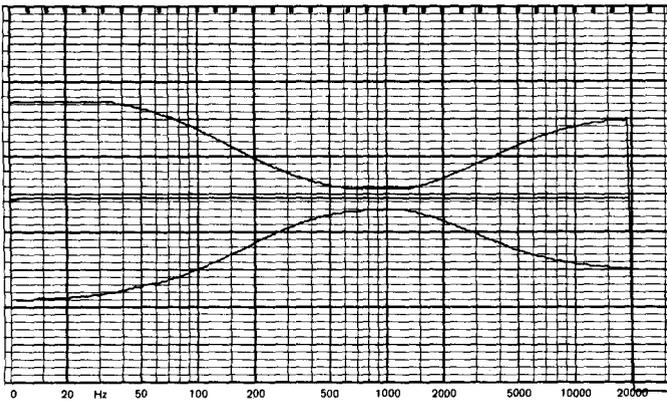
An examination of the wave shape soon revealed the presence of an unexpected amount of 'cross-over distortion'. I know that this particular system is a 'pre-production' release. As a result, I assume it had not undergone a complete quality assurance assessment prior to its shipment.



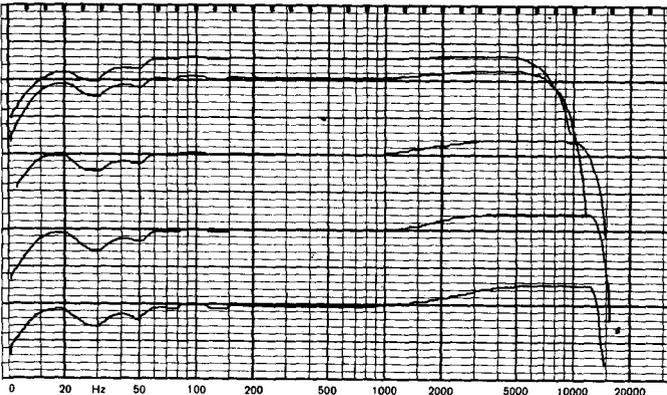
Top trace shows the FM tuner response, and the bottom channel separation.



The AM response. Woeful!



The operation of the tone controls. The three traces show, from top to bottom, the max, mid and min positions.



Five traces show the performance of the cassette deck. These show frequency response with Dolby in and Type 1 tape. From top to bottom at +3, 0, -10, -20 and -30 dB.

ability to simply record 'off-air' make it pleasant to use. The addition of the internal CD player makes tape recording even easier.

While the Dolby B circuit reduces background noise and hiss adequately, it also changes the characteristics of the recorded sound in a perceptible manner. As a consequence, I found I preferred to use the recorder without activating Dolby music reduction.

I played a number of new and old discs on the CD player including Crowded House in "Temple of Low Men" (Capitol CDP7 48763 2) and track number 1 in particular "I Fell Possessed" confirmed that this system would be well suited for use in a shop or residential situation. Large or efficient speakers would be desirable if the listener wants to listen to rock.

I listen to Telarc's "Time Warp" (CD-80106) and specifically to the tracks with Don Dorsey playing "Ascent" and Johann Strauss Junior's "On the Beautiful Blue Danube". I compared the quality of sound with that of my monitoring system, utilising the same speakers. The sound was perceptibly different, and I was convinced that the difference was primarily in the amplifier, rather than being in the CD player.

Overall

I assessed the system with a new CBS Masterworks disc with Sir George Solli and Murray Perahla playing Bartok's "Sonata for two Pianos & Percussion", (MK 42625) which is one of the few pieces of Bartok's music which I am prepared to acknowledge I like. I evaluated the CD player in the Proton unit by extracting the signal before the main amplifier and playing it through my monitoring system, before playing the same disc with my full monitoring system. My conclusion was that the Proton's CD player is reasonably good, but the amplifier requires some minor re-adjustments to its cross-over bias control circuitry, to smooth out the nasty transition.

Taken overall, the Proton A1-3000 audio system is a neatly designed unit that offers effective user convenience and multi-functional capabilities in a modestly sized package. The major sections are reasonably well designed and provide adequate performance with a touch of panache.

If the quality assurance group at Proton correct the minor cross-over distortion problems that I measured and heard in this pre-production release, they will have what most people will consider to be "a winner".

eti

Before you it's best to get

Never before in the history of high fidelity sound has a range of hi-fi equipment received such rave reviews from the world's experts.

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HI FI ANSWERS-(U.K.)

"What makes this receiver congenial to knob-shy listeners is that fact that it hides

its sophistication behind a facade of rare simplicity. In welcome contrast to gaudy models speckled with flashing lights that make them seem like refugees from a penny arcade, NAD opts for visual reticence. In terms of audio styling, this is Saville Row. Front panels are dark, matte and muted. Controls are happily kept to an unconfusing minimum but amply serve all normal needs."

NEW YORK TIMES-(U.S.A.)

"All in all, this new NAD compact disc player is an obvious sonic winner. As a further bonus, its front panel controls are a pleasure to use, in contrast to (others, which are) baulky, frustrating and touch sensitive?"

I.A.R. HOTLINE-(U.S.A.)

"Clearly the tuner is far above average: indeed there is no other we know of that can match its overall measured performance?"

STEREO REVIEW-(U.S.A.)

"The NAD 6220 is a new cassette deck on the market and is yet another example of (NAD) putting all of their effort and most of their budget into producing a machine with excellent sound quality performance rather than offering lots of

buy a hi-fi a few quotes.

extra facilities. It is this very excellence of sound quality at a low price that gains this player the winner's prize in the budget category this year (1986)"

WHAT HI FI-(U.K.)

"If you believe that I'm impressed with NAD equipment you're right. In some 25 years of audio experience I have rarely encountered such fine sounding equipment at such realistic prices?"

SUNDAY TELEGRAPH-(AUSTRALIA)

"...the NAD 5120 (turntable) stands out for me as the most interesting to listen to. Quite simply it allows you to hear more of the music than any of the other three, (Sansui, Harman/Kardon or B&O)"

POPULAR HI FI-(U.K.)

"In fact, the NAD units had such a good measured performance that no product (of the five) in this group could manage significantly better, which is astonishing (since all were double or triple the price and very highly regarded). It is directly due to the ability of their London based designer Bjorn-Erik Edvardson. As a comparative guide, I have never tested a Japanese amplifier that could match the NAD in this sort of detail?"

NEW HI FI SOUNDS-(U.K.)

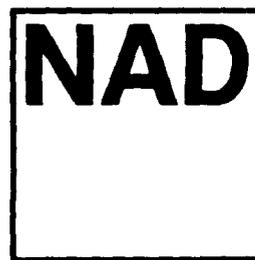
"In the case of the NAD 3020, we're dealing with an inexpensive, modest integrated amplifier. Don't let that fool you. It is capable of real-world performance far in excess of what its specifications indicate and cannot be judged by the same standards as other equipment in its price or power class. Quite simply, it's one of the best buys in audio?"

STEREO/HI FI EQUIPMENT-(U.S.A.)

Now you've read what the hi-fi critics had to say. (Although you couldn't say they found much to criticise.)

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READER INFO No. 11

REVIEWS



ANTHONY O'GRADY

SOUND OFF

The No Speak series

Miles Copeland (or Miles A. Copeland III to use his preferred title) is one of the more outstandingly successful rock managers to have emerged in the 80s.

He was the power behind the throne as the Police conquered world charts in the early 80s, then he did it all again with Sting as the Police singer re-launched as a jazz/rock superhero and a cinema star apparent.

His ancillary interests include the IRS label, which aggressively signs acts from left field and re-packages them for the mainstream. Their successes include REM (almost certainly the most commercially successful "cult band in the world today), Timbuk 3, the Alarm, the Go-Go's and Concrete Blonde.

Miles also takes credit for choosing and developing IRS's first four No Speak releases under the slogan "Music Too Good For Words". Perhaps, in time, his role as father of No Speak will loom as a major credit in his biography. But not on the evidence of these four CD's.

The No Speak artists are guitarist Peter Haycock, drummer Stewart Copeland, reformed band Wishbone Ash and studio all rounder William Orbit. As the name implies, guitar heroic or quasi-classical.

Banal

To quote from the blurb: "Its sound is based firmly in the rock idiom, but unencumbered with banal lyrics." Unfortunately there is such a thing as the banal rock riff and, unfortunately, Pete Haycock and Wishbone Ash seem to play nothing else but.

Pete Haycock used to lead the Climax Blues Band, a handy enough rhythm and blues band in the 70s, with a solid reputation for raising a sweat live. But his Guitar and Sons (IRS Cat No 460472-2) doesn't raise anything much, nor does the guitarist do much more than finger through a number of guitar scale exercises, on top of a limited number of rhythm feels.

There is no flash, fire or variation here, this is play by numbers stuff and it does Haycock's reputation no good at all. Neither does Nouveau Calls (IRS Cat

No 460473-2) enhance Wishbone Ash's 70s reputation as a guitar hero band of some distinction and original inspiration. Nouveau is twin-guitar rock with no bite or aggression. At their prime, Wishbone Ash's music pumped adrenalin. These days, they're more likely to send listeners to the kitchen for a wake up cup of tea.

Sketches

Stewart Copeland (Miles' young brother and ex-Police drummer) wrote the splendidly beaty theme for The Equalizer TV series and he has lots more where that comes from.

Unfortunately, most of the other ideas are expressed as minimalist piano sketches and Stewart Copeland simply does not have the facility of expression of say, the minimalist master Philip Glass, or the comprehensively developed technique of say, Australian Chris Abrahams. (Stewart Copeland: The Equalizer and Other Cliff Hangers. IRS Cat No 460474-2).

Which leaves William Orbit's Strange Cargo (IRS Cat No 460475-2) as easily the best of the No Speak series. There are actual instrumental ideas here, and a welcome degree of variation, with Orbit unafraid to run the gamut from background mood pieces to soaring rock anthems, tackling each on its own merits and generally succeeding. Certainly he's the only artist here seemingly aware that passable instrumental music is not just a matter of tuning out the vocals and turning up the guitars.

CD Reviews

GERRY RAFFERTY

NORTH & SOUTH

(Polydor)

Cat No. 42283 54492

Believe it or not, Gerry Rafferty was once half of a folk duo called The Stumblebums with scatological Scottish comedian, Billy

Connolly. Then, in 1978, after more than a decade in the wilderness, he came through with the soothing sounds of Baker Street, one of the most successful singles of the decade.

A decade later, Rafferty is keeping on keeping on. He's still a sales leader in the lucrative soft jazz/rock arena and his secret is not to mess with a winning formula.

His arrangements remain impeccably jazz flavoured upon a solid folk-rock base, saxophone remains the favoured harmony instrument, his breathy vocals still float across the music like froth on a cappuccino, he retains a penchant for using balmy pastoral imagery to depict the gentler moods of love.

This is high quality smooth music from a master of the genre.



James Morrison.

JAMES MORRISON

POSTCARDS FROM DOWN UNDER (WEA)

Cat No. 255697.2

James Morrison, the young trumpet player moving fast toward recognition as a contemporary great, has made a smart career move with Postcards From Down Under.

Subtitled Contemporary Music to Contemporary Art, the album is billed as a mind collaboration between Morrison and popularist painter Ken Done, with Morrison gaining musical inspiration from seven of Done's paintings, and Done painting to fit the mood of two Morrison pieces.

Perhaps more could have been made of the link between music and art (buy the

CD, get 12 postcards free!), but it's the association of names that will surely help Morrison make headway into the mainstream.

Just as Done took gallery art to the masses via imprints on t-shirts, t-towels and postcards, Morrison clearly hankers for an audience beyond that of the already converted jazz club devotee. And he has the style, panache and power to make the move.

His finger technique is uncannily close to the greatness of Dizzy Gillespie, he has the confidence to scat into the wild blue yonder, knowing he can re-enter on the beat with a spectacular swoop, any time.

Postcards primarily showcase Morrison's more mellow moods but when he does blast out, as on Sydney By Night, there can be little argument with the LA Times' evaluation: "James Morrison is beyond doubt tomorrow's jazz superstar."

MONDO ROCK

ALIENS

(Polydor)

Cat No. 887 230-2

This CD release of last year's vinyl epee from Mondo is a case of better late than never.

The songs (three originals and one cover) are perhaps not the most commercially viable to have come from the Mondo's stable of writers (everyone in the band writes, but guitarist Eric McCusker is by far the most prolific).

Ross Wilson however, is in very good voice, and the band has been recorded at its sharpest and hardest ever.

On A Woman Like You and Aliens Walk Among Us, they hammer down on the beat so forcefully, and Wilson's vocal moves are so varied, the rather pedestrian melodies become attention grabbers.

Mondo's version of the Rolling Stones' 60s classic I'm Free turns the Rabelaisian raucousness of the original into streamlined, near wistful soul. Strangely, both versions sound exactly right for their times.

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We gave the 151 VR companding circuitry for Dynamic range over 110 dB. Which means no background hiss or overload distortion — it sounds as good as the best hardwire mic you can buy. Without the hassle of a cord.

The system works with all video cameras and camcorders having an audio input. Range is 250 feet. The 151 Wireless Transmitter Bodypack clips on your belt where it can't be seen.

Then the attached Lavalier Microphone is positioned near the speaker's mouth on a tie, coat, shirt, etc. The Transmitter is powered by a 9V battery. Controls include Transmitter ON/OFF and Audio ON/OFF.

The 151 VR Wireless Receiver is ruggedly built and packed with professional features. The Receiver is powered by a 9V battery in convenient "pop-in" battery compartment. LED lights indicate Low Battery and Received Signal. Controls include Output Level and Mute adjusts. Audio Output and Headset connectors are 3.5 mm mini-plugs. An attached software antenna extends from the top of the Receiver.

For the best in wireless audio for video, the clear choice is Nady.

Specifications

Overall System Performance

Frequency Response: 25-20,000 Hz \pm 3 dB
Dynamic Range: 120 dB (max SPL to A-weighted noise level) **Harmonic Distortion:** <.3% **Frequency Stability:** \pm .005%, crystal controlled **Modulation:** FM \pm 15 KHz
Operating Range: 200 feet, adverse conditions, up to 1,500 feet line-of-sight

Nady 151 VR/LT Transmitter

Audio Input Impedance: 600 ohm electret condenser microphone permanently attached.
Controls: Transmitter ON/OFF, Audio ON/OFF, Input Level Adjust **Indicators:** Low Battery LED **RF Power Out:** 50mW (maximum allowed by FCC) **Harmonic and Spurious Emissions:** Less than -40 dB **Battery:** 9V alkaline **Battery Life:** 6-8 hours, nominal

Nady 151 VR Receiver

Controls: Mute Adjust, Output Level Adjust
Audio Output: 600 ohm unbalanced
Connectors: Audio Output; 3.5mm mini jack. Headset Input; 3.5 mm mini jack **Indicators:** Low Battery and Transmitter "TX" **Mute:** Externally adjustable; 1 μ V preset minimum
Image Rejection: 60 dB image and spurious response **Power Requirements:** Single 9V alkaline, internal



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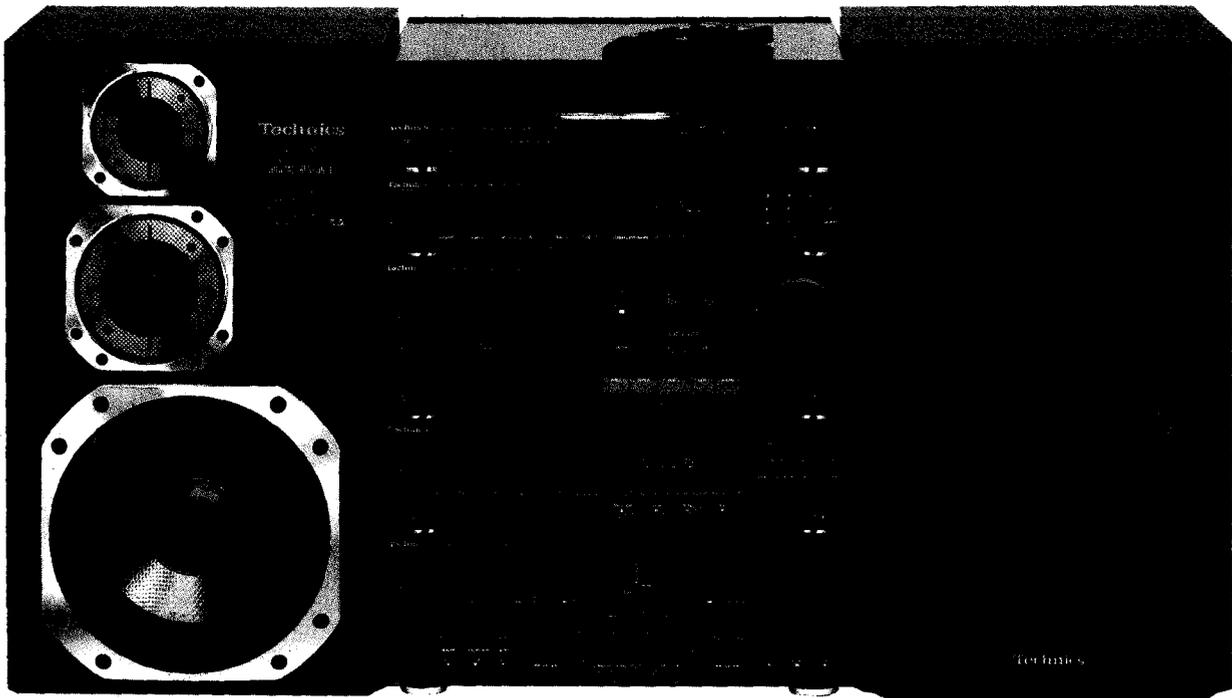
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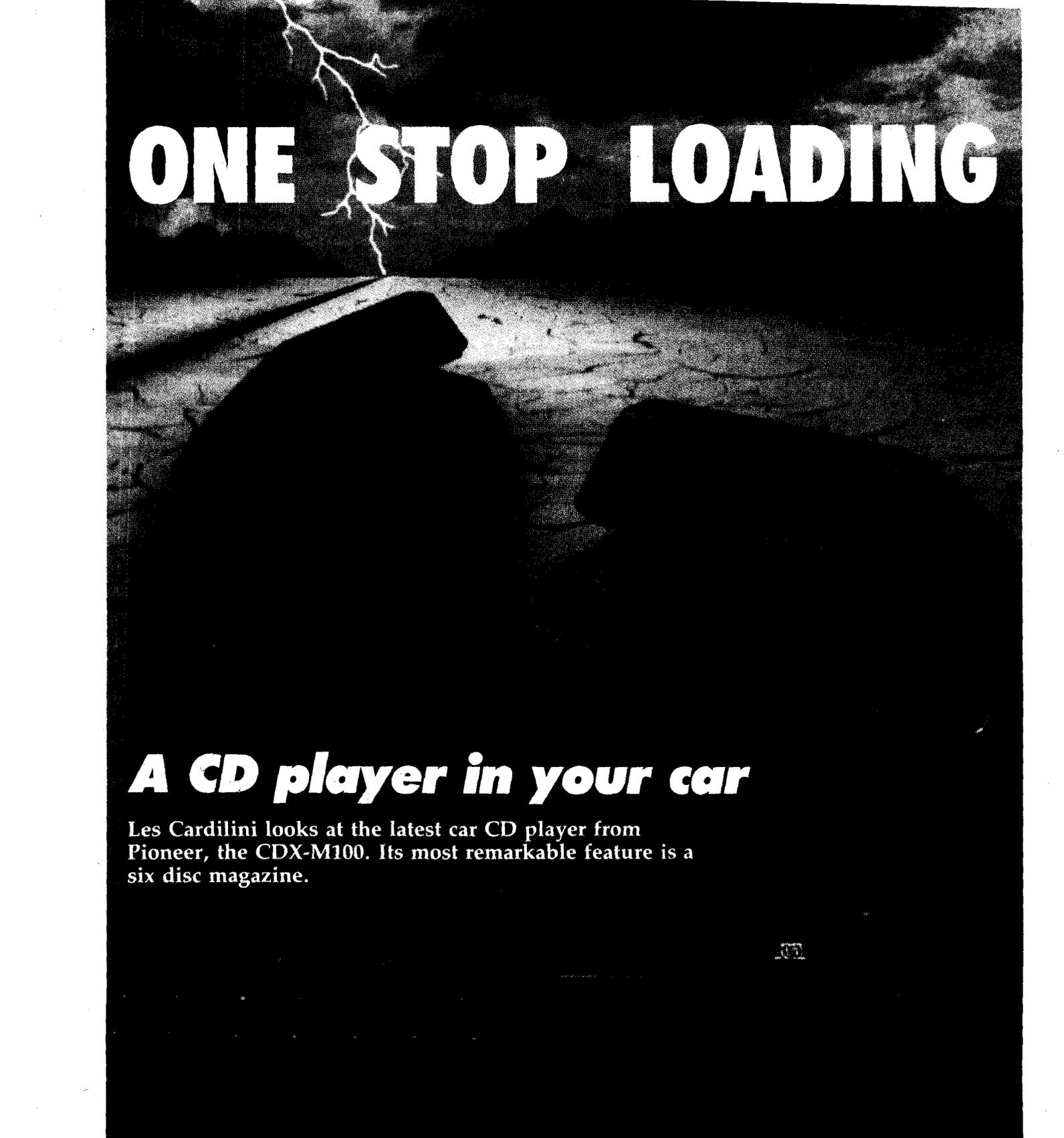


Technics

HI-FI

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READER INFO No. 5



ONE STOP LOADING

A CD player in your car

Les Cardilini looks at the latest car CD player from Pioneer, the CDX-M100. Its most remarkable feature is a six disc magazine.

Pioneer Electronics has been very active in both car sound systems and home system components including multi-disc home compact disc players and perhaps it is not surprising, therefore, that Pioneer's new, boot-mounted multi-play compact disc player

has taken the disc out of the dash and can provide hours of single-load music on compact disc, car sound systems.

The Pioneer multi-play compact disc player model CDX-M100 mounts out of the way — and safely out of sight — in the boot of a car. The player accepts

up to six compact discs loaded into a six-pack magazine and electrical connections and operating controls are cabled forward to a controller mounted in the dash, in front of the driver.

The controller unit supplied with the CDX-M100 for this review was the

KEX-M700, which is basically an AM - FM stereo tuner, stereo cassette deck and clock. It also has an infrared remote control which despite its relatively few buttons and simple layout can take advantage of most of the functions in several modes of operation available on the KEX-M700 Deck.

Extensive features

Closer examination of the operating instructions and technical handbook, however, suggest the controller is more like a computer, so extensive are its features.

About the only restrictions placed on mounting the player are that it is to be kept within ten degrees of horizontal in a clean area and that it is not located in the flow of hot air from a heater. A temperature sensing element turns off the power to the set if high temperatures due to any cause are detected inside the unit. This measure protects the laser pickup from possible damage due to overheating.

The disc magazines can be conveniently loaded into and removed from the CDX-M100, provided power to the player is applied direct or, as is more likely to be the case, via the controller. Additional magazines may be purchased separately as they are required. The magazine supplied with the CDX-M100 can also be used in Pioneer's home multi-play compact disc players. So this means that compact discs taken from home, to the car and back again need never leave the protection of their magazines, if you are fortunate enough to have one of each.

The CDX-M100 can be programmed extensively - up to 32 tracks over six discs in a magazine. Facilities such as disc changing, track skipping and searching, displaying track and elapsed time and so on, as provided on home players, can be accessed using the pushbuttons on the controller or its remote control. As well, the CDX-M100 has random play, and repeat modes of operation.

Memory

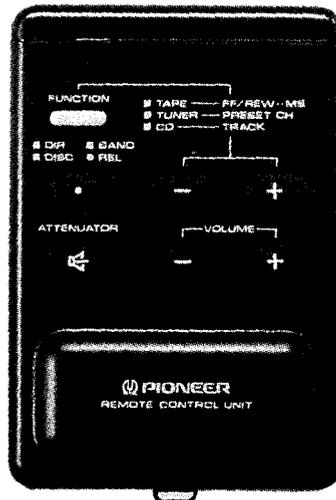
A further programming innovation in this Pioneer system is the Automatic Magazine Program Selection (AMPS) feature whereby the program memory can store programming data for up to 16 magazines - that is, a total of 96 compact discs! When the AMPS mode is active the player automatically identifies a particular magazine load of discs and plays tracks from the discs in a predetermined order.

likely to be encountered in city traffic and on-road touring.

The specifications suggest that the CDX-M100 will operate with the input voltage ranging between 10.8 Vdc and 15.6 Vdc. Maximum power consumption is 9 watts at 750 mA. Double oversampling is used and the frequency response is specified at 5 Hz to 20 kHz. The CDX-M100 measures 210(W) x 110 (H) x 330 (D) millimetres.



The boot-mounted CD player (above) and its infra-red remote control (left).



Communications between the player and its controller is via a 13-wire cable. Sensibly, the 13-pin connecting plug on each end of the cable has a 90 degree bend that minimises the amount of space needed between the set and, say, a wall or bulkhead, to fit the plug into its socket. Left and right channel audio at a fixed level of 500 mV (Line Level) is also carried on two separate wires in the same cable, to the controller unit.

Controller

Control data is serially transmitted between the Controller and the CDX-M100 in its remote location. A common data bus interfaces a microprocessor in the controller unit, with the tuner and cassette deck -also in the controller - and, the CDX-M100. Data are organised in 16-bit packet-like groups and are interpreted by the microprocessor according to the mode in which the system is currently operating.

In other words the data slots have different meanings when playing compact discs, cassette tapes or listening to radio.

'Compact disks need never leave the protection of their magazines'

Theft proof

One 4-bit slot in the data stream carries the User's Personal Security Protection Code (UPSPC) which must be re-entered at the controller to allow the set to work after the battery has been disconnected for any reason, including after the set is first installed. The set will not play if the UPSPC is not present effectively making it theft proof.

The KEX-M700 Multi-CD Control

A car compact disc player

FM/AM Tuner Deck - to give it its full title - uses the shaftless, standard DIN mounting and has the general appearance of a pushbutton digital radio.

Separate battery wires are provided so that the amber panel illumination on the set can be controlled with the instrument lights in the host vehicle. A switched power lead is included for connecting power to a motor-driven or active antenna when the radio section is used.

All operations associated with radio, cassette deck, tuner and compact disc program sources are pushbutton controlled; the set has no knobs. The pushbuttons have multiple functions depending on the mode in which the controller is operating and the various modes typically are accessed according to the sequence in which keys are pressed and, in some instances, the length of time for which a particular button is held down.

Radio

The tuning increments on the radio dial in the controller are easily changed to match Australian AM radio channel spacings, to ensure that the exact number on the dial is obtained for accurate tuning. The steps are just as easily reprogrammed to suit say, North American continent, spacing rules, if required.

A total of six AM stations and 18 FM channels, in three "bands", can be programmed into the station, pushbutton memory on the controller. The set has manual and automatic, UP/DOWN, SEEK tuning and SCAN facilities. The search tuning logic can be modified to seek only stations above a pre-determined strength or reception quality, so that the set does not stop speculatively on hissy, weak stations.

Pioneer's Super-Tuner III works on the FM band, for automatic control of stereo separation, muting and frequency response, in order to optimise the quality of sound.

It is easily demonstrated on a regular FM tuner, that a noisy, weak signal, in stereo, sounds better if the tuner is switched to mono. The problem then, of course, is that the stereo separation, or dimension, is lost when the tuner is in the mono mode. Super Tuner III compromises between hissy stereo, and a less noisy mono sound, according to the strength of the signal received at the antenna.

Setting the volume levels and balance between the left, right, front and rear speakers in the system is accomplished with the aid of a single UP/DOWN button that works in conjunction with a VOLUME/BALANCE/FADER selector.

The selected mode illuminates in the display panel and blocks appear across the top of the display to indicate the relative level, channel balance and the relative loudness in the front and rear speakers, if applicable. The volume can be adjusted through 31 smoothly changing steps while the balance control adjusts from left to right through 32 intermediate settings. Fading from front to rear occurs in 31 increments. The relative balance and fading levels are displayed automatically when the adjustment is selected.

Muting control

Pioneer have also allowed for those occasions when it is necessary to lower the sound volume for brief periods, such as when approaching a railway crossing or intersection, or to just hold a brief conversation with a passenger. In the KEX-M700 a ten-to-one drop in volume can be obtained simply by pressing the attenuator button on the infrared remote control. While this muting feature is active the volume *blocks* in the display flash until normal volume control is restored. A second press on the attenuator button restores the volume to its previous setting.

Up to 12 decibels of bass and treble boost and cut can be set in 2 decibels steps above and below the *flat* or defeat position. Separate, bass and treble push buttons are provide for UP/DOWN con-

strongest stations are duplicated on the remaining buttons so that there are no *dead* tuning buttons among the used channels. The process can be repeated when driving in a new area in which case newly found, stronger stations simply replace the weaker ones in the Best Stations Memory. The same six push-buttons, incidentally, are used in the compact disc mode, for selecting one of the six compact discs in the magazine currently loaded into the CDX-M100 player.

The stereo cassette deck, like other sections of the KEX-M700 is designed for convenience of operation and minimum driver distraction. It features the regular, forward, and manual and auto reverse play, and automatically sets its equalisation for normal 120 uS or 70 uS tape coating formulations according to the cassette currently in the deck, and then shows its selection in the display panel. A single pushbutton can be pressed to select in sequence either Dolby-B or Dolby-C noise reduction or to bypass the noise reduction altogether, if it is not required.

Music repeat and music search modes should also help to reduce the amount of attention a driver needs to pay to the sound system while searching for particular pieces of music on a tape playing in the KEX-M700 Controller Deck. The REPEAT mode simply rewinds and replays the tape and continues to do so

'The system tends to make less demands on driver attention'

trol and, again, the selected function is clearly displayed while the blocks which fill across the top of the display show the current boost and cut as the tone controls are adjusted.

Stations memory

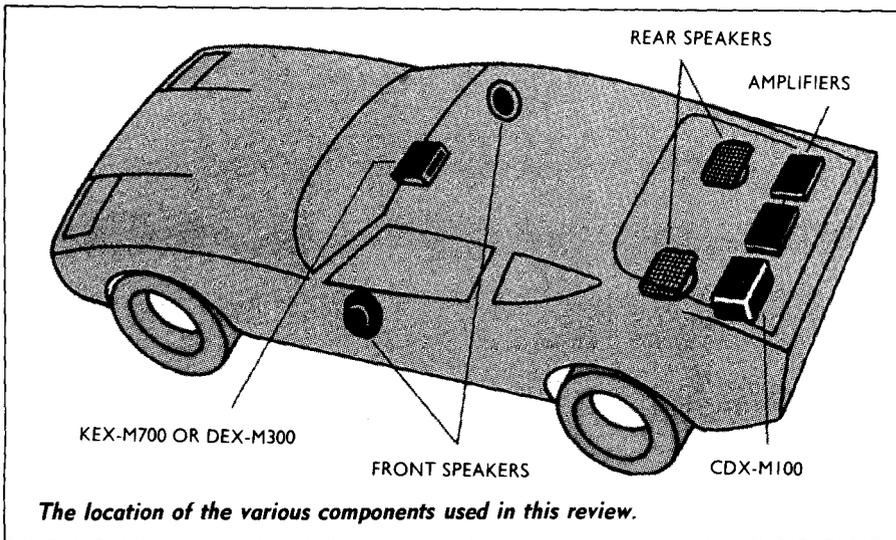
Perhaps nothing is more annoying while listening to a car radio in an unfamiliar part of the country, than not knowing how many local stations there are, and where they are on the dial. Searching for them, even on a digital tuner, can be frustrating. This tends to be less of a problem with the Pioneer KEX-M700 which has a Best Stations Memory (BSM) tuning mode.

When the BSM mode is selected the tuner in the KEX-M700 automatically finds and tunes in to up to six of the strongest stations it finds along the dial, and then memorises them in order of strength, on the six tuning pushbuttons. If less than six stations are found the

until the REPEAT mode is cancelled. The MUSIC SEARCH is used in conjunction with the fast forward and rewind modes and speeds through the cassette in the required direction, stopping where periods of silence longer than four seconds are detected on the tape, such as between music tracks.

The process can be repeated until the required program is located at which time the MUSIC SEARCH is terminated at the press of a button and the deck goes into the PLAY mode.

Many of the functions available at the front panel controls on the KEX-M700 can be operated from the small infrared remote control supplied with the set as a standard accessory. In fact, only occasionally might the user need to resort to the front panel at all, for simple day to day use of the system. Station selection on six AM and 18 FM, pre-tuned stations is possible using the remote control with the KEX-M700 in the tuner



The location of the various components used in this review.

mode. In the cassette player, or tape mode the set can be switched from forward play to reverse play, fast-forwarded and rewind, and the MUSIC search mode asserted and disabled using the cordless infrared remote control.

The volume can be raised or lowered conveniently using the remote control, and discs and tracks can be selected and searched according to the current, CDX-M100 programming; the remote will even switch the system ON and OFF.

The remote control has only seven pushbuttons, widely spaced to minimise the chance of accidentally operating more than one at a time, and can be attached to any convenient part of the vehicle, using Velcro patches supplied with the set. The remote control tested could be aimed in almost any direction and still operate the system correctly; in fact it was able to operate effectively, from within a trouser pocket. At one stage I suspected it was other than an infrared device and sought reassurance from the user manual. The point to be made here is that, again, the system tends to make less demands on driver

attention insofar as the remote did not need to be aimed accurately to be positive and effective in its execution of commands to the set. The pocket-sized remote control measures only 85 x 57 x 15 millimetres, approximately and is powered by two UM-4 cells.

An added bonus for owners of Pioneer home multi-play compact disc players such as the PD-M70 is that programs stored in compatible remote controls can be "dumped" directly into the KEX-M700 using the home unit remote control.

Of course, the CDX-M100 and the KEX-M700 are decks, that is they provide only LINE level audio. Accordingly, additional, power amplifiers are needed for FRONT and possibly REAR, stereo speaker operation. Pioneer provided two models, the GM-4000 and the GM-2000 for this review. Both have standard connections to enable them to be integrated with and switched on and off via the KEX-M700 multi-CD control FM/AM tuner deck. Both amplifiers are of slim-line flat-pack type construction for mounting conveniently under seats or against bulkheads and firewalls.

The GM-4000 is a compulsory fan-

cooled, bridgeable, 200 watts per channel stereo power amplifier typically suited to front stereo channel operation but which can be switched to form a single channel, 400 watts amplifier if required. A low pass filter switch converts the amplifier for alternative, operation with a sub-woofer speaker system. The input level sensitivity is adjustable between 200 mV and 2 V, and both 2 and 4 ohm speaker can be used.

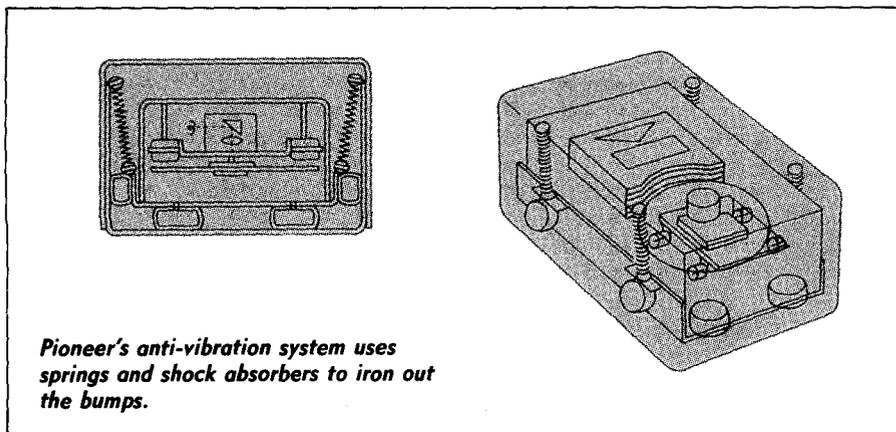
Similar in general appearance to the GM-4000 the Pioneer Model GM-2000 is rated at 100 watts per channel and is not fan cooled. It, too, can be bridged to operate as a single channel amplifier rated at 200 watts. Bridging in both amplifiers is accomplished simply by operating a MONO/STEREO switch on the front panel and modifying the speaker connections at the back of the set. Both amplifiers also have a switched bass boost feature for use in systems otherwise lacking in bass response. Speaker impedance switching, input level, and low pass filter for sub-woofer operation - all similar to those on the GM-4000 - are also available on the GM-2000, together with oxygen-free speaker cables. Both, RCA and DIN input connectors are provided on both models.

Ample fittings and leads are provided in the Pioneer system tested although RCA leads were not included with the KEX-M700 and had to be obtained separately. This at first seemed a little odd in view of the generous helpings of other bits and pieces but perhaps the uncertainty of how long the leads would need to be and whether DIN or RCA leads might be used between the controller and amplifier are logical reasons for not supplying them. The user manuals, installation instructions and other documentation packed with the sets are comprehensive and easily followed and understood.

The future

The Pioneer car system is certainly interesting. Looking further down the track, Interactive CD-ROM and its potential applications in cars is just around the corner. Multi-size optical disc players already exist, and doubtless automotive models are on the drawing boards. We will soon have many more, exciting new systems based on laservideo and compact disc technology. 

READER INFO No. 265



Pioneer's anti-vibration system uses springs and shock absorbers to iron out the bumps.



MARY RENNIE

BEHIND THE BRAND NAME

Who makes what for whom?

Buying a product featuring a company label doesn't necessarily mean that company actually produce it as Mary Rennie reports.

Some time ago, Sony announced its intention to manufacture VHS video recorders. Amid the fanfare, a spokesman explained that the first production run of 5000 or so would be manufactured by Hitachi on an OEM basis.

OEM? "OEM", or Original Equipment Manufacturer, is a term that has slipped into the language with little explanation. Its linguistic sibling, "badge engineering", too has gained a certain (or uncertain) currency.

One could be forgiven for misunderstanding the term "OEM". It is widely misapplied as an adjective and noun. A "manufacturer" is a noun so original equipment manufacturer is no problem. But what does one make of cases like "... a locally-produced OEM version of the Novell Netware package ..." (adjective — from a local computer rag)? It

players, videos, or whatever, coming from the same factory and badged to different companies?

According to Panasonic's John Metzner, sales manager for that company's OEM facility in Australia, it means the consumer is buying brand image. While different brands set their different specifications for manufacture, these don't dif-

'... no company produces its products from components up'



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sounds like gobbledygook. It means, however, that another company besides the badged company was the original manufacturer of the product (not that the badged company was the original maker).

Presumably because of the clumsiness of acronyms, the term is used to describe the actual manufacturer, and it has come to refer to the whole process.

Common procedure

This procedure of employing manufacturer to make your item is exceedingly common, especially if one considers the fact that no company produces its product from components up. Components are manufactured by one company, circuit boards possibly somewhere else, the housing somewhere else again. However, the most common understanding of OEM manufacturing is the assembly of an item to certain specifications set by the commissioning firm with another producer, like Hitachi was doing for Sony.

This practice is very popular among hi-fi manufacturers and has been for a long time.

Given a certain standardisation in technology and design (brought about by collusion between companies as much as patents for designs) what does it mean for the consumer to have most of the CD

fer much and all products are of a high quality anyway, he says. Because standards have been set, nobody with an established reputation gets away with an inferior product these days.

Interest in quality

Original equipment manufacturing underwrites this by virtue of the fact that the original equipment manufacturer has an interest in the quality of the product. The OEM line is a line of sale just as any other product, and reputations are at stake.

Metzner cites a very real advantage in having an OEM facility: it allows products to get off the ground cheaply and quickly, at a competitive price. Because of the standardisation of the market, prices are established for particular goods at a certain quality and anyone trying to break into the market must compete with the established prices and quality.

So the costs of producing an item, R&D, setting up a factory, marketing, distribution, etc, mustn't exceed what can be recouped in the market. For companies with relatively small production runs, to set up a competitive, automated factory is out of the question. It couldn't be recouped by the amount of product. However the OEM option, using an already established factory to produce the necessary numbers of product might

make the run feasible.

Such an option is particularly helpful for Australian manufacturers with initially small domestic or international markets and therefore production runs, and should be considered by our burgeoning hi-fi manufacturers.

The result for the consumer is arguably a wider range of products at a lower cost. Whether the insides of the various products, CD players, video recorders, etc, differ substantially is often doubtful. One

thing is that the consumer might be sceptical of claims made by the brand company. While products are made to their (not greatly varying) specifications, it is not necessarily the brand company's crafting you are buying.

Irony

The market has changed a good deal since Sony was a fledgling company setting out to sell itself to the world, but a story from Sony Executive Officer Akio

Morita adds a touch of irony. In 1955 when in the US trying to sell the first Sony transistor radio, he spurned an order for 100,000 units from the Bulova company. Why? Bulova had stipulated that its brand name must go on them. In explaining his rejection to Bulova, Morita said "I am here with a new product and I am now taking the first step for the next 50 years of my company". Declining OEM orders has not become a principle with Sony.



CESA forecasts

The Consumer Electronics Suppliers Association (CESA) has released the revised half-yearly Industry Consensus Market Report for video and colour television products for 1988. Sales of video cassette decks are forecasted at 488,000 units and estimates of household penetration are in excess of 65%. Forecasts for camcorders are estimated at 48,000 for the year and colour TVs are expected to be 600,000.

With the end of the year approaching these figures will soon be verified. S-VHS is apparently responsible for some of the optimism.

According to Mark Plummer of Hagemeyer (Australasia), the entire first shipment of S-VHS equipment from JVC sold out even before it reached Australia, the biggest back-order seen by Hagemeyer for the past five years.

AM becomes FM

Under the Federal Government's development plan for metropolitan radio stations two AM stations in each mainland city will become FM stations.

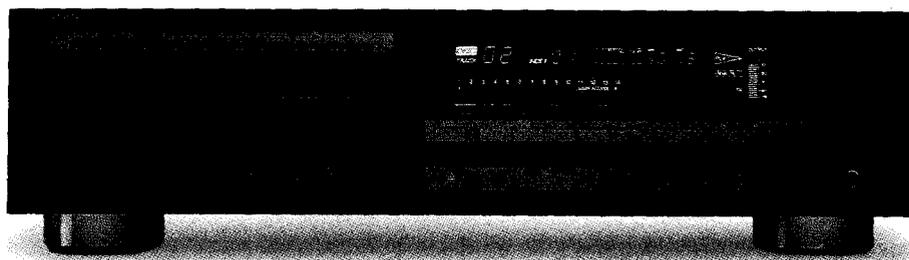
These FM licences will be exchanged for the stations' existing AM transmitters and frequencies which will be used by Radio for the Print Handicapped and for parliamentary broadcasts.

Two further FM frequencies will later be released in each city for open tender.

This plan, popular with government revenue raisers and the wealthier of AM stations, is likely to be fully implemented by 1993.

eti

YAMAHA'S NEW CDX 1110 CD PLAYER OWES ITS BRILLIANCE TO A PIECE OF TWO-BIT TECHNOLOGY.



Until now, CD players were limited to 44.1 kHz and 16 bit technology. Now Yamaha has, as Audio Magazine states, "found a way to improve on perfection". Introducing the world's finest CD player that features 18 shifting bits and 8 times oversampling digital filters. A technological progression that quadruples both sampling frequency and density to produce exquisite wave-form resolution.

The result is unsurpassed sound quality. We could mention its 44 key wireless remote control, its new 3 beam laser pick-up, its 24 track direct access and random access programmable playback. Or we could compare it to our previous model, the CDX 1100. Of which Audio Magazine said "As to how a CD player is ideally supposed to sound, we do not hesitate to say that it should sound like the

CDX 1100". All of which proves that the new CDX 1110 won't sound one bit better than any other CD player. It'll sound two-bits better. Starting at \$399, our entire CD player range is there for the picking in your local Yamaha Hi-Fi store.

Y M H

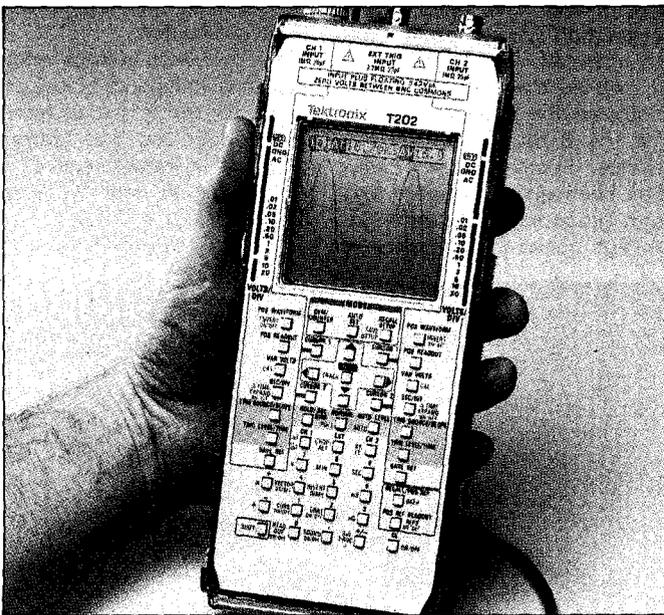
5 YEAR WARRANTY.



Cutting edge ▶

Roland have introduced a vinyl cutting machine designed to be interfaced to an ordinary PC. It's called the PNC 1000 and combines plotting and cutting functions in one unit. Primary use is the creation of graphics for indoor or outdoor displays. Using a conventional plotter, it can be employed in the normal way, and interfaced to standard CAD packages. It comes with both RS232 and centronics ports. ☎ (03) 429 2977.

READER INFO No. 230



Hand held ▲

Tektronix have released a hand held oscilloscope with a LED matrix for a display. The Tek T202 offers a traditional oscilloscope interface with front panel controls divided into ordinary functional groups. A calculator-like front panel is also available called the T201.

The unit has a powerful in-built software package that allows functions like time and frequency measurements, built-in user definable display configurations, true RMS measurement as well as different types of voltage measurement. ☎ (02) 888 7066

READER INFO No. 232

Voice check ▼

MTI is distributing a voice recognition door security system made by Ecco industries. To use the system, all the people who are allowed to use the system spend 20 seconds talking to it. The unit stores the voice pattern against an identity number. It is a stand alone unit, requiring no mainframe or wiring. It

doesn't need keys or cards either.

The heart of the system is a proprietary speech verification technology based on Linear Predictive Coding (LPC). At verification time, speech samples are compared with stored templates. ☎ (03) 584 2699

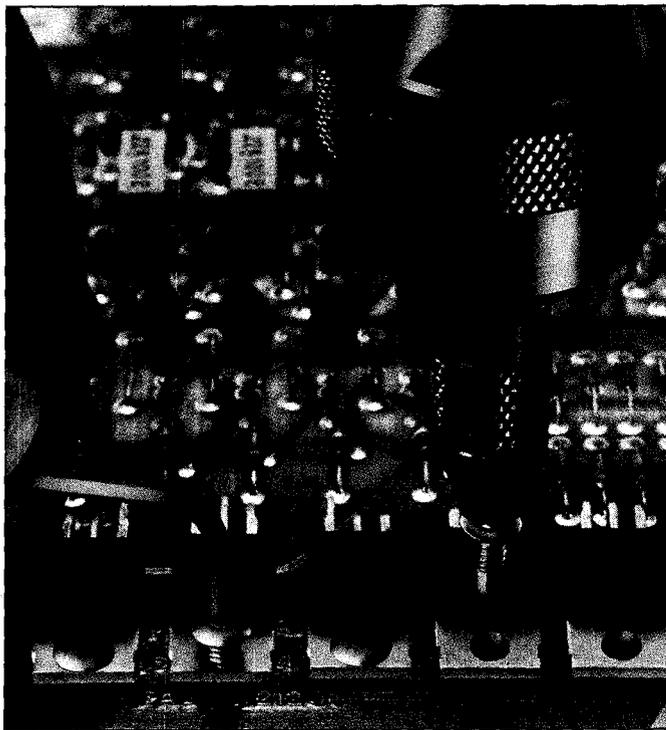
READER INFO No. 231



Hi class mixer ▶

Lexicon has released a new digital audio production system called the Opus. It offers sound effects editing and replay, dialogue recording, editing and replacement and music editing. It uses distributed DSP processing architecture. Storage is on an 800 M Winchester disc. Opus is controlled from a workstation set off to one side of the unit, however, most of the familiar analogue mixing functions are available on the main console so that the unit can be configured like a conventional desk when required. Contract Amber technology ☎ (02) 975 1211

READER INFO No. 234



Fasteners ▲

A revolutionary new fastening system is being distributed by Avdel in Melbourne. It is a cross between a screw and a pop rivet, and is designed to anchor large devices like big transistor cans to the board with the reliability of a rivet,

but the convenience of a screw. Rivescrew is the first and only fastening of this type specifically designed for printed circuit board applications. ☎ (03) 240 0561

READER INFO No. 236

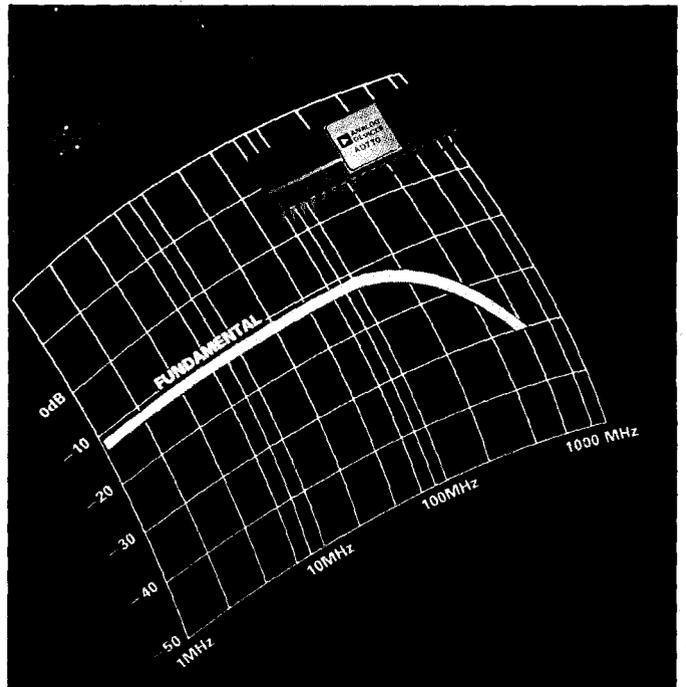
Digital capers ▼

Parameters have released an evaluation board for Analog Devices AD770 flash ADC. It's called the ADEB770, and holds all the support circuitry for the 8 bit, 200 M/sample device. Special consideration has been given to board layout, grounding and buffering. A high speed DAC is also on

the board so that inputs may be reconstructed.

The on-board voltage reference has independent adjustments for the converter reference ladder top and bottom ranges. The board requires 5 V at 600 mA and -5.2 V at 1.8 A. ☎ (03) 575 0222

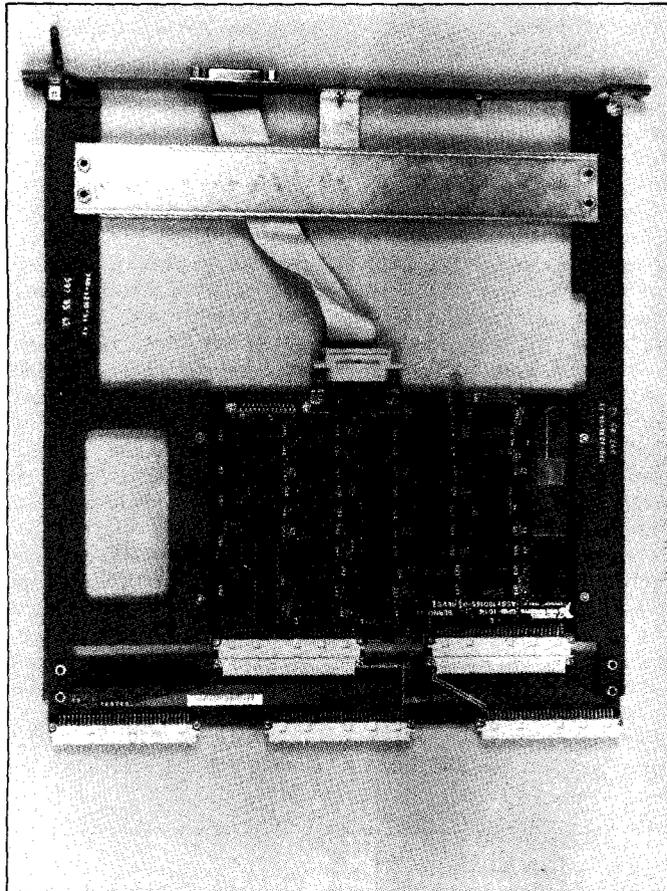
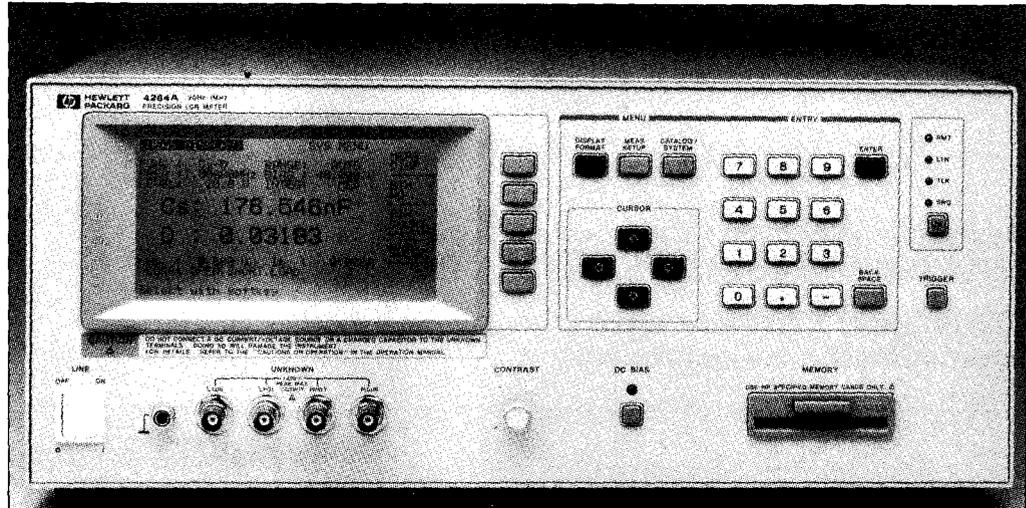
READER INFO No. 235



Three in one ▶

HP have released an LCR meter, model 4284A, capable of operating from 20 Hz to 1 MHz. It offers six digit resolution with a basic accuracy of 0.05%. Price is \$15533. ☎ (02) 895 2895

READER INFO No. 237



Sun to IEEE-488 interface kit ▲

National Instruments Corporation has announced a complete Sun to IEEE-488 interface kit for the VME-based Sun Microsystems Systems 3 and 4 workstations. Sun workstations have become increasingly popular as high-

performance instrument controllers because of their flexibility and expandability.

For information contact Elmeasco Instruments' office ☎ (02) 736 2888 or (03) 879 2322.

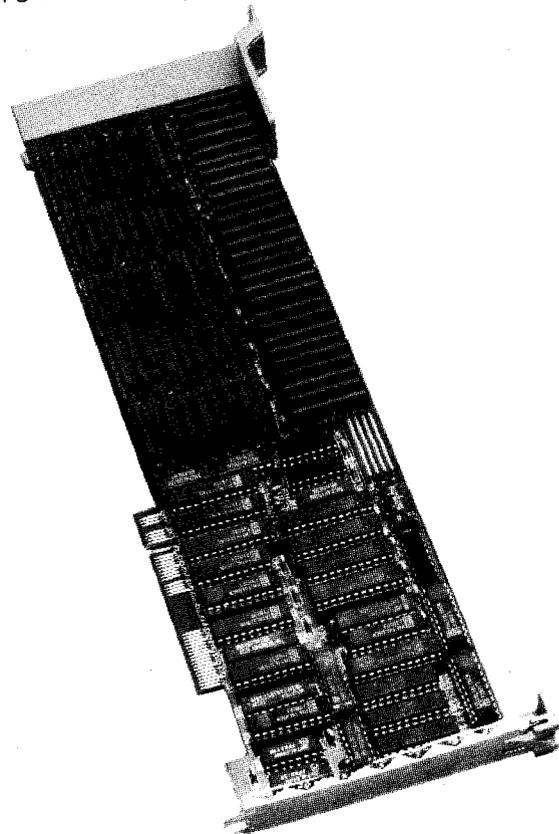
READER INFO No. 239

Memory board gets "All clear" ▼

Hyperam 50/60 memory boards are available in two configurations, Hyperam 50/60 2 Mb (which comes standard with 512 Kb and can be upgraded to 2 Mb) and Hyperam 50/60 8 Mb (standard with 2 Mb and can be upgraded to 8 Mb).

They are designed to comply with IBM's comprehensive specification released recently and runs in the Models 50, 60 and 60Z. For more details ☎ (02) 819 7222.

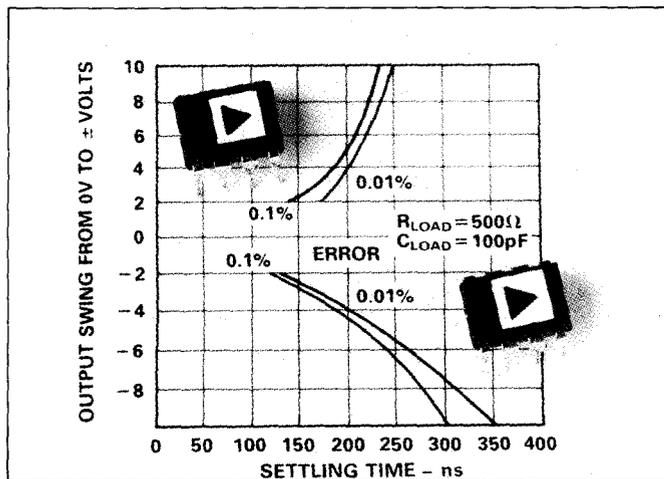
READER INFO No. 238





SEMICONDUCTOR WATCH

ETI engineer Terry Kee takes a look at the latest available in semi-conductors.



Fast settling op amp

Combining excellent ac and dc performance, the AD845 FET-input op amp from Analog Devices features a typical settling time of 350 ns to 0.01% (for a 10 V step) into a 500 ohm/100 pF load. Total harmonic distortion (THD) below 0.0001%, makes this device well suited for driving high-speed ADCs and DSP system front ends, and for critical aspects of high-performance sample-and-hold circuit designs. A monolithic device, the AD845 replaces hybrids in many applications at lower cost.

The ac performance of this unity-gain stable, internally compensated IC is designed for high-speed precision data acquisition systems. Dynamic performance includes 100/ μ s slew rate, 16 MHz small-signal bandwidth, and 1.75 MHz full-power bandwidth (± 10 V into 500 ohm).

For dc performance, the input offset voltage of the AD845 has a maximum value of 250 μ V with drift of less than 5 μ V/ $^{\circ}$ C. Warmed-up input bias current is guaranteed below 1 nA at +25 $^{\circ}$ C, with an effective input impedance of 10^{11} ohms. Open-loop gain is typically 250 V/mV into a 500 ohm load. Minimum CMRR and maximum noise of 94 dB (113 dB typical) and 4 μ V maximum peak-to-peak noise (0.1 to 10 Hz) respectively.

Laser trimming provides the low input offset voltage and voltage drift in this N-channel JFET monolithic device. Packaging options include plastic 8-pin mini-DIP and hermetic cerdip, with available temperature ranges of 0 to +70 $^{\circ}$ C, -40 to +85 $^{\circ}$ C, and -55 to +125 $^{\circ}$ C. Parameters

Pty Ltd ☎ (02) 888 8777.
READER INFO No. 226

New 32-bit bus architecture

A group of personal computer manufacturers has introduced a new 32-bit bus architecture, known as the Extended Industry Standard Architecture (EISA), that is 100 per cent compatible with the industry's de facto standard 16-bit bus, the IBM PC-AT compatible architecture.

Intel Corp. worked with the group to define EISA silicon specifications and announced the first peripheral chip-set supporting the new standard.

The EISA specification, developed by leading personal computer manufacturers including Compaq, Epson, Hewlett-Packard, NEC, Olivetti, Tandy, and Zenith, is designed to fully exploit the performance of the Intel 386 architecture.

The Intel chip-set, called the 82350 family, is comprised of a 32-bit, high-performance direct memory access (DMA) controller; a high-integration bus controller optimised for the 386 micro-

processor family; and an advanced bus master adapter that supports sophisticated input/output capabilities while maintaining backward compatibility to existing 8- and 16-bit PC/AT-compatible bus architectures.

Personal computers and workstations based on the 82350 peripheral chip-set will serve as hosts for sophisticated add-in cards accommodating file servers, advanced disk subsystems, high-speed networks and high-end graphics. The 82350 peripheral chip-set is tuned to match the high performance requirements of systems based on Intel's 386 microprocessor family.

Sample quantities of the 82350 peripheral chip-set will be available in the second quarter of 1989, with production following in the second half of the year. For further information, please contact Intel Australia ☎ (02) 957-2744. READER INFO No. 227

Microcontroller with vacuum

The Motorola Microcontroller Division has announced the MC68HC05M4, an advanced 8-bit microcontroller (MCU) with high voltage driver pins and an A/D converter. The 24 high voltage (up to 40 volts) pins may be used to directly drive the grids and anodes of vacuum fluorescent displays. Relay drive is

another use for the eight pins that source the 10 mA and the 16 pins that source 2 mA.

Available in a 52-pin plastic leaded chip carrier (PLCC), this HCMOS device contains 4096 bytes of ROM, 128 bytes of RAM, 40 I/O lines, a 16-bit free running timer, a watchdog system, and an 8-bit modulus timer. The 8-bit

timer subsystem has an output mode that is useful for audio tone generation. The 8-bit A/D converter and watchdog subsystems make the MC68HCO5M4 particularly attractive for electromechanical controllers such as household appliances, machine tools, and automotive displays.

The new M68HCO5-M4EVM provides the design, debug, and evaluation support for the MC68HCO5M4. This evaluation module provides all of the essential MCU timing and I/O circuitry necessary to help the user evaluate the prototype hardware and software. For information ☎ (02) 438 1955.

READER INFO No. 228

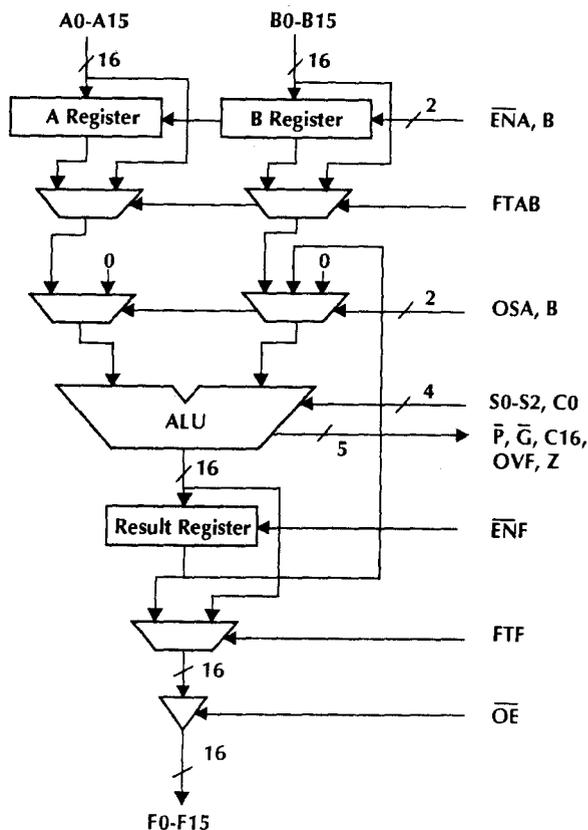
ALUs from Logic Devices

The ALU range from Logic Devices comprises the L

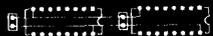
429C01 and L 4C381. The L 429C01 is a 16-bit ALU Slice downward compatible with existing bipolar 2901 designs. It is equivalent to four AM 2901 bit slice ALU's and an AM 2902 carry look-ahead unit, plus on-chip facilities to support fully cascadable 16-bit, 32-bit and larger architectures. 12 MHz commercial or 10 MHz military speeds for 16-bit machines are provided. The device is available in all the usual package versions.

The L4C381 retains full functional and performance compatibility with bipolar 381 designs and features extensions to the 54S381 Instruction Set.

A combination of four 381 type 4-bit ALU's, a look-ahead carry generator and miscellaneous interface logic are built into the single 68-pin package, (LCC, PGA and PLCC). Full data sheets and other details from Dynamic Component Sales ☎ (03) 873 4755. INFO No. 229



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READER INFO No. 17

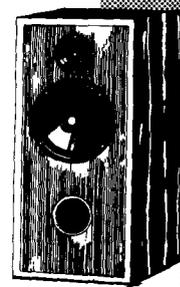
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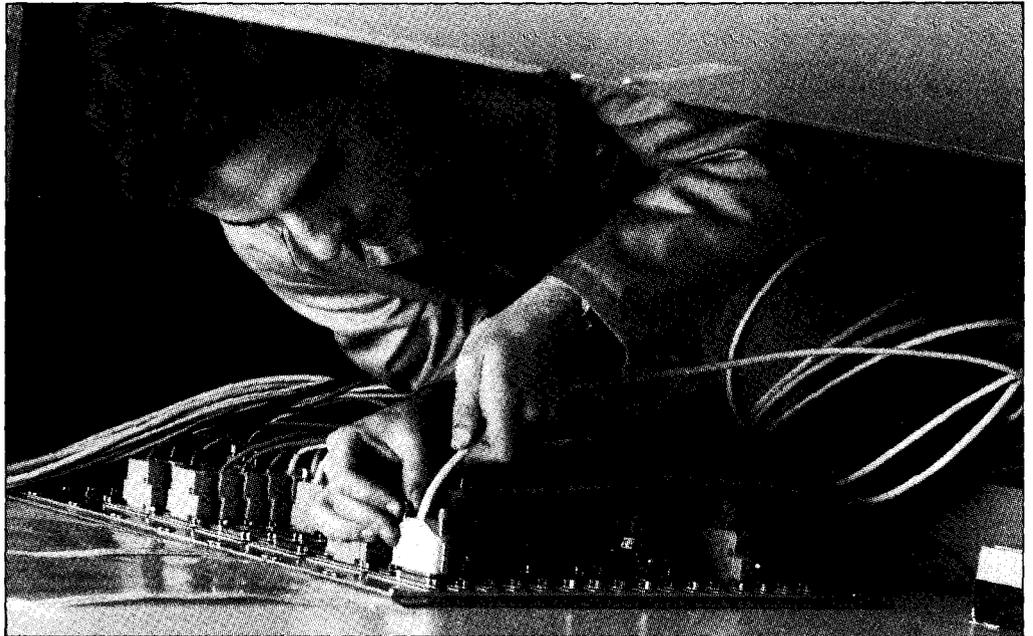
Data cable

range grows ►

A new range of general purpose data cables has been released by Austral Standard Cables (ASC) to suit RS232 applications.

Called B25, the new range is designed for use when a quality data cable is required.

The new range is fully screened with aluminium to exclude external interference; particularly flexible and easy to strip; tinned for easy soldering; with a neutral sheath but unique core colours for ease of termination. ASC can be contacted on ☎ (02) 821-9777. READER INFO No. 240



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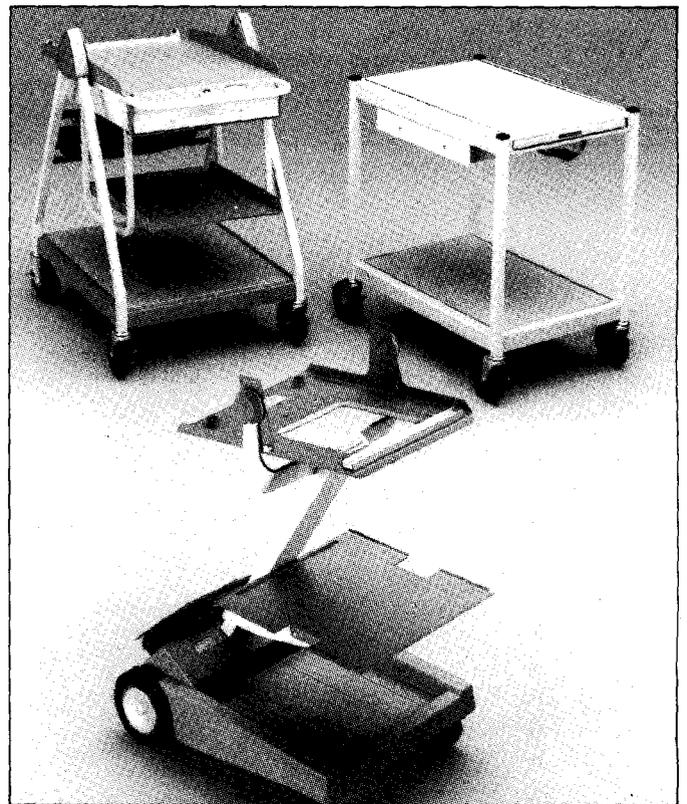
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In W.A. contact:

Ace Industrial Distributors
63 Collingwood St. Osborne Park W.A. 6017
Tel: (09) 446 5577 Fax: (09) 446 6586

READER INFO No. 19



Carts galore ▲

Tektronix has introduced a portable instrument pedestal and three carts for test and measurement instruments. The new products include the K501 Tek-Tilt Pedestal, the

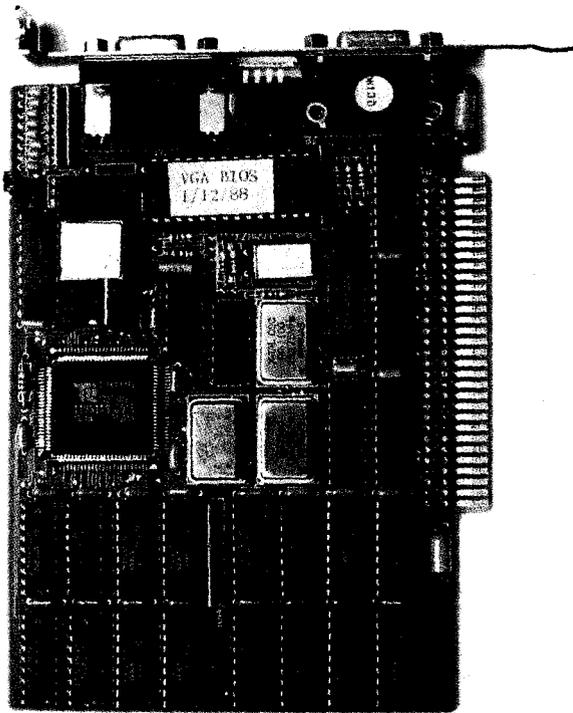
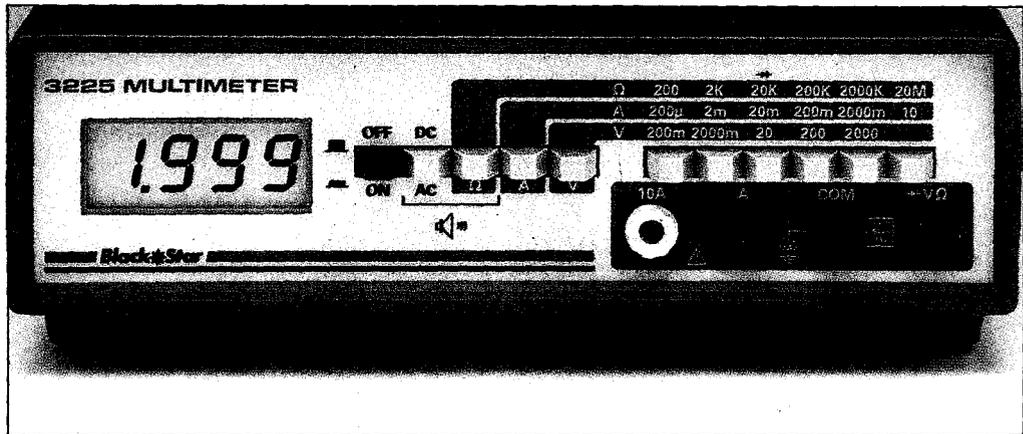
K217S Rack-Mount Instrument Cart, the K318 Utility Cart, and additional options to the K212 Portable Instrument Cart. ☎ (02) 888 7066.

READER INFO No. 242

Measure it ▶

Atest in Melbourne is distributing the Black Star 3225 DMM. It is a battery powered bench top device, claimed to give 7500 hours of operation from a set of alkaline batteries. It offers 3.5 digit resolution, and all the usual functions including diode test and continuity beeper. ☎ (03) 233 5889

READER INFO No. 243



The lot ▶

Rod Irving Electronics in Melbourne is distributing the EVA/1024X video card for the IBM PC. It supports all the IBM standard video modes including VGA, EGA, MGA, and CGA. It also supports the Hercules mono standard. Thus it will support software written for 320 x 200 x 16 colours right through to 1024 x 768 x 16 out of 256000 colours.

According to the publicity, the card has register level compatibility with the VGA standard, and BIOS level

compatibility with EGA standard. As a result, all PS/2 systems graphics will run, and most EGA type graphics. If this is not sufficient, it is possible to reconfigure the card manually to look like an EGA card down to register level, at which stage any software that conforms to IBM standards will run.

RIE is selling the card without memory for \$395. With 512K on board, it costs \$895. ☎ (03) 543 7877

READER INFO No. 245

Baby cone ▶

IRH components, have recently released a new miniature mylar cone speaker transducer on the Australian market.

The new KSS 3108 has a frequency response of 500-4000 Hz, and a resonant frequency of 1250 Hz.

Tune in and ☎ (02) 648 5455.

READER INFO No. 244



Radio Code Analyser ▶

The Schlumberger 4922 Radio Code Analyser is now available from Tech-Sales.

In the testing of cellular mobiles the 4922 simulates the data traffic of the base station and evaluates the cor-

responding responses of the mobile. All screen displays, measured results and signalling procedures can be printed on an IEEE printer. Tech-Sales is on ☎ (03) 879 2266.

READER INFO No. 246

Poster ▶

In conjunction with the CSIRO Science education Centres, COSSA has issued a poster covering aspects of Space Technology. Actual size is 595 x 420 mm. It's available for \$5.00 from COSSA ☎ (062) 70 1811
 READER INFO No. 247



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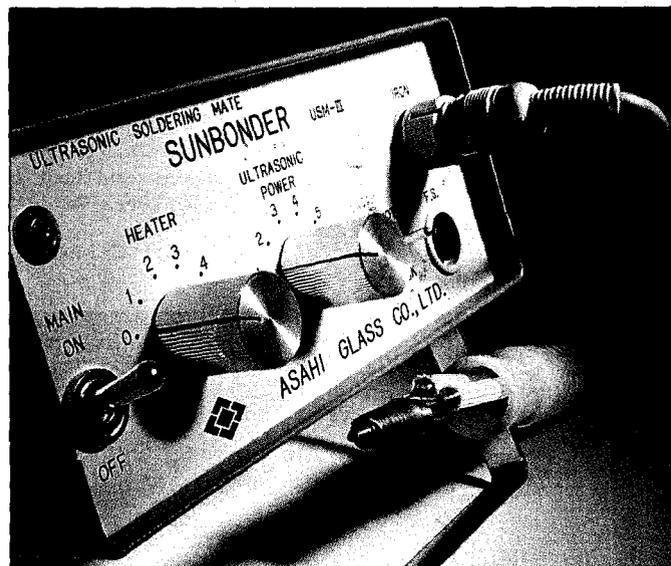
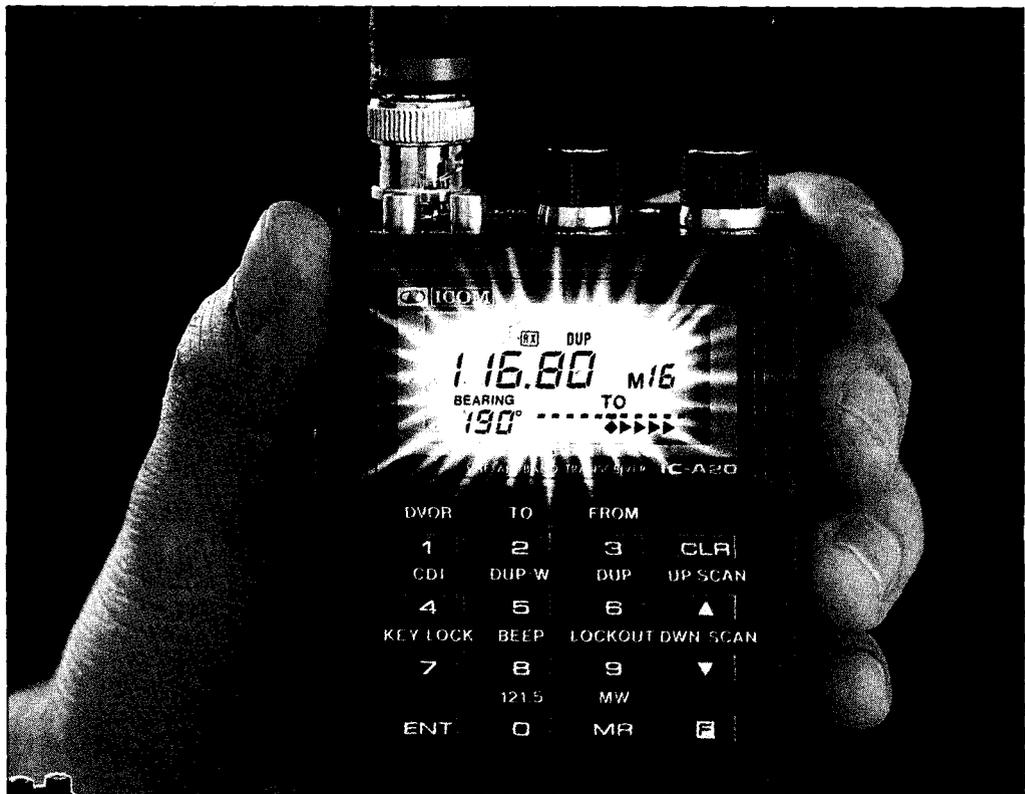
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Check on the flyboys ▶

The Icom IC-A20 is a conventional handheld scanner especially configured for use in the aviation industry, (and interested bystanders). It covers the full 108-136 MHz airband, with 720 Com and 200 Nav channels. It also has VOR reception and display capability.

It allies these features with typical high class scanner technology. Sixteen memory channels can be scanned, or all of them can. It can also lock out certain bands from the scan cycle as required. 121.5 MHz, the emergency frequency, is available from a single button. ☎ 008 33 8915

READER INFO No. 248



Solder with sound ▲

Electromark is distributing the Sunbonder, a portable ultrasonic device designed to allow soldering on glass and ceramics. It uses a material called Cerasolder which has been developed by Asahi Glass Co in Japan to replace solder. The unit applies ultra-

sonic waves ($f = 59.5 \text{ kHz}$) to the job. It is possible to solder directly onto metals such as aluminium and stainless steel and also to metal oxides. Both heat and ultrasonic power levels can be adjusted. ☎ (02) 570 7287

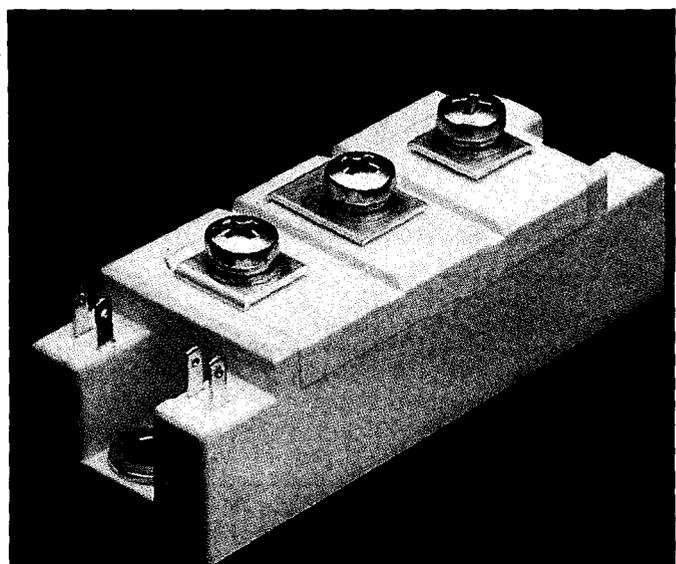
READER INFO No. 250

Mighty Mouse ▼

A new Mosfet power module can handle 1000 V or 200 A because of a new packaging configuration. These Semi-trans M modules consist of five building blocks: a copper baseplate (heatsink), an alumina ceramic substrate

that bonds directly onto the copper, chips, interconnects and packaging. The packaging is a special silicon compound with a layer of epoxy over the top. ☎ Semikron on (03) 561 3044

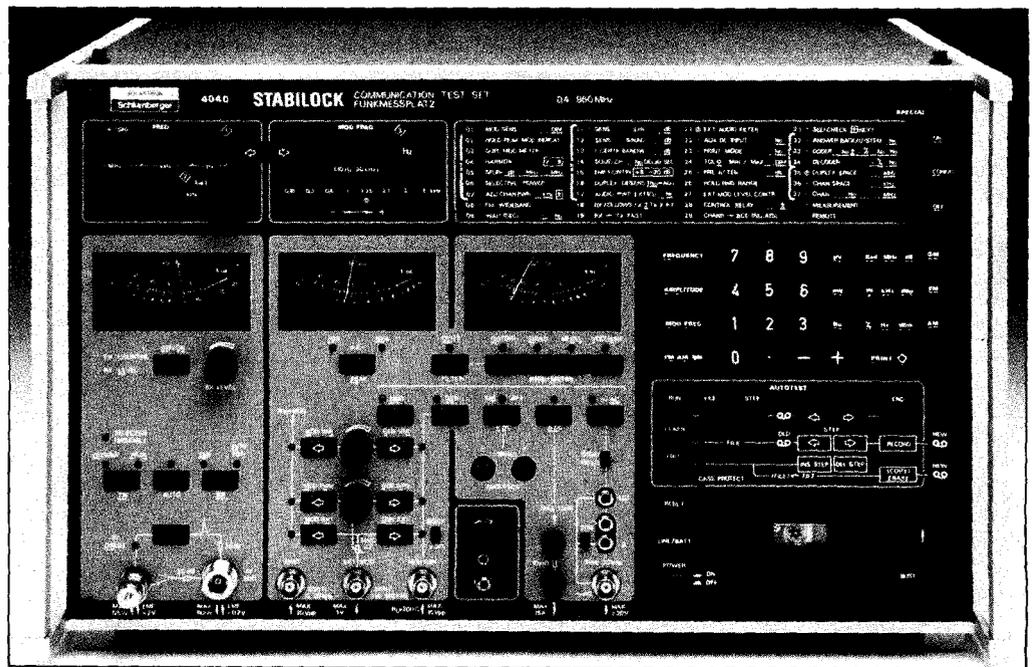
READER INFO No. 249



Radio communications test set

The West German Schlumberger 4040 provides two-way radio measurements from 0.4 to 960 MHz, or up to 1.85 GHz with an optional frequency extension. Built-in test routines allow measurements of sensitivity, bandwidth, centre frequency, squelch, modulation sensitivity, adjacent channel power, harmonics and spurious signals. ☎ (03) 879 2266.

READER INFO No. 251



Scanning

Mark have released the Saiko SC-8000 AM/FM scanning receiver. It operates on HF, VHF, airband, and UHF. It has a 50 frequency memory so that some frequencies can be pre-set. Features include manual channel select, scan-

ning, memory scanning, search, delay, auto AM/FM selection and channel lock-out. It operates from 13.8 Volts and has a 1.8 W audio output ☎ (03) 329 5433.

READER INFO No. 253

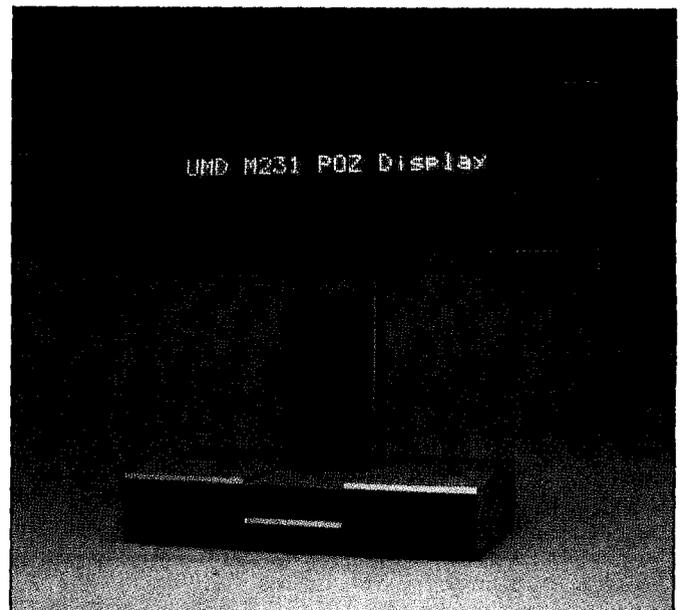
Customer Display

Melbourne based Unique Micro Design have added the model 231 POZ customer display to their range of point of sale peripherals. It features a 1 x 20 character display, each character consisting of a 9 mm 5 x 7 dot matrix. It is

intended for retail checkouts, banks and library counters.

The unit retails for \$864 and is designed and built in Melbourne by UMD. ☎ (03) 887 1022

READER INFO No. 252



New impedance analyser

Tech-Sales has announced the new Solartron 1260 Impedance Analyser, recently launched by UK-based Solartron Schlumberger.

The 1260 offers gain, phase, group delay and impedance measurements over a frequency range 10 μ Hz to 32 MHz ☎ Tech-Sales on (03) 879 2266.

READER INFO No. 254



Controlled monitors

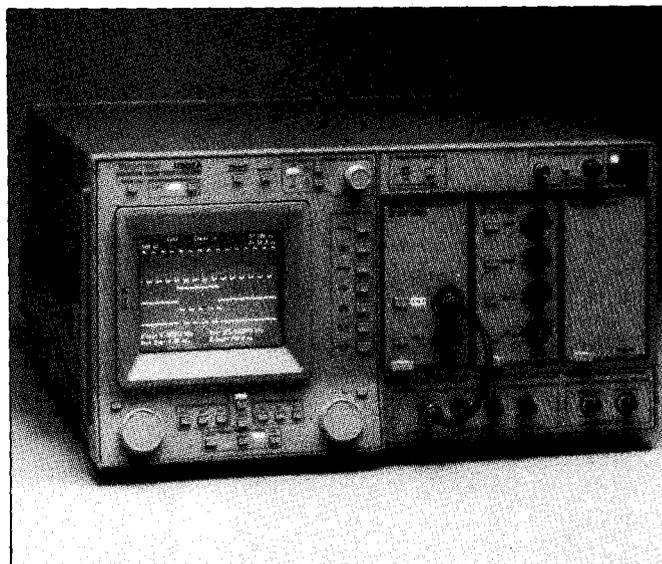
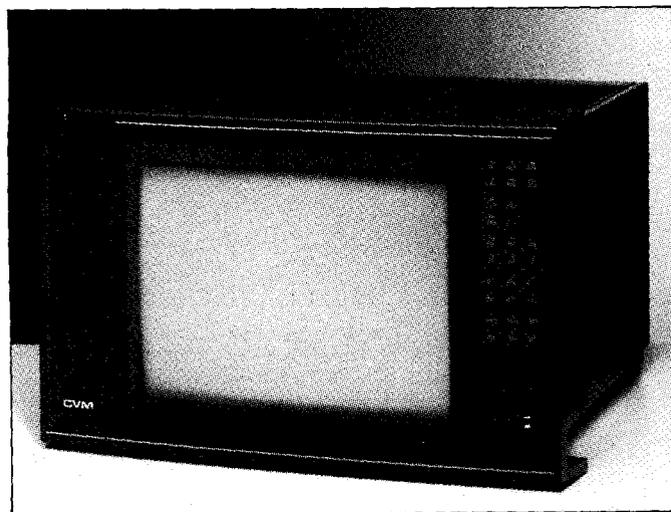
Described by Quantum as good value at less than \$5,000, the CVM 14V (37cm) and 20V (51cm) monitors are fully micro-processor controlled and characterised by its brightness, raster size stability.

Offering full broadcast features, the CVM monitor is built around a micro-processor, offering flexibility and

remote control capability.

Like Barco's CVS series broadcast monitor, the CVM is fitted with AKB (automatic kinescope biasing) circuitry, offering a colour stability independent of tube-aging and ambient temperature fluctuations. Quantum is reached on ☎ (02) 975 1323.

READER INFO No. 255



'Scope with trigger

The 11301A and 11302A Counter-Timer Oscilloscopes from Tektronix offer bandwidth and 500 MHz respectively, a 10-digit counter-timer, two analogue oscilloscopes with a built-in 750 MHz, video triggering, expanded automatic pulse pa-

rameter measurements and non-volatile RAM for storing test set-ups.

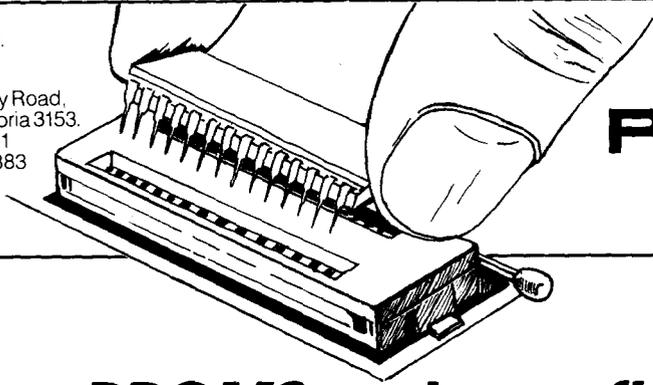
The Tektronix 11301A and 11302A Counter-Timer Oscilloscopes have a 750 MHz counter timer capability ☎ Tektronix on (02) 888 7066.

READER INFO No. 256



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PROMAC

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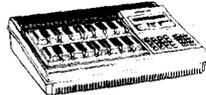
When you invest in the quality of a JMC Programmer, you can rest easy knowing you'll get first-class results every time.

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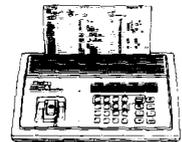
Model 11 Universal Programmer (PALs, E/EEPROMs, etc.)
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Model 16-IV High-Speed Set Programmer
Offers set/gang programming in formats 8 x 2, 4 x 4 and 2 x 8, and 16-piece gang programming.



Model 2A Universal MOS Device Programmer
Versatile unit for all popular 24/28/32/40 pin E/EEPROM's and single chip micros including 2M bit parts and future devices up to 4M bits.



Model 2 Low-cost E/EEPROM Programmer
Programs all popular 24/28 pin E/EEPROM's up to 512K and supports popular single chip micros.

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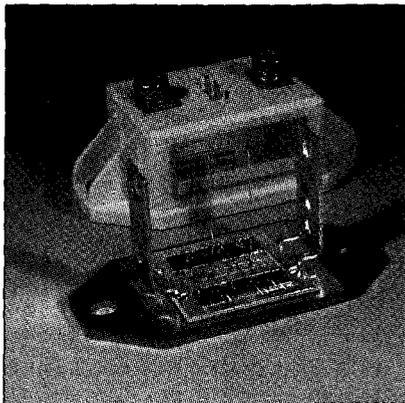
2130 ALF

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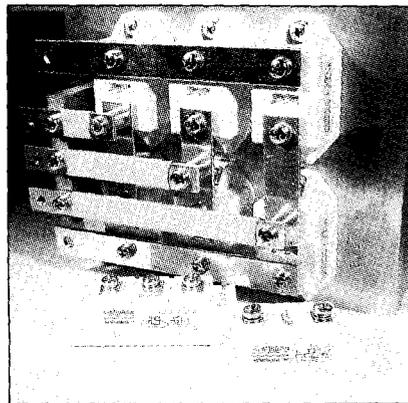
MOSFET

Power MOSFET that handles 1000V, 200A

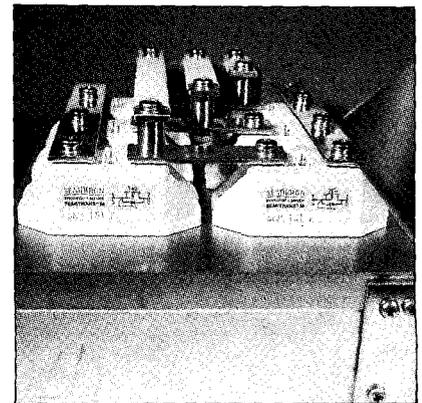
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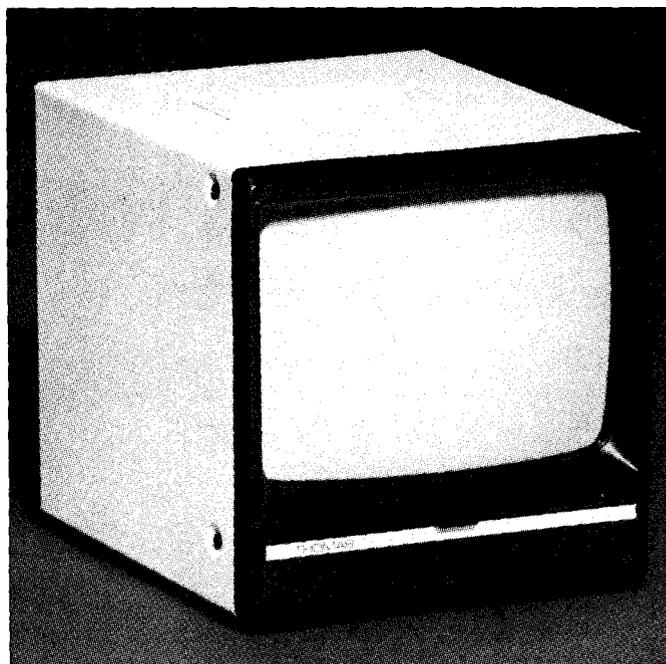
ETI DECEMBER '88

Plastic Man

B and K have released a new head and torso simulator intended to simulate a human figure acoustically. It has been built for the development of telephone handsets, audio terminals, microphones, headphones, hearing aids and

protectors.

According to B and K, it replicates the geometry of a median adult male. It also has industry standard ear and mouth simulators. ☎ (02) 450 2066



Better picture

Thomas Electronics in Sydney has just released its TE901K video monitor for broadcast monitoring, CCTV, medical imaging, NC machine monitoring and data display. It is designed for use in rugged environments and enclosed in a metal case but manages to

weigh just 6.65 kg. Power is either 240 Vac or 12 Vdc.

The tube is available with either green or amber phosphor for data display or white for broadcast or CCTV applications. Long persistence types are also available to stop flicker. ☎ (02) 53 0721

CB radio

Standard Communications has released the GME electrophone TX 830D. It's a 40 channel 27 MHz CB transceiver. It has an autocal function on the emergency band (Channel 8). It also has a sophisticated interference suppression circuit which offers a selectable noise blanker coupled to an automatic noise limiter. ☎ (03) 584 8099





LOGGING UP A WINNER

The DT200 Datataker

From the drawing-boards of a young company comes a data logger to please the market. Jon Fairall admires the well-researched product.

Data Electronics, the Melbourne company that first came to prominence in 1983 with a low-priced, highly specified data logger, has just released a new version of the product, called the DT200. It seemed like a good excuse to take a look at a technology that has made people both here and overseas sit up and take notice.

A data logger is a device that collects data and stores it for later computer analysis. Why? Data Electronics, in its publicity, mention things like monitoring pollutants in Port Philip Bay, recording temperature and humidity in an Art Gallery, monitoring the body heat of Antarctic researchers, recording weather information in Chinese ricefields, and outside an American U2 aircraft at an altitude of 20,000 meters or more.

All these applications are linked by a requirement to regularly sample the output from a sensor of some kind. The difference between a good data logger and a bad one resides in the number and type of different sensors that can be supported, the amount of input data one can store, the range of frequencies at which one can sample, and so on.

Flexibility

Data Electronics has made a name by providing data log-

gers that offer unparalleled flexibility in their operation for an extremely moderate price. The DT200 Datataker has 23 analogue input channels, each of which may be split in two to give 46 single ended channels. There are also eight digital channels, which may be used for monitoring logic states and general low speed counting.

Physical connection to these channels is made via four input sockets on the back. These sockets are connected to the mechanics of the Datataker via wire wrap terminals. Thoughtfully, Data Electronics supply a wire wrap tool and some hook up wire in the package so that the state of the output ports may be reconfigured at a moment's notice.

The range of sensors which may be connected to the analogue channels is also large. Effectively, the data logger can measure voltage, current, resistance or frequency from a sensor, so any device that turns some physical measurement into one of these can be supported.

However, frequently the relationship between the parameter to be measured, say temperature, is not a linear function of the sensor output. When this happens, some sort of correcting sub routine needs to be written. Some of these are already included in the Datataker's ROM.

'It's obviously a way of doing things the market likes'



Temperature recording with the use of a pengraph.

Manipulations

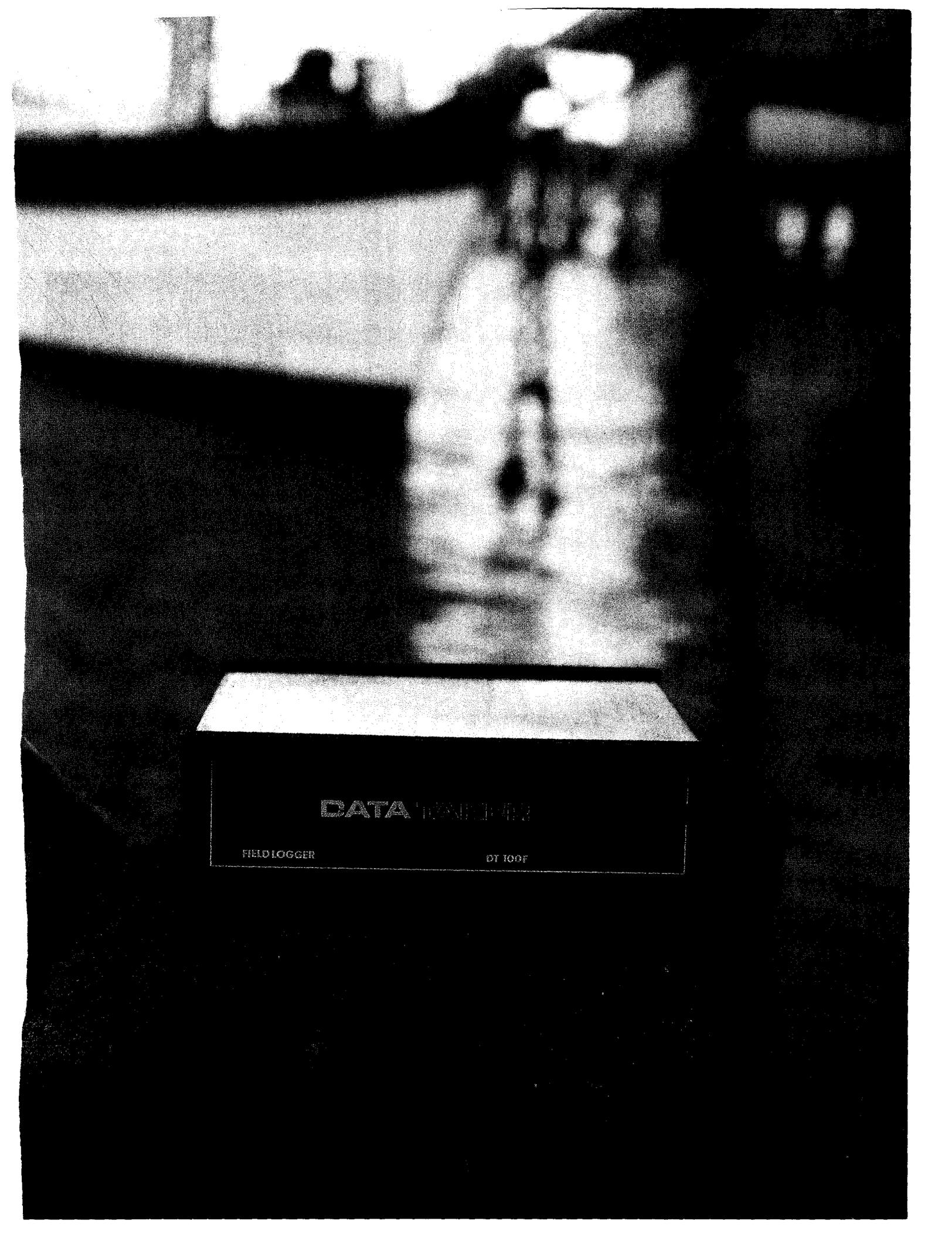
The power of the Datataker comes from its microprocessor. This is programmed from a host computer connected via the RS232 link on the back. The computer talks to the Datataker in a simple programming language, which can specify that a particular channel should record its value at particular time intervals. It also includes a few manipulations of the data. It's possible to average data collected from a sensor for instance, or simply acquire the maximum and minimum reading between certain times.

More sophisticated manipulations require the full power of the host computer. However, it's not necessary to have the host connected all

the time. The most popular mode of operation of the Datataker is to use the host to instruct the logger on the input requirements, and then disconnect it. Data can be saved into the on-board RAM and then downloaded at a later date.

It's obviously a way of doing things the market likes.

According to Terry Jones, the man who originally had the idea for the Datataker, the company made \$2m last year, about half from overseas. Nor is it resting on its laurels. About half the twenty staff in Data Electronics work in research, so the next generation of products is already on the drawing boards. It's sound strategy if you want to stay in business, but I wonder what they will look like. **ETI**



DATA

FIELD LOGGER

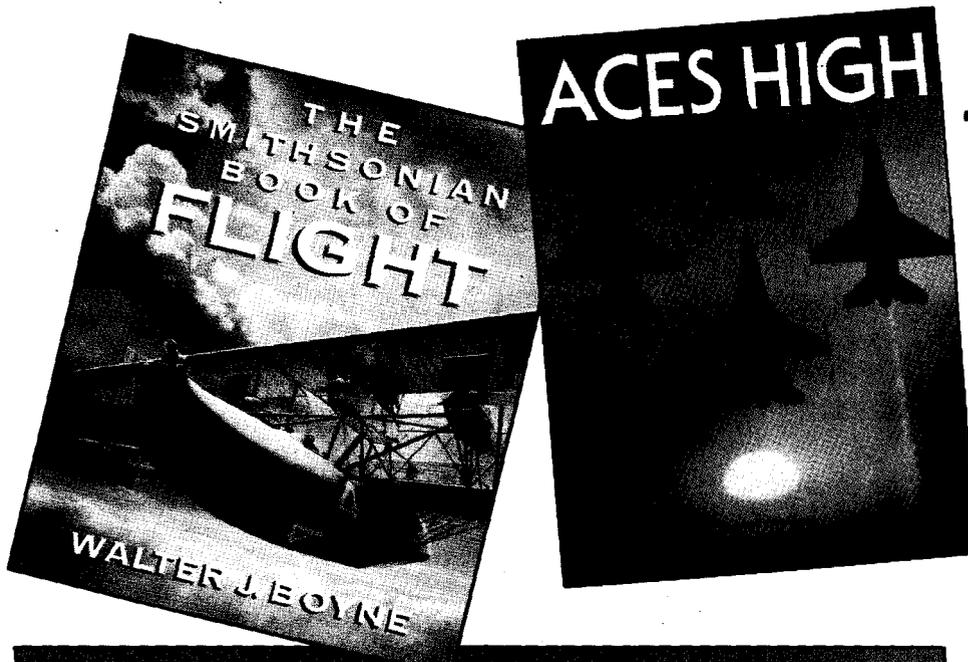
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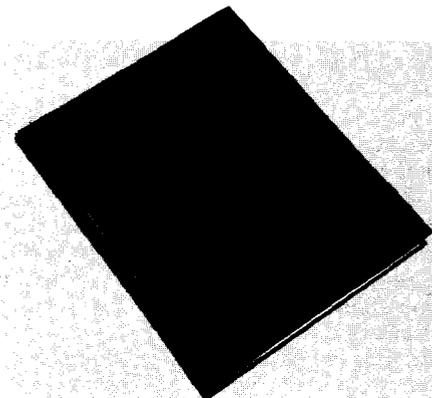
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Adjustable motherboard to build

A modem project with a difference. Datacom's Nigel Kulkulka shows how to build a single motherboard, and then adjust the performance to your needs (and your pocket) with plug-in processor boards.

Modems have probably been the most popular projects in electronics magazines over the past few years. They have ranged from the extremely complicated through to the downright simplistic.

For the consumer this is fine. It gives you a wide range of choices, provided you know what you want, and provided you learn nothing as a result of owning one. Most people will buy one, quickly discover its limitations, throw it away and buy a better one. It's an expensive way to learn.

We have adopted a new approach to the problem that hopefully solves this dilemma. The ETI-1618 can be configured in a variety of different ways. You can mix and match to your heart's content. We have designed it for flexibility at an affordable price.

We have also addressed another problem. While there may be dozens of modems out there to build, none of them seems conscious of the problems involved in hobby construction. If they work first up, well and good, but few projects do, and in the case of a complicated, logic dependant circuit, troubleshooting can be a nightmare.

For the hobbyist, a fun project can quickly turn into a monster that eats time and money for breakfast.

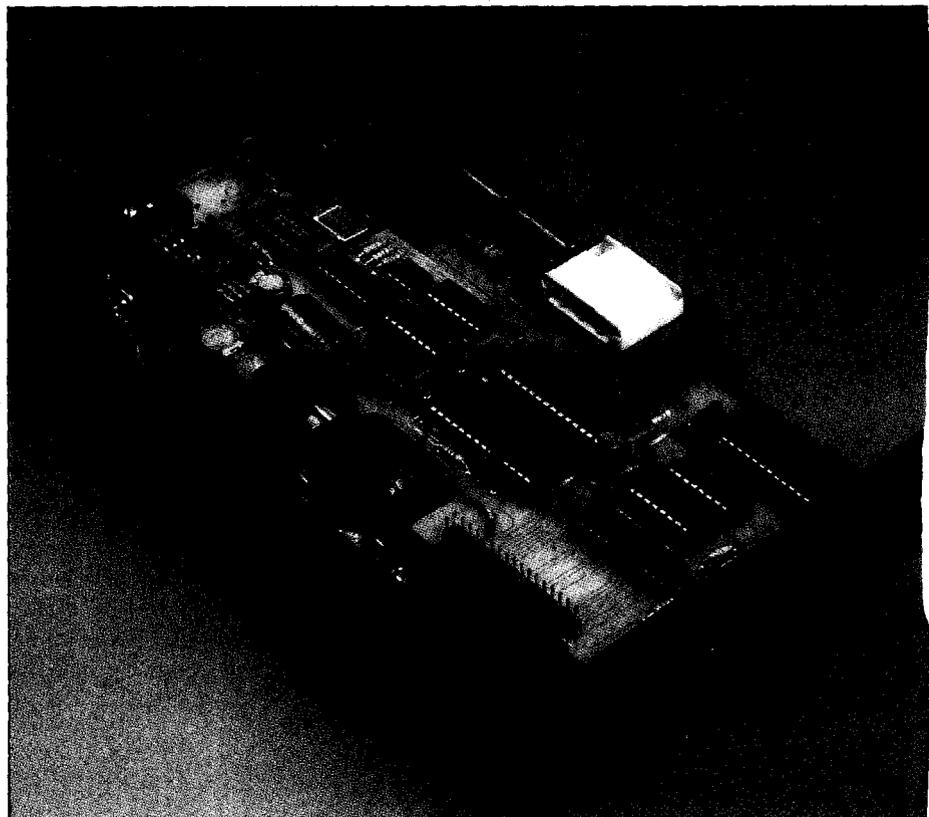
That's where this project stands out from the rest. It's designed so that you can build and test as you go to make sure it's all working. You can even try your hand at making your own modifications to the software. If you are daring you can try hardware changes too, and what's more it's not going to break the bank getting the project up.

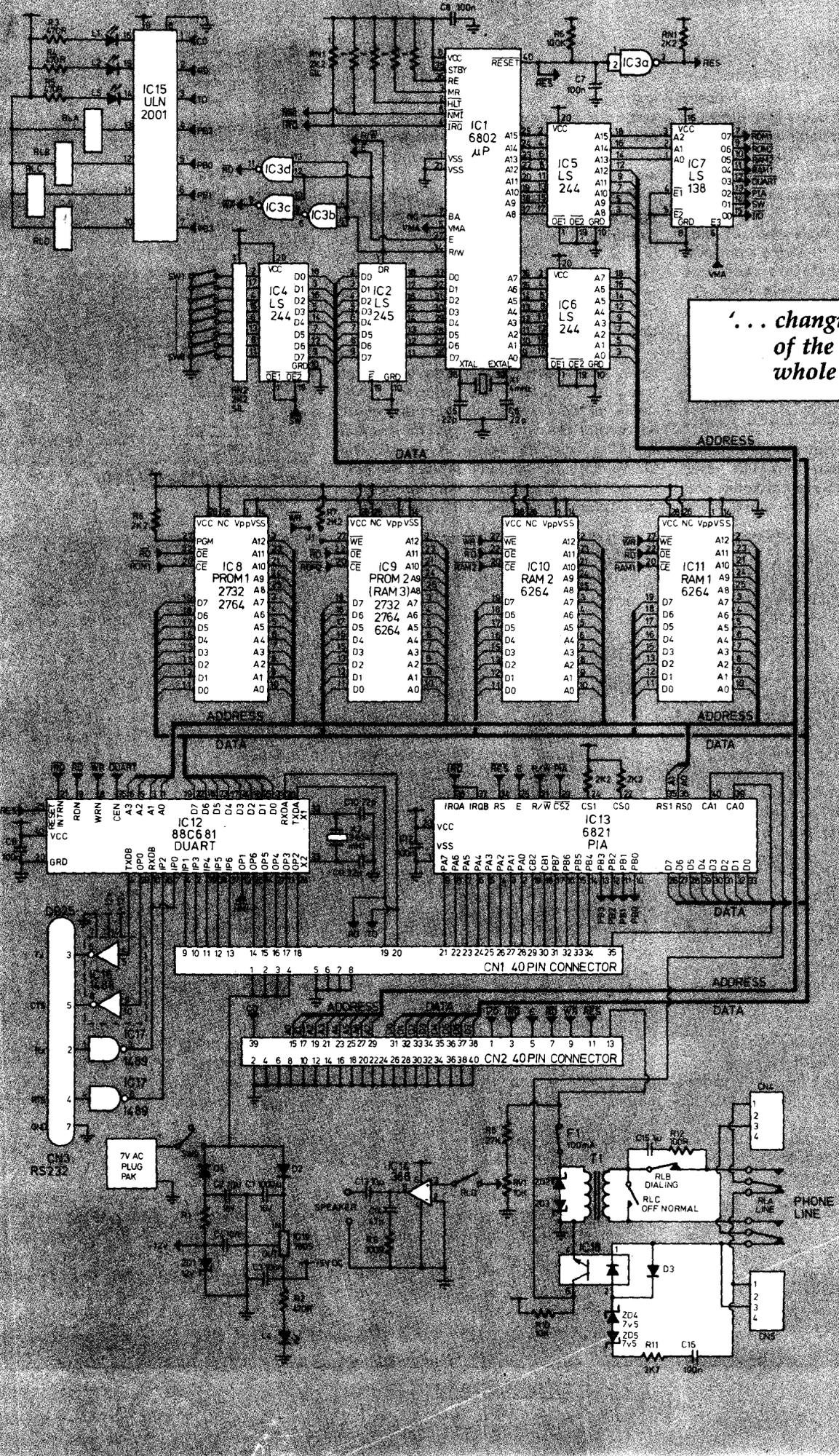
The design

Several years back most modems did not get much above 1200 baud except on specially conditioned leased lines. They were very large and bulky as most of them were built from discrete circuitry. They were also expensive, thus limiting their use for most business applications and certainly for personal use. But when Telecom opened up the public

switched telephone network to modems the pressure was on the data communications industry to provide faster and smaller devices.

This inevitably led to the design of modem chip sets. They ranged from the simple ones using switched capacitors for the filters, and frequency synthesis to generate the waveforms, through to elaborate designs using high speed dedi-





'... changing one small part of the system changes the whole thing'

Universal modem

cated microprocessors. These chipsets are known as DSP chipsets and are normally required for modems operating at 2400 baud and above. They have the ability to process signals due to varying line conditions, as well as to generate and distinguish signals.

With the advent of high levels of integration, the design of modems from 300 baud up to about 4800 has been, not trivialised, but at least made relatively simple. It no longer takes years of R&D to design one.

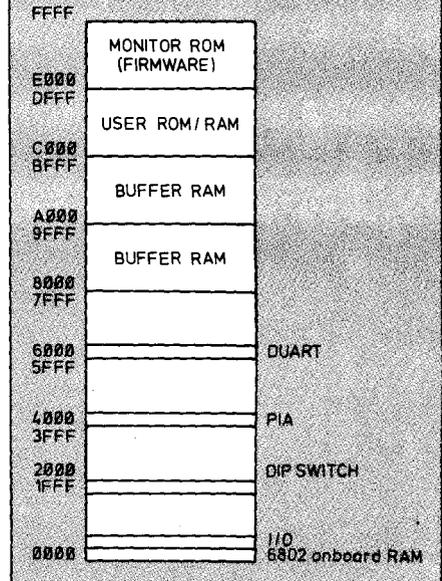
'You can mix and match to your heart's content'

However, it is still not possible to obtain a complete modem on a chip - they still require much discrete hardware and software, especially when multi-mode

specifications are considered. As a result, we have designed a modem in modular form, so that changing one small part of the system changes the whole thing.

The ETI-1618 consists of two PCBs sandwiched together and fitted inside a pre-drilled metal box finished in a durable power-coated paint, with a screen-printed front panel. There is no messy wiring. Indeed, the only wiring leads are from the ac plug pak, which can be soldered to the pcb either way around.

The motherboard carries the line interface, which connects to the telephone lines, the RS232 interface which connects to the computer, and a processor to control the whole thing. The modem board which fits above it carries the DSP chips and actually defines the performance of the device. We plan to produce several over the next few months.



Memory map of the ETI-1618 processor.

HOW IT WORKS

The heart of the motherboard is the 6802 processor from Motorola. Although it is not the newest or the fastest processor on the market, it does the job quite adequately.

A more practical benefit is that it has onboard RAM at page zero. It's extremely handy for running fast routines that need temporary storage.

Looking at the circuit diagram it can be seen that the 74138 (IC7) decodes the 64 k addressing map into eight 8 k blocks, giving us total access to the 64 k map (see figure 1). 32 k is used for memory, 16 k for programme and 16 k for buffer if required. The rest of the decode signals are used for accessing the DUART (Dual UART), PIA, DIP switch and I/O. The latter of course is found on the modem board.

Four memory chips are available. The first location IC8 is for the firmware and the other three are for the static RAM and ROM as required. The ROM locations are arranged for a minimum size of 4 k, as 2 k ROMS would not be adequate and would consume other memory positions. The RAM sockets will accommodate 2 k to 8 k size memory chips so again you may select whatever suits your needs.

The R/W signal of the processor is decoded by IC3 to provide us with separate read and write signals for the DUART and memory. This enables us to use other microprocessor family support chips.

The 6821 Parallel Interface Adaptor (PIA), IC13 provides signals to the modem chip and provides some degree of flexibility on the card as individual lines may be programmed as input or output lines.

Returning to the DUART, an 88C681 is used as it is packed with little goodies such as programmable timers, baud rate selection and has several miscellaneous I/O lines all contained in a 40-pin package. As the receiver's holding registers are triple buffered the modem is easily able to run at 9600 baud without any concern for errors occurring at all. Only 5 wires are required between the modem and the PC. They are, Transmit and Receive data, Clear to Send, Request to Send, and ground.

The eight position DIP switch (SW1-SW8) is located on the copper side of the mother pcb and is accessible through a slot underneath the metal case. The DIP switch is read on reset or when power is initially applied to the modem it is used to setup parameters in the modem without the need to interface to the modem via a terminal or PC. This is very handy when the modem is being used by another person not familiar with the set-up procedures of the modem.

The telephone line is terminated into the modem via an RJ11 connector (CN4-5) on the rear of the modem case. Relay A is the line changeover that switches the incoming telephone line to either the

modem terminating transformer or back out to a telephone for voice communication whenever the modem is not in use. Relay B is the double dialing relay and has the associated spark quench circuit across the contacts (C15 and R12), and Relay C is the Off normal relay that shorts out the line transformer during pulse dialling thus stopping any spurious voltages being induced into the duplexer circuit. The incoming ring current is detected by the ac circuit consisting of C16 and R11. It is then opto coupled (IC18) to present TTL pulses to the CA1 input of the PIA.

The primary side of the transformer has back to back zener diodes to limit the voltage fed to the telephone line as required by Telecom. The line signal is then fed via the pico fuse (F1) up to the duplexer circuit on the modem pcb.

The front panel LEDs indicate Power-on (L4), Carrier detect (L1), transmit data (L3) and receive data (L2). A speaker, not shown in the photographs, is available for those who like to listen in to what is happening on the line without having to use the telephone. It is driven by op amp IC14 and its surrounding components.

The power supply is of standard design using a single diode to half-wave rectify the ac plug pak voltage ready for smoothing and then regulation by the 7805 voltage regulator. The minus voltage required by the RS 232 interface is supplied by the small 12 V zener diode ZD1.

Construction

Construction of the main card is quite straight forward and should be completed in a couple of hours, taking care not to apply too much heat to the components during soldering. Begin by placing all the resistors, ic sockets (if used) and other low profile components on first, followed by the capacitors, voltage regulators and connectors.

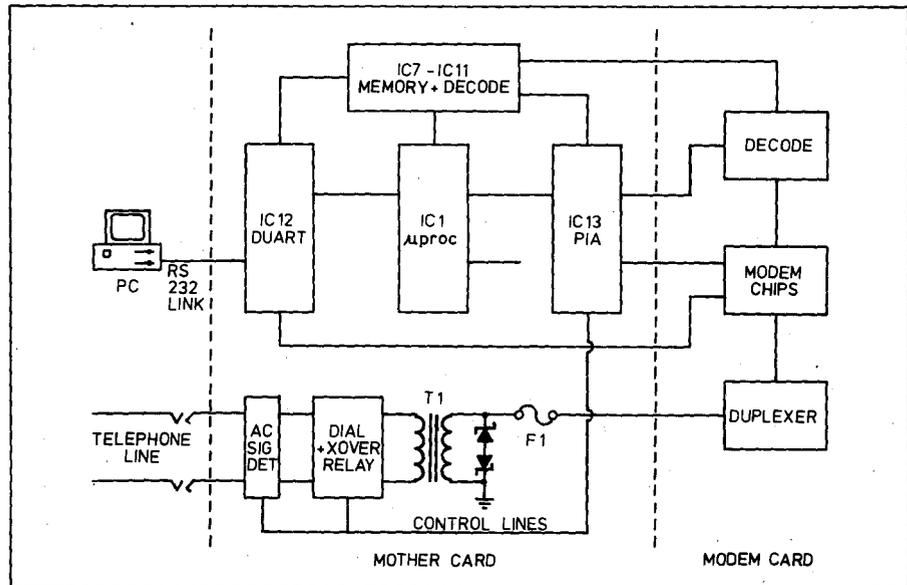
Solder in the line transformer and relays. Plug in all the ics that have been socketed and you should be just about ready to check out the board taking note of the orientation of the ics, diodes and electrolytic capacitors.

Once you are happy with the inspection solder the plugpak leads onto the boards and fire it up! If nothing goes bang, and great volumes of smoke doesn't start to drift up from the board then everthing should be ok. But just to be sure grab a meter and check the voltages on the ics making sure that all are within limits.

Connect the board to a VDU or PC operating in terminal mode with a one to one cable from the RS232 socket. Set the comms protocol to 9600 baud 8 bits 1 stop bit and no parity then reset the micro by switching the power off then

Availability

The motherboard is available as a complete kit, and includes all the associated components or just the board and EPROM. The kit comes with its own basic monitor to help in the testing and



Block Diagram. Note that next month we describe the first of a series of modem cards for the ETI-1618.

back on again and the message "Smartmodem monitor V2.01" followed by a carriage return and line feed and then the prompt ">" should appear, waiting for an input. If a carriage return is entered a listing of the command set

will appear on the screen followed by the prompt waiting for your input. **ETI**

Nigel Kulkulka is the general manager for the Melbourne-based Datacom company.

de-bugging of the board. It will also enable you to check the modem card before you replace it with the Smartmodem firmware.

So there we have it: get the motherboard working and when you are happy

with that, start on the modem. Sounds practical? It sure is because you could be up and running for under \$300. Then if you want to spend bigger bucks on faster chip sets you can do so at a later date when the pocket money has had a chance to recuperate.

Next month I shall describe the first modem card which uses the ever popular world modem chip accompanied with the Thompson 7515 V22 modem chip.

This will enable you to communicate with most bulletin boards and Viatel. I will also describe the software that operates the chips, which will enable you to continue using your existing monitor and to get the modem up and going in a short time, and of course, most of all you will be able to learn as you go.

We will also be supplying a comms software package that will run on your PC. It has many features similar to popular commercial packages but costs about a quarter of the price.

WHERE TO GET IT . . .

The full kit as described this month (less the modem card) includes pcb, pre drilled metal case and front panel, all ICs with 8 k static ram 4 k monitor EPROM construction details, and software description. SM101 \$199.00 ex tax \$219.00 inc tax.

Plug pak to suit \$19.00 ex tax \$23.00 inc tax. Post and packing \$9.00 per kit.

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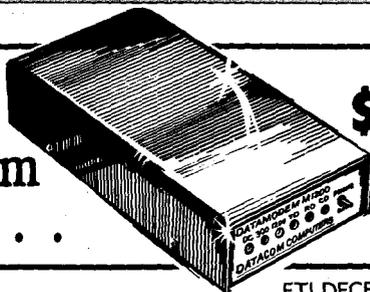
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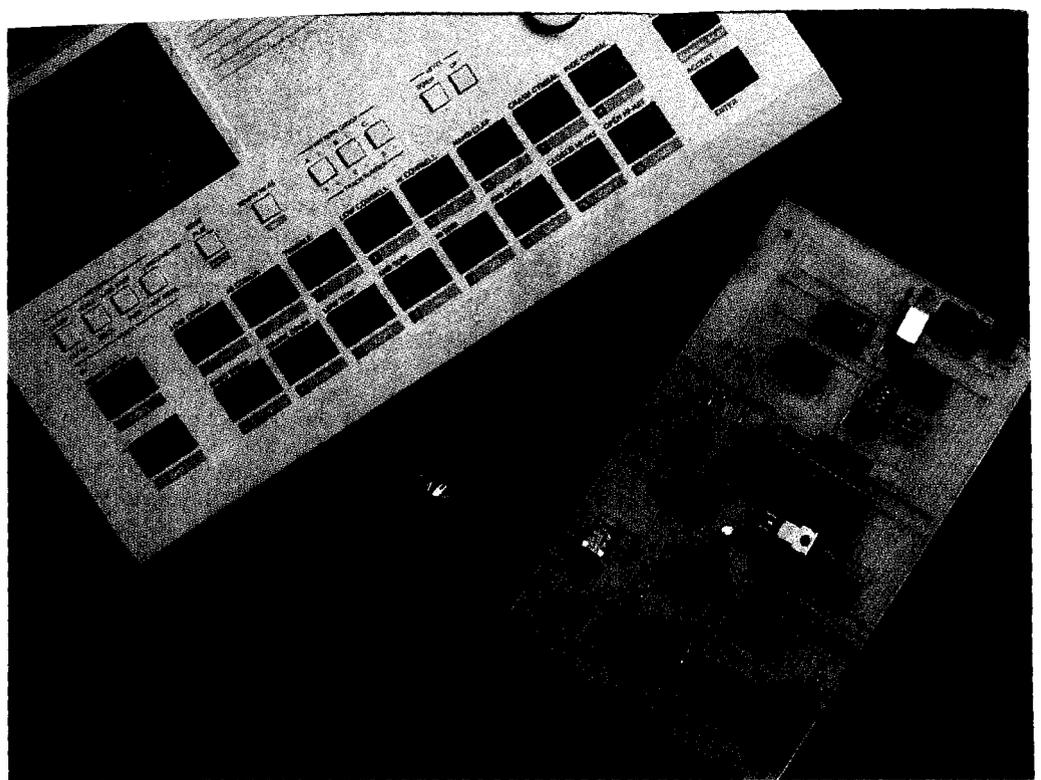
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ETI-615
ELECTRONICS



THE BIG TURN ON MIDI controlled switch Part 2

Terry Kee this month completes his project for yet another application for the use of MIDI.

Part 1 was published in ETI last month and described the theory of MIDI, applications and how the switch worked. This article puts all that theory into practice.

Construction

All the electronics are contained on a single-sided pc board measuring 189 mm x 111 mm. The track density is fairly high as is typical with pc boards carrying logic circuits with data busses. The penalty one pays for opting for a single-sided pc board is a fairly large number of links.

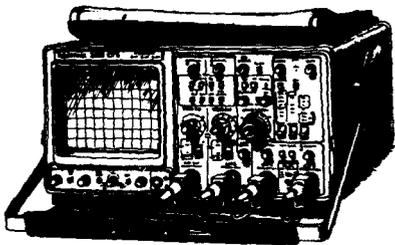
The first step in the construction procedure is to inspect the pc board for broken tracks and unetched bits of copper as some of the tracks are quite close together. It is worthwhile doing this even if the pc board was obtained from a board manufacturer. Spotting defects now is much easier than when it is populated with components. Think of the spared heartache and saved time if you find a defect lurking in the tracks. Check in particular where tracks run close together, between ic pins etc. and compare with the artwork to establish if a connection is to be made. Holding the pc board against a light source is a good way of detecting unetched copper and broken tracks.

Once you are satisfied with the pc board it is time to do some serious soldering. A finely tipped soldering iron

should make the job easier. Insert and solder in the optional ic sockets. I've used them in the prototype as they make trouble-shooting easier. It is advisable to use a 40 pin ic socket for the UART (IC3) as it is a fairly costly chip. Next, insert and solder in the links. Note that some links need to be bent around components, see the overlay and use insulated hook-up wire if there is any possibility of links touching component legs. Solder in the resistors, capacitors, dip switch (SW1) and relay (Rly 1). The resistor network (RN) has the commoned point marked with a dot and is connected to +5 V. The orientation of RN has the dot located towards pin 1 of IC3, as can be seen on the overlay. There is an option to use eight individual 10 k resistors instead of the resistor network (RN). Solder in one end of each resistor and then stand them up vertically. Connect the top end of the resistors together with a length of wire and solder this connection to the commoned point. Note that the values of R13 and C7 are incorrect in the circuit diagram that was published last month. R13 should be a 100 k resistor and C7 a 150 nF capacitor.

The pc mount MIDI Channel switch (SW1) needs to be mounted in an eight pin ic socket to allow it to protrude through the top panel of the box. Measure the height of the tallest component and allow sufficient lead to bend it over

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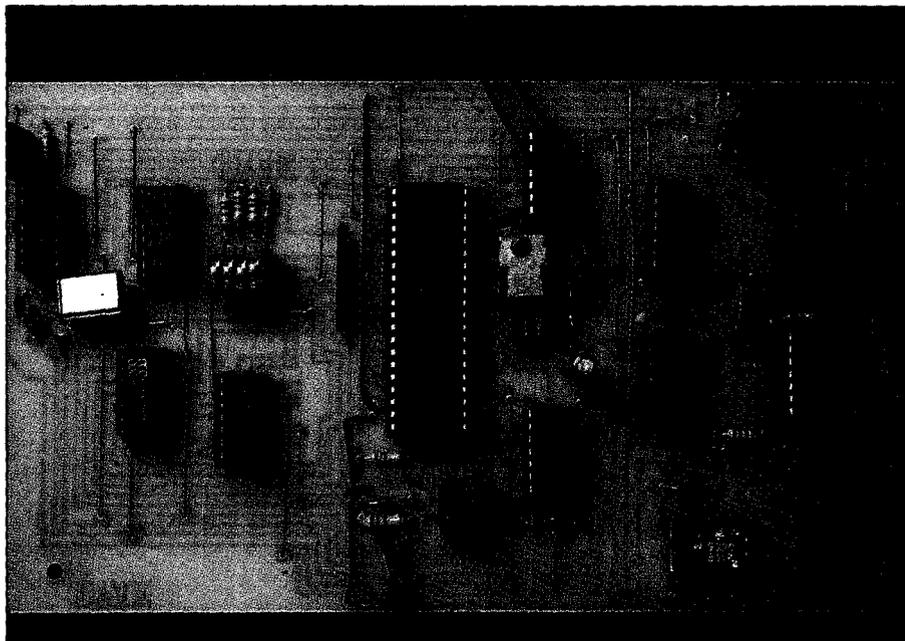
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MIDI controlled switch

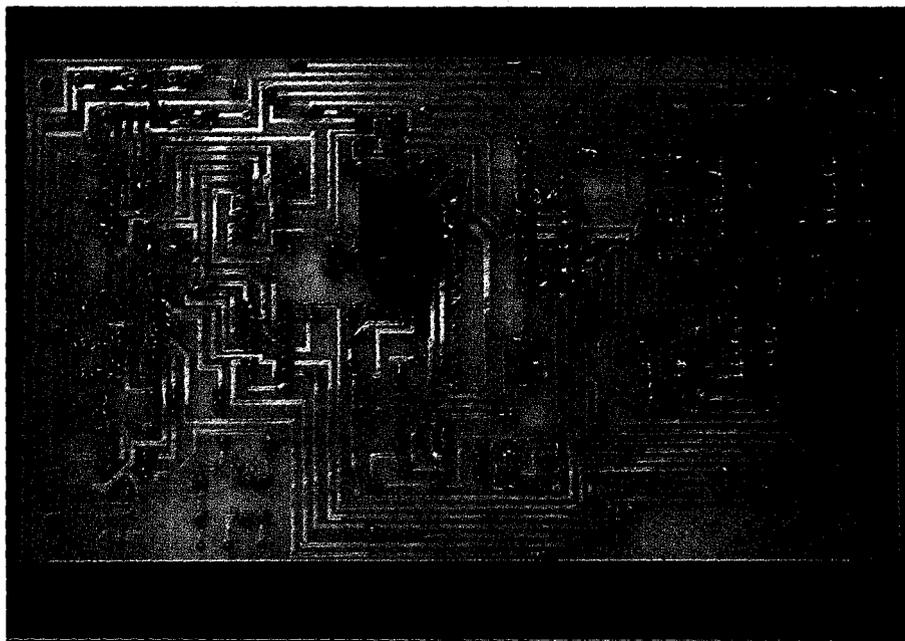
ETI-615

if it interferes with the mounting. Capacitor (C8) can be mounted on the solder side of the pc board. Solder in the crystal (X1), diodes, transistor (Q1) and regulator (IC14). Ensure that the correct polarity orientation of the semiconductors and electrolytic capacitors are observed. Insert the ic's into their sockets. Note that the orientation of all the ic's have pin 1 located towards the top of the pc board, except for IC10. Refer to the overlay carefully to make sure you

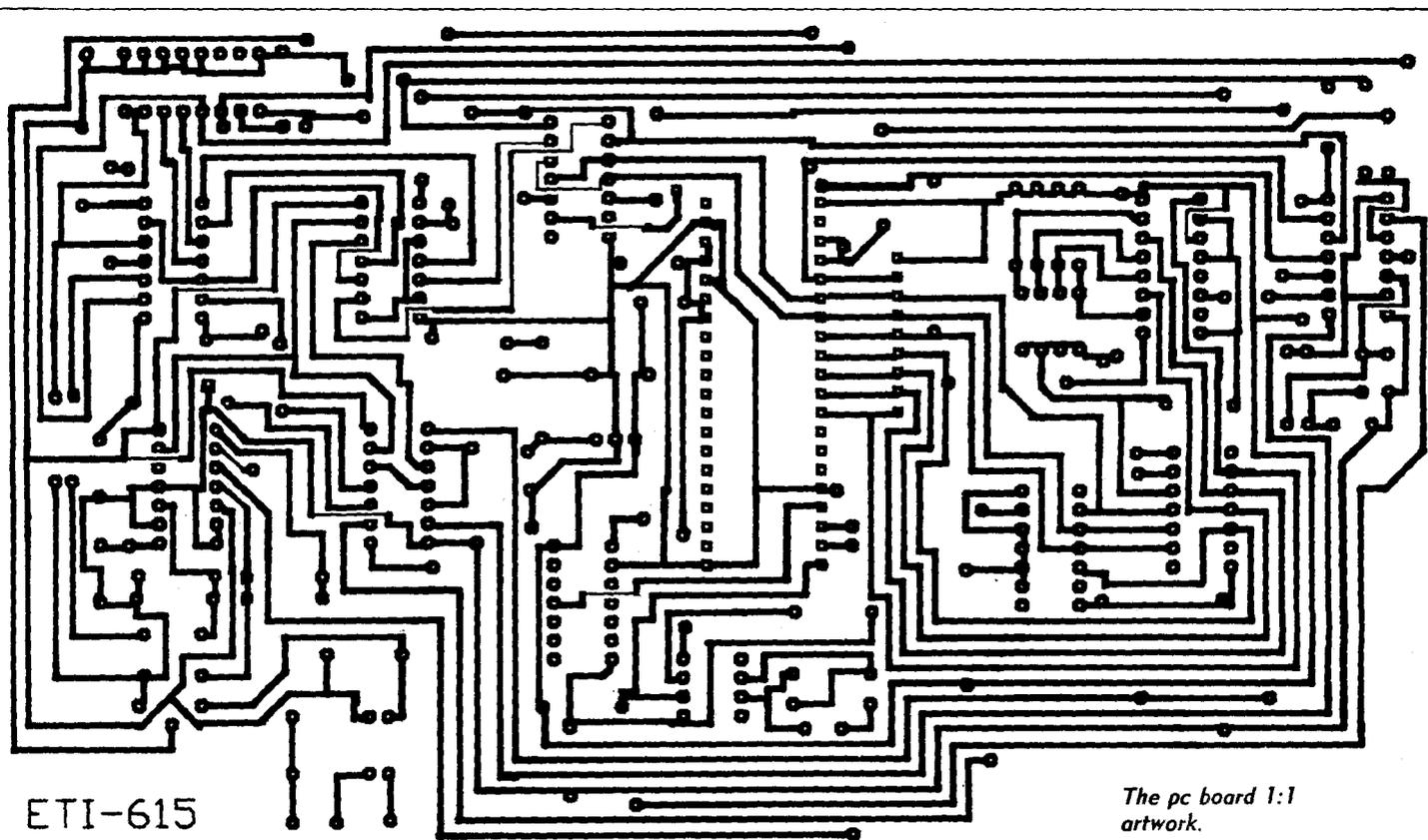
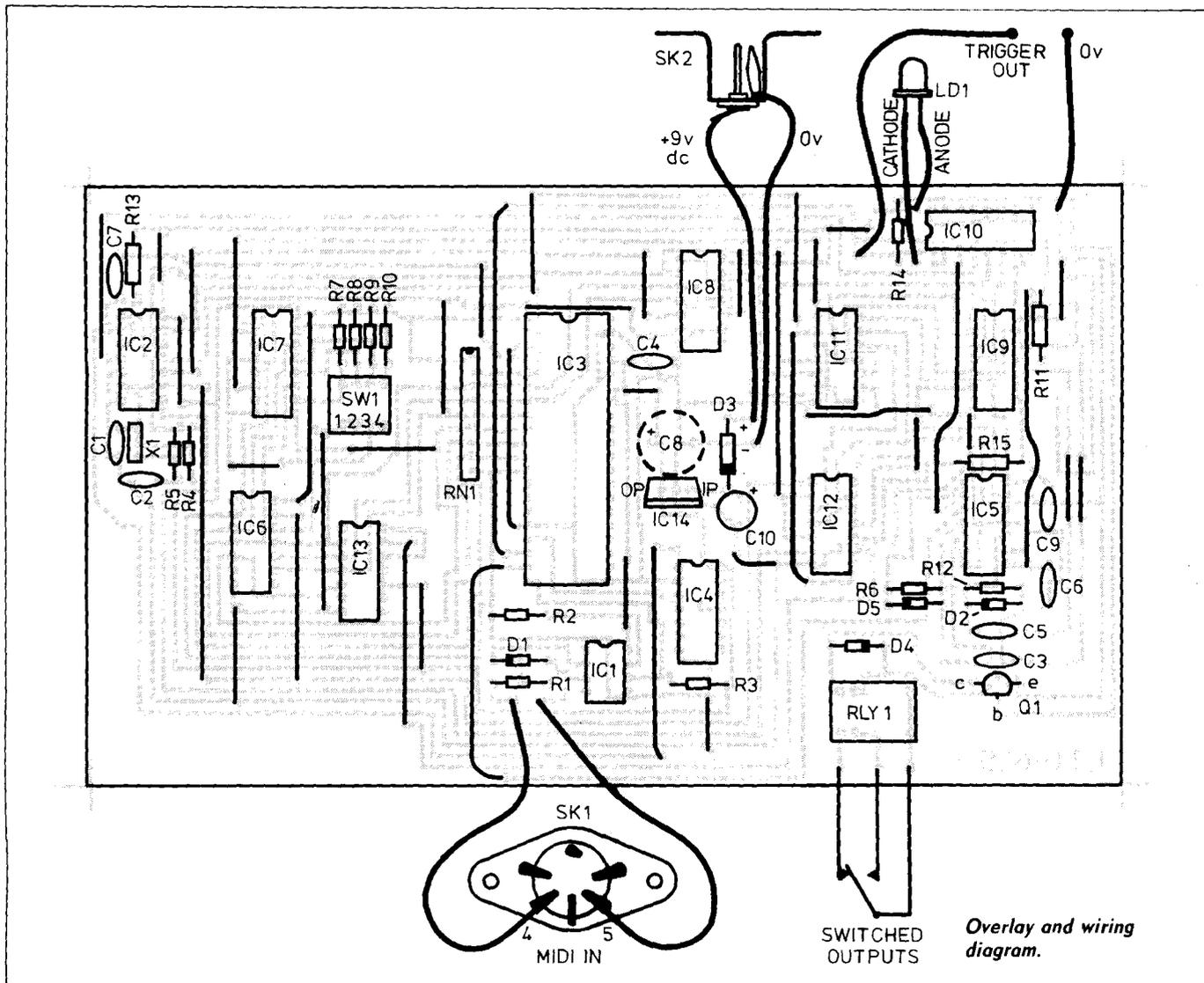
get this right. If you have not used ic sockets then solder in the ic's carefully. Take the normal precautions with handling and soldering CMOS devices. Solder the LED (LD1) directly to the pc board; the shorter leg (cathode) of the LED should be connected to pin 2 of IC10. Ensure that the LED is inserted on the pc board so that it can be mounted on the front panel of the box. All that remains to be done now is to wire in the MIDI in socket (SK1) and the plug-pack



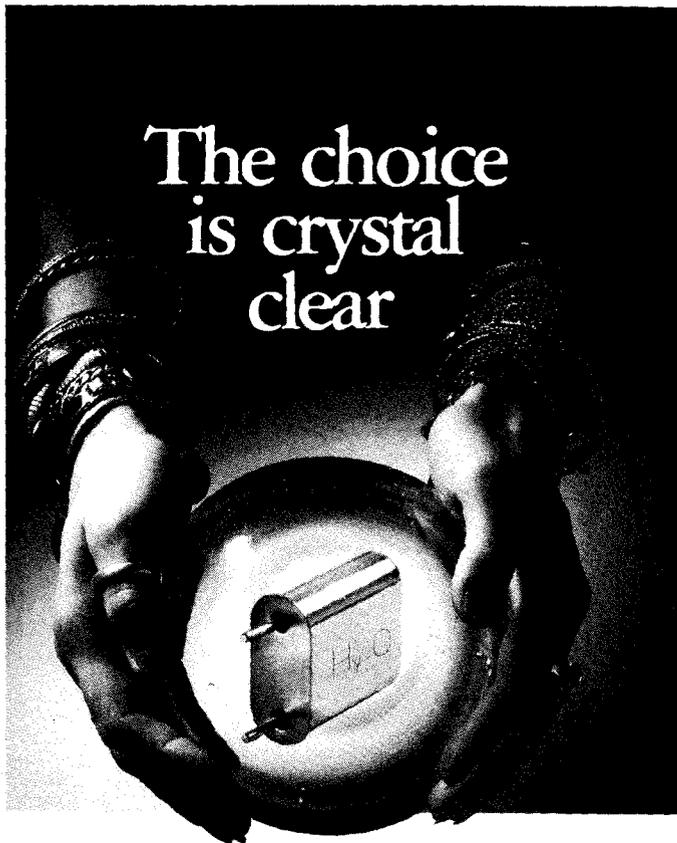
The pc board (component side).



... and the solder side.



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MIDI controlled switch

socket (SK2) with hook-up wire and the MIDI switch is complete.

The choice of box is not critical and any enclosure with dimensions to fit the pc board will be suitable.

Testing

After you have rechecked the pc board for bad solder joints, solder splashes and corrected any mistaken component orientation, it is time to connect a 9 Vdc plugpack to the circuit. The circuit draws a maximum of 67 mA with the relay activated so a 9 V plugpack rated at 300 mA is ample. Check the polarity of the plug on the plugpack and wire the dc

SWITCH SETTINGS MIDI CHANNEL (SW1)

1	2	3	4	MIDI CHANNEL
Logic '0'	---	---	---	1
---	---	---	---	2
---	---	---	---	3
---	---	---	---	4
---	---	---	---	5
---	---	---	---	6
---	---	---	---	7
---	---	---	---	8
---	---	---	---	9
---	---	---	---	10
---	---	---	---	11
---	---	---	---	12
---	---	---	---	13
---	---	---	---	14
---	---	---	---	15
---	---	---	---	16

TABLE 2
RECEIVE MIDI CHANNEL SETTINGS

socket (SK2) accordingly. Use an insulated socket if the positive volts is not connected to the centre pin. Apply power and check with a multimeter, set to measure volts dc, that the power rails are at 5 V. With the power rails checked, no smoke from the board, and no nasty burning smells, the situation looks healthy.

The next step in the test procedure is to determine the transmit channel of the MIDI instrument you intend to use. Most keyboards tend to default to channel 1 on power up. The setting of the receive MIDI channel of the MIDI switch can then be set accordingly on the dip switch (SW1). The channel number setting of the switch is in binary notation with switch 4 (refer to the overlay) being the least significant bit of the four bit word. The actual MIDI channel is the number set on the switch plus 1 i.e: 0000 is channel 1 ; 0001 is channel 2 ; 0010 is channel 3 and so on. The switch position away from the resistors (R7 to R10) represents a logic low. A drawing of the switch positions and the corresponding MIDI channel is shown in Table 2. This table can be glued to the top panel of the box, near the switch to identify the channel numbers quickly.

Connect the MIDI out of the instrument to the MIDI switch via a suitable MIDI cable. Set up the corresponding MIDI channel numbers and start playing some notes. The LED should light up when a key on a keyboard is depressed and extinguish when the key is lifted. You should also hear the relay latching. The MIDI switch will always decode the last note data in a series of notes that are played. For example, if ten keys on a keyboard are played simultaneously, the LED will light and the relay will switch over. Lifting one key and keeping the others depressed means that a note off is transmitted last and the MIDI switch turns itself off.

CUW/HOB

Change the transmit channel of the MIDI keyboard, and at the same time change the switch on the box to correspond, and check that the relay responds to the correct channel. Next, change the receive MIDI channel of the switch so that it does not correspond to the transmit channel and the switch should ignore all the data on the MIDI line. Repeat the procedure for the other channels.

The final test is to check that the switch ignores the MIDI realtime messages such as clock, start and end of song etc. A MIDI drum machine or sequencer is required for this test.

Testing with drum machines

I used a Roland TR505 drum machine to test the MIDI switch. It can also be a useful tool for fault-finding. The facilities of a drum machines will differ for different brands and models, however a lot of features are common to most machines. Refer to your manual if you are uncertain of the features of your machine.

When a drum sound is initiated the 505 transmits on the selected MIDI channel a note on, note and velocity value and, about 8 mS later, a note off. The switch will decode the data as an 8 mS pulse and the LED will flash briefly each time the note data are received. The relay will switch over its contacts in sympathy. MIDI clock data are also interleaved with the note data and the switch should ignore it.

Start by assigning each drum voice to one of the 16 available MIDI channels. Set the machine to manual play so that pressing the keys activates the drum voices. Connect the MIDI out of the drum machine to the MIDI switch and set the receive MIDI channel to 1. Press the drum voice key transmitting on channel 1 and the LED should flash in sympathy. The other keys should not have any effect. Change the receive channel and repeat the procedure. Each time the channels are matched the switch becomes activated. Program a drum sequence and hit the start button. The switch should only respond to the selected drum voice on the matched MIDI channel.

Trouble-shooting

There should not be any problems if you were careful with your soldering. The prototype worked first time! If you do not have access to an oscilloscope then trouble-shooting could be a bit more difficult. All is not lost though, as there are tests you can carry out. All

you need is a drum machine and a dmm.

To test that MIDI data is received and converted to parallel form correctly, use a drum machine and monitor the data bus of the UART (IC3). Set the drum machine to transmit MIDI clocks to the MIDI switch. The 505 transmits clocks automatically with the MIDI Sync turned off, and clock transmission occurs even when the machine is in the stop mode.

This feature may differ with different drum machines. If you are uncertain then clear a drum pattern in memory and hit the start button. Listen to the output to ensure that no drum sounds are present. The drum machine should only be transmitting MIDI clocks in this mode. Use a dmm to measure the dc voltage on pins 5 to 9. These points are the 8 parallel data outputs of the UART (IC3), where pin 5 (D7) is the most significant bit and pin 12 (D0) is the least. The dc voltages on pin 5 to 9 should be 5 V i.e. logic high. Pins 10 to 12 should be at logic lows (>100 mV).

If the readings do not correspond then a fault exists in the circuitry around IC 1,2a,2b,3,4 or 5a. Check that a 500 kHz clock signal is present on pin 17 of the UART (IC3). If all is well then the fault lies in the decoding circuits.

To check that the MIDI receive channels are being decoded correctly set the

switch settings of SW1 to channel 9, refer to the switch chart in Table 2. With the drum machine set to transmit MIDI clocks as described previously, pin 6 of IC7 should be at a logic high i.e. 5 V only on channel 9. If this is not the case then check the circuitry around the switch (SW1) and IC7.

On power-up pin 13 of IC5b and pin 1 of IC10a should be reset to logic 0 by R13, C7 and IC2f. If this is not the case then check that R13 is a 100k resistor and C7 is a 150 nF capacitor and not the values as stated in the circuit diagram.

Switched outputs

The pc mount relay (RLY1) as used in the prototype is an SPDT device and its contacts are rated at 500 mA at 120 Vac. Care must be taken not to exceed these ratings and this relay must not be used to switch 240 V mains voltages directly.

Using the MIDI switch is straightforward. It really comes into its own when it is controlled by a pre-programmed device such as a sequencer or a drum machine. The trigger output provides a 5 V logic signal when the switch is activated and 0 V when de-activated. Because of the general-purpose nature of the switched outputs, the configuration of the relay contacts is left to the reader. Happy switching. 

Parts List ETI-615

Resistors			
All 1/4 W, 5% unless stated otherwise.			
R1, R3	220R	IC6	flip flop 4078B CMOS 8-input
R2	3K3		Nand gates
R4	8M2	IC7	74HC85N CMOS 4-bit
R5	8k2		comparator
R6, R7, R8, R9,		IC8	4002B CMOS 4-input Nor
R10	12k		gates
R13	100k	IC9	4071B CMOS quad
R11	10k		2-input Or gates
R12	270k	IC10	4027B CMOS Dual J-K flip
R15	27k		flop
R14	4k7	IC11,12	4081B CMOS quad
RN	10k dil 8-commoned resistor network or 8 off 10k resistors (see the construction section)		2-input AND gates
CAPACITORS		IC13	4068B CMOS 8-input
C1, C2	33p ceramic		Nand gates
C3, C4	10n greencap	IC14	7805 5V regulator
C5	470p ceramic	Q1	BC338
C6	220p ceramic	*D1, D2, D5	1N914/1N4148
C7	150n greencap	D3, D4	1N4001
C8	100u/25V electro	LD1	LED
C9	47p ceramic	MISCELLANEOUS	
C10	10u/25V electro	X1	2 MHz Crystal
SEMICONDUCTORS		SK1	5 pin DIN socket (180 degree)
IC1	16n138 Opto-coupler	SK2	dc plug pack socket
IC2	4069B CMOS hex inverters	RLY1	dil socket mount relay, 5 V coil at 56 ohm. Contacts rated at 1A. Dimensions 11 (H) x 16 (W) x 11 (D) mm Jaycar cat SY-4058 or similar
IC3	AY-3-1015D UART	SW1	4 way 8-pin dip switch 9 V dc plugpack rated at 300 mA, ic sockets.
IC4	4024B CMOS 7-stage Binary Counter		
IC5	4013B CMOS Dual D-type		



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ELECTRONICS

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Although it is more difficult to maintain the low frequency response with a small enclosure, reducing the dimensions has a number of advantages. A significant increase in structural stiffness reduces unwanted radiation from the cabinet walls. The narrow frontal area also improves the sound distribution.

Larger loudspeaker systems have to be complex because a mid-range unit is needed, with careful integration of responses to cover the whole frequency

range. In a smaller unit, a single bass/mid-range unit provides seamless coverage beyond the critical mid-frequency range, easing crossover design and producing a radiation pattern conducive to a natural spread of sound and a useful wide stereo sound stage.

However, if a small enclosure results in an abrupt roll off of bass level below 100 Hz, the bass lightness becomes readily apparent and there is, therefore, a limit to the economy feasible if a unit is to provide the reasonably long throw cone excursions necessary for adequately low frequency radiation.

Close proximity to a wall can give rise

to interfering standing wave patterns which deteriorate the stereo image. Having the speakers away from the wall, stably in space at a height such that the high frequencies are not absorbed by the sofa, gives an obvious improvement in depth and image precision.

Bearing all these points in mind it seems logical to consider whether the space within and under the speaker stands could not be used to enhance the low frequency response while maintaining a low cost, freestanding unit.

Design

A freestanding loudspeaker enclosure with similar dimensions to that of a small speaker on a stand, if of conventional design and construction, presents a difficult acoustic problem to the designer because of the long narrow parallel walls. These will tend to vibrate and resonate giving a resonant pipe-like colouration to the low frequency sound which is difficult to control and eliminate.

Another approach (satisfying from an acoustic engineering point of view) is to deliberately exploit the characteristics of a resonant pipe in such a way that the loudspeaker unit is correctly loaded and terminated at the low frequencies, while adequately suppressing unwanted pipe resonant modes.

The low frequency efficiency of such an arrangement is somewhat between that of a horn and a bass reflex enclosure and, therefore, reduces the demands made on the low frequency excursions of the small diaphragm bass speaker unit.

The principle involved utilises the properties of a closed at one end quarter wavelength pipe as originally proposed by Voight in his patent No 447749 and subsequently adapted and described by R. West and R. Baldock in their designs. The design produced by R. West was intended for a corner position with the speaker unit firing into the corner to spread the high frequency sound by reflection from the walls, and R. Baldock's designs were intended to either a semi-omnidirectional sound distribution or a wall reflected distribution.

Present day practice favours loudspeaker operation away from corners and walls, firing directly at the listeners.

The enclosure

The construction of the design is depicted at left. The bass enclosure consists of a quarter wavelength rectangular section pipe with a linear taper, resonant at about 50 Hz.

The bass loudspeaker unit is situated at approximately halfway along the acoustic axis in the best position to suppress higher order resonant modes. At resonance the acoustic pressure is high at the tapered end and still reasonably high at the loudspeaker unit. This ensures that effective acoustic loading is presented to the loudspeaker cone and small excursions of the cone at high pressure are manifested as much larger low pressure movements of air out of the port at the bottom of the enclosure.

Such a process, similar to horn loading, contributes to efficient bass frequency operation with low distortion up to a frequency of 200 Hz, where direct radiation from the cone takes over. The enhanced bass response produced by this method of loading compared with that from the same unit in a 10 litre sealed enclosure is shown in Figure 2, where the curves were obtained under identical measurement conditions.

This enclosure not only satisfies the requirements of being free-standing with the drive units at a convenient height but also provides an enhanced bass response, using the space that would otherwise have been taken up by a stand. Furthermore, only small cone excursions are required in the bass loaded region and this places the minimum of demands on linearity of the cone suspension and the magnetic field in the voice coil gap, allowing reasonably low priced drive units to be employed.

Continuing the quest for a low price design, it is tempting to consider a wide range twin cone unit for use in this enclosure. Figure 3 shows the high frequency response of a 165 mm diameter paper cone bass unit used in this position with considerable ripple in the response due to cone "break-up" modes. Unfortunately, when a small tweeter cone is added to the main cone to widen the frequency range, any im-

provement in frequency response is accompanied by main cone "break-up" ripple as shown in Figure 4.

A much smoother performer is the 165 mm polypropylene cone bass unit with a frequency response as shown in Figure 5 and this type is recommended for use in the quarter wave enclosure.

Because of the unsatisfactory response of twin cone units, space is provided in the top of the quarter wave enclosure to house a suitable tweeter.

Construction

The enclosure has been designed to make the construction as simple as possible and if the various pieces (see Figure 6) are cut accurately square than there should no difficulties in assembly.

Referring to Figure 7 it can be seen that there are only two angle cuts to be made, those at the top of both the long front and back panels. All the rest are simple 90° butt joints, and it is left to the individual constructor to decide whether to attempt the angle joints or simply butt the joints and fill the wedge shape gaps with whatever technique and material is convenient.

The dimensions quoted are not critical provided everything is checked to fit as shown in the diagrams so that airtight joints are obtained, particularly in the high acoustic pressure areas in the tapered wedge and around the speaker unit.

The front, back, bottom, top and internal partition members are all made of nominally 12 mm thick chipboard and should all be matched to the same width of 175 mm. The two side panels are made of nominally 6 mm thick plywood and it is recommended that one of the panels is marked out indicating where the 12 mm thick panels are located.

As the assembly progresses check it for squareness and, if necessary, secure

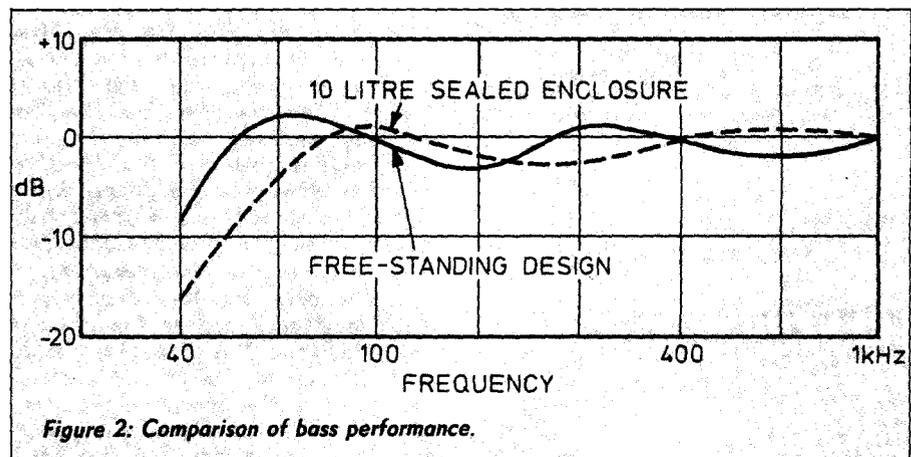


Figure 2: Comparison of bass performance.

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Quarter wave loading

one or two cross pieces of plywood with pins driven a little way in to hold the assembly square while the glue sets.

Being reasonably liberal with the glue should ensure airtight joints but pay particular attention to the pointed end of the wedge section and, if necessary, run a fillet of glue along this particular joint.

Finally complete the assembly by glueing and pinning the second 6 mm thick plywood panel into place. It will be noted that the enclosure is reasonably light and stiff and this minimises the energy storage in the enclosure walls. Tapping the sides of the enclosure produces different notes at different positions indicating that the internal bracing and asymmetry is working to minimise undesirable reflections and panel resonances.

Finishing tasks involve punching the pins home, filling and sanding prior to painting or covering with material or an iron-on veneer.

After several years experimenting with various drive units, the best solution — both in terms of cost and performance — seems to be the simplest of crossover arrangements with a direct connection to the bass unit and a capacitor feed to the tweeter.

The need for attenuation is avoided by choosing a sensitivity for the high frequency unit just below the bass unit. The speaker baffle is as small as possible for rigidity and minimum frontal area. The sloping of the baffle time-aligns the outputs from the two units, improves the coupling of the bass unit to the air column in the enclosure. It also exploits an improved smoothness in frequency response of the bass/mid frequency unit observed at this angle off its central axis rather than complicating the crossover.

The response

Figure 8 shows the combined anechoic response of the two units as derived from the manufacturer's quoted responses as a dotted line, with the in-room frequency response as a solid line (in-room measured using third octave noise with a calibrated mic at 0.9 m height). The responses show good integration and smoothness. A bonus of the simple crossover and small sloping baffle is an excellent off-axis response.

The modulus of the installed bass unit's impedance against frequency as shown in Figure 9. A resonance was detected at about 250 Hz but became inaudible with the insertion of damping material into the open end of the closed tapered section as indicated in Figure 1.

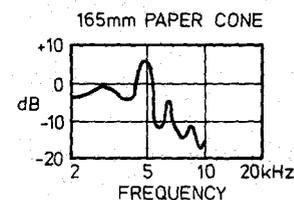


Figure 3: Frequency response of paper cone unit.

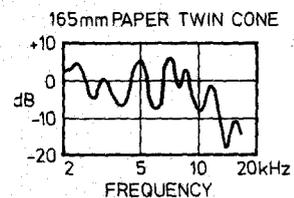


Figure 4: Frequency response of twin cone unit.

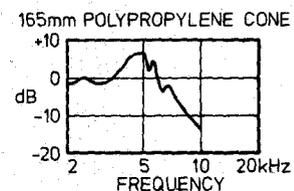


Figure 5: Frequency response of polypropylene cone unit.

The effect of the damping is also shown in Figure 9.

The damping material is a square metre of terylene wadding (from addressmaker). It should weigh about 100 grams and is cut in two — a piece for each enclosure. Each piece is folded lengthwise in two and the resulting strip is folded again twice to form a 25 cm square, ready for insertion.

The loudspeaker units are mounted from the outside of the enclosure and the bass unit needs a sealing gasket cut out of a thin sheet of plastic foam or paper, depending on the surface finish of the baffle. Use chipboard screws and do not over tighten.

Electrical connections may be made to a connector block fastened just above the port. The bass speaker lead is simply passed down through the bass enclosure and out through the port, while the tweeter lead is secured by clips down the back of the enclosure. The series capacitor supplied with the tweeter is a non-polarised electrolytic and readers may wish to upgrade the performance by replacing this component by a better quality version. Readers may also wish to experiment with the provision of steel or plastic spikes in the base of the enclosure.

Performance

The present design is the result of many

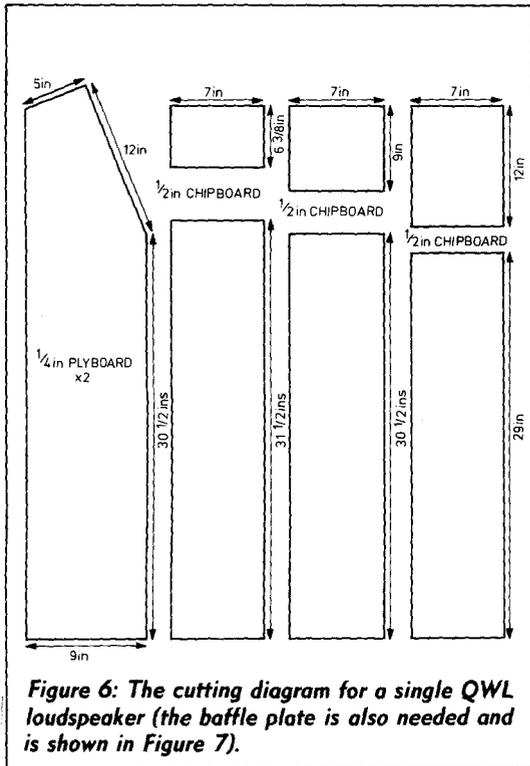


Figure 6: The cutting diagram for a single QWL loudspeaker (the baffle plate is also needed and is shown in Figure 7).

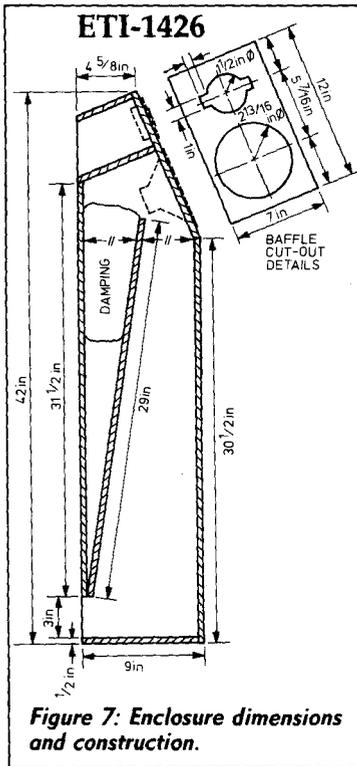


Figure 7: Enclosure dimensions and construction.

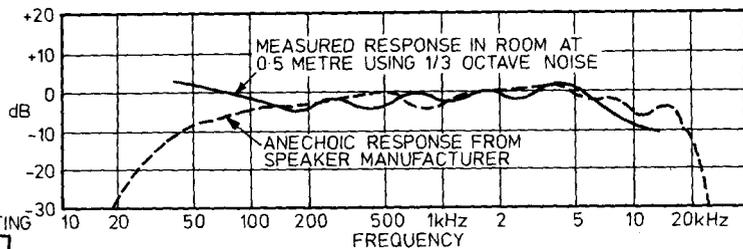


Figure 8: Frequency response of complete loudspeaker systems.

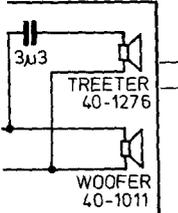


Figure 9: Off-axis response.

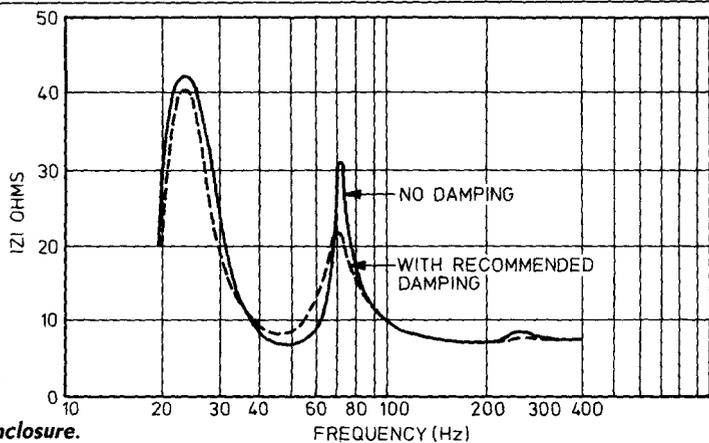


Figure 10: Bass loudspeaker impedance in enclosure.

hours of measurement and listening.

This QWL design is relatively cheap and easy to build but achieves a combination of good measured frequency response, stereo imaging, sound quality and efficiency. They occupy very little floor space, are easily moved and are

the correct height to preclude the need for stands.

Happy listening.



The drivers used in this project are the Tandy 40-1011 and 40-1276.

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READER INFO No. 26

THE RING-IN RECORDER





ETI-1537
ELECTRONICS

Your own built-in phone conversation memory

There are many reasons people wish to record their phone calls. Be it posterity, security or even blackmail, ETI's Keith Brindley can show you how.

Every now and again, it happens. You wish you had taken notes of that vital telephone conversation. Whoever you were talking to had said something of great importance but you can't remember it now. Or he made a verbal commitment to you which you know he'll never keep — and being only a verbal commitment, how can you hold him to it?

...bear in mind your telephone provider might not like you tampering with his equipment'

The answer, of course, is to record the telephone conversation. Then you've got a record of the whole affair. However, short of dismantling your instrument (excuse the expression) and diving into the telephone's circuit, how do you do it?

A simple coil of wire is used in the ETI telephone recorder to pick up minute electromagnetic disturbances

corresponding to the audio tones passing to and fro along the telephone line. The interface circuit merely amplifies these audio tone disturbances to a level sufficient to be recorded by any typical cassette recorder.

Telephone pickup coils are, of course, available from many electronics outlets and any one of these can be used as a pickup for the ETI unit, but we give details here to make your own, out of common insulated copper wire. Our home-made version gives every bit as good results, too, as the more expensive purpose-made options.

Construction

Building the unit is very simple but the usual procedures and precautions should be taken, depending on your chosen method.

The PCB component overlay is shown in Figure 2. The only precaution is to leave the transistors until last. This way, there is less likelihood of heat damage from a slap-happy soldering iron. Watch for electrolytic capacitor polarisation — make sure you get them the right way round.

The pickup coil is made by winding 150 turns of 30swg insulated copper wire onto a 25 mm former. Leave about 75 mm of wire at each end of the coil free. Neither the number of turns nor the former size are critical, so don't worry if you lose count or can't find a former which is exactly the right size. We used a bottle of Papermate typing correction fluid as our former (slightly over the size) and that proved adequate.

Similarly, the wire gauge isn't critical either — anything from about 25 to 35 swg wire will do. Once wound, slide the coil off its former and tie with string, lacing cord, wire or tape.

The ends of the coil now need to be connected to the circuit board and screened cable should be used for this. If you have used enamel-covered copper wire for the coil, you'll need to scratch off the last few millimetres of enamel from the ends of the coil, baring the copper, before they will accept solder. If you've used polyurethane coated copper wire, this is self-fluxing and can be

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TIP31A	NPN 60V 3A	0.20
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READER INFO No. 27

The ring-in recorder

soldered direct. Whichever, solder earth and signal leads of the screened cable separately to the ends of the coil. It's best to insulate the connection, too, to prevent shorting. Heat-shrink sleeving is ideal for this but insulating tape provides a suitable alternative.

The length of screened cable between the coil and circuit board depends on your requirements but bear in mind that the longer this is, the more susceptible the project will be to interference. The circuit is basically a high-gain amplifier, and any small levels of interference will be amplified greatly, along with the signal. Our prototype has about 1.5 m of cable for this purpose and this seems to work without much interference at all.

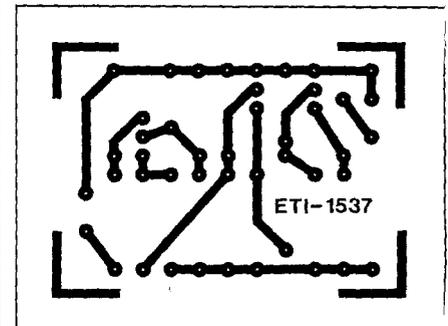
The output lead (the lead from circuit board to cassette recorder) on the other hand, can be much longer. The signal here has already been amplified and so is much less affected by interference.

We leave the housing up to you. As the project is a high-gain amplifier, a metal box earthed to the 0V battery line would be the best choice but is by no means essential. It all depends on where the circuit board is to be sited. If it's anywhere near a source of electromagnetic interference such as a mains power supply in a TV, computer or even your cassette recorder, the circuit may pick up the interference in the form of hum. If it's nowhere near such a source, you may get away with a plastic box.

Even though we give all this advice about reducing interference, it's worth noting that the pickup coil itself will pick up more interference than the screened cable and the circuit board, because that's what its purpose is! In this respect, the position of the phone is probably more important than cable and housing. If the phone is close to an interference source, the pickup is going to pick up interference, too.

Setting up

The circuit itself requires no setting up but the coil may require some



HOW IT WORKS

Figure 1 shows the circuit diagram for the telephone recorder. The pickup coil transforms any local electromagnetic radiations into signal voltages. It has a very low impedance and any amplifying circuit connected to it must consequently have a similar low impedance.

Positioned somewhere near the earpiece of the telephone instrument, the coil will pick up anything that would normally be heard by the user. Readers unfamiliar with telephone equipment may be forgiven for thinking that the sound heard in the earpiece consists of only the incoming part of the conversation — the voice of the person at the other end. However, all telephone instruments inject a certain amount of side tone into the earpiece circuit, which means a certain amount of the outgoing conversation is mixed with

the incoming one. The result is that the user can always hear his or her own voice as well as that of the other participant.

First stage amplification is provided by transistor Q1, connected in a common base amplifying mode. This presents the necessary low impedance to the pickup coil, acting merely as an impedance matcher (that is, a buffer) rather than a signal amplifier. Its output impedance is much higher than its input impedance, so any following stage of amplification can have a more usual higher input impedance.

Second and third stage amplification is provided by identical amplifiers based around transistors Q2 and Q3. These are connected in common emitter mode, together providing around 1000 times voltage amplification.

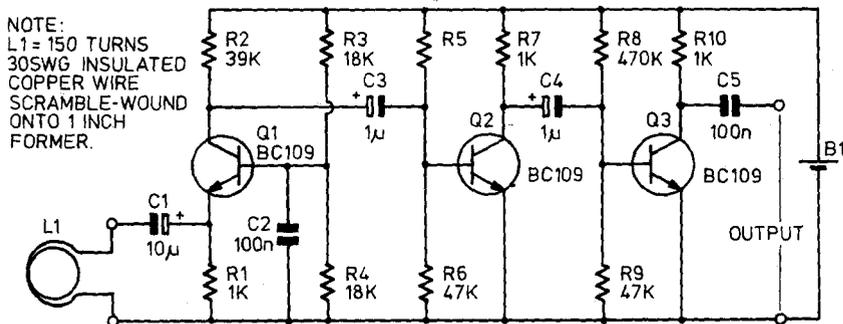


Figure 1: The circuit diagram of the telephone recorder.

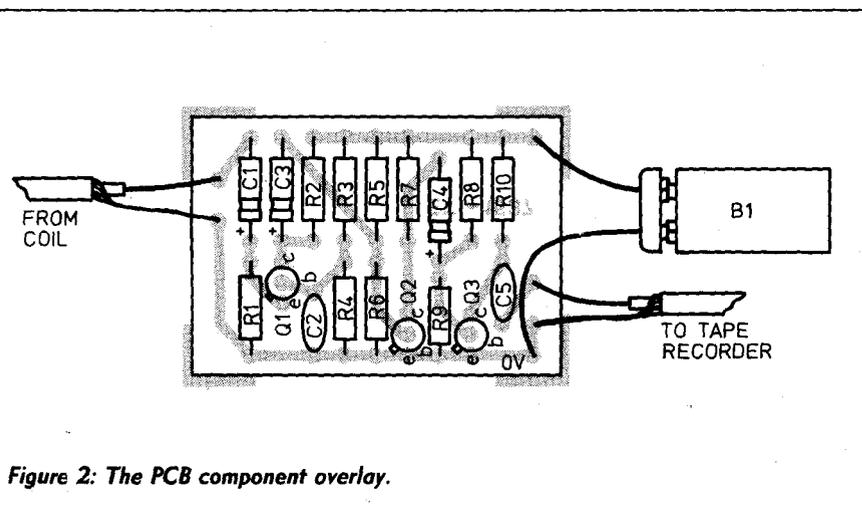


Figure 2: The PCB component overlay.

experimentation in positioning. Generally, the coil should be positioned somewhere near the earpiece of the phone — taped either to the back, or better still to the front, between earpiece and ear. Taped to the back the user won't feel the coil, but even between earpiece and ear the phone is still comfortable to use. Try different positions until you get the optimum.

If you really feel handy, you could mount the coil inside the handset of the phone, and fit a sub-miniature jack socket too, so that the phone is normally free of dangling wires. When you want to record a conversation, you only then need to plug in the screened lead to the circuit board and you're away. However, if you rent your phone from Telecom, bear in mind that they have a view on people drilling holes in their handsets.

It's worth mentioning here that some phones have an enclosed metal earpiece and the coil can't really pick up sufficient signal through the housing for the project to operate satisfactorily. However, all other modern phones we've tried have a plastic earpiece which gives superb results. If yours is a phone with such a metal earpiece, it's worth trying to experiment with the coil elsewhere, say around a line-matching transformer inside the main unit. You can but try.

Setting up your cassette recorder is totally up to you. Remember that the signals you are trying to record are audio, in particular, voice signals — well renowned for rapidly changing in amplitude. So, if your recorder is set too high, some parts of the conversation will be over-recorded and distorted. On the other hand, if the recorder is too low, some parts may not be recorded at all. Try playing around with the recorder setting, perhaps first dialling a 0055 service to give you a rough guide to incoming voice levels.

PARTS LIST — ETI-1537

- Resistors (all 1/4 W 5%)**
 R1, 7, 10 1k0
 R2 39k
 R3, 4 18k
 R5, 8 470k
 R6, 9 47k
- CAPACITORS**
 C1 10 µ 16 V axial electrolytic
 C2, 5 100n polyester
 C3, 4 1 µ0 16 V axial electrolytic
- SEMICONDUCTORS**
 Q1, 2, 3 BC109
- MISCELLANEOUS**
 B1 PP3 or similar 9 V battery
 PCB or Stripboard. Screened lead. 30swg insulated copper wire. Case to suit.



GOOD VIBRATIONS!

. . . and one way of measuring them

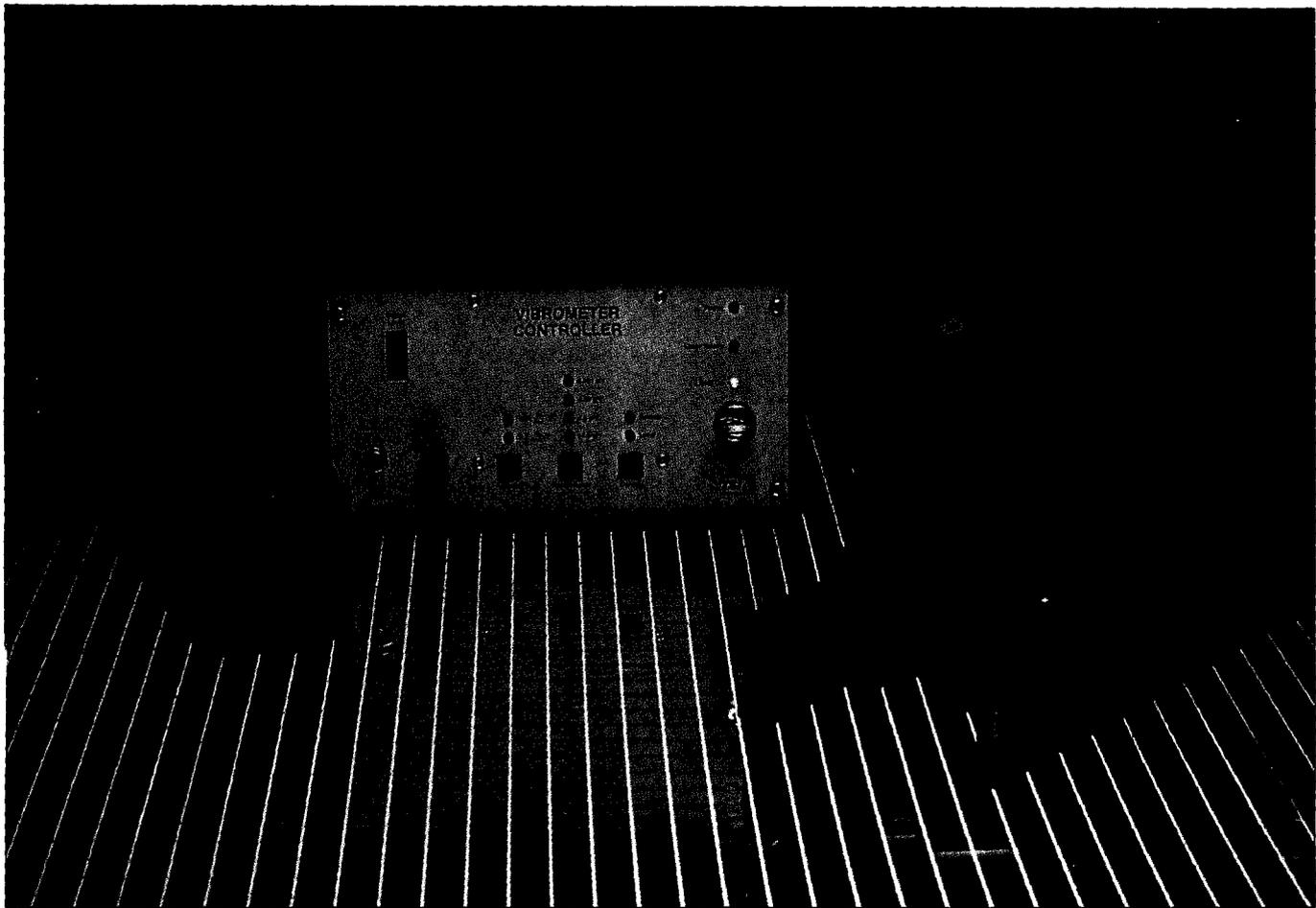
Jon Fairall delves under the hood of a new instrument from TSI that uses a laser to detect mechanical vibration.

Optical electronics is having a profound impact on instrumentation. As designers learn more about the new medium, and as the components become more accessible, we can expect rapid changes in bandwidth, noise immunity, sensitivity and so on.

We can also expect completely new types of devices, as optical solutions are found to problems that have no comparable electronic solution. A device of this type has just been released by Kenelec in Melbourne. It's TSI's Model 1930 Vibrometer,



The vibrometer at work on a mechanical assembly.



The vibrometer comes in two boxes: a head and a controller. The head carries the laser and must be aligned carefully in front of the surface to be tested.

a device to measure and analyse the vibration in mechanical structures.

Measuring vibration is important in a wide variety of situations, from launching a spacecraft through to testing gearboxes in trucks. In fact the Model 1930 sprang directly from a US Army requirement for a simple method of trouble shooting gearboxes.

Traditionally, this type of work is done mechanically; that is, a mechanical connection is made to the measuring device, the pressure or tension on the arm is measured in some way and an output recorded. Such systems suffer from a number of constraints: they are limited in frequency;

they work over a very limited physical amplitude: the physical connection itself may well alter the vibration performance of the device under test.

A new answer

However, opto electronics provides a new answer to all these problems. The essence of the technology is simplicity itself: a laser beam is shone onto the surface to be measured. Its frequency is known rather precisely. Reflected light from the device under test is detected and its frequency analysed. This is dopler shifted by an amount proportional to the movement of the reflecting surface at any given instant in time. The result: an electrical analogue

of the movement of the reflecting surface that can be manipulated in all the usual ways.

The physics underlying this process was demonstrated some twenty years ago, but the precise line up required, plus the problems associated with handling the laser, made such devices specialist laboratory tools.

Principals

To see how this works in a little more detail, we need to start with the laser. The Model 1930 uses a laser diode as a light source. At the required distance between the reflecting surface and the optical head of the vibrome-

ter, a few milliwatts of laser power are quite sufficient.

Two types of laser were considered for the design, an NeHe (neon helium gas type), and a semiconductor. Semiconductor lasers are attractive because they use less power, therefore generate less heat, are physically smaller and also have longer lifetimes than the gas types. They also do not require large voltages.

On the other hand, compared to gas types, laser diodes need precise control of temperature and current since output is critically affected by both parameters. Unfortunately, it not possible to predict the numbers for each individual diode, so it's necessary to test individual diodes

Good vibrations

for the current and temperature of best operation.

Even so, it was decided to go with the laser diodes. In practise it turns out that the need to tweak each diode for best performance is not all that onerous. The process can be slotted into the normal quality control system one would expect on any high quality instrument.

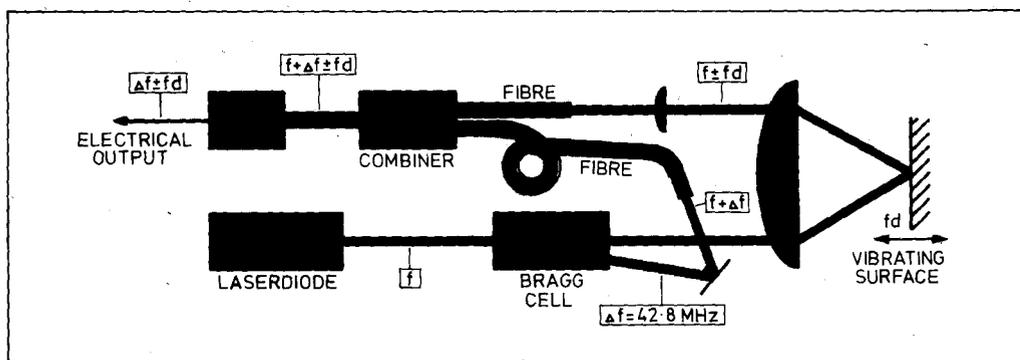
The signal from the laser contains effectively just one frequency. The signal is coupled into a Bragg cell, which bends a small amount of light out of the primary optical path. In doing so it alters the frequency of the light by some 42.8 MHz. Light on the primary path is passed through a lens and focussed onto the vibrating surface. It is reflected back, through the same lens and coupled into an optical fibre.

Meanwhile the light that was bent in the Bragg cell is also being coupled into a fibre. The two fibres are coupled and routed to an avalanche photodiode. This diode responds not to the frequency of the two incident waves, but to the beat frequency between them. If the reflecting surface is perfectly still, the beat frequency of course will be 42.8 MHz. However, in operation it will contain some other components caused by the movement of the reflecting surface. Thus the 42.8 MHz carrier will be frequency modulated by the dopler shift of the surface.

To turn this into an electrical analogue of the movements of the device under test, the output of the photodiode can be treated as a perfectly conventional FM signal, filtered, heterodyned, demodulated and buffered for



Analysis of the result is best done on computer.



The light paths through the instruments. f_d , the doppler frequency, is the critical measurement Δf is imposed on the fundamental frequency by the Bragg cell.

presentation to the outside world.

Problems

Of course, life is never quite this straightforward, and indeed, there is a predictable swag of problems. Probably the most important, because it is absolutely fundamental to the design method, is the requirement that the laser beam strike the reflecting surface at right angles. If it doesn't, the apparent amplitude of the vibrations will decrease as the angle away from the right angle increases.

From the point of view of

practical measurements, it's fortunate that the measurements are not particularly sensitive to errors of a few degrees. For example at 5 degrees off axis, the velocity error reading is only 0.3%. But as it gets bigger, the error increases out of proportion.

Another problem, also fundamental to the design, is that the optical head must be a certain distance from the reflecting surface, about 500 mm. One reason for this is that the best signal to noise ratio occurs when the two optical paths have about the same path length. To ensure this, the laser to reflecting

surface to detector path must be the same as the path from the laser to the Bragg cell down the fibre to the detector. So that this occurs the optical fibre is coiled up to provide a lengthy optical path, and the distance to the reflecting surface is standardised by means of two LEDs next to the laser lens. These LEDs shine onto the reflecting surface at an angle, such that the distance between them is related to the distance between the head and the reflecting surface. When the two spots are coincident the range is set. It's simple but extremely precise. ■

TEXAS INSTRUMENTS

TECHNOLOGY AWARD UPDATE

During 1987 Texas Instruments sponsored various final year students in the field of Digital Signal Processing, Local Area Networks and Parallel Processing.

In Parallel Processing systems, a computational task is split between multiple processors, potentially offering a significant increase in system throughput. In a study of artificial ambiphonic reverberation carried out at the University of New South Wales, the use of multiple TMS32020 Digital Signal Processors is investigated for meeting the high computational requirements of a reverberation system.

Student: Ronald Barrett
Supervisor: Prof. W H Holmes

Principle of operation:

The fields of artificial reverberation and sound reproduction are combined to simulate the effect an enclosure has on the transmission and reception of sound within it. While previous methods of artificial reverberation have adequately simulated echo density and high frequency attenuation, ambiphonic reverberation goes one step further in simulating echo directionality. This allows for the generation of reverberant sound fields and thus provides a more realistic approach to room simulation.

Introduction

When one listens to music in a concert hall it is not the original sound from the instrument which strikes the ear, but also the torrent of echoes resulting from the reflections of the original sound by the various surfaces of the room. It is these echoes, being a characteristic of the enclosure in which the music is performed, which convey the subjective impressions of space and position to the listener and do much to enhance the overall listening experience. The echoes are not perceived as separate sounds,

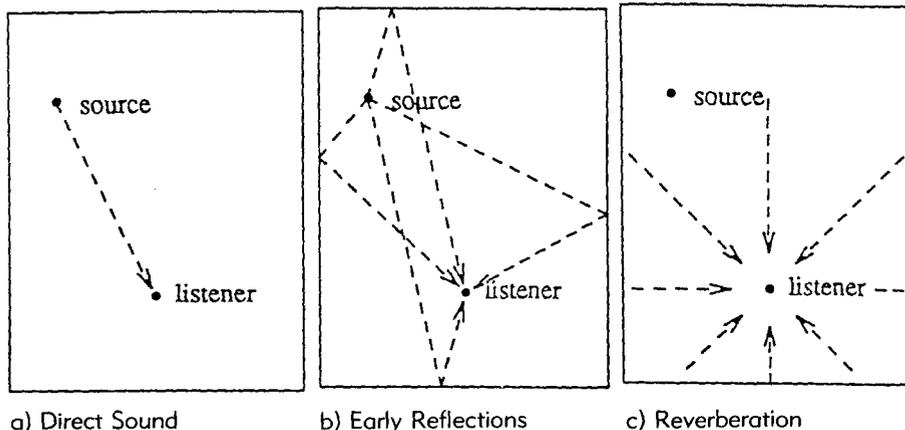


Figure 1: Reverberation process within a room.

that is there is no HELLO...hello answer back effect as would be noticed in the Grand Canyon for instance; however the overall effect of the reflections is to reinforce the original sound making it far more pleasing to the ear.

The overall response of a room can be divided into three sections (Figure 1).

- a) direct sound.
- b) early reflections.
- c) reverberation.

The decay time, *reverberation time*, is an indication of the *liveness* of the room in question and is dependent on many factors such as the frequency spectra of the original sound, the frequency response of the room, wall, floor and ceiling materials and the placement of objects in the room as well as temperature and humidity.

The overall aim of this thesis is to develop a room simulation system that will enable the user to specify:

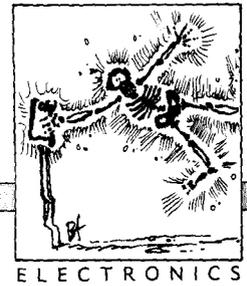
- the dimensions and structure of an enclosure,
- sound source and listener positions,

- the (wide band approximate) sound absorption characteristics of the walls, and then to reproduce the 3-dimensional sound field the listener would hear, were he/she in that enclosure through a suitable array of loudspeakers. A more advanced system would allow for the inclusion of objects in the room being modelled as well as specification of the frequency dependence of both sound absorption and reflection characteristics.

The possible applications of such a system are numerous; ranging from concert hall design evaluation through to special effects such as audio enhancement/enrichment for both the professional and the consumer markets. Many professional systems presently available allow for the stereo simulation of the reverberation process. But perhaps due to the lack of a 3-dimensional sound reproduction standard, there does not appear to be a system similar to the ambiphonic reverberator presently available.



TEXAS INSTRUMENTS AUSTRALIA
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Programmes

Apple IIC clock

The program uses a number of page zero locations :

- Byte 215 (\$D7 hex) is the control byte :
- bit 0 - DISPLAY ENABLE : Setting this bit to 0 will turn off the clock display but still update the time in memory.
 - bit 1 - UPDATE ENABLE : Turning this bit off will stop the time being updated.
 - bit 2 - INVERSE BIT : Turning this bit on will cause the time to be displayed black on white.
 - bit 3 - 1/100 SECOND ENABLE : Turning this bit on allows hundredths of a second to be displayed along with the normal time.

The time is stored in the following bytes :

- 252 (\$FC hex) - hours
- 253 (\$FD hex) - minutes
- 254 (\$FE hex) - seconds
- 255 (\$FF hex) - 1/100 seconds

Apple IIC

This program puts a 24-hour clock at the top right-hand corner of the text screen. The program uses the 50 Hz vertical blanking interrupt, normally used by the mouse firmware, to update the clock's time and display. This means that at every interrupt pulse, the subroutine displays the clock on the screen and adds two 1/100 seconds to the time.

The interrupt frequency is slightly less than 50 Hz, so we must compensate for this with two "accuracy bytes" which work like binary fractions. These bytes are shown boxed in the hexadecimal listing, and may need modifying if your frequency is different to that of my computer. What these bytes mean are: every interrupt, we add 1. FF2E hundredths of a second to the total time, where this figure contains a sort-of "hexadecimal point".

Unfortunately, because of the I-O arrangements, this program will only work on an Apple IIC. However, you may

be able to modify it to enable the interrupt from the Apple IIE mouse card, if you know the correct I/O location, which I don't.

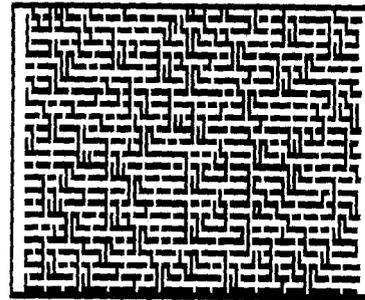
To get the program up and running, type it in through the monitor and save it, if necessary. Then, to turn it on, type CALL 768 from basic or 300G from the monitor. Note: It will not work if you BRUN it — you must BLOAD then CALL it for it to work properly.

The time bytes are stored in BCD format so that the hexadecimal value of their contents are the displayed and actual values. For example, to set the minutes to 36, do POKE 253,54 — since 54 is \$36 in hex.

Note that disk operations turn off all interrupts and during such times the clock will be momentarily stopped. Also, pressing reset will stop the clock permanently until it is restarted by doing a CALL 768.

B. Murray
NSW

Maze



Here is the complete listing:-

```
00100 REM [MAZE] By Philip A. AGE 13.
00110 REM
00120 SD4:CLS:LORES
00130 FOR M=1 TO 47 STEP +2
00140 FOR N=5 TO 121 STEP +2
00150 X=N:Y=M
00160 IF POINT(N,M)=0 THEN GOSUB 200
00170 NEXT N:NEXT M
00180 PLOT 0,0 TO 127,0 TO 127,47 TO 0,47 TO 0,0
00190 GOTO 190
00200 Q=X+1:W=Y
00210 IF X<5 OR X>121 OR Y<1 OR Y>47 OR POINT(X,Y)<>0 THEN RETURN ELSE PLOT Q,W
TO X,Y
00220 Q=X:W=Y
00230 D=INT(RND*4)+1
00240 IF D=1 THEN LET Y=Y+2 ELSE LET B=B+1
00250 IF D=2 THEN LET X=X+2 ELSE LET B=B+1
00260 IF D=3 THEN LET Y=Y-2 ELSE LET B=B+1
00270 IF D=4 THEN LET X=X-2 ELSE LET B=B+1
00280 IF B=4 THEN LET B=0:RETURN
00290 B=0
00300 GOTO 210
```

This program generates a very useful if incorporated in a graphics game.

This is a screen dump of the resulting maze.

Philip Andrew

Quick draw

- 1 REM *** QUICKDRAW ***
- 2 REM *** FOR COMMODORE PLUS 4 ***
- 3 REM *** BY BILL PUGH ***
- 10 ?CHR\$(147)
- 20 ?TAB(12);"QUICKDRAW"
- 30 ??:?TAB(3);"MOVE THE DOT AROUND THE SCREEN"
- 40 ??:?TAB(3);"BY PRESSING THE CURSOR CONTROL KEYS."
- 50 ??:?TAB(3);"PRESS RETURN WHERE WHERE YOU WANT YOUR"
- 60 ??:?TAB(3);"LINE TO BE DRAWN TO."

Commodore Plus 4

```

70 ??:TAB(3);"THEN MOVE THE CURSOR TO WHERE YOU"
80 ??:TAB(3);"WANT THE LINE TO BE DRAWN FROM."
90 ??:?:TAB(7);"PRESS ANY KEY TO CONTINUE."
100 GETKEY$:?CHR$(147)
110 ??:?:TAB(3);"THEN PRESS THE SPACE BAR TO DRAW A LINE?"
120 ??:TAB(3);"TO DELETE A LINE, MOVE THE CURSOR"
130 ??:TAB(3);"TO THE END OF A LINE AND PRESS D"
140 ??:?:TAB(11);"PRESS S TO START."
150 GETKEY$:?CHR$(147)
160 X=80:Y=80:GRAPHIC 4,1
170 COLOR 0,2,2:COLOR4,1:COLOR1,8
180 GETA$:GOSUB 270
190 IF A$=CHR$(13) THEN GOSUB 300
200 IF A$=CHR$(157) THEN GOSUB 280: X=X-5:IF X<1 THEN X=1
210 IF A$=CHR$(29) THEN GOSUB 280:X=X+5:IF X>158 THEN X=158
220 IF A$=CHR$(145) THEN GOSUB 280:Y=Y-5:IF Y<1 THEN Y=1
230 IF A$=CHR$(17) THEN GOSUB 280:Y=Y+5:IF Y>158 THEN Y=158
240 IF A$=CHR$(32) THEN DRAW TO A,C
250 IF A$="D" THEN DRAW 0 TO A,C
260 GOTO 180
270 Z=1:GOTO 290
280 Z=0
290 DRAW Z,X,Y:RETURN
300 DRAW 1,X,Y:A=X:C=Y:RETURN

```

Full instructions are included in the program. I have not included any REMs but the following is a short description of some of the commands. Lines 10 & 100 clears the screen. Lines 10 to 150, the "?" is an abbreviation for "Print". Line 160 positions the cursor in the middle of the Graphic screen. Line 190 is the CHR Code for Return. Line 200 moves the cursor Left.

Line 210 moves the cursor Right.
Line 220 moves the cursor Up.
Line 230 moves the cursor Down.
Line 240 is the CHR Code for Space Bar to draw the line.
Line 250 Deletes a line.
NOTE: This program will also work on the Commodore 16 and with minor changes will also work on the Commodore 64.

W. Pugh
Werrabee
Vic

Super disk menu

```

1 REM *****
2 REM **** SUPER DISK MENU ****
3 REM **** FOR THE C64 ****
4 REM **** BY JOHN SYMONDS ****
5 REM **** 8/8/88 ****
8 REM *****
9 POKE 788,52:POKE 792,193
10 POKE 53281,11:POKE 53280,11
12 PRINT "SUPER DISK MENU":PRINT ""
14 DIM A$(8):DIM B$(8)
16 REM -INSERT-THE-GAMES-LOADING-NAME
18 REM -IN-BETWEEN-THE-TALKING-MARKS
20 A$(1)="":B$(1)="RUN"
22 A$(2)="":B$(2)="RUN"
24 A$(3)="":B$(3)="RUN"
26 A$(4)="":B$(4)="RUN"
28 A$(5)="":B$(5)="RUN"
30 A$(6)="":B$(6)="RUN"
32 A$(7)="":B$(7)="RUN"
34 A$(8)="":B$(8)="RUN"
40 FOR T=1 TO 8:PRINT:PRINT A$(T);
42 PRINT T;" "A$(T):NEXT T
44 PRINT "ENTER THE NUMBER OF YOUR CHOICE":PRINT "*****";
46 GET C$
48 LET C=VAL(C$)
50 IF C=0 THEN 46
52 IF C>9 THEN 46
54 PRINT " ";
56 POKE 198,2:POKE 631,13:POKE 632,13
58 PRINT "NOW LOADING ";A$(C)
60 PRINT "LOAD"+CHR$(34)+A$(C)+CHR$(34)+"",B,1"
62 PRINT "*****";B$(C)
64 PRINT "":END

```

READY.

Are you sick and tired of having to type out LOAD 'NAME OF PROG.' Even when you do, you have to do it again and again, till you get the spelling right? Well you won't have to any more with this super menu.

All you have to do, is type the name out once in this program and save this program on the same disk, as with all the programmes you listed. This programme will not only save you time, but will load easier. I saved my

menu under the title '!' which is very close to the talking mark key.

You can change the amount in the menu by changing the 8 in line 14 and the 8 in line 40 and if you like you can cut out the string lines not used. But be warned, if you type out the programme and run it before saving, you won't be able to list it again. If you don't want this to happen cut out line 9.

J. Symonds

Letters

Creation vs evolution

I was greatly surprised to read that only scientifically illiterate "crazies" believe in creation and not in the "fact" of evolution. At least that is what the author of Dregs would have me believe.

The list of the scientifically illiterate creationists is long

and distinguished, including people like Galileo, Francis Bacon, Roger Bacon, Isaac Newton, Pascal, Louis Pasteur and Leibnitz. Men like Faraday, Lord Kelvin, James Maxwell and Sir John Fleming also believed in creation. Kelvin and Fleming even started lectures with prayer and de-

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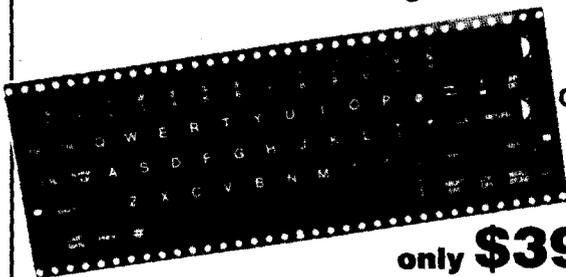


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F E E D F O R W A R D

nounced Darwin's theory as utterly unscientific.

Darwin himself admitted that the fossil record was at the time the single strongest evidence against his theory. He believed further exploration would uncover the missing links.

Today the missing links are still missing. Some high school text books use examples like Coelacanth (fish to amphibian), Seymouria (amphibian to reptile) and Archaeopteryx (reptile to bird). However, examination of living Coelacanth (thought to be extinct until 1938) show it to be a fish. Seymouria is not a missing link as true reptile are found in rock strata older than the oldest examples of Seymouria. The same applies to Archaeopteryx and true birds.

Now some interesting quotes. From Co-holder of the 1945 Nobel Prize for developing Penicillin, Sir Ernest Chain — "To postulate that the development and survival of the fittest is entirely a consequence of chance mutation seems to me a hypothesis based on no evidence and irreconcilable with the facts . . .

(1) From Dr Etheridge, Paleontologist of the British Museum —

"Nine-tenths of the talk of evolutionists is sheer nonsense, not founded on observation and wholly unsupported by facts. This museum is full of proofs of the utter falsity of their views. In all this great museum, there is not a particle of evidence of the transmutation of the species."

(2) And lastly, Dr Albert Fleischmann, University of Erlangen —

"I reject evolution because I deem it obsolete; because the knowledge, hard won since 1830, of anatomy, histology, cytology, and embryology, cannot be made to accord with its basic idea. The foundationless, fantastic edifice of the evolution doctrine would have long ago met with its long-deserved fate were it not

that the love of fairy tales is so deep-rooted in the hearts of man."

(3) I challenge the author of Dregs to an open debate on which theory has the facts going for it. It could be eye opening to see who the illiterate really are. But first the author should note "scientifically" is spelt with two Is

Footnotes
(1) Rosevear, D.T., "Scientists Critical of Evolution," Evolution Protest Movement, Pamphlet No 224, July 1980, p.4

(2) Lindsay, Gordon, "Evolution — The Incredible Hoax", Christ for the Nations, Dallas, Texas, 1977, p. 16.

(3) Acworth, Captain Bernard, "Darwin and Natural Selection", Evolution Protest Pamphlet, London, 1960, p.6.

David Eather
Upper Mt Gravatt
QLD

I'm not going to open the pages of ETI for a re-run of the Monkey Trial. Fun no doubt, but we don't have the space. However, a few points are worth making in defence of the much maligned Dregs Hack.

1. The list of distinguished opponents of evolution cited by correspondent Eather is impressive, but irrelevant. Newton was wrong about gravitation, but that doesn't make him any less a giant of scientific thought.

2. I didn't know that Kelvin and Flemming started their lectures with prayer but it doesn't surprise me. Plenty of scientists are religious including many of the best. Read Steven Hawkins for an example. So are plenty of Churchmen, like the Archbishop of Canterbury, His Holiness the Pope and Sir James Cardinal Freeman. None of them believe in creationism.

3. Modern evolutionists would disagree with Darwin on just about everything which is hardly surprising given the evidence acquire

since the turn of the century. Is that evidence for creationism? What would count as such evidence?

4. The biggest argument against the Rise of Man is the Dregs Hack, who is walking evidence that the species is in decline. We keep him tethered by his typewriter, and are busily trying to teach him how to spell.

-Ed

Praise

Your magazine is very informative to me as a hobbyist. I find that I can read all the latest advances in the industry.

As electronics advances so fast, it is good that your magazine can help someone like me to see what is happening. I intend to do an ICS course to help me get into the hobby that I love so much. Congratulations.

P. Briggs
Mooroopna
Vic

Beginner's request

Could you please do some articles for beginners in the future.

M. Riddle
Belmont
Vic

R and D and thee

I found your editorial on the Research and Development activities in the electronics industry to be somewhat simplistic — albeit some of the material contained in the article is both depressing and predictable.

I find it simplistic because it may well be that regeneration of the electronics industry as we used to know it in the 60s and early 70s is not likely to happen nor will regeneration be achieved through the implementation of only one policy — the tax incentive based R and D scheme currently in force. In an environment where most of the current large players in the elec-

tronics industry (with the obvious exception of AWA) are transnational corporations, it is not necessarily surprising that Australia has not been the centre of their R and D. The mere provision of tax incentives in Australia is not necessarily sufficient to convince the transnational organisations into Research and Development in this country. Indeed, in recognition of this the Government's current "partnership" scheme is perhaps a more effective step in this direction.

The more interesting issue however, is contemplation of the nature of the electronics industry which we may envisage in your "10 year" time-frame. It is entirely possible, indeed probable, that the electronics industry will create a base of indigenous products in areas where the intellectual component of the price of the product is perhaps more significant than the cost of production. We need to recognise that in Australia we do have some structural problems which will prevent us being highly successful in the international mass market. As examples, we do have high labour rates compared with our Asian neighbours, there is no silicon technology infrastructure with the capacity needed to support a modern micro-electronics based industry (at least at this time) and of course, we have the perennial problem that we are distant from many of the relevant markets that exist for these high 'intellectual value' products.

The fact that the 150% R and D scheme has not been an appropriate vehicle for revolutionising the electronics industry does not necessarily mean that the scheme of itself has failed. It may well be that the scheme is more appropriate in other areas of technology.

P. F. Rehn
General Manager
Computer Sciences
of Australia

Course aid

Great magazine. However, more basic theory would be a plus. To help with my studies in electrical engineering I would like to see not just voltages and resistors but a bit of network analysis, design of inductors etc.

Also, how about a rally computer along the lines of the typical car computer but with distancer etc.

C. Pugsley
Backburn
Vic

Hot go-cart

I read with great interest the ETI-1534 speedo module in the July issue and intend using the unit as an engine tacho on a kart. The engine is a two stroke and revs to about 16,000 rpm.

The other important instrument that is required for kart racing and tuning is a temp gauge that can measure the head and/or the exhaust temp. The engine temp is critical to the engine tune and therefore power output.

Can you advise if you have ever designed a temp gauge that read these high temps. As the only place these gauges can be mounted is on the steering wheel they need to be small but with a reason-

able large readout. If possible they could share the same readout.

Any advise you have on this application of ETI-1534 and the temp module would be appreciated.

R. J. Smith
McGregor
ACT

We have not published anything on temperature sensors recently. However an article on transducers is in the pipeline.

—Ed

Sharp Interface

Has ETI ever published a MIDI interface kit to suit a Sharp MZ-700 computer and does anyone know where I could obtain one.

A. Howell,
70A Hamilton St.,
Latrobe, Tas 7307

No, we haven't. Perhaps other readers can help — Ed

Sellers' corner

I have a selection of used computer equipment including a complete S-100 CP/M computer and terminal (\$300), a Qume daisy-wheel printer (\$220), floppy disks, disk drives, etc for sale. ☎ (02) 958-4079.

★ GOSFORD FIELD DAY ★ Media release Preview

INVITATION: All amateur radio operators, their families, friends and all interested in amateur radio are invited to attend the Club's 32nd Annual Field Day on Sunday, 19th February, 1989 at the Showground, Showground Road, Gosford NSW.

REGISTRATION: Gents — \$5.00, Ladies and Pensioners — \$3.00, Children under 15 — \$2.00. A special group concession will be available on application.

DISPLAYS: Companies, persons, groups or clubs wishing to set up a table or display at the Field Day should contact the Central Coast amateur Radio Club Inc at P.O. Box 252, Gosford NSW 2250. Any telephone enquiries concerning the Field Day may be made to Bren Connolly VK2BJC (043) 23 1662.

SPECIAL EVENTS: Start building now for Home Brew Contest, 70cm Home Made Antenna Evaluation.

Proposed Programme and other special attractions will be forthcoming in our next Media release.

Les Watsford VK2CLP

Nice advice

The new format for the magazine is terrific. Suggestions:

- (a) An end of article marker so you know when it's finished!
- (b) Larger headings for each section (eg, "Frequency", "Kilohertz Comment").
- (c) How about a simple synthesizer project?
- (d) Don't go too far overboard with Consumer Products.

The colour is great!

**Peter Coffey
Armadale, Vic**

We agree with the end marker. You've got it. — Ed.

You're write

Please include excerpts from DATA sheets with I.C. based projects; i.e: data for devices used which are not "run of the mill" types (example — not necessary for data on

"555"s or 741 op Amps but some devices are quite unfamiliar).

**Dave Dunn
Bayswater, WA**

★ ★ ★

Only one thing could make this magazine better: a regular column on valve radio restoration!

Please consider this.

Great mag. Keep it up!

**Darren Oster
Vista, SA**

★ ★ ★

I like the "new" magazine, but why has there been an increase in price when there are more adverts. Also, could you publish projects for computers other than the IBM PC every now and then?

**Benjamin Hoad
Armadale, WA**

The price of ETI has grown less than the CPI. At least you are being paid more than you are asked to pay. — Ed.

Great magazine — wide variety of 'projects, but I don't like the idea of Sound Insights as a separate magazine within another magazine.

Tearing them out means they'll get lost, but leaving them in makes a mess of

page numbers.

**Brian Murray
Gorokan, NSW**

★ ★ ★

New-look is a change for the better, if first impressions are anything to go by.

**S. McBride
Townsville, Qld**

Video & audio splitter

This circuit was designed to connect three video monitors to one video cassette recorder. The circuit is divided into an audio and a video section. The audio signal from the VCR is buffered by emitter followers and provides unity gain and a low output impedance drive.

The video amplifier has unity gain with a bandwidth (−3 dB points) of 5 Hz to 58 MHz. Up to 6 dB gain is possible by progressively reduc-

ing R1 but the upper −3 dB point falls to around 10 MHz, with no compensation capacitor. A bridge/terminate switch is provided if a monitor at the sending end is required. The amplifier limits at 2.2 Volts into 75 ohms which should give sufficient headroom. Heatsinks may be needed on the output transistors. Typical dc voltages are shown on the circuit diagram.

**C. Wilmhurst
Christchurch
New Zealand**

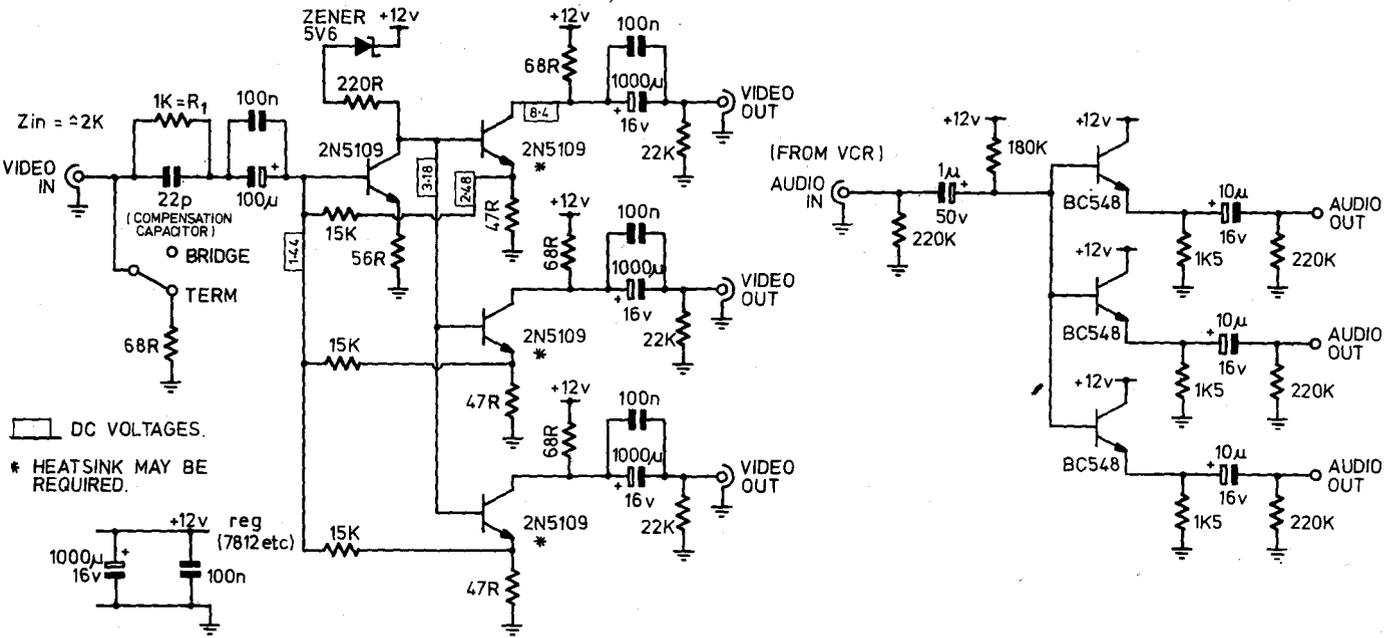
Shh... "Killer" is at work.

You would call it a Merlin Gerin UPS. I call it "Killer" because it kills off the Power Bugs which would love to get into my data.

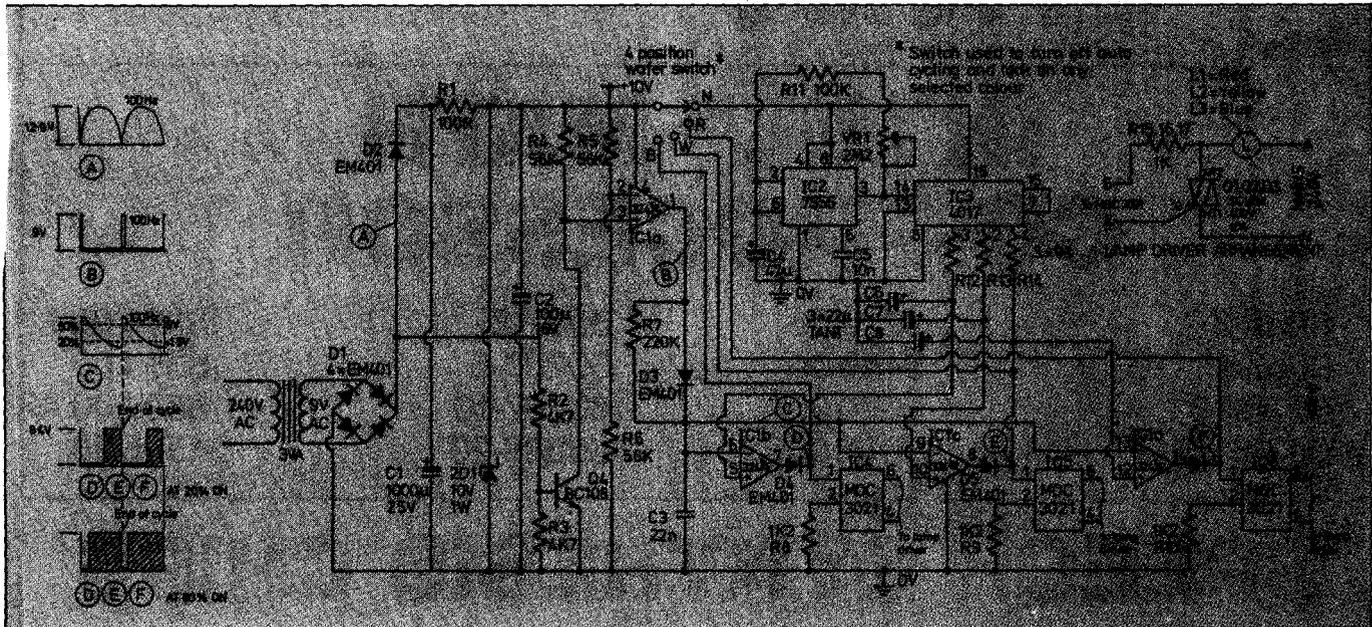
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Lamp fading unit

The idea of this circuit is to use three different coloured lamps (I used red, yellow and blue) and to fade them on and off sequentially. A 100 Hz ripple is picked off the anode of D2 and blocks any dc feeding back to the bridge rectifier. R2, R3, R4 and Q4 forms a zero-crossing detector and along with IC1a generates a pulse at pin 1 whenever the supply voltage crosses zero. The

positive going pulse rapidly charges C3 which is then slowly discharged by R7 when the output of IC1a goes to 0 volts. The result is a rougher sawtooth type of waveform. This signal is fed to the inverting inputs of IC1b, IC1c and IC1d which are connected as comparators. IC2 is configured as an oscillator to clock the counter, IC3. The clock frequently can be varied by RV1 to alter the speed of the

four changes. The outputs of IC3 charges and discharges C6, C7 and C8 via R12, R13 and R14 respectively in sequence. When these voltages exceed the voltages on the non-inverting inputs, the output of the respective op amps goes high and drives the opto isolator. The switching of the lamps are controlled by the triacs Q1, 2 and 3. The brilliance of the lamp being turned on depends on which part of the

supply cycle the lamp is activated thus making it fade on and off. SW1 is used to stop the unit cycling by switching off IC2 and IC3 and biasing on whatever colour is selected via the opto couplers. Diodes D4, 5 and 6 are used to stop this signal from being fed back into the outputs of IC1.
D. Baillie
Moe
Vic

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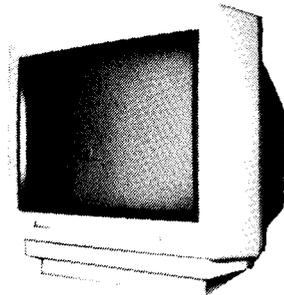
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SPO256A-AL2	\$15.00	CTS256-AL2	\$30.00
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ALL PRICES INCLUDE SALES TAX. TAX EXEMPT AND OEM P.O.A.

Freight: The prices quoted are ex Store, cost of delivery and the risk of loss in transit fall upon the purchaser. For the convenience of customers, delivery can be arranged through the supplier at the schedule of rates set out below.

Minimum Charge Only

1. Local Post \$2.50	only SMALL ITEMS will be sent by post.
2. Interstate Post \$3.50	
3. Carrier: Melbourne & Metropolitan — \$5 up to 3kg	
4. Carrier: Interstate — \$8 up to 3kg	



REGULAR MEETINGS

The Vic branch of the **Australian Dataflex Users Group** meets the second Wednesday of each month at Bird Cameron, 316 Queen Street, Melbourne, at 6 pm. ☎ (052) 21-1300 or (03) 670-9212.

The **NSW Dataflex Users Group** meets the third Tuesday of each month at the offices of Touche Ross, Level 40, MLC Centre, Sydney at 5.30 pm. Contact Gary Reid ☎ (02) 816-5866.

The **Sydney Open Access User Group** meets the second Tuesday of each month at the Fujitsu Education Centre, 475 Victoria Avenue, Chatswood. Contact Judy Jeffrey ☎ (02) 439-5982.

The **Sydney Apple User Group** meets the first and second Monday of every month at the Stephen Roberts Theatre at Sydney University. Contact Graham Clarke ☎ (02) 958-2709.

Club Mac meets the second Wednesday of each month in Lecture Theatre 5, Carslaw Building, Sydney Uni at 6.30 pm. Contact Brian Hinder ☎ (02) 660-5530.

ARCAD/GDS User Group meetings are held in Sydney the first Tuesday of every month. For information contact Klaus Bartosch ☎ (02) 958-2388.

The **Apricot-Victor Users' Group** meets the last Wednesday of every month at 6.15 pm at Prince Henry's Hospital, Melbourne. Contact Elizabeth Lyons ☎ (03) 611-2873.

The **C Language Users' and Enthusiasts' Society (CLUES)** meets at Frenchs Forest in Sydney on the first Tuesday of the month. Contact Jim Sharples ☎ (02) 958-4705.

The **Australasian Lotus Users' Group** meets on the first Tuesday of each month at 5.45 pm. Contact Barry Roberts ☎ (03) 267-4844.

The NSW branch of the **Office Automation Association** meets the last Wednesday of each month at the Commercial Travellers Club in Sydney from 6 pm-8 pm. Contact Pat Reid ☎ (02) 371-5132.

Western Australia Unix Systems Group meets on the third Wednesday of each month. Contact Sam Pascoe ☎ (09) 470-3077.

Special Interest Groups of PC users: CONSIG meets on the first Wednesday of each month in Sydney; ☎ (02) 290-

2655. The **DTP Graphics SIG (Desktop)** meets on the second Tuesday of the month in Sydney; ☎ Mark Richards (02) 929-5855. **PCWEST** meets on the first Monday of the month in Sydney; ☎ Bill McEwen (02) 627-2488. **ACS Expert Systems SIG** meets third Monday of each month in Melbourne; ☎ Tony Davidzik ☎ (03) 873-1664.

The **NEC Users' Group of NSW** meets at St Leonards, Sydney, on the second Tuesday of each month. Contact Ian Cowell ☎ (02) 489-1156.

The **CAT-dBase Users Group** meets every third Tuesday of the month at 6.30 pm at Expert Technology Training, 185 Elizabeth Street, Sydney. Contact Hans Schneider ☎ (02) 309-2961.

NOVEMBER

15-18: AI'88, the Australian Joint Artificial Intelligence Conference, will be held in Adelaide. Contact ☎ (08) 228-5586.

29-Dec 1: SST-88, the second Australian International Conference on Speech Science and Technology, will be held at Macquarie University in Sydney. Contact ☎ (02) 805-8784.

30-Dec 2: U-CUBED, the United Unisys Users, will hold their spring conference in Melbourne at the Regent Hotel. Contact Kevin Pilkington ☎ (03) 628-2642.

DECEMBER

4-7: The annual conference of **Australian Society for Computers in Learning in Tertiary Education** will be held at Canberra CAE. Contact Kay Fielden ☎ (02) 52-2410.

13-18: Beyond 2000 Spectrum Exhibition. Darling Harbour, Sydney. Information from Spectrum Exhibitions ☎ (02) 281-2555.

FEBRUARY

4-17: Beyond 2000 Spectrum Exhibition. Royal Exhibition Building, Melbourne. Information from Spectrum Exhibitions. (02) 281-2555.

13-17: The World Conference on Engineering Education for Advancing Technology will be held at the University of

Sydney. Contact the Conference Manager, Institution of Engineers, 11 National Circuit, Barton, ACT 2600.

20-25: Asia Telecom 89 in association with the ITU and Telecom Singapore ☎ +65 730 3935

MARCH

14-17 biannual: PC89 The 12th Australian Personal Computer Show at Darling Harbour, Sydney. Contact ☎ (03) 267-4500.

14-17 annual: Elenex Australia The Australian International Electrical & Electronic Industries Exhibition at Darling Harbour Sydney on ☎ (03) 267-4500.

APRIL

27 April: The Institution of Engineers, Australia, has called for papers for a conference on **New Business Applications of Information Technology**, to be held in Melbourne. ☎ (062) 70-6549.

27-29 April: The **Computer '89 computer show** will be held at the Perth Entertainment Centre. Contact Swan Exhibitions ☎ (09) 443-3400.

MAY

3-5: An international working conference called **Shaping Organisations, Shaping Technology** will be held at Ter-rigal, near Sydney. Papers must be received for review by September 30. Contact Roger Clarke ☎ (062) 49-3666.

10-12: There's been a call for papers for the **Fourth Australian Software Engineering Conference, ASWEC 89**, to be held in Canberra. ☎ (062) 70-6549.

JUNE

6-9: PC89 The 13th Australian Personal Computer Show, Communications 89. The 5th Australian International Electronic Communications and Information Technology Exhibition and Office Technology 89. The 4th Australian International Office Technology Exhibition will be held at Royal Exhibition Building Melbourne. Contact AES or ☎ (03) 267-4500.



BUFFOONERY

YOUR JUNK IS IN THE MAIL

Hackers, smelly fish and Pentagon prices

Every now and then we allow the Dregs Hack to tidy the editor's desk and as usual our friendly creature retains little snippets for this column, slithers away and writes . . .

Once again into the breach! As usual, a vast amount of junk mail and press releases has crossed my master's desk, some in glossy covers, some on the back of a fag packet, much of it boring, a few interesting, and the occasional one to bring a smile to the lips, or at least a quizzical raising of the eyebrows. Herewith some random samples:

Hackers

The Brits, jolly tars to a man, are all set to make computer hacking (putting your sticky nose into someone else's data base) a crime. The reason: The British upper house, the House of Lords, has been told that two hackers who ferreted around in Prince Phillip's Videotex file were not breaking any law.

The outraged Lords have decided to follow Canada, the US and France and make it illegal. Why they were so furious is difficult to say. Perhaps they, too, were busting with curiosity to find out what the good Duke sends and receives electronically. Probably just junk mail, like the rest of us.

Anyway, penalties have not yet been decided, but if you fiddle with the monarchy, expect to be hung drawn and quartered. The Lords understand how to deal with these people.

Red Storm

You've read the book-now get the programme. We've all heard of books being turned into movies, operas into books, stage plays into movies and so on, but now it appears the world is ready to include computer programmes in the merry go round.

Micropro, the US software house, has created an adventure game for the Commodore based on the Tom Clancy

bestseller, *Red Storm Rising*. I haven't read it, but apparently a lot of valiant Yanks beat off the foul fiends of the evil empire, (reeking, I'm glad to say, of Australian fish).

According to the blurb, you are in charge of a submarine, and can choose various way of slaughtering lots of people. You have missiles and bombs and even programmable torpedos at your disposal. It's loads of fun.

Only in America

Readers who keep an eye on the world will know that the US Pentagon keeps the US electronics industry alive by what are quaintly known as "defence" purchases. Mostly, the Pentagon pays outrageous prices for some piece of old rubbish, which can then be used by the company for more productive invest-

ment. (Like an executive flat on the Gold Coast).

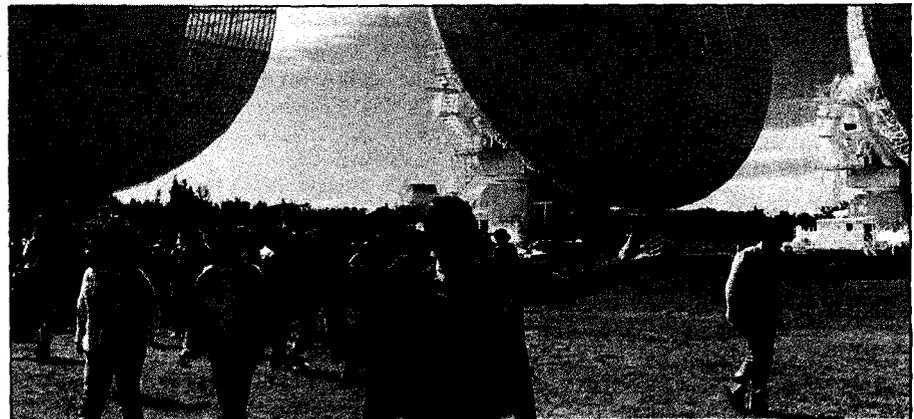
Let readers think that we might be gilding the lily here, just a bit, consider that the Pentagon once paid US\$10k to fit ashtrays to a Boeing 707, (that's US\$10,000 per ashtray) or that another sub-contractor was able to charge a similiar amount for step ladders.

Now, however, it appears that US industry is taking this process one step further, and supplying goods before the Pentagon has even asked for them. According to a report in the New York Times, Unisys, the computer company, sent five of its computers to the National Guard, and a few days later, sent the bill, for US\$17.5m.

Apparently the computers are only worth \$100k, even to the Pentagon, even if they had asked for them, so the generals finally spat the dummy, and called in the lawyers. A messy little saga has unfolded before a spell bound congressional committee, which has heard that the computers might have been part of a US\$522m deal but then again, might not have been (and you wondered how they could afford that big office in North Sydney). At last report, Unisys has taken back its computers, but the Pentagon has agreed to buy new ones if the company would care to supply them.

And you wonder why Australian companies can't compete? 

Do you know this creature?



At the recent opening of the Culgoora radiotelescope, our ETI photographer was confronted by this image resembling a homo sapiens. Was it the Dregs Hack dressed up for the occasion, someone posing for an underarm commercial or perhaps a mad salesman stopping visitors in their tracks (clicks) in an effort to flog his product?