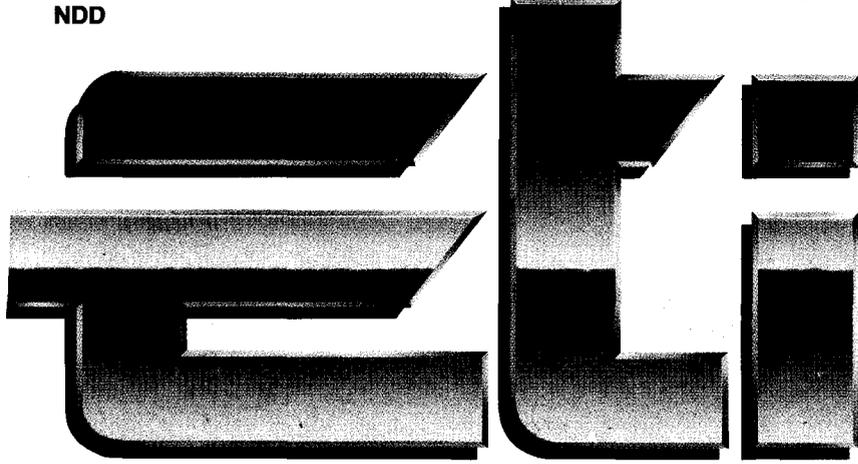
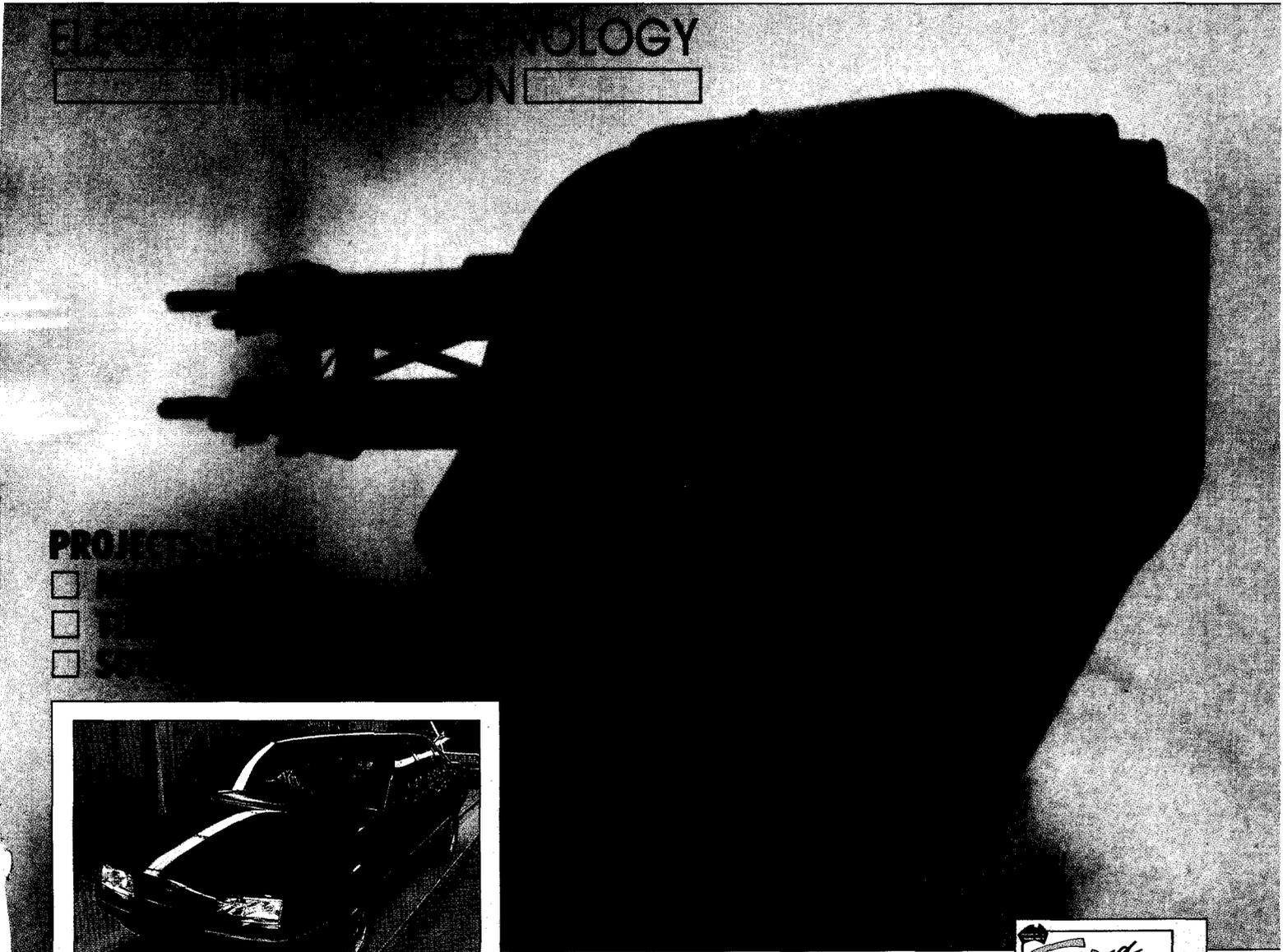


NDD



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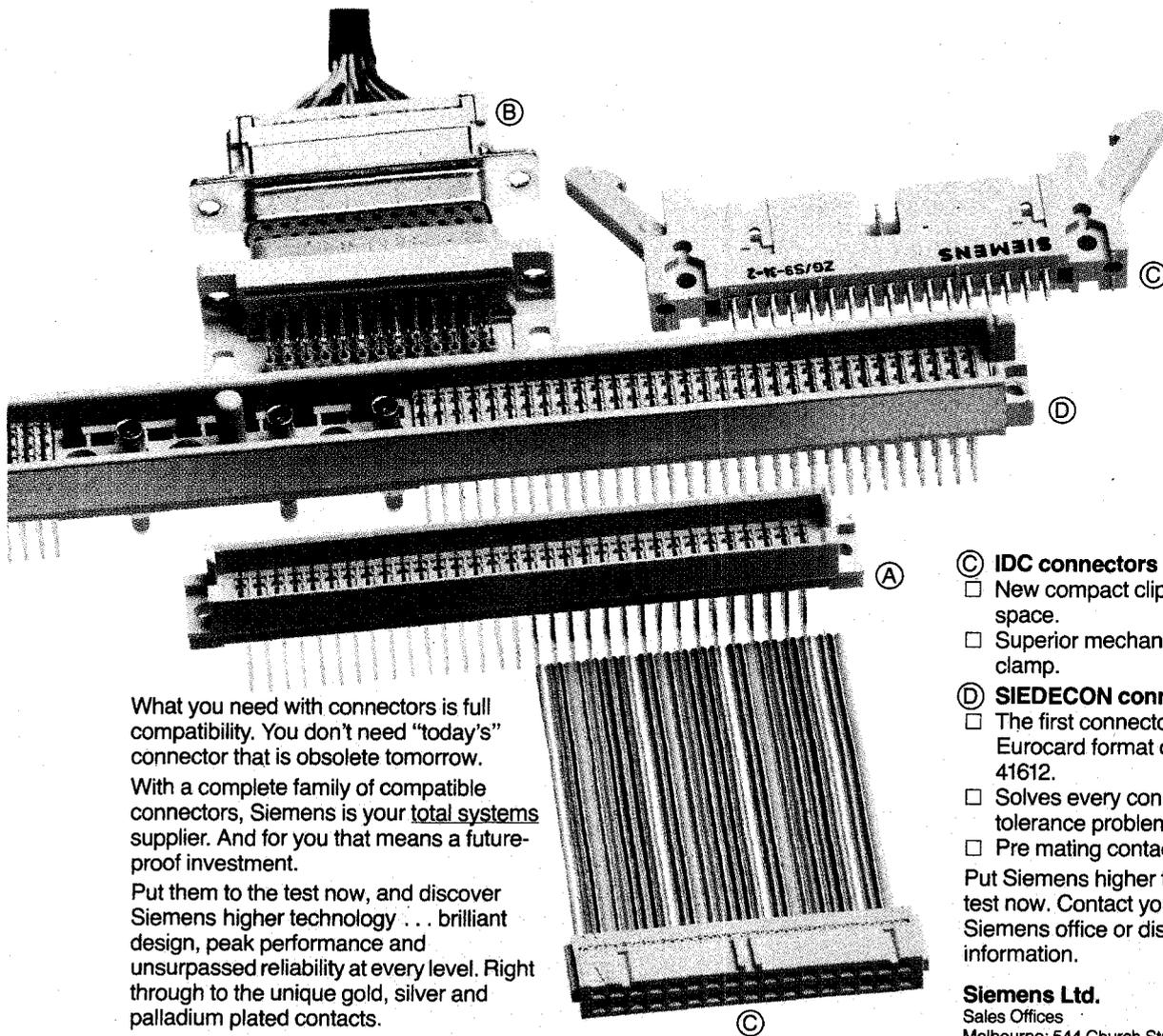
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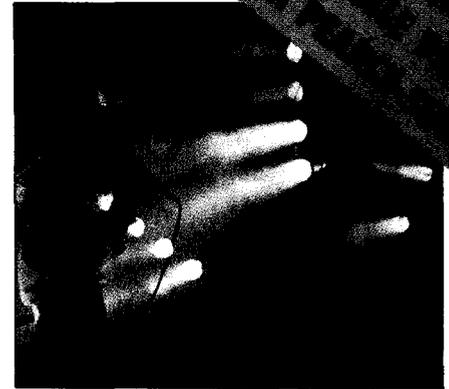
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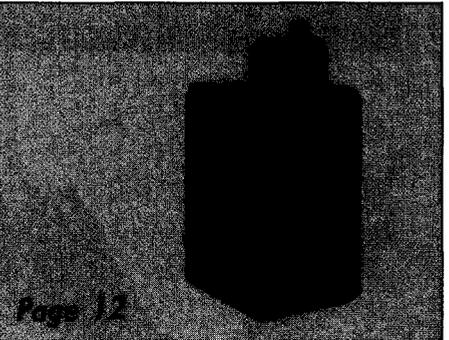


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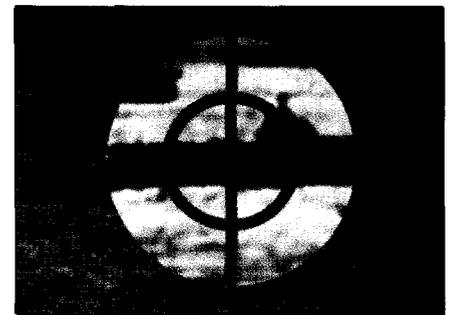
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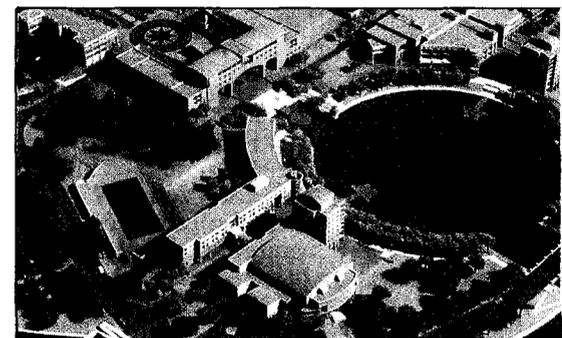
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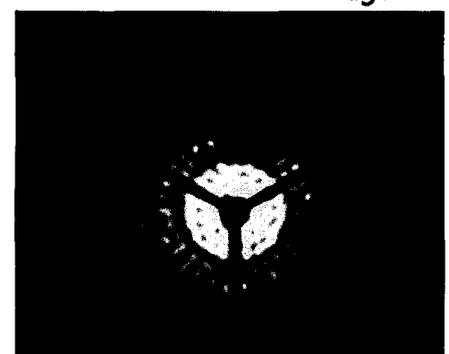


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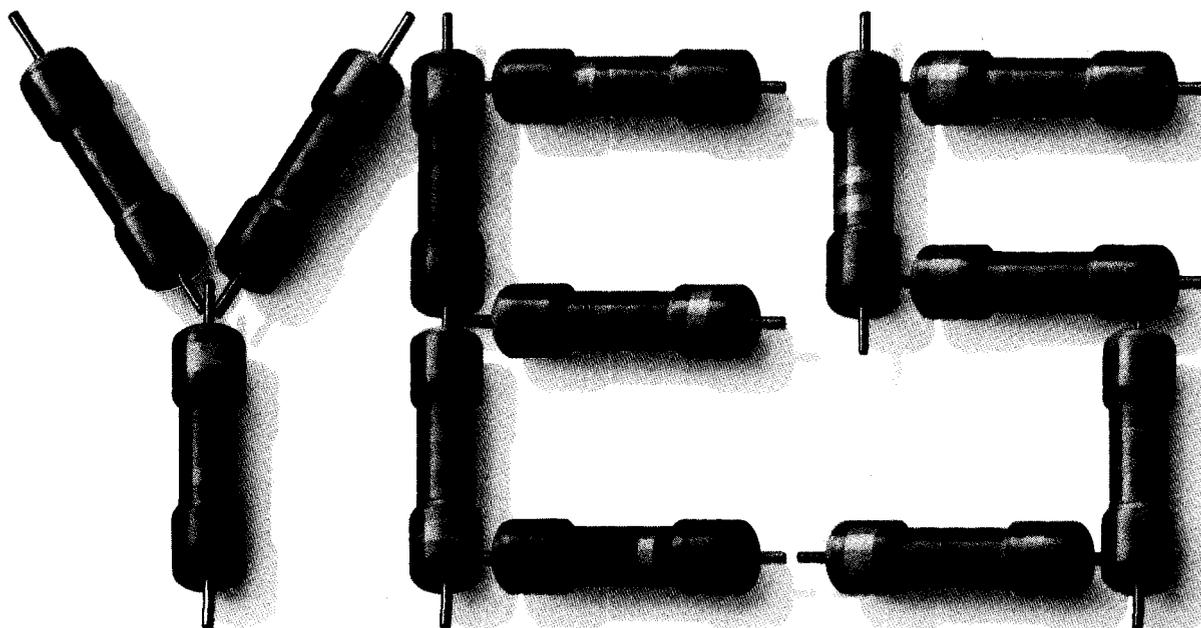
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**Cover:** Seaguard anti-aircraft guns like this may equip the next generation of ANZAC surface vessels.

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JON FAIRALL

## CSIRO — no friends, no funds

**T**he budget brought down from the new parliament house in August was small comfort to the embattled scientists at the CSIRO. Direct government funding was cut by \$13 m, and the organisation is now required to find an extra \$25 m from the private sector in order to meet the costs of current commitments.

It is rather strange that a government so committed to restructuring the economy via technology would allow the major Australian research organisation to be emasculated by a lack of funds. Its not as if the CSIRO has been inept. Rather the reverse in fact. It has been the source of considerable enhancement to the primary sector through the application of advanced genetics, minerology, animal husbandry and so on. It has pioneered much physical science, and runs arguably the best radio telescope in the world. Its scientists are published and cited regularly in all the major academic journals.

Nor is the CSIRO faced by a cabinet of technological barbarians, such as those clustered around the skirts of the British Prime Minister Margaret Thatcher. The Cape York spaceport gets \$2.2 m more, up to

*'most members of the public have not the slightest idea of what the CSIRO does'*

\$5.4 m, the Space Board \$4 m, and the government will fund investment promotion schemes. It will also increased the flexibility of Management Investment Companies, allowing increased revenue into R and D from that source.

The CSIROs problem is one of perception; most members of the public have not the slightest idea what the CSIRO does. Why should they? Unlike US institutions, whose scientists appeared ad nauseam on late night chat shows, the CSIRO's officers like to behave with a proper degree of dignity. Most definitely, they are not salesmen.

To its credit, the CSIRO has set up a public relations department. Unfortunately, its not at all clear what it actually does. Certainly its functions do not appear to include wining and dining journalists from technical magazines who might want to provide some insight into the workings of the organisations. Instead, the CSIRO presents a daunting front to any journalist without intimate connections to its individual scientists.

Deprived of insight by both scientists and journalists, the public is predictably mystified by all the fuss. The result is that the CSIRO does not have any constituency it can appeal to when the going gets tough. Unlike the ABC, (Budget up \$19 m) it has no Friends who will write letters to politicians and newspapers. Instead, it is forced to rely on the persuasiveness of its chairman and the few senior scientists who can bend the prime ministerial ear. The evidence is that it's not enough, and we will all be the poorer because of it.

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### ADVERTISING

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**Britain:** Peter Holloway, C/- John Fairfax & Sons, 12 Norwich Street, London EC4A 1BH. Phone: 353-9321.

### ELECTRONICS TODAY INTERNATIONAL

is published and distributed monthly by The Federal Publishing Company Pty Limited, 180 Bourke Road, Alexandria, NSW 2015, under licence from Double Bay Newspapers Pty Limited, General Newspapers Pty Limited and Fairfax Community Newspapers Pty Limited. Printed by Hannanprint, Sydney. Distributed by Newsagents Direct Distribution, Alexandria, NSW 2015.

\*Maximum and recommended Australian retail price only. Registered by Australian Post. Publication No. NBPO407. ISSN No. 0013-5216. COPYRIGHT© 1985, Double Bay Newspapers Pty Limited, General Newspapers Pty Limited and Fairfax Community Newspapers Pty Limited (trading as "Eastern Suburbs Newspapers").



## Industry News



Steve Vardy

Praxa, a Co-operative Marketing Partner with Digital Equipment Corporation (DEC), has expanded its service network into Queensland.

Brisbane born Steve Vardy has returned home after 6 years to head Praxa's Queensland operation.

★ ★ ★

Peter Jeffery, who worked in production on the Concorde project in the UK has joined Sydney add-on board designer and builder Hypertec — with similar responsibilities.

Further appointments announced by Hypertex are Paul Knight, Senior Hardware Engineer; John Mylordis, Senior Software Engineer; Barry O'Connor, Senior Technical Engineer and Phillip Moore, Client Support Representative.

★ ★ ★

Queensland Macintosh desktop publishing specialists, Laser Type Systems, a division of Byte Technologies, has appointed two new executives.

Colin Filshie has been appointed senior systems consultant.

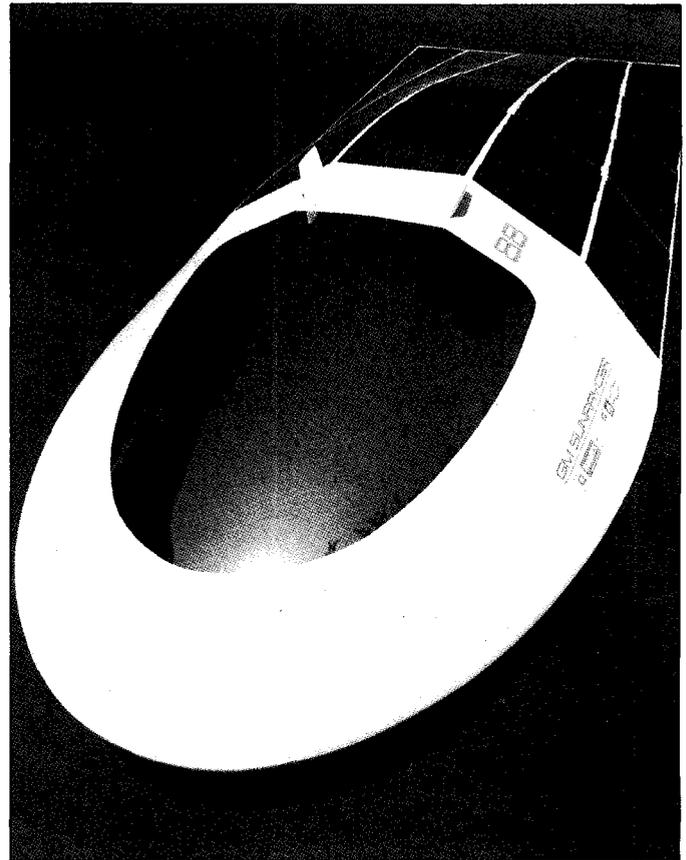
Gordon Wright has been appointed senior customer support specialist for desktop publishing technology in the printing industry.

## Sunrayer speed record

*Electric Vehicle News* has reported new speed records for GM's electrically powered Sunrayer. It now has an officially recognised top speed under solar power alone of 77.93 kph. Unofficial trials have seen Sunrayer clock over 85 kph.

With batteries, the car has done even better. It currently holds the battery powered record, at 120.04 kph over the officially recognised 10 km course. To do this speed, it was necessary for Sunrayer to reach a top speed of some 136 kph, faster than some petrol powered vehicles. To achieve this record, Sunrayer used five 24 V super light lead acid batteries.

The driver of the car during its record breaking season was Molly Brennan. Almost as remarkable as the car, Brennan is an engineering manager for GM. She graduated summa cum laude from Michigan State University and did postgraduate work as a Rhodes scholar at Oxford. She is also an All American sprinter, and holder of 14 women's track records.



*General Motors Sunrayer, which now holds world records for both the fastest solar powered car and the fastest using battery power.*

## Kiwi defences

In spite of uncertainty surrounding the country's defence budget, New Zealand is making a major commitment to defence software. Phillips subsidiaries PEAB of Sweden, Signaal of Holland, and Phillips Defence Systems of Australia have combined to set up a specialist software house in New Zealand.

Two contracts in particular appear to have been the main incentive for the con-

tract. The New Zealand armies Command and Control system requires updating, and two RNZN frigates, HMNZS Canterbury, and HMNZS Wellington, are to be refitted within the near future.

Eclipsing this however, is the ANZAC ship project. (See p. 48). Both the prime contenders for the contract use Philips equipment in their overseas version, so Philips equipment in the local design

would be a logical choice.

There is considerable uncertainty about the participation of the New Zealanders in the project. Placing industrial capacity in the country is seen as one way to shore up the Kiwis flagging enthusiasm.

The facility will use ADA, the US defence departments computer language, for the development of its systems.

## Snowy communications link

Mitec, the company set up by Queensland University to market microwave equipment, has scored considerable success by winning a contract to supply microwave equipment for Cabramurra in the Snowy Mountains. A 2 Mbit digital link is to be instituted to replace an aerial wire system.

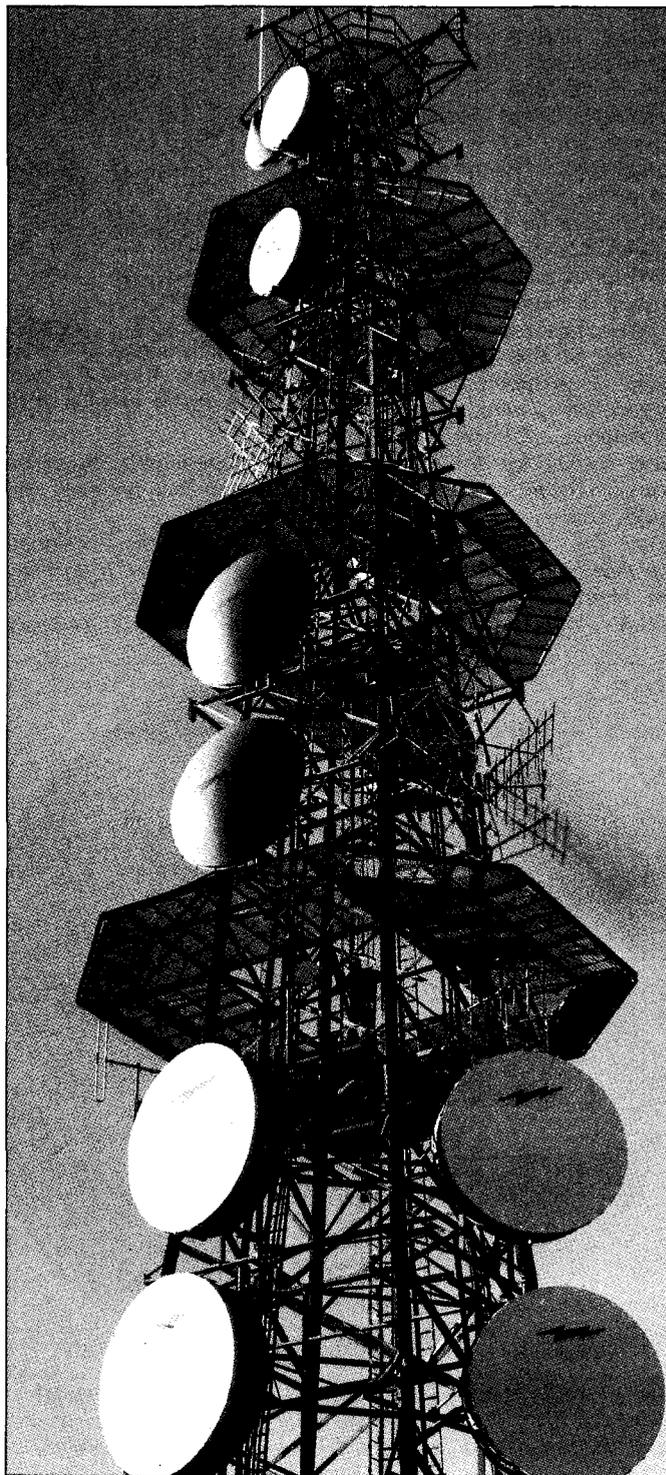
Snowy mountains communications engineers Kerry Nufer and John McGee first recognised that Mitec equipment would be suitable for communications in the high country when they visited a communications convention in Sydney during 1987. Mitec had a video link on display that had a bandwidth in excess of their requirements, and they invited Mitec engineers to consider tendering for the job.

In the event, it was comparatively simple to design an interface to allow a CCITT G703 compatible communications link to be mated with the FM video microwave link.

According to Mitec publicity, the new link has a considerable price advantage over other comparable products. It will carry 30 channels and is fully compatible with ISDN primary rate services.



*Kerry Nufer inspects the Mitec unit which is housed inside an ice proof fibreglass dome on the 50 metre high communications tower at Cabramurra in the Snowy mountains.*



## Industry News

Technico Electronics (Melbourne Office) has moved to; 23 Lakeside Drive, Tally-Ho Technology Park, Burwood East, Victoria 3151 or P.O. Bag 30, Mount Waverley, Victoria 3149. ☎ (03) 235-3685, (03) 235-3686

★ ★ ★

IRH Components have appointed Denis Lamb as Managing Director. Lamb was formerly General Manager.

IRH also announced the appointment of Bob Roughton as Product Manager. Mr Roughton was formerly the Manager of Bell-IRH (NZ), based in Auckland, NZ.

★ ★ ★



*Graeme Young*

Amber Technology has announced the appointment of Graeme Young to its Melbourne sales team.

Graeme has an in-depth practical knowledge of the professional audio industry. Before joining Amber he was principal sales executive of Cunningham Consolidated.

Lance Beal, General Manager Victoria, said Graeme's formal qualifications together with his industry experience will further increase Amber's presence in the Victorian market.

Industry News

The major business divisions of the Adelaide-based Quentron hi-tech group — representing about 90 per cent of the company's \$6 million annual turnover — have been sold by the receiver and manager.

★ ★ ★

Paul Berry has been appointed Sales Executive, Dynamic Sound Plus Vision a member of the Andrew Sweeney Electronics Group.

He will be responsible for customer service and technical support for the New England Digital range of digital audio systems plus a range of Dynamic Sound products.

Paul Berry comes from a substantial background as a senior technician in the broadcast industry.

★ ★ ★

ACME Electronics, a part of the James Hardie Technologies group, has appointed Ted Harnett to the position of Product Manager.

Mr Harnett, 28, will be responsible for the large range of ACME products. He will be based in the company's national head office in the Melbourne suburb of Box Hill.

★ ★ ★

Gordon Jalkemo has been appointed General Manager for Integral Fibre Systems (IFS), a member of the Andrew Sweeney Electronics Group.

Mr Jalkemo who comes from a business and technical background in communications and computing, was project director at Tower Technology prior to joining IFS.

IFS is a Data Communications company that has developed shorthaul and Local Area Network equipment based on fibre optic technology with installations in commercial high security applications.

CAD link

AWA Microelectronics has further solidified its links to British Aerospace Australia with the implementation of a satellite link dedicated to carry CAD information between Sydney and Adelaide.

BAeA and AWA first became partners with the creation of AWAM and its new microelectronics facility at Homebush, now nearing completion. The plant was set up to specialise in Application Specific Integrated Circuit (ASIC) manufacture. The NSW government is the third partner in the joint venture.

BAeA has established itself as one of the most prolific users of microelectronics in this country, with a number of defence contracts. Thus a local facility for the production of these devices made good strategic sense. However, the distance between the Adelaide head office and the Homebush NSW site of AWAM has been something

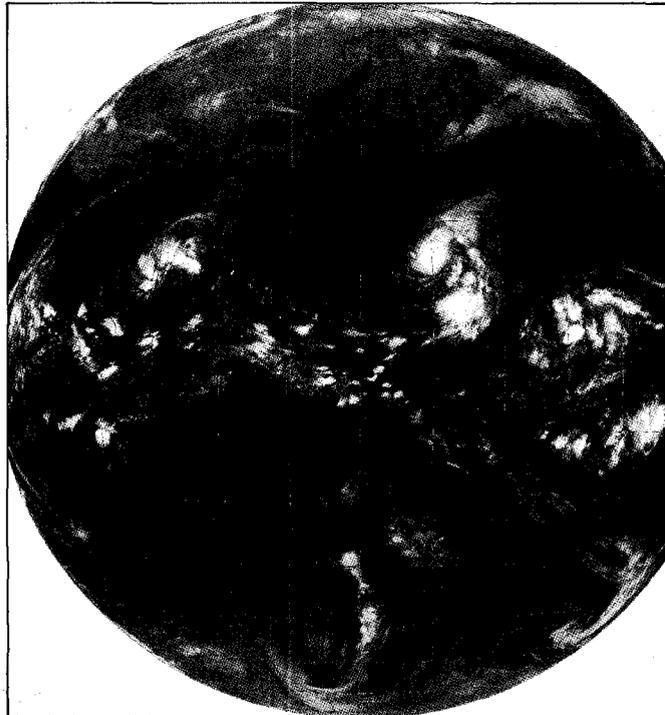


Brian Harris of British Aerospace and Peter Crawford of AWAM at the opening of the new BAeA link.

of an impediment, thus the need for a link between the two.

The link has been designed by BAeA. Initially it was by landline, but now the M-Sat system has been implement-

ed. This allows a suite of Apollo workstations in Adelaide running Mentor graphics CAD software to talk directly to the six inch CMOS silicon fabrication facility in Sydney.



The view from space on 1st December, 1986. This photograph was computer enhanced on earth after having been transmitted from the current GMS satellite. GMS-5 will improve resolution greatly.

GMS-5 order

The Hughes Aircraft company has been awarded the contract to build Japan's fifth weather satellite. The NEC corporation of Japan will supply elements of the communication and sensing payload of the Hughes satellite.

Hughes won the contract for Aussat's second series of satellites recently, but lost out on the recent order for the new Intelsat order. That went to Ford Aerospace. Hughes is scheduled to have the Aussats ready sometime in 1991, and the Japanese satellite ready by 1995.

The new satellite will be known as GMS-5. Australian weather pictures are now all sourced from the current GMS satellite, which is due to come to the end of its working life shortly. Presumably, GMS-5 will be the source of all our weather pics until the next century.

## Maths in industry

The CSIRO division of Mathematics and statistics will hold its fifth mathematics-in-industry seminar at Monash University between January 31 and February 4, 1989. The meeting will be interesting to anyone interested in the transfer of mathematical ideas to industry. The division has put out a call for workers or managers in industry who would like to propose scientific problems for consideration.

The format of the study group will be unchanged from previous years, with about 20

industrial researchers and 50 mathematicians in attendance. The director has the chance of identifying about eight industrial problems which are considered of national importance and amenable to mathematical modeling. These problems will be considered collectively during the study group. A modest fee is charged and opportunities are available for detailed follow up work.

Further information is available from Dr N. Barton at Maths and Stats ☎ on (02) 467-6702.

## The armchair punter

A new service on Viatel, the national videotex network, has joined the list of facilities now available to the punter. Accuratings has been running since 1983, providing professional help to racegoers. Now it has extended its service to Viatel on page \*66693#.

Currently, the Victorian and West Australian TAB are both available on Viatel, with up to the minute odds, and even a bet placement service. The NSW TAB is also joining the service in the near future.

Dennis Abramson, the managing director of Accu-

ratings uses a lot of electronic media to bring information from the racecourse to punters.

### Friedman Graphic Equaliser Contest

The winners were:

Peter Klitscher  
Coonalpyn, SA  
Darryn Farrugia  
Thomastown, Vic  
Peter Richler  
Redcliffe, Qld

The contest was drawn on August 16. Winners were notified by mail.

## Pathfinder

### finds

### home

The Nissan Pathfinder Subscription offer has been drawn with the lucky winner being:

D. Doherty  
22 Queens Road,  
Tighes Hill 2297. NSW

The vehicle was handed over on September 4 at the official closing ceremony of the 1988 Wynn's Safari.

Congratulations!



## NDD briefs

### Aussies

Officials of the giant Nippon Denshin Denwa (NDD), the Japanese Telecom, gave a special briefing for Australian exporters recently. The aim of the meeting was to allow Australian exporters a better chance at getting a slice of the Y35b (\$325m) annual equipment budget spent by the Japanese.

NDD is Japan's biggest user of imported communications product. Although the Japanese market is notoriously hard to crack, the Japanese in recent months have been signalling their willingness to buy offshore, particularly in the communications and electronics arena, because of internal and external political pressure.

The Japanese apparently told Austrade, the Australian export development agency, that it wanted to know more about the capability of Australian companies to supply some of its needs.

During the past year, NDD has purchased PBX, and private line switching equipment, data terminal equipment, modem and network control units, computer system memory, video information retrieval terminals and so on, from overseas.

## Industry News



Keith Murray

Datacraft Australia has appointed Mr Keith Murray as Manager, Systems and Marketing in its New South Wales office.

Mr Murray has re-joined Datacraft after 12 months with Prime Computers where he was Product Marketing Manager — Communications.

He was previously with Datacraft for four years and was Senior Engineer, Special Projects Group.

★ ★ ★

One of Australia's most distinguished academics, Professor John H. Carver, Director of the Research School of Physical Sciences, at ANU, has been appointed Chairman of the aerospace concern, Auspace Limited.

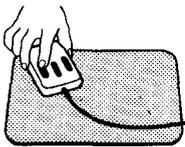
Professor Carver, who is also a Director of the Australian Space Board and a Member of the Board of ANUTECH, takes up the appointment immediately.

★ ★ ★

Ian Laird of Avenue Audio-visual Services was the lucky winner of a case of Richmond Grove champagne when he visited Amber Technology's booth during the recent SMPTE show.

Ian was one of hundreds of the Amber booth's visitors who were asked to drop their business cards in a container located in the booth, with the chance to win the champagne.

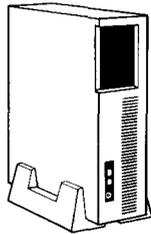
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\$50 - ..... \$5.00

**FREE POSTAGE FOR ETI READERS THIS MONTH**  
for b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, z, aa, ab, ac, ad, ae, af, ag, ah, ai, aj, ak, al, am, an, ao, ap, aq, ar, as, at, au, av, aw, ax, ay, az, ba, bb, bc, bd, be, bf, bg, bh, bi, bj, bk, bl, bm, bn, bo, bp, bq, br, bs, bt, bu, bv, bw, bx, by, bz, ca, cb, cc, cd, ce, cf, cg, ch, ci, cj, ck, cl, cm, cn, co, cp, cq, cr, cs, ct, cu, cv, cw, cx, cy, cz, da, db, dc, dd, de, df, dg, dh, di, dj, dk, dl, dm, dn, do, dp, dq, dr, ds, dt, du, dv, dw, dx, dy, dz, ea, eb, ec, ed, ee, ef, eg, eh, ei, ej, ek, el, em, en, eo, ep, eq, er, es, et, eu, ev, ew, ex, ey, ez, fa, fb, fc, fd, fe, ff, fg, fh, fi, fj, fk, fl, fm, fn, fo, fp, fq, fr, fs, ft, fu, fv, fw, fx, fy, fz, ga, gb, gc, gd, ge, gf, gg, gh, gi, gj, gk, gl, gm, gn, go, gp, gq, gr, gs, gt, gu, gv, gw, gx, gy, gz, ha, hb, hc, hd, he, hf, hg, hh, hi, hj, hk, hl, hm, hn, ho, hp, hq, hr, hs, ht, hu, hv, hw, hx, hy, hz, ia, ib, ic, id, ie, if, ig, ih, ii, ij, ik, il, im, in, io, ip, iq, ir, is, it, iu, iv, iw, ix, iy, iz, ja, jb, jc, jd, je, jf, jg, jh, ji, jj, jk, jl, jm, jn, jo, jp, jq, jr, js, jt, ju, jv, jw, jx, jy, jz, ka, kb, kc, kd, ke, kf, kg, kh, ki, kj, kk, kl, km, kn, ko, kp, kq, kr, ks, kt, ku, kv, kw, kx, ky, kz, la, lb, lc, ld, le, lf, lg, lh, li, lj, lk, ll, lm, ln, lo, lp, lq, lr, ls, lt, lu, lv, lw, lx, ly, lz, ma, mb, mc, md, me, mf, mg, mh, mi, mj, mk, ml, mm, mn, mo, mp, mq, mr, ms, mt, mu, mv, mw, mx, my, mz, na, nb, nc, nd, ne, nf, ng, nh, ni, nj, nk, nl, nm, nn, no, np, nq, nr, ns, nt, nu, nv, nw, nx, ny, nz, oa, ob, oc, od, oe, of, og, oh, oi, oj, ok, ol, om, on, oo, op, oq, or, os, ot, ou, ov, ow, ox, oy, oz, pa, pb, pc, pd, pe, pf, pg, ph, pi, pj, pk, pl, pm, pn, po, pp, pq, pr, ps, pt, pu, pv, pw, px, py, pz, qa, qb, qc, qd, qe, qf, qg, qh, qi, qj, qk, ql, qm, qn, qo, qp, qq, qr, qs, qt, qu, qv, qw, qx, qy, qz, ra, rb, rc, rd, re, rf, rg, rh, ri, rj, rk, rl, rm, rn, ro, rp, rq, rr, rs, rt, ru, rv, rw, rx, ry, rz, sa, sb, sc, sd, se, sf, sg, sh, si, sj, sk, sl, sm, sn, so, sp, sq, sr, ss, st, su, sv, sw, sx, sy, sz, ta, tb, tc, td, te, tf, tg, th, ti, tj, tk, tl, tm, tn, to, tp, tq, tr, ts, tt, tu, tv, tw, tx, ty, tz, ua, ub, uc, ud, ue, uf, ug, uh, ui, uj, uk, ul, um, un, uo, up, uq, ur, us, ut, uu, uv, uw, ux, uy, uz, va, vb, vc, vd, ve, vf, vg, vh, vi, vj, vk, vl, vm, vn, vo, vp, vq, vr, vs, vt, vu, vv, vw, vx, vy, vz, wa, wb, wc, wd, we, wf, wg, wh, wi, wj, wk, wl, wm, wn, wo, wp, wq, wr, ws, wt, wu, wv, ww, wx, wy, wz, xa, xb, xc, xd, xe, xf, xg, xh, xi, xj, xk, xl, xm, xn, xo, xp, xq, xr, xs, xt, xu, xv, xw, xx, xy, xz, ya, yb, yc, yd, ye, yf, yg, yh, yi, yj, yk, yl, ym, yn, yo, yp, yq, yr, ys, yt, yu, yv, yw, yx, yy, yz, za, zb, zc, zd, ze, zf, zg, zh, zi, zj, zk, zl, zm, zn, zo, zp, zq, zr, zs, zt, zu, zv, zw, zx, zy, zz

For effective protection such spikes must be stopped before they reach your equipment. Simply plug The Button into an outlet and it will protect all equipment plugged into adjacent outlets on the same branch circuit. The Button employs unique metal oxide varistor technology and will dissipate 150 joules of electrical energy. (nearly twice that of comparable surge arresters.)

Errors and omissions excepted. Prices and specifications subject to change.

IBM®, PC®, XT®, AT® are registered trademarks of International Business Machines. Apple is a registered trademark. Denotes registered trademarks of their respective owners.



### PRINTER RIBBONS TO SUIT:

CP80, SX80, DP80, BX100

MB100 (C22036) 10+  
\$8.95 \$7.95

MX70/80 FX70/80 RX70/80

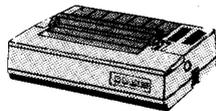
1-9 (C22031) 10+  
\$8.95 \$7.95

MX100, FX100, RX100

1-9 (C22002) 10+  
\$19.95 \$18.95

LX80 (C22003) 10+  
\$9.95 \$8.95

LQ1000 (C22012) 10+  
\$27.60 \$25.00



### CANON A-50 PRINTER

- Serial Impact Dot Matrix
- 180 C.P.S
- Near Letter Quality Mode
- 1.4K Buffer

Cat. C20045 ..... \$595

### PRINTER LEAD

- Suits IBM® PC/XT, compatibles
- 25 pin "D" plug (computer end) to Centronics 36 pin plug

P19029 (1.8 metres) \$14.95

P19030 (3 metres) ... \$19.95



### PRINTER STANDS

- Restores order to your work area.
- Conveniently stacks paper printout in document tray automatically
- Made of black plastic coated steel
- Suitable for most printers (80/132 column)
- Excellent value at these prices!



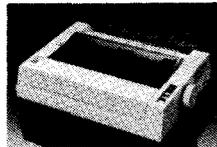
### THE BUTTON SPIKE PROTECTOR

Surges and spikes are caused not only by lightning strikes and load switching but also by other equipment being switched on and off, such as fluorescent lights, electric motors, fridge freezers, air conditioners, etc.

For effective protection such spikes must be stopped before they reach your equipment. Simply plug The Button into an outlet and it will protect all equipment plugged into adjacent outlets on the same branch circuit. The Button employs unique metal oxide varistor technology and will dissipate 150 joules of electrical energy. (nearly twice that of comparable surge arresters.)

**SPECIFICATIONS:**  
Voltage: 240V Nominal  
Total Energy Rating: 150 joules  
Response Time: 10ns  
Protection Level: 350V peak

..... \$34.95



### PANASONIC KX-P1081 DOT MATRIX PRINTER

- 120 C.P.S.
- Pica or Elite character set
- Print Modes: NLO, Dot Graphics, Draft, Proportional Font.
- Reliable and Compact
- Proportional Printing
- Logic Seeking
- 1K Printer Buffer

C20035 Normally \$595  
We won't be beaten! only \$379



### IBM® XT\* COMPATIBLE KEYBOARD

- 100% IBM® PC®, XT\* compatible
- Low profile keyboard design
- Proper placement of shift keys with large key tops to suit professional typists.
- 3 step height/angle adjustment
- Cherry brand TS-M00001 19mm low profile switches, meet 30mm ergonomic requirement and provides high performance and maximum reliability.
- Curl lead plugs straight into PC
- 3 Status displays

Just like the "Real McCoy" only at a fraction of the price!  
Cat.X12020 .... only \$89



### IBM® XT\* & AT\* COMPATIBLE EXTENDED KEYBOARD (101 KEYS)

These new keyboards are both XT\* and AT\* compatible!

- 20 Dedicated function keys
- Enlarged "Return" and "Shift" key
- Positive feel keys
- Low Profile Design, DIN standard
- Separate Numeric and Cursor control keypads
- Additional Functions...

Key-LOCK, Audio Beep, Previous Word, Next Work, Fast Repeat, Line Feed, Pause, Clear Screen, Reset.

X12022 ..... ONLY \$109

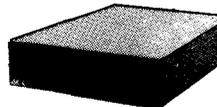


### PRINTER LEAD

- Suits IBM® PC/XT, compatibles
- 25 pin "D" plug (computer end) to Centronics 36 pin plug

P19029 (1.8 metres) \$14.95

P19030 (3 metres) ... \$19.95

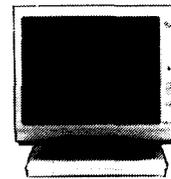


### APPLE® COMPATIBLE SLIMLINE DISK DRIVE

Compatible with Apple 2+  
Cat. X19901 ..... Only \$179

### APPLE® IIC COMPATIBLE DISK DRIVE

(including cable ..... only \$199  
(\*Apple is a registered trade mark.)



### RITRON 2 MONITORS

Stylish 20MHz monitors available in green or amber displays and with built-in swivel and tilt base.

**SPECIFICATIONS:**  
CRT Display Size: 12 inches

non-glare 90 degree deflection.

Input Signal: 1.0 - 2.5V p-p composite video signal.

Input Impedance: Normal 75 ohm, high approximately 50K ohm.

Input Terminals: RCA phone jack.

Rise and Fall Time: Less than 25 us

Video Bandwidth: 20MHz

Corner: 800 lines

Geometric distortion: 2% or less

Linearity: less than 2%

Controls:

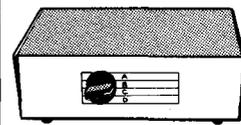
Front: Power On/Off, brightness, contrast.

Rear: Vertical hold, Horizontal hold, Vertical line, Vertical size.

Green Cat.X14506 ..... \$179

Amber Cat.X14508 ..... \$179

ONLY \$149



### DATA TRANSFER SWITCHES

If you have two or four compatible devices that need to share a third or fifth, then these inexpensive data transfer switches will save you the time and hassle of constantly changing cables and leads around.

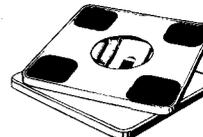
- No power required
- Speed and code transparent
- Two/Four position rotary switch on front panel
- Three/Five interface connections on rear panel
- Switch comes standard with female connector

2 WAY RS232 X19120 ..... \$49

4 WAY RS232 X19125 ..... \$59

2 WAY Centronics X19130 ..... \$49

4 WAY Centronics X19135 ..... \$59



### SWIVEL BASE

Make life easier with these quality, swivel and tilt bases, complete with rubber fittings!

Cat.D11100 (12") \$24.95

Cat.D11101 (14") \$29.95



### RS232

### GENDER CHANGERS

- Saves modifying or replacing non-mating RS232 cables.
- All 25 pins wired straight through

Cat.X15650 Male to Male

Cat.X15651 Male to Female

Cat.X15652 Female to Female

Normally \$14.95 each

Only \$9.95\*\*

### DB15

### GENDER CHANGERS

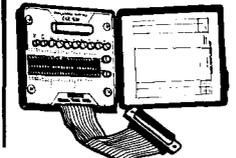
- Saves modifying or replacing non-mating DB15 connections
- All 15 pins wired straight through

X15645: Male to Male

X15646: Male to Female

X15647: Female to Female

..... only \$14.95



### RS232 BREAK OUT BOX

A simple way of monitoring RS232 interface lead activity. Interface powered, pocket size for circuit testing, monitoring and patching.

**SPECIFICATIONS:**  
10 signal powered LED's and 2 spares. 24 switches enables you to break out circuits or reconfigure and patch any or all the 24 active positions.

**SPECIFICATIONS:**  
Connectors: DB25 plug on 80mm ribbon cable and DB25 socket.

Indicators: Tricolour LED's for TD, RD, RTS, CTS, DSR, CD, TC, RC, DTR, (E)TC.

Jumper Wires: 20 pieces.

Power: Interface power.

Dimensions: 85 x 95 x 30mm

X15700 ..... \$94.95



### COMPUTER CABLE

CIC6 6 conductor computer interface cable. Colour coded with braided shield. (to IE422 specifications). Copper conductor 6 x 7/0.16mm.

1-9 metres 10+ metres

\$1.90/m \$1.70/m

CIC9.100 9 conductor computer interface cable. Colour coded with mylar shielding. 9 x 7/0.16mm.

1-9 metres 10+ metres

\$2.50/m \$1.95/m

CIC12 12 conductor computer interface cable. Colour coded with mylar shielding. 12 x 7/0.16mm.

1-9 metres 10+ metres

\$2.70/m \$2.50/m

CIC16 16 conductor computer interface cable. Colour coded with mylar shielding. 16 x 7/0.16mm.

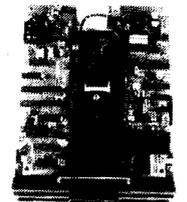
1-9 metres 10+ metres

\$3.90/m \$3.40/m

CIC25 25 conductor computer interface cable. Colour coded with mylar shielding. 25 x 7/0.16mm.

1-9 metres 10+ metres

\$4.90/m \$4.40/m



### MITSUBISHI 5 1/4" DRIVE 4851/MF501

Slimline 5 1/4" disk drive, double sided, double density. 500K unformatted, 360K formatted. 40 track/side. Steel band drive system.

Cat. C11901 ..... \$239

### MITSUBISHI 5 1/4" DRIVE 4854/MF504

Slimline 5 1/4" disk drive, double sided, high density, 1.6MB unformatted, 1.2MB formatted.

Cat. C11904 ..... \$279

### MITSUBISHI 3 1/2" DRIVE MF353C

Double sided, double density, 1MB unformatted, 720K formatted.

C11908 ..... \$239

C11909 Incl 5 1/4" mount bracket \$269

### MITSUBISHI 3 1/2" DRIVE MF355

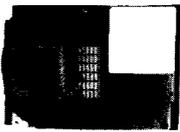
1.6 M unformatted, 1M formatted.

C11910 ..... \$269

C11911 Incl. 5 1/4" mount bracket \$299

### 5 1/4" MOUNTING BRACKET KIT FOR 3 1/2" DRIVE

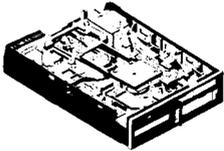
X11050 ..... \$29



**20 M/BYTE HARD DISK**  
Tandon drive with controller card.  
IBM\* compatible. 12 month warranty.  
X20010 ..... **ONLY \$495**

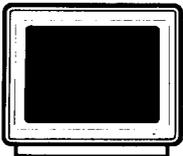
**40 M/BYTE HARD DISK**  
Seagate drive, IBM\* compatible.  
12 month warranty.  
X20020 ..... **ONLY \$649**

**80 M/BYTE HARD DISK**  
Seagate drive, IBM\* compatible.  
12 month warranty.  
X20030 ... **ONLY \$2,490**



**FUJITSU 5 1/4" 1.2 M/BYTE DRIVE**  
• 1.2 M/Byte unformatted, (720K formatted).  
• IBM\* AT\* compatible  
• Quality at an affordable price  
Cat.C11906 ..... **\$249**

**FUJITSU 3 1/2" DRIVE**  
• 1 M/Byte unformatted  
640K formatted  
• Double sided, double density,  
• Affordable quality  
Cat. C11905 ..... **\$255**



**GOLDSTAR 20MHZ COMPOSITE MONITOR**  
X14514 (GREEN) . \$119  
X14516 (AMBER) . \$119  
10 OR MORE \$109 EACH

**GOLDSTAR 12" TTL MONITOR**  
X14500 (GREEN) . \$139  
X14502 (AMBER) . \$139  
10 OR MORE \$129 EACH

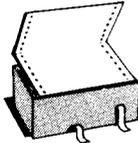


**SCHMIDT 123AT MULTI STANDARD MODEM**  
• V21, V22, V23 Multi standard modem (300/300, 1200/1200, 1200/75)  
• Auto dial "AT" command set (Hayes\* compatible)  
• Auto answer/auto disconnect  
• Auto answerback (Similar to Telex)  
• Auto or manual control  
• Dial-up or leased line operation  
• Pulse or Tone Dialing  
• Automatic speed ranging  
• Speaker for call progress monitoring  
• Baud-rate converter with 48 character buffer (V23)  
• Synchronous or asynchronous operation  
• Fully self contained power supply  
• Low power operation  
• Metal case (R.F. shielded)  
• Visual monitoring of important interface circuits (7 LED's)  
• Full or half duplex (V23)  
• Double adaptor plug to allow use of standard phone (Mode 1/3/5)  
• Telecom Authorised (C87/37/65)  
..... **\$595**

\*Hayes is a trademark of Hayes Microcomputer Products Inc.



**COPY HOLDER (YU-H33)**  
• Copy area 9 1/2" x 11"  
• Sliding line guide  
• Flat metal base  
C21060 ..... **\$39.95**



**COMPUTER PAPER**  
Quality paper at a low price!  
2,000 sheets of 70 gsm bond paper.  
C21003 11 x 9 1/2" . **\$39.95**  
C21005 15 x 11" . **\$67.95**



**THOMSON EGA MONITOR**  
Top quality high resolution EGA monitors with a space-age design.  
**SPECIFICATIONS:**  
CRT: 14 inch (360mm) diagonal, 90 degree deflection.  
Display Size: 245(H) x 180(V)mm  
Phosphor: P22, non glare, tinted screen.  
Dot Pitch: 0.38mm  
Video Bandwidth: 18 MHz  
Resolution: 15-75KHz - 640 x 200  
21-85KHz 640 x 350  
**Input Signals:**  
1. RGBI - positive, H(+), V(+)  
2. RrGgBbl - positive, H(+), V(-)  
**Input Impedance:** 330 ohms  
**Dual Scanning Frequency:**  
Horizontal: 15-75 KHz or 21-85 KHz  
+ - 10Hz  
Vertical: 50 - 60 Hz  
**Connector:** 9 pin, D-type  
**Size:** 312(H) x 363(L) x 380(W)mm  
**Weight:** 10-8 Kg (Net)  
X14525 ..... **\$695**  
EGA CARD ..... **\$195**

PRICE BREAKTHROUGH!

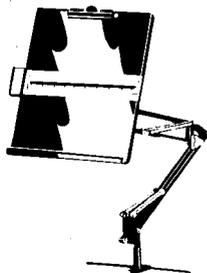
## VGA MONITORS

**\$995**

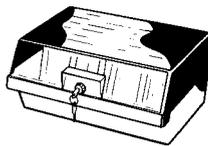


**3 1/2" DISK STORAGE (DD80-L)**  
• Holds up to 80 x 3 1/2" diskettes.  
• Smoked plastic hinged lid  
• Lockable (2 keys supplied)  
• High impact plastic base  
• Contemporary design  
C16038 ..... **only \$19.95**

**3 1/2" DISK STORAGE**  
• Holds up to 40 x 3 1/2" diskettes.  
• Lockable (2 keys supplied)  
• High impact plastic lid and base  
C16035 ..... **only \$14.95**



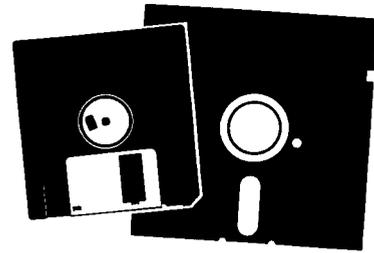
**COPY HOLDER (YU-H33)**  
• Copy area 9 1/2" x 11"  
• Sliding line guide  
• Flat metal base  
C21060 ..... **\$39.95**



**JUMBO 5 1/4" DISK STORAGE (DD120-L)**  
If you have lots of disks, you'll appreciate the extra capacity of this disk storage unit when it comes to locating a particular disk.  
**Features...**  
• 120 x 5 1/4" disk capacity  
• Smoked plastic hinged lid  
• Lockable (2 keys supplied)  
• High impact plastic base  
• Contemporary design  
C16028 ..... **only \$19.95**

**5 1/4" DISK STORAGE (DD100-L)**  
Efficient and practical. Protect your disks from being damaged or lost!  
**Features...**  
• 100 x 5 1/4" disk capacity  
• Smoked plastic hinged lid  
• Lockable (2 keys supplied)  
• High impact ABS plastic base.  
• Contemporary design  
C16020 ..... **only \$15.95**

**5 1/4" DISK STORAGE (DD50-L)**  
Efficient and practical. Protect your disks from being damaged or lost!  
**Features...**  
• 50 x 5 1/4" disk capacity  
• Smoked plastic hinged lid  
• Lockable (2 keys supplied)  
• Contemporary Design  
C16025 ..... **only \$14.95**



## "NO BRAND" DISKS!

Now you can buy absolute top quality disks that are also the cheapest in Australia! They even come with a lifetime warranty, which indicates the quality of these disks. So why pay 2-3 times the price for the same quality?

Packs of 10, D/S D/D without boxes, or brand name, just their white paper jacket, and index labels. (5 1/4" disks includes write protects).

**5 1/4" 2S/2D "NO BRAND" DISKS**  
10+ DISKS 100+ DISKS 1,000+ DISKS  
**\$6.95<sup>ea</sup> \$6.75<sup>ea</sup> \$6.50<sup>ea</sup>**  
(ALL PRICES PER 10 DISKS. TAX EXEMPT PRICES LESS \$1)

**5 1/4" HIGH DENSITY DISKS (DOUBLE SIDED)**  
10+ DISKS 100+ DISKS 1,000+ DISKS  
**\$27.95<sup>ea</sup> \$26.95<sup>ea</sup> \$25.95<sup>ea</sup>**  
(ALL PRICES PER 10 DISKS. TAX EXEMPT PRICES LESS \$1)

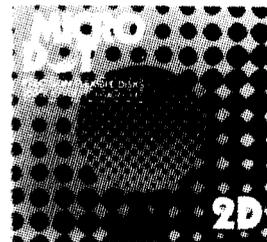
**3 1/2" 2S/2D "NO BRAND" DISKS**  
10+ DISKS 100+ DISKS 1,000+ DISKS  
**\$24 \$23 \$22**  
(ALL PRICES PER 10 DISKS. TAX EXEMPT PRICES LESS \$2)



## VERBATIM DISKS!

(ALL PRICES PER BOX OF 10 DISKS)

DESCRIPTION	1-9 BOXES	10+ BOXES
3 1/2" 1S/2D ...	\$39.95	\$37.95
3 1/2" 2S/2D ...	\$46.95	\$43.95
3 1/2" 2S/HD ..	\$99.00	\$89.00
5 1/4" 1S/2D ...	\$22.00	\$21.00
5 1/4" 2S/2D ...	\$26.00	\$24.00
5 1/4" 2S/4D ...	\$75.00	\$70.00
5 1/4" 2S/HD ..	\$41.00	\$39.00



## MICRODOT DISKS!

FREE PLASTIC LIBRARY CASE WITH EVERY 10 DISKS!

DESCRIPTION	1-9 BOXES	10+ BOXES
3 1/2" 2S/2D .....	\$32.95	\$30.95
5 1/4" 1S/2D .....	\$11.95	\$10.95
5 1/4" 2S/2D .....	\$13.95	\$12.95
5 1/4" 2S/HD .....	\$24.95	\$23.95

# HI-TECH C

## The High-Performance Family of C Compilers

HI-TECH C is now better than ever, with more processors and operating systems supported, new features and even better code optimization than before. Our compilers are wholly developed in Australia but are used by over five thousand programmers world-wide.

We emphasize in our software portability and reliability. Our compilers are 100% source code compatible and implement "Standard C", as defined by the draft ANSI standard for C. They issue an unequalled range of diagnostic messages and warnings to catch programming errors at compile time instead of run time. This is backed with consistently tighter code generation than any other compiler.

### NATIVE COMPILERS

HI-TECH C Compilers are available for the following systems:

MS-DOS/PC-DOS    CP/M-86  
Concurrent DOS    Atari ST  
Applix 1616  
Honeywell Superteam

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STUART CORNER

# TRADING IN SERVICES

## IAC inquiry feature

**Communications services today are traded like most other commodities. Stuart Corner looks at Australia's trade in international services.**

Communications are likely to feature prominently in an enquiry being conducted by the Industries Assistance Commission into Australia's trade in international services. The Commission has been instructed by the Treasurer, Paul Keating, to "identify and evaluate the effects of domestic barriers and impediments to international trade in services in relation to their effects on the efficiency and competitiveness of Australian industry and in the general context of the Uruguay round of negotiations in the General Agreement on Trade and Tariffs (GATT). The commission must also "have regard to international developments affecting Australia's trade in services."

The enquiry comes at a time when Australia is pushing GATT to establish a set of principles to allow free global trading in services such as banking insurance and communications and will overlap with the crucial World Administrative Telephone and Telegraph Conference (WATTC) on international communications regulation being held in Melbourne in November (ETI August 1988 page 28).

Communications, apart from being a service in its

own right will be crucial to most other services traded internationally, such as finance, banking and tourism.

The IAC enquiry called for submissions from interested parties to be completed in preparation for an initial round of public hearings this month. Information/discussion papers and draft report will then be issued, followed by a second round of hearings in April 1989. The Commission expects to complete its report by June 1989.

Minister for Trade, Michael Duffy, released an Australian outline of a treaty to open up international trade in services at a GATT meeting in Geneva in July. It called for a process of long term

*'... to establish a set of principles to allow free global trading'*

liberalisation in services, for foreign sellers to be treated the same as nationals within each industry, and for arrangements to prevent discrimination against service firms exporting to foreign markets. Duffy claimed that services were the fastest growing sector of the

Australian export industry, almost equal in value to the manufacture of exported goods. He claimed it was in Australia's interest to "create a treaty to reduce barriers against the export of services."

His sentiments are not shared by all. Last year, Telecom's director of corporate strategy, Roger Banks, said the push in GATT to open up the market for international trade in services would lead to "Australia becoming an intelligent terminal off an information processing hub located in the Northern Hemisphere.

The outcome of the WATTC conference will also be crucial to the development of international services based on communications. Thomas Sanders, a US lawyer specialising in communications issues, told the Comdex conference in Sydney in July that: "the WATTC conference will be the key to determining the boundary line between what the telecommunications administrations are going to do and what the users are going to do. The regulations should allow countries themselves to determine where that boundary line lies and not put a regulatory bias. We are concerned that many of the value added service providers would be defined into entities which will be regulated."

### ***If the kap fits . . .***

Acoustic modems with a speed limit of only 300 bits per second have almost disappeared from the scene with the advent of low cost direct connect modems operating at 2400 bits per

second and faster. But there are some situations where connecting direct to the phone line is just not possible.

To cater for these, a US firm ABC Data Kap Computer Inc of Miami, is offering an acoustic modem able to operate at up to 2400 bits per second, and a 9600 bps model is on the drawing board. The products went on show in Australia for the first time at Comdex in July. They won't be on sale in this country until the company finds a distributor and obtains Telecom approval, and even they then are likely to be expensive. They retail in the US for about \$US1000, (\$A1250).

The products were designed in Germany and the company claims that 20,000 are already in use in Europe. They have only recently been launched on the US market.

There are a number of models currently available. All incorporate pivoting and sliding transducers to suit different types of handset and the company claims they will operate with most handsets in use of the world today. Telephone handsets use either an electromagnetic or piezo-electric transducer in the earpiece and the modem can be switched to provide inductive rather than acoustic coupling when the phone has an electromagnetic earpiece.

The modems operate from internal rechargeable batteries which give up to six hours continuous operation. There are at present four models available. The speedy 1200+ offers 300/1200 full duplex communication. The 1200M combines a built in direct connect Hayes compatible modem. The Adam 2400+

## Communication news

and 2400M are similar, but also operate at 2400 bits per second, synchronous or asynchronous. Speed selection is automatic depending on line quality.

### Aussie OSI facility

Australia's first public facility for testing conformance to Open Systems Interconnection (OSI) standards has been opened by the National Protocol Support Centre (NPSC). The installation, located at the NPSC headquarters in Melbourne, will be accessible to computer hardware and software developers throughout Australia via Telecom's Auspac X25 packet switched network.

The NPSC facility comprises a Sun minicomputer and software developed by the UK's National Computer Centre. It is capable of testing conformance to level four, the transport layer, of the seven layer protocol. This is the highest application independent layer.

Users will have full control over testing from their own location, and will be able to interrogate the test system remotely to obtain test data. If they need printouts of the detailed logs kept by the system, they will be able to order these by phone from the NPSC. Users will pay on a subscription basis for the service at about \$3000 per month.

The facility will be vital to the development of OSI products in Australia, according to Thomas Winsemius of the NPSC. "Experience overseas has shown that you can't build OSI products without some sort of reference point to test them. If we did not have this facility, Australian companies would have to access a test centre offshore."

Testing for conformance to OSI does not however, guarantee interworking between systems from other manufacturers. To test and demonstrate this interoperability, the Australian OSI community, Osicom was established early this year. At its formal launch, 12 vendors demonstrated exchange of data be-

tween their different systems using OSI standards. A public demonstration of this interoperability was held by Osicom at the Australian Computer Exhibition at Darling Harbour in September. Digital Equipment Corporation, Data General, Fujitsu, Honeywell Bull, ICL, OTC, Telecom and Wang participated.

### Telecom/Fujitsu pact

The F9600 PABX, based on The Fujitsu Fetex 150 ISDN PABX will be the first to employ the Telecom developed Telinc PABX. The F9600 PABX will be built at Fujitsu's new \$30 million Dandenong factory under contract to Information Switching Technology, a Telecom/Fujitsu joint venture in which Telecom has 60 percent shareholding, Fujitsu Australia 20 percent and Fujitsu's Japanese parent company 20 percent. It will be sold exclusively by Telecom in Australia and will initially be available in two versions, the larger supporting up to 1300 ports and the smaller 600.

It is now common for large corporations with offices in many locations to set up a transparent corporate telephone network in which all telephone extensions in any location appear to users to be connected to the same PABX. Fourth generation PABX systems use proprietary protocols to achieve this, which means that this level of interworking is not possible if PABX are supplied by different manufacturers.

In the Integrated Services Digital Network it was hoped that this same level for interworking could be provided over dial up links, but the CCITT protocols for inter PABX signalling offers only limited features. British Telecom and others have developed their own signalling systems which manufacturers in those countries have adopted, but there is no widely accepted international standard.

Earlier this year, Telecom announced that it had developed, at a cost of over \$1 million, its own protocol for

PABX interworking, Telinc Telecom claimed that Telinc was at least a year ahead of any similar development anywhere in the world. It supports a total of 31 features between PABX systems. However, at the time of announcement, no manufacturer had committed to implementing Telinc.

A Fujitsu spokesman said there were no plans to market Telinc PABX systems outside Australia.

### Skycom for Darwin

An ambitious plan by an Australian entrepreneur could lead to a factory being set up in Darwin's trade development zone to manufacture satellite earth stations dishes and associated electronics for both the domestic and export markets.

The project is the initiative of Glen Nichols, who has formed a company Skycom



Michael J. Duffy

and with finance raised from financial institutions in the USA has bought a majority shareholding in the US company Skyswitch. The company manufactures satellite communication systems using a proprietary full mesh demand assigned multiple access (DAMA) technology. This system allows any earth station to communicate via a satellite with any other earth station on the network and to share the space segment with other stations on the network. Other systems use pre-assigned multiple access technologies, Nichols says these are much less efficient in the

use of the space segment and require costly master earth stations through which all traffic is routed.

He estimates that he will be able to bring the technology to market for about \$A35,000 per site, providing communications at up to 2 megabits per second for voice, data and compressed video. Voice is public telephone quality, allowing Skyswitch systems to be interconnected with the public telephone system, regulations permitting, to provide communications to isolated locations.

Skycom will also sell a video codec developed by Concept Communications of the US. This is capable of transmitting compressed video at bandwidths from 56 to 364 kilobits per second.

Skyswitch was originally sold in Australia by McConnell Dowell Nichols, a joint venture between Nichols and the New Zealand engineering and construction consortium McConnell Dowell. Last year McConnell Dowell Nicholas was taken over by AAP Reuters Communications which presently sells Skyswitch in Australia.

Skyswitch systems were previously manufactured in the US by Comsat, the US signatory to Intelsat, the international satellite co-operative. Comsat was prohibited from manufacture by new US regulatory rules, according to Nichols. Skycom has acquired the factory from Comsat.

Nichols says that as the company no longer has to amortise the R&D cost of the technology it will be able to offer systems at a much lower cost than previously. He believes the low cost will open up a number of niche markets such as distance education, medical, military and judicial applications. Skycom is negotiating with military authorities in Nigeria, Greece and India for possible sales. **eti**

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



PETER CRAWFORD

# MICROELECTRONICS

## The ramifications of silicon in Australia

Peter Crawford looks at the implications of home grown microelectronics.

The microelectronics industry operates in a dynamic environment. If we are to contribute effectively to the future, we need to recognise the accelerating pace of change, and that technology is only one force driving that change. We are faced with complex economics, social and management conditions — including contraction of resources, volatile economic markets, stock market crashes, a wave of deregulation and privatisation, more new companies entering and leaving product areas than ever before.

If the microelectronics industry in Australia is to succeed in such a climate, and I believe it can — and must, — now is the time for critical self analysis. Unfortunately, many other industry segments have maintained an orientation which is inward looking, engineering dominated and insular in approach toward the global markets. So we can't afford to focus alone on technical issues, nor the relative merits of our products nor the latest variant on semi-conductor technology. We will only be successful from a national perspective if we consider the microelectronics industry in its wider economic and social context.

### Economic ramifications

Let's begin with the economic

ramifications. Australia's economic position in terms of its small market, geographic position and global exposure will require a diversification from its reliance primarily on a commodity base to a broader more balanced base. This new base will fundamentally rely on high productivity and high value added services, systems and products. But diversity is not easily achieved in light of the competitive factors facing Australia. Microelectronics, through its continued enhancement of productivity, can make a major contribution and certainly a vigorous microelectronics capability is an essential prerequisite in the growth

of a strong indigenous electronics industry.

To achieve this, Australia needs to round out its capability so we cover the full range of activities associated with production of advanced integrated circuits — from concept, design and fabrication, to test, assembly and quality control. We all know that Australia's relative economic performance has been declining in recent years and that we have lived beyond our means. This trend can be reversed but the time available for change is years, not

decades. The microelectronics industry provides a real base on which to launch more competitive industry and in so doing to reduce our import requirements.

Our main prospects nationally for developing alternative exportable products — those alternative to our commodity based exports — lie in high value added, skill intensive fields such as microelectronics. And we must continue to pursue these areas with a clear view of reducing import dependence; as a conscious strategy to develop efficient, competitive export oriented industry.

There is, however, more to consider in terms of the impact of microelectronics on our pattern of life. New developments in microelectronics and the new products and applications that will result will present manufacturers worldwide with great opportunities and — of course considerable risks. The accelerating miniaturisation of semiconductor integrated circuits

competitors, particularly those lacking a sound commercial base or those with inadequate economic capacity to capitalise on entrepreneurial creativity and innovation.

It is clear, in this economic context, that microelectronics is playing a major role in the reduction in the cost of computing power and memory that has allowed computers to enter society's bloodstream. But, as all that continues there will be a steep rise in R & D and capital expenditure. We only need to look back over the past few years to illustrate the sums we are talking about. "Electronics Business" estimated that the top R & D spenders in the semi-conductor industry segment spent \$1.8 billion on R & D in fiscal 1986, an average of 10 per cent of the revenue of 13 major companies. And, more recently we have seen major co-operative initiatives being forged on a regional basis to bolster the R & D efforts in the US, in Europe and in Japan, for instance:

- the US\$1.5 billion, six year Sematech research initiative launched in the United States by leading chipmakers with the financial backing of the US Government. and
- the 8 year US\$2 billion R & D scheme (JESSI) (Joint European Submicron Silicon Initiative), to equip Western Europe's semi-conductor industries with the technology needed to make microchips in the late 1990s.

On the production side, Integrated Circuit production is difficult not only because manufacturers must produce a million or more of these circuit elements on a small sili-

*'the financial risk at today's levels of plant investment is very high'*

will permeate electronics equipment, microwave and optics technology, and biotechnology — opening up novel applications in speech processing, artificial intelligence, communications, military equipment, and home security systems, as well as in medical, testing, designing, and manufacturing equipment.

However, on the risk side, cycles of industry overcapacity and fast-rising costs for research and development and advanced production facilities will quickly cull weak

## Comment

con chip, but also because of the amount of capital investment now necessary to build a high volume world-class microelectronics facility. Very large facilities cost \$100 million to \$200 million today versus \$10 million or less some 15 years ago.

So, the financial risk at today's levels of plant investment is very high, if imperative for national development, and investment decisions must be soundly based, not on technical criteria or enthusiasms but on tough commercial criteria and national technological need.

Certainly, AWA has decided to bear that risk — together with our partners in British Aerospace and the NSW Government.

### **Social responsibility**

So much for the economics — what about our social responsibilities?

As a responsible sector of the community, the electronics industry must look beyond its technical boundaries to ensure that the possible impacts of new technology are clearly identified and understood within the community. And we know from past experience that the path of technological progress is not always smooth. Environmental planning and social accountability are among those issues which we cannot afford to overlook, and in particular the human response to technological change.

For example, while Silicon Valley is usually seen as the high technology ideal, it is as well to remember that it is now almost as famous for its toxic wastes. Since the first discovery in 1981 of water contamination caused by trichlorethane, nineteen major high tech companies in the Valley have joined listings as owners of the worst toxic waste sites in the US.

While the semiconductor industry has worked to solve the toxic chemical problem in the US, spending over \$100 million to identify, track and clean up their sites — the

stigma remains. The lesson is — we need to plan and to identify social impacts and to bear the costs up front despite the apparent time and money penalties involved.

Without suggesting fault on any side nor presuming to commentate on regulations in the West, I note the recent example in Australia involving the search for a site in Western Australia to locate a \$120 million silicon plant — which has involved moves from Pinjarra to Bunbury to Harvey, with all of the attendant preparations, studies, oil testing and plant redesigns which alter costs and timing. All this is very tough on the investor, the technologist and the planner but it is part and parcel of contemporary society.

The microelectronics revolution provides another dilemma for us all in equipping individuals to cope with the social changes that derive from that technology. What may seem to be a futuristic concept today is rapidly approaching tomorrow's reality. Current proposals such as the joint Australian-Japanese, Multifunction Polis, could critically alter our pattern of urban living. The proposal, even now at its embryonic stage, suggests that potential Japanese investment in Australia could amount to \$10 to \$12 billion beginning in 1993. The proposal is aimed at

*'... it is part and parcel of contemporary society'*

creating a new urban complex for international exchange between high technology industries, R & D and education and leisure facilities. The concept, although not clearly enunciated as yet, places heavy emphasis on the development of leading edge infrastructure to support high-tech and high touch industries. It could radically alter our current perceptions and provide an entirely new ex-

perience in work and, leisure and social infrastructure. Patiently, microelectronics will occupy centre stage in this concept and we need to be alert to our wide responsibilities as the progenitor of change.

### **Management**

The technology associated with microelectronics forces the industry itself and society at large to cope with rapid and constant change. The technological dimensions of silicon alter the markets in which we operate and cause radical changes in the way we do business. To capitalise on this "enabling technology" of microelectronics, Australia needs to improve its management, marketing and commercial talents. We need actively to direct that change process if we are to manage our operations in a world environment.

There is no doubt that one of the real competitive advantages held by Australia is a highly educated and highly skilled workforce. This is particularly true in the electronics industry where the skills, creativity and inventiveness of our scientific and engineering workforce have long been solving the unique problems we face. Frequently the way in which we have solved difficult transportation, communications or medical problems with technologically advanced products, by applying our resident expertise to local conditions, has drawn praise from overseas. But praise is not enough!

While we have often capitalised on our innovations internally, we are notoriously lacking in our ability to turn these into hard-nosed commercial successes by thinking laterally and translating the skills we've developed to meet needs of other more lucrative markets. Not only do we need to continue to foster the growth of our technical skills, we need to link them with management and marketing skills in order to compete in world markets.

So, our attention needs to

be focused not only on attracting the best people but also on developing them. We, in industry, must work with the educational institutions to ensure that our educational system produces the right people, with the right blend of skills. And, we have to keep on training these people to broaden their skills base and to foster their leadership and entrepreneurial capacities.

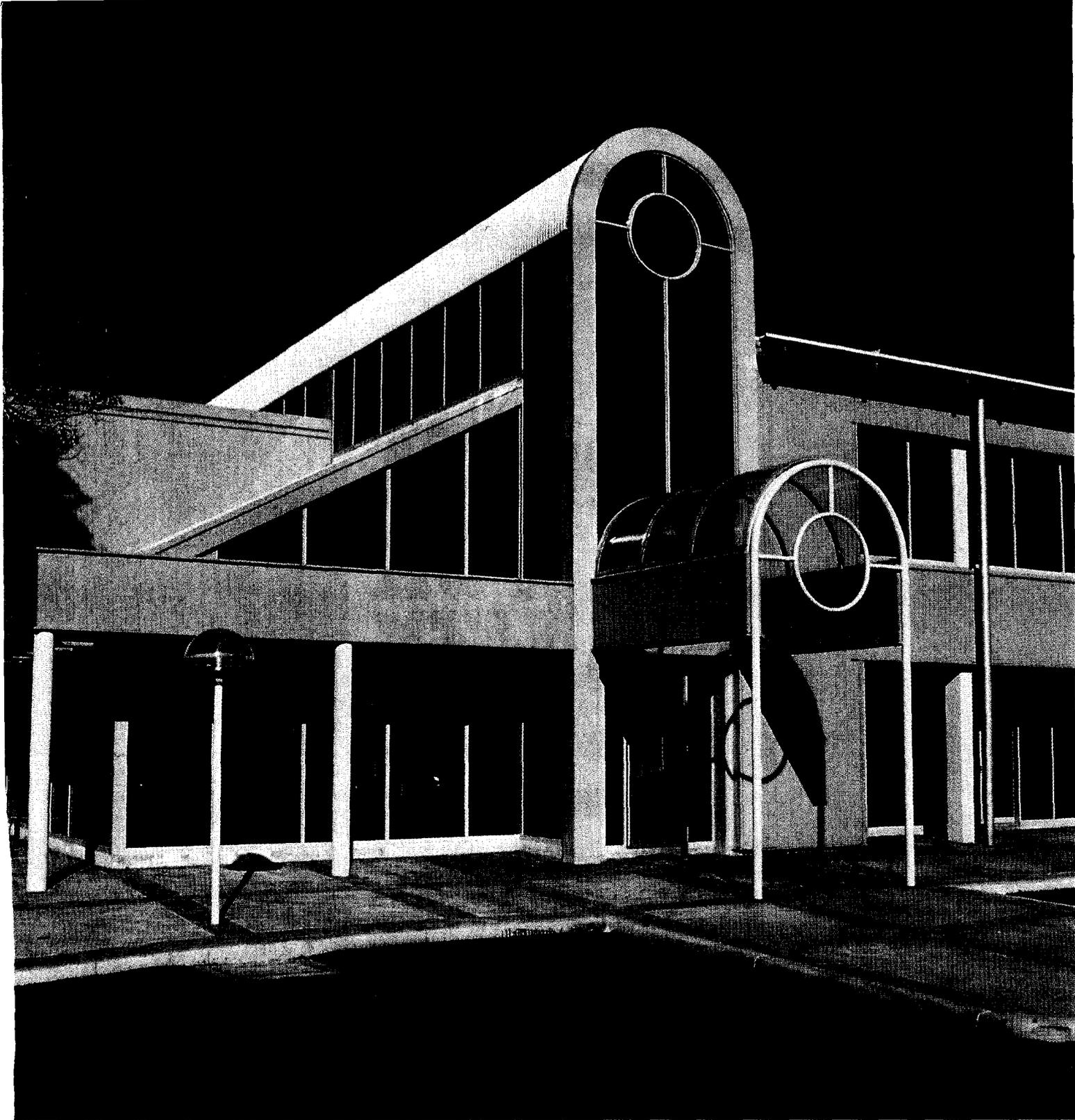
In the electronics industry we are currently suffering from a lack of experienced engineers. We have allowed the financial sectors to lure away many of those who would traditionally have entered such engineering fields with significantly higher salaries. We are losing many of those who do specialise to

*'... now is the time for critical self analysis'*

the big multinationals overseas who recognise and are willing to pay for such valued skills. Clearly we need to provide the right incentives to counter these problems.

We must also recognise that management, not debt or the exchange rate or our technological base, is our most vulnerable weak point nationally. Good management is not intuitive nor inherent in the individual, it is acquired and learned. It is a skill to be acquired and practised and we must be willing to remunerate those who have put in the time and the energy to become good managers, as well as highly skilled technologists.

In an environment which sees information as power it is important to remember that information increasingly derives from the application of technology which has its foundations in electronics and microelectronics. Not only our citizens but also our managers are hard pressed to keep up with these changes but they must in order to survive.



*The new Microelectronics Centre at Sydney's suburban Homebush.*

This means that we need to educate people — citizens, employees and managers, so that they understand and can cope with technological change, including acquiring a reasonable grasp of the general concepts behind the technology and how to use it.

Our national success in the

microelectronics field will help to determine Australia's competitive success in the broadest range of strategic high tech industries — telecommunications, defence, aerospace, as well as consumer products and so on. Early access to the very latest chip technology will be a vital ingredi-

ent in our successful advances in the global economy. However, access to this technology is not sufficient to position Australia competitively in the world environment.

**ETI**

*This article is based on a*

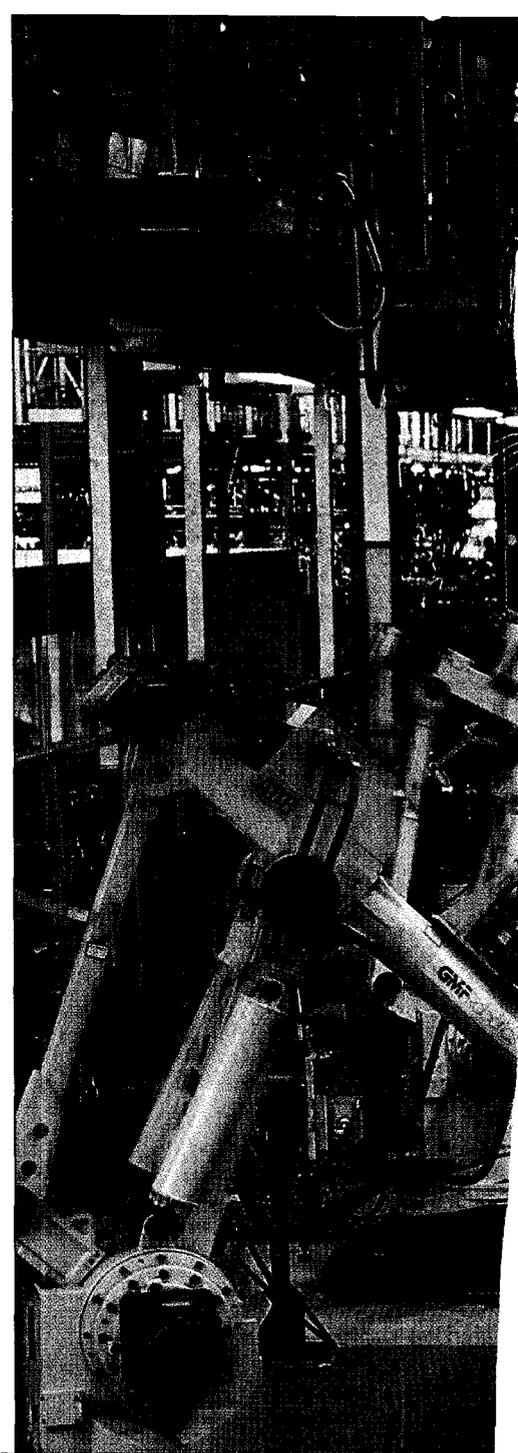
*speech given at Microelectronics 88, a conference on the future of microelectronics in Australia. Dr Peter Crawford is managing director of AWA, which has recently set up a joint microelectronics venture with British Aerospace Australia and the NSW State Government.*

PETER BREWER

# A QUEST FOR QUALITY

## *Robots build a family car*

The heat is on. The automotive battle promised for some years now has finally come to fruition. Peter Brewer takes a look at the vehicle building industry.



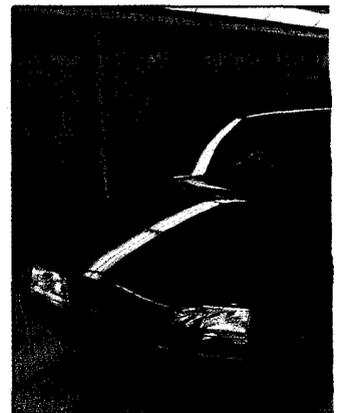
**T**wo new cars — the Ford Falcon and the Holden Commodore — are squaring off to decide the title of Australia's best-selling family car.

It has been a mismatch for too long. When the popular Kingswood was dropped from the Holden lineup in 1978 and replaced by the smaller Commodore, Ford slowly but surely inched its Falcon up the sales charts and by 1983 had grabbed the overall lead to become the country's most popular family car.

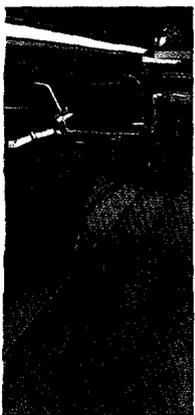
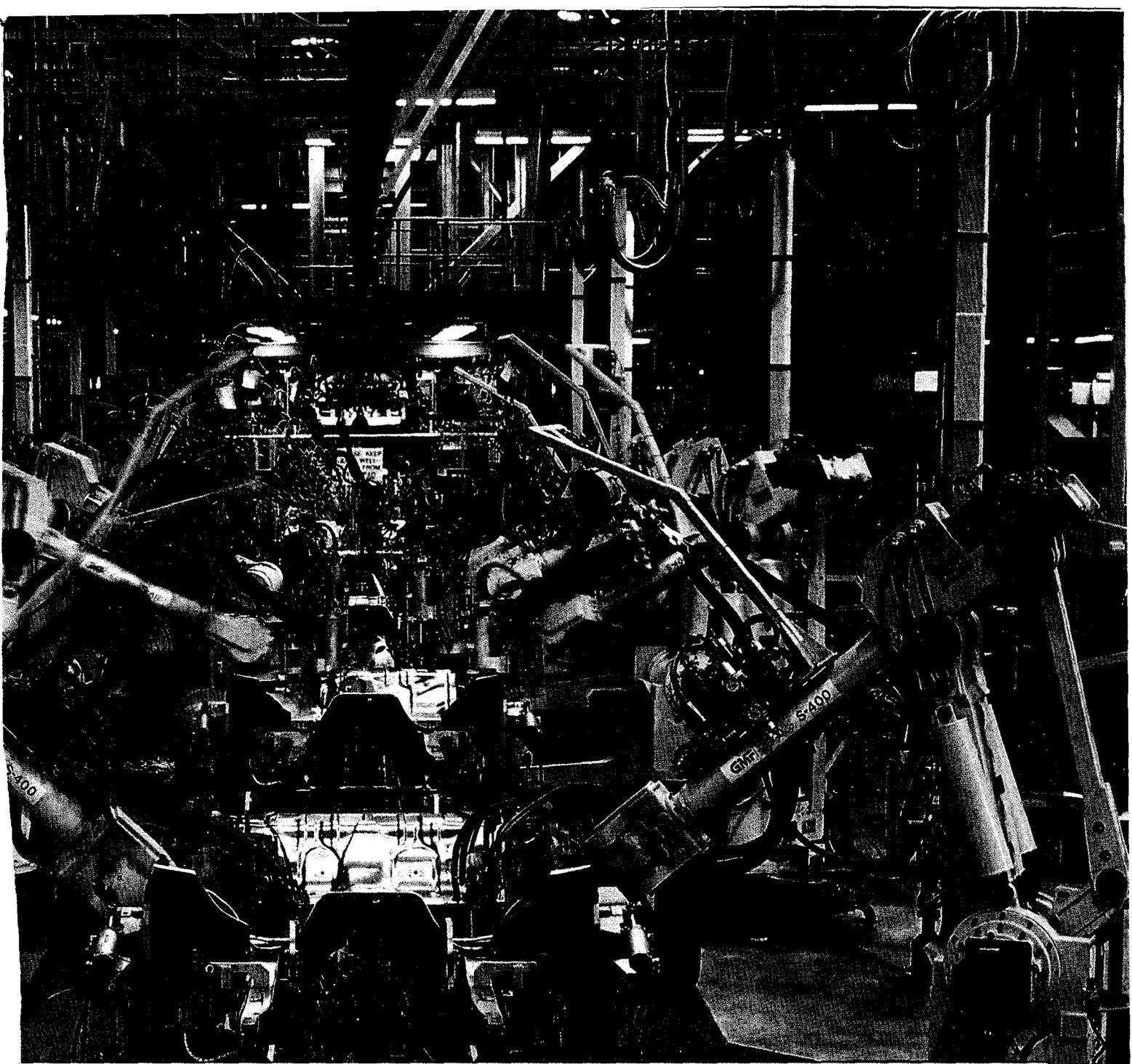
Now Holden, by adopting many of the design attributes of the award-winning Opel Omega (notably a rounder, barrel body to provide more interior space) produced by GM's West German affiliate, and blending it with a mechanical package courtesy of GM's Buick car



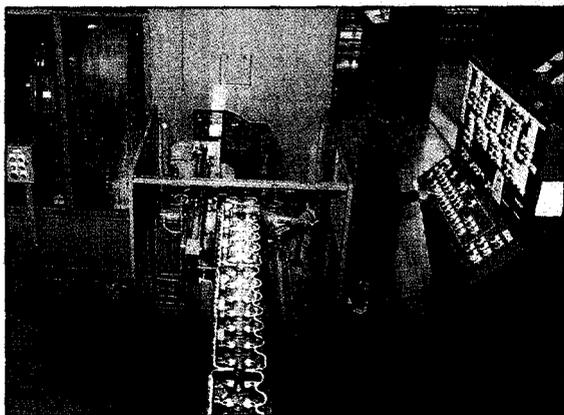
1. Engine analysis at the Ford proving ground.



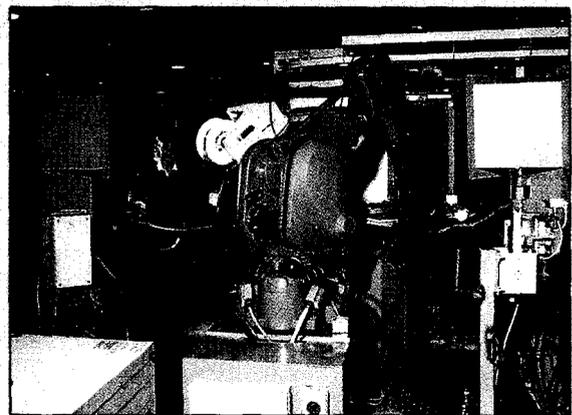
2. The final line at Ford's Broad



indow plant.



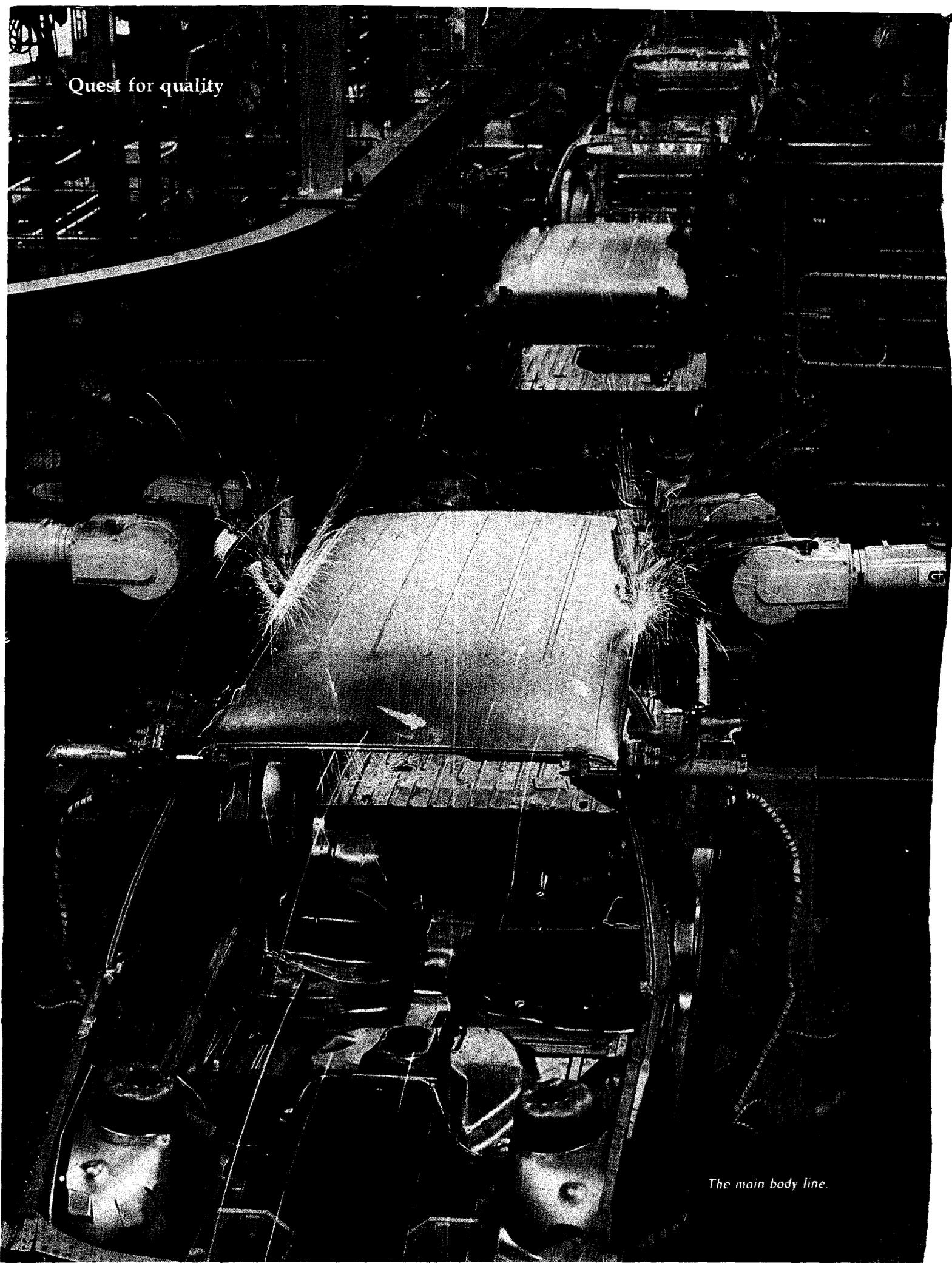
3. Ford's cylinder head machining line at Geelong.



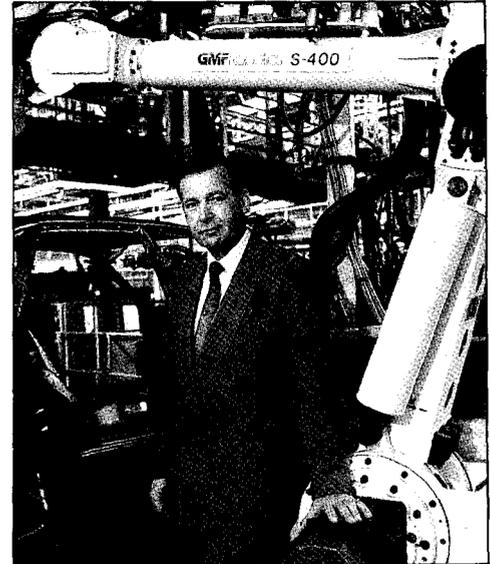
4. Robot welder building seat frames.



Quest for quality



*The main body line.*



**Above: Ray Grigg — General Manager of operations.**

**Left: Programming a robot with a co-ordinate measuring machine.**

division in USA, it has produced a car which, measure-for-measure, finally competes head-on with the Ford Falcon.

But the products are only one side of the equation. While their features, performance and size will form part of the basis on which Australian car buyers will make a comparison, there is one factor which is now tipping the balance in any evenly-weighted contest: product quality.

If you didn't think this was a major consideration, let's look at the example of Ford Australia when it launched its Falcon in March. Its first-run cars were all hit by quality problems: dash rattles, poor door and boot closures, overheating and a rash of minor ailments.

Within a week of these difficulties surfacing in the press and in the first batch of customer deliveries, Ford had no option to wind back production in their efforts to trace the problems. A huge backlog of special order cars was put on hold, which in turn arrested the flow of other new products from the Broadmeadows plant, including the long wheelbase luxury Falcon and LTD models, and the new SA30 sports car.

Designers however, concede that quality is no longer a pure production line responsibility. Cars now must be designed so that the various parts of assembly process are streamlined: engines and gearboxes are easily fitted, trim panels clamp in neatly and quickly, and carpeting overlaid — all with a minimum of delay.

### **Robots**

Each part of the assembly process is interlocked. If the line workers experience difficulties in any particular task, the quality of the whole car can suffer, as the problems are magnified further down the line.

Robots are deemed to be one solution and this is where Ford has spent the bulk of the \$700 million allocated by its US Parent company since 1984. At Broadmeadows, the company now has the most automated car production facility in Australia.

***'Only robots can provide the high degree of weld-point accuracy'***

By world standards, the Ford facility is still in the medium bracket of automation. The international leader is acknowledged to be Fiat's Robogate, which uses more than 1000 robots in the production of the Uno. More than 99 per cent of its operations are automated. Asynchronous transportation of the Uno's engines from one work station to the next is achieved by 37 computer co-ordinated automatic guided vehicles. The software required is extremely complex, as the system is designed to handle more than 100 engine

derivates, each of different tolerances and specifications.

### **Lasers**

The monitoring and diagnostic robots keep "watch" over the processes, and lasers are used to check critical measurements.

No volume car manufacturer in the Western world now operates without a high degree of automation in its body welding plant. Only robots can provide the high degree of weld-point accuracy required to ensure the body satisfies the parameters of rigidity and torsional stiffness mapped out in the CAD (Computer-Aided Design) stage. Some 90 per cent of Ford's welding is automated.

It is the more complex tasks which are now being tackled.

Ford's overhead gantry materials delivery systems, developed in association with Melbourne manufacturer Machine Dynamics, passes the components onto the line. Items like doors are pressed, welded, and trimmed off the main line, then "handed" across for installation. Holden has had little choice but to opt for a lower level of technology simply because it hasn't the financial resources to match those at Ford. At its older Elizabeth plant in South Australia, it has invested some \$300 million on new production facilities to build the VN Commodore, and installed 52 robots.

Some \$150 million has been earmarked for ongoing improvements, particularly in the paint shop, where

## Quest for quality

plans are underway to ensure that the company can offer a high quality clear-coat-over-base-coat finish, in line with that of Nissan and Ford, on its cars within two years.

### Standard

Yet while Holden's factory is generally out of step with the innovation seen at Ford, there are key production innovations established for the new Commodore which set the standard for the rest of the industry to follow.

One is the door frame rolling and bending machine, installed because only automation can achieve the extreme accuracy required in the fitment of flush window glass. This extraordinary device takes a flat strip of treated metal and passes it through a 27-stage forming mill which wraps and shapes it into the frame.

At the end of the mill stands a GMF S400 multi-axis materials handling robot surrounded by three "fixture" machines, each one assigned to form a different type of door frame: one for the rear doors of the wagon, another for the sedan's front doors, and the third for the sedan's rear doors. The software in the master computer instructs the robot as to which fixture it should "feed".

The fixed machines monitor and measure the frame shape, pierce the metal

and attach the trim, then the frames are retrieved and stacked by the robot — all in a matter of seconds!

Holden has also eliminated one continental source of quality problems through taking the dashboard and instrument panel assembly — a difficult task on the line proper because of the restrictions of the car's cabin dimensions — into a separate shop. The assembly time saved through this change is a remarkable 26 minutes per item.

*'... quality is no longer  
a pure production  
line responsibility'*

### Accuracy

The company's body transfer system has played major role in ensuring uniformity of body measurements. Each body is now built on the same tool, and shuttled between individual work stations. Where only 30 per cent of the previous VL bodies were accurate to plus or minus 3 mm., 90 per cent of the latest VN bodies are true to within 1.5 mm.

Holden will double shift its factory to

produce between 320 to 340 cars a day by the end of this year, and 416 a day next year when it will bring a long wheelbase luxury version of the Commodore on stream.

The sales success of both the Falcon and the Commodore is critical, not just to the financial viability of both manufacturers, but to ensure that investment in new plant and equipment continues.

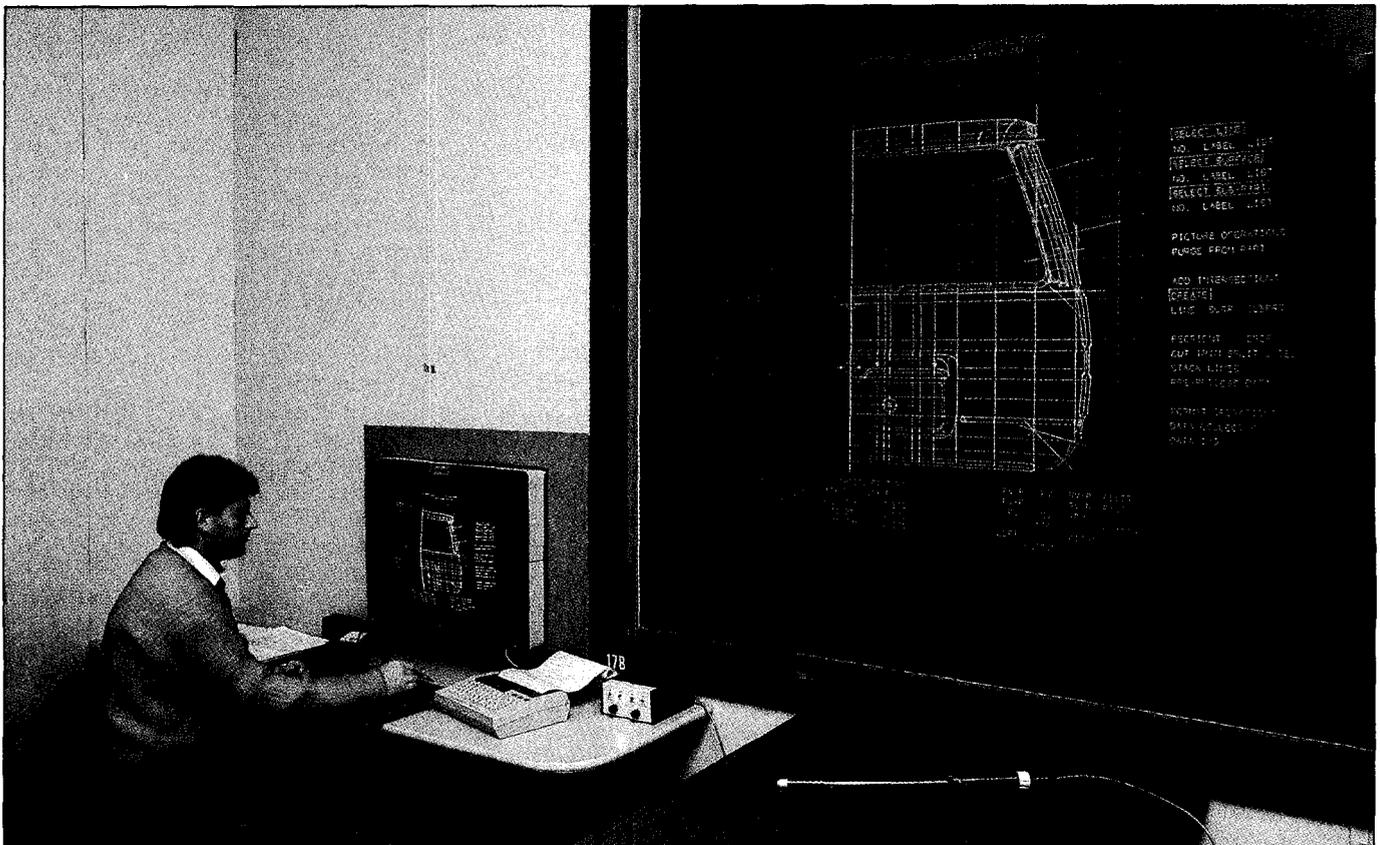
If high volumes are sustained over the next three years and quality continues to improve, both companies will begin to plough their cash back into the next generation of highly complex multi-function equipment.

This is the future of car manufacturing where one style of car, such as a small two door hatchback, is followed down the same line by a large five door station wagon, then a sports car or a conventional sedan — all in consecutive order. Each style of car is "recognised" by the automated assembly machines, which correctly source the various components required to suit that style and put them in place.

Australia is part of the way there. Ford and Holden have committed themselves to new technology in the hope it will bring the ultimate sales rewards.

The verdict rests in the hands — or rather the hip pockets — of the motoring public.

ETI



Robots at work.



ARTHUR CUSHEN

## SHARING THE AIRING

### Major boost in facility partnerships

In past years the number of international broadcasters who shared facilities could be listed as the BBC, Radio Canada, and the Voice of America, but in recent months there has been tremendous growth in this means of international broadcasting.

The idea is that stations, for instance, in Europe; offer the use of transmitting time on their facilities to a station in the Far East for a similar use of their transmitters. The programmes are carried from the studio in Europe to the stations in the Far East by satellite. The growth of this type of operation has extended to all continents where international broadcasters find it easier to use someone else's transmitters, rather than attempting a long range shot from their home base.

#### Latest moves

Austria is the latest country to indicate a wish to use the facilities of Radio Canada International for two hours each

day in order to provide a better signal into North and South America, in return for the use of the high powered Austria shortwave facilities near Vienna.

Japan was one of the first countries to offer facilities on an exchange basis. Radio Canada is being relayed by Radio Japan in two daily transmissions at 2200UTC on 11705 kHz, 1200 on 15385 and 17710 kHz. Radio Japan's broadcasts are relayed by Radio Canada in several transmissions in English and Japanese. An agreement has been made by Radio Japan with Radio France International to share facilities. Radio Japan's programme will be relayed from the RFI transmitter at Montsinery, French Guyana. The schedule is 0200-0300 on 15350 in Japanese; 2200-2300 9685 Japanese. In exchange Radio France International programmes in French are carried on Radio Japan from Yamata 0930-1130 15410 kHz 1000-1100 15325;

2300-0030 15300, all programmes beamed to Asia.

China is another country which is offering its facilities. The broadcasts were offered to Swiss Radio International and that transmission in English at 1330UTC is on 11695kHz. China is also offering its broadcasts to Spanish Foreign Radio, and in return Madrid relays an English hour of programmes of Radio Bandeirantes, Sao Paulo which

**'Transmitters built solely for hire on a commercial basis'**

has both medium wave and shortwave frequencies and is popular in Brazil.

Radio Canada has announced that they plan further expansion in Asia by sharing time with Radio Beijing, and this will give them better signals in China and also into India, an area they have found difficult to reach. The BBC transmitters at Daventry have been used for many years by Radio Canada to serve Europe, and the medium wave station Radio Antilles to provide broadcasts into the Caribbean.

#### Commercial

There are two major complexes of transmitters which are built solely for hire on a commercial basis. Trans Europe at Sines in Portugal and Africa No. 1 at Moyabi, Gabon are used by many international broadcasters as well as religious groups such as Adventist World Radio.

Recently Costa Rica and Spain signed an agreement in Madrid under which work will begin shortly, on the installation of a powerful shortwave

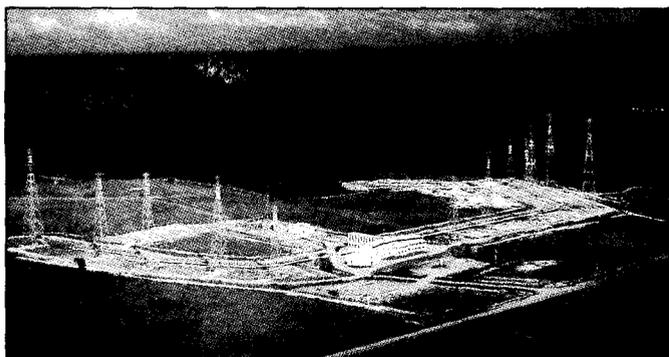
transmitter. The Spanish investment in this shortwave transmitting centre in Costa Rica amounts to some \$US4.5m. When the transmitters enter into operation, there will be a notable improvement in the reception of Radio Espania Exterior broadcasts in Central America. Adventist World Radio is using Radio Lira transmissions for its broadcasts into Central America and has been noted on 9725 kHz from 1200UTC in Spanish, and from 1300 in English.

#### Around the globe

NETHERLANDS: Hilversum broadcasting to Australia 1030-1125UTC in English is now on 9505 kHz replacing 9675 kHz. An alternative frequency of 6020 carries the same transmission. The first transmission to the South Pacific from Radio Nederland which also originates from the Bonaire relay base in the Caribbean is 0730-0825UTC on 9630, 9715 kHz. On Thursday at 0750UTC on 9630, 9715 kHz. On Thursday at 0750UTC "Media Network", an electronic magazine for radio listeners is broadcast.

SWEDEN: Radio Sweden, Stockholm for the past 20 years has broadcast to the South Pacific 0930-1000UTC in English. This transmission has been cancelled in favour of a later service 1230-1300 which is now broadcast in 15430 and 17780 kHz. 

Arthur Cushen, 212 Earn St., Invercargill, New Zealand would be pleased to supply additional information on medium and shortwave listening. All times are quoted in UTC (GMT) which is 11 hours behind AEST.



Radio France International's transmitting site at Montsinery, French Guyana which is now carrying programmes from Radio Japan.



INNOVATION

**O**ne person taking a firm stance in the film versus HDTV battle is Rune Ericson, Swedish film-maker and innovator. His background is film. His attitude is that film — 35mm — can not only equal, but exceed the quality of High Def TV. He holds that the 90 year old medium has plenty of gasp left within its 'ancient' chemistry and 'medieval' plastic foundations.

Ericson's approach has been to re-think the gauge, and re-formulate it as a high quality, economically viable sourcing medium for the HDTV system.

In April, 1987 Ericson, not only a notable film-maker but also Director of Stockholm equipment company Film AB Rune Ericson, gave an important address in a London theatre. The subject of the talk was 35mm motion picture shooting using camera equipment converted to a three perforation pull-down in place of the normal four.

In May of 1986 he started shooting the 51st feature film of his career — 'Mälar Pirates'. The story of three young boys and a shipwreck.

Ericson: 'It could have been just another film among others, but ... is the first feature, to my knowledge, ever shot with a camera that has a 3-perf pull-down for every frame, instead of the conventional four.'

The normal wide screen print contains great wastage — 30% of the total area. 35mm negative is consumed at the rate of 300 million metres a year worldwide. Print material — around ten times that. If a 30% saving could be effected, the annual savings would be over 800 million Australian dollars.

The idea is far from new. Linwood Dunn in Hollywood first modified a camera in 1954, as part of an optional printer. The Germans, Canadians and the Russians also spent time considering the approach. But there was no pressing demand at the time for the potential economies in three perf shooting.

Ericson now feels 'the situation is completely different and I venture to say there is no longer any need for the academy aperture.' Strong words.

### **Global transition**

Ericson: 'It is time to consider, seriously, a global transition from 4-perf to a 3-perf pulldown system — a stage process over a period of five to 10 years, in

which the practical disadvantages are minimal.'

Present and future formats would be affected in the following manner:

#### **1. Wide Screen:**

No drawbacks when in 1:1.66 or 1:1.85 wide screen formats.

#### **2. Cinemascope/Super 35 anamorphic:**

Ericson feels that anamorphic (e.g. Panavision) shooting would gradually give way to the new Super 35 (or a re-born two perf format of the 60s called Super Techniscope).

Super 35 used ordinary, spherical lenses, unaffected by the optical complexities demanded by anamorphic squeezing. The picture frame extends across the film from perf to perf, the height of the frame a little less than three perfs — the frame line would shrink to 1.5mm. From the original flat, non-anamorphic negative and anamorphic internegative is produced for release printing. The recent increase in quality in rawstock now permits blowups

*'... it will take some time before all cinemas are equipped with interchangeable sprockets'*

for 70 mm release as well.

The Swedish film-maker is disarmingly frank about the drawbacks of anamorphic optics: he holds they compare poorly with 'the most common spherical lenses, especially with wide open apertures.' They offer poor close focusing, and depth is comparatively limited. It is a sad fact that film people have to accept the fact that TV release is a 'make or break' factor in a film's budget, and a flat, non-anamorphic, original eases the lab path.

And the final nail: 'Anamorphic lenses on the camera are doomed to gradual extinction, which is no great loss in as much as the Super 35 will successfully take over without the 3-perf pulldown posing any problems.'

#### **3. Super 1:1.85.**

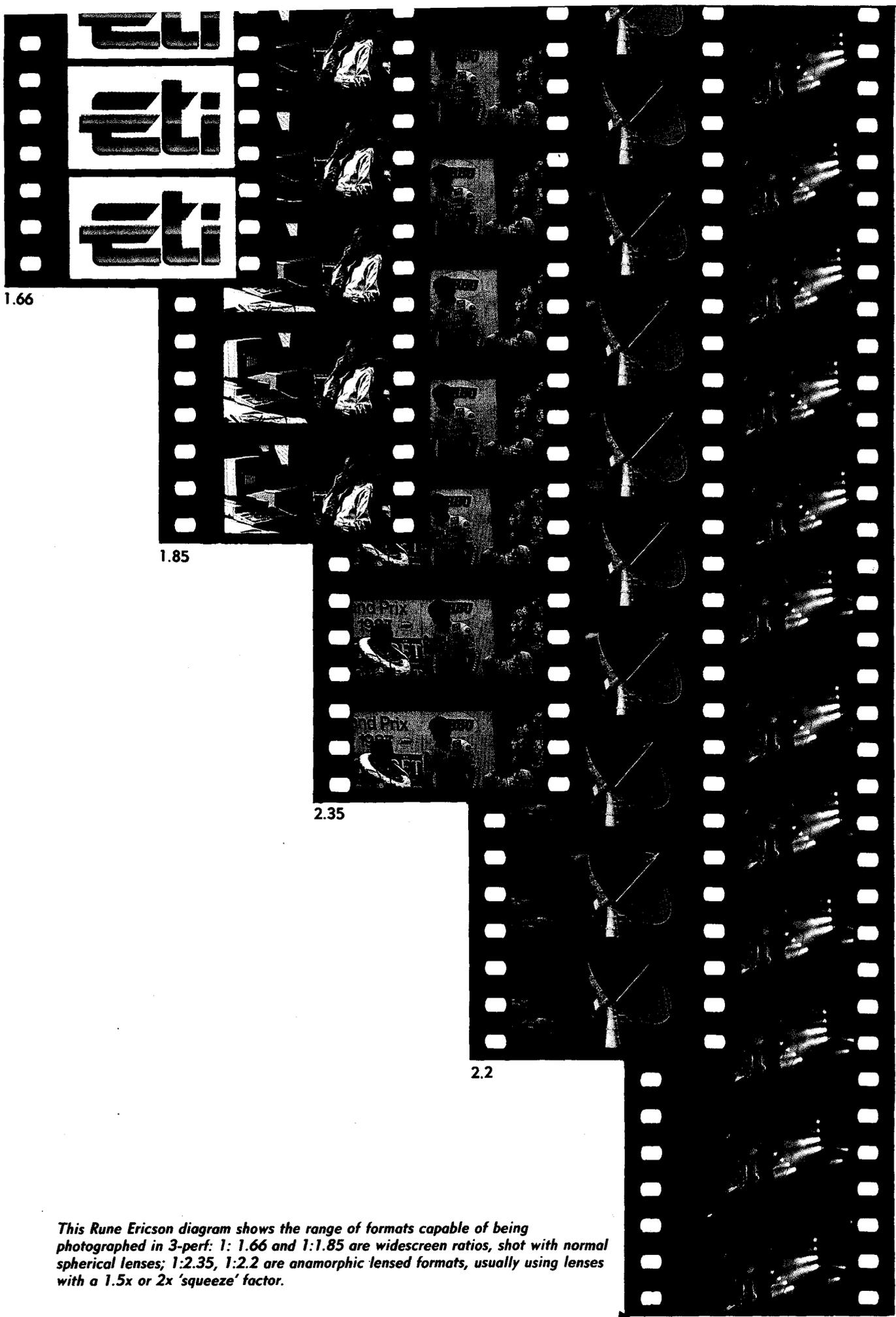
Ericson explains this method produces an original for wide screen 1:1.85. productions, giving around 40% larger original negative for reduction to a wide

**Whatever else television and film interests my crave, HDTV marches ever closer. Barrie Smith delves into the many misgivings by European interests — and the PAL countries specifically.**

# **SUPER 35**

## **Film shapes up to HDTV**

ETI NOVEMBER '88



1.66

1.85

2.35

2.2

*This Rune Ericson diagram shows the range of formats capable of being photographed in 3-perf: 1: 1.66 and 1:1.85 are widescreen ratios, shot with normal spherical lenses; 1:2.35, 1:2.2 are anamorphic lensed formats, usually using lenses with a 1.5x or 2x 'squeeze' factor.*



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

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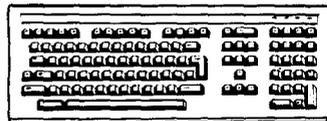
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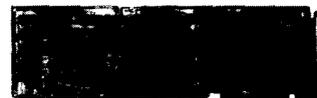
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- Serial port
- Parallel port
- Games port
- Clock/Calendar with battery back-up
- provision for second serial port

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- DTE/DCE Selectable
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- Interactive installation procedure available.

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**16 BIT FLOPPY DISK DRIVE CONTROLLER CARD**

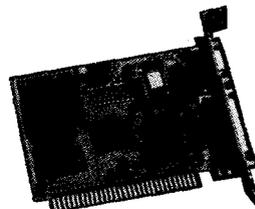
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**GRAPHICS CARD**

- Hercules compatible
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- One Centronics parallel printer port
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- Display Mode: 720 dots x 348 lines

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**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.

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**ENHANCED GRAPHICS ADAPTOR CARD**

- 256K display RAM
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- Paradise\* compatible
- Up to 16 colours
- Standards: 320 x 200, 640 x 200, 640 x 348, and 720 x 348.

X18070 ..... \$195

**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

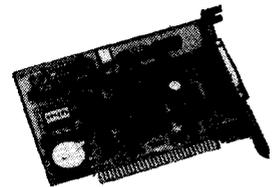
**PRINTER CARD**

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

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**RS232 [SERIAL] CARD (WITHOUT CABLE)**

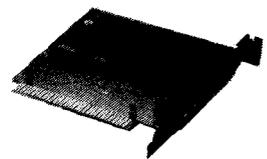
This RS232 card supports 2 asynchronous communication ports. Programmable baud rate generator allows operation from 50 baud to 9600 baud. Fully buffered. Second serial port is optional.

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**CLOCK CARD**

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**I/O PLUS CARD**

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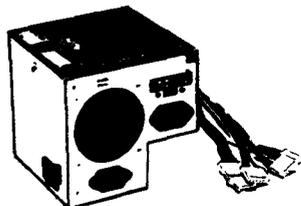
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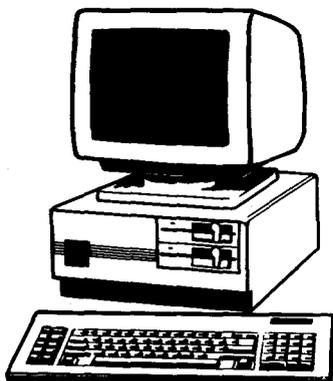
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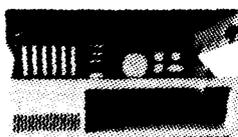


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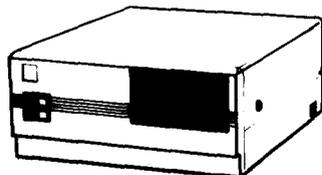
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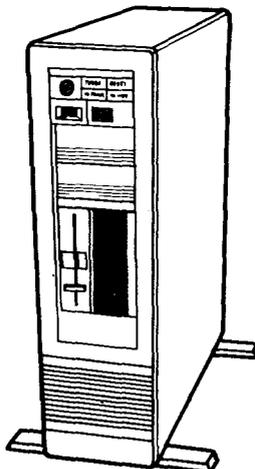
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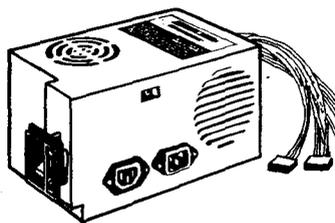
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- Real time clock with on board rechargeable battery or external battery
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- 8042 keyboard controller interface for AT\* compatible keyboard
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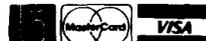
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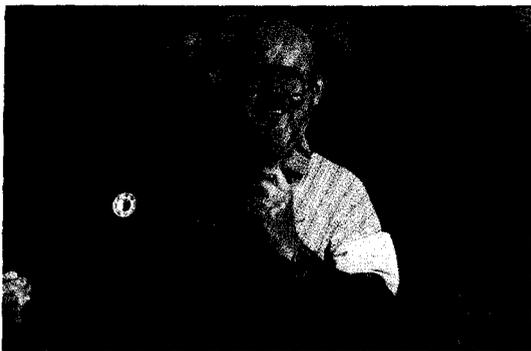
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*Rune Ericson holds a reel 25% cheaper and 25% lighter.*

screen intermediate. This gives better quality when shooting on normal 1:1.85.

Super 1:1.85 closely matches the 3-perf pulldown. The frame line width is identical to that of the present CinemaScope negative, quite sufficient for good splices.

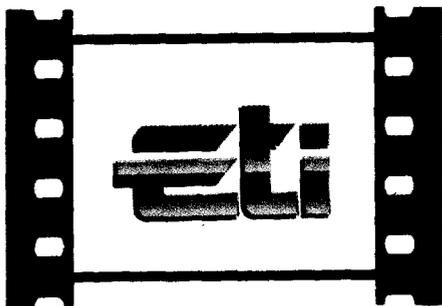
**4. TV-Video:**

Ericson: 'In Scandinavia and practically all other European countries, features are shot on wide screen 1:1.66 format. There are only two variations for showing these features on TV:

1. Show the entire width of the film but with a black strip on both the top and bottom of the screen.

2. Enlarge the centre of the picture area when scanning, and automatically lopping both ends of the frame.

Though it sounds appalling to a cam-



*The 90 year old 1: 1.33 Academy aperture: 4-perforations per frame B.*

eraman's sense of aesthetics, it actually works out exceedingly well, if the procedure is planned in advance by marking the dimensions on the ground glass.'

Although the exposed area is slightly smaller than the Academy format the negative area parallels Wide Screen 1:1.85. Modern raw stocks available today deliver more than enough margin of quality for the present 525-625 TV systems. And, with HDTV approaching ominously, you get a high quality picture 'ready to go' — as it were.

**Future resale**

The modern producer must consider future re-sale, even as far as ten years ahead. To provide for this, the following must be considered:

1. Shooting 525-625 line video and transferring to 1125 lines HDTV does not produce acceptable quality for HDTV broadcast.

2. Standard 16mm; only a 65mm<sup>2</sup> area of the frame can be used for



*1:1.85 format shot inside Academy aperture: 4-perforations.*

HDTV. Not acceptable.

3. Super 16 at 1:1.66, gives a usable 92mm<sup>2</sup> frame area — acceptable in HDTV.

And finally:

4. 35 mm is the only alternative today to HDTV origination which give maximum quality for future HDTV transmission.

Three perf is designed to accommodate all the alternatives existing today, and the decades to come. Ericson also forecasts that the present 4:3 TV screen ratio will be retired in favour of a wide screen shape. How about a wall picture 75 x 125 cm?

The 800 million dollars plus per year saving is, of course, an estimate. But, the economies are important to a producer interested in continuity. Put crassly it could be expressed as 'buy four for the price of three'.

When Ericson shot his first feature in 3-perf technique, he needed three important elements to make it a success:

1. A trusting producer: He was fortunate at the outset in that the production company were convinced of the system's soundness. Since they also owned the second largest chain of cinemas in Sweden, they found it hard to conceal their delight, at the news that '3 perfs would be 25% cheaper, 25% shorter, 25% lighter and would probably save 25% in freight charges.'

2. A 3-perf camera:

John Farrand, president of Panavision was convinced of the plan and just 'two

months after our discussion and four months before the start of shooting I was already filming 3-perf tests at the Panavision plant in Los Angeles. Things work fast there! They promised to convert two Golden Panaflex camera for the start of the film.'

3. A brave laboratory, unafraid of the unknown.

**Belief in the system**

'One of Europe's most modern labs, Film Teknik firmly believes in the system, and modified the necessary equipment.

One Panaflex was 'on set' for 'Mälars Pirates', with the other body stored as a back up. The shoot was not one of the easiest in Ericson's career, calling for over 300 shots on the water, much of it 'boat-to-boat'. Not only were the actors speaking dialogue, but they also had to sail the 8.5 metre craft.

There were a few near misses: at one point they were travelling at 7 knots with 12 people on board and a full load of equipment. One important crate contained Thermos flasks of coffee.

'When one of the crew yelled "coffee!" everyone made a dash to the bow of the catamaran where the coffee was being served — causing the catamaran to dip sharply forward. The effect was almost that of a diving submarine. The captain reversed the engines and everyone ran towards the stern and the bow raised again. We were a mere hair's breadth from catastrophe. The angle of the deck was so steep that it's still a miracle to me that the Golden Panaflex and all our expensive equipment didn't slide overboard.

'It didn't take long for the crew to forget the fact that we were shooting a film with a technique that had never been used in a feature production before. Everything seemed to be as it used to be. And for the most part it was.

**'And the final nail:  
anamorphic lenses are  
doomed to gradual  
extinction . . .'**

There was no visible difference. However from another point of view there was a notable difference. After shooting 11 minutes of our 300 metre roll, there was still 4 minutes more of film in the camera to shoot.'

A 300 metre roll of stock at 24 fps runs for 11 minutes. Three perf gives exactly 14 minutes and 51 seconds.

Fewer reloads, fewer short ends. One of Ericson's crew was heard to ask: "Why are you reloading again? You just reloaded this morning!"

The laboratory manager was at first sceptical when told of the scheme, but after consideration of all the possibilities became just as enthusiastic as the inventor.

### Problems

What are the problems?

Processing is not one of them. Nor is contact printing. Screening the release prints was the first stage where modifications had to be made. As the manager explained:

'All cinema projectors are equipped with only three sprockets to transport the film. On most projectors the upper and lower sprockets each have 32 teeth (8 frames). The maltese cross sprocket has 16 teeth (4 frames). By simply making them exchangeable to 2 x 24 tooth sprockets and 1 x 12 tooth sprocket, the projectionist can change from 3-perf



*Televised area of film shot in 1:1.85: 4-perforations.*

to 4-perf prints in a matter of minutes, and at a cost of less than a thousand dollars per projector.'

Running speed of three perf is 34cm/sec — twice that of 16mm film. It is considered that there is very little influence on the sound quality. Three perf can accept optical stereo sound and Dolby spectral sound with very high quality.

One problem encountered was the of flat-bed editing tables. They were obliged to make 16 mm work prints from the 3-perf negative — a common routine in Sweden. The edge numbering adaption proved the most difficult part of this option. Neg cutting called for an easily-modified synchroniser.

The lab people were also obliged to re-design an optical printer, allowing all opticals to be made 3-perf. The modification entailed new projector and cam-

era sprocket drives and a special Wet Gate movement for the 3-perf pull-down.

The 3-perf optical printer will also be used to make 3 to 4-perf blowups. Manager:



*Televised area of film shot in 1:1.85: as shot in 3-perforations.*

This is necessary because it will take some time before all cinemas are equipped with interchangeable sprockets. The projector suppliers in Sweden are now checking the most used typed to see if all are easily modifiable. The time limit to change back and forth between 3-and 4-perf has been set at 3-5 minutes.'

Swedish Television have embraced the new scheme with enthusiasm, even adapting a Rank Cintel Mark 3 to accept a 3-perf. Their engineers solved the problem by adjusting the velocity servo, phase servo and jump scan amplitude. Do I hear Australian TV station engineers crying 'too difficult?' If they're interested, plans of the mod are available from Stockholm.

The forward thinking people at Swedish TV are eager to promote the spread of three perf shooting as they can see a future for it in HDTV program generation.

Swedish TV has established a sound tradition in the use of film for TV, and are able to envisage a place for film in the likely appearance of HDTV as a major force in the 1990s

Swedish TV are now not alone in deploying a three perf telecine. Film Technik have also reconstructed a Rank Cintel, and two labs in Sweden process and print 3-perf negatives, as well as transferring the negative to tape.

Ericson: 'We needn't look very far into the future to see that HDTV is well on its way. To meet this challenge, we must adapt film to HDTV's demands, taking into consideration that we may be faced with other financial drawbacks. If the Japanese/American proposal be-

comes an international standard, that system will have an internal frequency of 60Hz, which means that the film camera speed may have to be 30 frames per second. (see ETI Sound Insights March 88) This would automatically escalate the film cost by 25% when shooting in 4-perf 35 mm.

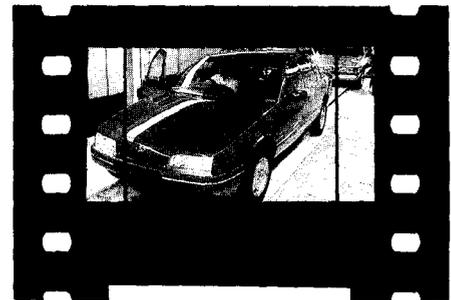
'If we shoot 3-perf at 30 frames per second however, it would still be 6% less expensive than shooting 4-perf at 24 fps. It's quite possible that in the future it will be a MUST to shoot all features at 30 fps.

'But that would mean an even greater advantage for cinemagoers who will enjoy superior quality in the screen, less flicker and strobing. It will be more like looking at a moving slide.'

So, the brave Swedes are at it again. If you looked away when Super 16

*"Do I hear Australian TV station engineers crying 'too difficult?'"*

pushed its head up in our unadventurous (Australian) society, and have lingering doubts about our film industry stepping into the unknown, modifying the cameras, the optical printers, the projectors, the telecines, to leap into Super 35 — take note of the Panavision Corporation's attitude:



*Super 1.85 ratio as photographed in 3-perf, with TV area inside. Note total and efficient use of area between perforations.*

As of March this year '3-PERF' became a registered trademark. Lyon & Lyon, the company's esteemed legal reps warn that they 'would appreciate it if you would refrain from using the phrase' unless it's a genuine triple perforated Panavision.

So, with the kind permission of the Panavision Corporation, we may look forward to lots and lots of 3-perf productions — sans CAPS! **eti**



PAUL BUDDÉ

# IT'S A VIDEOTEX WORLD

## An overall view

Videotex networks are now part of our daily business life. Paul Budde takes us around the world to find the latest developments.

### Australia

The travel industry has always been seen as an early adopter of new electronic services. Through the airline reservation system, travel agents were brought into this new era in the seventies, some ten years before a range of other industries became involved in electronic communication. Over the past five years, a range of new services for the travel industry has come and gone. But in all these years TIAS, the Travel Industry Automated Service, has stood firm. This company has an international and national reservation system. Some 800 travel organisations with over 2,000 terminals are linked into the TIAS network, which also provides access to international airlines.

A major attack from computer companies on this market has been mounted via videotex. Cas/Mayne-Nickless with the Aftel service and ICL with Bulletin were the main players. Aftel has been incorporated in the Viatel service since 1987.

None of these services had a great impact on the travel industry. The obvious reason being that Prestel videotex technology is too clumsy for the sophisticated bookings

and reservations services needed by the travel industry.

Recently a new player entered the market: National Reservation Systems, operating on the ANZ network using Telecom's Tran\$end EFTPOS service. This will allow travel agents to make a range of travel bookings varying from hotels to car rental companies and airlines.

The first agents to be connected are the TIAS users.

★ ★ ★

The Federal Government expects a profit from publishing its reports through the national electronic database, Viatel.

Subscribers initially would be offered access to a limited series of 300 Australian Government Publishing Service (AGPS) titles. The AGPS publishes about 3,500 reports and other documents a year.

★ ★ ★

Westpac's multimedia home-banking service Handyline is one of the fastest growing services of its kind. The service is accessible by Personal Computer, videotex terminal and telephone. The Audiotex (telephone) service is very successful.

Subscribers who do not have a tone-dial telephone need a small device that fits on to the receiver.

There are now close to 50,000 Handyline users and the service is growing by 1,000-2,000 per week.

★ ★ ★

Channel Seven Brisbane has started Australia's first nationwide teletext service called Austext. It replaces the NSW based service called Seventext, later named 'Teletext'.

Austext will be transmitted 24 hours a day to more than 100,000 television sets nationwide. The service is free but a special decoder connected to, or installed in, the TV set is necessary.

A range of services is provided on Austext such as news, TAB, weather, sport, etc. Teletext is a very popular service in Europe. Millions of European TV viewers are enthusiastic users of the service.

### New Zealand

The Australian Telecommunication Industry has ap-

*'I can see the industry throwing a party like no other'*

plauded the new Australian telecommunications policy. But imagine what would have happened if we had received a similar statement to New Zealand's. The Australian communication industry would have thrown a party like no other.

A few weeks before our May statement, the New Zealand government started a true deregulation process. Facts are: —

★ Full deregulation on leased circuits for VAS (including resale and sharing);

★ Full deregulation of customers premises equipment:

— step 1 — May 1988 on all telephones (business and domestic)

— step 2 — April 1989 on PABX;

★ Telecom Corporation of New Zealand Ltd still looks after the standards;

★ Commerce Act '86 controls Telecom's activities;

★ Full deregulation of leased circuits for voice communication (including resale and sharing) by early 1989.

As a first result the New Zealand Government Computing Service started the country's first private ISDN network with 4,000 terminals and a growth expectation of 25 per cent!

### United Kingdom

According to the Videotex Industry Association of the UK (VIA), the UK videotex terminal market is worth US\$100 million p.a.. They expect that Data Broadcasting will overtake videotex in the near future.

A South Korean Company will sell a videotex adaptor on the UK market for less than £100, if they can get an order for at least 1 million terminals.

At this stage the cheapest is Tandata with a £200 Terminal. There are some 90,000 Tandata terminals installed in the UK. Philips has a 35,000 terminal base and Sony sold some 55,000 terminals. The current growth is approximately 20,000 terminals p.a.

★ ★ ★

As Viatel quite often follows the developments of Prestel in the UK, it is worthwhile listing the new tariffs as from the 1st of July as well as an overview of some of Prestel

achievements. The Prestel network has been extended to provide 100 per cent local telephone call coverage and most customers now enjoy a wider range of 'on-line' services than ever before. There are now over 200 gateway services available on third party computers and the introduction of new facilities such as keywords have assisted customers to access the services more efficiently.

Prestel time-based charges as from July 1, 1988 are:—

- The standard rate will be 7p per minute;
- Standard rate will apply from 8 am — 6 pm Monday to Saturday;
- A cheap rate of 1p per minute will apply during all other times (6pm — 8am Monday to Saturday and all day Sunday).

### United States

USA videotex veterans are concluding that gateways offered by local phone companies are the missing link to mass market use of videotex services in North America. The USA Videotex Industry Association has been and continues to be the focal organisation in the policy and business resolution concerning the role of local gateways — first in its written and oral arguments before Judge Greene in 1987 and now in its widely supported industry study on North American Gateways.

The recent 3rd Annual VIA Conference in New York was an essential event in shaping the final conclusions of the VIA's North American Gateway Study. Preliminary results and a draft report were presented during this industry event.

The VIA Gateway Study: A broad spectrum of companies have made a commitment to co-operatively shape the future of videotex services in North America. Their goal is to establish a consensus regarding the critical elements of local exchange gateways.

### Europe

Over the past 10 years several European countries have tried to establish Insurance Data Networks to make it easier for insurance agents to do their work.

Competition between insurance companies, however, has resulted in a large number of small private networks without the necessary compatibilities. At the same time, banks all over the world have already established a global network for financial services.

Deregulation and further enhancements in the technology are shaping this network daily and this SWIFT network (Society for Worldwide Interbank Financial Telecommunications) is ready to extend its services to other

Germany during the coming years, as part of a plan to spur usage of Bildschirmtext (Btx), the videotex service that has acquired about 100,000 users in its three years existence. At least three major German hardware manufacturers are expected to respond to the request for proposals; all now make dedicated Btx terminals that sell in the \$1,300 (equivalent Australian price) or under price range. It is unclear how the government-run telecommunications agency will subsidise the distribution of the terminals, which is expected to begin by 1990.

★ ★ ★

Germany signed a contract with France and by doing so has at last accepted the

British Mercury system has 6,000 users and has a link with 16,000 users in the US. The battle between Telecom Gold and Mercury is quite serious, despite the fact that electronic mail services in general are fighting an up-hill battle. Facsimile and videotex are identified as the winners of the field.

### Portugal

Transdata, a subsidiary of the Portuguese PTT, started the test phase of the public videotex network in July; the commercial phase is due to start by the end of 1988.

Based on a Bell Belgium (Alcatel)/Micro Scope system, the public videotex service will support Btx standard and lower level standards such as Prestel and ASCII with a Prestel Gateway 2.2+ protocol.

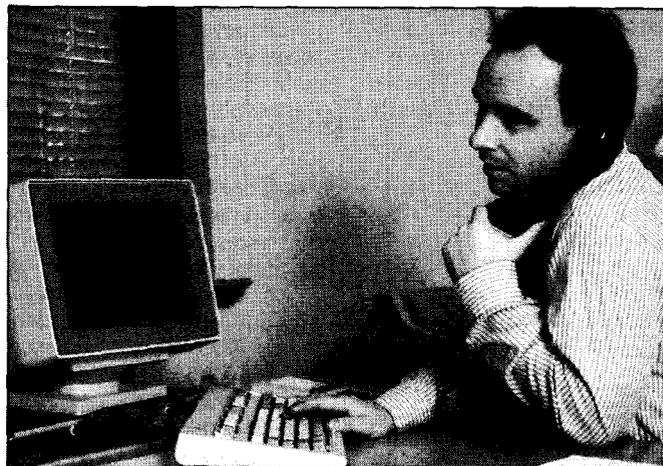
About 40 IPs — banks, administrations, insurance etc. — use the host computer to trial their services via Telepac, the national packet switched network. The host computer is to be connected to the public videotex system by mid-1988.

### Africa

Madagascar, Ivory Coast, Senegal, Morocco, Tunisia, Egypt and Lebanon are the seven French-speaking countries, out of a total 40, that will benefit from a French PTT videotex programme involving donation of Teletel/ASCII minitels to the French speaking community. About 1,000 minitels are to be installed in 1988, and the first two countries that should benefit from the project are Lebanon and Senegal.

The project is designed to develop local, minitel-based networks in these countries and to increase communication between the scientific, French speaking community by interconnecting Minitel-based nets for instance. **eli**

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



*Westpac's Handyline home banking system is now accessible by PC, videotex terminal or telephone*

financial institutions. Of special importance is the development of Electronic Document Interchange (EDI). This is of enormous importance to the insurance industry.

According to a recent conference on this subject it looks like it might well take another 10 years for the insurance industry to get their act together. By that time banks could possibly have taken an important part of this market.

### Germany

The Deutsche Bundespost plans to distribute 300,000 terminals throughout West

French Minitel standard. Up till now Germany rejected any co-operation with the French. Economics, however, have now prevailed over politics.

### France

Based on a new de-regulation agreement between France and UK, new value added services will be made available to users in both countries. Private companies in the two countries have set up the first service, an electronic mail link.

The French system has 5,700 users and expects this number to increase to 10,000 by the end of this year. The



KRY S WAREING

## GROWING THEIR OWN

### *Privately funded university benefits industry*

**The government's failure to correct market requirements in higher education has spawned the privately funded Bond University. Krys Wareing reports on the benefits.**

On privately funded universities Lauchlan Chipman, Professor of Philosophy at Wollongong University wrote in 1986: "It is traditional economic wisdom that government get involved in the marketplace to correct for market failures.

"What we are now seeing in Australian higher education is a growing interest by the private sector to correct for the failures of government agencies to meet market requirements."

Bond University, innovative, privately funded, and situated in Burleigh Forest on the Gold Coast, has identified those market requirements in offering industry-sourced courses in pragmatic pursuits like computer science, business and technology.

The Chancellor, Sir Sydney Schubert, has said that the University's aims were to produce the type of graduates and research that Australian commerce and industry lacked, and to undertake certain research projects and consultancy work for industries prepared to pay.

One of those strengths rests on contributing to Australia's research base through the Bond Research Park, established concurrently with the University. As the Federal Minister for Industry, Com-

merce and Technology Senator Button said at the presentation on the park in 1987, while CSIRO science was of a high quality, it was "not well translated into wealth-generation".

As explained by Mike Hillsden, the head of Bond Corp's technology division, "The fact that Australia had to import \$3 billion worth of hi-tech (in 1986) helps explain why research at the research park will be market-driven —



Professor Tweedie.

blending skills in both technology and marketing."

According to Sir Sydney, the research park and its associated consulting, and Bondsearch, "will manage and market staff expertise through consulting, and Bondventure, a joint venture capital company, will become the vehicle by which staff re-

search can be commercialised and joint ventures established to transfer technology into Australia and license out our intellectual property."

United action in research development and innovation was important for Australia, he explained, adding that no other affluent nation had a lower percentage of professionally trained personnel so thinly spread over such a huge area.

But apart from establishing national objectives in research, new policies needed to be developed to shift the focus of the nation's research away from the public and to the private sector.

"These policies must recognise that tactical research, innovation and design are private responsibilities because they must be market-driven," Sir Sydney said.

Set up much like a corporation and with no federal funding or AUSTUDY assistance, the \$125 million 212 ha university must compete with other tertiary institutes for the brighter, more highly motivated students and staff.

According to Bond University's Professor Richard Tweedie, Dean of the School of Information and Computer Science, the University has not only approached industry for input on the development of the computer science courses, but it has forged links on curricular development with other Queensland tertiary institutes.

#### **Harvard-type**

While Australia's older universities struggle with overworked computer science academics and overcrowded lecture rooms, Bond University, with its first intake of 850-1,000 students in 1989 and its projected growth to 2,500

students within three years, has a chance to develop into Australia's first "Harvard-type" university.

Pitched at the "currently and emerging requirements of private and public sector employers in Australia and the Asia and Pacific regions," as a Bond brochure says, the student mix at Bond will be Australians, Japanese, South East Asians and North Americans.

The University's "flexible" admissions procedures will

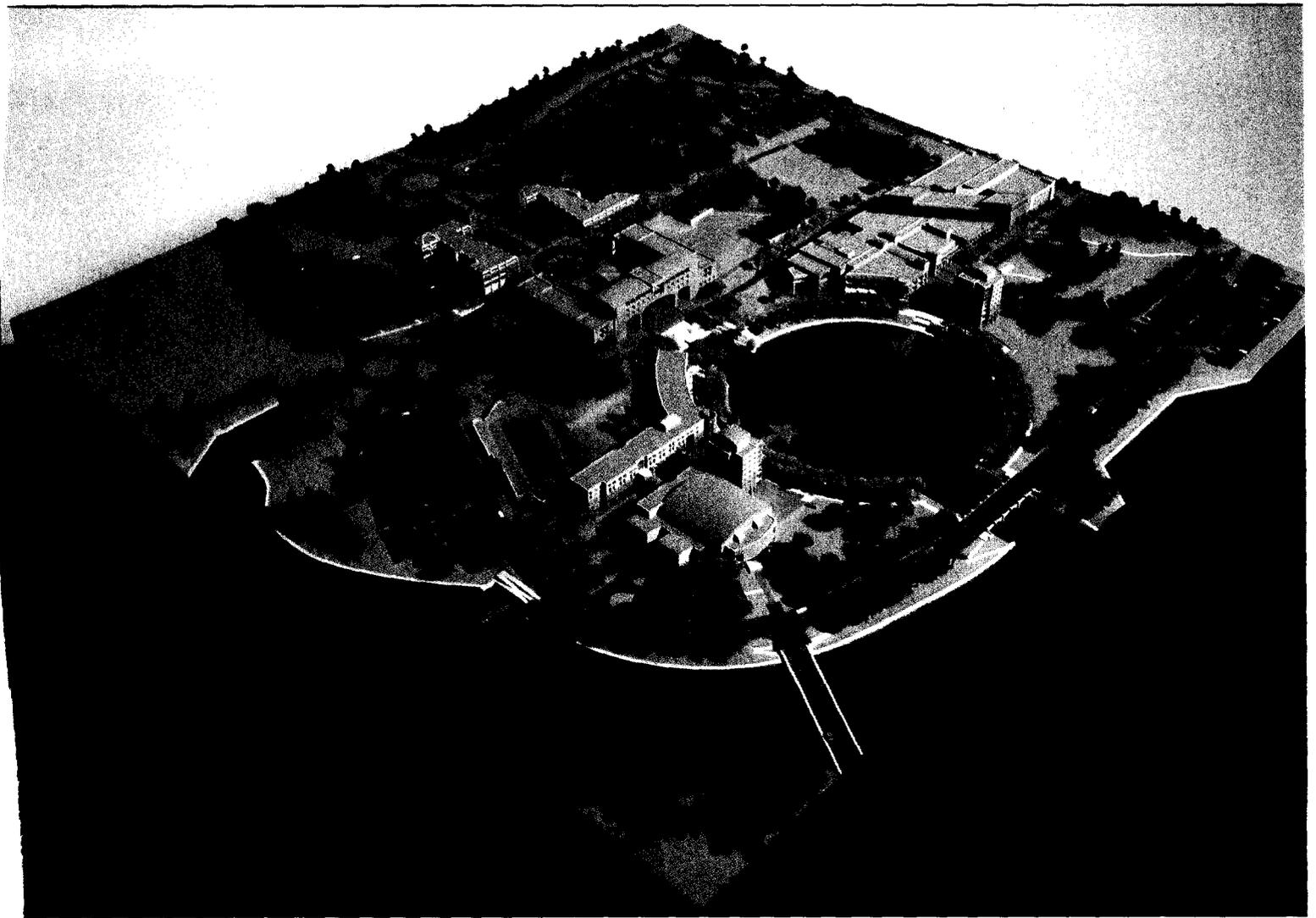
*'... Bond academics will need to justify their existence'*

take account of motivation and potential to achieve and will not rely solely upon academic merit as shown in entrance examinations.

"In particular, the university will seek information about students' capacity to succeed in a competitive academic environment in which basic and applied knowledge are given equal priority," Foundation President and Vice-Chancellor, Professor Don Watts has said.

The basic undergraduate fee over three years is expected to be about \$36,000 or up to \$49,500 based on the cost of \$6,000 for each semester with the student having to buy their own personal computer. Students are not confined to the present three-year academic undergraduate programme, Professor Tweedie explained. They can elect to complete their degrees in two years instead of the current three, by a restructuring of the annual academic programme.

Bond is named after one of



*Bond University's 100 hectare Gold Coast campus model.*

the university's co-founders Perth millionaire Alan Bond; the other is Mr Harunori Takahashi, of the EIE Development Company Limited. The university will not offer traditional "pure" courses in engineering, said Tweedie, for two reasons: potential engineering students are well-catered-for already in Australian tertiary institutes and secondly, the courses are "too expensive". Although, he explained, Bond University has not ruled out the discipline from future planning.

For some time, Australian universities have feared a brain drain to Bond. In what was described by one daily

newspaper as "pushing a free market broom through the cobwebs of Australian academia", Dr Don Watts, who has attacked the Federal Government's way of running higher education, said the university

*'... no other affluent nation had a lower percentage of professionally trained personnel'*

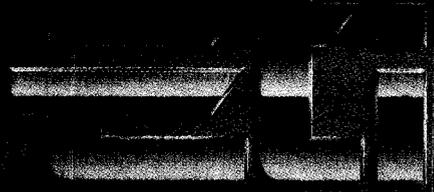
would pay staff "quite a bit above the award". Recruiting quality academics under centrally fixed salary arrangements was "impossible", he has said.

It was ludicrous, that a business systems graduate received a first-year salary higher than that of the head of the business school. continued Watts — a member of an inner circle of academics,

the "Purple circle" (they have advised the federal Minister of Employment Education and Training, Mr Dawkins) — and ex-Vice Chancellor of Curtin University.

Like business employees, Bond academics will need to justify their existence through "performance and competence". Recent advertisements for academic staff to teach law, read: "Bond University does not subscribe to the concept of tenured appointments. Promotion within the University will be based on competence and performance. Appointments are viewed as continuing unless otherwise indicated."

Importantly, Bond University sets out armed with the entrepreneurial academic, able and capable, giving industry what it has hungrily demanded for years. **ETI**



... a feature-rich cellular telephone designed specifically for Australian conditions."

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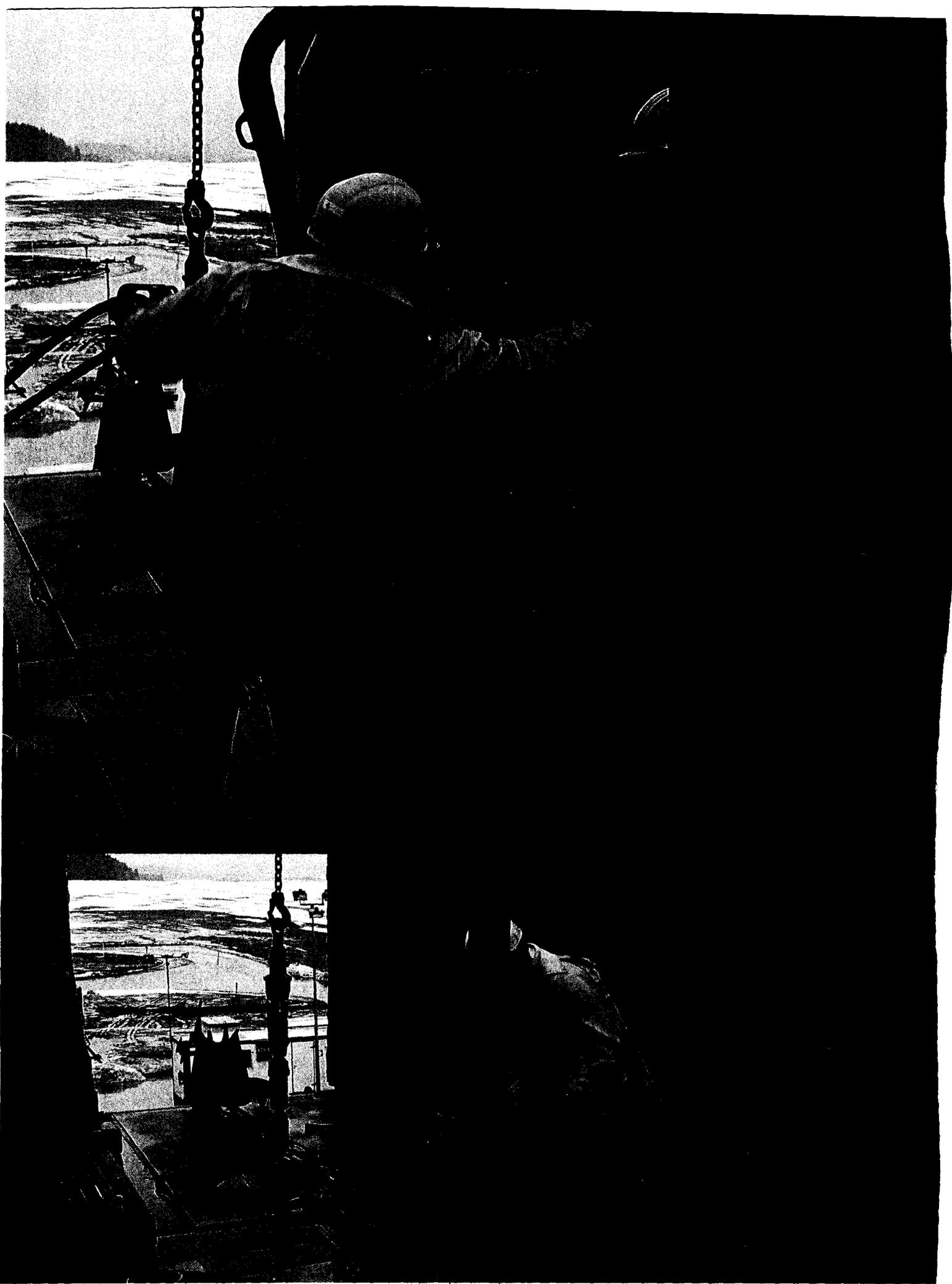
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INNOVATION

A sample of mud from deep within the earth has put a new slant on the origins of hydrocarbon fuels. Sydney Morning Herald Science correspondent, Bob Beale reports.

# OILS AIN'T OILS...

Rare core sample sparks biological origin debate

**S**ixty kilograms of extremely smelly black sludge from the bowels of the Earth have become the focus of sharp dispute between supporters and critics of a strange and unconventional theory about the origins of oil and natural gas.

The "black stuff", as it has unceremoniously been named, has the consistency of modelling clay, and incorporates molecules of material that seem to have a biological origin.

It was unearthed from the bottom of an extraordinary hole being drilled into an ancient meteorite crater in Sweden, in an attempt to explore the theory of Thomas Gold, professor of astronomy at Cornell University, in the United States.

The black stuff appears to have come from somewhere around 6.7 kilometres beneath the Earth's surface, and with its apparent biological component, it has unearthed a much broader debate about whether Gold is right in believing that it hints at a volume of subterranean life perhaps as great as all known life on the planet's surface.

Even if he is wrong in that speculation, critics still have to deal with the possibility that Gold is right in asserting that beneath the planet's surface, deep down, lie almost limitless quantities of hydrocarbon fuel.

The Swedish drilling project began in 1986. Gold, with the support of private investors, the Swedish State Power Authority, and the Chicago Gas Research Institute, selected the Siljan Ring to test his ideas about the origins of hydrocarbon fuels.

He chose the site because he felt other physicists and geologists would only take him seriously if he found gas

or oil in ancient basement rock where no biological material could be suspected of being present in sufficient quantities to give rise to the fuels.

Why? Well, that lies at the heart of Gold's ideas on oil and gas.

The prevailing viewpoint has arisen over the past century or so that oil has a biological origin: plant and animal debris, the orthodox view states, have been buried with sediments and undergone chemical change that results in the production of petroleum and natural gas.

"Most people now believe that there has been ample proof of this, and that the subject is beyond debate," Gold

*'... our ideas on the formation of our planet have changed radically'*

said in an interview in Sydney last year. "Everyone calls these substances 'fossil fuels' and their presence is taken to be proof that vast amounts of biological materials were buried in the remote past."

Gold, however, believes that the view put forward by Mendeleev in 1887 is more correct. Mendeleev considered that petroleum came up from deep down in the Earth. In his time, of course, the Russian's ideas hardly gelled with the state of knowledge as it was then. When the theory of biological origins was propounded at the time, it seemed almost inconceivable that hydrocarbons could be considered without some role played by biology. They were compounds of organic chemistry, a term which denotes virtually all chemistry

## The good oil on a professor



Professor Thomas Gold is no stranger to controversy. A regular visitor to Australia since the late 1950s, his newspaper clipping file is testimony to his highly individualistic approach to science.

In 1959, he was described as being part of a group of theorists who believed the universe had no beginning and would have no end: new matter was constantly being created in space, he said.

A year later, he stirred up another debate by suggesting that life on earth might have begun as microbes left behind on the planet by visiting space travellers.

Such ideas might be easily dismissed as those of a crackpot, were it not for the fact that Gold was appointed as director of radiophysics and space research at Cornell at the age of 39, and developed a disconcerting habit of being proved right by later research into many of his provocative ideas.

## Oils ain't oils

concerned with carbon in its unoxidised form.

The biological origin theories gained further credence, Gold notes, when petroleum was found to contain components that had never been observed in non-biological circumstances. Coupled with that evidence was the prevailing idea that the Earth had once been a molten ball that slowly cooled to form a crust. "In that case, there would be no expectation that any hydrocarbons would survive, and that there would be little chance of them being subsequently created by the melt or its frozen products. Starting from those positions, an explanation for the origin of petroleum in terms of biological debris in the sediments seemed almost inescapable."

### Debate not over

But the debate was not over, as many people assumed. The geographic distribution of petroleum seemed to point to much larger scale features than the scale of the individual sedimentary deposits or, indeed, the scale of any of the surface features. The quantities of oil and gas that were found turned out to be hundreds of times larger than the estimates initially made on the assumption of a bio-origin.

"The viewpoint that hydrocarbons were a bio-product which could not be expected to arise without biology became quite untenable when one observed that hydrocarbons were in fact the most common form of carbon in the entire planetary system. Jupiter, Saturn, Uranus and Neptune contain enormous amounts of methane and other hydrocarbons in their giant atmospheres. "The comets and the asteroids are now known to contain various types of hydrocarbon compounds, and the core of Comet Halley was found recently to have a surface that was "black as pitch", most probably because it was made of pitch or some similar hydrocarbon substance. All these materials are most unlikely to have been created by biology."

Moreover, notes Gold, our ideas on the formation of our planet have changed radically as well. We now know that the Earth accumulated from solids, and that only partial melting caused the formation of a relatively thin crust of lighter rocks segregated from the largely solid mantle which forms the outer half of our planet.

"In this picture, one can no longer rule out that volatile fluids, including hydrocarbons, could be cooked out from this mantle and eventually work their way up towards the surface," Gold

says. "The water of the oceans and the nitrogen of the atmosphere, as well as smaller quantities of other volatile substances, must have originated from such outgassing processes."

Carbon, although abundant on the Earth's surface, was only a minor component of the basement rocks, and must therefore have entered the crust from somewhere else, he argues. He presumes it was from deeper levels as a fluid, oozing to the surface over geological time, or escaping in gaseous form.

For a long time it was argued that the high temperatures and pressures existing at depth in the Earth would destroy all hydrocarbon molecules. But more recent evidence, Gold says, suggests that in the temperature and pressure regime at depth, methane and other hydrocarbons would be stable down to 300 kilometres or more.

### No evidence

As for the biological molecular evidence in petroleum, Gold claims they don't indicate anything more than biological contamination, perhaps from bacteria that feed on oil: these molecular "fossils" provide no evidence for the origin of the bulk substance, Gold claims.

Global patterns of hydrocarbon occurrence continue to provide problems for the bio-theory, he points out.

"Why was the Middle East so rich in hydrocarbons?" he asks. "the areas of the mountains of south-eastern Turkey, the valley of the Tigris, the folded mountains of Persia, the Persian Gulf, and the fault plains of Saudi Arabia, have little in common with each other, except that they form one connected region that is enormously well supplied with oil and gas. "No unifying feature for the region as a whole has been discovered."

"The oil fields span over different geologic ages, have different reservoir rocks and different cap rocks holding down the contents of those reservoirs.

**"There will be no need to fight over regions that supply fuels"**

"Despite this wide range of age and type of reservoir, there is a notable homogeneity of the chemical composition of the oils, and therefore the presumption that in some way they have a common origin."

Gold puts great store in the phenomenon known as vertical stacking, often noted in hydrocarbon deposits, where areas with oil or gas at shallow levels



often have more at deeper levels, sometimes all the way down to basement rock. His theory fits that pattern well, he argues, and raises the possibility that these deep materials are unevenly distributed all over the Earth and have no simple relationship to crustal features.

### The Siljan Ring

All that, of course, would be theory and remain so, if Thomas Gold were a less determined man. Enter the Siljan Ring, and his drilling project. The ring is an area almost totally free of sediments, but thoroughly smashed up at deep levels by a giant prehistoric meteoritic impact, and formed of ancient granite.

Before drilling began, comprehensive surface investigations were carried out, and revealed plenty of evidence of hy-

drocarbons. "It was clear that gas was streaming out through the area," says Gold. Farmers' wells brought up enough gas so that one could light a flame. Small lakes in the area had a lot of methane dissolved in their waters; there were seeps of oil seen in stone quarries, and many tales existed of spontaneous flames being seen in the forest, and of explosions and strange noises one might

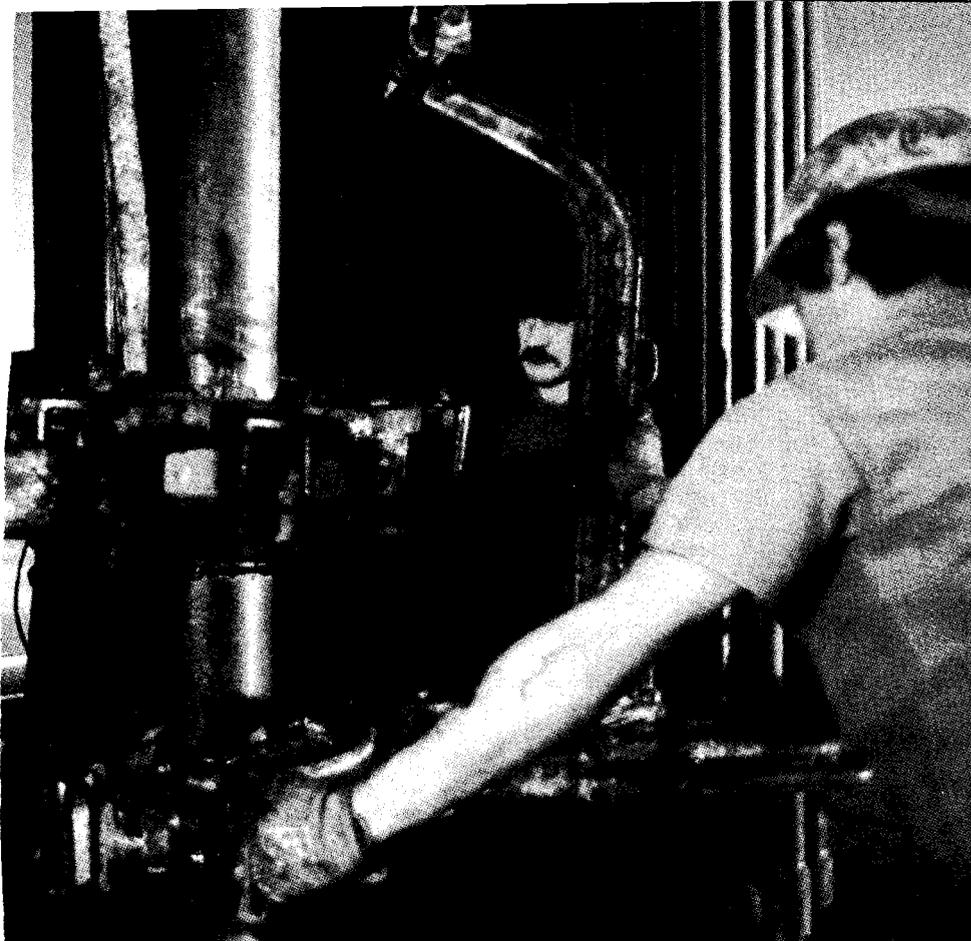


Photo courtesy Santos

associates with gas coming out of the ground. Yet in this case there were hardly any sediments, and a biological origin for these hydrocarbons could not really be envisaged.

Gold anticipated that drilling would reveal critical layers in the basement rocks, where the great weight of overburden would have crushed the pores and cracks in the rock, trapping gas and oil under great pressure beneath them in more porous and less crushed rock.

So drilling began. "At a depth of six kilometres, we encountered the expected porosity," Gold recalls. "Suddenly, from one metre to the next, the rate of progress of the drill increased five-fold. Then a large quantity, more than 100 tonnes, of the heavy drilling fluid disappeared very rapidly into the cracks. It is clear that the entire viewpoint on which the operation was based was correct."

Then, earlier this year, at 6.71 kilometres down, the contentious black stuff appeared. It consists of fine-grained magnetite (an oxide of iron) and various hydrocarbons, as well as "biomarkers", or carbon compounds usually taken as being characteristic of biological activity.

The pungent stink suggested recent bacterial activity, according to Gold, who claims that bacteriologists who examined samples of the sludge agreed that the bacteria must have been active

until they were brought up from the drill hole.

### ***Life at deeper levels***

"What this means," he is quoted as saying recently in *The Sunday Times*, "is that it suggests there is an enormous sphere of life, of biology, at deeper levels in the ground than we have had any knowledge of previously."

As if that were not puzzling enough, the sludge contained anomalously high levels of iridium, which is present in significant amounts in some of the meteorites Gold thinks may have contributed hydrocarbons to the young Earth. As well, it emerges that some bacteria are known to be capable of making magnetite. Lastly, Gold also claims to have found increasing quantities of hydrocarbon gases as the drilling has progressed, as well as hydrogen and helium.

Gold argues that contaminants, such as the lubricants put down the drill shaft, cannot be the source of the gases or the black stuff. The helium, for example, is known to emanate from the deep Earth, and is not present in any of the drilling additives.

But the critics remain critical. Alan Jeffrey, of the Global Geochemical Corporation in Los Angeles, thinks biological marker molecules from oils near the surface somehow leached down the drill hole and accumulated there. He notes that the black stuff was found inside the

hollow drill pipe, and not outside, as might be expected. Supporters of Gold counter that strange pressure effects could explain how the material was sucked into the pipe.

Other critics suggest that the helium measurements could be a result of occasional pressure drops in the shaft. Such drops tend to make any gases present come out in solution, and so they could explain the apparent correlation with measured levels of the other gases that apparently suggest a common origin for them all.

The whole project recently faced financial difficulty, but the Swedish State Power Authority has now been sufficiently convinced to support further drilling. The current plan is to go down to about 7.5 kilometres. It remains to be seen how Gold will incorporate his latest discovery into his theoretical framework. Does the presence of biological material, perhaps even freshly dead bacteria, in his black stuff represent contamination from the surface, or a hidden world of subterranean life? Does it mean that a biochemical process is producing hydrocarbons much deeper down, and in previously unsuspected ways, than science has even guessed at until now? And if there are hydrocarbons in his drill hole, has he discovered something analogous to the bacteria associated with deep ocean vents?

### ***Intriguing implications***

Even if his explanations are wrong, however, the possibility that vast supplies of natural gas are available to be tapped almost anywhere on the planet has intriguing social and economic implications.

"What this means for the future of oil and gas is that many areas that were totally ignored before can now come under consideration," Gold says.

"Oil may run out, but gas at the deeper levels will be there for a very long time, and in very many parts of the globe. There will be no need to fight over regions that supply fuels — it will be much easier to find one's own.

"I estimate that there will be hundreds of times more than was estimated on the basis of biological origin theories."

Right or wrong, Gold has taken the fight to his critics in the best way possible: it is up to them now to explain how sixty kilograms of pungent black sludge containing evidence of life came to end up in Gold's drill pipe underneath six kilometres of granite. Meanwhile, he will keep drilling, and perhaps his next find will hold both puzzlement and joy for us all.

**eti**



TECHNOLOGY

**T**he September opening of the Australia Telescope (AT) at Narrabri was one step that will ultimately synthesise an antenna bigger than the entire Earth. It will be called Radioastron, and involve both space based and surface based radio telescopes.

Since the beginning of astronomy as a science, astronomers have always held the view that if only they could see a little more clearly, most of their problem could be solved. This has meant that succeeding generations of telescope makers have tried for greater sensitivity and greater resolution in their instruments. Sensitivity is the ability to see faint objects. Resolution is the ability to distinguish between two objects very close together. Both are related to telescope size, so over the years telescopes have grown bigger and bigger.

Around the turn of the century, however, most of the techniques of mechanical construction were well understood, and so the upper limit to the size of a telescope was set by the materials used. Once these were optimised, further meaningful growth in the size of telescopes came to an end.

The great five metre reflector on Mt Palomar, for instance, was commissioned during World War II, and is still the biggest functioning telescope in the world. The Soviet Union tried for a bigger dish, but it has never worked properly.

Attempts by other groups, notably in West Germany and the US, met with a similar fate.

Not that developments in sensitivity or resolution have stopped. On the contrary, if anything, new techniques have accelerated the trend. CCD cameras and image intensifiers now allow telescopes to use individual photons of light, so improving sensitivity many hundred fold. Image enhancement techniques ensure that this increase in sensitivity is used as efficiently as possible.

Increases in resolution have relied on a completely different technique, interferometry. Until now, because of the extremely fine tolerances required, it has been used exclusively in radio astronomy, although that is changing with the

development of optical interferometers like the one under construction at Narrabri for Sydney University.

### Interferometer

An interferometer is a device that ties together a number of different telescopes in such a way that they have the resolving power of a single telescope with a diameter equal to the distance between the elements.

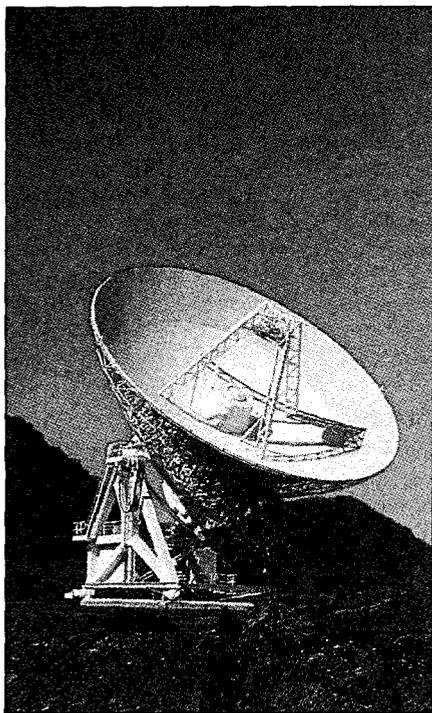
To see how this is done, imagine what happens when we combine the radio signals from two small telescopes. Suppose they are observing a point source of radiation, like a star. There is no necessary reason why the distance between the star and both telescopes will be identical, in fact, unless the star is exactly at right angles to the baseline between the telescopes, the path length to one telescope will be quite different to that of the other. This difference in path length will show itself as a phase difference between the signals received at the two telescopes.

As the Earth rotates, the path length difference, and thus the phase difference, will change continuously. Some-

*'It is the only significant observing source in the southern hemisphere'*

times the waves will be in phase, sometimes out of phase. When the object is at right angles to the baseline between the telescopes, the amplitude of the wave will be at a maximum, and then will go to a minimum when the path length has changed by a half a wavelength. As the object moves further and further away from the normal, the phase will first add, then subtract, then add again in a regular repeating pattern. These amplitude variation are called fringes.

The distance between the fringes is determined by the distance between the telescopes. The further apart, the closer together the fringes, and the more pre-



**Bill Chapman reports on the creation of a huge radio telescope.**

# THE RADIOASTRON PROJECT

## *Seeing it more clearly*

ETI NOVEMBER '88

The Universe at optical wavelengths can be a turbulent place. This cloud of gas and dust contains much to interest astronomers but it also obscures what lies behind. One of the strengths of radio astronomy is that radio waves go right through such clouds. Opposite; The 22 metre AT antenna at Coonabarabran.





cisely we can locate the maxima. However, there are problems with this simple scenario. For instance, in general, we do not know the precise position of the object we are measuring. Thus, when maxima occur, we know the path length difference is a whole number of wave lengths, but not what the number is. This means it is not possible to tell at which maxima in the fringe pattern the object is located.

One way around this is to use a number of different baselines. The various different interferometer pairs will then all give a maximum when the object is directly over the baseline. Then the problem is that if the object is not exactly a point source, it may be resolved, that is, signals from one part of the object will be in phase, and signals from another part of the object will be out of phase, with the result that the signal does not

vary and the fringes disappear. The only way around this is to have a shorter baseline, and thus wider spaced fringes.

### ***The AT***

It's this theory that lies beyond very big baseline interferometers like the Australia Telescope. It consists of six antenna at the Paul Wilde Observatory near Narrabri, Northern NSW. Five of these are contained on a track three kilometres



ing, and, with a camera, we track people in the dark at night. It's a very, very important part of the AT.

An important part of the AT is the Special Operations Forces. A lot of the AT is done by the Special Forces, and they're the ones who are doing the most important work. They're the ones who are doing the most important work.

The AT is a very important part of the AT. It's a very important part of the AT. It's a very important part of the AT.

to the South. The Parkes radio telescope has been a vital part of modern astronomy for the past twenty years, and its inclusion in the AT design will give us a new sense of it.

When the array is combined it will have a baseline, some 320 km long, together with the ability to synthesise some 26. It's a very important part of the AT. It's a very important part of the AT.

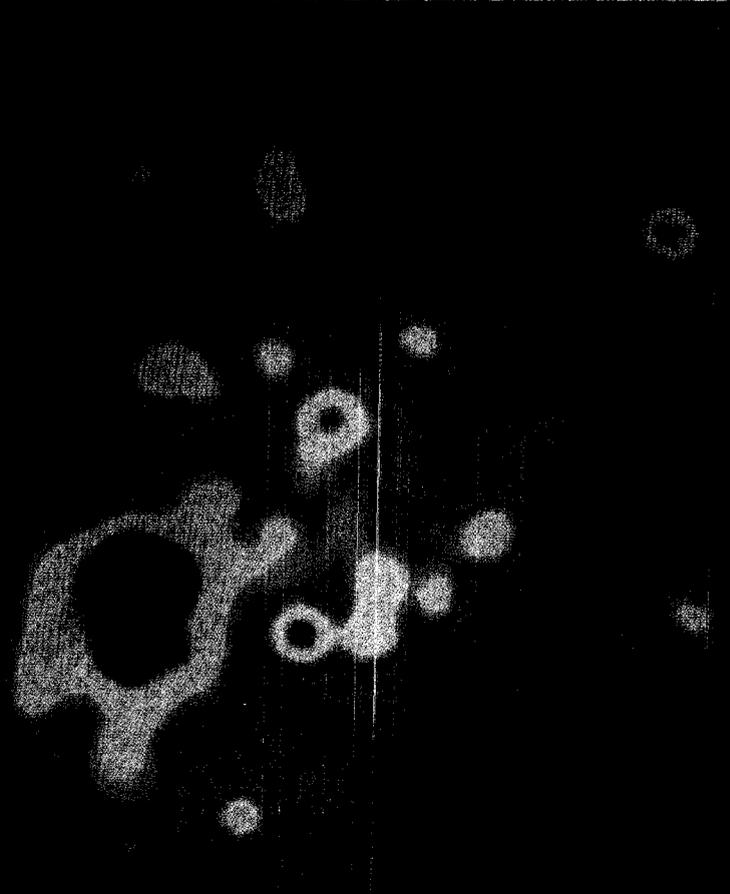
NASA deep space tracking station at Tidbinbulla (70 m) and the University of Tasmania's dish (26 m).

However, it's possible to see a number of different astronomical problems that won't be resolved even with this impressively sized baseline. Intercontinental baselines have been used before from Australia. Parkes has been linked to antennas in Hawaii and even to the US West Coast, but there is no need

## Radioastron



The universe at radio wavelengths looks quite a bit different to its optical counterpart. This image is of a supernova remnant obtained by the University of Sydney's Murgulla Telescope



The Large Magellanic Cloud  
Both these images are computer synthesised maps of radio intensity in the sky. The colour bar above represents the intensity of emission, so white is 'hot' and blue cool. Generally, dispersed radio emissions like this indicate hydrogen clouds in space, which may or may not be visible at optical wavelengths.

amount of common sky between the two antennae, which makes the setup rather clumsy. A much better answer to the problem is to use an antenna in space.

### Radioastron

Radioastron was originally conceived within the Soviet academy of sciences as a space based radio telescope. However, in the years since it was first announced, it has grown into a truly international project, one in which virtually every country with a serious interest in radio astronomy is now involved. It is designed so that it can be used as an adjunct to all the major terrestrial radio astronomy facilities.

The Australia telescope is vital to this plan. It is the only significant observing source in the southern hemisphere, and the second most powerful in the world, so its inclusion in Radioastron planning was virtually guaranteed. When Radioastron is launched, sometime in 1992, it will give astronomers a base line some five times larger than the earth with which to probe the fine structure of a number of radio sources.

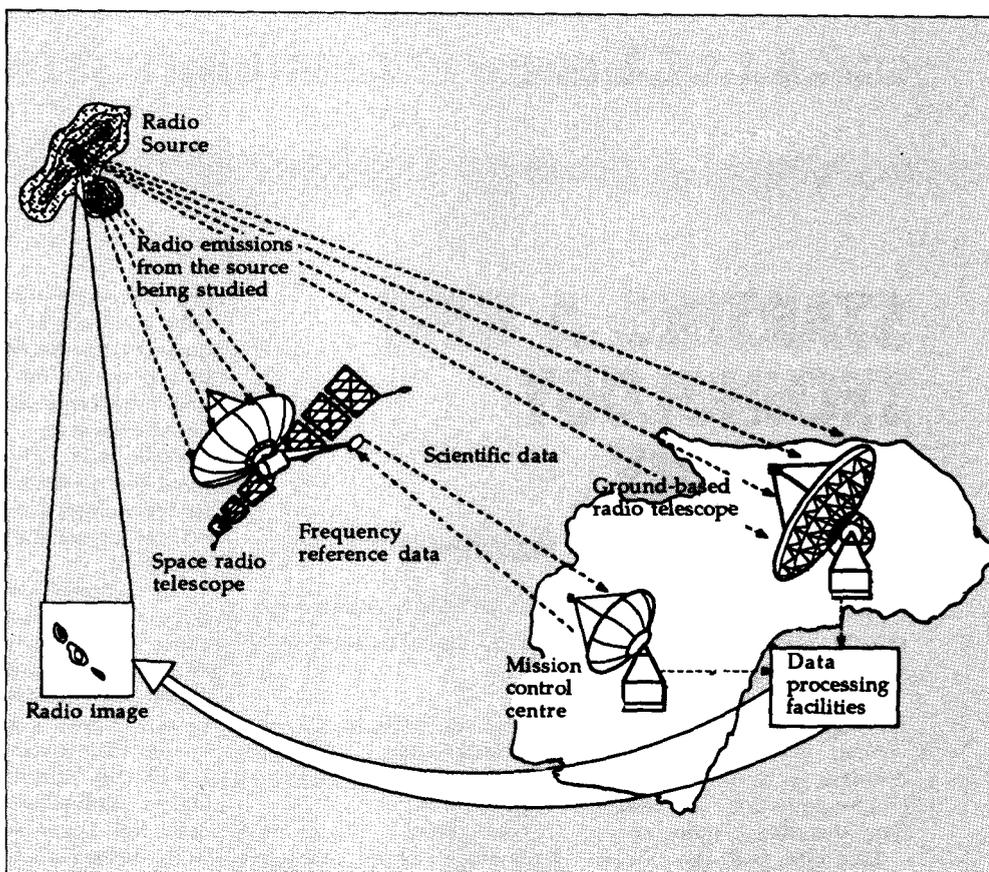
The space craft will be dominated by its antenna, although it will also have large solar panel wings attached to its main body. There will also be a smaller antenna on a boom, pointing at Russia for command and control information. As well, it will be used to send data from the antenna back to waiting receivers at the control centre.

Control of a spacecraft like this is especially difficult. Not only do all the normal problems need to be solved, but also the distance to the spacecraft needs to be determined to within ten percent of the operating wavelength. For the results to be interpreted cor-

*'... a device that ties together a number of different telescopes'*

rectly on board there will be four transmitters, at 320 MHz, 1.6 GHz, 5 GHz and 22 GHz, corresponding to vital astronomical frequencies. The 1.6 GHz transmitter is being designed by British Aerospace Australia in Adelaide and Mitec at the University of Queensland. It just so happens that the transmitter is operating at precisely the same frequency as Aussats proposed L band mobile radio. Happy synergy no doubt!

In practice, data from the spacecraft,



**The structure of Radioastron. The space based telescope sends data to tape recorders on the ground, where it is combined with data from the AT using correlators produced by Austec, the Adelaide based microelectronics company.**

rectly together with clock information from Australia, will be loaded onto a taperecorder. The tapes will then be processed just like data from any other telescope in the Array. The clock pulses, supplied from super stable sources, are necessary to align the tapes correctly in time, and indeed, the accuracy with which they can be supplied determines in large part how accurate the system is.

A lot of work still needs to be done before Radiastron flies. The Australian managers of the project seem prepared for an elastic timescale as problems are encountered and solved in an unpredictable fashion. However, the basic concept has already been proved. In 1986, an existing comsat, TDRS-E was linked to ground stations in Australia and Japan. This system was equivalent to an antenna 28000 km across, and successfully detected 25 quasars.

### What is it good for?

Radioastron will push back the frontiers of the possible in observation, probably well into the 21st century. Its extremely high resolution will give new insights into masers, (microwave lasers), believed associated with the birth of stars.

At 22 GHz it will observe spectral lines of water and at 1.6 GHz the spectral line of OH. The exact structure of these objects is not known, but it is believed they hold valuable clues not only to the way stars originate, but also to distance measurement to other galaxies, absolutely fundamental to our understanding of the universe.

Radioastron will also push back the frontiers of knowledge by imaging closer to the centre of two sources of black holes. Quasars, the most distant and luminous objects yet discovered, are thought to be an extreme type of active galaxy. Most astrophysicists think that the huge outflows of energy from these objects are triggered by matter falling into a massive black hole at the galaxies' heart.

The centre of our own galaxy, Sagittarius A, is also believed to contain a black hole. Although permanently hidden to optical astronomers because of the dust clouds of the galaxy, radio telescopes can see it quite clearly. An ability to unravel its fine structure will be one of the most exciting projects astronomers have had for a while. **eti**



JOHN COWARD

# STARTING A NEW TECHNOLOGY COMPANY

## *The important factors*

This month John Coward outlines major points for those who wish to commence a high-tech business.

Starting and growing an advanced or high technology business is a very exciting, challenging and demanding time. It is also, in many cases, a high risk and complicated exercise.

There are substantial rewards for you if you are successful in the process. There is a range of good examples of new technology companies

growing in Australia, creating substantial wealth for their owners and helping Australia's long term future.

Your decision to start a technology based company depends on whether you have entrepreneurial traits, the abilities, attitudes and motivation to be successful. You should also be asking yourself whether the potential rewards

are commensurate with the risks involved. Entrepreneurial qualities can be as important to success as the technology you may have developed or plan to develop.

While it is difficult to pinpoint the qualities of successful technology company owners, certain qualities tend to be important.

For instance your level of drive, whether you are a self-starter, self-reliant energetic and ambitious to succeed are important factors. You will need a sense of priority and be interested in making the best use of time. Starting and growing a technology company does not come without hard work, missed holidays and the need to be flexible.

### **Weaknesses**

Everyone has their strengths and weaknesses — it is important that you recognise yours.

Hopefully your partners, employees, consultants or Board of Directors will compensate for particular weaknesses you may have. You should look carefully at your formal business training and experience, the knowledge of your technology and the market and the strengths and weaknesses of your competitors.

In the human relations area you will need the ability to effectively deal with people, motivate employees, sell to customers, negotiate with vendors and convince lenders. You will need to be a good communicator and have the ability to "sell yourself".

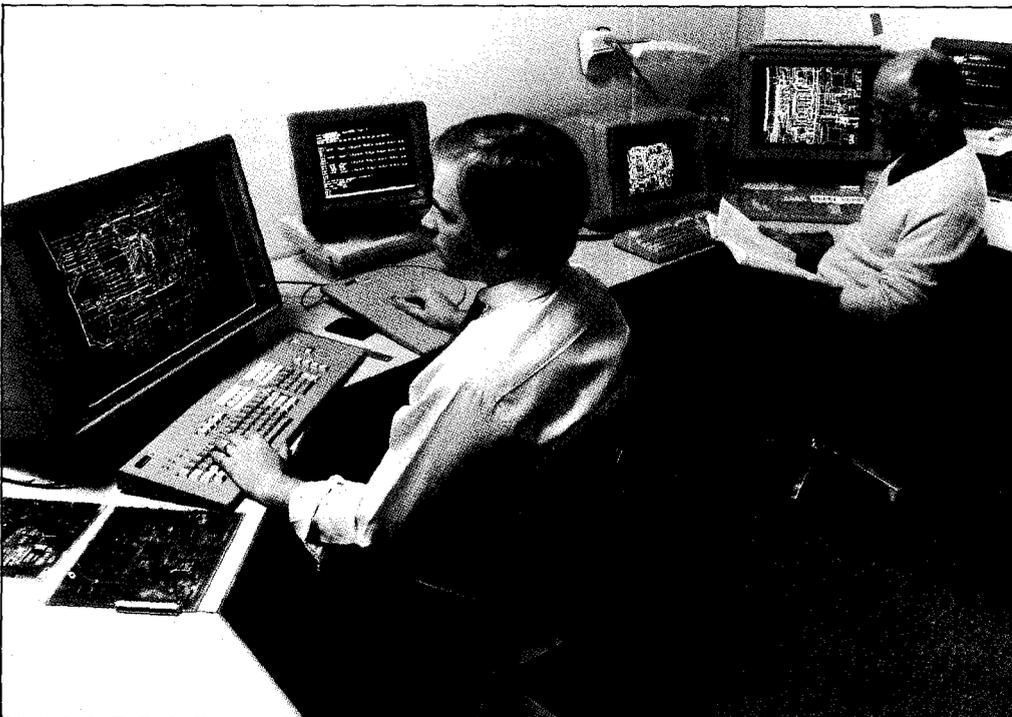
The initial "pre-start up phase" of a technology business involves a conceptual formulation of the product or technology or you may have already developed a prototype. You may require a small amount of "seed finance" to undertake initial research to generate a tangible entity such as a prototype, or to further refine what has already been developed. Consideration will

***'Starting and growing a company does not come without hard work'***

need to be given to the raising of such seed money which is often from personal sources or government grants and assistance.

Of vital importance prior to commencing the business will be the presentation of a meaningful business plan and financial forecast — which is especially important for the raising of capital in a technology start up company.

The business plan needs to



clearly explain who you are and what your objectives are. An explanation of your technology, its distinctive features of uniqueness, is also important. Your working capital requirements need to be clearly stated and provide an indication of when and how a financier will be repaid. (See last month.)

Of critical importance are your market estimates for the technology. You should analyse this area critically and objectively, setting aside your enthusiasm for your technology. Consideration in many instances (especially for high growth technology companies) needs to be given to the international market place for your technology.

### **Initial funding**

Another important and very difficult aspect of starting a technology business is the initial funding. Apart from injec-

tion of your own savings and other personal finance sources, you will need to consider obtaining some "risk capital" or venture capital. There is a range of sources of risk and venture capital in Australia but since the October sharemarket downturn the available funds have diminished. There are certain State Government Investment Companies, the Management Investment Companies (MIC's), public venture capital companies and other private venture capital companies and sources. To attract equity capital investors in your business there should be strong prospects for future growth. As mentioned, attracting funding for start up technology companies is a difficult task at the current time. Potential financiers will be carefully assessing you, your management team, your business plan, your technology as well

as a range of other factors. The most important factor will be your management expertise.

Selecting the best type of business structure for your needs is a primary consideration in technology business start up. Proprietorship (sole trader), partnership, corporation (company), a trading trust or an unincorporated joint venture are the types of alternatives available. In most cases the separate legal entity of a company will be chosen where your liability is limited only to the amount you and your investors invest in the business, unless you have given specific personal guarantees. There is also the added advantage (perhaps at a later time when profits are being generated) of the taxation relief for research and development expenditure being allowed for certain structures. There are methods of structuring research and

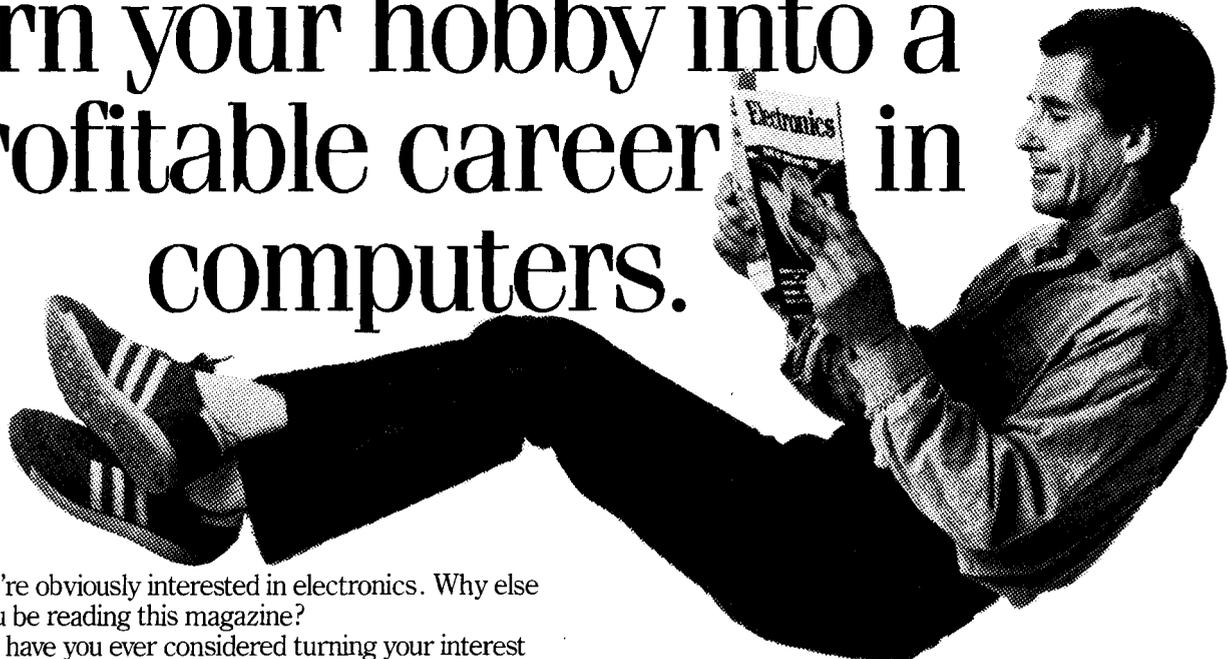
development financing whereby contributors all receive the 150 per cent taxation concession for their contribution to the R&D process. Capital gains tax considerations may well be important, together with a range of other issues.

As you can see, having a good idea is not enough in itself to guarantee a successful business. The transformation of that good idea requires enterprise and a lot of hard work. If it was easy everyone would have done it.

However, for those who can stick it out, the rewards are there. Ralph Sarich didn't make his money accidentally, after all. 

*John W. Coward is the National Technology Partner for Coopers and Lybrand, Management Consultants.*

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ANNA GRUTZNER

**A**ustralia, after having let its once-sizeable shipbuilding capability fall apart is building its first two frigates, the FFG-design ships underway at Melbourne's Williamstown dockyard — and is embarking on a construction project in Adelaide for six Knokurns Type 471 submarines — with no previous experience.

But the project attracting most attention is the Australia-New Zealand "ANZAC" light patrol frigate program, also known as the new surface combatant program. It will be the biggest shipbuilding exercise in Australia's peacetime history, and rivals the largest such projects underway outside the United States and Soviet Union. The \$5 billion price tag (costed on August 1987 prices), or \$3.5 billion in the unlikely event of New Zealand failing to sign up for the project, is the dearest ever budgetted for by an Australian Government.

The venture will see eight ships built in Australia for the Royal Australian Navy (RAN) and up to four for the Royal New Zealand Navy (RNZN) with significant local industry participation. The frigates will initially replace Australia's five remaining 2700t River-class destroyer escorts and New Zealand's four Leander-class ships. The last three frigates off the production line will put the oldest of the RAN's Fremantle-class patrol boats out of service. New Zealand may want two of the earliest frigates, given that it faces a 1994 deadline to retire the older HMNZS Southland and HMNZS Waikato ships. Replacements for the Wellington and Canterbury,

which are due to be replaced in 1998, are less urgent, allowing the RNZN to spread its cost burden.

### **Modernising the fleet**

In operational terms, the ships will modernise the middle-layer of the RAN's three-tier surface fleet. Tier One, comprising of three 4600t Perth-class guided-missile destroyers, four 3700t FFC-7 class frigates, and two more FFG-7s under construction, is the large ocean-going fleet. It aims to counter high-level threats and to operate with allied forces in distant waters for long periods. Tier Three comprises 15 peacetime coastal protection vessels of the 42-metre Fremantle class, which are suitable for policing and low-level surveillance work. Tier Two are less capable ships than the Tier One group, but have an endurance and seakeeping capability commensurate with the task of defending Australia against short-term contingencies in its regional sphere of economic and military interest.

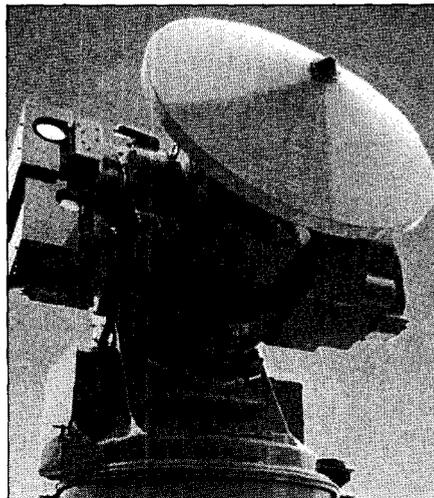
The Government's base-level requirements are that the frigates have a range of 6000 nautical miles at 18 knots, with a maximum speed of at least 27 knots. It has also insisted on the ship closely conforming to an established design in operation or under construction with only the minimum change necessary to adapt the frigate to Australia's special requirements. This design limitation will significantly reduce the time it takes to roll the ships out of the yard.

The Dutch M-Glass frigate of the Koninklijke Maatschappij de Schelde (Royal Schelde) group and the West German Blohm and Voss (Aust) Pty Ltd's MEKO 200 ANZ design have been short-listed for the ten-year project, BVA is a majority-owned subsidiary of B&V in Hamburg and Thyssen Phelnsstahl Technik of West Germany. Twelve

**The Australian shipbuilding industry is living in ambitious times. Defence writer Anna Grutzner explains how, after years of buying off-the-shelf overseas we are currently undergoing a defence-led construction revival.**

# SHORE PROTECTION

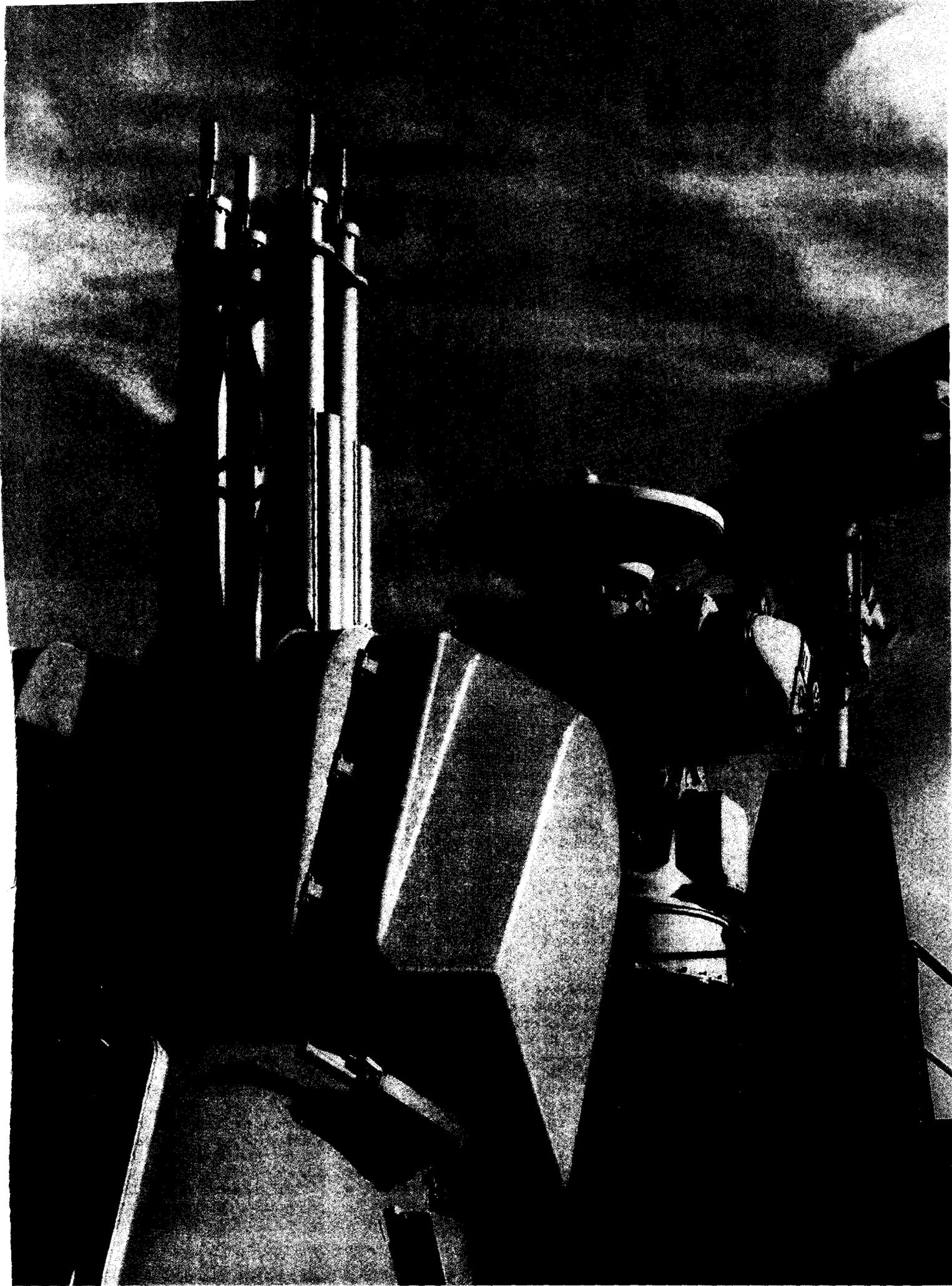
**Embarking  
on a  
frigate  
building  
programme**



companies or consortia originally tendered for the lucrative prime contract and the field was narrowed to three, with Yarrow and Swan Hunter's British Type 23 frigate being eliminated from the final bid.

### **Joint tender**

Both European designers have joined forces with Australian and New Zealand companies to tender for the construction contract, in conformity with the requirement that the consortia represent both countries' interests. Royal Schelde is part of the Australian Warships Sys-



## Frigate building programme

tems (AWS) group, which also comprises Amalgamated Wireless Australasia (AWA), Carrington Slipways, McConnell Dowell Corporation, and TNT. Their proposed construction site is Carrington's Newcastle shipyards, in the troubled blue-collar Labor party heartland of New South Wales' central coast.

The Australian Marine Engineering Corporation (AMEC), with whom Blohm and Voss have joined forces, is made up of ICAL, Australian Shipbuilding Industries (ASI), Transfield NZI Corporation Ltd, and Brierley Investments Ltd. Last February, AMEC bought the Williamstown dockyard for \$100 million from the Government (inheriting in the process the completion of the FFG frigates) with a view to doing about 30 per cent of the work there and spreading the rest around to subcontractors.

Royal Schelde and its predecessors have captured an impressive share of Dutch warship construction contracts since World War II and are in the process of building warships for several foreign novices. They have continuously built frigate-size ships for the Royal Netherlands Navy, which is regarded as one of the most professional middle-power blue-water navies in the world. Similarities with the size and activity of the RAN, as well as Royal Schelde's proven track record, make the M-Class an attractive proposition. While the Dutch yard has never before applied its design and management services to an overseas construction project, it has a solid reputation for design and building skills. It has built frigate-size ships for the Greek Navy and provided the design for the Indian navy's 15-frigate project.

### Spreading workload

The MEKO 200 design Blohm and Voss is said to be proposing for Australia would be closer to that being built for the Turkish Navy than its frigate on order with the Portuguese Navy. The company also has built ships for the Argentinians, and is using its experience in building the West German F122 frigate to refine the Meko type modular concept for the following generation of F123 frigates. Its modular construction process makes it a strong contender for the NATO NFR70 frigate project, to fulfil the requirements of up to eight NATO navies. This construction method would also facilitate spreading the workload between more than one Australian dockyard and between the trans-Tasman partners for the ANZAC venture.

The Navy has specified very limited weapons and sensors for the ship, with the option of building up the capability



*The German Blohm and Voss design. This Meko 200 class frigate is in service with a number of different navies.*

as budgetary constraints permit. A medium-calibre gun, a point defence missile system (PDMS), air and surface search and navigation radar, hull-mounted sonar, an ESM system, torpedo decoy system, and combat data system are the basics. Ship or helicopter-launched anti-ship missiles, a close-in weapons system, ship-launched torpedos, a towed-array sonar, and an active off-board missile-decoy system are being examined as future options. The AWS group has already indicated it will dedicate 35 per cent of the cost of each ship to outfitting with radar armaments and information systems.

Both the M-Class and MEKO 200 incorporate the vertically-launched Sea Sparrow PDMS. The system is likely to be attractive for commonality reasons to the RAN, whose existing Seact PDMS is now obsolete. Both ships also have American Harpoon surface-to-surface guided-missile systems, and as the anti-ship weapon is already in use in the RAN, it would be the strongest contender for the ANZAC frigates. Likewise, the RAN has Mark 32 surface-launch torpedo tubes already in service.

Australia's own Muloaka has a good chance of winning the hull-mounted sonar tender, as does its AWA Milnet for the combat data system. The new frigate will almost certainly have a data facility that is compatible with that to be installed in the new submarine fleet.

The close-in weapons systems (CIWS) aboard the ships differ, the M-Type having the Goalkeeper and the MEKO 200, the Seaguard. But again, for the sake of compatibility, the navy is more likely to stick with the Phalanx or a close derivative.

### Propulsion

The RAN wants a cost-effective propulsion system of certain capability but is open to suggestions on the specific engine. The propulsion systems are one of the most significant differences between the two ships. The M-Class has both gas turbine and diesel systems, the diesel being CODOG-driven by Rolls-royce Spey and Werkspoor. The MEKO has only MTU diesel propulsion. Were cost not a factor, the navy would choose both gas turbine and diesel propulsion. Given its financial constraints, New Zealand's preferred option of diesel alone would be the most likely compromise. Given the RAN's concerns about compatibility with existing defence hardware, it may prefer the MTU and LM2500 diesels.

No limit has been placed on the ship's displacement, although cost militated against the larger of the 12 original tender designs. The displacement of both the Dutch and West German tenders is likely to be well beyond the 2000t proposed in the Dibb review of Australia's defence capabilities, for the

simple reason that the ships must carry Seahawk helicopters.

An ability to house and operate the new S70B2 Seahawk helicopter is, in fact, one of the essential criterion of the modified frigate design. In this respect, the existing Dutch design is the better option, as it would have to undergo no changes. The M-Class is designed to take the EH101 and European helicopters, which are of similar size to the Seahawk. The MEKO 200, on the other hand, (as it has been built for the Turks) is designed for AB212 helicopters, which are smaller than the Australian aircraft. Modified hangars and handling facilities would be necessary. The RNZN, however, can be flexible, as its Wasp helicopters will have gone out of service by the time its frigates are built.

The RAN must maximise the equipment already in service on its FFG7's and, to a lesser extent, its DDGs. This consideration will help dictate the choice of armaments. As the ANZAC project would replace New Zealand's entire surface warship capability, its navy is virtually free to choose an entirely new generation of hull, machinery and combat systems.

### **Wastage**

The \$8 million documentation development contracts (DDC) were awarded to the two consortia in April to enable them to adapt their designs to Australian requirements and to meet the local industry participation objective. Scheduled completion date for this stage of the project is now mid-January 1989. The project departs from previous defence practice in that the prime contractors themselves assume responsibility for much of the conceptual development. Like the US system of the commercial sector drafting a great deal of the specifications, the ANZAC project places the onus on the competing ten-

derent proposals employing different systems be assessed? Should the tenderers have the chance to retender for a comparable system fit with that proposed by their competitors? The contract development process, whereby each tender is presented as a complete, fitted package, precludes local industry hedging its bets on the winner and securing a chunk of the workload no matter who is awarded the prime contract.

The cost-ceiling provides obvious advantages to the Government. The potential disadvantages are less obvious. The \$3.5 billion bill for the eight Australian ships must cover every facet of the project from three years spares support, trials and training to initial outfits of stores and ammunition. It will determine the extent to which the ships are armament-fitted beyond basics. The Navy already fears that at the end of the day it may be delivered little more than the vessel "platform" with a gun and helicopter.

### **Cost is key factor**

However, cost containment is an important inducement in keeping the New Zealanders in the game. The NZ Cabinet could be persuaded to buy one of the designs straight off the shelf from Europe if the cost discrepancy is too great. It is understood the M-Class is the more expensive ship, although the total project cost, not the sail-away price, is the key factor. Furthermore, the lowest price does not necessarily equate with the best value for money.

A major Government objective in constructing the frigates in Australia is to revive the heavy-engineering and local defence industries. Success thus relies heavily on industry participation and the accompanying transfer of technology from the European design contractors to local design-development facilities. Both countries recognise the outstanding op-

portunity the frigate project represents in financial and operational terms. However, the degree of commonality between the two navies' assets is limited and has been achieved only in the past 20 years. The RNZN's Type 12 frigates may be similar in appearance to the RAN's River-class ships, but their armaments and sensors are quite different. Commonality of strategic interest is stronger, and was a factor which made the joint-project feasible in the first place.

### **Strikes and takeovers**

money are genuine and legitimate enough, it has also played some smart politics in capitalising on Australian fears that it won't finally come to the party. The Minister for Defence, Mr Beazley, is looking for more than 70 per cent local input, up to 30 per cent of which could be hived off across the Tasman. He has also indicated the Government is prepared to, in his own words, "sweeten the pot", an inducement the cynics read as a willingness by Australia to subsidise the modernisation of New Zealand's navy. New Zealand industry is also getting a share of the capital investment in the project. It could, too, win some of the construction work, as it has an adequate shipbuilding capacity.

Industrial trouble has been one of the early and gravest threats to the frigate project. AMEC's Williamstown site had a long history of industrial thuggery, corruption and indolence. The new management has insisted on and gained limited union representation, but not before the dockyard was closed, picketed, and taken through the Arbitration Commission. AMEC has also been the subject of some unsettling takeover bids, ironically from within the consortium itself. The heavy-engineering partner, Transfield, attempted to take over ICAL after ICAL earlier outwitted Transfield for control of ASI. Yet precisely because the ANZAC project is by far the largest venture in a depressed heavy-engineering sector, takeovers are almost inevitable for the final competing tenderers.

The AWS group suffered more serious, if shorter-lived, complications when Australian National Industries (ANI) pulled out, leaving an expertise and capital gap that was later filled by TNT. The consortium's early failure to hang on to its big capital investor in the project is symptomatic of the problems involved in finding large sums of risk money in Australia. While the Government has voiced private concerns about instability in the AMEC group, the latitude it has given both consortia to meet their tender commitments shows how determined it is to maintain strong competition between the groups. The final prime contract for the ANZAC frigates is expected to be awarded by the Government in the middle of next year, at which time New Zealand will commit itself either way to the project.

**eti**

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

## **'... the biggest shipbuilding exercise in Australia's peace time history'**

portunity the frigate project represents in financial and operational terms. However, the degree of commonality between the two navies' assets is limited and has been achieved only in the past 20 years. The RNZN's Type 12 frigates may be similar in appearance to the RAN's River-class ships, but their armaments and sensors are quite different. Commonality of strategic interest is stronger, and was a factor which made the joint-project feasible in the first place.

While New Zealand's concerns about

Some defence analysts foresee problems down the track with the Government's ability to fairly assess the competing tenders. On what basis besides cost or "value for money", can two dif-



INNOVATION

**A**stronomers at Parkes Radio Telescope have discovered a star spinning at 13,000 rpm. It is locked in orbit about an unseen companion at about the same distance as that between the Earth and the moon, but the two bodies circle one another in just 32 minutes.

The discovery has enormous implications for currently understood theories of physics. Conditions in the system are so extreme that scientists believe they will be able to make really detailed tests of the Theory of Relativity and also of Quantum Mechanics for the first time.

Both stars in the system are pulsars, located in the naked eye globular cluster 47 Tucane. One, called PSR 0021-72A has a period of 4.478953 mS, and the other, PSR 0021-72B a period of 6.127 mS. This type of star was first discovered over twenty years ago in late 1967 by Jocelyn Bell and Antony Hewish at Cambridge University; Hewish was awarded a Nobel Prize. The pulsars are now recognised as being highly magnetised, spinning neutron stars that emit radio energy in a narrow beam, or beams, received at earth as pulses because of the spinning motion. The regularity of the pulse repetition is extraordinary, and allowing for a slow steady decrease in the rate that all pulsars seem to exhibit, the time keeping attributes of pulsars rivals the best of our laboratory standards, the atomic clocks.

These stars are now understood to be the ultra-dense remnant cores of dead stars. Neutron matter is so dense that a piece the size of an ordinary sugar cube weighs a thousand million tonnes. It is likely that neutron stars are formed when a massive star (several times as massive as our sun) ends its life in a supernova explosion.

The spin rates vary, but until about five and a half years ago none of the more than 500 that had been discovered was spinning faster than the 1800 rpm of the very young pulsar found in a

small bright and peculiar nebula named the Crab by Lord Rosse in 1844. Almost 800 years ago in the year 1054 A.D., Chinese astronomers observed and recorded the supernova that gave birth to the pulsar and the nebula around it.

### **Limited lifetime**

According to current theory, pulsars have a limited lifetime of a few million years because they spin down as they radiate away their energy and because at the same time their magnetic field decays. When the spin rate drops to about 30 rpm the radio beam is extin-

*'The first to be discovered by a southern hemisphere observatory'*

guished. Most pulsars are spinning at about 100 rpm.

However, six years ago, in late 1982, the scientific world was delighted by the discovery of a pulsar with a spin rate more than 200 times faster than the Crab Nebula pulsar. It was called the "millisecond pulsar" because its spin period was measured in thousandths of a second. Such a rapid spin rate was then thought to be the mark of a very young pulsar, but two observational facts contradicted this. First, there was no indication of the remains of a supernova explosion around the pulsar nor was there any historical record of a supernova at this position in the sky. Second, the rate of decrease of its spin rate was so small, almost unmeasurable, that the pulsar could have existed for thousands of millions of years, even as long as the supposed age of the universe, without significant change. Needless to say, pulsar theories were rewritten overnight.

**Einstein's theory once again comes under scrutiny with the discovery of a new star.**

# **MILLISECOND PULSARS**

## **Unique Parkes radio telescope discovery**



*Sunrise over the CSIRO's radio telescope at Parkes, NSW. Scientists working here have devised new tests for Einstein's theory of relativity.*

The best theory that emerged was that this was a reborn pulsar, one that had lived a few million years as an ordinary pulsar and then, much later, had been spun up to its present incredible rate so that even its weak, decayed magnetic field was sufficient to reform the radio beam. The weak magnetic field ensures that the spin energy is dissipated very slowly; hence the almost imperceptible slowing down and the great longevity.

The spin up, it was hypothesised, was due to the dead pulsar having a normal

star as an orbiting companion. This is not unusual, as about half of all stars are actually found to be double (binary) stars in orbit about each other. The theory goes that the normal companion star bloated up to become a red giant and spilled some of its matter on to the neutron star. This is not unusual. In fact, astronomers believe all stars swell as they age. As a result, orbital energy was transferred to the neutron star and it spun faster and faster — the pulsar was reborn. Eventually the red giant shriveled down to become a white

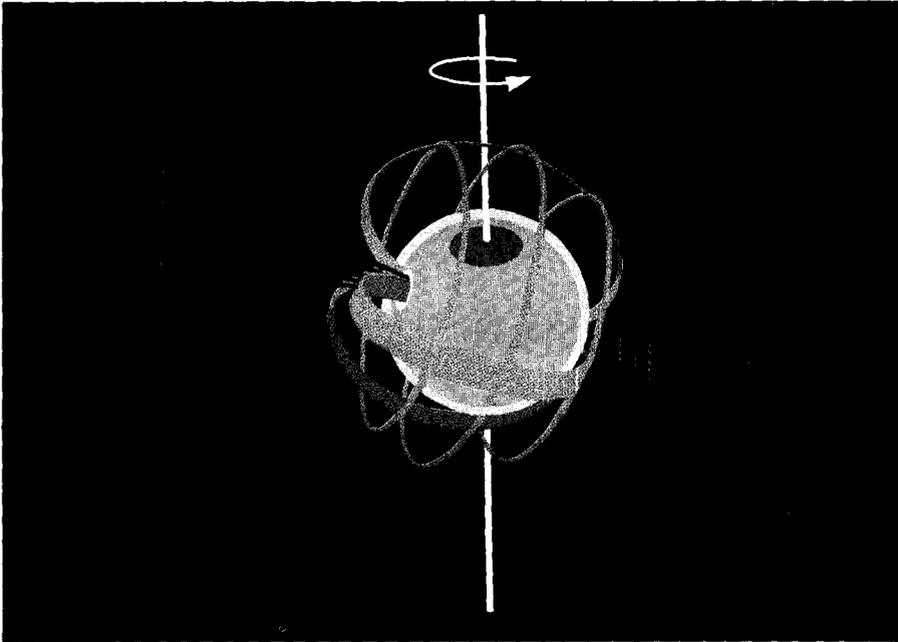
dwarf; or perhaps it too became a neutron star in a supernova explosion.

### ***Explanation flaw***

There was one little flaw in this explanation. The millisecond pulsar has no companion. If it had once had one, it must have somehow escaped or been consumed.

After the first discovery, search programs were begun to find more reborn, millisecond pulsars. Progress was painfully slow. After four years only a half dozen, had been found. Most do indeed

## Millisecond pulsars



**A pulsar is a star that has collapsed in on itself. As it does so, its magnetic field becomes so compressed that it forms a 'magnetic bottle,' Only at the magnetic pole is the field weak enough for radiation to escape.**

turn out to be binaries. The first binary pulsar, which had been discovered almost ten years earlier, was belatedly recognised as one of the reborn class, marked by its vanishingly small spin down rate rather than a true millisecond period.

Each of the few discoveries was greeted with enormous interest by the astrophysical community, indeed with great interest by all the world of physics because these objects provide the most extreme conditions for the testing of quantum and gravitational theories. Most of the tests available today rely in some way on the presence in the observed system of a highly accurate clock such as provided by the stable spinning of a neutron star.

Suddenly it seems possible that we could detect gravitational waves moving through the galaxy by monitoring several of these "clocks" widely separated in space. Gravitational waves moving between us and the pulsar subtly distort time. Only with such accurate clocks could the effect be noticed.

Also, having a pulsar clock in mutual orbit with another massive object presents wonderful opportunities for the study of the interaction of space, time and gravity, the domain of Einstein's general theory of relativity.

The requirements for an orbiting system to provide a good general relativity "laboratory" are that at least one of the orbiting objects be a very good clock, that the other object be at least as massive as our sun and highly compact,

that the orbit be very tight (small separation and hence small orbital period) and, finally, that the orbit not be circular but elliptic, the greater the eccentricity the better.

The best such "lab" before now has been the first discovered binary pulsar. Its orbital period is just under eight hours, and study of this system over the past 14 years has pushed Einstein's theory hard. It has stood the test.

### New tests

According to scientists at Parkes, the discovery, by a team from the CSIRO, University of Tasmania and the University of Sydney, will result in a wealth of new science.

Einstein's theory predicts that any el-

liptic orbit will slowly precess; the ellipse itself rotates without the influence of any external force, something forbidden in Newtonian theory. How fast it precesses depends on the orbital parameters.

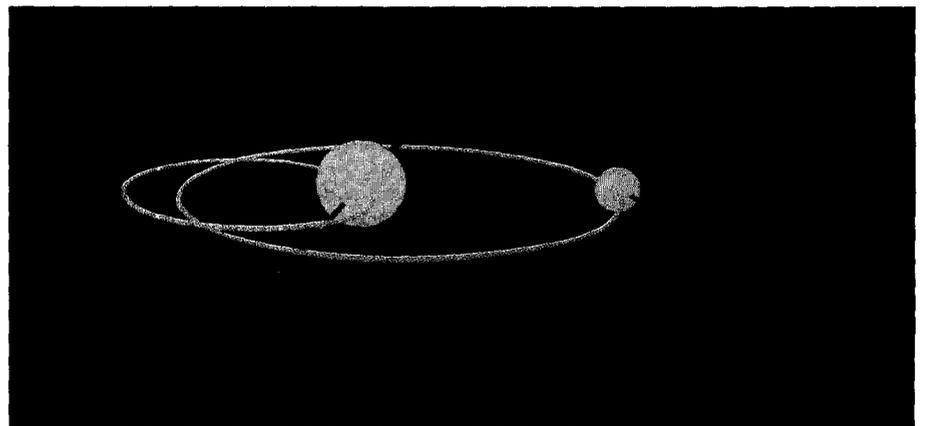
In our own solar system the effect of general relativity is felt most strongly by the planet Mercury because it is closest to the sun and its orbit is moderately eccentric. Einstein's theory predicts that Mercury's orbital ellipse rotates in space at the rate of 43 seconds of arc per century. This rotation is indeed seen; but, due to the smallness of the effect, 300 years of observation provides only the most meager of results. The error in the measurements compared to the predicted effect is so large that it is not possible to rule out rival theories of gravitation, such as the Brans-Dicke scalar-tensor theory.

The first discovered binary pulsar has provided a much more stringent test. Its eight hour orbit and high ellipticity results in an orbital precession rate (the so-called rate of advance of periastron) of 4.2 degrees per year. Over a decade of observation confirms the prediction of Einstein and seems to rule out all rival theories.

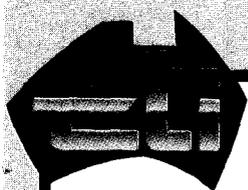
But if past history is any guide, the first cracks in our present theoretical triumphs will appear when conditions are so extreme that the prevailing theory is forced to predict very large deviations from the everyday Newtonian world.

The rate of advance of periastron has already been measured to be in excess of one-half degree per day, roughly 200 degrees per year.

Conditions in this system are so extreme that minor, second order effects predicted by general relativity such as the transverse doppler and gravitational redshift effects could, for the first time, be strongly evident. ETI



**A lab in space. One element emits radiation at 220 Hz, the other at 163 Hz, and both bodies complete their orbits in 32 minutes. Conditions are confused by relativistic effects which may well interfere with the measurements.**



# Sound Insights

AUSTRALIA'S HIGHEST CIRCULATING HI-FI MAGAZINE

YAMAHA CHIEF  
LOOKS  
AT HI-FI

B&W 801  
SPEAKERS

THE NEW  
BREED OF  
DIGITAL VCRs

# **BOSE**

## The Bose 601™ Series III Direct/Reflecting® Loudspeaker System

**B**ose 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.

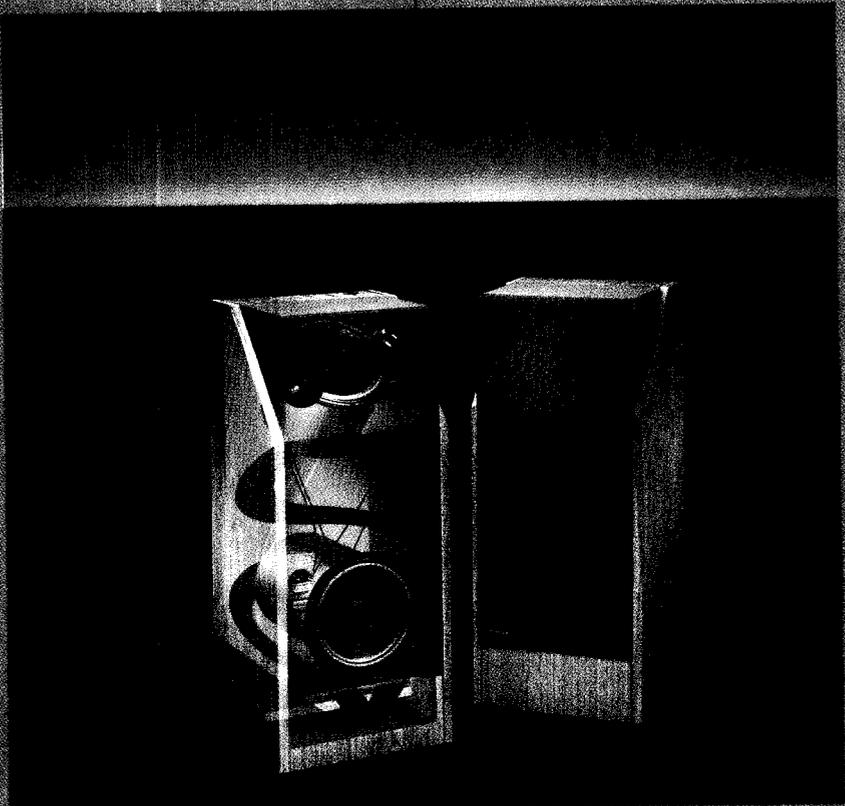
### **The performance: ideal for audio, video and digital.**

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-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-VCRs and video disc players.



Bose 601 Direct/Reflecting® system



Conventional speaker system

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

#### **Bose Distributors:**

NSW and VIC: Bose Australia (Reverse charge) (02) 684 1022; QLD: Stereo Supplies (07) 229 7930;  
WA: Prosound (08) 326 1086; SA: Blackwood Sound (08) 276 1281; TAS: Chessmen Distributors  
(003) 26 4622.



## New distributor

Sydney based M & G Hoskins has been appointed distributor of Audiolab products. Audiolab is designed and manufactured by Cambridge Systems Technology Ltd. in the U.K., and has been selected by the Design Centre, London.

Three amplifier models are available. The 8000P power amplifier delivers over 100 watts per channel and features ultra-linear slew free design with DC servo feedback. An electronic auto-muting system protects the

amplifier and loudspeakers from short circuits and severe overload.

The 8000C is a versatile control pre-amplifier utilising wide-band, low distortion class A operational amplifiers using no integrated circuits. The 8000C can drive power amplifiers and active or bi-amplified loudspeaker systems.

The 8000A is an integrated amplifier delivering over 50 watts per channel. It shares features of both the 8000C and 8000P.

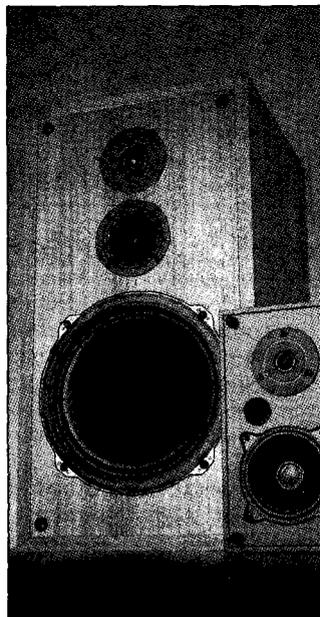
READER INFO No. 222

## New Oz Speakers

Homemade Australian hi-fi products are increasingly available, and that goes doubly for speakers. Australian speaker manufacturers are burgeoning while receiving a good deal of attention and commendation for their product.

From Adelaide (homebase for the famous Duntech speakers) comes new a range produced by Krix Speaker Systems. Four of its speaker systems are the small, compact Brix model, the K100MP bookshelf model, and the Monitor 250 model.

The latest in the range is the K150MB. This 520 x 220 x 300 mm large bookshelf model is a 2-way speaker system, with stated frequency range of 42 Hz to 20 kHz, 150 Wrms power handling, and 89 dB for 1 watt at 1 metre. The bass driver — or, rather, the two bass drivers in parallel — are 165 mm doped polypropylene drivers with 100 mm magnet and 33 mm voice coil diameter. Resonant



frequency is 30 Hz. The tweeter is made with a 25 mm soft dome diaphragm. It features the new Hexatech voice coil with serrofluid damping. Crossover point is at 2 kHz.

READER INFO No. 223

## Microwave for multipoint

While heading the Dept of Transport and Communications, Gareth Evans and his staff have been keeping very busy. In addition to reviewing the introduction of pay TV and a Radio Data System, they have been considering the introduction of a Multipoint Distribution System (MDS) which makes use of microwaves to transmit text and graphics.

In addition to text and graphics, it is intended that MDS should carry audio and video information to multiple special receivers. Special equipment will be required to receive the signal on the television.

The type of services immediately envisaged for MDS are those similar to Sky Channel, stock and commodity exchange reports, real estate information, general or emergency information and sports results, ie, Video and Audio Entertainment and Information Services (VAEIS).

According to the Minister, several hundred expressions of interest have been received for such transmissions since Mr Duffy invited them when he held the portfolio in 1986.

A draft plan for the service has been issued by the minister and proposes licence categories in the areas of text



Senator Evans

and graphics; text, graphics and still pictures; the three preceding plus sound; non entertainment video and entertainment video including pay TV.

Under this plan licensing would take place for the first four categories between the present and 1990. Licensing in the last category must wait upon the outcome of a review of the government's policy on pay TV. However, six of the total 19 MDS frequencies assigned for each location have been reserved for pay TV.

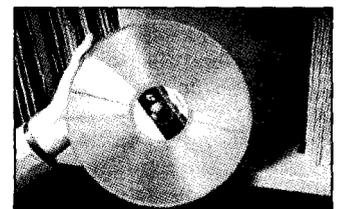
Also on the drawing board for the Department of Communications (a iportfolio now held by Ralph Willis) is an Ancillary Communications Service (ACS), which provides audio or data services to a specific audience by use of a subcarrier on existing VHF-FM signals. More about this in the future.

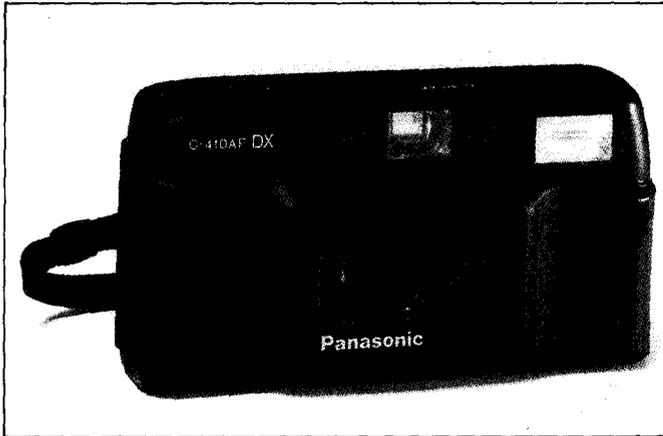
READER INFO No. 224

## Laser disc

Both Sharp and Matsushita (Panasonic) have announced in Japan that they will soon release LD (laser disc) players which will be able to play LD, LD singles, CD-V, CD and CD singles without an adaptor.

READER INFO No. 225





## Latest in 35 mm cameras ▲

Panasonic has released two new automatic 35 mm cameras, the C-410AF, and the C-330EF.

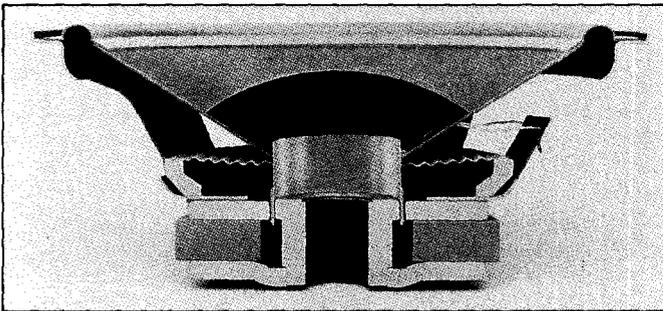
The C-410AF has an auto-focusing system with a focus lock for distances of 1.3 m to infinity. Other features are automatic film loading (with a window), winding and rewinding, plus automatic DX film

speed settings at ISO 100 or 400.

The camera has a built-in flash for distances from 1.3 m to 3.5 m and an f3.8 mm lens. RRP is \$169.

The C-330EF, with automatic focus range of 1.5 m to infinity is priced at \$139 RRP.

READER INFO No. 207



## New powered speaker system ▲

The Bose Acoustimass professional powered loudspeaker System has arrived in Australia. It is a two-way, seven-driver amplified system with speakers, amplifier, equaliser and electronic signal processing in a single enclosure. "Acoustimass" refers to the system of using "two acoustic air masses to launch the sound" as opposed to the

conventional speaker cone.

Each enclosure contains an amplifier which produces 450 watts, 122 dB sound pressure level at one metre. The system is aimed at travelling musicians or others who need high power and portable sound reinforcement. RRP is \$4500.

READER INFO No. 208

## Broadcasting Boom

Australian radio broadcasting is in for some changes. The ABC has announced its intention to provide blanket coverage of Radio National throughout Australia. The Second Regional Network is a Federal Government initiative with capital costs of \$25.1 million, including \$5.56 million this year.

The project involves building 25 new radio stations, establishing offices or studios in 17 new locations, installing 300 VHF-FM transmitters, and upgrading 19 existing regional studios.

As well as this the Federal Government has pledged to make FM frequencies available for ABC radio to develop a national youth network along the lines of Sydney's 2JJJ. Marius Webb, formerly of 2JJJ, has been appointed director of the ABC's Youth Network Project. The first cities to enjoy the expanded youth service are Adelaide and Perth at the beginning of next year. They will be followed by Hobart, Darwin, and regional centres such as Canberra and Newcastle.

READER INFO No. 209



## PCM Digital Sound on Camcorder ▲

Sony's new CCD-V200 8 mm camcorder has been released with a number of sophistications, including the incorporation of PCM (pulse code modulation) digital stereo sound.

This system uses a built-in, one-point stereo microphone that records on two tracks, PCM left and right; another tiny microphone handy to the operator's mouth allows for the operator's running narration.

The camcorder, a precision charge-coupled device imager rated at 495,000 pixels which, Sony claims, will eliminate comet-tail blurring in light as dim as 5 lux (i.e., the

brilliance of a burning birthday candle).

One of its sophistications is a variable-speed shutter with choices of 1/50, 1/120, 1/250, 1/500, 1/2000 to 1/4000 second. Its other features include an 8X power zoom lens varied by finger pressure, a telephoto and wide-angle facility, and still, frame-by-frame and slow playback for editing. Other enhancements such as a fader, the choice of seven colours for scene wipes and superimposition of notes are also catered for.

The CCD-V200 can be used with either Beta or VHS VCRs. It retails at \$4999.

READER INFO No. 210

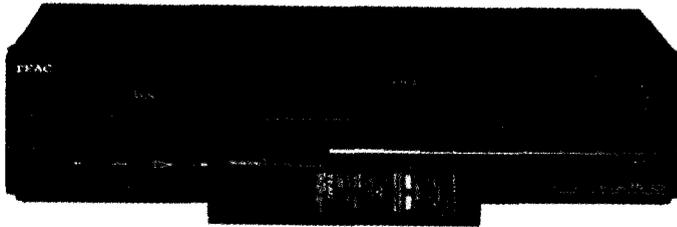
# IN BRIEF

## Logging recorder

The Electrodata 8600 supports a reel-to-reel tape recorder which can be tailored to record from one to 61 telephone conversations simultaneously. Replay is by push-button channel selection and listening to the in-built speaker. Designed and manufactured in Australia it is suit-

able for verification of calls by stockbrokers, bankers and spies but will probably need the collective imaginations of ETI readers to find its true market niche and realise its potential. Electrodata is contactable ☎ (008) 25-2696.

READER INFO No. 213

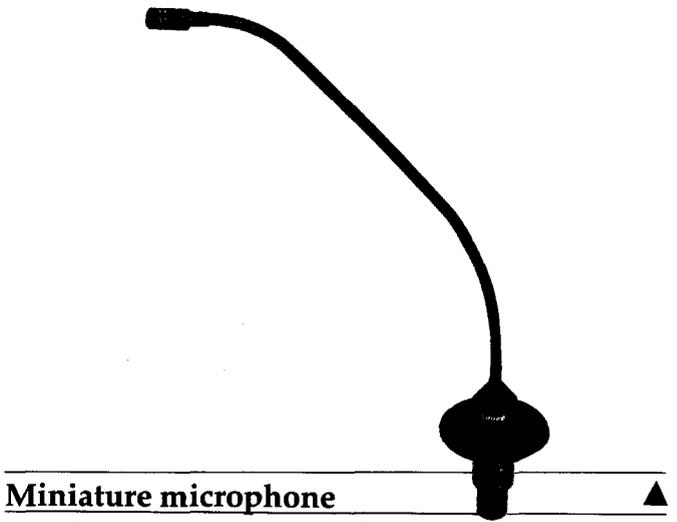


## Doze mode?

For those who like to fall asleep in front of the video, the new TEAC MV435 VCR auto-rewinds, ejects and switches itself off. If you're more of a video participant, the unit is equipped with an edit facility, a still frame and

noise cancel, a remote control, and an in-built TV tuner with an electronic search. The MV435 has a 14-day, 6-event timer, and a dew protection system against excessive moisture.

READER INFO No. 214

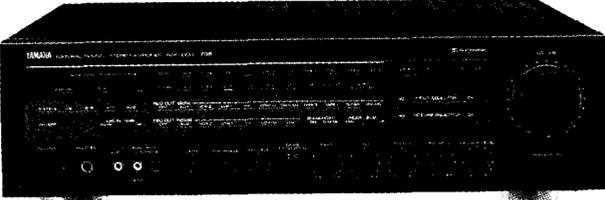


## Miniature microphone

Audio Engineers has released the SM99, a new miniature gooseneck-mounted microphone that has been designed primarily to reduce background noise in pickup of a vocalist, speaker or a particular instrument in an orchestra. It has a 12

dB/octave roll-off below 100 Hz to minimise pickup of low frequency noise. The microphone preamplifier is housed in the gooseneck base. Audio Engineers is at 342 Kent Street, Sydney. (02) 29-6731.

READER INFO No. 215



## Amp for home entertainment

Yamaha's new centrepiece of the audio/video integration concept is the AVX100 amplifier. This update of the AVX30 is a four-channel audio/video amplifier. Like its predecessor, the AVX30, incorporates some of the features of the famed DSP-1: eight built-in surround modes including "hall surround", "live surround", "Dolby surround" and "simulated surround", six more than the AVX30. They can be used effectively on both video and audio sources.

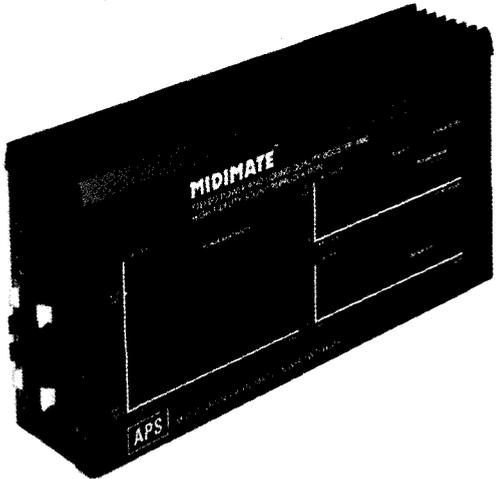
to front speakers and 14 watts per channel to rear surround speakers. Its infrared remote control controls other Yamaha RS-compatible products as well as this amp (ie, Yamaha tuners, turntables, cassette decks, CD and CDV players, etc).

The amplifier has a few attractive video functions including a video title editing facility, a superimposition facility which displays each function on the screen, and a video enhancer giving control over detail, sharpness, and video level.

The AVX100 has facilities for 10 audio inputs and six video inputs, and is equipped with S-VHS terminals. It delivers 65 watts per channel

The price of this amp? \$1399.

READER INFO No. 211



## Amplifier booster

The QED Midimate Power Pack is an add-on amplifier designed to connect between an amplifier and speakers to give extra power and dynamics to the average midi system.

channel. It fits behind the system and turns itself on by sensing sound. Specifications are 40 watts per channel into 8 ohms, 65 watts per channel into 4 ohms, sensitive to inputs of 5 watts to 35 watts rms and costs about \$400.

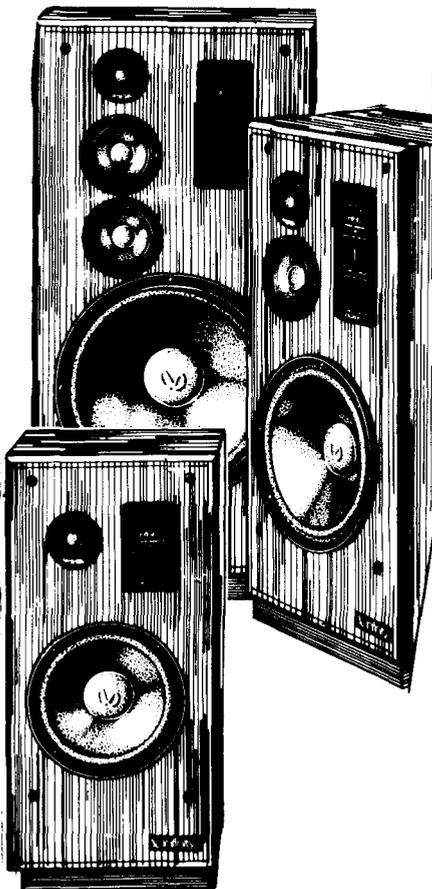
The Midimate is intended for use with any midi system rated up to 70 watts per

READER INFO No. 212

# MAXIMUM HEADROOM

The SM Studio Monitor Series gives you live concert punch, clarity and a knockout performance.

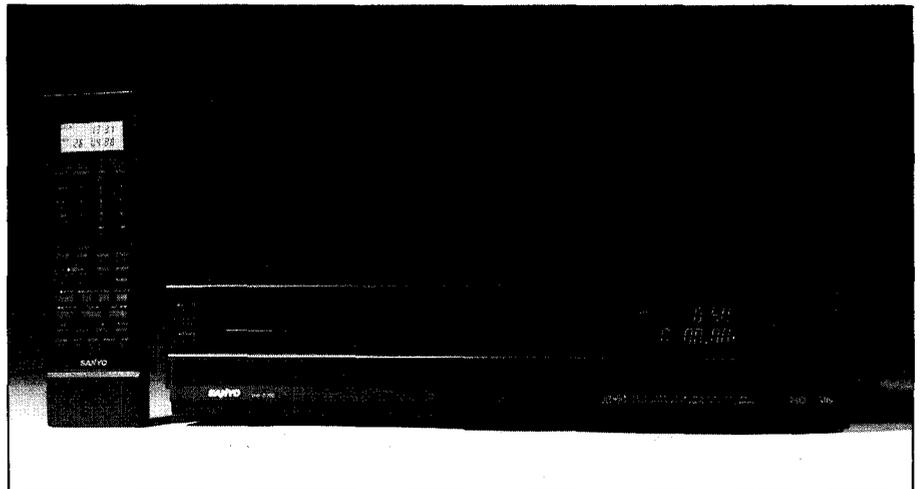
Infinity gets you back to what it's all about. Music power.



**Infinity**

Distributed by:  
Silver Australia Pty. Ltd.  
4 Rushdale Street, Scoresby, Vic. 3179.  
Ph: (03) 763 0177, Fax: (03) 763 0677.

READER INFO No. 7



## Fast . . . ▲

Sanyo's new 8 mm releases, as the conventional speed of the VM-DIP camcorder, the VHR-D500 digital video recorder and the VHR-D700 stereo video recorder, aim to capture fine detail of moving objects. The VM-DIP has a fast shutter speed of 1/1500th of a second as well

as the conventional speed of 1/50th of a second.

The VHR-500 digital recorder allows manipulations of the picture like cycle strobe, mono strobe, picture-in-picture, digital still and mosaic picture.

READER INFO No. 216

## . . . and slow ▶

The PAL standard version of Polaroid's FreezeFrame video still image recorder has arrived in Australia. FreezeFrame captures and digitises an image field from PAL colour or RGB video signals. The device then delivers a choice of self-developing photographic prints or 35 mm slides. The system also accepts conventional slide and negative films.

Resolution with PAL FreezeFrame is 350 lines horizontally and 560 pixels when fed a PAL signal, and 600 lines x 500 pixels when fed an RGB (red, green, blue) video signal.

Meanwhile, the 42 member, world-wide Electronic Still Camera Standardization Committee has approved 500 x 500 resolution as a standard for use with still video floppy systems.

READER INFO No. 218



SOUND INSIGHTS, NOV. '88

# WE USED THIS AS THE INSPIRATION FOR CLEARER SOUND.



*Aerolam. Honeycombed  
cabinet structure*

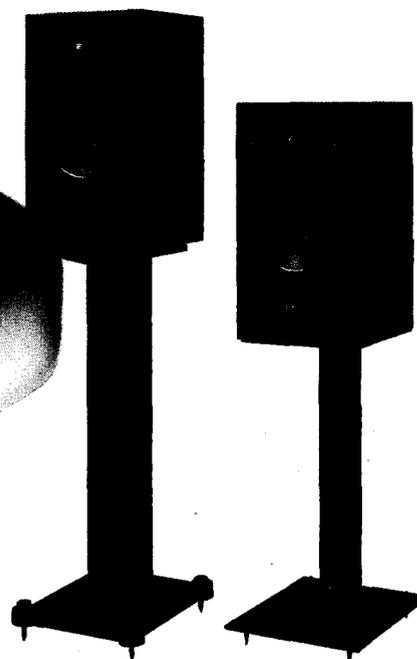
*The Award Winning SL700 is now the Industry's landmark in speaker design. Prominent critics have quoted — "When sat dead centre, the sound from the SL700's seemed to extend well beyond the speakers. Instrumental definition of complex passages was outstanding."*  
Julian Hirsch — Stereo Review, Sept. 87

*UK — "If the overall performance of the SL700 had to be summed up in just two words they would be 'precision' and 'transparency'."*  
David Praker — Hi Fi News, Nov. 87

**JAPAN — HI FI VIDEO AND AUDIO AWARD 1988**  
**JAPAN — COMPONENT OF THE YEAR 1988**

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SL700

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**CELESTION**  
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# THE VIDEO REVOLUTION

## Reviewing the digital VCR

Introduction of digital technology to the video cassette recorder has brought the videophile a whole new box of electronic tricks to play with. David Frith reports . . .



**P**icture in picture screens showing a second sub-screen in the main display, jerky-action strobe pictures, mosaic tiled effects, the ability to freeze or modify TV broadcast images as they are received, digital noise reduction . . . these are just a few of the new capabilities opening up.

Most of these effects are fun to play with, but only a few may prove really useful once the novelty has worn off. Whether that makes digital-video really worthwhile for you may depend on your point of view.

"Digital", it should be noted, has become a marketable word in the home entertainment trade, and the public relations and advertising people are apt to

plaster it on anything they can — even VCRs with nothing more digital than the figures on their LCD readout display.

So let's make it plain — what we are talking about in this review is true digital technology: the conversion of the normal analogue video signal to binary-code form, for the purpose of further processing of the signal in new and interesting ways.

The three VCRs under discussion here all fit that bill. They are by no means the only ones on the market — new models are being launched all the time — but they are certainly among the most interesting.

The fact that each uses its digital technology to achieve different ends suggests that a new era for video is opening up: one in which we will see genuine differences blossoming among models.

In video — unlike audio — that has mostly not been the case. For the first few years of the video revolution, standardisation of the VCR, Beta and Video 8 formats meant that the picture on every maker's screen has been virtually identical.

That situation however has already begun changing as developments like hi-fi stereo sound and HQ image-quality circuitry broaden the options for the makers.

Digital technology and the forthcoming introduction of Super-VHS and ED-Beta will carry this process further. Further down the track, the prospect of high-definition or enhanced-definition satellite broadcast systems promises much. It seems to me the market may well split in two: a high-end range for a new breed of videophiles, determined to have the best possible image quality and features; and a low-end for those who just want the convenience of a



VCR at the lowest possible cost.

### How it's done

The normal video signal, whether from tape, broadcast or video camera, is analogue in form.

In all of the VCRs reviewed here an analogue-to-digital converter (opposite in effect to the D/A converter used in compact disc players and digital audio tape recorders) is interposed into the signal chain.

Encoded in binary form, digital information is continuously transferred to a digital memory chip. When selected, by a key on the remote control or the VCR itself, the digital information in memory at that instant is reconverted to an analogue signal capable of being displayed on-screen.

Signal processing and control circuits provide the varied special effects, such as still frame reproduction, mosaic tiling or noise reduction. In mono machines

And now an examination of the three recorders submitted for review. We have concentrated on their digital functions.

### Sanyo VHR-D500

This is a single-speed, mono machine, with remote control and a large LCD display.

Digital effects include picture-in-picture, multi TV programme scan, memory still, strobe, zoom, mosaic and "paint picture".

Picture-in-picture (PIP) allows you to keep one eye on the telly while you watch a video tape, or vice versa. A click on the PIP button and a sub-picture about one ninth the size of the main image is displayed in the lower right hand corner.

The sub-picture is a bit too small to see what is really going on. But it's certainly useful to check, for instance, whether the football has started yet.

If you prefer, you can view some

nel. It can show up to 32 (the limit of the Sanyo's presets) by cycling through them nine at a time, but naturally if you have only four or five channels preset — and few Australians will have the option for more until pay-TV becomes a reality — that's all you'll see.

The image from each channel is refreshed in turn every few seconds, so you get a kind of jerky frame-advance. It's a reasonably effective quick guide to what's screening on TV, although again the picture is too small to really follow the action.

Multi-Index Scan is another way of using the nine-way split screen, this time with taped images. If you insert index marks at the start of recordings or scenes on a tape, the Sanyo will automatically display the first five seconds of each scene, and then leave a still shot from the end of each recording on the split screen.

For anyone who does a lot of home video taping or editing, it's an excellent way to quickly review your tapes.

In another variation, the centre picture of the nine displays a normal moving picture from either TV or tape. The eight surrounding segments are still frames, frozen in sequence — very neat for analysing a golf swing.

Memory Still gives a full-sized freeze-frame of any scene, either from tape or TV broadcast. It's a perfect, noise- and jitter-free shot and unlike normal still-frames, you can leave it on-screen as long as you like. (In most analogue VCRs, the still-frame disconnects after five minutes in order to protect tape and heads from heat build up caused by the heads continuously traversing the same point on the tape).

If you want a closer look at part of a scene, you can zoom in at four, 9 or 16-times normal size. Since the resolu-

*'a security camera over the front door or in the baby's room'*

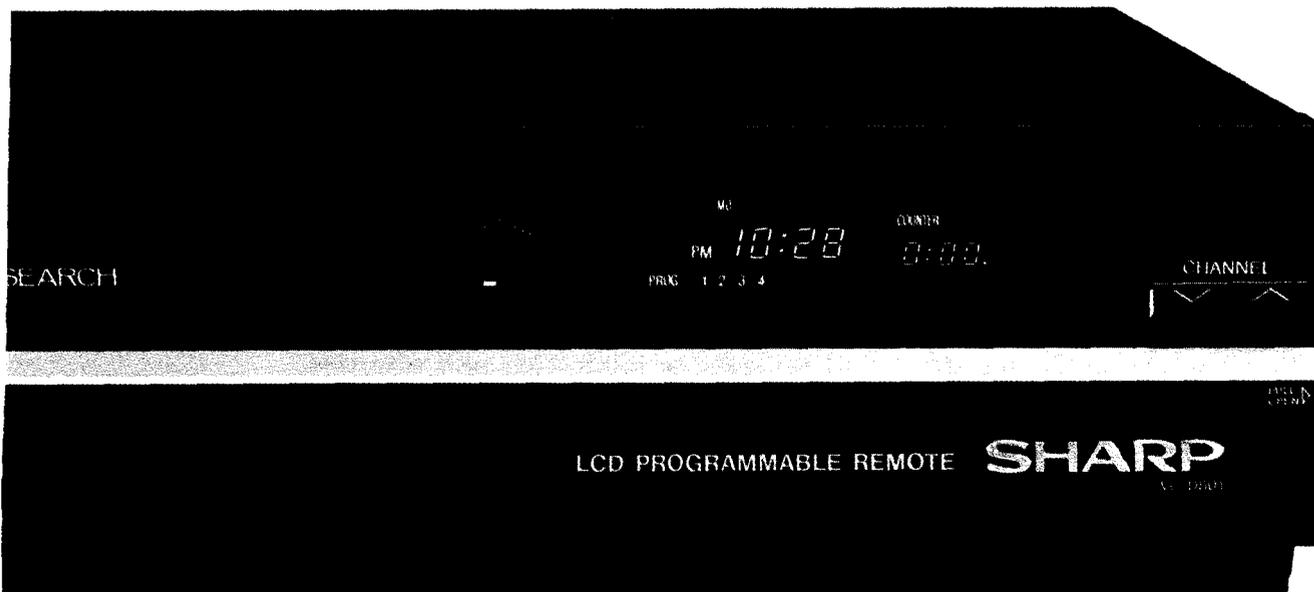
only two heads are needed against the four that are usually provided for video special effects. Four heads are still needed for hi-fi stereo models.

In case you're wondering if digital technology makes possible the recording of perfect tape copies, the answer is: no. There are no direct digital output or input terminals on these recorders. And even if there were, all that has been stored is the information to reconstruct one frame at a time. True digital recording, as opposed to digital effects signal processing, would require prodigious amounts of memory, beyond the scope to today's tape technology.

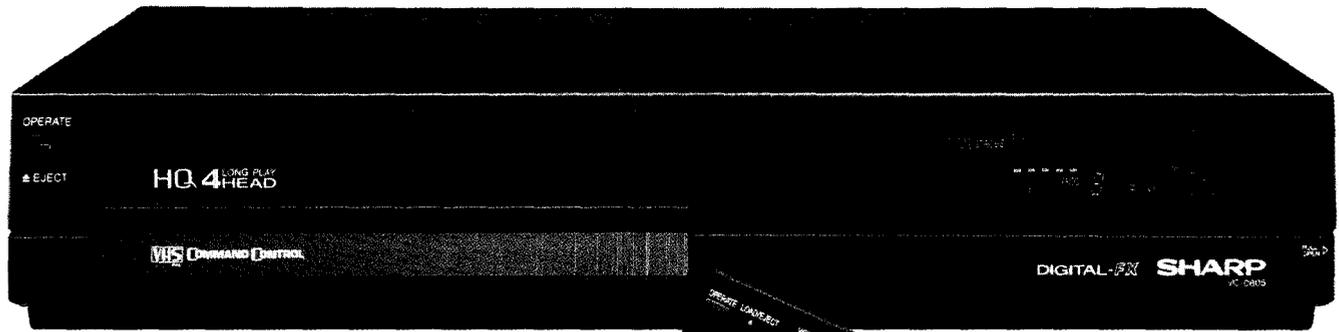
other signal — e.g.: the view from a security camera over the front door or in the baby's room — as the sub-picture. But you would have to pull the input from your TV to accept a signal from the camera.

And although you have two separate tuners, one in the VCR and one in the TV, it seems impossible to display two broadcast pictures — it has to be one from video tape, and one outside source.

With what Sanyo calls Multi-TV Programme Scan, the screen is split into nine small pictures. Each one displays a still picture from a broadcast TV chan-



## Digital VCR



*The Sharp VC805; one of the new breed*

tion remains identical, the image at bigger zoom sizes looks quite fuzzy, so not a lot is gained.

Other special effects include strobe, mosaic, tiling, and "Paint Picture", which gives a high-contrast appearance said to be akin to an oil painting. Few appeared to these eyes to have much more than novelty value.

All these effects, incidentally, can be captured on tape by dubbing to another machine, using the video-out and video-in terminals.

The Sanyo has a programmable remote control so you can program your recordings into the remote from the comfort of a lounge chair, then transfer them to the VCR by clicking button. The settings, along with current time, are displayed on an LCD screen on the remote.

The remote lacks a volume control, however, which would make it a much more useful instrument.

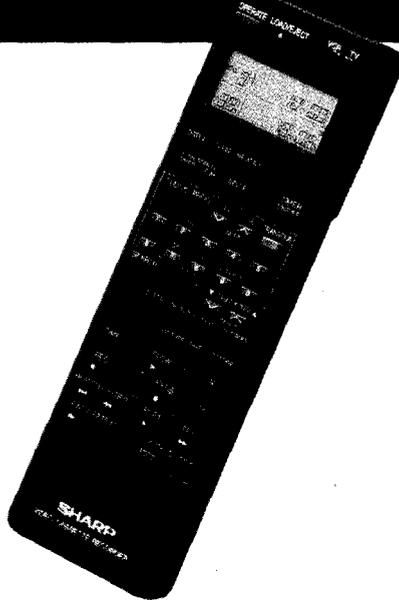
I especially liked the large-scale read-out on the VCR's LCD display; clearly visible across a big room.

The VHR-D500 sells for a recommended \$1,569 and carries a one-year warranty. All it lacks is a headphone jack and hi-fi stereo sound — and for those who want these, as we went to press Sanyo released a hi-fi version the VHR-700.

### **Sharp VCD-801X**

The Sharp is also a single-speed mono machine with remote control. Like the Sanyo, it offers Picture-in-Picture for simultaneous display of video tape and TV, or input from a camera.

There is Nine-Channel Picture Search, which is broadly similar to Sanyo's Multi-TV Programme Scan — that is, it gives a nine-way split of the screen, each segment showing a still frame from one TV channel. But where the Sanyo's frames are refreshed every few seconds, the Sharp's remain stubbornly frozen and unchanging. A point to Sanyo.



There's a TV-still for freeze framing a broadcast picture. This can, incidentally, be handy for jotting down addresses for competition entries, or for recipes in cooking programs.

And for jerky action addicts, there is variable speed strobe for either video tape playback or off-air TV broadcasts. This is really a continuous series of still-frames with the intervals between them variable from 0.16 sec to 1.2 sec. Normal sound continues throughout — as with the TV-still, it's only the video signal that is affected, not the audio.

The Sharp has only 16 preset channels, against the Sanyo's 32. But this is a fairly academic difference while Australians remain so starved of channels. Sharp delivers its VCRs with 12 channels factory-pretuned to all the major city and regional channels. Sanyo expects you to do this little job yourself.

Sharp's remote control is excellent, the pick of this particular bunch. Like the Sanyo, it's bigger than normal with a built-in LCD display for programming recordings or just telling the time.

The remote has large well-spaced buttons, each very clearly marked. The two most important buttons — video Play and Stop — are bigger again, so you are able to find them instantly. There is

no volume control.

By contrast the display on the VCR itself is too small, and many people would find its figures hard to read from the other side of the room. On the other hand, program settings can be displayed, and changed if need be, in large type on the TV monitor screen.

A novel touch is Sharp's Blue Mute system. When there is no active broadcast — for instance when a non-broadcast channel position is accidentally selected or the unrecorded section of a tape is played — instead of a snowy image and harsh static, you get a pleasant, solid blue screen and audio silence. A nice touch others should copy.

Another good feature: Child Lock. Press the C-Lock button and none of your programmed settings can be accidentally changed. A little key symbol flashes in the VCR display to let you know the lock is engaged.

The VC-D801X has Random Repeat which will endlessly playback the same scene: handy for budding musicians who like to play along with on-screen groups, or language lessons.

It sells for a recommended \$1,150 and carries a one year warranty. It certainly lacks a couple of the Sanyo's digital features but a price \$400 less could be a compelling argument for many.

A two-speed four-head model, the Sharp VC-D805X, was scheduled for release as we went to press.

The 805's remote commander was to include volume control; while several new weapons have been added to the digital-effects armory: nine-picture frame advance of video tapes, and nine-picture variable speed strobe of live TV and video tapes.

### **NEC DX3000A**

NEC has taken a slightly different approach to Sharp and Sanyo in its use of digital circuitry, and this is in some ways the most interesting of the three machines under review.

It's plain the NEC designers see digital's appeal lying less in the flashy op-

tions and more in using technology to improve picture quality. So while it has similar digital circuitry to the other two, there is no picture-in-picture, no nine-way split screen, no mosaic tiles or fake art painting.

There is, however, digital noise reduction (DNR), and it works very well, NEC's DNR system uses field correlation techniques to give a lift to image quality on the majority of tapes. "Dramatic" would be too strong a term to describe this improvement, but it is certainly noticeable and well worthwhile.

I found it cleaned up a coarse, grainy effect on both my own camcorder recordings and many pre-recorded movie tapes. You just press the DNR button and you instantly have a smoother, grain-free picture, without loss of detail.

If the picture is still affected by noise, a second level boosts noise reduction further. This is especially handy for off-air recordings which are more noise-prone.

Other digital features include Digital Memory, for noise-free still pictures of either video or TV broadcasts, Slow Motion and Strobe replay. All work simply and well.

The DX3000A is a two-speed VCR, capable of recording up to eight hours, with some loss of picture quality, on an E240 tape.

It has a two-speed "Jet Search" system for finding wanted scenes. This will search at four times normal speed in SP mode or seven times in LP mode. A second tap on the fast forward button speeds this up to eight times (SP) or a blinding 14 times (LP).

This is also a hi-fi stereo model: as with all these machines it is possible to regard it as a high quality audio tape deck, with capabilities only marginally below compact disc, with a video recorder tossed in for free. It does however lack Dolby noise reduction which is supplied on many competitive machines of course, hi-fi stereo, when played back through a quality audio system, gives a tremendous lift to video movies, capturing a lot of the emotional impact of a cinema performance.

The 56-function remote control can operate some compatible NEC TVs as well as the VCR. It includes a volume control, which is a plus point; but on the minus side, it is much too small, with tiny keys, hard to distinguish and set much too close together.

Programming can be accomplished from the remote, with the setting information displayed menu-style on the TV screen.

	Sharp VCD-801X	Sanyo VHR-D500	NEC DX3000A
<b>Digital features*</b>			
PIP	✓	✓	✗
9-screen display	✓	✓	✗
TV freeze	✓	✓	✓
Strobe	✓	✓	✓
Cycle strobe	✓	✓	✗
Zoom	✗	✓	✗
Cycle memory	✗	✓	✗
Mosaic	✓	✓	✗
Art painting	✓	✓	✗
Index scan	✗	✓	✗
Digital noise reduction	✗	✗	✓
<b>Other features</b>			
No. of heads	2	2	4
Speeds	SP	SP	SP, LP
Max recording time	4hrs	4hrs	8hrs
Hi-fi stereo	✗	✗	✓
Audio only recording	✗	✗	✓
Presets avail.	16	32	20
Search method			
Counter	✓	✓	✓
Index	✓	✓	✗
Tape search speed	7x	9x	4/14x
Timer recording**	14d/4e	365d/6e	365d/4e
Remote control			
Programmable	✓	✓	✓
Inbuilt display	✓	✓	✗
On-screen (TV) display	✓	✗	✓
Volume control	✗	✗	✓
Sharp/soft picture control	✓	✓	✓
Auto load	✓	✓	✓
Auto switch-on	✓	✓	✓
Auto play	✓	✓	✓
Auto rewind	✓	✓	✓
Childproof "lock"	✓	✗	✗
Headphone jack	✗	✗	✓
H'phone variable output	✗	✗	✓
<b>Price (\$)</b>	1159	1569	1699
<b>Warranty</b>	1yr	1yr	1yr
* See text for explanation			
** d/e = days/events			

The NEC sells for a recommended \$1,699 and has a one-year warranty. According to NEC, a mono-only version is to be released shortly, selling for around \$869.

### Conclusions

Each of these three machines has something to offer. The Sanyo has the most complete range of digital functions; the Sharp is a clear winner in the value-for-money stakes; the NEC is more of an enthusiast's machine, lacking some of the other machines' generally appealing

features but delivering clearly superior images — and hi-fi sound to match.

These are early days yet for digital technology. New effects and capabilities will undoubtedly appear in future models. It would be nice to see, for instance, digital VCRs equipped with several inputs, allowing easy switching between several decks, cameras or even CD-Video and other sources. No doubt it will come.

**ELI**

David Frith is video and audio columnist for *The Sydney Morning Herald*.

# SEARCH FOR PERFECTION

## **B & W 801 M series monitor loud speakers**

This month Louis Challis reviews the B & W 801 M series monitor speakers and compares them with the earlier model F series.

**I**n late 1980 (see ETI February, 1981) I reviewed the first of the B & W 801 series loudspeakers to reach Australia.

During the past seven years B & W have continued their research work and have developed some of the most avant garde innovations in speaker design. Possibly the most controversial (and I suspect expensive) was the development of their 'Matrix' concept, in which the speaker cabinet resonances are dampened by a foam filled cellular cardboard structure, which virtually fills the cabinet enclosure.

In their quest for perfection, it was obvious to most of us that B & W would sooner or later have to combine the ad-

vantages of the Matrix concept with the already tried and proven advantages of the B & W 801 F series monitor speakers to advance the state of the art one small step further.

When I was offered the chance to review the first pair of 801 series M speakers to come to Australia, needless to say, I didn't need much coercion. I was being offered the opportunity to compare the qualities of a new generation of monitor loudspeakers, with one which I had thoroughly tested before and with whose attributes I was very familiar.

A direct comparison of the 801 M with the 801 F is interesting in that a superficial glance at the units reveals an obvious remarkable similarity. Each has the same ungainly tweeter and mid range cluster on the top of the main cabinet. It is only when you look more closely that you find there are no contour controls on the back of the mid-range speaker enclosure, which were a feature of the old F series. You will find that the tried and proven battery powered speaker protection circuit of the F has now been replaced by a self-powered protection circuit on the M.

The front face of the speaker cabinet has a rather intrusive base reflex venting port which the designers have unceremoniously placed slap bang in the front face of the speaker. Reading the manufacturer's literature, you find that the only way the designers could extend the bottom end of the frequency response down to below 25 Hz, without increasing the size of the cabinet, was to change their design philosophy to utilise a vented enclosure in lieu of their long preferred sealed enclosure.

Had I not placed a pair of 801 Ms side by side with a pair of 801 Fs, I would not have realised that they have actually increased the height of the base enclosure by a small but significant margin. The 801 Ms are now approximately 25mm higher.

The only other significant external visual change has been the repositioning of the speaker terminals from half-way up the back of the cabinet, to a new position right down near the floor. Once again I had to look twice, for instead of a single pair of terminals, as I would have expected, I found that there are now two sets of gold plated terminals, one which feeds directly to the base end driver of the system, while the other is intended to feed the mid range driver and tweeter. Why you ask? Well B & W claim that if the two groups of speakers are fed with separate low impedance leads, it can reduce the magnitude of intermodulation problems in the cable feed system.

They claim that by utilising the two

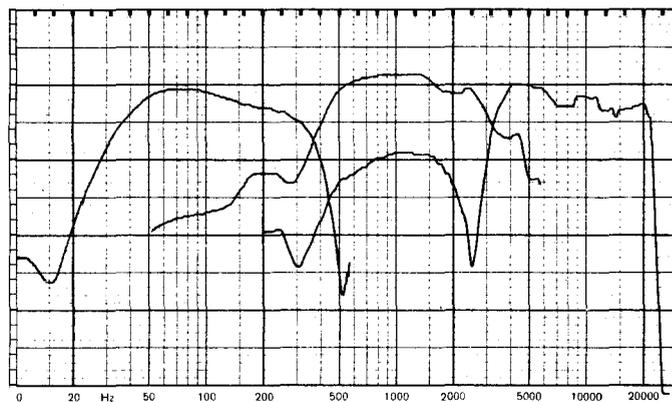
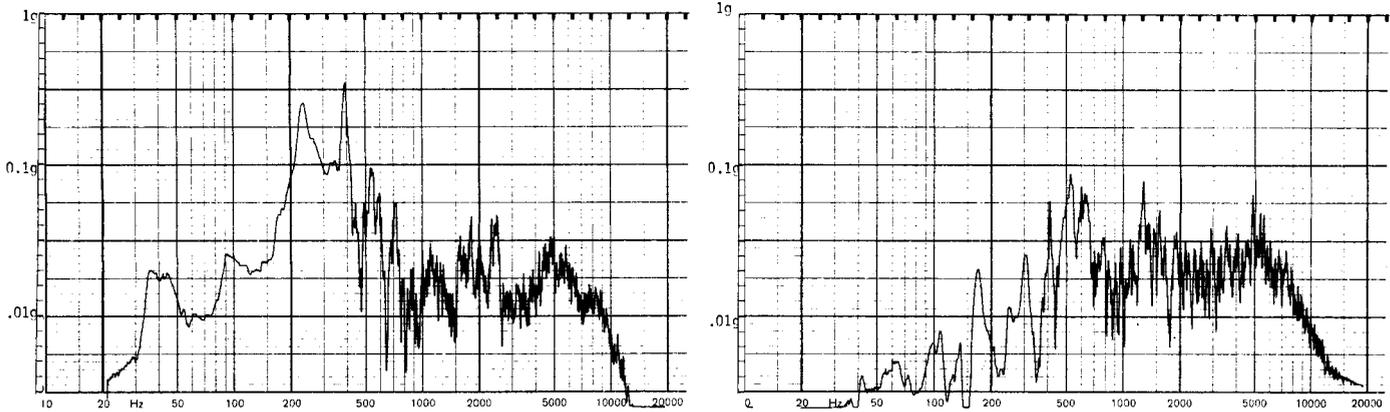


Figure 1: Response of the three drivers measured 5 cm away on the axis. Note the extreme low end performance.



**Figure 2: A side panel vibration test of the 801 F (left) and 801 M (right). This is the response to a swept sine wave input that generated 90 dB SPL at two metres.**

sets of terminals there is a nett improvement in the system's sonic quality.

Of course the two groups of terminals can be linked together inside the cabinet and each speaker cabinet can then be driven by a conventional low impedance cable. However, B & W, as well as Convoy International, the Australian agents, assure us that is not quite as good as going the 'whole hog' and separately feeding each speaker with two pairs of cables.

### The cabinet

Inside the cabinet, there are a number of major, but otherwise invisible advances in speaker technology. The foremost of these is the development of a new tweeter diaphragm which is absolutely brilliant. The second development involves a new crossover circuit, which achieves subtle, but nonetheless worthwhile advances over its predecessor. The most subtle advance of all is the incorporation of the Matrix system into the largest speaker enclosure to be yet so endowed.

It did not take me very long to move the first of the Matrix 801 Ms into our laboratory. As you can see from the on axis frequency response measured under anechoic conditions, the frequency response has been extended at the lower frequencies from what was previously 35 Hz to 25 Hz and I should point out, with a simultaneous improvement in the smooth linearity of the bottom end of that response. Whilst the 801 Fs exhibited a 5 dB peak at 40 Hz, the 801 Ms are much smoother.

At the top end of the spectrum, the 801 Ms are equally smooth up to 20 kHz, but exhibit a measurable resonance which is higher than 25 kHz. Normal testing would not reveal this, but our decay response spectra analysis shows this up quite nicely. The cross over points of 280 Hz and 3.3 kHz are still the same as they were for the 801

F, and are well chosen to allocate the power distribution between the three drivers without taxing them, nor introducing unwanted distortion. It is also interesting to note that the input impedance curve of the 801 Ms is particularly smooth over the frequency region 10 Hz to 1000 Hz, with approximately a 7 ohms minimum impedance and 13 ohms maximum impedance. Between 1 kHz and 3.25 kHz the impedance rises to approximately 31 ohms, but this is not a cause for concern.

*'... the new yardstick against which all other speakers will be measured'*

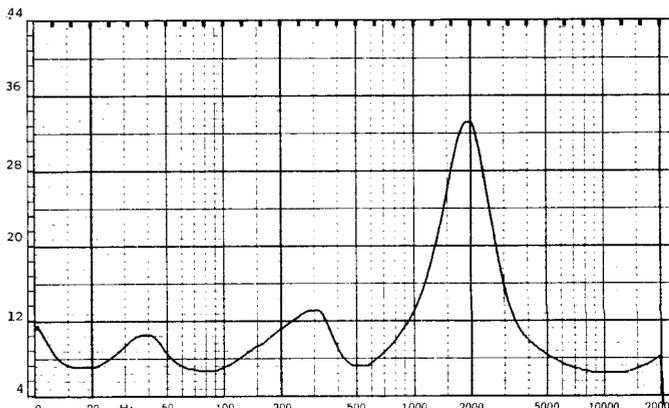
A comparison of the phase response to the 801 Ms to 801 Fs reveals a significant improvement at low frequencies, but no real improvement over the high frequency region.

As one of the major selling features of the 801 Ms is the use of the Matrix system for dampening resonances in the main speaker cabinet, I decided to carry out one test on the 801 Ms that I have

never thought to perform on the 801 Fs or on few other speakers for that matter.

I mounted an accelerator centrally on the side of the 801 Fs and recorded the side panel acceleration level while simultaneously exciting the enclosure with a swept sinewave signal which produced a 90 dB signal at 2 m on axis. I then repeated precisely the same test on my own 801 F's to provide an appropriate comparison. The two level recordings reveal how effective the Matrix system is over the frequency region 20 Hz to 500 Hz with more than 10 dB of cabinet resonance attenuation at virtually all frequencies, and more than 30 dB of attenuation at the fundamental resonances at 220 Hz, and more than 15 dB attenuation at the dominant resonance at 390 Hz.

The distortion in the 801 M is significantly lower at low frequencies than it was in the 801 Fs, is comparable mid frequencies, and is again substantially lower at high frequencies. The lateral sound field distribution of the 801 Ms is exceptionally good and marginally better than the 801 Fs. At 10 kHz, the distribution is within +0, -2 dB over a 60° arc and is only 6 dB down over a 90°



**Figure 3: Input impedance.**

## B & W 801 M speakers

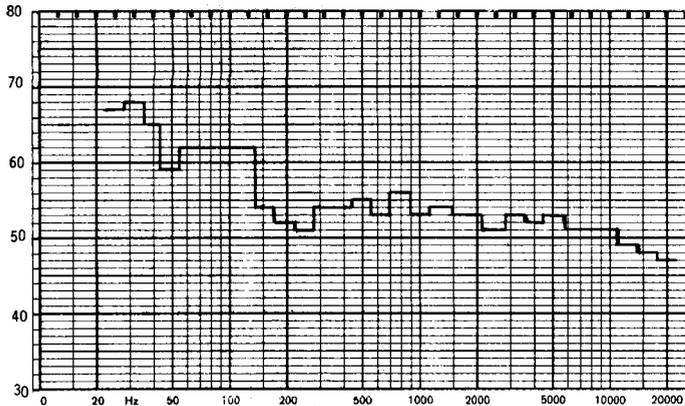


Figure 4: One third band room response.

arc. It is interesting to compare the Decay Response Spectra for the 801 Ms with that provided for the 801 Fs which were just about the best I have measured in the past eight years. The 801 Ms are just about as good up to 20 kHz, display a trace of droop at about 20 kHz, and the lower edge of what is most probably a modest ultrasonic resonance at around about 30 kHz. The critical region from 10 kHz to 22 kHz is very smooth. The cabinet and speaker basket resonances are well attenuated and absolutely docile.

Even the tone burst tests of the 801 Ms are better than those of the 801 Fs and consequently I was impressed that the designers had delivered small but worthwhile improvements in almost every department.

That statement of course, warrants a little more comment, in that, once you have already designed and constructed one of the finest speakers available, it is no easy task to produce something that is substantially, let alone measurably, better.

Having measured an almost impeccable objective set of performance characteristics, I set out to assess what I hoped would prove to be a subjective advance of all is the improvement in the performance of the 801 M over the 801 F.

### Subjective

I spent more time on the subjective evaluation of these speakers than I have ever allocated before, as the subjective assessment of such expensive speakers could not be rushed. Over the 10 weeks I listened to a lot of music for long periods, during which time I compared the 801 Ms with the 801 Fs.

I listened to some of the most outstanding music I could find to determine why, where and how the 801 Ms subjec-

tively differ the 801 Fs. But rather than keep you on tenterhooks, maybe its better that I tell you what I listened to and what I tried.

The first disc I listened to was provided with the speakers by B & W; a series of extracts recorded by Chris-

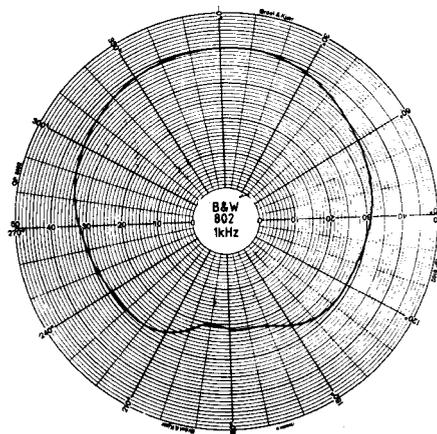


Figure 6: Polar plot at 10 kHz. Note the very small lobes. At 1 kHz they have completely disappeared.

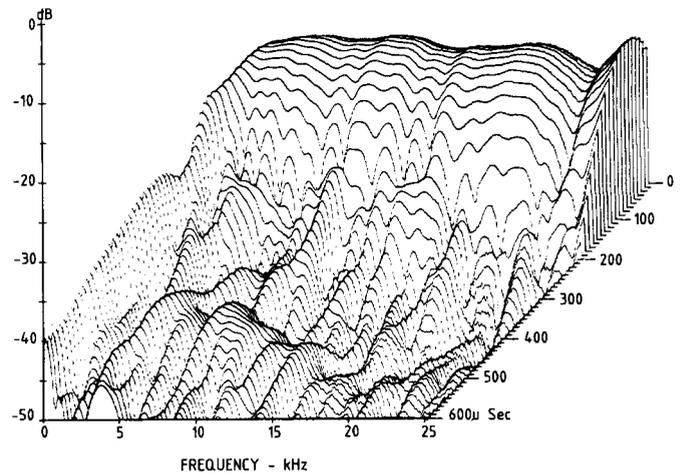
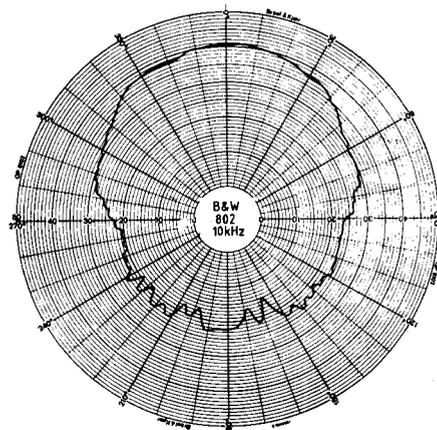


Figure 5: Decay spectra.

topher Hogwood with the digital and analogue material recorded by Decca. The quality of music ranged from exciting to ordinary, but the performance of the 801 Ms was definitely marginally cleaner than that provided by the 801 Fs.

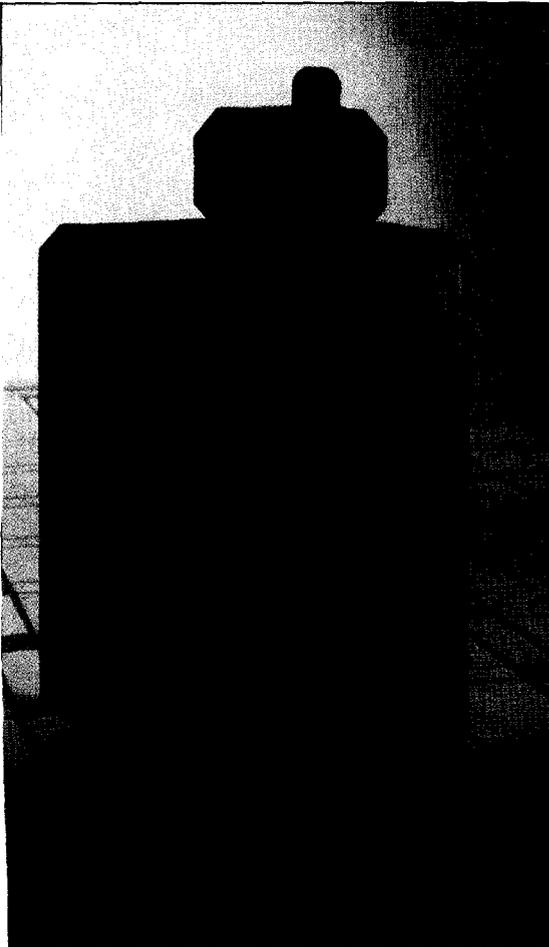
The second disc I listened to was a brand new CBS disc with Sir George Solti and Murray Parahia playing a pair of pianos with Bela Bartok's Sonata for Two Pianos and Johannes Brahms playing variations on a Theme by Joseph Haydn for Two Pianos (Opus 56 B CBS 42625). While I have never been a lover of Bartok, this disc and the reproduction provided by the 801 Ms may well change that.

The third disc that helped to convince me of the merits of the 801 Ms was another brand new release by CBS Records of Beethoven's Eroica Symphony (No. 3) with Michael Tilson Thomas and the Orchestra of St Luke's (MK 44516). The 801 Ms produced a concert hall in my living room with base response and timpani that was absolutely outstanding.

### Spectrum appreciated

As outstanding as the music was, I initially experienced some difficulty in hearing the differences between the two sets of 801 speakers. As the lowest frequencies enveloped the room, I started to appreciate, not just subtle differences, but very significant differences right across the audible dynamic and frequency spectrum. Those differences were not always audible, but for many of the critical performance characteristics (or at least those that I regard as being critical) they were clearly and positively audible.

I listened to a considerable number of discs and recordings of singers, speech and even talking books. Much to my surprise the quality of the spoken voice,



LOUDSPEAKER DATA SHEET

MEASURED PERFORMANCE OF: B & W 801 SERIES 2

SERIAL NO.:

FREQUENCY RESPONSE:

CROSSOVER FREQUENCIES: 380Hz, 3.2kHz

SENSITIVITY:

(for 96 dB average at 1m) 7.0 V r.m.s. = 6.1 Watts (nominal into 8 Ohms)

HARMONIC DISTORTION: (for 96 dB at 1m)

	96dB 100Hz	96dB 1kHz	(90dB) 6.3kHz	
2nd	-47.3	-65.4	-55.3	dB
3rd	-62.3	-52.1	-50.6	dB
4th	-62.6	-66.1	-47.5	dB
5th	-59.3	-66.5	-	dB
THD	0.46	0.26	-0.54	%

INPUT IMPEDANCE  
ONE TEST:

100Hz/7kHz 4:1

100Hz	7.2	ohms
1kHz	13.2	ohms
6.3kHz	7.2	ohms
Min at 10kHz	6.4	ohms

**Dimensions: 1008mm high x 432 mm wide x 560 mm deep**

**Weight: 50 kilograms**

**Price R.R.P: \$7,900 per pair (including demonstration disc)**

which I had already regarded as being excellent on the 801 Fs was aurally better and more natural when played through the 801 Ms.

My younger son availed himself of the opportunity to listen to a wide range of pop and rock music, which convinced

him that the 801 Ms are much more suitable for rock than are the 801 Fs.

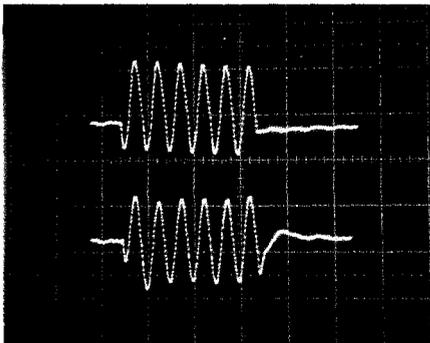
The B & W 801 M speakers are without question the most outstanding speakers to be released in Australia over the past year. More significantly they offer a performance which few other speaker systems can hope to match. Exceptional performance normally has a price tag, and in this case that tag is relatively high.

While the Australian recording studios and sound dubbing suites, which have already purchased 801 Fs, are unlikely

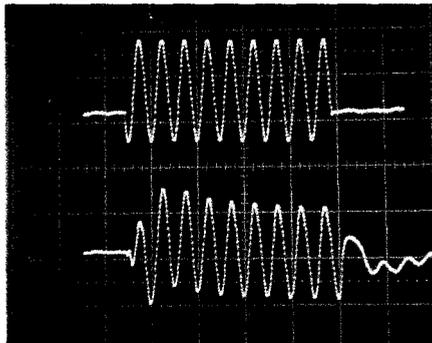
to change them to 801 Ms, there are still plenty of well heeled professionals who have the money to buy the best and will spend the money to buy these speakers. Even if you can't buy them, if you get the opportunity to hear them at your local hi-fi dealer, grab the opportunity, for these are likely to become the new yardstick against which all others are measured. 

*Louis Challis is the audio consultant for Electronics Today International*

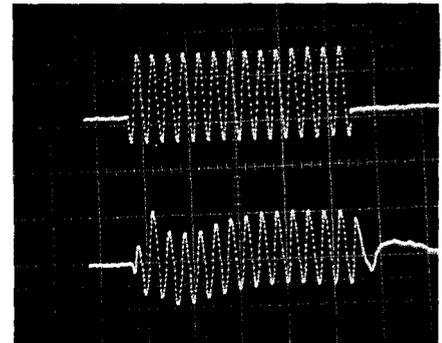
**100 Hz**



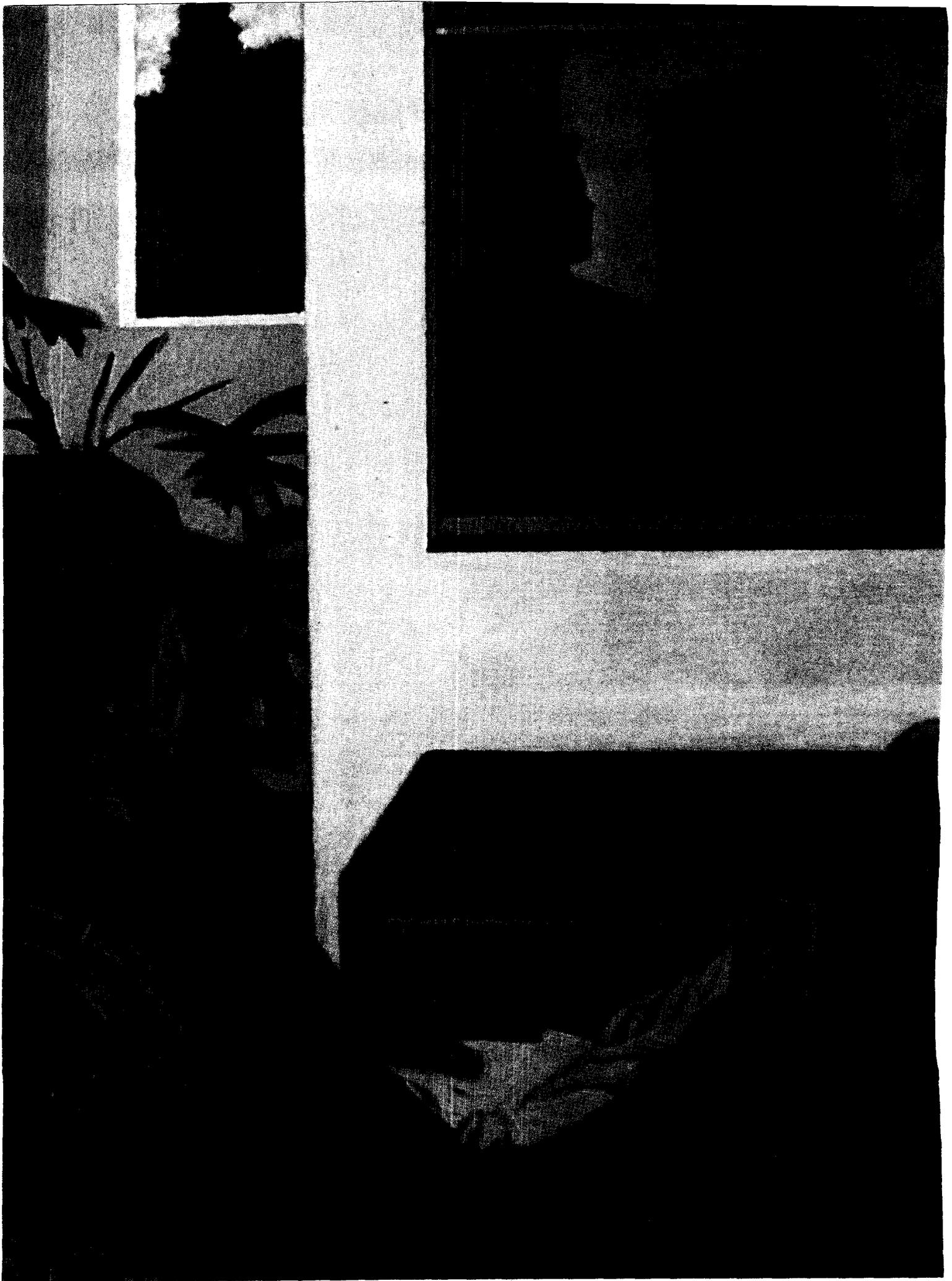
**1000 Hz**

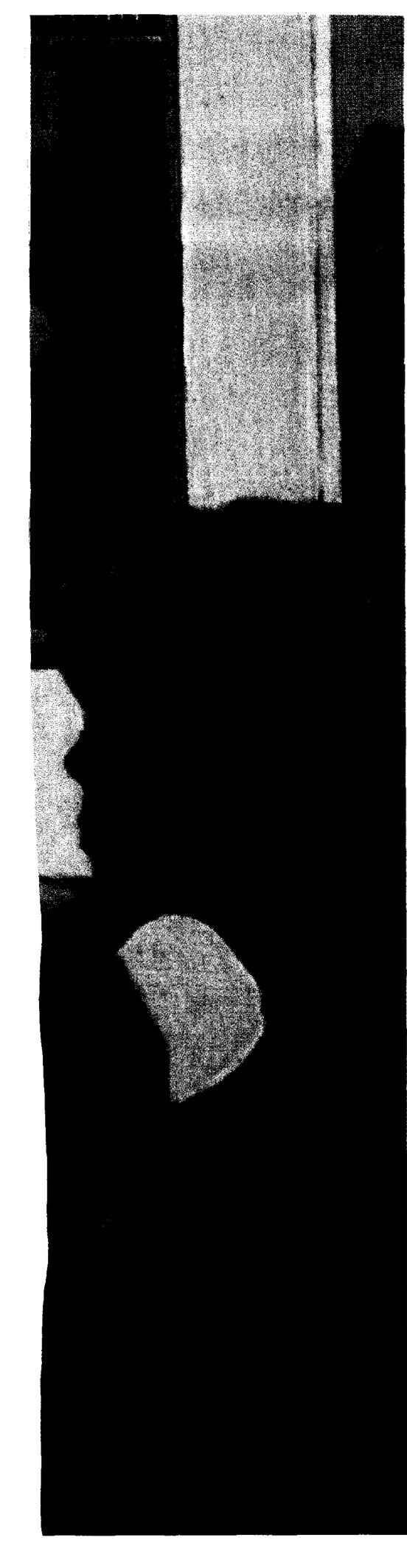


**6300 Hz**



**Figure 7: Tone burst response. Upper trace is electrical input and lower trace the audio output.**





# VIDEO-AUDIO INTEGRATION

## *Something old, something new*

As video components gradually integrate the traditional audio world Derek J Powell reports on the latest trends.

**H**i-fi systems once were strictly instruments for sound reproduction. Now, with better educated and more demanding consumers, the Audiophile has been joined by the Videophile. High resolution video monitors are making their appearance alongside the high fidelity loudspeakers in a true enthusiasts system.

The current trend is to integrate video components into the traditionally audio only world of high fidelity.

There are two important directions this trend is taking. The first is a quantum leap in the quality of domestic video reproduction devices with the "component system" of separate video monitor, tuner and recorder taking the place of the familiar TV receiver. The second is the integration of video and audio systems.

Buyers can no longer afford to consider audio only when purchasing a Hi-Fi system. For example, should the CD

player be capable of a video output as well? CD V with discs which combine high quality vision and sound is already with us. Is a Hi-Fi VHS recorder a better investment than a top class cassette deck? After all, the audio quality of the FM recording on VHS Hi-Fi is more than comparable to reel to reel and a four hour cassette is attractive . . .

Let's examine some of the key areas of "cross-over" where video and audio considerations both need to be taken into account when making purchase decisions.

### **Signal sources**

The laser disc is a prime example of a multi-media technology. Its vast storage capacity makes it a natural for storage of not just digital audio, but video and computer data as well. There are now three different types of laser disc on the market.

The Laser Video Disc with high qual-

WE'LL CHANGE YOUR IDEAS

# B&W CONCEPT 90

## B&W REVEALS THE HONEYCOMB MATRIX

B&W have taken the Matrix quantum leap a stage beyond. They challenged the view that only a sizeable and intrusive enclosure could possibly produce a sound of true monitor quality.

That equation between size and sound quality is now rewritten by B&W in their Concept 90 series CMI/CM2 loudspeakers. Giving an incredible response to the wide dynamic range of today's compact discs.

*At one end a rich and satisfying bass output.*

*At the other, fastidious reproduction of the most delicate passages.*

Here is a loudspeaker whose mighty performance is at home in limited roomscales... whose appearance is perfectly attuned to design-conscious living.

The Matrix revolution - an historic breakthrough in enclosure design - has lit the fuse. The honeycomb Matrix structure has virtually eliminated unwanted radiation characteristics, setting you free to enjoy the pure, uncoloured sound of the drivers.

With one of the last great barriers to perfect sound reproduction lifted, B&W have undertaken an intensive development programme using the latest Computer Aided Design techniques. This has brought about a new generation, demonstrating B&W's sensitive shaping of audio for the rest of the century. It's called Concept 90. CMI and CM2 are the latest progeny of the state of B&W art.

## THE MATRIX REVOLUTION SETTING SOUND FREE

## CMI AN INCREDIBLE SOUND SYSTEM

By moulding the CMI enclosure and Matrix in one piece and using a new glass-fibre reinforced polyester material, B&W have drastically reduced cabinet thickness - normally 15mm - to just 5mm. The result: a gain of 40% internal volume and a bass output which completely belies the CMI's diminutive size.

Bass/midrange performance has been refined by the introduction of a new version of the woven Kevlar cone used in B&W's celebrated 801 monitor. System sensitivity of 85dB. Maximum sound pressure level of 105dB (in 2000 cu.ft.). The perfect expression of the Concept 90 philosophy.

## THE MATRIX CROWN THE GLORY

For the resolute perfectionist, Concept 90 reserves a further dimension. The supreme power and bass extension (a full 1 1/2 octaves more) of the CM2. The CMI element crosses to the slender sub-bass module of CM2 at only 150Hz, leaving performance unimpaired and giving a fully omnidirectional pattern of sound radiation. Drivers are reflex loaded and deliver perfect optimisation of output and bass extension. In CM2 the maximum sound pressure level is raised to 107dB with superlative accuracy and stereo imagery.

READER INFO No. 8

The **B&W**  
MATRIX  
Revolution

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## Video-audio integration

ity (analogue) vision and sound is inherently capable of much better reproduction than domestic tape formats (though Super-VHS may come close) and its complete freedom from wear and easy random access make it a natural for music video replay. A library of material encompassing movies, live concert recordings and a wealth of educational material is already available on Laser Video disc.

The largest collection of software still belongs to traditional Audio only CD with up to an hour of Digital audio content but the latest development is CD-V which marries quality analogue vision with digital sound.

It's possible, of course, to buy a 'Video Disc only' or 'Audio CD only' player and in some circumstances this may be the best course. However, it is no longer possible to ignore the existence of the other formats and a combination player is an option that should be strongly considered.

The proliferation of optical disc formats and the radical new uses of the optical storage media means that you should at least contemplate a CD or laser disc player with a "sub-code" or digital output. These are provided to build in a degree of flexibility so that as yet undeveloped uses for CD storage may be catered for by an external adaptor.

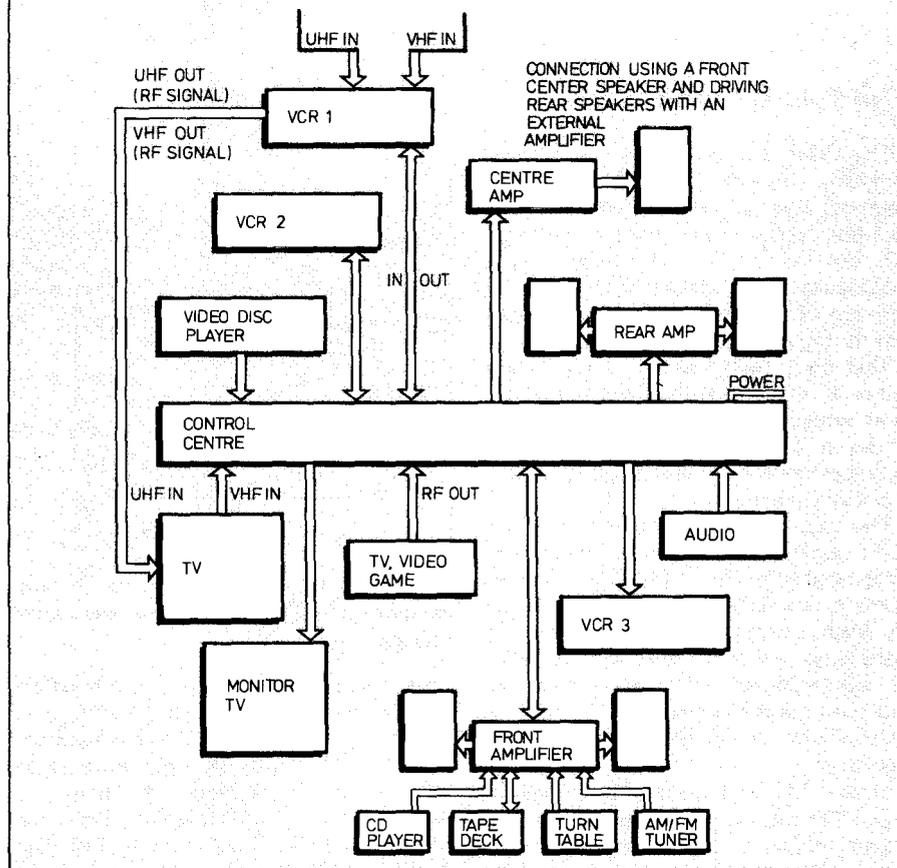
While Digital Audio Tape (DAT) remains locked in legal battles and market uncertainties, there are two other options as far as recording high quality audio is concerned.

Hi-Fi VHS (and its Beta equivalent) is not a digital recording method, but nonetheless is capable of consistent and superlative results in audio recording. Special heads on the spinning video

**'Buyers can no longer consider audio only when purchasing a hi-fi system'**

drum record the frequency modulated audio signal onto the same part of the tape as the video signal.

High relative tape to head speed allows excellent frequency response and high signal to noise figures while the servo mechanisms needed for stable video replay guarantee wow and flutter results almost too low to measure. Along with great audio quality comes the bonus of very sophisticated timer record facilities and freedom from the tyranny of the 45 minutes a side maximum of the compact cassette format.



*With unlimited money, and space, the modern A/V set up can be expanded to this sort of level. The whole unit can be controlled from a single remote operating via the control centre.*

Against this, it must be said that a VCR is not as convenient to use as a cassette machine. Operation can be a drag where you have to wait for the machine to thread and unthread the tape between operations. Another factor to consider is that car sound systems and personal "Walkman" replay machines are almost universally Compact Cassette, so a cassette deck as part of the Hi-Fi does make good sense.

Nonetheless, on economic grounds alone, combining the functions of a VCR and Hi-Fi audio recorder in one unit does make sense. One small word of caution here. Some units require the presence of a video signal before stable audio can be recorded. Check to be sure that the unit you are considering for a dual role has an "audio only" recording feature.

For the purists among us, several manufacturers (notably Sony) offer the ability to use a VCR as a pure digital audio recorder. An external PCM (Pulse Code Modulation) converter takes the incoming audio signals, digitises them and then adds television synchronising pulses so that the output signal "looks", to a VCR, just like a video signal.

The signal is recorded in the same manner as an ordinary vision signal and on replay the PCM adaptor reconverts the digital audio to analogue format. The advantage, of course, is higher quality and the ability to copy tapes al-

most without degradation.

Note that, unlike the "Hi-Fi" VHS standard, where the audio is laid down along with the vision by a second pair of heads, an external PCM adaptor used with a VCR will lay down the digital audio signal INSTEAD of the vision. Teamed with a Porta-Pak VCR, a PCM encoder can be used to record superb quality sound on location.

Not content with that, however, Sony developed a PCM Digital Audio system which integrates with its Video 8 products. All Video 8 products use a Frequency Modulated mono audio track as standard, but space has been reserved on the tape to allow the recording of an additional digital stereo audio track.

### Dubbing

This track can be recorded independently of the video and standard audio track, making audio dubbing in digital stereo possible. This is a significant advance over the FM audio tracks of Hi-Fi VHS and Beta because FM tracks can only be laid down at the same time as the video.

It's also possible to use the Video 8 system to record audio only with the Multi-PCM feature. By utilising the video signal area, a total of six independently PCM audio tracks can be placed side by side. This means that it is possible to record an amazing 18 hours of digital stereo audio onto one cassette! **eli**

## Video-audio integration

The Video 8 system does use a lower compiling frequency (31.0 kHz) than Compact Disc standards, which means that the quality is not quite as high as CD, but results are nonetheless quite spectacular. It is claimed that up to 30 per cent of Video 8 users buy the system for the audio capabilities alone.

The third high quality Audio/Video source is, of course, the TV tuner itself. Most capital city stations broadcast in Stereo and with a decent aerial, the technical quality of the received sound is extremely high.

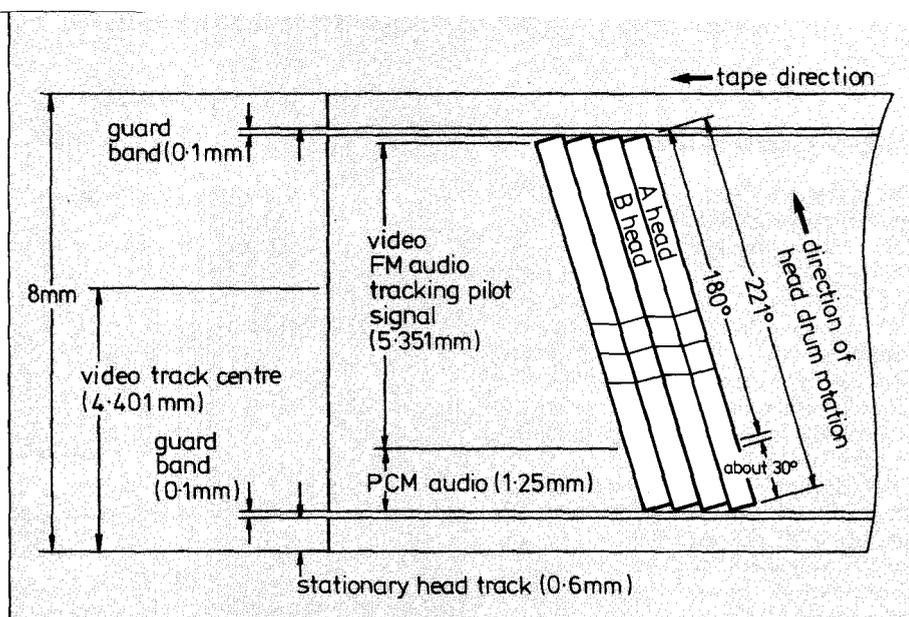
The days are long gone when the audio quality of music programmes was compromised to meet the visual requirements of no visible microphones and so on. Most concert performances on TV these days are simultaneously recorded on synchronised multitrack machines and then painstakingly re-mixed to produce album quality sound on the final broadcast.

Stereo TV sound can be routed to your Hi-Fi amp and speakers from line output terminals on the receiver itself, from audio outputs on a stereo VCR or from a component TV tuner.

## Control centre

We have seen that there are now a number of video entertainment devices which can be connected to the Video monitor or TV. A "Technologically Advanced Family"\* may well have a Laser Disc Player for movies, a VHS VCR for time shift viewing, an 8 mm Video Player for 'home movies' plus a TV tuner and maybe a satellite receiver.

The video portion of these signals needs to be distributed, selected and



**8 mm video tape format shows the vertical scan of the two heads, the pulse code modulation audio track and the guard band between them. It's all very small and very precise.**

routed just as audio signals are handled by the pre-amp in an audio system. It is feasible to use a separate video switcher for this task, but as all these sources do have audio associated with them as well, it would seem logical to integrate the vision switching functions with the audio control system.

A generation of "Audio/Video Control Centres" is emerging to take on this role in an integrated audio and video entertainment system.

Traditional Hi-Fi manufacturers like Akai, Marantz and Teac have all introduced products which combine audio and video selection and control. (Sometimes it is difficult to categorise such equipment. Is 'Unit X' a Vision Switcher with audio capabilities or is it a Hi-Fi pre-amp which also switches video?)

A high degree of sophistication is required in this equipment as vision sig-

nals must be handled more carefully than audio. Vision signals must always be correctly terminated with a 75 ohm impedance at each input so buffer stages are required to allow for monitoring functions while duplicating.

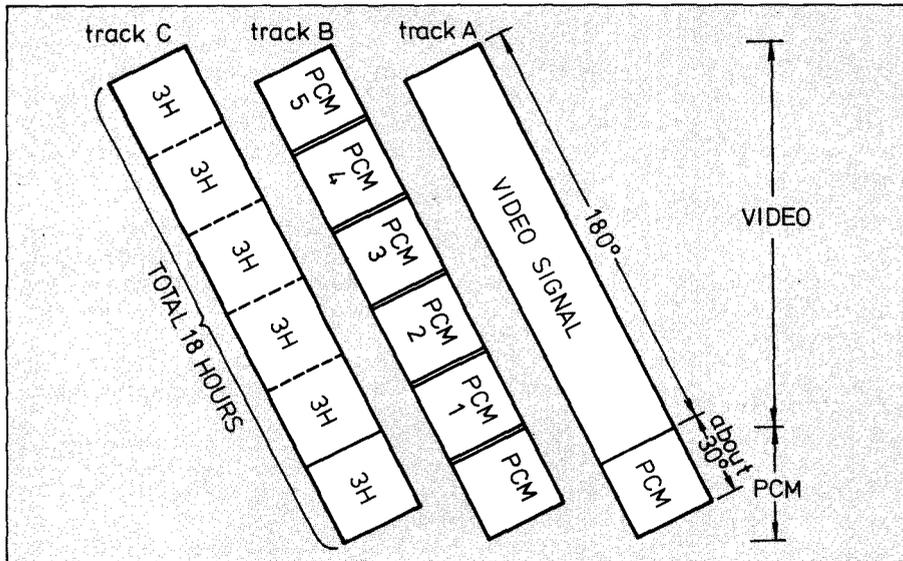
Some systems allow for video signals equalisation (enhancement) and vision fade to black functions along with audio tone and volume controls. Another feature offered but generally misunderstood is the "Dolby Surround" decoders offered for use with stereo VCR and video disc sources.

Briefly, Dolby Surround is a matrixing system used to record four audio channels (left, centre, right and surround) onto a stereo compatible two channel audio soundtrack. Many recent movies have used this system to achieve exciting effects like helicopters buzzing overhead or background ambience that seems to come from all around you.

The exciting part is that this encoding is preserved when the movie is translated (in stereo) to video. With the decoder and an extra amp and speakers, it is possible to redecorate the four channels in your own home.

The true A/V control centre can become very complex indeed, switching and distributing RF signals to FM tuners and TV receivers, audio signals to and from VCRs, Disc players, amplifiers and recorders, video signals to monitors and video recorders and speaker outputs to main, remote and surround speakers.

To sum up, when buying entertainment electronics today, the questions must be asked: "How well does this audio component handle video?" and equally, "Could a video component handle this audio role better?"



**Pulse code modulation audio recording on the Video 8 system from Sony. It allows 18 hours of vision on a PS-90 tape. In ordinary video mode, the tape accommodates one video and one audiotrack (track 1). In track 2, the video is replaced by five audio tracks.**

\*The 'TAF' is another acronym to add to the growing list of Yuppies, Dinks and other such categories.



ANTHONY O'GRADY

CD Reviews



Mason Ruffner

MASON RUFFNER

GYPSY BLOOD

(Epic)  
4509332

You'll get people who'll tell you there is nothing new in rock and roll and Mason Ruffner, for one, would agree. He's from Texas, USA, was influenced at an early age by Jimi Hendrix as a guitarist and Bob Dylan as a lyricist and has seen no need to

change direction or mentors ever since.

Gypsy Blood is his second album but, with veteran rocker/producer Dave Edmunds at the console, by far the better. From the opening bars of the title track (which proudly evoke Hendrix) to the apocalyptic lyricism of Distant Thunder, to the rockabilly good-time of Red Hot Lover, Mason keeps pouring old wine into new bottles, and it still tastes just fine.

THOMAS DOLBY

ALIENS ATE MY BUICK

(Manhattan-EMI)  
CDP-7-48075-2

Thomas Dolby is perhaps the foremost exponent of "clever-rock" on today's charts.

His melodies are quirky, his rhythms intense, but it's his lyrics especially that mark him a logical successor to Frank Zappa as a musician/satirist pulling off the difficult double of mocking popular culture, while making music attractive enough for the mainstream to buy as a home entertainment.

The difficulty is, what is cleverness to some will remain forever obscure to others. For instance, it takes a leap of imagination to tie the album title to the contents of the CD, there is no

title track, nor do the words "Aliens Ate My Buick" occur in any song.

Dolby's rationale seems to be a general exploration of trash culture and trashy people, though his satire can be laced with sexism — girls are usually airheads, or only good to be used as hot sauce.

Despite a generous scattering of clever lines throughout the lyrics e.g.: "check between your fingernails/in between your toes/right between your earlobes darling/that's where culture grows". (Pulp Culture), the real cleverness of Aliens is in the music.

Dolby, a former wizz session player who moved out of the backroom with the world hit Blinded by Science, is still a most proficient constructor of classy, pop melodies.

Such a pity they're also so eminently disposable.



Thomas Dolby

## CD reviews

### OTIS REDDING

#### THE OTIS REDDING STORY

(Atlantic)

Cat No. 781 762-2

(3-CD set)

Not everything recorded by Otis Redding in his brief but incandescent career was wonderful, a very small percentile was merely very good indeed.

This 60-song set (so far only available on Compact Disc, rec retail price \$59.95) covers the gamut of Redding's studio work, from *These Arms Of Mine* in 1962, to the posthumously released (*Sittin' On*) *The Dock Of The Bay* in 1968.

Historically, he remains one of the most successful soul performers of all time, the tragedy was, he died in a plane crash at the age of 26, just as it had become obvious that rhythm and blues, soul or any other bag was too small to hold him.

His forte was to drench a song with blues-drenched, anguished vocals, he'd kick through the melody with relentless energy, yet he had a whole bag of little tricks and nuances that makes his best work enduring.

The way the story goes, his career had almost mythic — at the very least Hollywood spectacular — overtones. Driving someone else to a recording session in 1962, Otis Redding mentioned he also sang a bit. He cut some things at the end of the session, one of them was *These Arms Of Mine*.

The truth was he'd been flogging his wares for over two years, but *These Arms Of Mine* broke him through. After that, he seemed to come on strong on every level without respite — as a performer, arranger, producer, writer.

Redding's songwriting credits include: *Respect*, *Sweet Soul Music*, *I Can't Turn You Loose*, *I've Been Loving You Too Long*, *These Arms Of Mine*, *Dock Of The Bay* — a prodigious number of classics for any writer to have penned

— when his version of *Satisfaction* was released shortly after *The Stones'*, it was popularly supposed Jagger/Richard & Co had covered yet another Otis Redding song.

He was the only black soul performer to turn up to the Monterey Pop in 1967, where, as the film of the event testifies, he proved effortlessly what mainstream European audiences had known for at least the past year, live Otis was too classy to be restricted to the chitlin' circuit.

When he recorded *Dock Of The Bay* he was unquestionably aiming for the heart of white America but he was never to see the song hit the mark — it was his first record to sell over a million.

*The Story Of Otis Redding* has just about everything he recorded in the studio from late 1962 to the last session in December 1967. It contains no live tracks, yet Redding released two superlative in concert albums and was recorded live in devastating form on many occasions. Perhaps someone in the record company is already plotting the definitive Otis Live Collection?

### THE STYLE COUNCIL

#### CONFESSION OF A POP GROUP

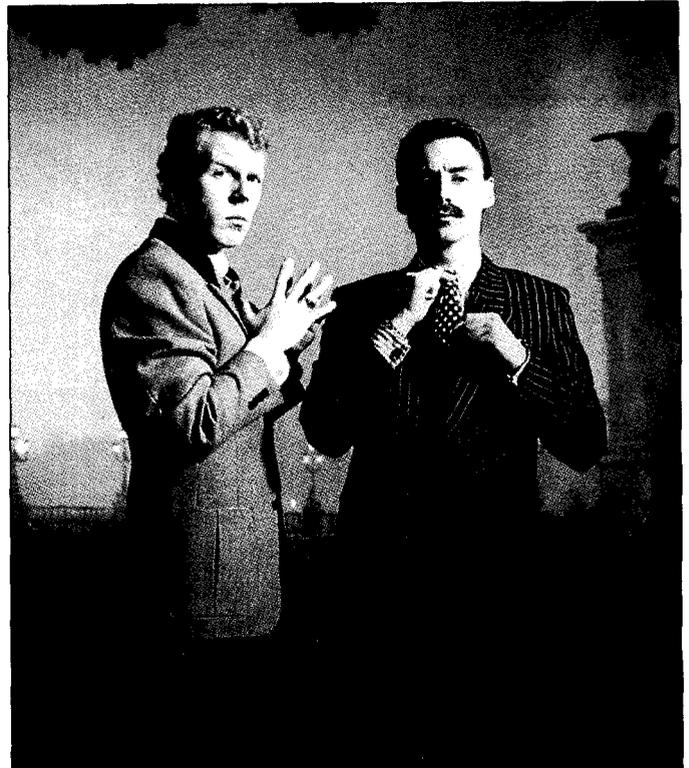
(Polydor)

Cat No. 835 785-2

Parcelling a pop past into the cupboard and starting again as a contender in "serious" contemporary music has been a fraught business for Englishman Paul Weller.

After leading *The Jam*, one of the very few 70s Brit bands to survive punk and seriously influence the mainstream (these ears hear *The Jam* sandwiched inside Australian hitmakers *Spy Vs Spy*), Weller formed *The Style Council* in 1983.

Whereas *The Jam* started as raw rock then gradually realigned to a slick dance beat sophistication, (tellingly, their own success in America was



*The Style Council*

on the disco charts) *The Style Council* were always angled more towards the Modern Jazz Quartet.

On the one hand, Weller and his *Style Council* cohort Mick Talbot, have graced the charts with some wonderfully evocative jazz tinged rhythm and blues, on the other they've sometimes taken themselves so po-faced seriously, their musicianship has fallen into a miasma.

Such was the case with last year's album *The Cost of Living*, a soporific self-indulgence if ever there was one. Happily, *Confessions Of A Pop Group* is the pinnacle of *The Style Council's* achievements so far.

More cohesive, yet with a broader outlook than the earlier *Cafe Bleu* (which was greeted with critical puzzlement upon release but is now starting to appear on *Classic Albums* lists) *Confessions* brims with haunting ballads and passionate political sidewipes.

From start to finish, the album has been assembled with nth degree of attention to style and content, though a quasi-classical intro to *Dee C.*

Lee's torchy vocal on *The Gardener of Eden* is uncomfortably close to the pastoral doodles of early *Moody Blues* on *Days Of Future Past*.

Still, Weller swings with joie de vivre on tracks such as *Changing Of The Guard*, *How She Threw It All Away* and *Life At A Top People's Health Farm*, and bounces with funky chic on *Iwasadoledstoyboy*.

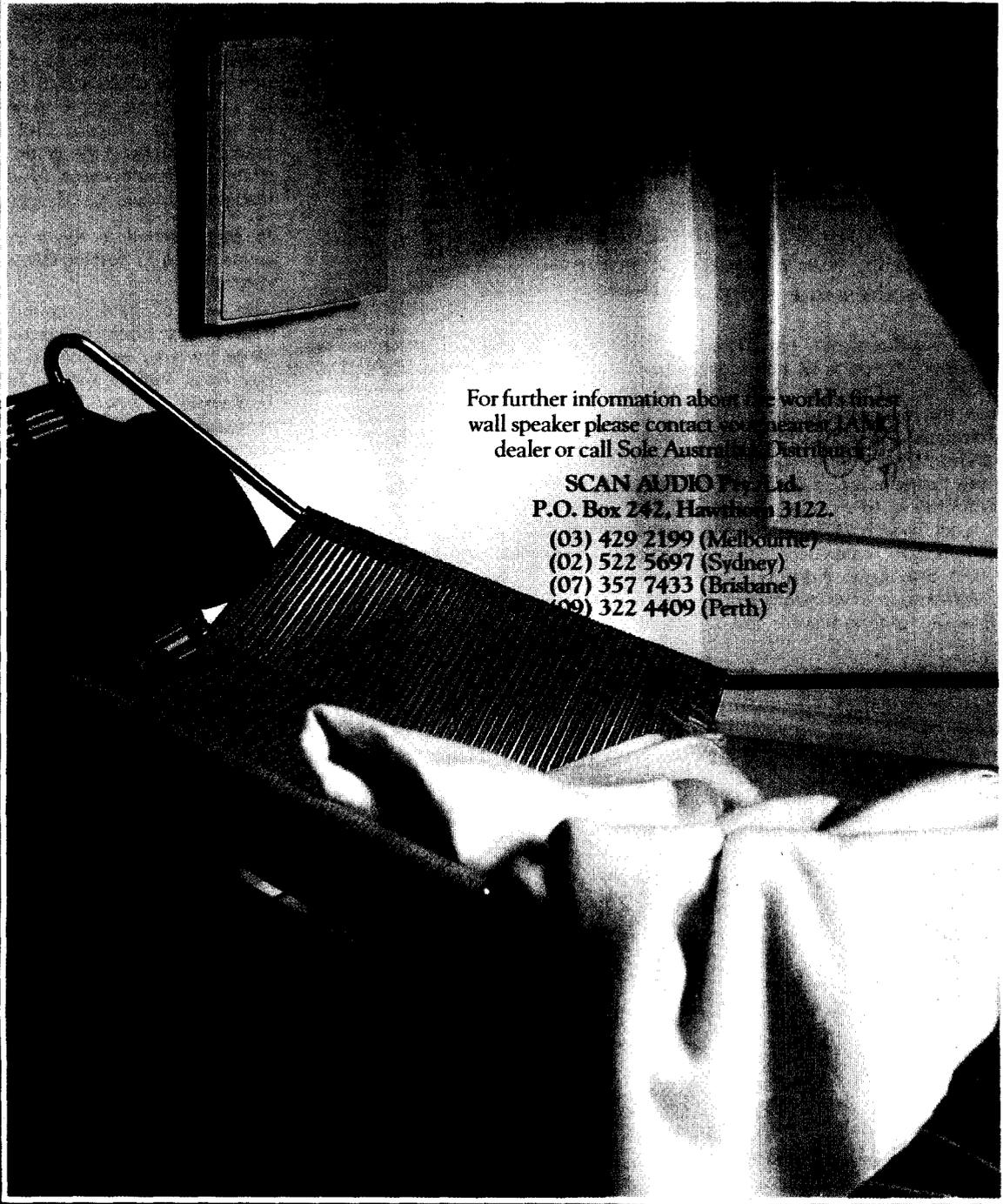
Then again, as one of the world's most popular miserablists, Weller wouldn't be Weller if he didn't howl at the moon somewhere along the way.

On the cover notes for *Confessions* he calls his peer group of musicians "a ragged bunch of scoundrels and vagabonds who abuse and wilfully neglect the true essence of and purpose of music. Thankfully there are those who, who in the face of such barbarity, apply even more determination, purpose and dignity to their work... needless to say, you now hold a shining example of this in your hands and are therefore asked to act accordingly."

For Paul Weller, polemics never was a dirty word. **ELI**

# Jamo ART

## THE ART OF LISTENING



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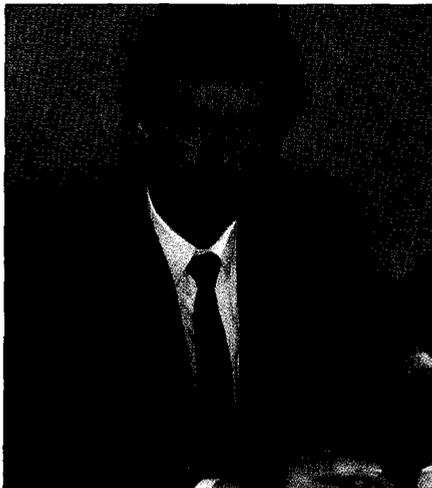
MARY RENNIE

## MORE PRIDE AND PREJUDICE

### *Hi-fi questions you were afraid to ask*

Continuing ETI's quest for the right answers to all that is hi-fi, Mary Rennie discovers what distinguishes one from another . . .

**T**here is a wealth of hi-fi out there in the shops. A range of items at a variety of prices that beckon, even frighten, the modest buyer. The manufacturers' literature suggests a litany of characteristics and specifications. We put a series of questions to some manufacturers to find out what they think. Last month we printed responses from Ralph Waters of Richter Acoustics and Bob Egan from NAD's Australian distributors. This month Lindsay Woodland of Yamaha has his say.



Lindsay Woodland

**What is the currently available product of which you are most proud?**

Your first question is very difficult to answer as there currently exists so many outstanding audio products in the range.

Possibly the product of which we are most proud is the Yamaha DSP-1 Digital Sound Field Processor. In terms of technological advancement the DSP-1 is regarded as the most significant new development in audio products since the introduction of the compact disc player. It has won worldwide acclaim, and for good reason. The DSP-1 can accurately recreate the live listening environment in your own lounge room — and what better way to listen to music than to experience it as it would be heard in the live concert environment. The DSP-1 has the ability to transform both the hi-fi System and Video System into a total home entertainment package, literally launching home entertainment into a new dimension.

**What is your biggest selling hi-fi product?**

The CDX510 compact disc player. It features Hi Bit-quadruple oversampling; Hi Speed D/A converter; 24 track programmable playback; 24 track direct access and an infra-red remote control. When a product of this quality is available at under \$500 (and a 5 year warranty also happens to be part of the package), it is easy to understand why this is a most successful product.

**Do Japanese products have a particular national characteristic which you could describe?**

Technological Innovation! Japanese hi-fi products are typically more advanced technically than products produced by manufacturers in other countries.

These advancements are not only evident in the array of user convenient

features supplied on most Japanese hi-fi products, but the Japanese are also applying this technology to finding new ways to improve the sound quality and performance of their hi-fi products. This is very obvious in the development of compact disc players, and many audio critics throughout the world are amazed that the development of the compact disc player could have gone this far.

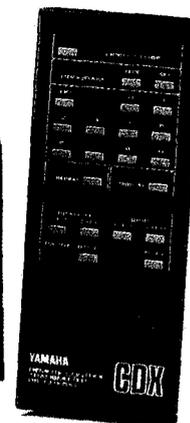
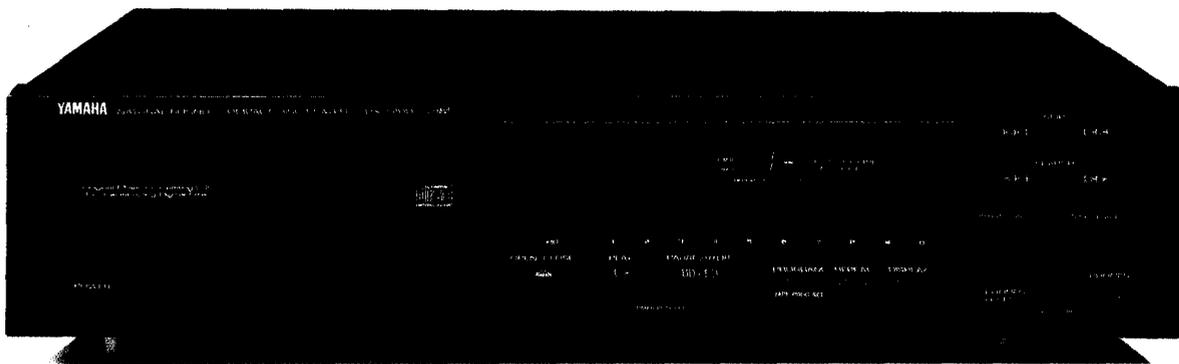
**In your opinion, is there a loudspeaker sound which is fashionable at present in Australia?**

The way a speaker sounds or should sound has been a contentious issue since the very beginnings of hi-fi. Some say Bass Reflex; others infinite baffle; bookshelf vs floor standing; British vs American; 12" Bass cone vs 8" cone; dome vs horn tweeter; three way vs two way, etc. The point is that there exist so many varieties of speakers currently

*"... consumers are becoming more aware of the quality factor"*

available to the consumer (and as many arguments for and against each type to match) that the selection of this type of product is open to greater subjectivity than with any other hi-fi product. I don't believe that there has been any significant trend in the short term, however, some minor trends do exist. Consumers are becoming more aware of the quality factor in all hi-fi components and this is also very obvious in the purchase of speakers. There appears to be a minor trend towards more compact speaker systems such as bookshelf speakers or smaller stand mount speakers. Over the years the trend toward large floor standing speakers has dissipated as consumers have become aware that size bears little relation to how good the speaker will sound. Yamaha themselves caters for all tastes by offering two very different ranges of speakers.

**What technical innovation has been the most important for hi-fi in recent times? Could you explain its effect.**



Possibly the most important technical innovation for hi-fi in recent times has been the introduction and development of compact disc players. Compact disc has stimulated the hi-fi market significantly throughout the past five years and has certainly increased consumer awareness of high quality sound.

The very same technology used in CD players will be incorporated in CDV (Compact Disc Video) players and we

expect that CDV will play a major role in the future direction of the audio/video market. In relation to this, companies such as ours are now establishing a direction toward the development of AV related products.

**How does the fiscal year '87-'88 compare with previous years in sales?**

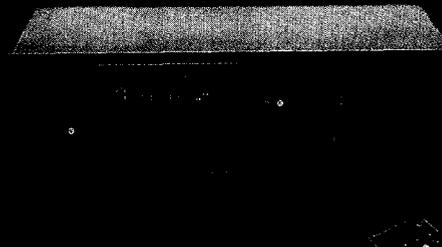
The fiscal year of 1987-88 was the most successful year. This success can be directly attributed to the fact that we

provided the market with an excellent range of products which catered well for consumer demand.

Consumers demanded high quality compact disc players at affordable prices and we were in a position to offer the best quality possible in the budget area. Growth was very noticeable in the product areas of compact disc; speakers; cassette decks; receivers; amplifiers and AV related products.



## THE SYSTEM *Compact Hi-Fi From A Compact Hi-Fi*



*Styled by Reinhold Weiss Design in the United States, the Proton AI-3000 Music System is streamlined, compact and ideal for the listener who is short on room space.*

*The System offers all the versatility of individual audio components without the clutter. It is designed with your convenience in mind. The lesser used controls are hidden away behind the front panel and the ones used most are placed at the top for easy access, along with clear, easy-to-see LED displays. A turntable or VCR can be connected to the rear panel inputs and the privacy of headphones can be enjoyed.*

*Delivering The Perfect Blend of Power And Fidelity. Rated at 22 watts per channel. The System's component quality power amplifier assures stable, efficient performance and 3dB dynamic headroom. Broadcast reception is clearly outstanding. The reason? The digital tuner's phase locked loop frequency synthesizer locks in stations precisely, even in crowded metropolitan areas.*

*Fulfilling The Promise of Compact Disc. Never before has the dynamic potential of recorded music been so great. A Level Of Excellence In Auto-reverse Cassette Decks. The remote controlled auto-reverse cassette section features Dolby B Noise Reduction and automatic bias and EQ selection.*

*The fully logic controlled solenoid operated transport includes automatic programme search (APS) and allows recording in both directions. Three playback modes are provided, so you may select to listen one side of a tape, both sides or repeat both sides of the tape continuously.*

*The Power In Your Hands. A sleek remote unit provides full control over The System from almost anywhere in the room.*

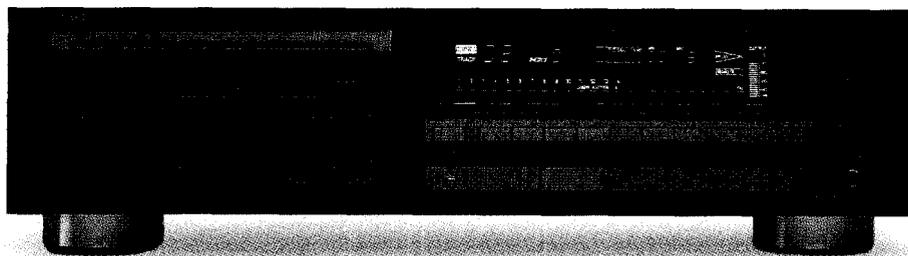
**The System - Compact, Convenient And As Clear As Crystal**

W.C. WEDDERSPOON PTY. LTD.  
3 FORD STREET, CHULLORA, N.S.W. 2190  
TEL. (02) 642 2595 (02) 642 4993 FAX (02) 642 8606  
P.O. BOX 21, GREENACRE, N.S.W. 2190

READER INFO No. 10

Audio

# YAMAHA'S NEW CDX 1110 CD PLAYER OWES ITS BRILLIANCE TO A PIECE OF TWO-BIT TECHNOLOGY.



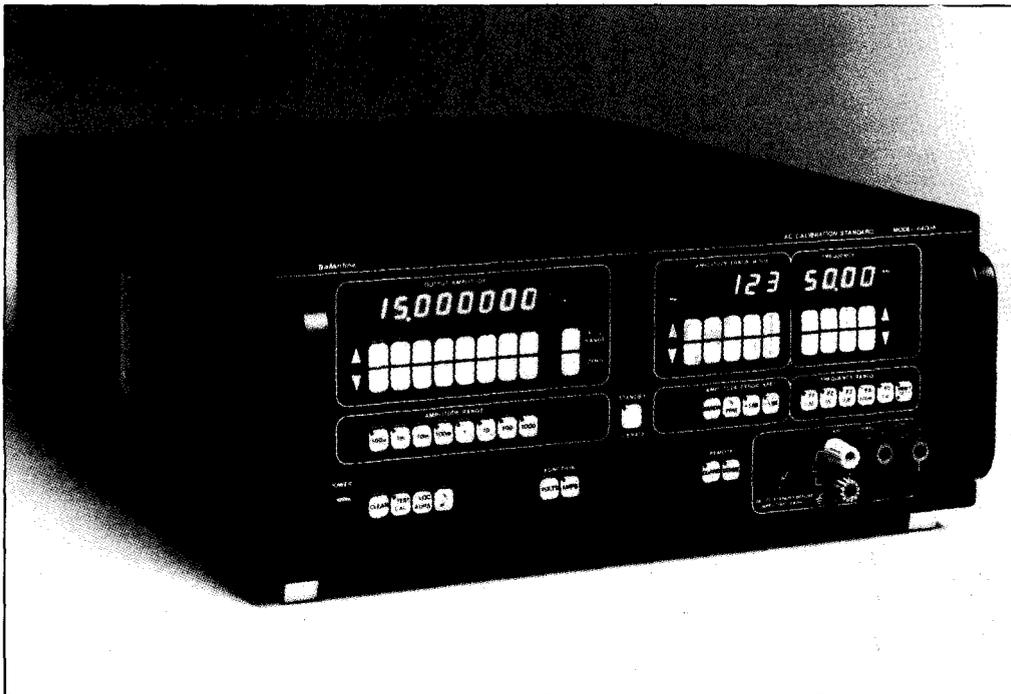
Until now, CD players were limited to 44.1 kHz and 16 bit technology. Now Yamaha has, as Audio Magazine states, "found a way to improve on perfection". Introducing the world's finest CD player that features 18 shifting bits and 8 times oversampling digital filters. A technological progression that quadruples 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.**



## State of art

### bettered

Considered an improvement in the state-of-the-art, Ballantine model 6400 ac voltage standard delivers ac voltages from 1 nanovolt to 1000 V with an amplitude uncertainty of no more than 32 parts per million between 40 Hz and 20 kHz. The standard, which can be programmed over the IEEE-488 interface bus, has an uncertainty of only 475ppm at 1MHz.

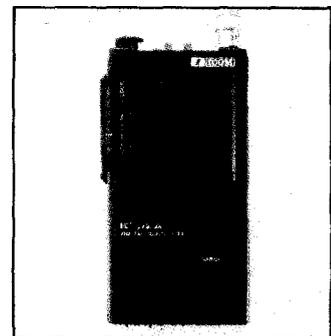
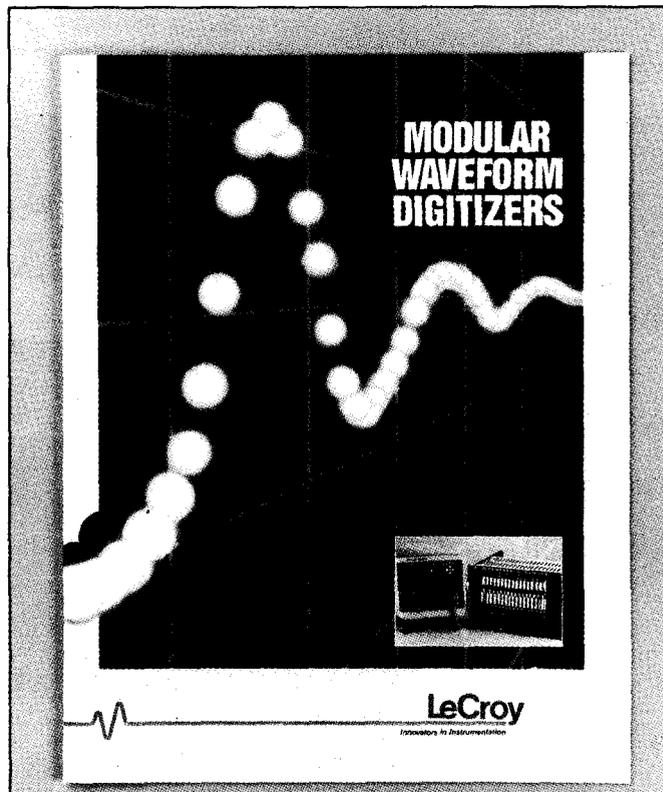
Details from Dindima ☎ (03) 873 4455

READER INFO No. 219

## Book buy

ETP Oxford has a 16-page booklet called Modular Waveform Digitizers available from LeCroy Corporation that describes its line of high accuracy, long memory waveform digitizers. Illustrated with photographs, charts and diagrams, the publication details the benefits and applications of the digitizers' modularity, fast waveform capture, long memory, and precision capture of waveform details. The brochure also describes software solutions for both oscilloscope emulation and for complete waveform analysis on a PC. For information contact: Fred Blake, ☎ (02) 858 5122

READER INFO No. 205



## Shirt-pocket

### ICOM

Captain Communications of Parramatta is now stocking the micro-sized ICOM hand-held series — the ICOM u2A/a. Features include:

- ★ 10 programmable memories
- ★ Odd offset capability
- ★ LCD readout
- ★ 2.6 watt output
- ☎ (02) 633 4333.

READER INFO No. 206

## Towering sphere

Webster has added another sphere to its business with the introduction of the Webster-386, an Intel 80386 based tower system capable of supporting up to 34 users.

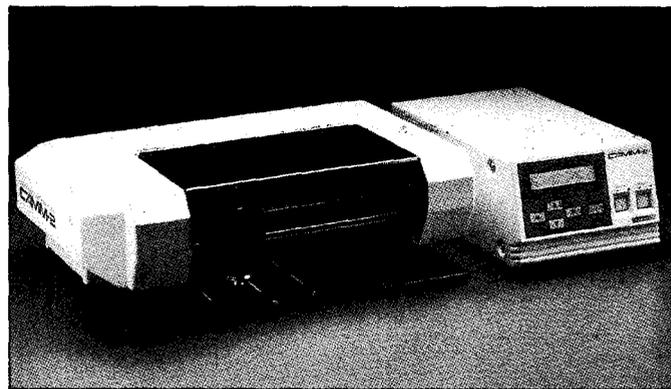
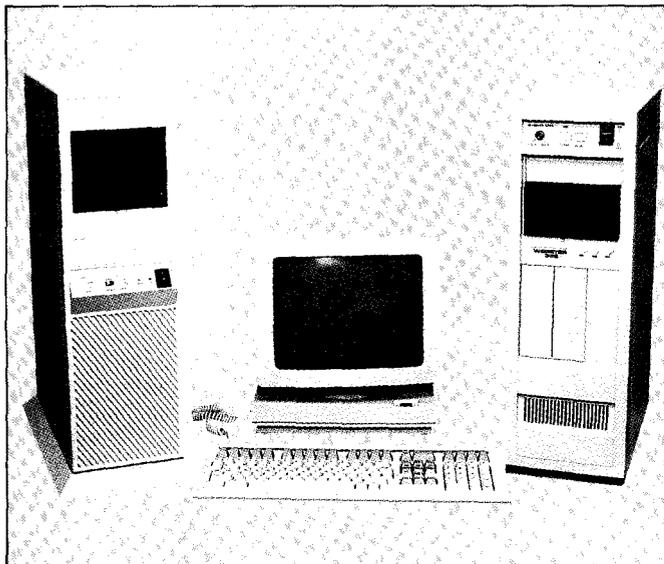
A choice of either a 16 MHz or 20 MHz processor is available. The processor provides support up to 16 Mb.

An ESDI disc controller is installed which permits selec-

tion of either a 172 Mb or 382 Mb drive. Total access times for all drives are approximately 28mS.

The CT16 model (16 MHz processor) retails at around \$7,000 list (including tax), with the CT20 (20 MHz processor) retailing at around \$7,900 (including tax). Ms Sambidge on (03) 764 1100.

READER INFO No. 190

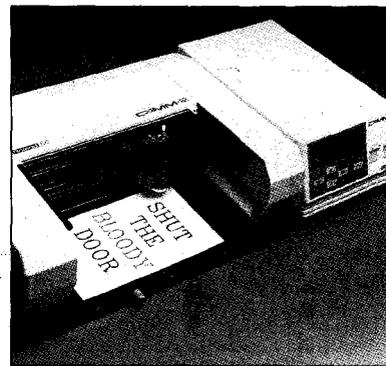


## Plotted penmanship

Roland has opened up a whole new vista for the use of microphones in business and industry with the release of a PC driven engraving machine.

The CAM-2 can be used to engrave light metal plates such as brass and aluminium, as well as standard single and multi-layer plastics.

The spindle revolves at 11,000 rpm and the unit has a maximum engraving speed of 1.8 metres per minute. It has a working area of 200mm on X-axis, 140mm on Y-axis and a maximum engraving depth of 10mm with



a resolution of 00.01mm/step. Roland ☎ (03) 241 1254 will tell you more.

READER INFO No. 191

## Low cost UV

### Eprom eraser

The BUV-3 family of UV Eprom erasers are housed in steel enclosures, the rated average life of the UV lamp is approximately 6 months of continuous operation, and the built-in UV glow indicator replaces the conventional pilot lights and add-on UV lenses.

The BUV-3 features a full 10 inch wide drawer with an integrated handle capable of holding up to 30 24-pin chips at a time. A conductive foam pad protects the chips from possible electrostatic charge.

Bytek UV Eprom erasers are available through Parameters ☎ (02) 888-8777.

READER INFO No. 192



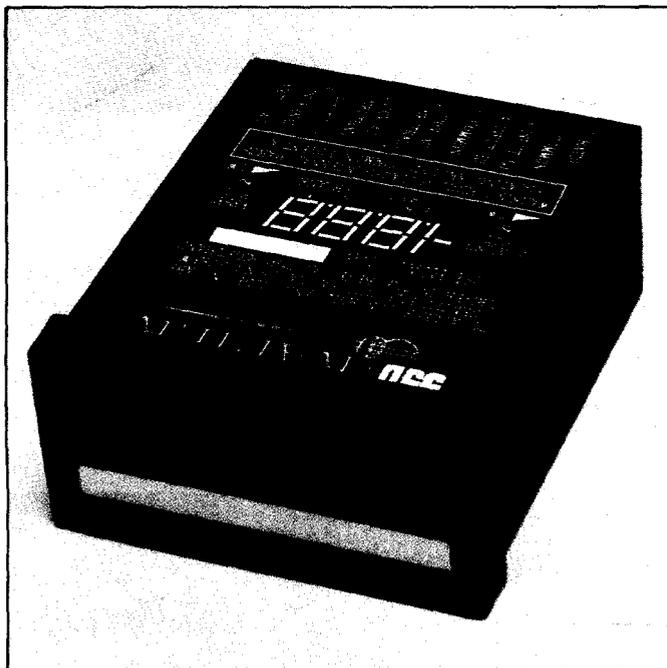
## Quality

### rewarded

Schaffner Elektronik AG, the manufacturer of EMI filters and components, has been awarded the SQS Certificate, category A, by the Swiss Association for Quality Assurance Certificates (SQS). It is certified that Schaffner has introduced and maintains an integral quality assurance organisation which conforms to the strict Swiss Standards SNO29100, category A, in all respects.

Schaffner products are handled in Australia by Westinghouse Systems. ☎ (03) 397 1033.

READER INFO No. 193



## Digital panel meter

The Rapier Drives Digital Panel Meter (DPM) has just been released by the drives division of Eurotherm International, SSD.

The DPM will accept input signals up to  $\pm 400$  Volts or 4-20 mA loop in normal or ratio metric mode. Below 200 V full scale, it is possible to

adjust the full scale readout between 1999 and 199.

Offset control for true or preferred zero with a range of  $\pm 400$  units is also provided, as well as automatic polarity sensing.

Eurotherm is on ☎ (02) 477 7022.

READER INFO No. 194

## Scanner launched

Captain Communications have just released the high performance Saiko SC7000 scanner.

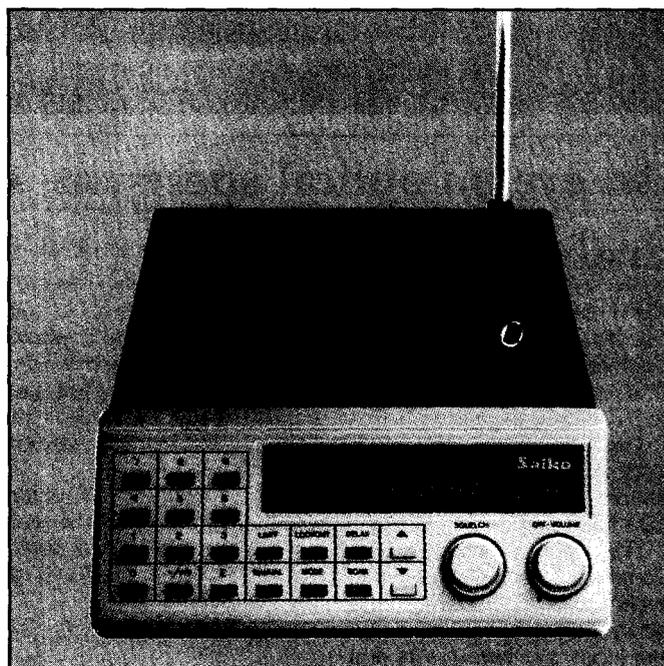
Frequency range is comprehensive, covering:

- ★ HF band including CB band 26.0-30.00 MHz
- ★ VHF Lowband 68.00-

- 88.00 MHz
- ★ Airband 118.00-
- 138.00 MHz
- ★ UHF band 380.00-
- 512.00 MHz

Input/output facilities include 12V power, antenna and speaker. The Captain is on ☎ (02) 633 4333.

READER INFO No. 201

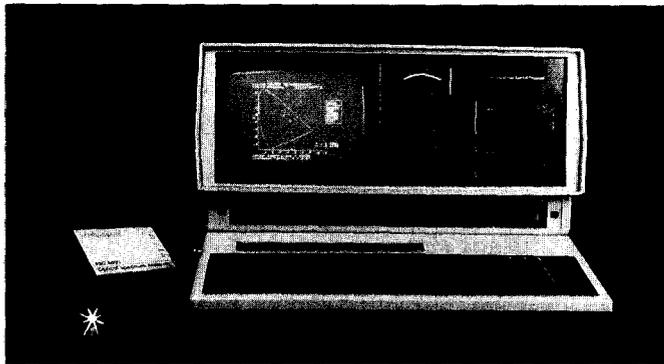
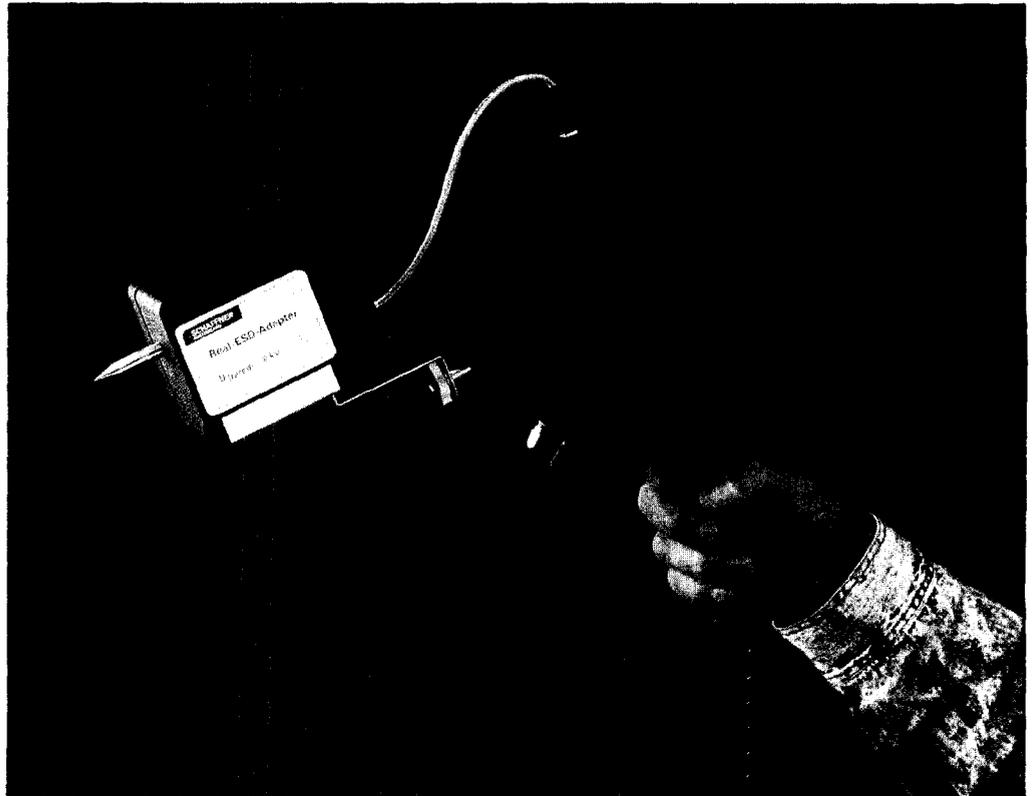


## Simulator ► with HV-relay

In order to test the stringent standards for electrostatic discharges, Schaffner have introduced the NSG 432 ESD simulator through Westinghouse Systems.

The discharge potential is continuously variable from 2 kV to 25 kV. Details on ☎ (03) 397 1033.

READER INFO No. 183



## An eye on optical spectrum ▲ analysis

Rofin has released a user-friendly optical spectrum analyser with open software that can readily be modified to the user's needs.

The Rofin-Sinar RSO 6240 optical spectralyser (OSA) covers the spectral range 200-5000nm.

The analyser employs the continuous spinning grating technique comprising the analyser head which contains the input and output slits and

the spinning grating, a suitable detector (silicon, photomultiplier tube, germanium, PbSe) and the spectral processor which includes the control circuits and an on-board computer.

The rotating diffraction grating scans each constituent wavelength past a detector at the exit slit. Rofin ☎ (03) 580 0802.

READER INFO No. 186

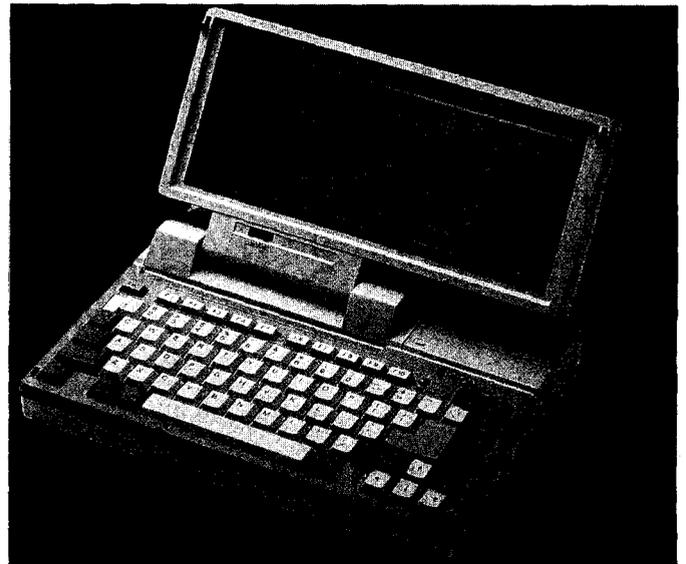
## Flexible computing power ▼

Epson Australia has released the PX-16 Portable Computer, a versatile PC-compatible machine for commercial, industrial and scientific applications.

Epson have been involved with lap top computers for many years and the PX-16

has been designed to offer the user maximum flexibility in system configuration, offering a choice of keyboards, screen units, cartridge interfaces, expansion interfaces and disk drives. ☎ Epson on (02) 451 0251.

READER INFO No. 185



## Security sounding off ▼

The housebreakers' brigade are about to be confronted by the Teleguard VP3.

Should they step down into the vision of a Teleguard VP3 they are going to experience a piercing sound that will make their eardrums shudder and will probably send them reeling into the street feeling quite queasy.

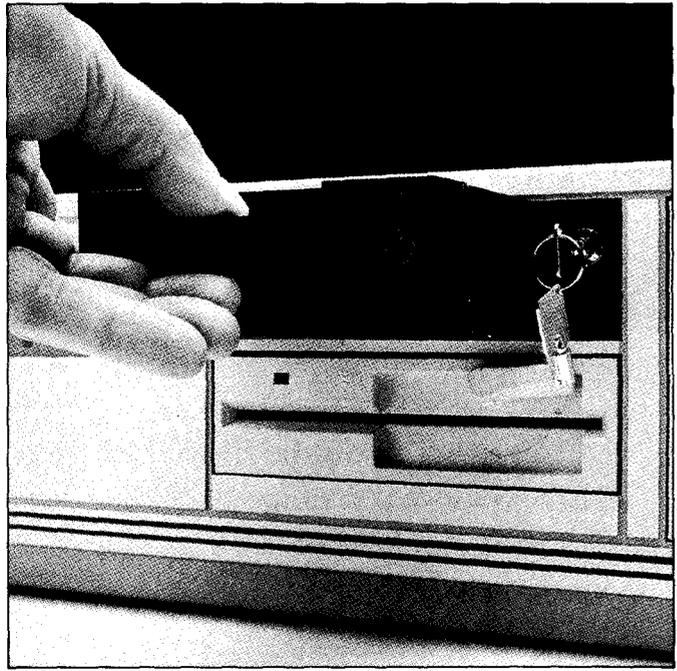
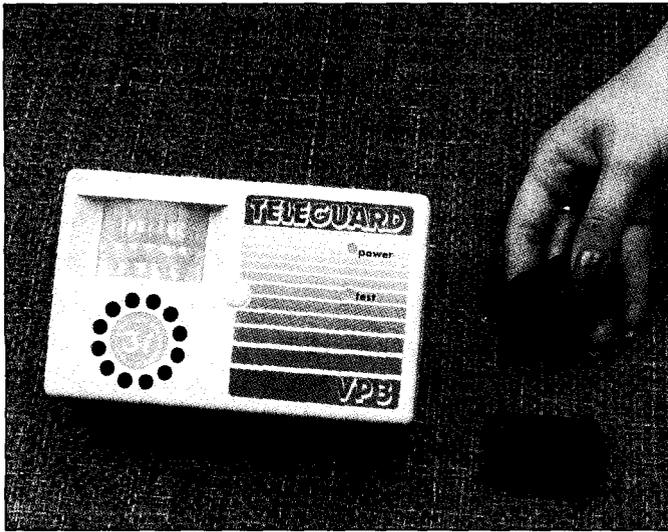
The remote controlled system employs a passive infrared detector which doesn't operate off the power supply,

but a re-chargeable battery. Once it is activated it emits a two-minute piercing wail before shutting off and then resetting itself for the next unwary felon.

The system can be armed and disarmed much in the same way as remote controlled garage doors are opened and closed, from a distance of 30m or 90ft. If you're willing to spend \$400

☎ (02) 427 1611.

READER INFO No. 195



## Portable hard disks ▲

The capacity of a hard disk and the interchangeability, portability and lock-away security of the floppy disk have been combined in the new ProStor TransPac hard disk.

Released nationally by Australian Executive Services, the TransPac is a 3½" Winchester drive that simply

plugs into an adaptor cartridge (dataframe) that fits into a spare 5¼" half height floppy drive opening in a computer. For users without spare internal space, a self-contained external unit is available.

Ask EAS ☎ (08) 212-5799.

READER INFO No. 196

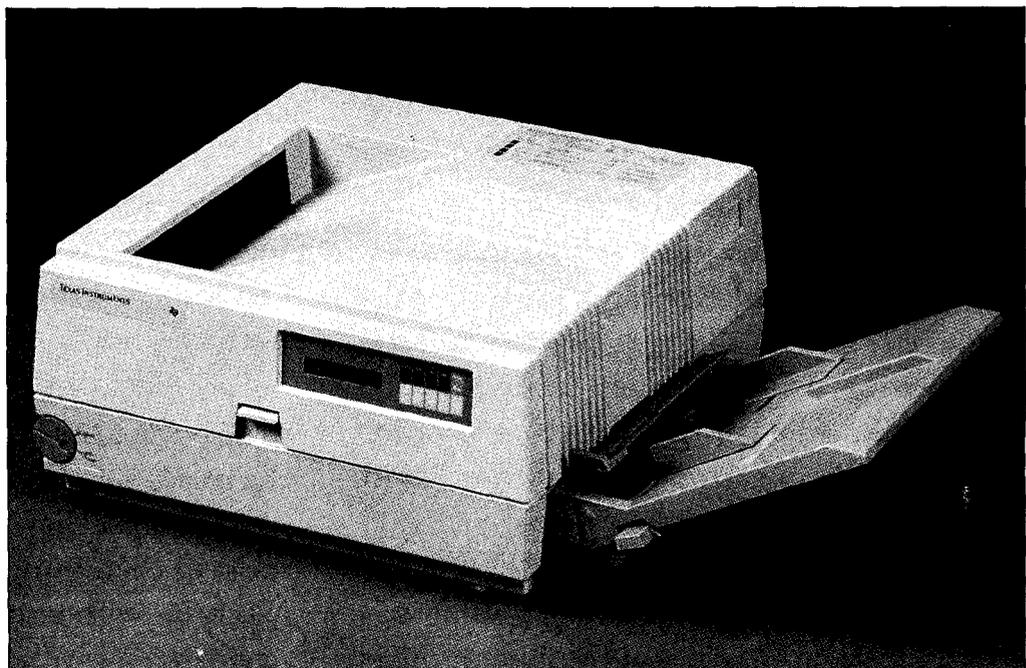
## Desktop laser printer with postscript ►

A new desktop laser printer with incorporates Postscript, 35 resident typefaces and the ability to print both envelopes and overhead transparencies has been launched by Texas Instruments.

Priced under \$8000 the Texas Instruments OmniLaser 2106 is a new entry level system to the highly popular Texas Instruments OmniLaser range of laser printers.

For details ☎ Texas on (02) 887-1122.

READER INFO No. 197



# 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.

NAD, standing for New Acoustic Dimension, is a European company which set the entire hi-fi world on its ear by providing the previously unheard of. Superlative quality sound at a ridiculously low price.

We're not just talking about superior sound performance to competitors in NAD's price bracket, we're talking about superior performance to competitors at any price.

As you can imagine, this really put the woofers amongst the tweeters.

Just how much it did, you can judge from the following:

"Nothing gives us more enjoyment than that rare event of finding a product to rave over and the cheaper the product the bigger the thrill. So when something (like this NAD) comes along that is both ridiculously cheap and ridiculously good, we tend to get rather ridiculous."

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.)

However, if you can hardly believe your eyes at what you've just read, you are cordially invited to visit the specialist NAD dealer near you or phone (02)597 1111 for further information.

We're confident you won't have any trouble believing your ears.



"Ridiculously good.  
Ridiculously cheap?"



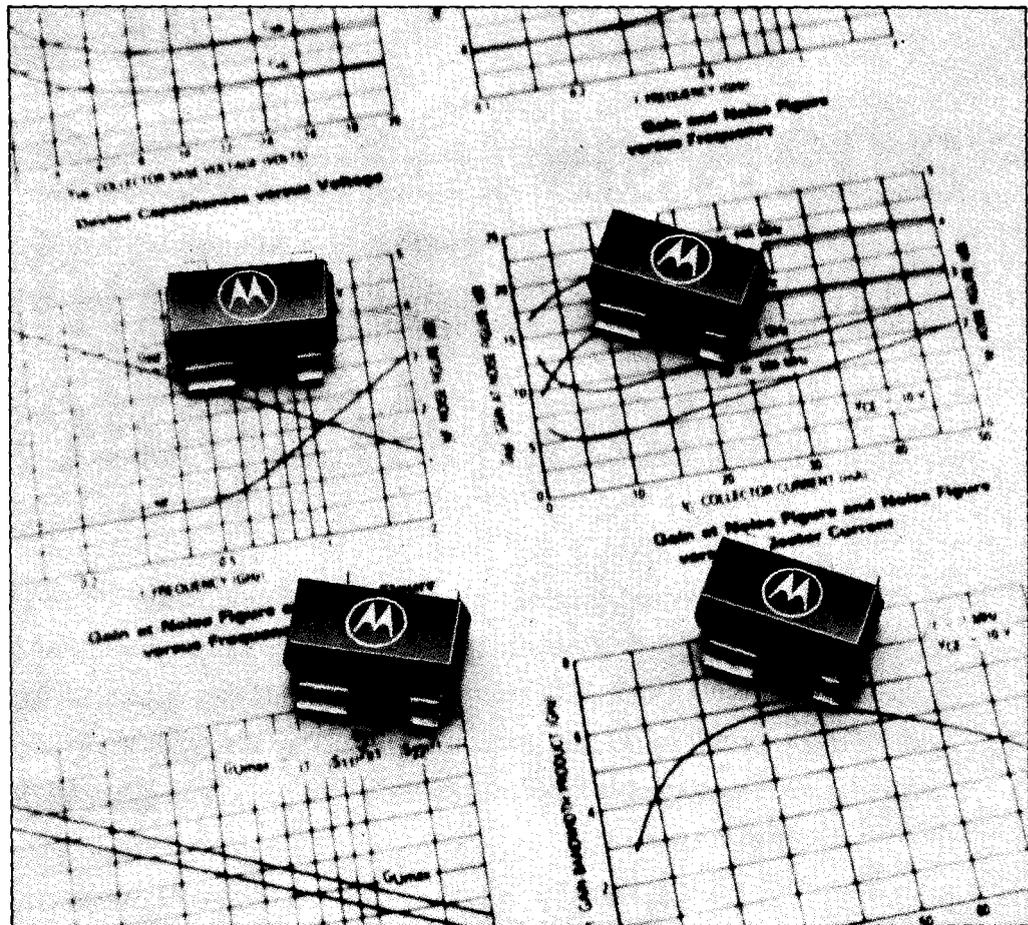
## Surface mount

## RF transistor ▶

Motorola has introduced the MRF0211 low noise, high gain small signal RF transistor packaged in the four lead surface mount SOT143 package for improved gain and automated assembly. Basically, the MRF0211 is a MRF2369 die in a SOT143 package serving as a replacement for the NEC NE 02133. The MRF0211 is also available in both standard and low profile package configurations and tape and reel options.

Important features of the MRF0211 are a high current gain bandwidth ( $F_T$ ) of 5.5 GHz Typ, a collector-base capacitance ( $C_{cb}$ ) of 0.7 pF Typ and a collector-emitter breakdown voltage ( $V_{(BR)CEO}$ ) of 15 volts minimum. It has a maximum collector current rating of 70 mA. Functionally the MRF0211 has a 1 GHz noise figure of 1.8 dB Typ and a tuned gain at noise figure of 13 dB Typ.

The MRF0211 is ideal for use in surface mount small signal amplifiers operating at



frequencies up to 3.5 GHz where high gain and low noise are crucial to amplifier performance. It may also be

used as a high speed switch. For information ☎ (02) 438 1955.

READER INFO No. 220



## Circuit

## breaker safety

Sprecher & Schuh has just released the new KT3 circuit breaker.

In less than 1/1000th of a second the contacts are opened by a solenoid armature in the event of a short circuit.

Because of the current limiting capacity of the KT3 preliminary fuses are superfluous. The device may therefore be used up to 6.3 A (at 415 V) in networks with any level of short-circuit currents. NHP is on ☎ (03) 429-2999.

READER INFO No. 221

# Data logging and analysis for those more interested in production than computers.

Now you can record, analyse, manipulate and display production data without programming skills. The easiest to use and the most sophisticated data analysis programs are now available for Datatakers - the world's most versatile loggers.

## **Decipher**

The terminal, graphing, reporting and file handling program specially for Datatakers. One to 800 channels of digital and analogue information can be individually allocated and monitored with ease. Decipher includes bar charts, histograms trend plots, cross plots, reports, keystroke macros and many more features. \$195

## **Labtech Notebook**

The world's leading software for sophisticated analysis and control now customised for Datataker. \$995.

## **Datataker 100**

46 Analog/8 digital inputs. Matches common transducers and sensors. Built in software /RS 232 communications. Portable, dedicated or stand alone. The complete

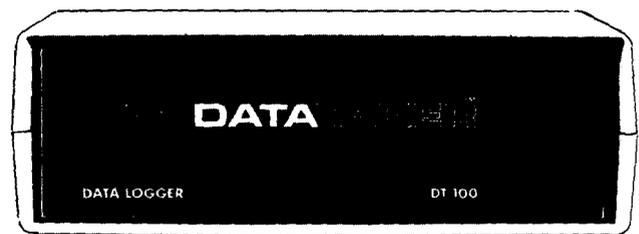
solution. No cards, modules or software to buy. No programming knowledge required. Datataker does it all. Industrial and field models available.

## **Datataker 200**

A DT200 new logger with up to 50 analog and 114 digital channels. The ideal unit for process control monitoring and alarms. All the Datataker features. The new standard for industrial data logging.

Write or call for your descriptive brochure today.

**54 analogue and digital channels for \$2400.**



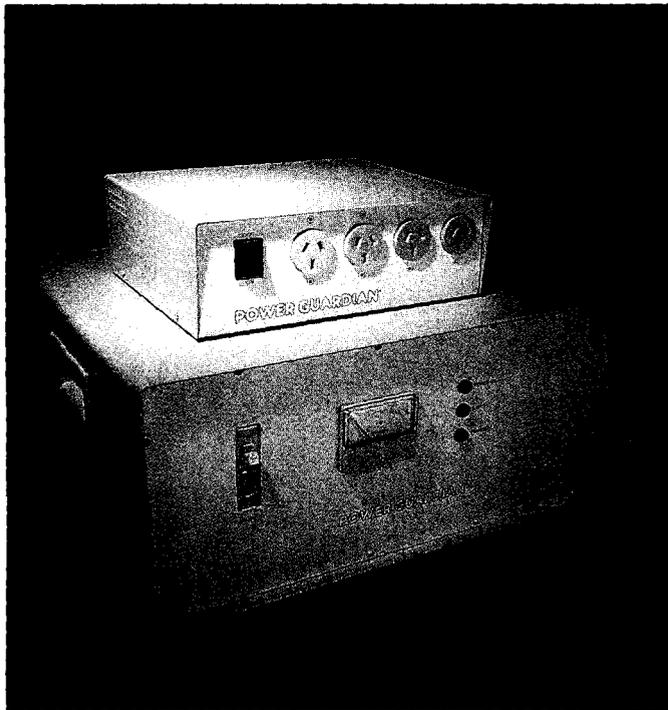
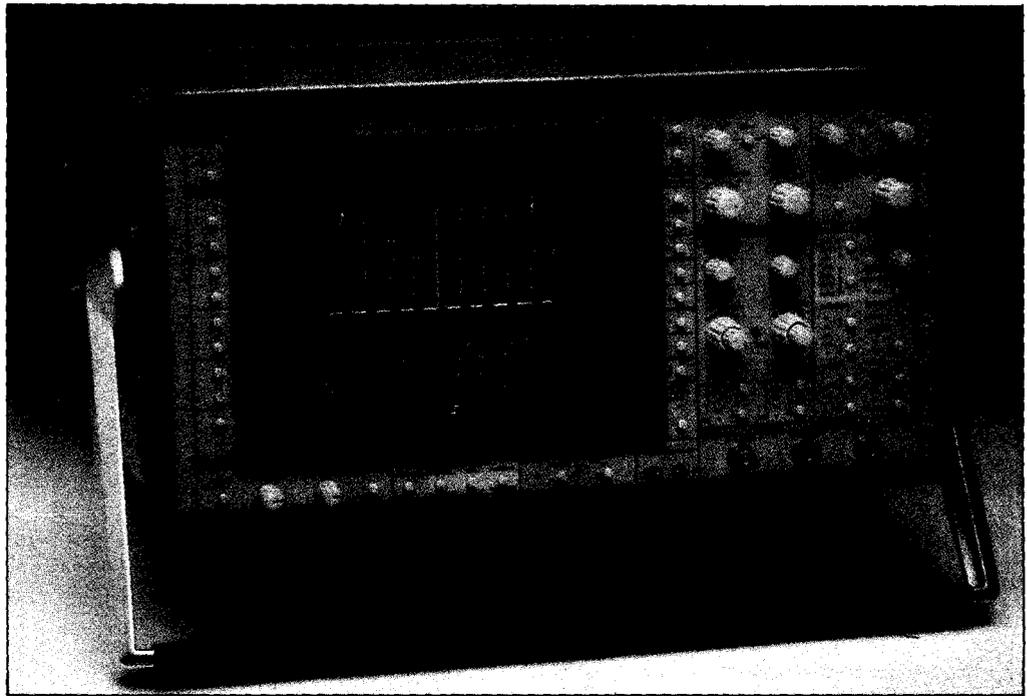
Data Electronics  
46 Wadhurst Drive,  
Boronia 3155  
Tel (03) 801 1277.  
Fax: (03) 800 3241.

## Digital oscilloscope ►

The LeCroy 9450 portable dual-channel 350 MHz Digital Oscilloscope pioneers the world's first and fastest commercial 8-bit "FLASH" ADC and features 50 K of memory per channel and an additional 200 K for storage (total memory 300 K).

LeCroy is distributed by ETP-Oxford ☎ (02) 858 5122 or (03) 347 0733.

READER INFO No. 202



## Computer systems guarded ▲

Powertech Systems has released a solid state load regulating power conditioner designed specifically for use with modern computer systems.

The Power Guardian II

products cover individual terminals, small office computers, communications equipment and memory typewriters. Powertech is on ☎ (03) 587 3077.

READER INFO No. 204

## Pocket-size iron is a gas ▼

An updated range of butane powered soldering irons are to be released. Known as Weller Pyropen, there are two models.

• WPA2 — Self-igniting temperature controlled iron in metal case with large Butane tank. (Burns to four hours on No 2 setting).

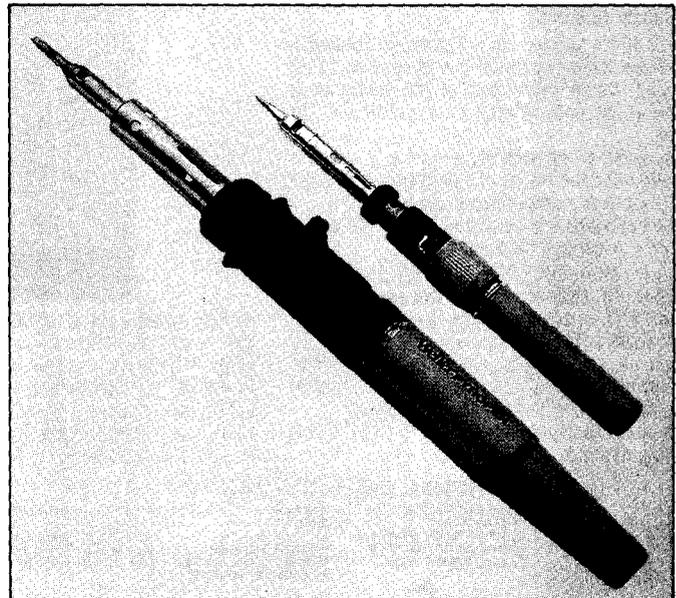
• Pyropen Junior — A

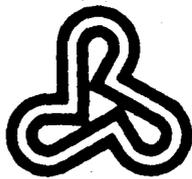
pocket size soldering tool for use with small jobs.

The Weller BR200 200 gram Butane Aerosol can is suitable for use with Weller Pyropen irons, or for that matter, other Butane gas appliances.

More information on ☎ (060) 21-5511.

READER INFO No. 203





# RADTEK

**DL8000**  
MOBILE RADIO DATA SYSTEM

## THE BIGGEST STEP FORWARD IN MOBILE COMMUNICATIONS

A big statement. Certainly. But the list of big mobile radio users who have chosen **RADTEK** conclusively proves the system works — and works efficiently.

■ Linfox, ■ DHL International, ■ Melbourne Ambulance Service, ■ RAA SA, ■ RACQ, ■ RACV, ■ RACWA, ■ Channel 9 Adelaide, ■ Vulcan, ■ WA Police, ■ Western Mining Corporation... the list goes on, and keeps growing.

Fully computerized communications — the secret of **RADTEK's** success.

**Radtek's DL-800** easily connects mobile two-way radio system and base computer enabling messages and information to be accurately passed to the field. Normal voice transmission capability is retained. (And **Radtek** will run on your existing computer system, so there's no expensive hardware to purchase).

**Radtek's** big advantage over voice-only communications is that every data communication is logged and analysed, ensuring your mobile fleet is operating at top efficiency, whilst easing radio channel congestion.

When a message is received at the mobile it beeps, and a flashing display indicates "message received", to alert the driver if he has been away from the vehicle. There's no chance of information being misinterpreted — it's right there on the screen for ready reference.

Up to 50 messages can be stored in **Radtek's** memory, while the driver can access up to 22 canned status messages at the touch of a button, for instant status transmission to base.

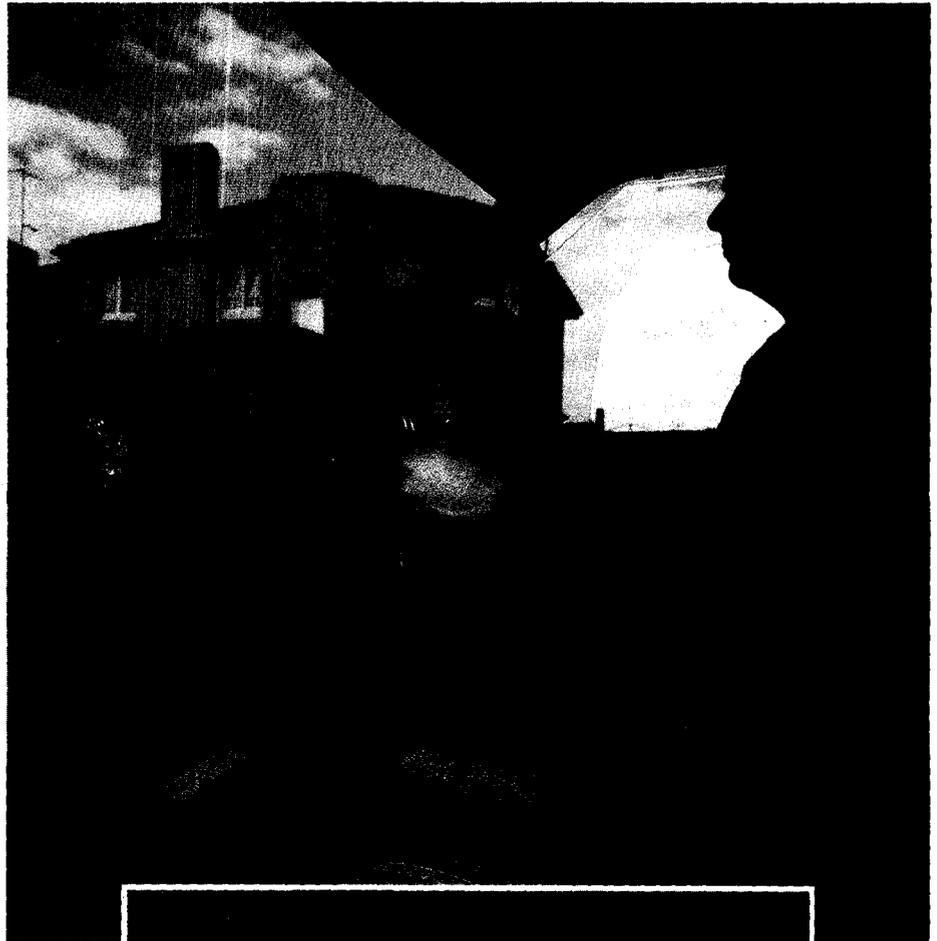
Base is also immediately aware of a driver's location and the status of a delivery — giving a true two-way computerized system.

A full keyboard can be added to give the driver access to central data bases.

### 30% INCREASED PRODUCTIVITY...

**Radtek DL-800** is totally manufactured in Australia and impacts positively on productivity. Taxi companies have reported as much as a 30% productivity increase, while billing efficiency is faster and more accurate. Double handling is kept to a minimum.

Security? That's ensured by a sophisticated coding system.



**Radtek** takes care of all the "other" aspects too, such as installation, training and full system back-up. **Radtek** is manufactured in Australia, by Australians. Our products are specifically designed to suit local conditions, giving us a tremendous flexibility in adapting to your requirements.

# RADTEK

### NATIONAL DISTRIBUTORS FOR RADTEK

**Kesselghur Pty. Ltd.**  
58 Berry Street  
NORTH SYDNEY NSW 2060  
PHONE NO (02) 957 4278  
FAX NO (02) 957 3760

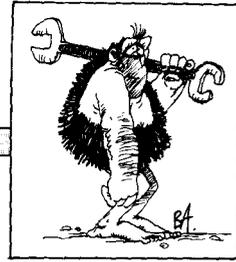
**Sea Software Pty. Ltd.**  
Suite 5  
250 Gore Street  
FITZROY VIC 3065  
PHONE NO (03) 419 7511  
FAX NO (03) 417 6275

**MailPak International Pty. Ltd.**  
14 Douro Place  
WEST PERTH WA 6005  
PHONE NO (08) 321 2806  
FAX NO (08) 324 2183

**Systems and Management Pty. Ltd**  
Suite 19  
Argyle Place  
Argyle Street  
ALBION QLD 4010  
PHONE NO (07) 262 7455  
FAX NO (07) 262 8082

**Communications and Peripherals  
Australia Pty. Ltd.**  
11 King William Street  
KENT TOWN SA 5067  
PHONE NO (08) 363 1900  
FAX NO (08) 363 0615

RAD311AME



TECHNOLOGY

## SEMICONDUCTOR WATCH

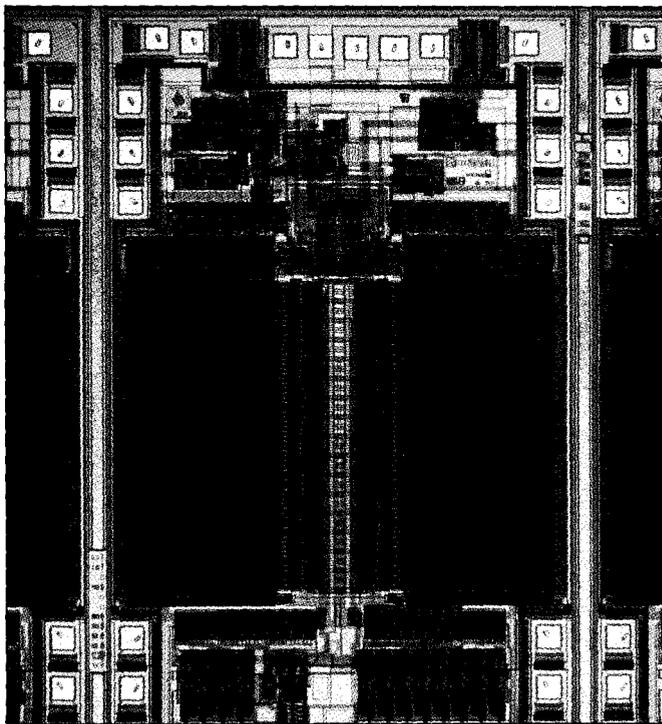
ETI engineer Terry Kee takes a look at the latest available in semiconductors.

### New 15 ns 4 K clearable SRAM

VLSI Technology has announced availability of the VT20C50, a 4 K static RAM having a 15-nanosecond access time and a memory reset, or "Clear", function that allows all memory cells to be set to logic 0 within two cycles. The Clear capability of the 1 Kx4 SRAM minimizes software development by eliminating the need for a software reset. This capability is especially useful for rapidly flushing an entire cache memory. Because it can operate with clock speeds in excess of 60 MHz, the VT20C50 can, according to Dick Eiler, Strategic Marketing Manager of VLSI's Memory Products Division, keep pace with the newly emerging higher clock rate microprocessors.

The SRAM also features separate inputs and outputs, which eliminates the need to multiplex data in and out. This feature facilitates implementation of system designs having multiple data buses and designs incorporating processors with separate input and output data buses. It allows faster system performance and is useful in pipelining applications.

It is intended for such applications as tag, data, and instruction storage in cache memories, writable control storage for image and other dedicated processors, and data acquisition in automatic



test equipment, Eiler added. "It's also ideally suited to word-by-word transformation of blocks of data in digital signal processing (DSP) applications, and as a page table memory map for address translation lookaside buffers in high-speed microcomputer memory systems."

Using a six-transistor memory cell that provides a higher immunity to alpha particles (soft errors) than the four-transistor cell used by many other manufacturers. "The six-T cell has wider op-

erating tolerances," Eiler said, "which also makes it more tolerant to system noise and more stable over the operating temperature range."

The VT20C50 4 K SRAM is available now in 15 ns, 20 ns, and 25 ns speeds. The devices are offered in a 300-mil, 24-pin plastic dual in-line package (DIP) and in both 24-pin small-outline gull-wing (SOIC) and small-outline J-lead (SOJ) packages. For further information: Energy Control ☎ (07) 376 2955.

### 12-bit, 1 $\mu$ S

### A/D converter

Datel's ADC-511 utilizes an advanced hybrid design to provide a high speed 12-bit A/D converter. The ADC-511 dissipates only 925 mW of power and needs just 1 microsecond for the 12-bit accurate conversion process. The ADC-511 is packaged in a space-saving 24-pin DIP and costs \$299. The ADC-511's performance is based on a digitally-corrected sub-ranging architecture enhanced by utilizing a proprietary custom chip and unique laser trimming schemes.

The converter contains an internal clock, and an internal reference that is capable of supplying +10 Volts at 1.5 mA externally. All digital inputs and Three-State outputs are CMOS/TTL compatible. The output coding can be in Straight Binary/Offset, Binary or Complementary Binary/Complementary Offset Binary.

A pin-programmable feature allows the selection of either Unipolar analogue inputs from 0 to +10 Volts or Bipolar analog inputs from -5 to +5 Volts. Typical applications include spectrum, transient, vibration, and waveform analysis. This device is also ideally suited for radar, sonar, video digitisation, medical instrumentation and high speed data acquisition systems. The ADC-511 requires  $\pm 15$  Volt dc and +5 Volt dc power supplies to operate and is available in the commercial 0 C to +70 temperature range. Military versions are also available. Further information contact: ☎ (02) 736 2888. 

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INNOVATION

# HIGH QUALITY LAPTOP

## Low priced Amstrad release

The innovative Amstrad company has just released the latest in PPC 1640 laptops — ETI editor Jon Fairall takes a four-fingered trial run . . .

The engineers at Amstrad are well known innovators. Behind them is a line of well thought out, well researched and above all else, well marketed products. The latest additions to that list, cheap portable computers, are true to their lineage.

Since their inception, about five years ago, laptop portables, light, small and battery powered, have been expensive items. Data General, Hewlett-Packard and others have tried to market machines that cost in excess of \$5000, especially when bundled with software. The price has become all the more preposterous as the price of desk tops has crumbled.

In the past year or so a number of Asian manufacturers have shown product with a more aggressive marketing strategy. It seems that people are getting serious about selling these machines. Now Amstrad has outdone them all. For \$1700 the PPC is all yours, with a bit of software thrown in to the bargain.

Amstrad desktops have a substantial proportion of the market, especially in Europe, where they are market leaders. The aim is clearly to do the same thing with lap-tops. Will they succeed? In part, it depends on whether the lap top market blossoms the way

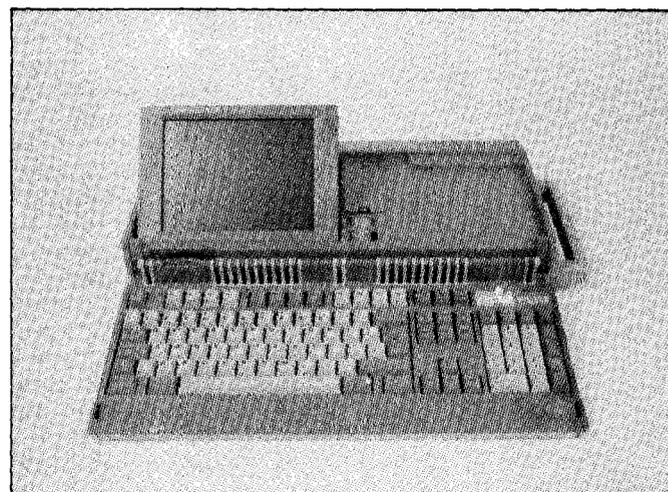
the pundits predict. If it does, the PPC will be on everyone's lips (or should that be laps?). If not, then Amstrad will have a lemon on its hands.

The PPC is a pretty ordinary PC clone with no obvious vices. It runs all the regular software without a hitch, albeit a little on the slow side. The main interest will be in the physical layout of the thing, and in the screen.

Layout is, as can be seen from the photos, unusual, cute and works well. The twin 3½ inch disc drives around the side are easy to get hold off, but difficult to see. Thoughtfully, the in-use lights are repeated on the top panel in front of the operator.

The battery compartment is concealed underneath the unit, and holds eight Ni-cads. None were supplied with the unit, which was a pity because I would have liked to

try it out without being tied to mains power. According to Amstrad, the batteries will last four hours, but disc operation takes quite a bit of power, so disc intensive procedures may reduce its operating life a bit.



### Tough

Physically, the PPC is great. It folds up into a tough totable package that should be capable of taking the rough stuff dished out to most laptops. The keyboard forms the top lid of the machine, and folds out from the main body. It feels quite pleasant. Obviously the touch of a computer keyboard is a very individual thing, but this four finger typist got up to quite a speed on it.

The screen is mounted on the top of the main body, and lifts up so that the viewer can read it. Thus when the machine is folded up, the keyboard protects the screen from damage. It's quite cur-

the screen itself is not sufficiently readable due to its poor contrast. A pot is provided to vary the angle of the crystals, but under normal ambient light even the optimum setting was insufficient.

I'm not sure why Amstrad has fallen down in this area. Other manufacturers seem to be able to come up with better solutions using twisted crystal technology. In fact, the Amstrad screen is only marginally better than the Hitachi LCD screen on my 1985 model Dulmont Magnum.

On the plus side, the screen is fine for text operation, and there is an RGB connector on the back panel for operating a CGA monitor. With the

*'Its success will depend on whether the laptop market blossoms the way pundits predict'*

ning. However, the screen is a big disappointment, quite the weakest part of the machine. Although it's a twisted crystal type, it falls down badly in graphics mode. Resolution is not good enough and even if it was,

monitor connected, of course, the PPC simply becomes a small footprint PC. Indeed, it may well be that Amstrad believe that is precisely how to market a laptop; a table top machine you can take out of the office once a month. **eti**



INNOVATION

**C**omputer Aided Dispatch (known by people who don't design pc boards as CAD) is rapidly becoming a multi-million dollar industry in Australia. Australian companies are rushing to install the equipment, and just as importantly, making and exporting it.

Essentially, CAD consists of a mobile terminal in a vehicle of some kind, a radio modem, and a mainframe computer at the base station. Operators working on the mainframe can direct the mobiles as required, and also supply them with whatever information might be appropriate either manually or via the software.

It seems an overly complex way of doing things, given the cheap availability of two way radio systems. The problem with voice operation is one of efficiency. It takes time to make contact, communicate the necessary information and then terminate the call. Computers can do the same operation in a thousandths of the time. This has important implications for spectrum usage, and as the spectrum becomes more crowded, the pressure on users of the two-way nets to install CAD will become greater.

The places where the pressure is being felt most are police, couriers and so on, but it is rapidly penetrating into other, less likely areas as well. Airports, and busy air traffic control systems

around the world are looking at implementing non voice control of aircraft. Large metropolitan taxi operators in particular are under intense pressure to improve the efficiency of their operations, given a requirement to dispatch thousands of jobs an hour during busy periods. In fact, in both Sydney and Melbourne, a limited form of CAD has been in operation for a number of years. This allows drivers in cars to accept jobs by pressing buttons on a small panel.

### **Ambulance**

Now Radtek, a Perth based public company, has developed a number of mobile data terminals. The company was floated in 1985 to exploit opportunities in the area, particularly in devel-

*'... the hardware actually does what the customer wants'*

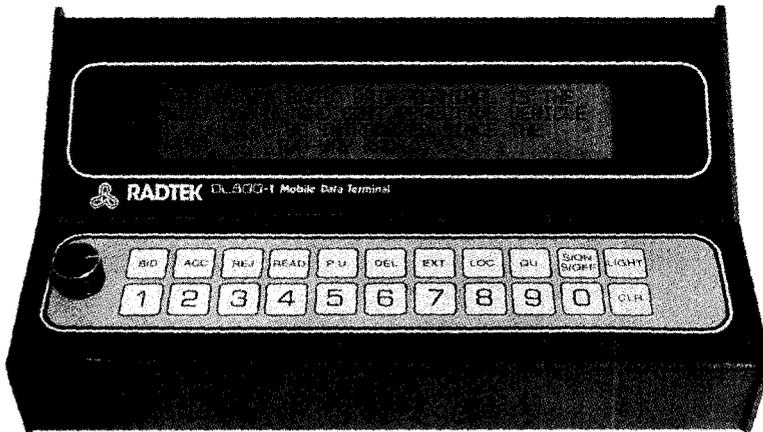
oping second generation CAD systems. The company has been remarkably successful, with sales of its systems to the RAC in the UK, RACV in Victoria, and the Melbourne Metropolitan Ambulance Service.

The latter illustrates nicely the capabilities of the system. The terminals are effectively tied to the NCR host computer over radio links. The precise nature of the information sent back and forth then depends on the software provided. NCR software engineers working with the software house, Logica, who provided the system, have developed a program that will not only tell the driver where to go, but might tell him of any known hazards or difficulties at the destination, instruct the ambulance driver in appropriate treatment of the patient, warn of particular problems with a particular patient and so on. It gives the ambulance driver complete access to the hospital database.

The application also illustrates another point about CAD systems: their dependence on customisation through purpose written software. Radtek has recognised this and appointed software engineering firms as distributors in all states, so that the hardware actually does what the customer wants.

Not that the hardware is insignificant. The present generation of terminals have LCD displays with four lines of text. However, currently Radtek is working on third generation CAD systems that will give the driver an 80 character by 24 line display that emulates a CRT in the car, capable of displaying graphics and other non text information. 

**Jon Fairall discovers the delights of a mobile radio data system.**



# **COMPUTER ON WHEELS**

## **At last, a mobile data system**



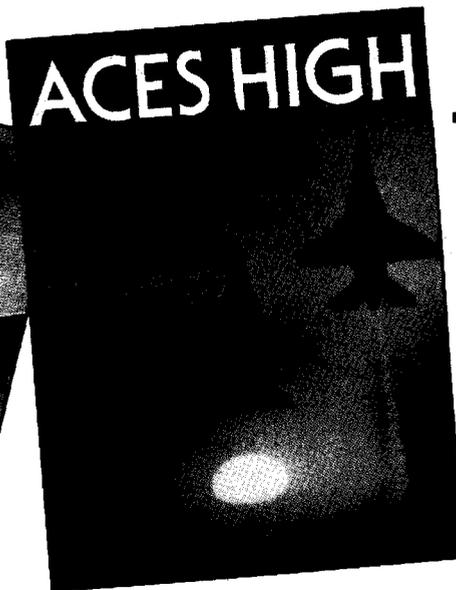
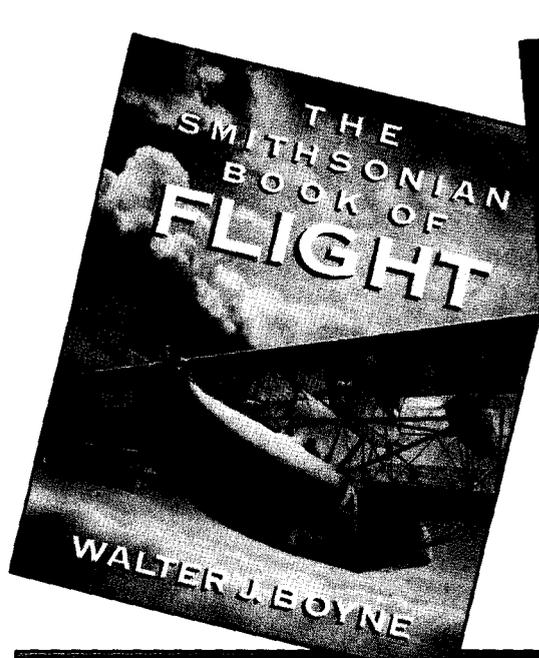
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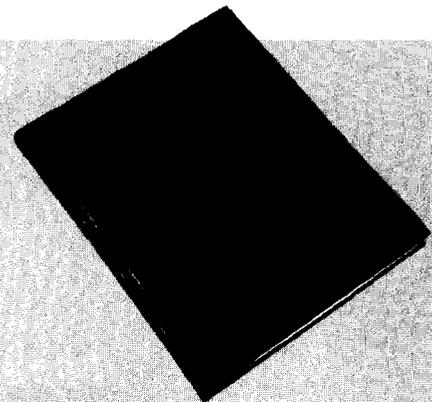
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# SWITCH ON WITH MIDI

## MIDI controlled switch

Here's one more electronic music project from ETI. Terry Kee shows yet another application for the use of MIDI.



ETI-615  
ELECTRONICS

**M**IDI is an acronym for Musical Instrument Digital Interface. It consists of a serial communication link to allow musical instruments fitted with MIDI to communicate with each other. Most electronic instruments available today, including some personal computers, have Midi ports to access the world of MIDI. With the ever increasing use of the MIDI interface, there is an increasing demand to control devices that are not MIDI compatible.

There are a host of applications, but more of that later on.

The MIDI Switch is designed to be connected to the MIDI line and has the capacity to decode playing data (in particular, the Note On and Note Off signals) and turn a switch on and off accordingly. The switch responds only to note data transmitted on its selected channel and ignores other data on the MIDI line such as the timing clock etc. The receive MIDI channel of the MIDI switch can be selected via switches and this allows the MIDI switch to receive data on any one of the channels transmitted down the MIDI line. To make the device as general purpose as possible, a relay is used as the final switching device.

### Applications

Application of the Midi switch can be extremely widespread. The heart of a typical MIDI set up would be a sequencer or personal computer fitted with a MIDI interface. MIDI synthesizers, drum machines and other MIDI devices would then be controlled in a sequence which you have pre-programmed. The MIDI specification allows up to 16 MIDI channels to be used and any one of these can be allocated to the switch. Note information (Note On and Note Off) programmed into the sequencer or notes played on a keyboard would determine whether the relay in the MIDI switch is open or closed. Alternatively logic pulses from the Trigger Out of the unit can trigger other devices.

The MIDI switch can be used in a variety of ways. An idea that comes immediately to mind is to turn a light on and then off in sequence to the programmed music. The receive MIDI channel of the MIDI switch is set on the DIL switch to correspond to the transmit channel of the sequencer or drum machine allocated to the MIDI switch. If you are recording the playing data into the sequencer in real time, then pressing a key down on the keyboard would activate the relay and lifting the key would de-activate it. The relay can be configured to control a light in sympathy. In a drum machine the voices can be allocated to transmit MIDI data on different MIDI channels. Setting the bass drum to transmit data on the MIDI Switch channel enables the light to flash in sympathy with the bass drum.

An interesting application of the MIDI controlled relay is to use it as an audio mute. The relay can be configured to mute an audio channel of a mixer or tape recorder at particular points in a

Continued page 104

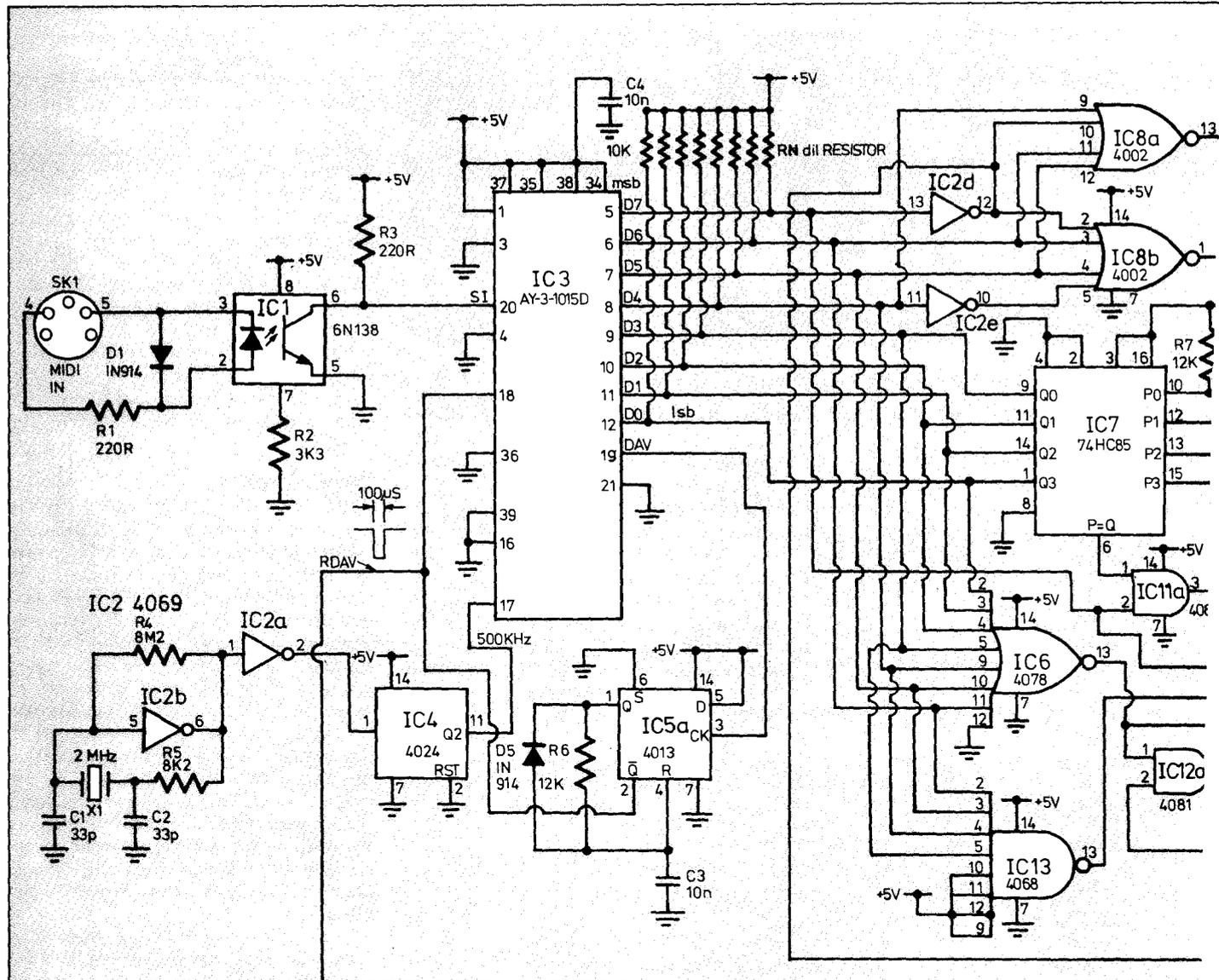
TABLE 1: SUMMARY OF STATUS BYTES

Status D7 — D0	# of Data Bytes	Description
<b>Channel Voice Messages</b>		
1000 nnnn	2	Note Off event
1001 nnnn	2	Note On event (velocity = 0: Note Off)
1010 nnnn	2	Polyphonic key pressure/after touch
1011 nnnn	2	Control change
1100 nnnn	1	Programme change
1100 nnnn	1	Channel pressure/after touch
1110 nnnn	2	Pitch wheel change
<b>Channel Mode Messages</b>		
1011 nnnn	2	Selects Channel Mode
<b>System Messages</b>		
11110000	*****	System Exclusive
11110sss	0 to 2	System Common
11111ttt	0	System Real Time

**NOTES:**

nnnn: N-1, where N = Channel #,  
i.e: 0000 is Channel 1.  
0001 is Channel 2.  
.....  
.....  
1111 is Channel 16.  
\*\*\*\*\*: 0iiiiii, data, ..., EOX      sss: 1 to 7  
iiiiii: Identification                      ttt: 0 to 7

## The MIDI switch



### HOW IT WORKS

The opto-coupler (IC1) converts the 5 mA current loop information of the MIDI line into 5 V logic levels. A logic low is established at pin 6 of IC1 when a 5 mA current flows through the loop. R2 biases the base access terminal of IC1 to produce faster switching transients. The UART (IC3) is configured as a data receiver and serves to strip away the stop and start bits of the MIDI data stream and convert the serial data into parallel form. The UART is set up for the MIDI format of 8 data bits, one stop bit and no parity. Note that the transmitter side of IC3 is not used. A clock is generated by a 2 MHz crystal oscillator configured around IC2b and divided down by

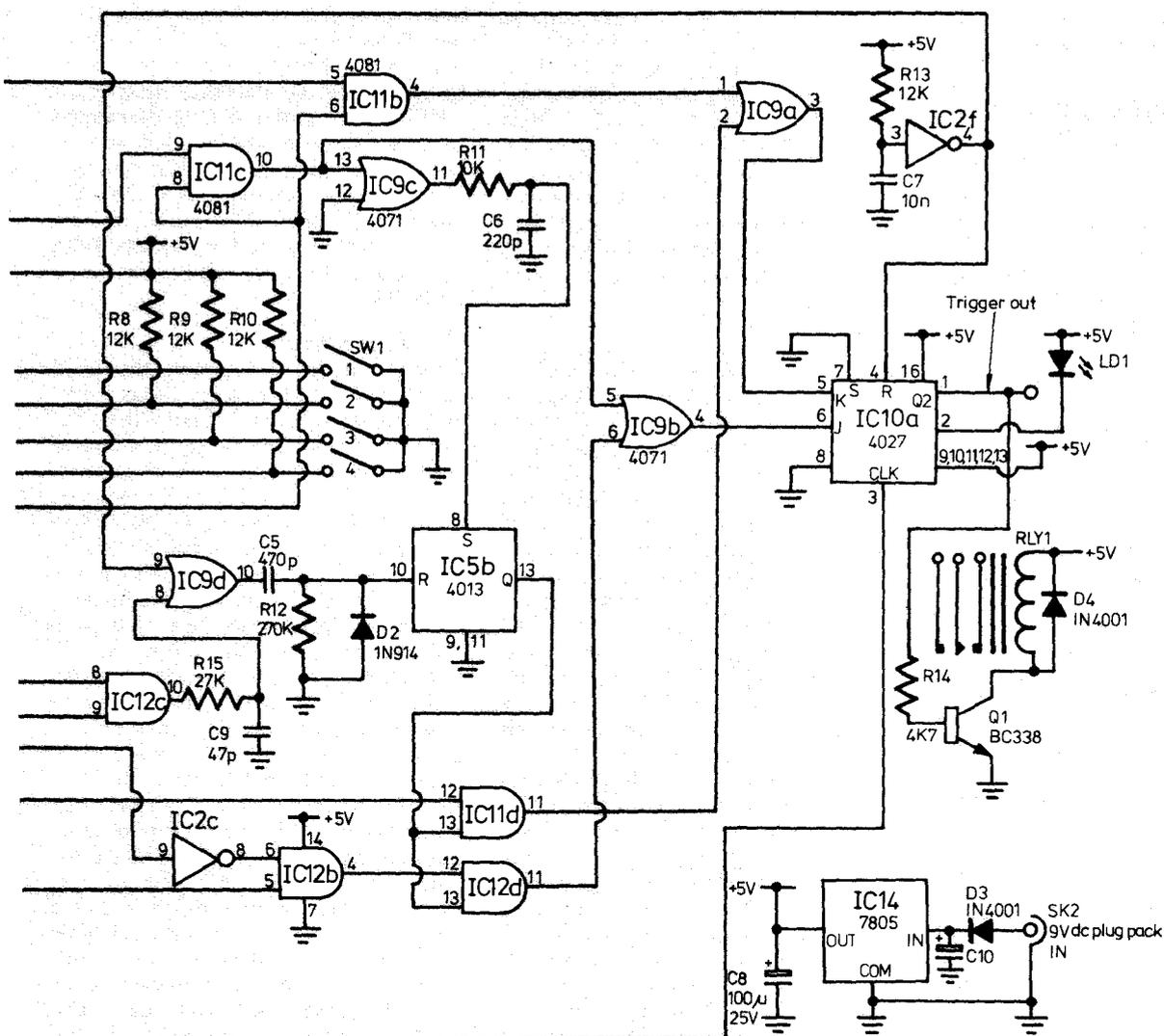
IC4 to clock the UART at 500 kHz. The UART requires a clock frequency of 16 times the MIDI rate of 31.25 kHz.

Each time an 8-bit character is received and transferred to the output registers of the UART, the data available line (DAV) at pin 19 of IC3 goes to a logic high. This line triggers a monostable, configured around IC5a, on the positive going edge, to reset the DAV line after 100 μs. The parallel data outputs (D7 to D0) are available on pins 5 to 12 of IC3 respectively and have pull-up resistors (RN) to 5 V.

The decoding logic has to provide the correct inputs to the JK flip flop (IC10a), which is clocked 100 μs

after the data has placed onto the output of the UART. This ensures that the data have settled down to their correct logic levels to avoid any glitching. A logic high on the J input indicates that a Note On with a matched MIDI channel was decoded and sets the output (pin 1) high. A logic high on the K input indicates that a Note Off was detected and resets the output. In turn this signal drives the transistor relay driver Q1. The diode D4 suppresses the back emf generated by the coil of the relay. The JK flip flop is reset on power-up by a positive going pulse generated by R13, C7 and IC2f.

The circuitry between IC3 and IC10 is all about decoding the various



MIDI codes. The various code detectors are as follows:

- Pin 10 of IC11c goes to a logic high only when a Note On code is detected on a status byte and matched MIDI channel.
- Pin 4 of IC11b goes to a logic high only when a Note Off code is detected on a status byte and matched MIDI channel.
- Pin 3 of IC11a goes to a logic high only when the data on the D/I switch SW1 matches with the received MIDI channel.
- Pin 3 of IC12a goes to a logic high only when a zero value byte is detected (ie. data byte = 0).
- Pin 4 of IC12b goes to a logic high only when a non-zero value of a

data byte is detected.

f: Pin 13 of IC13 goes to a logic zero when data lines D3 to D6 are all at logic high. This state indicates that a MIDI real time message is present on the data lines.

To establish a running status mode, the RS flip flop IC5b becomes set when a Note On code on a matched MIDI channel arrives at the output of the UART. This signal gates on the AND gates IC11d and 12d and allows the zero detector and non-zero detector of a data byte to reset and set the JK flip flop (IC10a) respectively, when a clock (RDAV) signal arrives. The RS flip flop (IC5b) is reset only when a status byte arrives (MSB = 1) and if it is not a

MIDI real time message i.e: when pin 13 of IC13 goes to a logic low. This signal gates out the msb via IC12c. R15, C9 and R11, C6 ensures that any glitches are attenuated. IC5b is reset on power up via IC9d and IC2f. Capacitor C5 and R12 forms a positive going pulse network with D2, clamping any negative voltage excursions to ground.

The LED LD1 is activated whenever a Note On has been detected and the voltage regulator IC14 provides a 5V regulated supply. The diode D3 protects the circuit from incorrect supply polarity.

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## The MIDI switch

song. Unwanted music or hiss on that channel can be stripped away using the MIDI line.

The MIDI switch can also be used to trigger synthesizers, drum machines or any sound source for that matter that has a Trigger input, but no MIDI capabilities. The Note On and Off is decoded by the MIDI switch to generate a pulse corresponding to the playing information. This facility is extremely useful if you want to use a drum sound in a drum machine without MIDI ports, which is often the case with earlier instruments.

### MIDI

For a more detailed explanation of MIDI, readers are referred to "MIDI — Real Computer Music" (ETI, October, 1986). It operates at 31.25 kbaud asynchronously with one start bit, 8 data bits and one stop bit. The 10 bit data stream has a time duration of 320 us and is transmitted in serial form via a 5 mA current loop built around an optocoupler circuit to eliminate earth loops. Three MIDI bytes make up a MIDI word. The first byte in the word is a status byte which has the main significant bit (msb) at a logic "1" (i.e: value > 127), followed by two data bytes with msb at logic "0" (ie, value < 127). The status byte consists of the MIDI channel number that addresses the message to one of sixteen channels and is contained in the first four bits of the byte (D0 to D3), where D0 is the least significant bit (lsb). The latter 4 bit serves to identify the message type, for e.g: a Note On, program change or aftertouch etc. and relates the values of the data bytes that follows the status byte to that particular message. The codes for status bytes are shown in Table 1 for the various parameters to be identified.

### Notes On and Off

To illustrate the principles involved let us consider a Note On situation. When a key on the keyboard is pressed down, a status byte is sent down the MIDI line with a value of 1001 nnnn, where nnnn has a binary range of 0000 to 1111 and corresponds to channel one to sixteen. The "1001" code is the operative Note On code. The next byte (data) determines which note is to be played, for instance a middle C would have a decimal value of 60. Although the MIDI specification allows for a note range of 0 to 127, a typical 5 octave keyboard with tuning offset facilities could have values of typically between 12 and 108. The third byte in the sequence carries the information about the velocity of the note played i.e: how hard the key is pressed. The code range is 1 to 127 and nor-

mally defaults to 64 if the instrument does not have this facility.

Lifting your finger off the key transmits Notes Off information. The MIDI specification allows Note Off mode to take on 2 options, both of which should be recognised by the MIDI receiver. A "1000 nnnn" status byte is designated a Note Off code which is followed by two data bytes to identify the note and velocity value. Alternatively a Note On '1001 nnnn' code followed by a Note range data byte and a velocity data byte equal to zero, also indicates a Note Off.

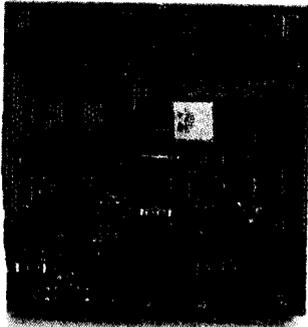
### Running status

Another mode written into the MIDI specification is the running status mode. When a status byte is transmitted, the receiver should remain in that status until a different status byte is received. Thus if a status byte is to be repeated then it may (alternatively) be omitted so that only the correct number of data bytes need to be sent. This means that only one Note On status bytes need to be transmitted at the start of a note data stream to set the receiver into the note mode. Two data bytes then needs to be sent: data byte 1 to identify the note, a non-zero velocity data byte to activate the note or a zero velocity data byte to de-activate the note. This feature effectively reduces a 3 byte note transmission to 2 bytes and presents unnecessary data activity from overcrowding the MIDI line. The running status is reset when any other status byte intervenes, except for real time messages such as timing clocks, start, stop, active sensing and system reset. These messages are transmitted as single status bytes and can be sent at any time.

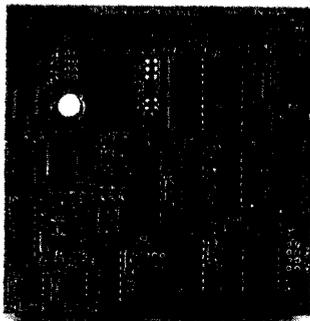
As an example, a sequencer will be sending out timing clocks to set the tempo or the start and stop of a song. The receiver has to either ignore or act upon the real time message after which it must resume operation under the previous status. The MIDI switch ignores all real time messages and the running status mode continues after the real time messages are received. Once the running status is reset, then only another note on status "1001 nnnn" code will place the receiver back into the 2 data byte mode. The MIDI switch is designed to incorporate all of the above specifications to make it compatible with most MIDI instruments. The MIDI switch is not designed to pick out specific notes and it will respond to any note played on the keyboard. **ETI**

*Next month concludes the construction and final testing details.*

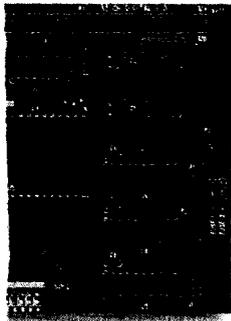
# One PC data acquisition system grows up: PCI-20000.



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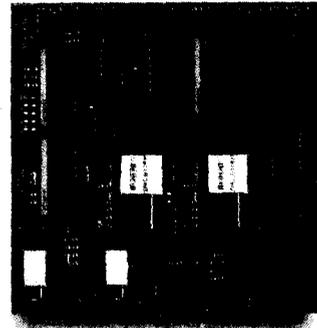
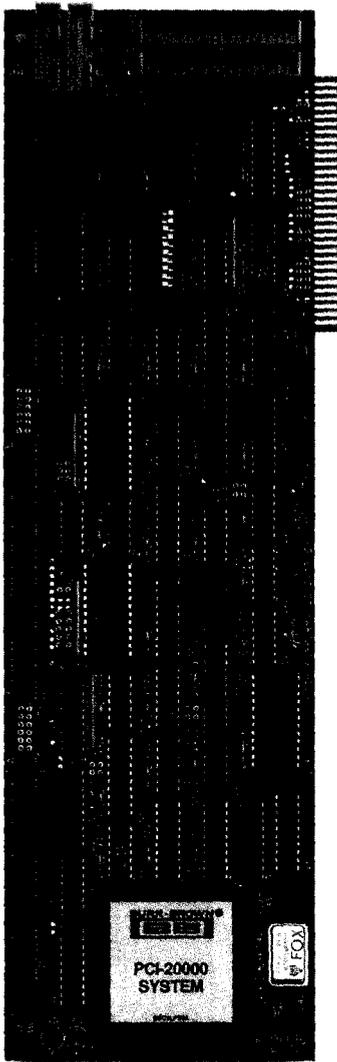


Special function modules: trigger/alarm, simultaneous sample/hold.



Expandable digital I/O module (to 128 points per carrier).

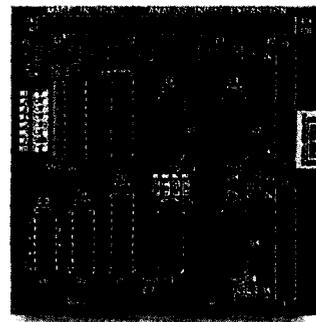
DMA carrier board with clock and digital I/O transfers data at 360 kBytes/sec. Holds 3 modules.



Analog output modules: 2 or 8 channel, 12 or 16 bits,  $V_0$  or  $I_0$ .



Counter/timer, clock, pulse generator & frequency measurement module.



Expandable analog input module (to 80 channels per carrier).

## The others just grow old.

Some personal computer data I/O systems make you pay for functions you don't need. These same inflexible systems can't be updated—at any price.

The unique PCI-20000 modular system, on the other hand, is easily configured to provide literally thousands of data acquisition, test, measurement and/or control functions. Just plug the application-specific modules you need into a carrier board. Then plug the carrier into your PC. No programming, no PC changes, no...

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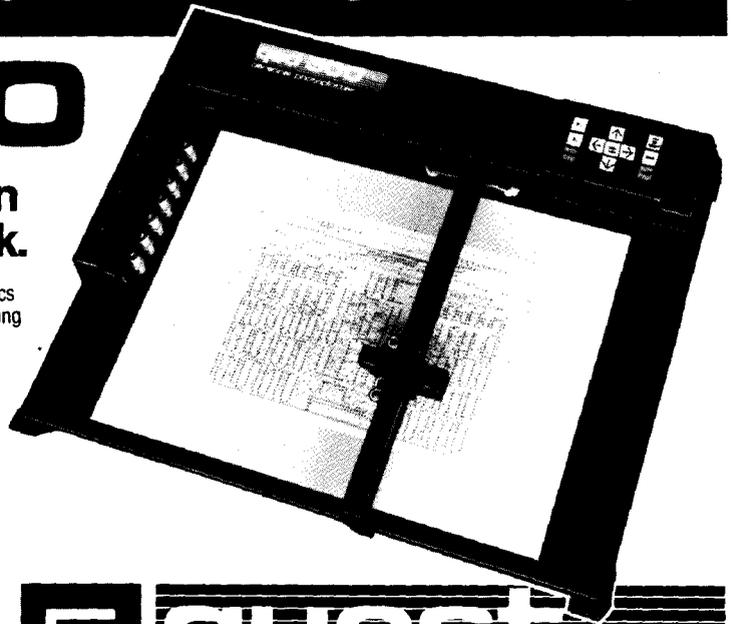
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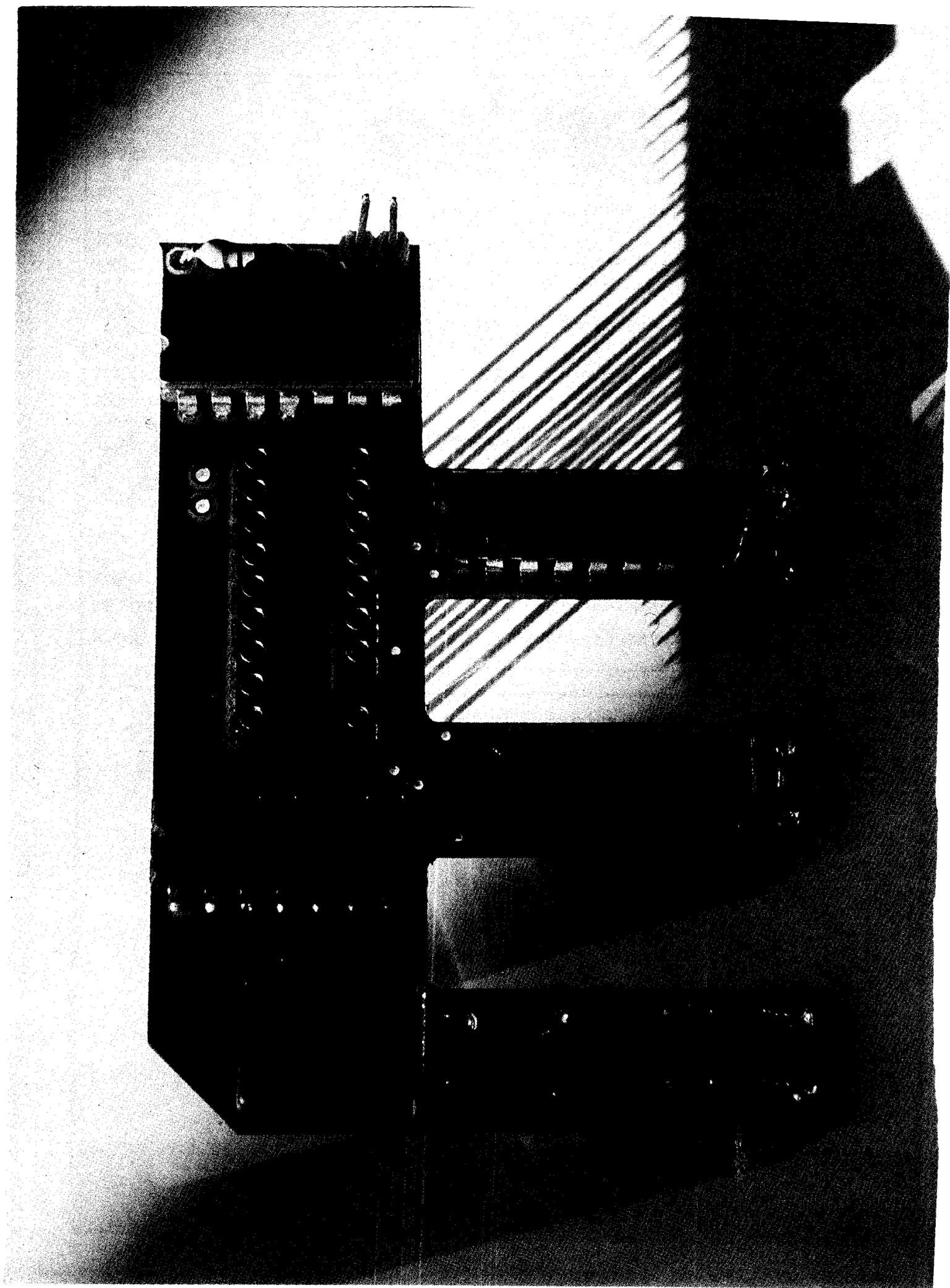


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ETI-1614  
ELECTRONICS

**T**HE motivation to start this project was a need for extra speed to make long-winded processes more realistic without the extra cost of purchasing a complete new motherboard at approx \$200 plus new RAM and new processor, an all up cost of over \$300.

With this modification the cost is reduced to approx \$30 if you have 150 ns RAM and an 8 MHz processor. For those who are less fortunate and have slow RAM the 24 MHz crystal can be replaced with a 22 MHz or less. A small penalty is paid in speed in the Turbo mode when a slower crystal is used.

This project was designed to upgrade a PC clone running at 4.77 MHz to run at 4.77/8 MHz, giving it a Norton SI rating of 3.1. (NEC V20 uP and 24 MHz crystal fitted)

The add on board does not take up a

slot but fits neatly on the motherboard requiring no tracks to be cut, special BIOS or other unsatisfactory procedures and what's more, it is suitable for a novice to build and install.

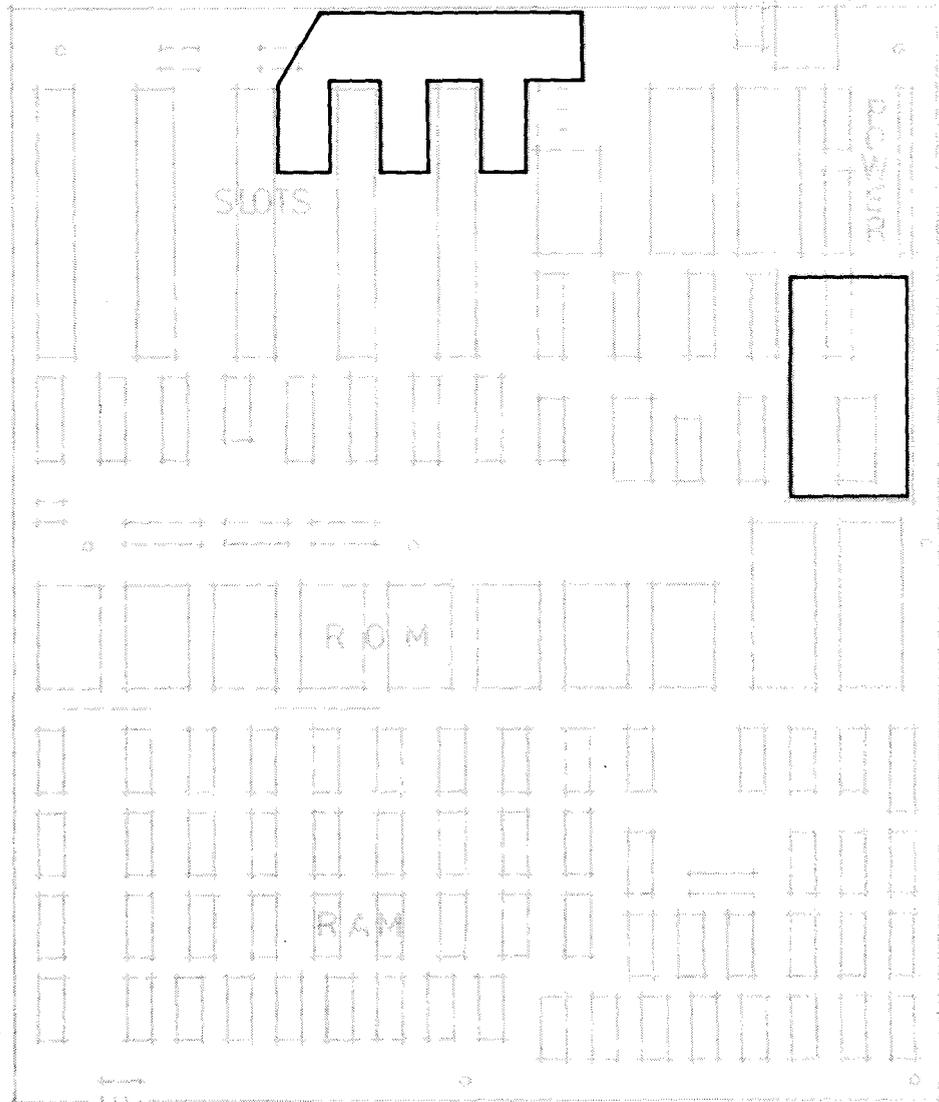
It should also be noted that this is not the PC-SPRINT modification, as advertised on some bulletin boards which has some serious defects, but a seperately designed circuit which duplicates the turbo PC Clones motherboard exactly.

### Construction

Construction of this project is simple, requiring little time to complete. Most of the parts are located on the pcb. Install the low profile parts on the pcb first starting with resistors, capacitors, crystal, intergrated circuits leaving to last the turbo PC Clones motherboard exactly.

The 18 pin socket requires pin 2 to be removed completely. I have found the

For extended processing, some PCs are just too slow. ETI writer Brian Roberts shows how to speed up your motherboard for around \$30.



# BORED WITH A SLOW BOARD?

## Build a turbocharger for your PC

# PC turboboard

easiest way is to heat the pin with the soldering iron until the pin loosens in the socket and remove it with small pliers. **DO NOT THROW THE PIN AWAY!!**

The single pin is then inserted into the pcb where pin 2 would normally go and soldered there before the 18 pin socket is soldered in.

If this procedure sounds complicated in reality it is not if you keep in mind that the objective is to have pin 2 of the 8284 free floating (ie: — not connected to anything) when inserted into the socket. The pin which was removed from the socket must make a connection to the pcb and the motherboard but not pin 2 of the 8284.

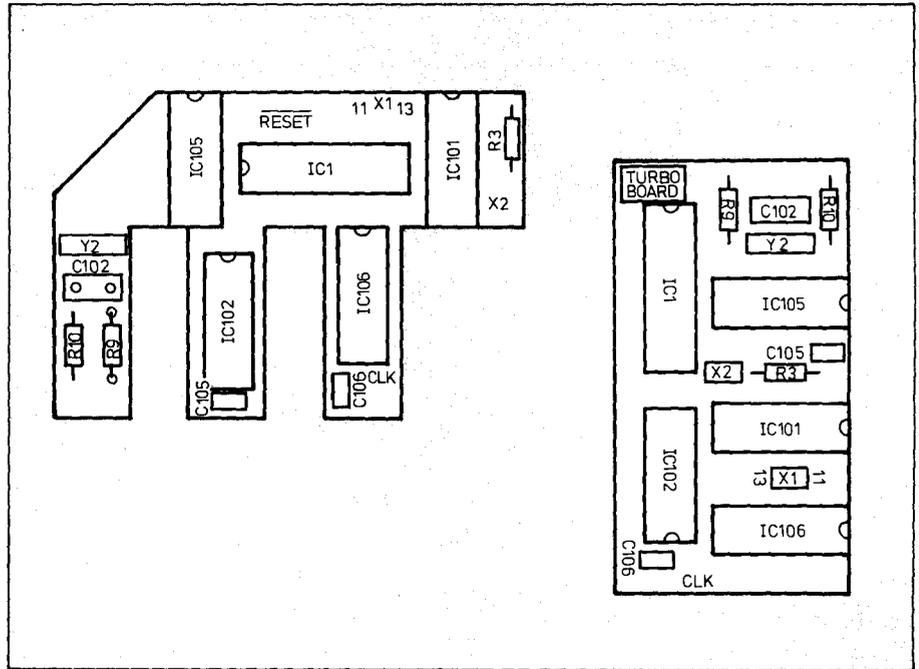
The only thing left to do is to snip pin 13 of the 18 pin socket so that it still connects to the pcb and the motherboard but not the motherboard.

Please note that the 74F00 and 74S51 are not substituted with LS type gates as this will render the circuit inoperative.

As a final check, test the circuit for shorts, especially the +5 Volt rail.

## Installation

The first thing to check is the speed of your RAM chips fitted as this deter-



mines the speed of operation in the Turbo mode.

RAM CHIP SPEED	CRYSTAL TO BE FITTED (Y1)
120 ns	24 MHz
150 ns	24 MHz
200 ns	22 MHz

Please note — IBM-PC's will not run at 24 MHz. They require a 22 MHz crystal. **Installation requires a degree of skill so be careful.**

1. Remove motherboard from the case
2. Locate integrated circuit U1 Type No — 8284. It is located near the card slots on the rear of the board (Clone) and near the power supply (IBMs) and has 18 pins.
3. Using desoldering equipment carefully remove the chip from the board making sure that all the pins are loose before attempting to remove the IC. IBMs and some clones have this chip already socketed.
4. Insert the low profile 18 pin IC socket (SK2) into the motherboard and solder it carefully into place, NOTE: — (SK2) is not the wire wrap socket.
5. Locate IC U36, Type No — 8237, from its socket on the motherboard and carefully bend out pin 12 so that when U36 is reinserted into the socket pin 12 makes no connection to the socket pin. IBM-PCs require this chip to be desoldered.
6. Run the wire from the pin on the turbo board marked CLK to pin 12 on U36. Type No — 8237.
7. Insert the switch into the front panel

of the computer case and neatly connect wires to the turbo board's 2 pin connector X2.

8. Plug the turbo board into the socket on the motherboard as per the diagram supplied.

## Operating instructions

### Hardware switch

Switch (S1) selects the speed of operation ie: — 4.77 MHz or 8 MHz. It is suggested that this switch be only used at the DOS level or when power is off as there is a small chance of corrupting data in RAM during the speed transfer. If operating at the DOS level make sure all of the data in the Ramdisk is secured first.

Switch S1 ON — Normal 4.77 MHz operation

Switch S1 OFF — 8 MHz operation

### Powering up

After installation the board test the +5 Volt rail again for shorts and select 4.77 MHz (normal mode) with switch S1. Power up the computer in the normal way and watch for signs that the computer is operating normally ie: RAM test etc. When the computer has finished its power up routine and is waiting with the prompt displayed, switch S1 to 6 MHz operation and check that the computer runs noticeably faster and functions correctly. If you have Norton utilities or other speed measuring programs run them in both modes. The Norton SI should indicate 1.7 if you are in turbo mode and 1.0 if in normal mode unless memory resident programs,

PARTS LIST — ETI-1614	
<b>Capacitors</b>	
C102.....	100pF Ceramic
C105,C106.....	0.1 M-layer Cer
<b>Resistors</b>	
R3.....	4K7 ¼ Watt
R9,R10.....	330 ohms ¼ Watt
<b>Integrated Circuits</b>	
U1.....	8284 Note: — Desoldered from motherboard
U101.....	74LS74
U102.....	74LS92
U105.....	74F00
U106.....	74S51
<b>Connectors</b>	
X1,X2.....	0.1 inch 2 Way pcb connector
X3,X4.....	Utilux pcb spade connector
<b>Crystals</b>	
Y2.....	24 MHz See text as this depends on RAM chips fitted.
<b>Sockets</b>	
SK1.....	18 Pin Wire wrap Low Profile (NB: — "Machined Pin" type)
SK2.....	18 Pin low profile socket Note: — This socket should be
2SK3,4.....	Spade type to suit X3, X4 as low as possible.
2SK5,6.....	To suit X1, X2 to suit X1, X2
<b>Miscellaneous</b>	
S1.....	SPST pushbutton to suit mounting on computer case Wire to suit connectors
PCB.....	Clone type or IBM-PC type as required

which make a demand on processor time, are activated.

A further increase in speed can be obtained by the simple substitution of the Intel 8088 microprocessor with a NEC V20 microprocessor which if fitted should make the SI rating 1.7 for normal mode and 3.1 for turbo mode.

### Problems

Firstly check the board making sure components are orientated correctly and no shorts or soldering faults are apparent. Then run through the construction and installation section to make sure that everything is in order.

Connect a multimeter to the +5 Volt rail and power up the computer. If it is not correct remove the board from the motherboard and recheck the +5V rail. If all is OK check the Turbo board for faults.

Check that pin 5 of U101 changes state when the turbo switch S1 is operated. If not check for faults around U101.

Further testing requires at minimum a logic probe. Select 4.77 MHz or normal mode with S1 and check that pin 1 of U102 is pulsing (approx 14 MHz), pin 8 U102 is pulsing at 2.38 MHz and that pin 12 U102 is pulsing at 2.38 MHz. If 14 MHz is absent check pin 12 of U1 is pulsing (14 MHz). If this signal is absent check connections between motherboard and turbo board. If the 2.38 MHz on pin 12 or 8 is missing check for faults around U102 as the divide by 6 function this chip is supposed to perform is not correct.

1. No disk operations but computer runs through self check

If all above is correct and pin 6 of U106 is not pulsing (4.77 MHz) check operation of U106.

2. Computer hangs when switched to turbo mode

The most common fault is that the RAM chips in the computer are not 150 ns access time. Check manufacturers specifications and replace with correct chips.

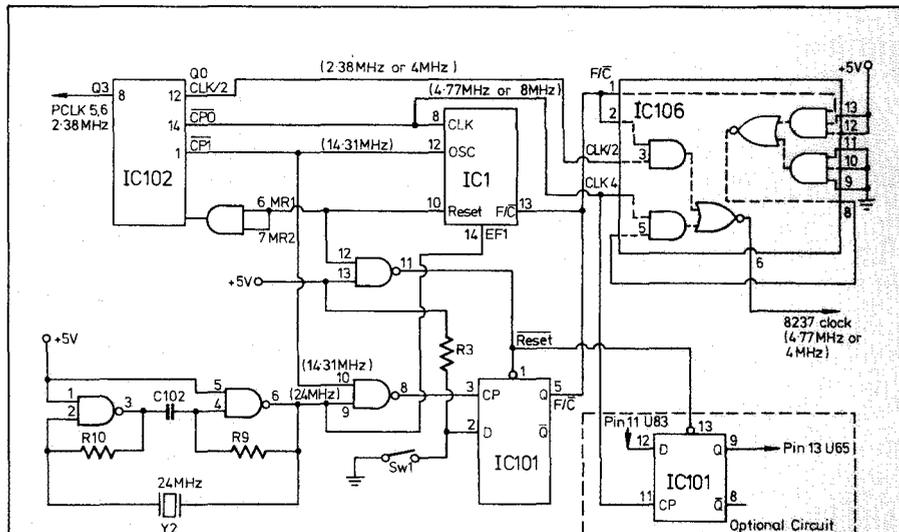
Check manufacturer's specs that the processor is capable of running at 8 MHz.

Check that U105 is a 74F00, not 74LS00 and check it for 24 MHz on pin 6.

Check that U101 pins 2 and 5 change state when switch S1 is changed.

3. Computer does not switch to turbo mode

Check that U101 is operating correctly and switch S1 is connected. 



### HOW IT WORKS

There are 4 signals the turbo board caretakes. They are: —

OSC — Main computer clock signal (14.31 MHz divided by 3 to 4.77 MHz for the 8088 microprocessor and DMA clock (8237)).

PCLK — (2.38 MHz) Is the clock for the timer chip 8253 which requires 1.19 MHz for its clock signal. Therefore this signal is divided by 2 on the motherboard.

F/C — A logic high or low signal which selects the frequency applied to U1's (8284) internal counters (either 14.31 MHz or 24 MHz).

EFI — The external frequency (24 MHz) applied to U1 which is divided by 3 to obtain the turbo clock of 8 MHz for the 8088 microprocessor.

Half of U105 is set up as a 24 MHz oscillator with Y2 as the controlling element. This 24 MHz signal is connected to U1 pin 14 which is the external frequency input which pin 13 selects which frequency is applied to the dividers internally. If pin 13 is low it selects 14.31 MHz to be applied (Normal mode) or high to select the frequency applied to the EFI pin (Turbo mode).

Internally U1 divides either the 14.31 or 24 MHz by three which is available on pin 8 (CLK) as 4.77 MHz or 8 MHz which is the processor clock. It is critical to maintain the signal PCLK at 2.38 MHz which is operating from

power up. Therefore the PCLK signal is derived from the 14.31 MHz by U102 which divides 14.31 MHz by six which remains constant regardless of the mode selected.

It is also undesirable to increase the speed of the DMA accesses due to older disk drive adapters not being able to cope with the increase in speed. We have to ensure that this signal is at 4.77 MHz in normal mode and approximately the same but in sync with the clock in the turbo mode. Therefore U102 divides the clock signal (8 MHz) in the turbo mode. U106 and the divide by 2 function in U102 caretakes this signal. U102 divides the clock signal (8 MHz) in the turbo mode by 2 which is selected by U106 and applied to the DMA controller chip as 4 MHz in the turbo mode. When in normal mode U106 ensures that 4.77 MHz is switched to the DMA controller. This is the area that PC-sprint falls down as it makes the systems real time clock run fast due to the 2.38 MHz at which speeds the drive is incapable of formatting disks and completing other sensitive functions.

U101 is reset on power up via gate 4 of U105 which inverts the RESET signal from U1. As U102 is already a positive resetting device the RESET signal from U1 clears the counters within.

Capacitors C105 and C106 are bypass caps for the 5 V rail.

A limited number of boards are available from the author on (03) 654-4022. The price will be about \$25.



ETI - 1541  
ELECTRONICS

**B**ack in the golden days when the world was young and electronics was fun, before designers became obsessed with creating ever more sophisticated multi IC circuits, a great deal of enjoyment was to be had from the simple pleasure of trying to squeeze the most spectacular performance from the smallest number of components.

If your sensibilities have been jaded by auto-ranging multi functional megachips and rubbed raw from exposure to high-tech gadgetry, just call on J J Flash to bring a breath of fresh air into your life.

Rumour has it that Jumping Jack Flash was born when some friends known collectively as Filament started to achieve notoriety around the pub and club circuit with their special brand of rock music.

For a simple way to give impact to their stage presence, Flash had all the answers. A microphone in the bass drum would pick up the driving beat of the song and relay it to powerful lights which could be trained on any member of the band or even the audience. For an outrageously OTT effect, a microphone and 100 W lamp inside each drum would cause the drum itself to flash each time it was struck!

Of course there are those who would dispute this version of JJ's provenance. Many say that he was called into being as an aid to photography. Capturing a balloon about to burst and a bullet in flight are his finest achievements, they claim. Yet others insist that his main talent is in his versatility as a capable and powerful sound to action controller.

But what of the man himself? What did Flash claim to be? Perhaps we will never know the truth behind the legend but the story of his life may shed some light on one of the most intriguing mysteries of our time.

**Showtime and the music starts — ETI's Paul Chappell shows how to build a sound-activated trigger for light shows that will upstage the best of them.**

### *It's a GaAs*

One matter which is undisputed is JJF's circuit. It is shown in Figure 1.

To the left, a microphone picks up sound vibrations and converts them to an electrical signal. This is amplified by an amount set by RV1 and fed to a circuit which responds only when the

peaks are above a pre-set level. A timer IC (the good old 555) is triggered by the peaks and gives a pulse of controllable length at its output.

The pulse drives an opto isolated triac, which drives a power triac, which in its turn drives a lamp. All 500 W of it!

The experience of operating the circuit in a small room is not to be missed — it gives a ridiculous sense of power to have every snap of your fingers accompanied by a blinding flash of light. Five hundred Watts in a living room is bright!

The length of the flash is set by RV2 — anything from the briefest supernova

*'It gives a ridiculous sense of power to have every snap of your fingers accompanied by a blinding flash'*

to several seconds of atomic blast. For a more restrained effect, you can use lower powered bulbs or coloured lamps.

For use on stage, the sensitivity control RV1 will have to be set very low and the microphone positioned so that it responds to the sound you want.

To pick up a hand clap from the opposite side of the room, it will have to be set somewhere near the maximum.

### **Construction**

The component overlay for the circuit board is shown in Figure 2. There is nothing to cause any difficulties here.

The only point to watch is the mounting of the triac which must make good contact with the heatsink if the circuit is controlling a respectable amount of power.

First lay it on the board with the hole in its tab over the mounting hole in the PCB. You can then judge exactly where to bend the leads. Bend them at right angles to the body of the triac (not too sharply, or you'll weaken them) then insert the triac leads temporarily into their holes to check that the tab hole is aligned with the PCB hole.

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74 ETI 183 OP-Amp Tester  
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E.A. Megohm Meter  
E.A. Signal Tracer  
ETI 184 In-Circuit Digital I.C. Tester

### MODEL TRAIN UNITS (see also "SOUND EFFECTS")

ETI 541 Model Train Control

### SOUND EFFECTS

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E.A. 492 Audio Sound Bender  
E.A. Electronic Sea Shell Sound Effects  
ETI 469A Percussion Synthesiser  
ETI 469B Sequencer for Synthesiser  
E.A. Effects Unit  
set as for Steam Train and Prop Plane noise

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ETI 481 12 volt to  $\pm 40v$  D.C., 100 watt Inverter  
ETI 525 Drill Speed Controller  
E.A. 1976 Speed Control  
E.A. Zero-voltage switching heat controller  
ETI 1505 Fluorescent Light Inverter  
E.A. Electric Fence  
ETI 1506 Xenon Push Bike Flasher  
ETI 1509 DC-DC Inverter  
ETI 1512 Electric Fence Tester  
E.A. Fluoro Light Starter  
HE 126 Nicad Charger

### ETI 578 Simple Nicad Charger

E.A. Heat Controller  
ETI 563 Fast Ni-Cad Charger  
E.A. High Voltage Insulation Tester  
E.A. Electric Fence Controller  
ETI 1532 Temp Control For Soldering Irons  
E.A. Deep Cycle Nicad Charger  
AEM 5505 Hash Harrier

### WARNING SYSTEMS

ETI 583 Gas Alarm  
ETI 528 Home Burglar Alarm  
ETI 702 Radar Intruder Alarm  
ETI 313 Car Alarm  
ETI 582 House Alarm  
E.A. 1976 Car Alarm  
E.A. 10 Ghz Radar Alarm  
E.A. Light Beam Relay  
ETI 247 Soil Moisture Indicator  
ETI 570 Infrared 'Trip' Relay  
ETI 585 T&R Ultrasonic Switch  
ETI 330 Car Alarm  
ETI 1506 Xenon Bike Flasher  
ETI 340 Car Alarm  
E.A. Deluxe Car Alarm  
E.A. Ultrasonic Movement Detector  
ETI 278 Directional Door Minder  
E.A. Multisector Home Security System  
E.A. Infra-Red Light Beam Relay  
E.A. Deluxe Car Alarm  
E.A. Doorway Minder  
E.A. "Screecher" Car Alarm  
ETI 1527 4 Sector Burglar Alarm  
E.A. Driveway Sentry (MK II)  
ETI 284 VCR Theft Alarm

### PHOTOGRAPHIC

ETI 5148 Sound Light Flash Trigger  
ETI 532 Photo Timer  
ETI 513 Tape Slide Synchronizer  
E.A. Sync-a-Slide  
ETI 553 Tape Slide Synchronizer  
E.A. Digital Photo Timer  
ETI 594 Development Timer  
F.A. Sound Triggered Photoflash  
HE 109 Extra Flash Trigger  
ETI 182 Lux Meter  
ETI 1521 Digital Enl Exposure Meter  
ETI 279 Exposure Meter

### POWER SUPPLIES

ETI 132 Experimenters Power Supply  
ETI 581 Dual Power Supply  
ETI 131 Power Supply  
E.A. 1976 Regulated Power Supply  
E.A. C.B. Power Supply  
ETI 142 Power Supply 0-32 V 0-15 A (fully protected)  
ETI 472 Power Supply  
ETI 577 Dual 12V Supply  
E.A. Power Saver  
ETI 480 PS Power Supply for ETI 480 (100 watt Amp)  
E.A. Bench Mate Utility Amplifier Power Supply  
ETI 163 0-40 V 0-5 A  
E.A. Dual Tracking Power Supply  
ETI 162 1.3-30 Volt Fully Adjustable  
ETI 251 OP-AMP Power Supply

### COMPUTER AND DIGITAL UNITS

ETI 633 Video Synch board\*  
ETI 632 Keyboard Encoder  
ETI 637 Cuts Cassette Interface  
ETI 651 Binary to Hex Number Converter  
ETI 730 Getting Going on Radio Tele Type  
ETI 760 Video RF Modulator  
E.A. Eprom Programmer  
ETI 668 Microbee Eprom Programmer  
ETI 733 RTTY Computer Decoder  
E.A. Video Amp for Computers  
ETI 675 Microbee Serial - Parallel Interface  
ETI 688 Programmer for Fusible-Link Bipolar Proms  
ETI 676 RS232 for Microbee all V.D.U. projects priced less connectors  
ETI 678 Rom Reader For Microbee  
ETI 659 VIC 20 Cassette Interface  
ETI 683 Mindmaster - Human Computer Link  
ETI 699 300 Band Direct-Connect Modern  
AEM 3500 Listening Post

### AEM 4600 Dual Speed Modem

ETI 1601 RS 232 For Commodore  
ETI 736 Radio Fax Computer Decoder for Microbee  
AEM 3502 Signal Operated Cassette Recorder Controller  
AEM 3503 Weather Satellite Decoder  
ETI 181 "BOB" RS 232 Break-Out-Box  
E.A. Teletink Modem  
AEM 4601 Baud Rate Converter

### BIO FEEDBACK

ETI 546 G.S.R. Monitor (less probes)  
ETI 544 Heart Rate Monitor  
ETI 576 Electrolyogram  
AEM 5504 Electrolyogram

### AUTOMOTIVE UNITS

ETI 081 Tachometer  
ETI 316 Transistor Assisted Ignition  
ETI 240 High Power Emergency Flasher  
ETI 301 Vari-Wiper  
ETI 318 Digital Car Tachometer  
ETI 319A Variwiper Mk. 2 (no dynamic Braking)  
ETI 319B Variwiper Mk. 2 (for dynamic Braking)  
ETI 555 Light Activated Tacho  
ETI 320 Battery Condition Indicator  
E.A. Transistor Assisted Ignition  
ETI 324 Twin Range Tacho less case  
ETI 328 Led Oil Temp Meter less V.D.O. probe  
ETI 321 Auto Fuel Level Alarm  
ETI 332 Stethoscope  
ETI 325 Auto Probe Tests Vehicle Electricals  
ETI 333 Reversing Alarm  
E.A. Low Fuel Indicator  
ETI 326 Led Expanded Voltmeter  
ETI 329 Ammeter (expanded scale)  
ETI 327 Turn and Hazard Indicator  
ETI 159 Expanded Scale Voltmeter  
ETI 335 Wiper Controller  
E.A. Ignition Killer for Cars  
ETI 280 Low Battery Volt Indicator  
ETI 322 Over Rev Alarm  
ETI 345 Demister Light  
ETI 287 "KITTE" Led Light Chaser  
E.A. Turbo Cool Down Timer

### ELECTRONIC GAMES

ETI 043 Heads and Tails  
ETI 068 L.E.D. Dice Circuit  
E.A. Electronic Roulette Wheel  
ETI 557 Reaction Timer  
ETI 814 Dinky Die  
E.A. Selectalott  
HE 107 Electronic Dice  
E.A. Photon Torpedo  
HE 123 Alien Invaders  
E.A. Roulette Wheel  
E.A. Chase-N-Chomp (Pac Man)

### MISCELLANEOUS KITS

ETI 604 Accentuated Beat Metronome  
ETI 547 Telephone Bell Extender  
ETI 044 Two Tone Doorbell  
ETI 539 Touch Switch  
E.A. Digital Metronome  
ETI 249 Combination Lock (less lock)  
E.A. Power Saver for induction motors  
E.A. Lissajous Pattern Generator  
ETI 247 Soil Moisture Alarm  
E.A. Pools Lotto Selector  
ETI 256 Humidity Meter  
ETI 257 Universal Relay Driver Board  
E.A. Simple Metronome  
ETI 1501 Neg. Ion Generator  
ETI 1516 Sure Start for Model Aeroplanes  
ETI 412 Peak Level Display  
ETI 1515 Motor Speed Controller  
ETI 1520 Wideband Amplifier  
E.A. Phone Minder  
E.A. Simple L.C.D. Clock  
E.A. Ultrasonic Rule  
AEM 1500 Simple Metronome  
AEM 5501 Negative Ion Generator  
AEM 4501 8-Channel Relay Interface  
E.A. Pest Off  
ETI 606 Electronic Tuning Fork  
ETI 184 In Circuit Digital IC Tester  
AEM 5503 Bed-Wet-Ector  
ETI 606 Tuning Fork  
ETI 287 Led Light Chaser  
ETI 589 Solar Generator

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READER INFO No. 21



*Jumping Jack Flash can be used as a photographic tool as well. This unusual effect was created by dropping a ball into an ashtray filled with milk. The sound of the ball hitting the bottom triggered the flash. The ball is visible on the rebound, just to the right of the plume of milk.*

Take the triac away from the board, smear the tab with a little heatsink compound then bolt the triac to the heatsink and PCB before soldering the leads. A flat washer between the bolt and the triac tab will help to spread the pressure and to prevent the tab from becoming distorted.

Figure 3 shows a suitable power supply for the circuit. Fig. 4 is a suggested layout for the circuit in a small plastic hobby box. There is no need to use a PCB for the power supply unless you are really keen to make a neat job of it. The smoothing capacitors and transformer will support the rectifiers.

The microphone insert can be fixed to the case or can be remote from it at the end of a length of screened cable. If you splash out on a 3.5 mm jack plug and socket, you can leave all your options open.

You'll notice the power supply has no regulator ICs. In the days when regulators had to be made from discrete components, they would only be used when absolutely necessary. These days they are included in every circuit almost as a reflex action. Just to be different (and since they are not necessary) We've left them out. Saves a dollar, doesn't it?

When you come to test the circuit remember that everything beyond the opto coupler (IC3) is live, including the heatsink which is connected via the

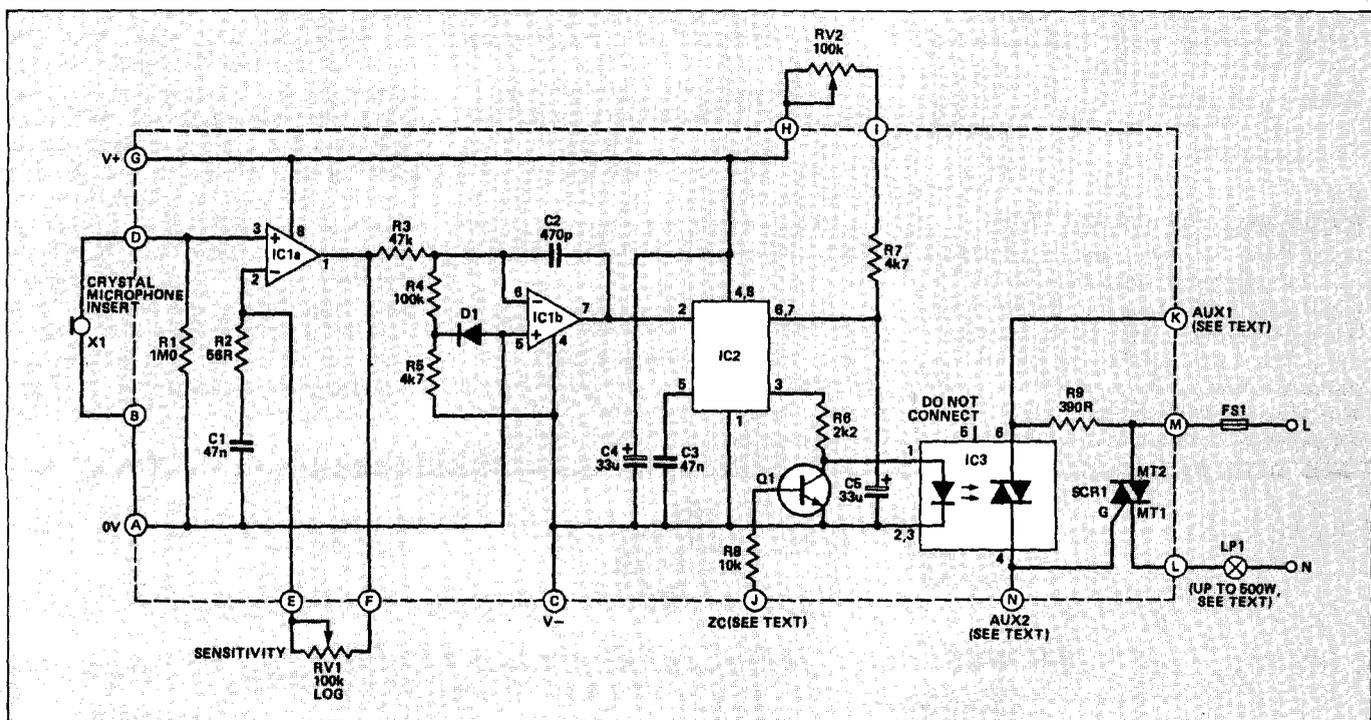


Figure 1: Jack Flash in the nude.

# TEXAS INSTRUMENTS

## TECHNOLOGY AWARD UPDATE

During 1987 Texas Instruments sponsored various final year electrical engineering projects in the fields of Digital Signal Processing, Local Area Networks, and Parallel Processing. A Local Area Network (LAN) is primarily a data transmission system intended to link computers and associated devices within a restricted geographical area. The linked computers and related equipment may be anything from full scale mainframe computing systems to small desk top office work stations and peripherals.

Since a Local Area Network is confined to a small area, it is possible to employ vastly different transmission methods from those commonly used on other telecommunications systems. Inexpensive line driving equipment can be used instead of the relatively complex modems needed for public analogue networks. High data transmission speeds can be achieved by utilising the advantages of short distances and the latest electronic equipment.

In order to meet a need for LAN communications within the James Cook University, experimental work has been carried out to design and build an intelligent Local Area Network Node compatible with the IBM Token-Ring LAN. Design work was carried out using the TI TM8380 chip-set which implements the IBM Token-Ring standard.

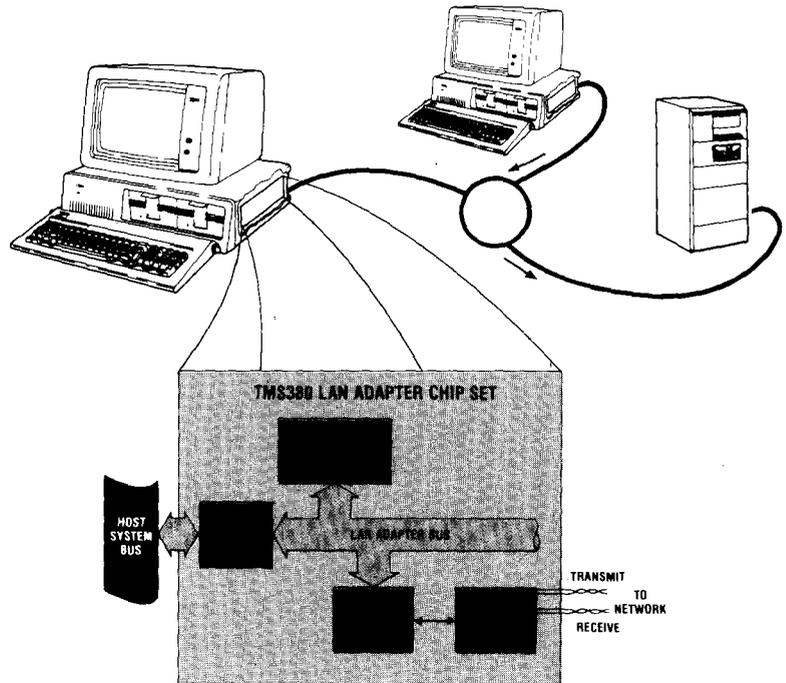
**Student: Carl Brunner**

**Supervisor: Dr. G. H. Allen — James Cook University.**

### PRINCIPLE OF OPERATION

Local Area Networks are distinguished by short distances (less than 10 km), a high transmission rate (0.1 to 20 million bits per second), and by a low error rate. The main advantage of present day LANs can be summarised:

- inexpensive transmission media
- inexpensive interfacing devices



- easy connection of devices
- high data transmission rates
- network transmission rates independent of rates used by attached devices
- any device attached to the network can communicate with any other device.

In order to make maximum use of LANs, provision must be made for linking them to wide area networks such as the Public Switched Telephone Network. This is usually accomplished by the use of gateways which perform protocol and speed conversions between different networks.

### Interfacing the TM8380 LAN chip-set to microprocessors

The TM8380 chip-set consists of 5 VLSI chips. These include the TMS38010 Communications Processor, TMS38020

Protocol Handler, TMS38030 System Interface, TMS38051 and TMS38052 Ring Interface chip pair. The TMS38030 System Interface provides up to 40 Mbps of data to the host via DMA (Direct Memory Access). This chip can be configured with either the 8086 family or the 68XXX family. A major aspect of the investigation was to examine the advantages of the various hosts and bus options to determine the most suitable solution for the university. Options that were investigated included interfaces to a 6800 on a VME bus and interface to an 8088 on a PC/XT bus. However, in view of the complexity of these interfaces it was decided to develop a 16 bit interface with a 6800 microprocessor as the host processor. A PCB design was done as the first step in the development of an intelligent LAN node.



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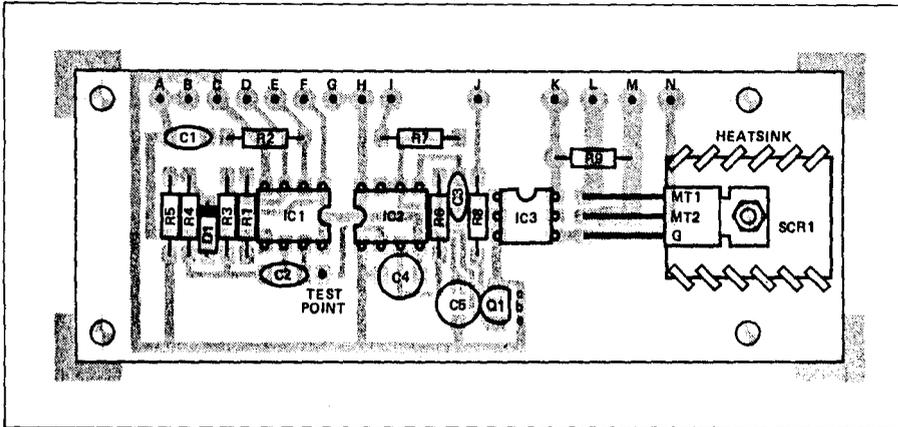


Figure 2: Jack Flash's internal organs.

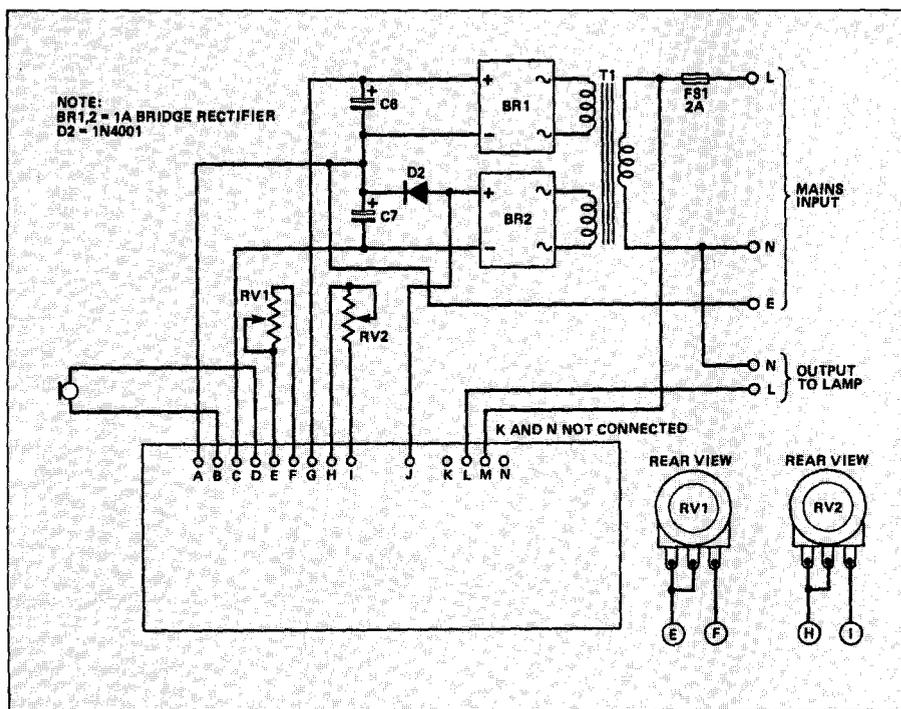


Figure 3: Jack Flash in stage costume.

triac tab directly to the mains input. If you think anything may be wrong with the low voltage side of the circuit, disconnect the mains from the PCB (by removing the connections to points L and N) before checking it out.

**Testing**

The circuit really is too simple to need much explanation. The fault finding procedure is simply to check that the signal is reaching pin 1 or IC1 and pin 7 of IC1, triggering the timer IC2. The outputs from IC1 can be checked with a crystal earpiece if you haven't got a scope and the output from pin 3 of IC2 can be checked with a test meter on 25 V range. It should normally be high, going low when a sharp sound is

present. Tapping the microphone with the gain set to maximum should be enough.

If you find that the lamp remains on at all times when RV1 is advanced to the maximum sensitivity (even when the room is perfectly quiet) the value of R4 should be reduced slightly. Use the largest value that will allow the lamp to turn off reliably.

Transistor Q1 and the connection to the J terminal form a zero crossing detector to cut down on the interference generated by SCR1. If this feature is not required, D2 and the link to terminal J can both be omitted.

**Other applications**

If your pulse doesn't race at the thought

**HOW IT WORKS**

The signal from the microphone is amplified by IC1a.

Immunity to mains hum is achieved by the crude but effective expedient of giving C1 a low enough value to reduce the gain almost to unity at 50 Hz while amplifying the fast spikes of percussive sounds anything up to about 2,000 times.

Components D1, R4, R5 and R3 hold pin 6 of IC1 slightly lower than pin 5 in the absence of a signal, keeping the output high. C2 tames the output of IC1b a little but no attempt is made to rectify or smooth the output since all IC2 requires is a signal which drops briefly below 1/3 V+.

IC2 is the familiar 555 timer connected in monostable mode with time period adjusted by RV2. R6 limits the current to the opto isolator.

When connected as shown in Figure 3, Q1 diverts the timer's output current from the isolator whenever any appreciable voltage is present across BR2, forming a simple zero crossing detector. The opto triac triggers the main triac via the surge limiting resistor R9. The main triac switches on the load.

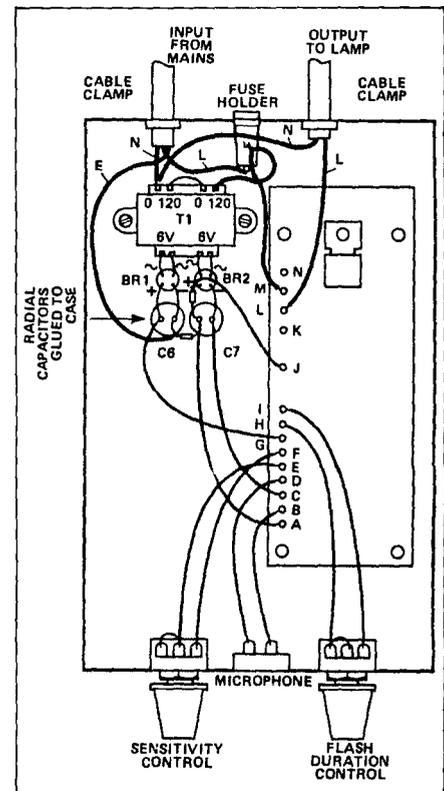


Figure 4: Suggested layout.

## The light fantastic

of JJF's electric stage performances, perhaps your mind is on photography. Sound triggers for cameras were all the rage a while back, allowing spectacular photographs of such things as bursting balloons, popping balloons, exploding balloons, balloons going bang and so on.

The photographs are made either by using the sound of the exploding balloon to trigger flash lights in a darkened room (the camera shutter would be left open throughout the procedure) or by triggering the camera itself if it was fitted with a solenoid operated shutter.

A touch of the soldering iron will transform JJF into a camera sound trigger. The way to do it is shown in Figure 5. The power triac and heatsink

are removed from the PCB and the opto triac is replaced by an ordinary opto-isolated transistor.

The only other difference is that the circuit is run from a pair of PP3 batteries instead of the mains power supply. You will probably want to put an on-off switch in the power supply as well.

The circuit can be armed by simply turning up the sensitivity. Otherwise, a switch in the 'reset' line of IC2 will give an arm/disarm function. You'll need to cut the PCB track for this.

For general sound switching purposes, the circuit of Figure 1 can be used for mains applications and the modifications shown in Figure 5 will make the circuit suitable for low voltage applications. The other feature you may

want to add — latching — is shown in Figure 6. With this configuration the circuit will latch when a sound triggers the switch and will remain on until the reset button is pressed. So — open your curtains with a whistle or your garage doors with a toot! Or just have fun experimenting.

ETI

### PARTS LIST — ETI-1541

**Resistors**

All 1/4W 5%

- R1 ..... 1M
- R2 ..... 56R
- R3 ..... 47k
- R4 ..... 100k
- R5, 7 ..... 4k7
- R6 ..... 2k2
- R8 ..... 10k
- R9 ..... 390R
- RV1 ..... 100k log pot
- RV2 ..... 100k lin pot

**Capacitors**

- C1, 3 ..... 47n
- C2 ..... 470p
- C4, 5 ..... 33µ, 25 V radial electrolytic
- C6, 7 ..... 1000µ, 25 V radial electrolytic

**Semiconductors**

- IC1 ..... MC1458
- IC2 ..... LM555
- IC3 ..... (MOC3021 etc)
- Q1 ..... BC338
- SCR1 ..... SC151D
- D1 ..... 1N4148
- D2 ..... 1N4001
- BR1, 2 ..... low voltage bridge, rectifier, any type

**Miscellaneous**

- X1 ..... Crystal microphone insert (almost any microphone will do as a substitute).
  - T1 ..... 0-6 V, 0-6 V, 6 VA
- Connecting wire; mains wire; plugs; sockets; plastic box. Optional parts for the modified versions are shown in the relevant diagrams.

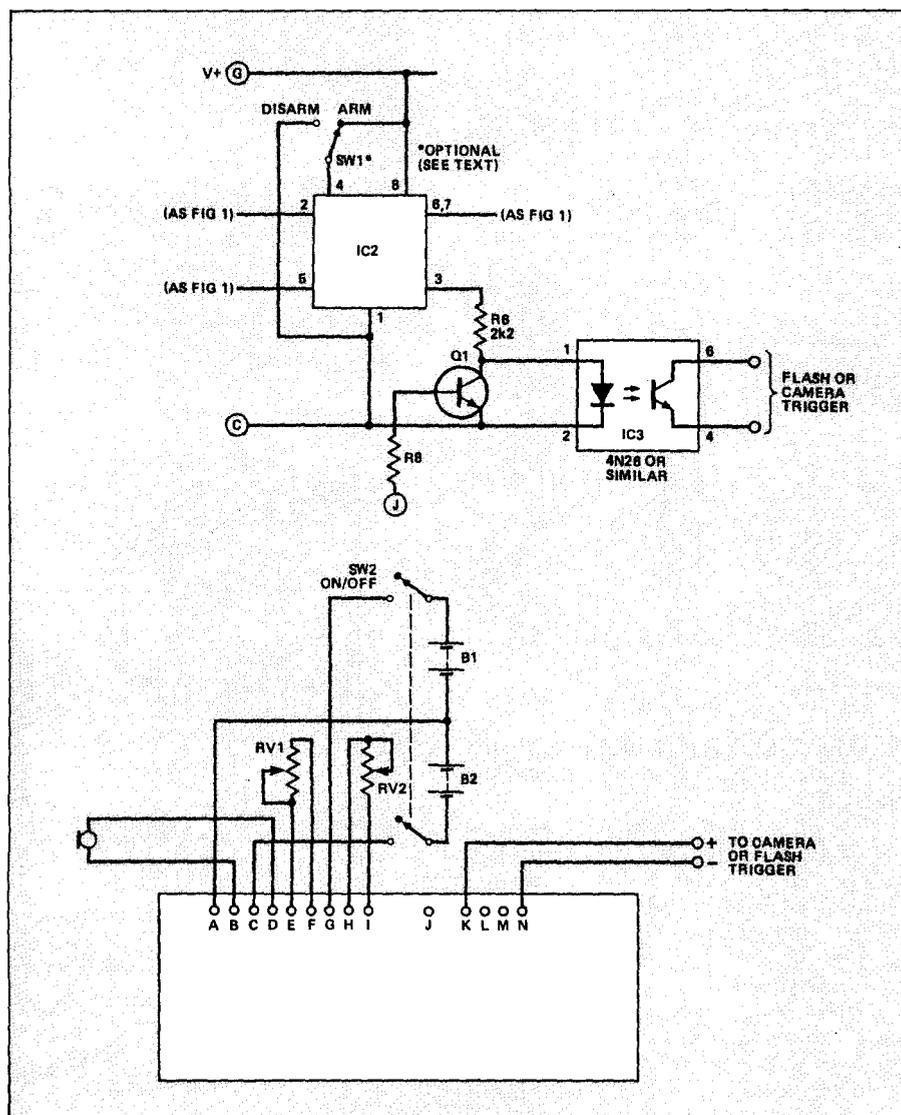


Figure 5: (a) Circuit modifications for the sound trigger. SW1 is optional (see text). Q1 and R8 are not required, but there is no need to remove them. All parts of the circuit not shown are the same as for Figure 1. (b) Connections to the PCB for photographic sound trigger.

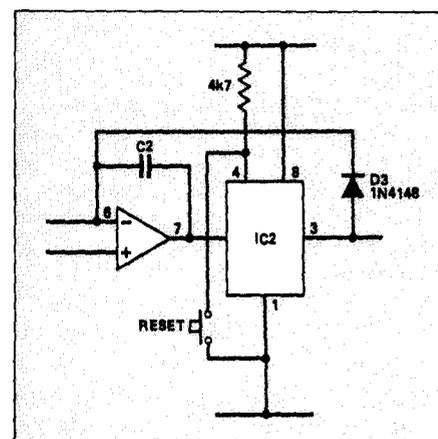


Figure 6: Making the trigger latch. A diode is added between IC2 pin 3 and IC1 pin 6. The track between pins 4 and 8 of IC2 is cut and pin 4 is taken to V+ via a 4k7 resistor. A reset button is added between pins 1 and 4 of IC2. The remainder of the circuit is as for Figure 1.



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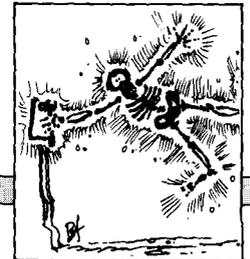


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## Programmes

```

1 '*****
2 '*   CLOCK   *
3 '* BY G. TUNNY *
4 '* (C) COPYRIGHT *
5 '*   JULY 1988 *
6 '*****

10 DATA33,192,121,53,192,54,60,58,197,121,60
20 DATA254,60,40,4,50,197,121,201,33,197
30 DATA121,54,0,58,194,121,60,254,60,40
40 DATA4,50,194,121,201,33,194,121,54,0
50 DATA1,0,1,33,42,0,205,92,52,58
60 DATA195,121,60,254,13,40,4,50,195,121
70 DATA201,33,195,121,54,1,201,0,0
100 TM=PEEK(30897)+256*PEEK(30898)-20
110 POKE30897, TM-INT(TM/256)*256+POKE30898, INT(TM/256)
120 TM=TM-1:A=TM-65536
130 FORI=0TO68
140 READD:POKEI+A,D
150 NEXTI
160 POKE30846, TM-INT(TM/256)*256+POKE30847, INT(TM/256)
170 POKE30845,195
200 CLS
210 S=31173:' STORAGE LOCATION FOR SECONDS
220 M=31170:' STORAGE LOCATION FOR MINUTES
230 H=31171:' STORAGE LOCATION FOR HOURS
240 PRINT" **ENTER CURRENT TIME**"
250 PRINT:INPUT"MINUTES" ;A:POKEM,A
260 INPUT"HOURS" ;A:POKEH,A
270 CLS
280 PRINT@20,"SECONDS",PEEK(S);" "
290 PRINT@0,PEEK(H);":";PEEK(M);" "
300 GOTO 280
    
```

### Clock

This is another of my interrupt controlled programs for all you VZ owners out there. This machine code program could be put into games as an accurate timer. Because this program does not depend on basic, it will not lose track of time when you break out of the program. There are only a few commands that will make it lose a second or two, such as DOS or sound

commands.

The storage locations used for the seconds, minutes and hours are written in the Basic program and can be poked to change them. It is advisable to save this program before you run it because machine code has a nasty habit of crashing.

G. Tunny  
Gorokan  
NSW

```

                                00100 ; WORDBEE ROUTINE TO INSERT PRINTER CONTROL COI
                                00110 ; TO ENABLE DOUBLE WIDTH CHARACTERS TO BE PRIN
                                00120 ; MID SENTENCE.
                                00130
                                00140 ;
                                00150 ; Insert fingers (I) in the file where control
                                00160 ; are to be placed, go to the monitor and run
                                00170 ; utility. Fingers will then be replaced by co
                                00180 ; codes.
                                00190
F400 00200 ORG OF400H ;or where you wish
F400 F5 00210 PUSH AF ;save registers
F401 C5 00220 PUSH BC
F402 D5 00230 PUSH DE
F403 E5 00240 PUSH HL
F404 AF 00250 XOR A
F405 3241F4 00260 LD (FLAG),A ;reset flag
F408 210009 00270 LD HL,0900H
F40B E5 00280 PUSH HL
F40C ED4B1D05 00290 LD BC,(051DH) ;get EOF pointer
F410 0B 00300 NXTBC DEC BC ;calculate file len
F411 2B 00310 DEC HL
F412 7C 00320 LD A,H
F413 B5 00330 OR L
F414 20FA 00340 JR NZ,NXTBC
F416 E1 00350 POP HL
F417 23 00360 NXTHL INC HL
F418 0B 00370 DEC BC
F419 78 00380 LD A,B
F41A B1 00390 OR C
F41B 2005 00400 JR NZ,SEARCH
F41D E1 00410 POP HL ;restore registers
F41E D1 00420 POP DE
F41F C1 00430 POP BC
F420 F1 00440 POP AF
F421 C9 00450 RET
F422 7E 00460 SEARCH LD A,(HL) ;get byte
F423 FE7C 00470 CP 7CH ;finger character?
F425 20F0 00480 JR NZ,NXTHL ;next if not
F427 3A41F4 00490 LD A,(FLAG)
F42A FE01 00500 CP 01H ;flag set?
F42C 280A 00510 JR Z,RESET ;if yes go to reset
F42E 3E01 00520 LD A,01H
F430 3241F4 00530 LD (FLAG),A ;set flag
F433 3E0E 00540 LD A,0EH ;CHANGE TO SUIT PRI
F435 77 00550 LD (HL),A ;insert on code
F436 1BDF 00560 JR NXTHL
F438 AF 00570 RESET XOR A
F439 3241F4 00580 LD (FLAG),A ;reset flag
F43C 3E0F 00590 LD A,0FH ;CHANGE TO SUIT PRI
F43E 77 00600 LD (HL),A ;insert off code
F43F 1BDF 00610 JR NXTHL
F441 00 00620 FLAG DEFB 0 ;0=off 1=on
0000 00630 END
00000 Total errors
    
```

### Wordbee control code insertion

This utility program was developed to enable printer control codes to be sent mid sentence to print double width characters. The format is to insert a finger (I) character where the on and off codes are to be sent, e.g:

The IquickI red fox jumped over the IlazyI brown dog.

Then, from the Menu, go to the Monitor, run the utility, and the fingers will be replaced with alternative on and off codes. Returning to the file will display.

The <x>quick<.> red fox jumped over the <x>lazy<

.> brown dog.

And the resultant printout is.

The quick red fox jumped over the lazy brown dog.

The codes used in lines 540 and 590 are the on and off codes for my printer and should be changed to suit other printers. This utility may also be used for other codes but note that values below OBH will not work as Wordbee sees these as an end of print code.

G. R. Laming  
Mile End  
SA



NOW FOR THE LISTING...

```

00000 REM ### ALL REM STATEMENTS ARE OPTIONAL ###
00000 REM ### NICEPIC.MWB. VER. 3. MARK COCCUIO. 1/2/88 ###
00100 COLORB1:CLS:HIRES2
00101 REM MAIN GRAPHICS
00110 R=511
00120 FOR A=1 TO 511
00130 PLOT1 A,0 TO R,255
00140 B=R-1
00150 NEXT A
00160 B=255
00170 FOR A=1 TO 255
00180 PLOT1 511,A TO 0,B
00190 R=R-1
00200 NEXT A
00201 REM CORNER GRAPHICS
00210 R=511
00220 FOR A=0 TO 254 STEP 5
00230 R=R-5
00240 PLOT 0,A TO B,0
00250 NEXT A
00260 R=511
00270 FOR A=254 TO 0 STEP -5
00280 R=R-5
00290 PLOT R,254 TO 0,A
00300 NEXT A
00310 B=0
00320 FOR A=254 TO 0 STEP -5
00330 R=B+5
00340 PLOT 510,A TO R,254
00350 NEXT A
00360 B=0
00370 FOR A=0 TO 254 STEP 5
00380 R=R+5
00390 PLOT B,0 TO 510,A
00400 NEXT A
00401 REM INVERT SCREEN
00410 CLEAR:FOR C=0 TO 511:PLOT1 C,0 TO C,255:NEXT C
00411 REM BAR ACROSS THE SCREEN
00420 CLEAR:FOR Z=1 TO 3:FOR C=1 TO 511:PLOT1 C,0 TO C,255:IF C>25 THEN PLOT1 C-
25,0 TO C-25,255:NEXT C:FOR C=487 TO 511:PLOT1 C,0 TO C,255:NEXT C:NEXT Z ELSE NE
XT C:NEXT Z
00421 REM MAKE SCREEN DISAPPEAR
00430 D=511:E=255:F=0:FOR C=0 TO 127:PLOT1 C,0 TO C,255:PLOT1 D,0 TO D,255:PLOT1
0,F TO 511,E:PLOT1 0,F TO 511,F:D=D-1:C=C+1:PLOT1 C,0 TO C,255:PLOT1 D,0 TO D,2
55:D=D-1:F=F-1:P=F+1
00440 NEXT C:PLAY 0,0:GOTO 110
    
```



**Nicepic**

Nicepic is one of those programmes that doesn't actually DO anything except draw pretty patterns on the screen. Using the PLOT1 routine it should earn you a few "Oohs and ahs" from people who aren't very computer inclined. You can run it at parties if you want to draw attention to your marvellous MICROBEE. I don't know about you, but when I'm feeling exceedingly bored I run NICEPIC just for the heck of it.

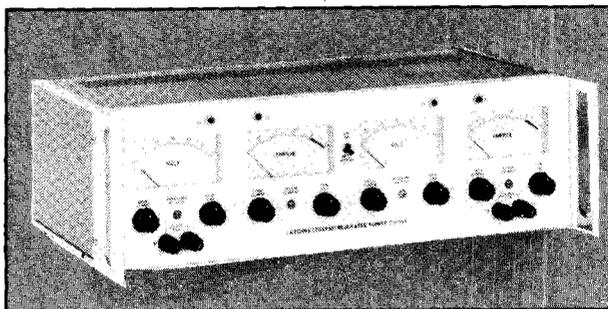
The program is designed so that the listing can be entered without the REMs using the auto command (thus the odd line numbering). Unfortunately the program uses the HIRES2 command, and so the programme will only run on PREMIUM Microbees (sorry standard users!).

M. Cocquio  
Gladesville  
NSW

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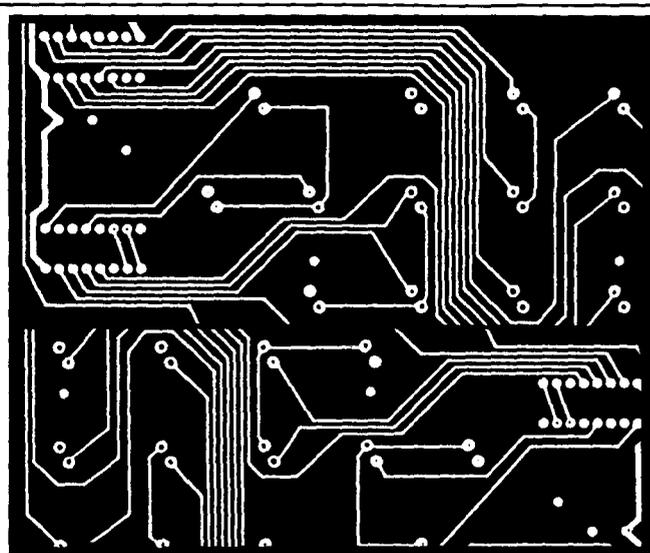
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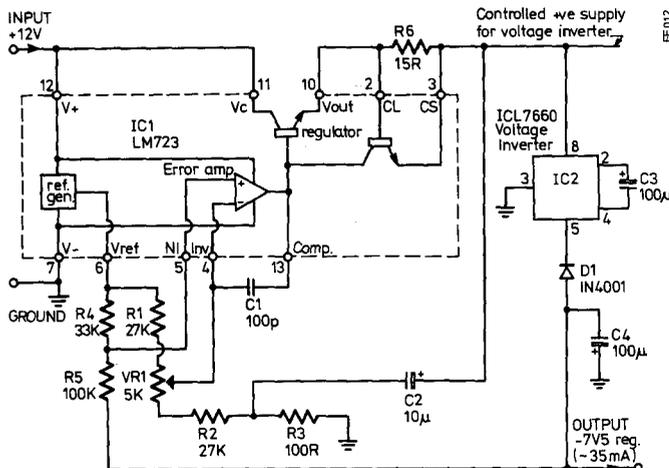
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READER INFO No. 22

Circuits



Regulated voltage inverter

The Intersil ICL7660 Voltage Inverter chip can perform voltage multiplication and/or supply voltage conversion (from a positive input to a negative output) at modest current levels. Its main application is the generation of the negative voltage rail for circuits requiring dual supplies, where only a single positive supply is available. It

can operate with supply voltages in the range +1.5 V to +10 V maximum, with high levels of conversion efficiency.

The output impedance of the 7660 depends on a number of factors but is typically in the range of 70 to 120 ohms. Output voltage regulation is therefore not ideal. The available negative supply voltage is also reduced by the need to include a series diode at its output as a precaution against destructive latch-up of the chip.

When used as a voltage inverter with the maximum permissible +10 V supply, the 7660 may not generate sufficient negative voltage output to allow, for example, the use of a series voltage regulator (with its typically 2-3 V voltage drop) where regulated negative voltages greater than 5 V or so are required.

The circuit shown overcomes these problems,

providing a regulated negative voltage of -7.5 V at about 35 mA.

Control of the 7660 output is achieved by regulating its positive input voltage, rather than inserting a series regulator in its negative output line. Output voltage drops under load and the forward voltage drop across the output protective diode (D1) are compensated for by boosting the positive supply voltage to the chip.

IC1, an LM723, provides in one package most of the circuitry (voltage reference, error amplifier, series regulator transistor, current limiter) required to control the voltage inverter, IC2.

The error amplifier compares the generated negative voltage with the 723's internal voltage reference, via voltage dividers R1/VR1/R2/R3 and R4/R5, controlling the series regulator transistor, and therefore

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the supply voltage passed to the voltage inverter, so as to maintain a steady condition.

C2/R3 combinations slows the response of the IC1 regulator action, as switching delays inherent in the 7660 do now allow its input to respond instantly to input changes.

R. Martindale  
Mill Park  
Vic

the vehicle and open SW1. The led (D1) should not light up when PB is depressed. Go through the test procedure with the ignition on and test the stop lights, left and right flasher, and parking and brake lights. If the led (D1) lights up then a faulty earth connection exists. Repeat the procedure with SW1 closed and check the leds for each function.

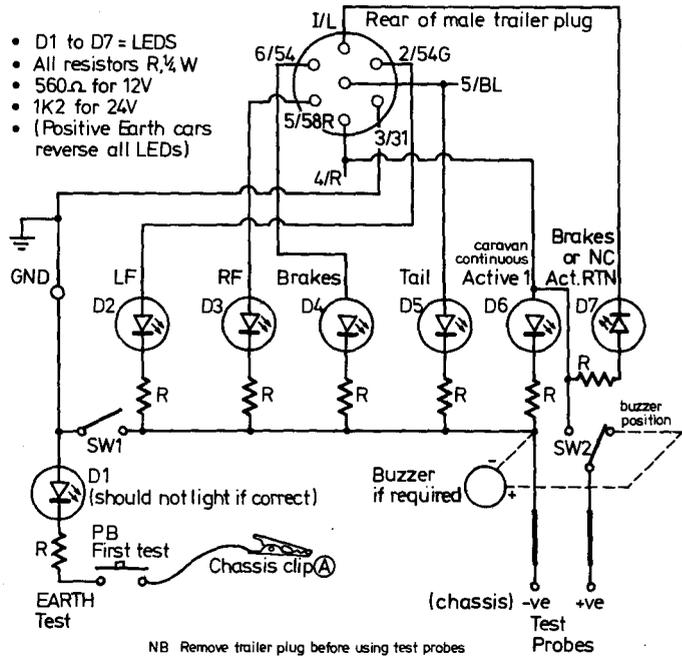
A test facility is provided for detecting voltages in a fault-finding situation. The trailer plug must be disconnected in this mode and the negative test probe connected to the chassis. The positive probe is used for detecting voltages. When the led (D6) lights up then a voltage is present, alternatively if a buzzer is required then switch over SW2.

T. G. Norris  
Port Clinton  
SA

### Trailer wiring test-set

The trailer test-set connections conform to the International Australian Trailer (12V to 24V negative chassis) standard. A cable of suitable length to extend to the front seat of the car should be used to allow you to test the brake lights without someone else holding down the brake pedal.

Connect the chassis clip to a good earth on the frame of



FF 011

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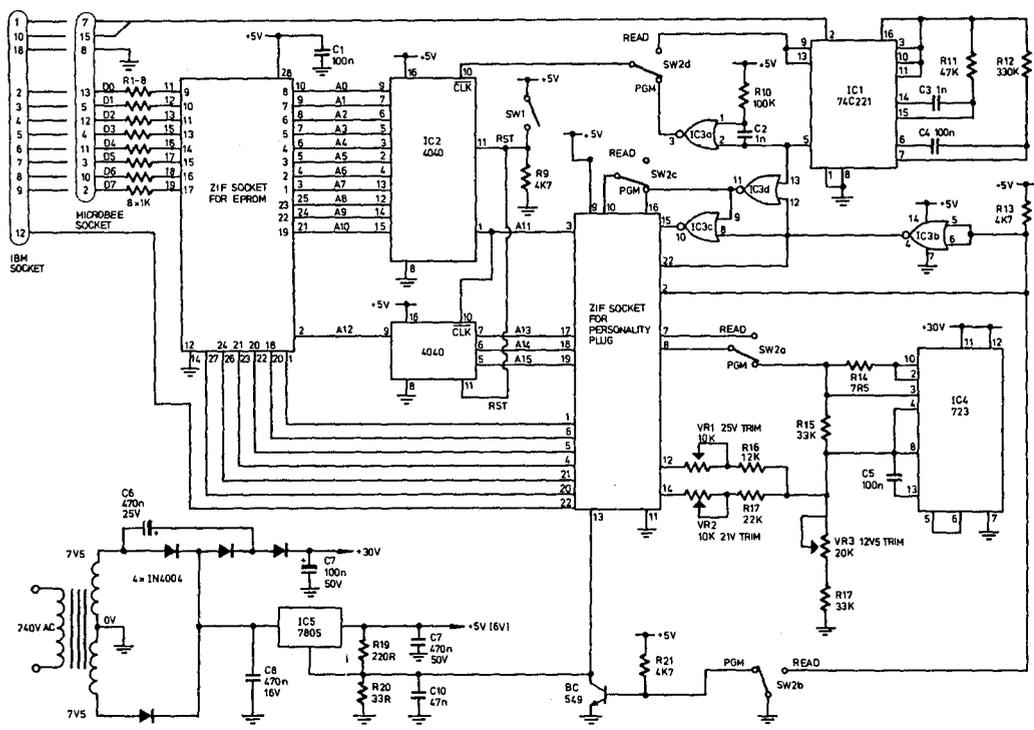
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**Errata**  
 Ooops! We goofed. The circuit for our ETI 688 Eprom programmer upgrade left a bit to be desired. In fact there were so many errors we decided to reprint it in its correct form. Thanks to all the puzzled readers who phoned in.

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17	42	67	92	117	142	167	192	217	242	267	292	317	342
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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
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## Letters

### Thought for food

I wish to comment on ANSTO a new era (ETI June 1988). I believe that the part of this article which discusses food irradiation is misleading and very biased towards the pro-irradiation lobby. A growing volume of scientific literature is raising serious doubts about the dangers of this process. Consumer resistance in the USA is forcing the food chains to reconsider their initial support for the process. The UK and several of the Scandinavian countries have banned the supply of irradiated food.

The pro-irradiation arguments make little sense to me; irradiation is only going to kill mature bugs in fruit etc. Wouldn't you be just as disgusted to find a dead fruit fly grub in your piece of fruit as a live grub? They can't ir-

radiate growing fruit for obvious reasons, so what is the point?

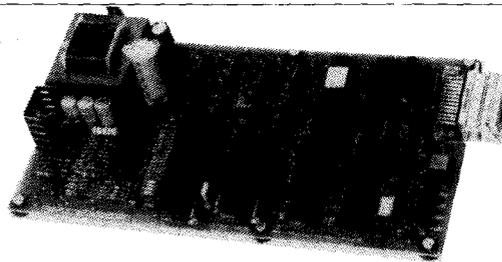
Apart from the logical arguments like the one above, there is growing evidence that cancer causing agents are produced when many foods are irradiated.

G. Lill  
Lindisferne  
Tas

### Wrong!

My entry to ETI Idea of the Month Contest was published on page 125 of the September 1988 edition. Unfortunately the part number of the temperature sensing device was published incorrectly, the part should be LM 35DZ not LM 335 as published.

L. W. Brown  
Burwood  
Vic



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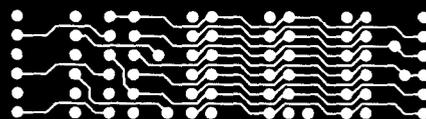
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## BEWILDERING BUDGET BLUES

### *A big drop for ASIS and a slow drip in Queensland*

The gentlemen in gaberdine raincoats, mirror glasses and wide brim hats have now received some of Paul Keating's largesse. According to the fine print in the Budget papers, the very fine print on the back page under the publishers imprint, it appears that ASIO is getting a pay hike of \$2 m. The Australian Security Intelligence Service, so secret even ASIO doesn't know the phone number, is also in the money. Its budget goes from \$15.7 to \$16.6 m without touching the sides.

What they will do with it is not at all clear. However, at least some of it is earmarked for an "Office Automation System" in the Canberra head office. This will be some comfort to those of you who imagined that all that cloak and dagger stuff was over, and that modern spies used computers and super surveillance equipment to keep tabs on what the socialists were doing. Not at all. Instead, it transpires that your typical Aussie spook is still keeping the dirty mac floggers happy, out there in the rain, patiently watching from the grubby Cortina parked under the No Standing sign. Of computer literacy there is not a sign. Make you feel good?

#### **Mobile comms**

Where will it end? Regular readers will know that we have been obsessed with the idea of mobile communications at this magazine. First there was mobile radio, then CB, and lately that wonder of wonders, the cellular phone. Now Aussat promises an L band satellite delivery of telephone channels.

Marvelous you say? Yes indeed, and so say all of us. Yet a little niggle worms away inside my head. I have lived my entire life on the principle that Things are divided in the Great Dichotomy. Outside is where you are, Inside is where I am. There is no great logic to this, except that Outside is where you stay, until I'm good and ready.

Most of us are like this, I suspect. Inside is where a civilised man can be

plain bloody disgusting, and no one else knows, or for that matter, cares. Inside is where you can recharge your batteries, indulge your eccentricities, fart, belch, sing arias like the Fat Lady in Don Giovanni and do a million other things Not Done On Busses.

And along comes the cellular phone. Now, you cannot be private in the bath, on the loo, in bed. Now you must answer, or be answerable. Progress? No doubt cellular phones will help Mr Paul Keating's J curve, and no doubt our efficiency will shoot ahead by leaps and bounds. But still I wonder.

#### **Science in Queensland**

They had been waiting since 1927. At Queensland University they watched the grass grow, Joh come and go, a generation or two of students grow up and pass, or not. And always in the cup-

*'Now, you cannot  
be private in the bath  
on the loo, in bed'*

board in the physics lab, they watched the Experiment.

Then came Expo. Distracted by the dancing girls, the mysterious men in the physics lab got all excited and sweaty palmed. They forgot about the Experiment. At 4.45 pm on July 3, it finally happened, and no one was there to see the black spot appear on the floor.

What was the Experiment? It was set up by Professor Thomas Parnell, to demonstrate that apparently solid objects have plastic properties. His ingenious method: to fill a funnel with pitch and set it in a stand so that it could ooze down the nozzle.

According to the press release from Queensland University, some six drops have fallen; about one every eight years. To keep the record straight, one should have fallen last year. But it did-

n't, and worried Queensland physicists have been speculating as to whether some new phenomenon might have been on the verge of being discovered.

In the end, however, the drip dropped in the most exciting bicentennial event of the year, and Queensland's scientists marked their calendars so they can count the days until the next one drops.

Nowhere in this article does it say, nor should any body interpret this article as saying, that Queenslanders are slow. That is definitely not our position. At all.

#### **What to do with a gun**

Shoot computers of course. Paul La Vista, of Atlanta Georgia owns a practice range where people with gun can go and do some target practice. He had a brainwave during the recent Comdex computer show which was held in Atlanta. He replaced the human dummies with computers, and invited the guests to the show to come on out and visit the range.

They did, in droves by all account. La Vista made several types of computers, machine guns and ammunition available to his patrons. Favourites appeared to be hard discs and personal computers. According to La Vista, several "heavy duty industry types" went 'manic', turning hard discs into flakes with an Israeli Uzi submachine gun.

"Another bunch bought in some kind of technical manual. The thing was enormous. They borrowed three machine guns and when they left it looked like confetti. A party of seven men once carried in a huge old printer and connected it to the power supply. Just as it commenced to whirr and spit out paper (presumably wrongly), they blasted it."

This article will be of great inspiration to those readers who have ever sat up late with a truculent computer. Now you know what to do with it. Teach it a damn good lesson.

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# COMING EVENTS



## 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. Contact (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.

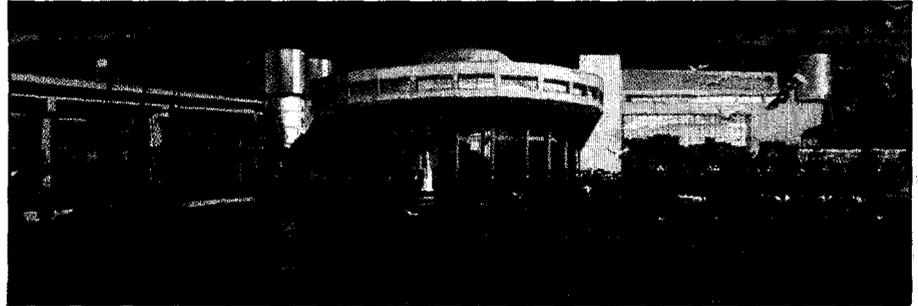
The **Sydney Apple User Group** meets the first and second Monday of every month at the Stephen Roberts Theatre at Sydney University. Contact Graham Clarke (02) 958-2709.

**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.

## OCTOBER

**30-Nov 3: 9th International Conference on Computer Communication** will be held at the Hilton Hotel, Tel Aviv. For more information contact Dr J. Raviv, Secretariat, ICCC '88, PO Box 50006. Tel Aviv 61500, Israel.

**31: CSIRO Division of Applied Physics—Golden Jubilee Symposium and Open Days.** Symposium Oct 31 to Nov 2. Open days Nov 4, 6. Inquiries: J Cook, DAP, PO Box 218, Lindfield 2070. (02) 467-6211.



Artist's model of the Darling Harbour Convention Centre.

## NOVEMBER

**6-10: The International Symposium and Exposition on Robots** will be held at the Sydney Hilton and Centrepoint. Contact the Australian Robot Association, GPO Box 1527, Sydney NSW 2001.

**7-10: The International Robot Show.** Contact Australian Exhibition Services, 242 St Kilda Road, Melbourne, Vic 3004. Phone (03) 267-4500.

**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.

## 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.

## NEXT YEAR

**4-17 Feb: Beyond 2000 Spectrum Exhibition.** Royal Exhibition Building, Melbourne. Information from Spectrum Exhibitions. (02) 281-2555.

**13-17 Feb: 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.

**14-17 March biannual: PC89 The 12th Australian Personal Computer Show** at Darling Harbour, Sydney. Contact (03) 267-4500.

**14-17 March annual: ELENEX AUSTRALIA The Australian International Electrical & Electronic Industries Exhibition** at Darling Harbour Sydney on (03) 267-4500.

**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. Contact (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.

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