Electronics Today

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INTERNATIONAL

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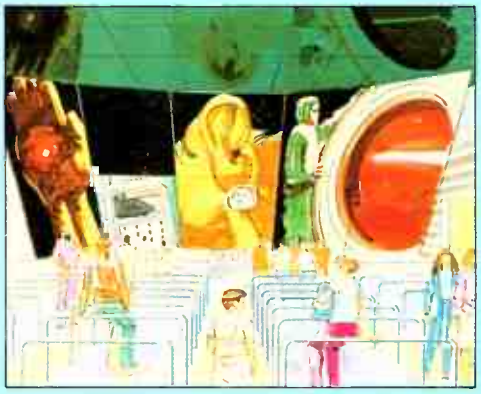
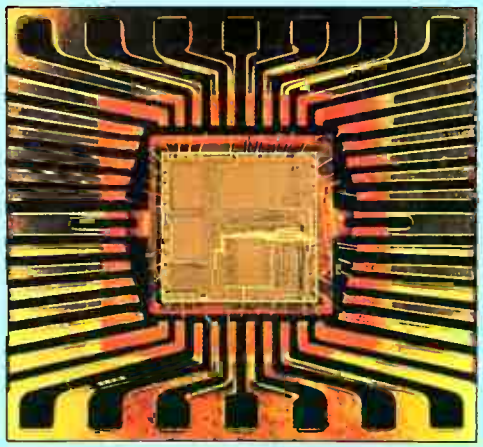


LEISURE TECHNOLOGY SHINES AT EXPO



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BUILD:

- EPROM PROGRAMMER
- MOTOR BIKE ALARM
- RTTY/PRINTER

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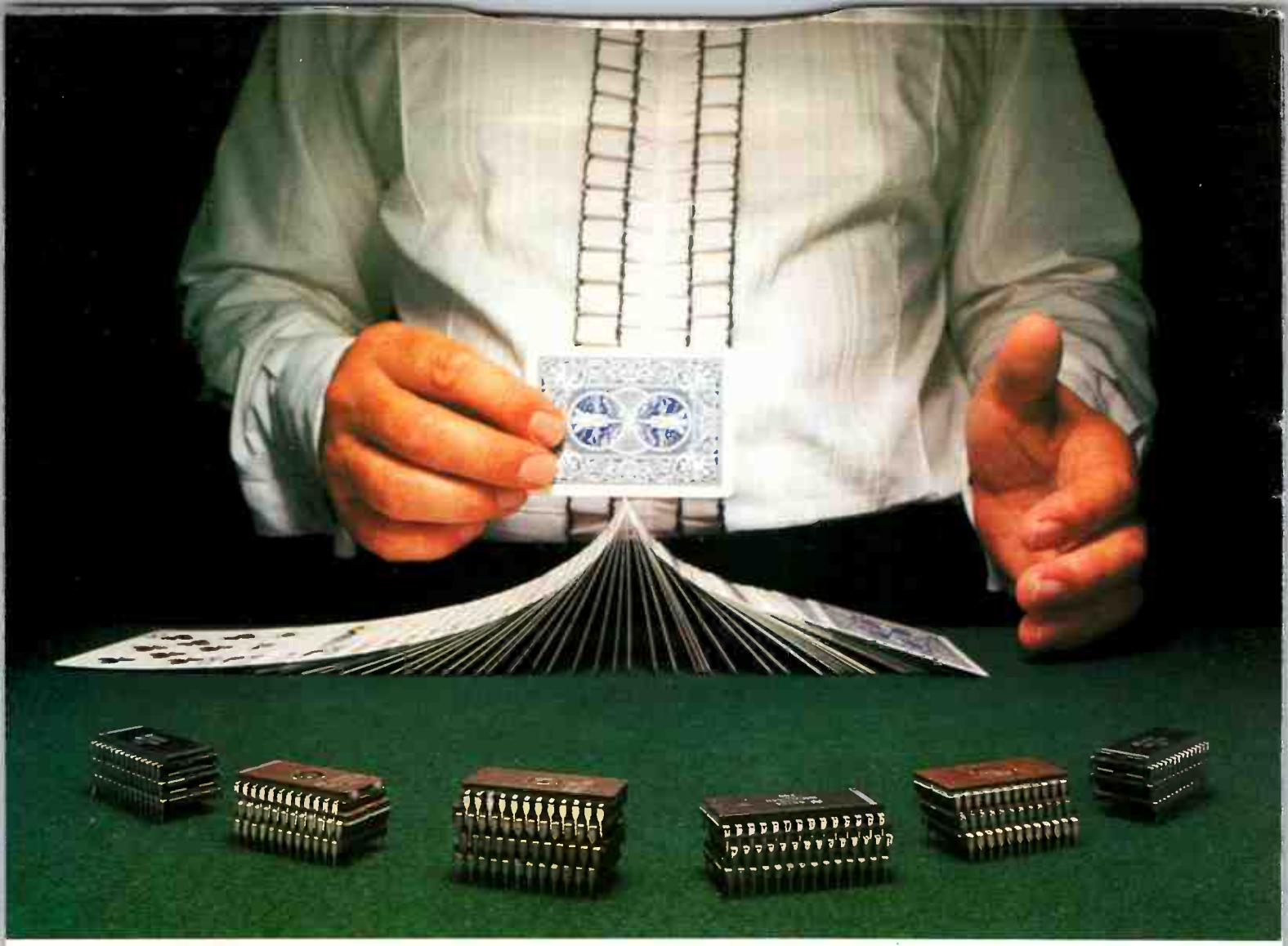
World Radio History



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There's the Orion microprocessor development system. It's fast and foolproof. And it lets you see what you're designing, so debugging is easy.

The Stag PPZ Universal Programmer is the swift, accurate, software controlled way to program chips for any technology.

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MAY 1988

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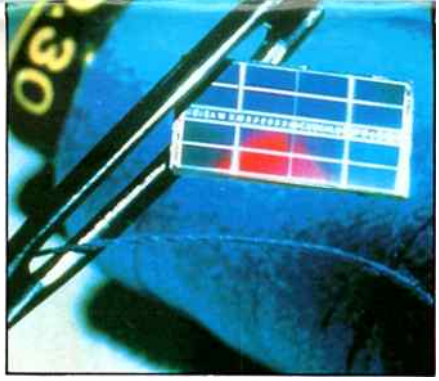

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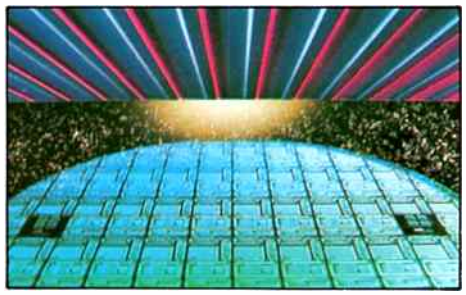

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World Radio History

What's the greatest threat facing the computer today?

Australian and American experts agree on what it is, although their estimates of how much it costs you in downtime varies. Americans believe it accounts for more than 30% of all computer failures. Yet some Australians say their practical experience leads them to believe 70% would be a far more accurate figure.

Surprisingly enough, the greatest threat to your computer is the very power it runs on.

The way to control the power to your computer and avoid these costly breakdowns is with Clean Line Systems. Their power conditioners, uninterruptible power supplies and other products and services can eliminate all disruptive power line disturbances. They provide stable, clean electrical energy. They can combat the damaging effects of lightning and even have inbuilt safety systems to ensure the power to your computer is never cut off unexpectedly.

Clean Line Systems is a wholly Australian-owned company that designs and manufactures its own equipment. They are the people more computer companies choose to protect their corporate computers.

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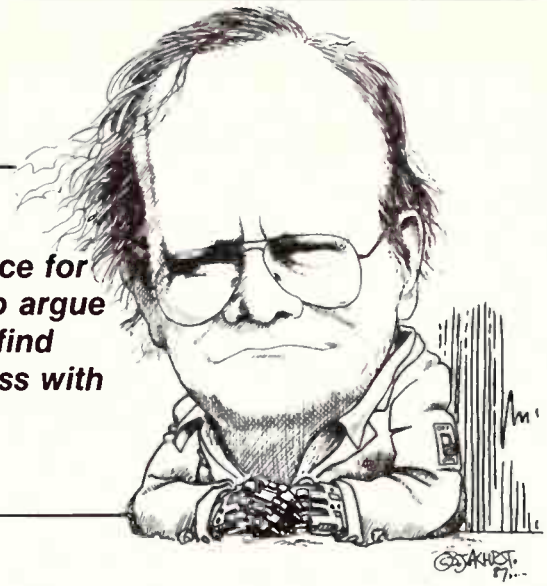
World Radio History

Frequency



"It is standard practice for foreign companies to argue that they cannot find anyone to do business with in Australia."

While there will be cheers all round now that the government has decided to do something about its offsets legislation, the new arrangements (See News Digest, this month) are scarcely any advance on the old ones.

The idea behind offsets policies is that a foreign corporation, in chasing government contracts, should be forced to do a certain amount of business in Australia. This might take many forms, increasing value added to goods in Australia, purchasing in Australia, transfering goods overseas. The new arrangements appear to remove the last obstacles to the type of work that could justify as ofsets. Attractive, you might say?

The problem is that the offsets policy is basically flawed. Instead of tinkering with it, Senator Button ought to throw the baby out with the bathwater, and rethink the whole strategy of how we deal with foreign companies and government purchasing.

The flaws in offset arrangements are twofold. Firstly, there is no effective penalty system of any sort for not complying with its provisions. It is standard practice for foreign companies to argue that they cannot find any one to do business with Australia, and equally standard practice for Canberra to agree with them. The result is that offsets are routinely ignored.

Secondly, we have to accept that there is precious little reason why foreign companies would want to do business here. Our manufacturing costs are not so significantly different from the rest of the world that a multinational would go to the trouble of setting up a manufacturing base for economic reasons. As for the oft-repeated claim that conditions could be made such that multinationals would actually do their research here, experience has shown it to be a pipe dream. Research laboratories, because they are so intimately tied to company policy and the company's perception of the future, are by and large kept close to home.

In seeking to use foreign companies to prop up local ones, the government is making a stick for its own back. It's far too difficult to get it right. Probably easier, and certainly more effective, would be a local purchasing policy. For a start the problems with such a policy are easier to identify, simply because we have so much more experience with them.

For instance, it has always been the Australian experience that local preference has turned into a local con job, in which the public has paid the price. Must it always be so? Have our civil servants not the wit to design a local manufacturing policy for government purchasing that would preserve competition and make our industries more competitive, more innovative, than they are now?

The question is worth asking, because, the size of the Australian market being what it is, the various levels of government in this country are the only organizations that have the ability to significantly affect the manufacturing sector. It's about time they did.

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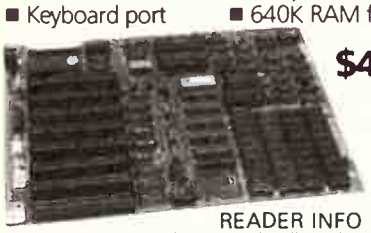
10MHz TURBO PLUS MOTHERBOARD

This 10MHz, no-wait-state board is a drop-in replacement for the sluggish 4.7MHz PC motherboard.

- 8088-3 running at 10MHz/no wait states
- Turbo/normal selectable
- 4 channel DMA
- 8 expansion slots
- Keyboard port
- 640K RAM fitted



$475

READER INFO No. 35

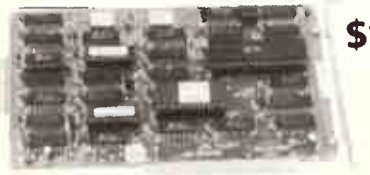
8MHz Turbo Motherboard still available at new low price. Was $450.00.

NOW ONLY $425

1.2MB/360KB FLOPPY CONTROLLER

The perfect answer for backing up hard disks, archiving etc.

- Supports both 1.2MB and 360KB drives
- Fully PC/XT, PC/AT compatible
- For suitable drive see below



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READER INFO No. 36

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Drop-in replacement for IBM PC's puny 63W supply.

- Boosts PC to PC/XT specs. Essential to run hard discs and other ad-ons on PC.
- Outputs +5V/15A, –5V/1A, +12V/5A, –12V/1A.
- All cables to disk drives, motherboard etc.

$148

READER INFO No. 37

AUSTRALIA'S BEST SPEEDUP CARD

Speed up your PC over 7 times with our superb new speed-up card.

- 80286 CPU *plus* 8088 for complete software compatibility
- Clock rate 6/8MHz (selectable)
- RAM on-board for disk cache
- DMA support
- Socket for 80287 co-processor

$545 Limited Stock

READER INFO No. 38

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FLOPPY DISK CONTROLLER

Controls up to 4 DS/DD 360K drives.

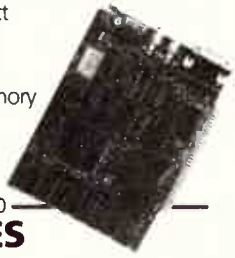
$65

READER INFO No. 39

PEGA EGA card – unmatched resolution

Get all the standards with this superb short slot EGA card.

- Supports Monochrome, Hercules, CGA, EGA and Plantronics modes. Fully Auto switchable.
- Supports 132 columns in Symphony, Lotus and WordPerfect
- Automatic monitor detection
- 256K of video memory standard
- Flicker free scrolling



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READER INFO No. 40

DISK DRIVES

40 Track Mitsubishi.

Very fast track-to-track. 360KB DSDD. Lowest price in Australia. **$245**

1.2MB NEC

Super high density. Superb construction and reliability. Works with 1.2MB floppy controller. **$275**

20MB NEC Hard Disk.

Very fast and super reliable. Best price in town. **$695**

Complete with controller. **$895**

READER INFO No. 41

XT Style Case with Hinged Lid

Perfect for building your own PC.

READER INFO No. 42

$95

MEMORY

512K Ram Card – Short Slot

- 512K RAM installed (41256 chips)
- DIP switches to start address

$195

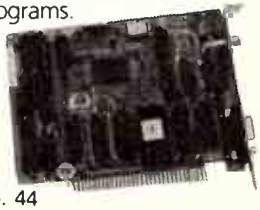
READER INFO No. 43

640K Ram Card – Short Slot

- 640K memory installed
- User selectable from 64K to 640K
- DIP switches to start address **$225**

Colour Graphics/Mono – Short Slot

This amazing new card drives RGB colour, composite colour or a TTL monochrome monitor. And it fits in a short slot. Full CGA support. Can be used as a colour graphics card with a monochrome display and still run all the colour programs. The card even cures the dread colour graphics "flicker and snow".



$195

READER INFO No. 44

World Radio History

Colour Graphics Video Card

- Suits RGB and composite colour monitors
- Light pen interface
- Fully CGA compatible
- 40 x 25 & 80 x 25 (text), 640 x 200 (mono) and 320 x 200 (colour)

$115

READER INFO No. 45

Colour Graphics/ Printer Adaptor

Attaches to IBM-compatible RGB monitor; provides complete compatibility with IBM Colour Graphics Adaptor. Equivalent to the IBM colour/graphics adaptor with additional printer port to replace the video port originally supplied by IBM.

$145 READER INFO No. 46

Parallel Printer Card

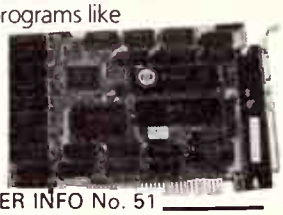
- Standard TTL level
- Centronics printer port, full IBM, EPSON compatible

$44

READER INFO No. 50

Turbo Mono Graphics/ Printer – Short Slot

If you want fast, flicker free scrolling and full Hercules compatability, this is it! Perfect enhancement for slow scrolling programs like Microsoft Word etc. The ultimate monochrome graphics card.



$175

READER INFO No. 51

Serial RS-232 Card

- Independent receive clock input
- 2nd serial port option
- Full buffering eliminates need for precise synchronisation

$55

NEW PC/XT PRODUCTS the power you're searching for!

2.5MB Multifunction card for PC/AT

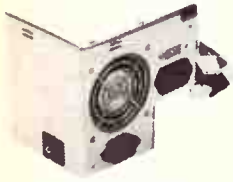
READER INFO No. 47

Give your AT a big boost with this superb quality, low cost expansion card.

- One RS232C serial port
- One parallel printer port
- Memory expansion to 2.5MB (0K fitted)
- Fully PC/AT compatible

$495.00 READER INFO No. 52

180W AT Power Supply



Suits all IBM PC/AT compatibles.

- User selectable 115/230V AC input
- Outputs: +5V/17A, –5V/0.5A, +12V/7A, –12V/0.5A Overload protection
- Short circuit protection
- Cooling fan stops when voltage output falls to zero
- Top quality components used throughout

$195.00

READER INFO No. 48

Enhanced Keyboard suit both PC/AT and XT

The finest keyboard on the market.

- Suits both IBM PC/XT and AT (switchable)
- Full 101 keys with separate cursor and numeric pad
- Superb key action
- Lights for caps, num and scroll lock

$145 READER INFO No. 49

10MHz Baby AT Motherboard

Ultra high performance PC/AT motherboard outperforms all the others. Drop it into your existing PC/XT! Up to 1MByte of RAM on-board (640K fitted)

- 80286-8 running at 6/10MHz switchable.
- Speed test 11.7 on Norton Utilities
- 7 channel DMA for disk and special I/O
- 8 expansions slots (6 full AT standard)
- On-board battery backup, real time clock
- Phoenix ROM BIOS

$945 READER INFO No. 53

Baby AT Case

$135.00

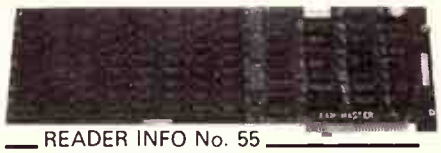
READER INFO No. 54

Suits "Baby AT" motherboard or 10MHz PC/XT motherboard.

- Hinged cover for easy access
- Keyswitch, reset/turbo buttons, indicators

2MB EMS Memory Card for PC/XT or AT

An affordable "Above Board" memory card. Fit up to 2MB of high speed RAM (0K fitted). At a low introductory price: **$495**

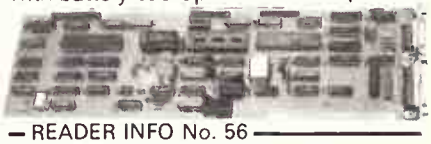


READER INFO No. 55

Multi I/O Card

- Floppy disk adaptor, 2 drives DS/DD
- 1 serial port, 1 parallel port, 1 joystick port
- Clock/calendar with battery backup

$175

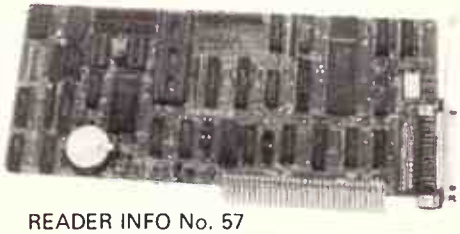


READER INFO No. 56

I/O Plus Card

- Clock calendar with battery backup
- 1 serial port, 1 parallel port, 1 joystick port

$136



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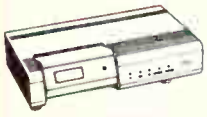

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- LED monitor for walk test
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Cat S12500	Normally $7.95	
1-9	10+	25+
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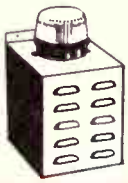

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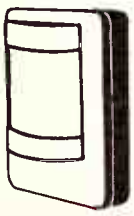
Housed in a waterproof, metal case, with tamper switch.

SPECIFICATIONS:
Siren:
DC 12V 450 mA
Impedance 8 ohm
S P L (dB/W) 110
Dimensions 135 x 150mm
Flashing Light:
DC 12V
100 flashes per minute
Dimensions 82 x 100mm
..... $89.50



PASSIVE INFRA-RED DETECTOR

(WP-800)

FEATURES:
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- Wall/corner/ceiling mount
- Micro switch tamper proof protection
- 24 detection beams in 3 different ranges
- N C silent S P S T dry relay contact output
- Alarm auto reset approximately 3 seconds after triggered
- Superior RFI immunity protection
- Extremely low power consumption
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- Easy installation, easy adjustment
- Dual element, low noise, high signal to noise ratio pyroelectric
- Detection degree indicator
- D C 8-16V power operating

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P10565	16 pin	$0.35	$0.20
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P10568	20 pin	$0.40	$0.30
P10569	22 pin	$0.40	$0.30
P10570	24 pin	$0.40	$0.30
P10572	28 pin	$0.50	$0.40
P10575	40 pin	$0.50	$0.40

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S13022	2 pol 2-6 pos	$1.95
S13033	4 pol 2-3 pos	$1.95
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P10884	DE9P R A Plug	$3.65
P10885	DE9S R A Skt	$4.25
P10890	DA15P Male	$2.10
P10891	DA15S Female	$2.25
P10892	DA15C Cover	$1.25
P10894	DA15P R A Plug	$4.25
P10895	DA15S R A Skt	$5.00
P10900	DB25P Male	$1.00
P10901	DB25S Female	$1.20
P10902	DB25C Cover	$1.25
P10904	DB25P R A Plug	$4.50
P10905	DB25S R A Skt	$5.95

CANNON TYPE CONNECTORS

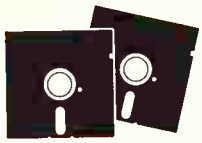
1-9	10+
P10960 3 PIN LINE MALE	
$3.90	$3.50
P10962 3 PIN CHASIS MALE	
$3.00	$2.50
P10964 3 PIN LINE FEMALE	
$4.50	$3.90
P10966 3 PIN CHASIS FEMALE	
$4.95	$3.95

10 TURN WIRE WOUND POTENTIOMETER

Spectrol Model 534
¼" shaft.
Equiv (Bourns 3540S Beckman 7256)
Dials to suit 16-1-11, 18-1-11 21-1-11

R14050	50R	R14100	5K
R14055	100R	R14110	10K
R14060	200R	R14120	20K
R14070	500R	R14130	50K
R14080	1K	R14140	100K
R14090	2K		

1-9	10+
$9.95	$9.50



"NO BRAND" DISKS!!

Now you can buy absolute top quality disks that are also the cheapest in Australia! They even come with a 5 year guarantee! 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 (5¼" disks includes write protects)

5¼" "NO BRAND" DISKS

DOUBLE SIDED/DOUBLE DENSITY

10 - DISKS	100 - DISKS	1000 - DISKS
$9.00ea	$8.50ea	$8.00ea

(ALL PRICES PER 10 DISKS)

3½" "NO BRAND" DISKS

DOUBLE SIDED/DOUBLE DENSITY

10 - DISKS	100 - DISKS	1000 - DISKS
$27	$26	$24

(ALL PRICES PER 10 DISKS)

HIGH INTENSITY RED LED BAR GRAPH

Dimensions:
Overall 63mm across 5mm high
LEDs 10 x 5mm x 1mm

Cat No	1-9	10+
Z10180	$2.95	$2.75

½" HIGH INTENSITY RED LED DISPLAYS

(Available in Common Cathode and Common Anode)

Dimensions:
Overall 12.7mm across 19mm high
Display 12.7mm(H) x 7.3mm(W)
Segment Width 1.2mm
Brightness 3400 ucd I_F 10mA

COMMON CATHODE:

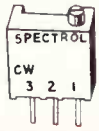
Pin 1 Segment E	Pin 6 Segment B	
Pin 2 Segment D	Pin 7 Segment A	
Pin 3 CC	Pin 8 CC	
Pin 4 Segment C	Pin 9 Segment F	
Pin 5 Segment Dp	Pin 10 Segment G	

Cat No	1-9	10+	100+
Z10190	$1.95	$1.75	$1.50

COMMON ANODE:

Pin 1 Segment E	Pin 6 Segment B	
Pin 2 Segment D	Pin 7 Segment A	
Pin 3 CA	Pin 8 CA	
Pin 4 Segment C	Pin 9 Segment F	
Pin 5 Segment Dp	Pin 10 Segment G	

Cat No	1-9	10+	100+
Z10191	$1.95	$1.75	$1.50



SPECTROL 64Y MULTI TURN TRIMPOTS

Cat No	Description	1-9	10+
R14700	10R	$3.50	$3.20
R14710	20R	$3.50	$3.20
R14720	50R	$3.50	$3.20
R14730	100R	$3.50	$3.20
R14740	200R	$3.50	$3.20
R14750	500R	$3.50	$3.20
R14760	1K	$3.50	$3.20
R14770	2K	$3.50	$3.20
R14780	5K	$3.50	$3.20
R14790	10K	$3.50	$3.20
R14800	20K	$3.50	$3.20
R14810	50K	$3.50	$3.20
R14820	100K	$3.50	$3.20
R14830	200K	$3.50	$3.20
R14840	500K	$3.50	$3.20
R14850	1M	$3.50	$3.20

PUSH BUTTON DIALLERS

Tired of old fashion dialling and re-dialling engaged numbers? These convenient push button diallers include last number redial (up to 16 digits) and instructions for an easy changeover

Cat A12030 **Normally $19.95**
SPECIAL, ONLY $14.95
(Note: Not Telecom approved)

OMNI-DIRECTIONAL WIRELESS MICROPHONE

Tuneable: 92 - 104MHz
Freq. Response: 50 - 15kHz
Range: Over 300 feet in open field
Modulation: FM
Power Source: 9V Battery
Type: Electret Condenser
Dimensions: 185 x 27 x 38mm
Weight: 160 grams
Cat A10450 $19.95

SUPER HORN TWEETER

- Requires no crossover and handles up to 100W!
- Sensitivity 100dB/0.5m
- Frequency Response 3kHz-30kHz
- Impedance 8 OHMS
- Size 96mm diameter

Cat C12102 **Normally $12.95**
SPECIAL, ONLY $9.95

CAR ANTENNA BOOSTER

- In-line instalation
- 12V boosts 100%

Cat A12073 $7.95

STEREO WIRELESS TRANSMITTER

This unit was developed to allow portable compact disc players to be used in cars by transmitting the headphone output signal directly in to your stereo FM car radio. It will also transmit any mono/stereo signal from any headphone output to any FM receiver

SPECIFICATIONS:
- Input 3.5mm stereo phone plug Impedance 32 ohm
- Mono/stereo switch has plug mounting clip
- FM Transmission approx 90-35MHz (Tuneable 89-91MHz)
- Range 15 metres (below 15mV/m at 100 metres)
- Power 1.5V AAA size batteries (100 hours continuous use)
- Size 72 x 38 x 21mm

A16100 ..... $69.95

UV EPROM ERASER

Erase your EPROMs quickly and safely. This unit is the cost effective solution to your problems. It will erase up to 9 x 24 pin devices in complete safety, in about 40 minutes (less for less chips)

Features include
- Chip drawer has conductive foam pad
- Mains powered
- High UV intensity at chip surface ensures EPROMs are thoroughly erased
- Engineered to prevent UV exposure
- Dimensions 217 x 80 x 68mm

WITHOUT TIMER

Cat X14950 **Normally $97**
Special, $79

WITH BUILT-IN TIMER

Cat X14955 $139
Special, $99

BRAND NEW FANS

Quality new fans for use in power amps, computers, hotspot cooling etc. Anywhere you need plenty of air

240V 4⅝"	Cat T12461	$14.95
115V 4⅝"	Cat T12463	$14.95
240V 3½"	Cat T12465	$14.95
115V 3½"	Cat T12467	$14.95

10+ fans (mixed) only $10 each!

FAN GUARDS TO SUIT

4⅝"	Cat	T12471	$3.95
3½"	Cat	T12475	$3.95

TEXTOOL SOCKETS

P17016 16 pin	$14.95
P17024 24 pin	$18.50
P17028 28 pin	$24.95
P17040 40 pin	$29.50

AUTOMATIC CABLE STRIPPER

- Stnps cable with diameter of 1.1-6, 2.2-6, 3.2mm
- Fully automatic action. Squeeze grip will simulataneously strip and eject insulation
- Length 180mm (7")

T11532 ..... $19.95

12 WAY TERMINAL BLOCKS

P18050	240V 10AMP	$1.95
P18052	240V 15AMP	$1.95

DIODE SPECIALS

We have millions of diodes in stock!

1-99	100+	1000+
IN4148 Small signal Cat Z10135		
3c	2½c	2c
IN4004 400V 1A Cat Z10107		
4c	3½c	3c

QUALITY 3mm LEDS

Cat. No. Col.	1-9	10+	100+
Z10140 Red	$0.15	$0.12	$0.10
Z10141 Grn	$0.20	$0.15	$0.12
Z10143 Ylw	$0.20	$0.15	$0.12
Z10145 Ora	$0.20	$0.15	$0.12

QUALITY 5mm LEDS

Cat. No. Col.	1-9	10+	100+
Z10150 Red	$0.10	$0.09	$0.08
Z10151 Grn	$0.15	$0.12	$0.10
Z10152 Ylw	$0.15	$0.12	$0.10

ECONOMY TRANSFORMERS

	1-9	10+
2155 240V 6-15V 1A Cat M12155	$9.95	$8.95
2156 240V 6-15V 2A Cat M12156	$14.95	$13.95
2840 240V 9V CT Cat M12840	$5.95	$4.95
2851 240V 12-6V CT 150mA Cat M12851	$5.95	$5.50
2860 240V 15V CT 250mA Cat M12860	$5.95	$4.95
6672 240V 15-30V 1A tapped Cat M16672	$14.95	$13.95

10 AMP RELAY

S P D T 12V Coil 240V (S14114)

1-9	10+	100+
$4.95	$3.95	$3.75

RS232 FAST CABLER

Makes RS232 interface configurating fast and simple. 3 slide switches enable line swapping functions, positive and negative voltages are displayed on 6 tricolour LED's

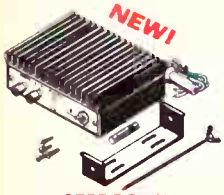
SPECIFICATIONS:
Connector: DB25 plug on 100mm cable and DB25 socket on 100mm cable
Indicators: Tricolour LED's for pins 2(TD), 3(RD), 4(RTS), 5(CTS) 6(DSR), 20(DTR)
Switches: 3 Slide switches to swap leads
Power: Interface power
Enclosure: Black high impact plastic
Dimensions: 85 x 95 x 30mm
X15710 ..... $145

008 335757 TOLL FREE MAILORDER HOTLINE FOR CREDIT CARD ORDERS! LOCAL ORDERS & INQUIRIES CALL (03) 543 7877

World Radio History

WHATS NEW AT ROD IRVING ELECTRONICS?

NEW!



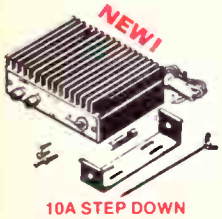
STEP DOWN CONVERTER DC-DC

Built around a heavy duty heatsink this unit features the latest transistor switching technology to convert 24V DC to 13 8V DC Finished in matt black with a unique mounting bracket makes it the best in its class

SPECIFICATIONS:
Input Voltage: 24V DC
Output Voltage: 13 8V DC
Primary Current: 4 2A (24V input 4A output)
Output Current: 4 Amp continuous rated (5 5A max)
Size: 125(W) x 50(H) x 90(D)mm
Weight: 450 grams

A16155 ..... **$99.95**

NEW!



10A STEP DOWN CONVERTER DC-DC

Built around a heavy duty heatsink this unit features the latest transistor switching technology to convert 24V DC to 13 8V DC Finished in matt black

SPECIFICATIONS:
Input Voltage: 24V DC
Output Voltage: 13 8V DC
Primary Current: 11A (24V input 10A output)
Output Current: 8 Amp continuous rated (12A max)
Size: 125(W) x 50(H) x 175(D)mm
Weight: 900 grams

A16160 ..... **$119.95**

NEW!

FOOT SWITCHES

- Momentary or on-off models to choose from
- Cord length 2 5 metres
- 6 3mm plug

A17000 Momentary operation
A17005 Push On Off operation
each $19.95

NEW!

INSTANT "SUPER" GLUE

2 gram plastic tube with instructions Suitable for all purpose applications

H11815 ..... **$1.95**

NEW!

6 WAY U.S. TELEPHONE CABLE (W11332)

- 6 conductors 7 strands 0 16mm
- Conductor insulated O D 1mm
- Sheath cream P V C
- O D 7 x 2 5mm

1-9 metres	10 + metres
$0.90/m	**$0.75/m**

NEW!

CD TO CAR CASSETTE STEREO ADAPTOR

Enables a portable CD player or portable TV to be played through any car speaker system by using the cars cassette player Reduces the risk of theft Just plug in when required, and remove when you are finished Hard wiring not needed

A10011 ..... **$29.95**

NEW!

TELEPHONE EXTENSION BELL

- 10 metre length extension cord
- Features US type plug
- Use with US Australian adaptor

Y16043 ..... **$25.95**

NEW!

TELEPHONE INDUCTION COIL

- For recording or amplification
- 3 5mm plug with 1 metre cord
- Peel-off stick-on adhesive back

A12032 ..... **$5.95**

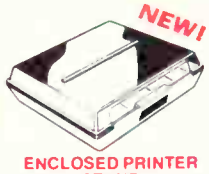
★★★★★★★

10mm JUMBO LED's

Z10155	Red	$1.00	$0.90
Z10156	Green	$1.00	$0.90
Z10157	Yellow	$1.00	$0.90

★★★★★★★

NEW!



ENCLOSED PRINTER STAND

- Keeps your paper and print-outs neat and orderly
- Transparent cover makes it easy to check on paper supply
- Paper can be fed from the centre or the rear according to the design of the printer
- Removable drawer which allows paper to be changed without moving the printer
- Retractable rear basket makes print-out collection fast and convenient
- Suitable for most printers

C **$69.95**

NEW!

U.S. PCB MOUNTING TELEPHONE SOCKETS

4 WAY: 4 Slot, 4 pins wired, small size
6 WAY: 6 Slot, 6 pins wired, medium size

Cat No	1-9	10 +
Y16008 (4 Way)	.....	**$2.60**
Y16009 (6 Way)	.....	**$2.95**

PORTASOL

FULLY PORTABLE GAS OPERATED SOLDERING IRON!

- No cords, batteries or gas bottles!
- Heavy duty, tip temperature up to 400°C
- Adjustable temperature equivalent to 10-60 watts
- Hard working, up to 60 minutes continuous use, refills in seconds.
- Powered by standard butane gas lighter fuel
- Range of easily replaceable screw-in tips available. 4·8mm, 3·2mm, 2·4mm, and 1·0mm. The tips include the patented catalytic converter.
- No leakage current to sensitive circuits
- There is NO FLAME during soldering
- The same principles that make gas cigarette lighters safe are applied to the PORTASOL.

Cat.T12637 ..... **only $39.95**

★★★★★★★

INDUSTRY NEWS

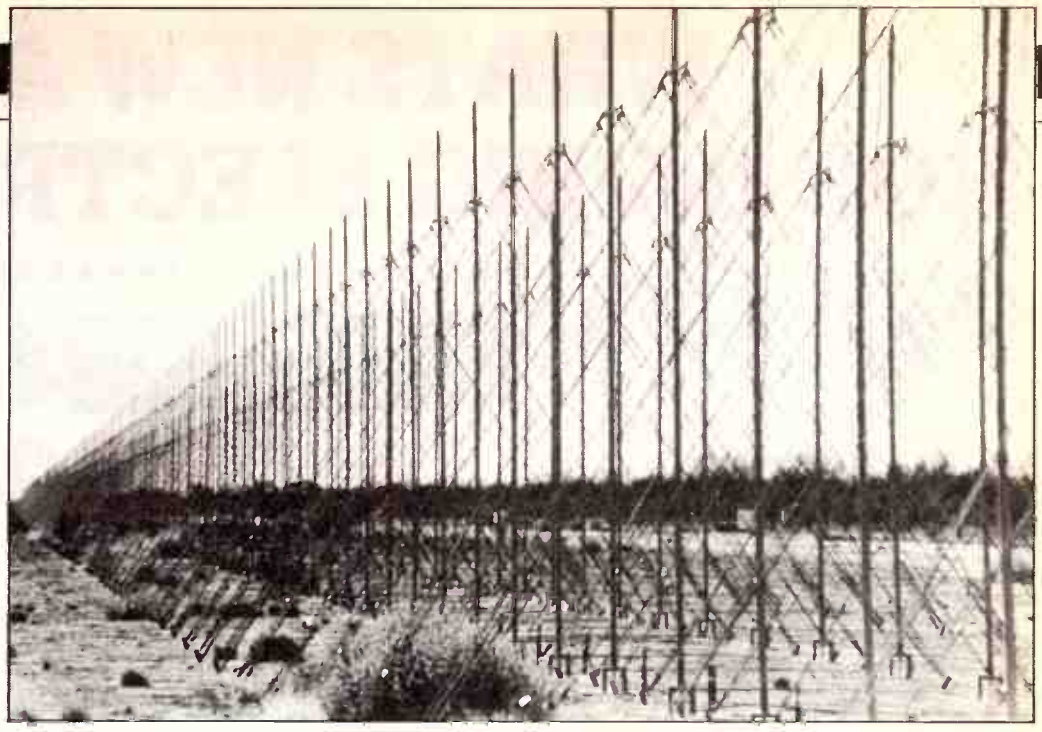
Robert Paul has been appointed general manager of Minicomputer maker Webster's new British operation. He was formerly with Webster in Queensland. Webster's sales into Europe have doubled over the last two years, and are now running at $650. Company heads expect this to rise dramatically with the appointment recently of a local distributor, Thames Microsystems.

* * *

Information storage company Storage Technology has announced net income for the year of $26m. Ryal Popper, the Chief executive officer, attributed the result to strong growth in the US market.

* * *

Motorola new Veep CD Tam is the first Asian to be appointed to such a height in Motorola, a US based concern. The move reflects the growing importance of the Pacific rim to Motorola. Tam was responsible for setting up the Hong Kong integrated design centre which handles Australian design for Motorola, as well as from other countries in the region.



Jindalee Antenna's Under Test

Antennae designed to withstand Top End cyclones should be fully operational at the Jindalee transmission site near Alice Springs later this year. Jindalee is the over-the-horizon-radar (OTHR) now commissioning in the Northern Territory.

Radio Frequency Systems (RFS), as subcontractor to AWA, will design, install and commission the antenna and masts for the Department of Defence.

Among the most challenge aspects of the project was designing the installation to withstand cyclonic conditions.

The company's engineering services manager, Mr Barry Styles, said: "We put about 80 per cent of our effort into producing a design that meets Australian wind-loading standards — among the toughest in the world.

The marketing manager for RFS Odd-Erik Jenssen, said today the company had recently achieved very stringent specifications which had been set for the 25kW balun transformers that would be used in conjunction with the antennae.

Mr Jenssen said the RFS antennae and supporting equipment were a significant improvement on the existing Jindalee facility and the company expected to have it operational by the end of the year using RFS technicians based on the Jindalee site.

OTHR systems give far greater coverage and penetrate much longer distances than conventional radar by beaming the signal skywards and bouncing it off the ionosphere and back to earth.

Conventional radar can operate only as far as the horizon.

Consequently, targets of all sizes and at any altitude can be illuminated up to 3,000 km away, compared to about 43 km by conventional radar, which may also fail to detect small targets at low altitude over the horizon.

In Australia, research into OTHR was begun by the Defence Science and Technology Organisation about 1974.

The Minister for Defence, Mr Kim Beazley, announced in October 1986 that a network of over the horizon radars would be developed to give Australia the capability to monitor activity over wide areas and greater distances, far in excess of that obtainable for the same cost using conventional radar. Total research and development cost for the system from 1974 to 1986 has been about $40 million.

The total cost of the Jindalee project, including the current update and the longer term extension of the network will be in excess of $500 million.

The current phase, worth more than $57 million, involves the upgrading of the experimental radar near Alice Springs to provide a test bed for scientific, engineering and operational development.

When the system has been fully developed — expected to be some time in the early 1990s — it will provide Australian defence forces with 24-hour surveillance of our remote northern approaches, not only for defence purposes, but with benefits for weather observation and forecasting.

RFS Australia is part of an international group of companies specialising in the field of radio frequency transmission.

The initial company was founded in 1967 and in March 1987 Antenna Engineering Australia, a subsidiary of Kabelmetal Electro of West Germany, and Hills Industrial Antenna Systems Division, combined to form the present organisation.

World Radio History

ABS Launches CDATA 86

The Australian Statistician, Ian Castles, has announced a new service from the Australian Bureau of Statistics (ABS), the availability of population census data on a compact disc.

For the first time complete details from two national censuses can be displayed on personal computers and printers as tables or coloured maps.

The ABS has signed an agreement with a Melbourne company, Space-Time Research, which produces software on floppy discs known as Superamp to retrieve and manipulate the census information on desk top computers.

The Census data is held on one compact disc. The data is read from the disc by a compact disc reader and transferred, through the software, to the screen of a standard personal computer ready for use. According to the ABS, potential users of CDATA 86 include business, advertising and marketing, all levels of government, research consultants, universities and schools.

Statistics ranging from income to ethnic groupings and housing details can be shown on colour maps State by State; by census collection districts of about 200 households and in specific areas of interest built up by the users.

Both the ABS and Space-Time Research will market CDATA 86.

Grand Opening

On March 11, amid much fanfare and assorted dignitaries the Power House Museum opened in Sydney. Guest of Honour at the proceedings was the governor general Sir Ninian Stevans.

The new museum, which cost $54 million to build and equip, has an interior floor space of some 35,000 square metres. It contains everything from a glass dog 1 cm high to a Catalina flying boat with a wingspan of some 32 metres. Broadly speaking, these exhibits are ranged into four basic categories, *Creativity and Australian Achievement*, everyday life in Australia, *Science, technology and people, Decorative Arts*, Style and Change 1740-1988, *Bringing people together*, which is concerned about transport and communciations.

Speakers at the opening commented on the fact that the Museum was intended to be far more than a simple storehouse of technological and cultural treasures. people will be encouraged to play an active role in the life of the Museum. Many of the exhibits, such as the plasma ball require the active participation of the onlooker to function properly. Two theatres, which can hold from 90 to 300 people respectively have been included in the structure and it is hoped to keep them functioning for some 12 hours a day.

Smart Cards On The Busses

The Darwin city fathers have introduced a bit of high tech on their busses in an effort to attract passengers back to the service. They have introduced a public transport fare collection system using the integrated circuit card, commonly known as the "smart card".

The system — produced and commissioned by Associated Electronic Services (AES) for the Darwin Bus Service — already has captured the imagination of the learned group of transport decision makers after a demonstration to the Canberra Bus Company — ACTION — last year.

Mr Ken Gibson, marketing director of AES, will take the group on tour of the Darwin system, the first of its kind to be implemented by a public transport company in Australia.

Darwin bus passengers — some 1000 — are validating their multi-rides using the credit card microprocessor and memory chip smart card that is set to revolutionise the transport industry the world over.

"It greatly reduces the workload on drivers and provides valuable management information so that we can plan for future services."

AES, based in Perth, Western Australia, is a specialist in smart card technology.

The company, part of ERG Australia, has stolen a march on other companies by developing an integrated commuter ticket control and data collection system for use by transport utilities throughout the world.

"Australia has an enormous opportunity that could make them world leaders of smart card technology outside of France. Little progress has been made elsewhere in the world," said Mr Gibson.

"For example, a national transport multi-ride card could be created if the various State bodies got together. We have the technological expertise and support to produce such a system."

Currently, AES is negotiating with a major Australian bank to pilot a smart card system for banking transactions in conjunction with a multi-use transport smart card.

AES, who represents the interests of a number of smart card manufacturers, buys 20 per cent of Japan's total production. Japan is the world's biggest producer of smart cards after France.

In Sweden, AES is currently negotiating a scheme which involves 50,000 smart cards for a transport company. Several years ago, AES installed a traditional ticketing system in Toronto, acknowledged as the most progressive city in transport in North America, using conventional tickets.

"The Canadians have taken an option to incorporate smart cards in their current system in the next few years," Mr Gibson said.

World Radio History

INDUSTRY NEWS

Sun Microsystems, suppliers to the heavy end of the CAD business, have just reported on their first year of operations in Australia. They reported nett revenue of $9.69m. 557 units were delivered during 1987, taking the total installed population in Australia to over 900 according to Sun.

* * *

Software distributor Arcom Pacific is trying to change the way the local software marketing scene works by setting itself up as a one stop shop for wholesalers, offering all the software anyone could want under one roof. According to Arcom, this is how the Yanks do it. According to the rest of the local industry, its not how it should be done. Arcom's Fred Muys says most dealers try to get on top of one or a few products and monopolise the market.

* * *

The optical fibre consultant Integral Fibre System has taken on the local distribution of Fibreonics, an Israeli company that has developed an advanced cabling system that mixes fibres, coax and twisted pairs. Meanwhile IFS itself has been acquired by Andrew Sweeney Electronics, the consultancy firm that was responsible for sound and vision systems at the commonwealth games, electronics in Parliament House, and a number of other spectacular projects.

Car Electronics Study

A recent study by consultants BIS Mackintosh, has reported that the number of electronic systems in vehicles will increase from 12 million in 1987 to 100 million by 1985 and 200 million by the turn of the century.

The Managing Director of Teleresources (the Australian associate of BIS Mackintosh), Mr Maurie Dobbin, said this trend had already created global destabilisation in the industry, and held out considerable opportunities for Australian firms.

The study shows that electronics will increase from the current level of 3 per cent of vehicle costs to 17 per cent by 1998.

Electronic transmission systems will increase from 1 million units today to 10 million by the year 2000, shock dampening systems will increase from 300,000 units in 1986 to 18 million and electronic door entry systems will increase from less than 200,000 units in 1986 to more than 27 million.

Currently electronic systems are mainly used for engine management tasks, but in future systems for anti-lock breaking, electronic door entry and on-board diagnostics will become widespread.

The study identified four major application areas where significant business opportunities exist. They are: powertrain control, including engine management systems, transmission controls and integrated powertrain systems; chassis controls, including braking, suspension and steering; cockpit controls, including safety systems and information management, including displays, on-board diagnostics and service diagnostics.

The study noted that the demand for electronics expertise from automotive manufacturers is causing a shake-up in the industry, will alliances being formed across national boundaries. "Many of the traditional automotive suppliers are finding that to compete they need to form alliances with the electronics industry for sourcing equipment, systems and integrated circuits," said Dobbin.

In Europe, governments have taken a leading role in promoting the use of electronics in vehicles, with hundreds of millions of dollars committed to projects such as PROMETHEUS (Programme for European Traffic with Highest Efficiency and Unprecedented Safety), EUROPOLIS and CARMINAT.

These projects form part of the EUREKA programme conceived by President Mitterand as a civilian Euro-initiative to match the boost that Star Wars will provide for high technology in the US.

The study postulates the view that the use of automotive electronics is at the transition point between the second and third phases in its development.

The first phase used simple stand-alone components and simple circuits with its primary objective to improve engine performance and/or exhaust emission legislation.

The second phase has been characterised by the advent of stand-alone sub-systems and functions based on complex circuits which employed discrete components. The initial pressure for the development derived from the need for better performance, and from legislation.

In the third phase, market forces are driving development of automotive electronics towards improved comfort, convenience and safety. This demand can only be met by the use of sophisticated microprocessor system technology.

The fourth system is likely to be the integration, or linking, of the individual functions into a system network. For example, traction control (anti-slip) requires control of engine and wheel torque which can be provided by linking the powertrain control electronics to the chassis control electronics.

For further information on this study and the implications for Australian manufacturers, call Maurie Dobbin (02) 913-3056.

World's Fastest

IBM researchers have reported the world's fastest dynamic memory computer chips.

The experimental IBM chips can retrieve a bit of information in 20 nanoseconds, three times than the current generation of advanced DRAMs (Dynamic Random Access Memories).

DRAMs are the most common type of memory chip used in computers.

The IBM Research division director of Manufacturing Research, Billy L. Crowder, in his conference keynote address called semiconductor manufacturing a "new science", outlining how this major computer industry trend will affect computer designers and manufacturers.

The unprecedented speed of the experimental IBM DRAM signals a new direction in this area of computer memory chip research, focusing on speed in addition to increased density.

The IBM design directs power on the chip more precisely, supplies faster circuits at critical points in the chip's access paths and provides more sensitive controls to detect and amplify the almost infinitesimal signals on the chip to useful levels.

The result is a chip that demonstrates how DRAMs using the one-transistor memory cell (invented by IBM in 1967) — traditionally used to achieve maximum density — can also attain speeds approaching those of the DRAM's high-speed cousin, the SRAM (Static Random Access Memory).

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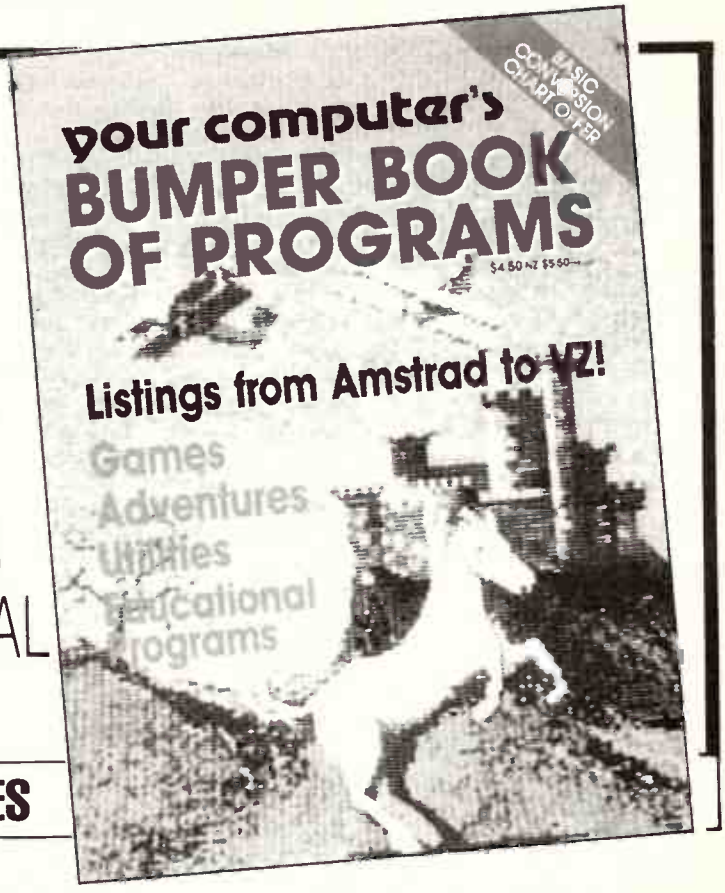

World Radio History

INDUSTRY NEWS

Majella Haughey, Operations Director of CSSC with the Supplier of the Year Award, presented by Scitec to the company in 1987.

Cablemaking whale, CSSC Australia, has eaten pcb assembling minnow, Sanders Electronics, in a deal welcomed by CSSC manager David Hiscock, who predicts the new conglomerate, based in Parramatta, Sydney, will double its output in the next twelve months.

* * *

The aggressive electronic marketing company, Fairmont marketing, has just scored a swag of new distribution deals. Now in the bag: Silitek of Taiwan, Rohm Semiconductors from Japan, New Era Electronics of the US and Opto electronics of Taiwan.

* * *

Ray Smith's RCS design has consolidated moves into the sales and support area of CAD systems by setting up a new concern called Techforce Sales. Chis Hurley from Racal will be heading up the new operation.

* * *

According to a recent survey by CSA, computer operators sleep better and suffer fewer illnesses if they work on twelve hour shifts instead of the traditional eight hour roster. According to researchers at the NSW Department of Occupational Health, an eight hour roster means that workers are continually having to re-adjust their sleeping times, which disturbs circadian rhythms.

FM Sideband On Line

A new financial information service which broadcasts to subscribers via a special FM radio band has been launched.

The service is the first of its kind in Australia to exploit FM sideband technology. It will initially be availble only in Sydney.

For the first time, live real-time data covering foreign exchange and share and commodity prices will be available to business people while they are on the move.

The new product also offers an international financial news service and will appeal to foreign exchane dealers, corporate treasurers, brokers and others for whom up-to-the-second information is vital.

The product is built around a sealed, pre-tuned FM receiver designed by Processor Product Development (PPD), the research and development arm of Voicecall.

COMING EVENTS

APRIL

Commercial Opportunities from Space Transport and Related Industries Conference will be held in Brisbane over April 26-28. Contact The Secretariat UniQuest Limited University of Queensland, St Lucia, Qld, Australia 4067. Phone (07) 377-2899.

MAY

The Canon Electrathon will take place in the VFL park, Melbourne, on Sunday, May 1. Contact the Co-ordinator, AEVA, P.O. Box 273, Mitcham Victoria 3132. Phone (03) 758-6871.

An International Conference on Environmental Radio-Activity in the Mediterranean area. Contact Mr Alejo Vidal-Quadras Roca, Servicio de Las Radiaciones, Universidad Autonoma De Barcelona, E-08193 Bellaterra, Spain.

An International Aerospace Exhibition is to be held at the Hanover Air Show from May 5-12. For more information contact Deutsche Messe- und Ausstellungs-AG, Abt. 312 Messegelande, D 3000 Hannover 82. Telex: 9-22-728

The first Australian FORTH Symposium will be held at the New South Wales University of Technology over May 19-20. Contact Jose Alfonso. NSWUT, PO Box 123, Broadway, NSW 2007. Phone (02) 2-0930.

The Australian Bicentennial International Congress in Mechanical Engineering (Mech 88) will host a Conference on Space Engineering to be held in Brisbane over May 8-13. Contact the Institution of Engineers, Australia, Conference Manager, Mech 88 Conference, 11 National Circuit, Barton, ACT 2600. Telex: AA62758.

JUNE

PC 88 The 11th Australian Personal Computer Show will be held at the Royal Exhibition Building, Melbourne. Contact A7UG, PO Box 357, Milsons Point, NSW 2067. Phone (02) 957-1333 or (008) 22-6287.

Infotech Asia '88, The 3rd Asian International Computer, communications and information systems show will be held over June 8-11. Contact AES Suite 33 Illoura Plaza, 424 St Kilda Rd, Melbourne, Vic. 3004. Phone (03) 267-4500.

JULY

The 10th Perth Electronics Show will be held at Claremont, Perth over July 13-17. Contact the Manager's Office, 94 Hat Street, Subiaco, WA 2008. Phone (09) 382-3122.

COMDEX Australia's national and International Computer and Communications Exhibition and Conference will be held in the Darling Harbour area of Sydney from 26-28 July. Potential visitors and exhibitors should ring (02) 959-5555.

AUGUST

The 3rd Regional Convention of the Melbourne Audio Engineering Convention will be held in Melbourne Hilton over August 16-18. Contact the Chairman Brian Horman, PO Box 131, GPO South Melbourne 3205. Phone (03) 329-0162.

SEPTEMBER

The ANZAAS Centenary Congress will be held over 2-6 September 1988 at Sydney University. Enquiries should be addressed to Mr B. O'Bourke, Organising Secretary, 1988 ANZAAS Centenary Congress, 118 Darlinghurst Rd., University of Sydney, NSW 2006. Phone (02) 692-4356.

The Australian Computing Exhibition will be held at Darling Harbour on September 20-22. Contact Michael Fleur (02) 264-1266.

The Fifth Aust.-New Zealand Geomechanics Conference will be held at the Hilton Sydney over 22-24 August. Contact 193 Rouse St., Port Melbourne, Vic. 3207. Phone (03) 646-4044.

OCTOBER

ACCA 88. The Australia Computer Society's Annual Conference will be held over October 1-3 at Darling Harbour in Sydney. Contact ACP Exhibitions Limited, 2/124 Castlereagh Street, Sydney, NSW 2000. Phone (02) 264-1266.

9th International Conference on Computer Communication will be held at the Hilton Hotel Tel Aviv from October 30-November 3. For more information contact Dr J. Raviv, Secretariat, ICCC'88, PO Box 50006, Tel Aviv 61500, Israel.

NOVEMBER

The International Robot Show will be held from November 7-10. Contact Australian Exhibition services, 242 St. Kilda Rd, Melbourne, Vic 3004. Tel. (03) 267-4500.

World Radio History

ELECTRONIC MOUSETRAP

This clever electronic mousetrap disposes of mice instantly and mercifully, without fail, and resets itself automatically. They'll never get away with the cheese again!
(ETI Aug 84) ETI 1524

Cat K55240 **$39.95**

STEREO ENHANCER

The best thing about stereo is that it sounds good! The greatest stereo hi-fi system loses its magnificence if the effect is so narrow you can't hear it. This project lets you cheat on being cheated and creates an 'enhanced stereo effect' with a small unit which attaches to your amp
(ETI 1405, ETI, MAR 85)

Cat K54050 **$79.50**

MICROBEE SERIAL-TO-PARALLEL INTERFACE

Most microcomputers worth owning have an 'RS232' connector or port, through which serial communications (input/output) is conducted. It is a convention that, for listing on a printer, the BASIC LLIST or LPRINT command assumes a printer is connected to the RS232 port. Problem is, serial interface printers are more expensive than parallel 'Centronics' interface printers. Save money by building this interface. (ETI Jan 84) ETI 675

Cat K46750 Normally $49.50
SPECIAL, $29.50

FAIR DINKUM RS232 FOR MICROBEE

The Microbee, among other home computers, has a 'sort of' RS232 port in that it doesn't implement negative-going portion of its ouput signal (TxD). Most peripherals with an RS232 input can cope with that but inevitably, there are those that can't. This project fixes that
(ETI 676, ETI FEB 84)

Cat K46760 **$39.50**

150W MOSFET POWER AMPLIFIER

Here's a high power, general purpose 150W Mosfet Power Amp Module! Suitable for guitar and P.A. applications and employing rugged reliable Mosfets in the output stage
(ETI 499) (ETI March 82)

Cat K44990 **$97.50**
(Heatsink not included)
plus transformer **$49.50**

ELECTRIC FENCE

Mains or battery powered, this electric fence controller is both inexpensive and versatile. Based on an automative ignition coil, it should prove an adequeate deterrent to all manner of livestock. Additonally, its operation comforms to the relevant clauses of Australian Stnd 3129. (EA Sept 82) 82EF9

Cat K82092 **$19.95**

ELECTRIC FENCE TESTER

This project was developed to take some guess work out of testing or checking an electric fence. Many factors can influence the operation of an electric fence energiser and fence, reducing its effectiveness. This tester indicates the presence of each pulse from the energiser and shows when the pulse voltage exceeds an amplitude of 2kV, 3kV and 5kV, once calibrated. If used in an uncalibrated mode, the unit will indicate pulse amplitudes on the fence of 40%, 60% and 100% of energiser output
(ETI 1512 Feb 83)

Cat K55120 **$19.95**

EPROM PROGRAMMER EP1 KIT

No need for a Micro with EA's great Eprom Programmer suitable for 2716/2758 Eproms
(EA Jan 82) 82EP1

Cat K82013 **$79.95**
(Including Textool Socket)

MODEL ENGINE IGNITION SYSTEM

Get sure starts every time, without glow plug burnouts on your model engines
(ETI June 83) ETI 1516

Cat K55160 **$49.50**

LOW OHMS METER

How many times have you cursed your Multimeter when you had to measure a low-value resistance? Well with the "Low Ohms Meter" you can solve those old problems and in fact measure resistance from 100 Ohms down to 0.005 Ohms
(ETI Nov 81) ETI 158

Cat K41580 Normally $44.95
SPECIAL, $39.95

SPEAKER PROTECTION UNIT

An expensive speaker system can be readily destroyed by a 20 watt amplifier. Carelessness with a high power amplifier can melt voice coils like cheese on toast. However, with this Speaker Protection Unit you can avoid risking the misery and expense
(ETI455.)

Cat K44550 **$44.95**

FAST NICAD CHARGER

This project is specifically designed for modellers and photographers who make heavy demands on Nicad batteries quite routinely. Theres nothing more frustrating than having your remote control model run out of juice as it runs/flies out of sight, or your flash run out of flash at an inappropriate moment. If you use Nicads and need a quick charge then this project is a must for you
(ETI 274 July 80)

Cat K45630 **$79.95**

AEM DUAL SPEED MODEM KIT

The ultimate kit modem featuring 1200/300 baud case and prepunched front panel
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(AEM 4600 Dec 85)

Normally $169
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LISTENING POST KIT

This device attaches between the audio output of a shortwave receiver and the input port of a computer. It allows decoding and printing out of morse code, radioteletype (RTTY) and facsimile (FAX) pictures using the computer. It has been designed from all readily available parts. Details for writing the software program are included
(AEM 3500 July 85)

Cat K93015 **$37.95**

MOTORCYLCE INTERCOM

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Motorcycling is fun, but the conversation between rider and passenger is usually just not possible. But build this intercom and you can converse with your passenger at any time while you are on the move. There are no "push-to-talk" buttons, adjustable volume and it's easy to build!
(EA Feb 84) 84MC2

Cat K84020 **$49.95**

MUSICOLOR IV

Add excitement to parties, card nights and discos with EA's Musicolor IV light show. This is the latest in the famous line of musicolors and it offers features such as four channel color organ plus four channel light chaser, front panel LED display, internal microphone, single sensitivity control plus opto-coupled switching for increased safety
(EA Aug 81) 81MC8

Cat K81080 **$114.95**

EFFECTS UNIT

An "effects unit" that can create phasing, flanging, echo, reverb and vibrato effects
(EA June 83) 83GA6

Cat K83060 **$89.00**

VIDEO AMPLIFIER

Bothered by smeary colours, signal beats and RF interference on your computer display? Throw away that cheap and nasty RF modulator and use a direct video connection instead. It's much better! The Video Amplifier features adjustable gain and provides both normal and inverted outputs. Power is derived from a 12V DC plugpack supply
(EA Aug 83) 83VA8

Cat K83081 **$18.95**

SLIDE CROSS-FADER

Want to put on really professional slide show? This slide cross-fader can provide smooth dissolves from one projector to another, initiate slide changing automatically from an in-built variable timer, and synchronise slide changes to pre-recorded commentary or music on a tape recorder. All this at a cost far less than comparable commercial units. (EA Nov 81) 81SS11

Cat K81110 Normally $99.00
SPECIAL, $89.00

MULTI SECTOR ALARM STATION

Protect your home and possessions from burglars with this up to the minute burglar alarm system. It's easy to build, costs less than equivalent commercial units, and features eight seperate inputs, individual sector control, battery back up and self-test facility
Specifications:

- Eight sectors with LED status indication
- Two delayed entry sectors
- Variable exit, entry and alarm time settings: entry delay variable between 10 and 75 seconds, exit delay variable between 5 and 45 seconds, alarm time variable between 1 and 15 minutes
- Resistive loop sensing: suits both normally open and normally closed alarm sensors
- Battery back-up with in-built charger circuit
- Built-in siren driver

The RIE kit includes a superb printed and prepunched metal case and inside metal work, plus a gell battery! Unbeatable VALUE!

K85901 without battery backup **$134**
SPECIAL, $115

K85900 complete kit **only $159**
SPECIAL, $129

AUDIO TEST UNIT

Just about everyone these days who has a stereo system also has a good cassette deck, but not many people are able to get the best performance from it. Our Audio Test Unit allows you to set your cassette recorder's bias for optimum frequency response for a given tape or alternatively, it allows you to find out which tape is best for your recorder
(81AO10) (EA Oct 81)

Cat K81101 **$59.50**

FUNCTION GENERATOR

This Function Generator with digital readout produces Sine, Triangle and Square waves over a frequency range from below 20Hz to above 160Hz with low distortion and good envelope stability. It has an inbuilt four-digit frequency counter for ease and accuracy of frequency setting
(EA April 82) 82AO3A/B)

Note: The RIE Function Generator has a high quality screen printed and prepunched front panel!

Cat K82040 **$109**

PARABOLIC MICROPHONE

Build a low cost parabola, along with a high gain headphone amplifier to help when listening to those natural activities such as babbling brooks, singing birds or perhaps even more sinister noises. The current cost of components for this project is around $15 including sales tax, but not the cost of batteries or headphones. (EA Nov 83) 83MA11

Cat K83110 **$14.95**

50/500MHz 7 DIGIT FREQUENCY METER

Want a high performance digital frequency meter that's easy to to build? This unit uses just five IC's, measures period and frequencies up to 500MHz, and features a bright seven digit display. Save a small fortune over comparable commercial units

Note: The RIE Frequency Meter Kit includes high quality prepunched and silk screened front panel!

(EA December 81)
(50MHz 81fm10a, 500MHz 81fm10b)

50MHz Cat K81120 **$149**

500MHz option Cat K81121 **add $29.95**

ELECTRIC FENCE CONTROLLER

Restore discipline to the farm or allotment with this new electric fence controller. It features higher output power and lower current drain than the previous design for use in rural areas
(EA Dec 85, 85ef11)

Cat K85110 Normally $49.95
SPECIAL, $45.95

TRANSISTOR TESTER

Have you ever desoldered a suspect transistor, only to find that it checks OK? Trouble-shooting exercises are often hindered by this type of false alarm, but many of them could be avoided with an "in-circuit" component tester, such as the EA Handy Tester. (EA Sept 83) 83TT8

Cat K83080 Normally $18.95
SPECIAL, $15.95

VIDEO FADER CIRCUIT

Add a touch of professionalism to your video movies with this simple Video Fader Circuit. It enables you to fade a scene to black (and back again) without loss of picture lock (sync) or colour
(EA Jan 86, 85ft10)

Cat K86010 Normally $24.95
Special, only $19.95

LAB SUPPLY

Fully variable 0-40V current limited 0-5A supply with both voltage and current metering (two ranges 0-0.5A/0-5A). This employs a conventional series-pass regulator, not a switchmode type with its attendant problems, but dissipation is reduced by unique relay switching system switching between taps on the transformer secondary
(ETI May 83) ETI 163

Cat K41630 **$249**

1W AUDIO AMPLIFIER

A low-cost general-purpose 1 watt audio amplifier, suitable for increasing your computers audio level, etc. (EA Nov 84)

Cat **$9.95**

30 V/1 A FULLY PROTECTED POWER SUPPLY

The last power supply we did was the phenomenally popular ETI-131. This low cost supply features full protection, output variation from 0V to 30V and selectable current limit. Both volatage and current metering is provided. (ETI Dec 83) ETI 162

Cat K41620 Normally $73.50
SPECIAL, $63.50

VIDEO ENHANCER

100's SOLD

Like tone controls in a hi-fi amplifier, touch up the signal with this Video Enhancer. (EA Oct 83) 83VE10

Cat K83100 **$39.50**

ZENER TESTER

A simple low cost add-on for your multimeter. This checks zeners and reads out the zener voltage directly on your multimeter. It can also check LEDs and ordinary diodes
(ETI May 83) ETI 164

Cat K41640 **$11.95**

Rod Irving TOP 40 Kits

HEADPHONE AMPLIFIER

PRACTICE WITHOUT ANNOYING THE FAMILY!

If you play any type of electronic instrument, this headphone amplifier will surely interest you. It will let you practice for hours without upsetting the household, or you can use it to monitor your own instrument in the midst of a rowdy jam session. (EA Feb 84) 83MA11

Cat K84111 **$39.95**

DIGITAL CAPACITANCE METER Mk.2

Updated from the EA March 80 issue, this Digital Capacitance Meter checks capacitor values from 1pF to 99.99uF over three ranges. Its main features include a nulling circuit and a bright 4 digit LED display

*Note: The RIE kit contains quality silk screen printed and prepunched front panel AND an exclusive High Intensity Display! (85cm9a, EA August 85)

Cat K85090 **$99.95**

THE SCREECHER CAR BUGLAR ALARM

Here is a low cost car alarm designed with a new deterrent strategy. Instead of using the alarm to try to draw the attention of passers-by to the felony in progress, this alarm sounds inside the car to deafen the thief and make it too uncomfortable to proceed with pinching the vechile!
(86a19, EA August 86)

Cat K86081 **$29.95**

CAR IGNITION KILLER

Most car burgular alarms are easily circumvented, but not this cunning "Ignition Killer". This sneaky antitheft device uses a 555 timer to place an intermittent short circuit across the points. Until disabled by its hidden switch the circuit effectively makes the car undriveable - a sure deterent to thieves! (EA Feb 84) 84AU1

Cat K84010 **$24.95**
(Our kit includes the box!)

50 W AMPLIFIER MODULE (ETI 480)

Cat K44880 Normally $31.80
SPECIAL, $21.95
(Heatsink optional extra)

100 W AMPLIFIER MODULE (ETI 480)

Cat K44801 Normally $34.80
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CRYSTAL MARKER GENERATOR FOR RECIEVER AND CRO CALIBRATION

A simple but very useful piece of test equipment for calibrating and aligning recievers, transceivers and oscilloscopes. It is portable, battery operated and inexpensive to build
(ETI 157 October 81)

Cat K41570 **$37.50**

FREQUENCY STANDARD

Get the equivelent of a rubidium frequency standard by draping a piece of wire over the back of your TV set!! Believe it or not your humble television can provide an extremely stable and accurate reference frequency. The wire acts as a transducer to pick up electromagnetic radiaton from the back of the set. Normally you would need to spend thousands of dollars to achieve accuracy beyond the "parts per thousand" you expect from ordinary meters. With this simple project, an extremely accurate 1MHz signal can be derived for very little outlay
(ETI 174, July 86)

Cat K41740 **$24.95**

SUPERB VIFA/EA 60+60 SPEAKER KIT!

The Vifa/EA 60+60 loudspeaker kit has been designed to completely out perform any similarly priced speakers. This is a 2-way design incorporating drivers which give a deeper, more natural bass response and 19mm soft-dome ferro fluid cooled tweeters which provide clear, uncoloured sound reproduction.

These Vifa drivers are identical to the ones used in such fine speakers as Missson, Rogers, Bang & Olufsen, Monitor Audio and Haybrook just to name a few. Some of which cost well over $1,000 a pair!

The dividing network is of the highest quality and produce no inherent sound characteristics of their own, they simply act as passive devices which accurately distribute the frequency range between both drivers in each speaker.

The fully enclosed acoustic suspension cabinets are easily assembled. All you need are normal household tools and a couple of hours and you've built yourself the finest pair of speakers in their class!

D19 TWEETER SPECIFICATIONS:
Nominal Impedance: 8 ohms
Frequency Range: 2.5 - 20KHz
Free Air Resonance: 1,700Hz
Sensitivity 1W at 1m: 89dB
Nominal Power: 80 Watts (fo 5,000Hz, 12dB/oct)
Voice Coil Diameter: 19mm
Voice Coil Resistance: 6.2 ohms
Moving Mass: 0.2 grams
Weight: 0.28kg
Cat C10301 **$38**

C20 WOOFER SPECIFICATIONS:
Nominal Impedance: 8 ohms
Frequency Range: 35 - 6,000Hz
Resonance Frequency: 39Hz
Sensitivity 1W at 1m: 90dB
Nominal Power: 50 Watts (12dB/oct)
Voice Coil Diameter: 25mm
Voice Coil Resistance: 5.5 ohms
Moving Mass: 15 grams
Cat C10322 **$89**

Cat K86092 (speakers only) **$379**

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Stuart Corner is a former editor of C in C news, and a regular writer on computers and communications. This is the first in a series of articles.

Communication News

OSI

The major companies in the Australian computer industry demonstrated a rare degree of co-operation last month with the launch of OSICOM, the Australian OSI community. OSICOM is an organisation dedicated to raising market awareness and confidence in OSI (the Open Systems Interconnection) as a practical solution to the problems of interworking between computer systems from different manufacturers. It also hopes to raise the level of OSI skills in Australia and to encourage the development of OSI products in Australia.

Full members of OSICOM are computer equipment suppliers and suppliers of information services. They undertake to make their equipment available to other members who wish to demonstrate that their products can interwork using OSI protocols. So, for example, if a company with an IBM installation wanted to buy a Wang system to work with the IBM using OSI principles, IBM would give Wang access to a system set up specially to demonstrate OSI support. The full members of OSICOM initially are JN Almgren, CSIRO, Datacraft, DSata General, DEC, Fujitsu, Hewlett Packard, Honeywell, IBM, ICL, the National Protocol Support Centre, Nixdorf, OTC, Sun Microsystems, Tandem, Telecom, Wang, Unisys, Concurrent Computer BHA Computer and NCR. Users, standard organisations, government bodies and academic institutions can participate as associate members.

OSICOM follows the lines of similar organisations which have been set up in other countries for some time, notably OSINET in the USA and Eurosinet in Europe. However, OSICOM's membership is drawn from a much wider cross section of the world's major manufactuers. Unlike either OSINET or Eurosinet it is not dominated by European or US manufacturers and is the only one of the three with Japanese companies as member. It will therefore allow members to demonstrate compatibility with a wider range of systems than any other country and so should help to create a favourable climate in Australia for the development of OSI products.

OSI is an internationally agreed design template for information technology developed by the International Standards Organisation. It is based on a layered or hierarchial structure divided into seven layers covering basic physical and electrical specifications for interconnection at the lower layers to the specification necessary for communication between different application programs in the upper layers. ISO work in developing OSI is closely paralleled by work being performed by the CCITT. So, for example, the CCITT's X.400 standard for interworking between different electronic mail services is the exact equivalent of the ISO Message Handling System MHS which relates to the upper four layers in the OSI model.

The first practical manifestation of the benefits of OSI produced by OSICOM was a demonstration of message exchange between computer systems from 12 OSICOM members using the X.400 protocol.

Another aspect of OSI in which Australia lags well behind other nations is the incorporation of conformance to OSI standards as a requirement in all purchasing proposals put out by government departments. The US, UK and the European community have all put in place Government OSI Profiles (GOSIPs). The aim is to facilitate procurement and acceptance testing of communications based products by government departments, to ensure that departmental systems obtained from different sources can interwork and to provide a clear specification to manufacturers on which to base strategic product development.

The UK's GOSIP paper contends that a narrow profile of OSU standards is necessary because "base standards developed by international standreds bodies are by definition very broad in scope and sphere of application and thus not on their own sufficiently precise to achieve these objectives."

In Australia the Standards Association and the National Protocol Support Centre have made recommendations and approaches to government on the adoption of similar procedures in Australia, but there has been little further progress to date.

ISDN Standards

The quadrennail plenary of the major international standards organisation the International Telephone and Telegraph Consultative Committee (CCITT) will be held in Melbourne this November. Apart from rubber stamping the decisions on technical telecommunications standards made by its various Study Groups over the previous four years, one of the major items on the agenda will be the establishment of priorities for study and standardisation over the next four-year period. Standards for the Broadband Integrated Services Digital Network (ISDN) are certain to be high on the list following failures by recent CCITT study group meetings to reach agreement on essential broadband standards.

ISDN networks will be introduced by all major telecommunications carriers, including Telecom Australia, in the next few years. They will offer subscribers access to switched digital links at 64 kilobits per second making possible a whole range of new services. This ISDN network is the culmination of several years of standardisation work by the CCITT. But telecommunications administrators around the world are already predicting that 64 kilobits will not be enough for new applications, and are experimenting with services offering multimegabit bandwidths. They are clamouring for standards for fear that eagerness to implement systems in the absence of such standards will lead to a proliferation of different and incompatible technologies.

The key application driving the push to broadband is high definition television. Standards for this are also in the melting pot, but it is anticipated that

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bandwidths of about 600 megabits per second will be needed to carry a digitised HDTV signal.

A study group meeting in Geneva failed to accept proposed standards for the user interface to the broadband ISDN network (UNI) and for the network node interface within the broadband ISDN (NNI). These were based on a synchronism digital developed from the US Synchronous Optical Network protocol (SONET).

Peter Darling, Telecom's senior engineer forward network plans and Australian coordinator for the CCITT study group working on ISDN said that "People in the know thought that the chances of SONET being accepted for the user network interface were quite small. The big push was for it to become the standard for the NNI. The Europeans found some objections to that, but at a pre-meeting in Tokyo before the Seoul meeting (in January) a compromise was worked out and that was accepted by the Seoul meeting. There is now an agreement for a new synchronous digital hierarchy that will incorporate the SONET proposals but also have options to allow the Europeans to fit in. Effectively there is now a standard for the network, but it still has to be passed by the Study Group meeting in June and then by the Melbourne Plenary."

The user network interface, however, is still wide open and will be a major topic for study during the next four-year period. Commenting on overseas reports that the failure of the Geneva meeting to accept SONET for the UNI had been a major setback to the evolution of broadband standards, Darling said "I think that is an exaggeration. The Americans had built up a full head of steam and expected to take the world by storm. But it takes time to get these things through. For the broadband network it is still early days and a lot of work has to be done." he said there was now broad agreement that the broadband networks of the future would use fast packet switching.

Taming The Tyrant

No, it is not a study about the overthrow of some brutal dictator. The Tyrant in this case refers to the new well-known praise gained by historian Geoffrey Blainey for his book of the same name: *'Tyranny of Distance'*, subtitled: How Distance Shaped Australia's History. *Taming the Tyrant* is the title of another book, just published, about how telecommunications conquered the gulf of distance-engendered isolation which afflicted the Australian colonies. The heroes of its opening chapters are the visionary entrepreneurs and engineers who linked Australia to England by submarine telegraph cable over 100 years ago, at a time when the fastest mail service took almost two months.

Starting with the primitive beginnings of early telegraph technologies, *Taming the Tyrant* traces the first 100 years of Australia's international communication services from the first cable in 1872 to the era of satellites. Its author, Edgar Harcourt, has himself a long and deep involvement in that history. He joined the Overseas Telecommunications Commission (OTC) in 1947 just after its formation, and served until his retirement in 1980 as Assistant General Manager. He was awarded an OBE in 1980 for exceptional service to international telecommunications.

Taming the Tyrant is less a history of technological progress than of the determination of those who saw the potential benefits of new technologies and who fought against established monopolies, political intransigence and factional differences to make their dreams come true. Anyone familiar with the current debate of competition versus monopoly will, on *Taming the Tyrant,* quickly discover that there is noting new under the sun, that the same arguments have surfaced in the past, and the same battles been fought.

For example, in the late 19th century the UK's Eastern Extension Cable Company enjoyed a situation somewhat akin to that of Telecom today: a monopoly on the network. It owned all the submarine telegraph cables from Australia and attracted much the same criticism as Telecom does today: overcharging and poor service. The cry went up for a competing carrier. The competitor this time was not private enterprise but the state itself. In 1902, after 10 years of political maneouvering and against lobbying by the Eastern Extension Company, the Commonwealth Government installed its own cable across the Pacific. There was an immediate and substantial price drop for telegraph messages.

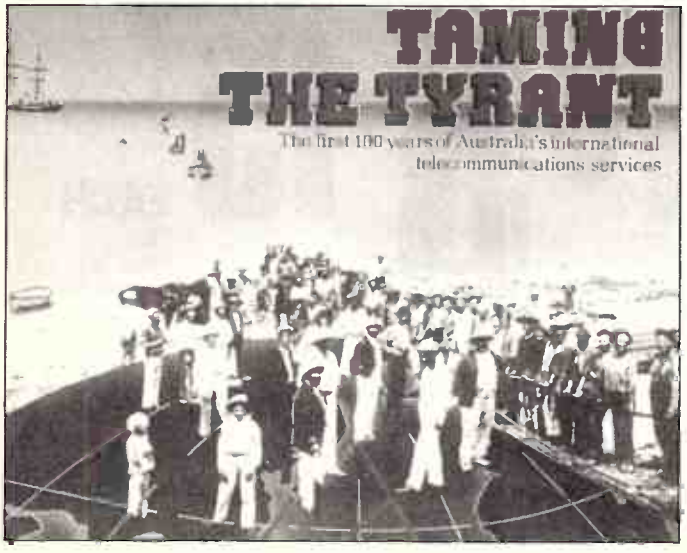
Next came new technology to threaten the established order. Wireless telegraphy, pioneered by the Marconi company, was able to undercut the rates on the cables by significant amounts. After a period of competition, the British Government was forced to step in and regulate the industry in order to maintain a viable cable network throughout the Commonwealth in the interests of national security.

Eventually, in 1946 both cable and wireless operations were nationlised under control of state-owned bodies in each member of the Commonwealth. And so was born OTC.

The political machinations which forged the structure of Australia's international communications services today are revealed in great depth and richness by Harcourt's work and the key figures tower over these events: John Denison Pender — early cable magnate and founder of the all-powerful Eastern Extension Company whose cables encircled the world with amazing rapidity in the last half of the 19th century; Charles Todd who's vision of a telegraph link from England to Australia was realised in his extraordianry achievement — the construction of the overland telegraph line across the unexplored heart of Australia; Ernest Fisk patiently pioneering wireless communications to England from his home in Sydney; and Billy Hughes, the Australian Prime Minister who pushed for the wireless service, dreaming of the day when Commonwealth prime ministers would be able to talk to each other by telephone.

Taming the Tyrant is not bedtime reading. The plot is immensely complex and the players many. But it provides valuable lessons for anyone seeking to understand the forces which have shaped and still are shaping Australia's communications environment.

Taming the Tyrant is published by Allen and Unwin with sponsorship from OTC. ●



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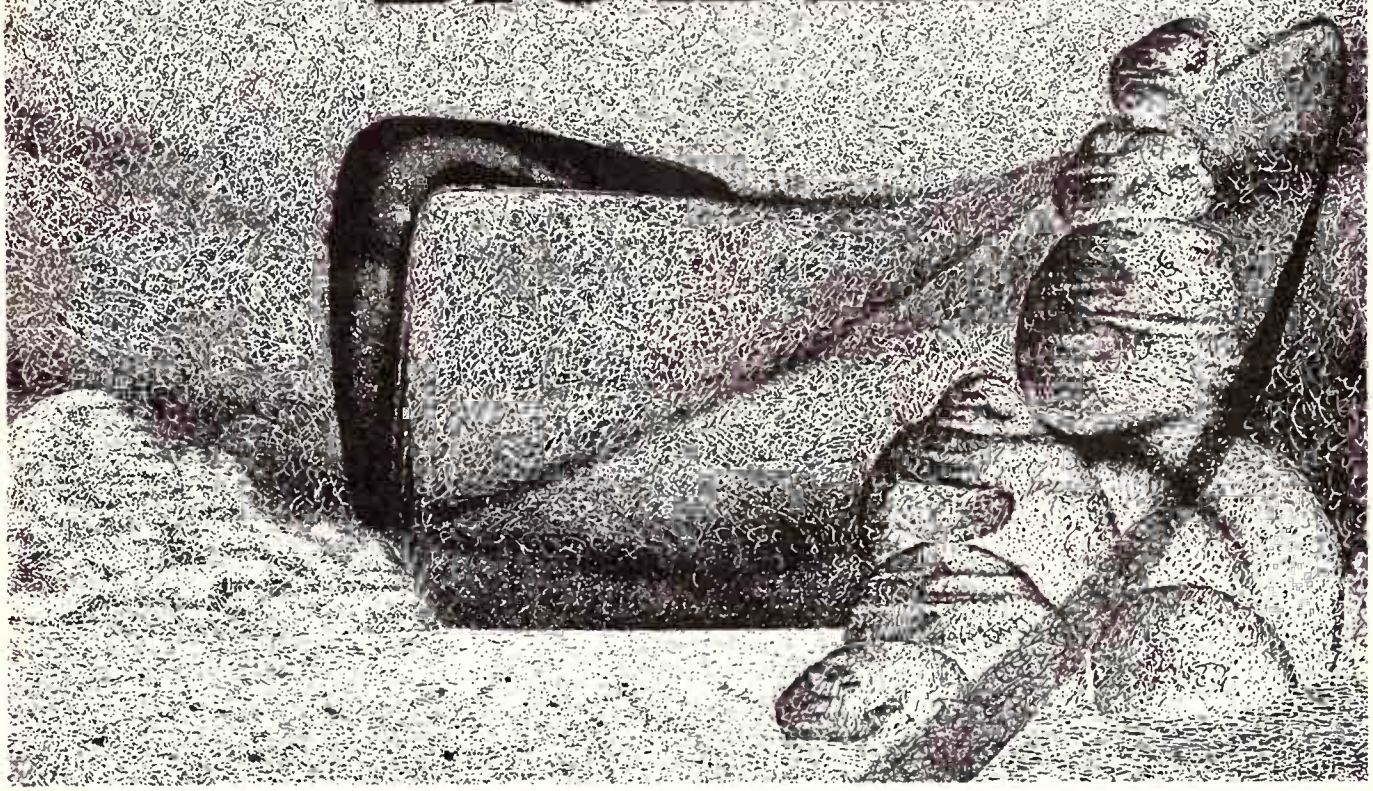

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World Radio History

This month Kilohertz Comment celebrates the achievements of three radio-pioneers

Kilohertz Comment

Morse, Hertz and Marconi each played a significant role in radio communications, and over the past few weeks anniversaries of their triumphs have been observed by radio organisations.

It was in January, 1838, that Samuel Morse first put his code into practice and, some 150 years later, morse code is still used for various means of communication.

The main use of morse today is for ship-to-shore communication. The radio amateur is also required to be familiar with morse as it is tested in the official examinations.

Although many radio transmissions are today carried by voice, morse still provides an essential service and it is still universal for any distress calls to be sent in the code.

Hertz Centennial

The Centennial of Heinrich Rudolf Hertz has been celebrated this year. It was in 1888 when Hertz carried out the very first transmission on electromagnetic waves. Radio Budapest Hungary has contacted broadcasters and radio enthusiasts including the writer, for contributions to a series of special programmes to honour Hertz. These are being broadcast in the Thursday transmissions. Already many well-known voices have been heard in the programme. The series is to continue throughout the year. The broadcast is carried at 0930UTC from Radio Budapest on 11910, 17710 and 17780 kHz.

Marconi Anniversary

Last year saw the 50th anniversary of the death of one of the greatest scientists of all time — Guglielmo Marconi.

Nowadays, we may switch on our radio receivers, insert a frequency, and can expect to receive signals from radio transmitters located thousands of kilometres away. But at the end of the nineteenth century however, nobody knew anything about microwaves and radio signals.

Marconi started his experiments from his farm house near Bologna in 1885. It was with a big cry of joy that a farmer, Augusto Marchi, picked up the first radio signal in the history of radio communications, at a distance of two kilometres. It was the letter 'S', a letter which always reoccurs in Marconi's experiments.

Marconi later found financial support in Great Britain. In 1897, from the grounds of the Royal Needles Hotel at Alum Bay, in the Isle of Wight, he began sending radio signals at a distance of around 50 miles.

February 12, 1931, marks the last important event in the scientist's life, the inauguration of the Radio Vatican transmitter he had been commissioned to erect. When he died in Rome, July 20, 1937, all the radios around the world kept silent for a few moments.

Kilohertz Comment

BRAZIL: Radio Deutsche Welle transmissions are being relayed by Radio Braz, in Barzil 2300-0050UTC on 6145 and 15186 kHz in Spanish, 0100-0300 on 6075 and 9545 in German.

CANADA: Radio Canada International is now sending programmes by satellite to be relayed by the Radio Japan transmitters at Yamata for reception in the South Pacific. Frequency changes were recently made and the broadcast is now 1200-1230UTC on 15385, 17710 kHz and 2200-2230 on 11705 kHz. Radio Canada continues to use 5960 and 9755 kHz for its broadcasts up to 0300UTC for our afternoon reception.

CHINA: Radio Beijing broadcasts are now relayed by the Spanish Foreign Radio Madrid on 9690 kHz from 0500-0550UTC. According to an announcement there are three other broadcasts to North America and they are at 1100 on 9665 kHz, at 1200 on 7335, 9635, 9665, 11715, and 15130 with the last two frequencies via Mali; 0000 on 9665, 9770 and 11715, with the last two frequencies via Mali. In the reverse case Swiss Radio International is relaying Radio Beijing programmes to Europe while Swiss Radio and Spanish Foreign Radio programmes are rebroadcast from Beijing for listeners in Asia and the Pacific.

GABON: The Adventist World Radio, Africa, is now using the frequency of 9625 kHz for broadcasts in French 1700-1800UTC while English is broadcast on Sundays 1200-1300 on 17890 kHz.

MONGOLIA: Radio Ulan Bator broadcasts in English to Oceania 0905-0940 on 9615, 12015 Monday-Saturday; also on 1200-1235, 1445-1520 on 9615, 12015; 1940-2015 on 9645, 11870.

NEDERLAND: Radio Nederland from March 27 made the following frequency changes: 1030-1125 9685 is to replace 9650; 1430-1525 there will be three new frequencies 11740, 15560 and 17575l Hz; 1830-1925, 9540 replaces 15175; 2030-2125 9715 is replaced by 11740 and 15560 is added. All these are for English broadcasts.

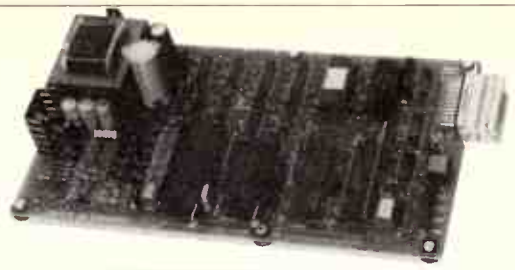
SYRIA: Damascus has been heard with English news at 2010 followed by Press Review at 2025. The balance of the programme is Arabic music, with the station closing at 2105.

USA: The Voice of America following an extensive survey in the South Pacific has brought forward its transmission to this area and now opens at 1000UTC. Three frequencies are in use: 5985 from Delano California and 15160, 15425 from a relay base in the Philippines. At 1100 the normal transmission is heard with additional frequencies of 6110, 7230, 9760 and 11715 kHz.

A new station using 100kW with the call WWCR (World Wide Christian Radio) will commence testing at the end of May and the address is Radio WWCR, C/o 3314 West End Avenue, Nashville, Tennessee 37203, USA.

This item was contributed by Arthur Cushen, 212 Earn Street, Invercargill, New Zealand, who would be pleased to supply additional information on medium and shortwave listening. All times are quoted in UTC (GMT) which is 10 hours behind Australian Eastern Standard Time.

World Radio History



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READER INFO No. 6

World Radio History

Paul Budde reports on the local and international position of Videotex services

Videotex News

Multi-use Financial Kiosk

Formic Videotex (Canada) has installed a multi-user public access kiosk in a Montreal office building with several independent financial organisations, including a bank, brokerage, realty/mortgage company and an insurance company. Information from each organisation appears on two touchscreen terminals in the building lobby; the kiosk also contains four 26" monitors — all of which are connected to a Sony videodisc player and videotex decoders.

The entire system is controlled from an IBM AT microcomputer located in a remote office. Employees can update material, including the addition of daily "crawls" of timely information such as new rates. The system runs on formic's Multidec software and uses a single Formic 8-port serial card. The financially oriented kiosk fits into the company's strategy to position itself as a software/system provider for videotex operations serving one to ten users, such as office buildings or trade shows.

Front Page News on Viatel

Cable Shop, firmly established as one of the top commercial services on Viatel, has undergone a major restructuring of its news service. On page 34567 the major current affairs and business-, office- and home-automation headlines are updated throughout the day.

The categories cover most items: finance, investments, medical, education, sport, weather, electronics, teleshopping, specials, reports.

It also includes the news of the 100 service providers who have their own data base in Cable Shop. All news sections are open for advertising. Sponsorships with linkages are leading to more information from the organisations concerned.

OAG (Official Airline Guide)

The Official Airline Guide, a US data base on international airline schedules, is working on an audiotext system. The user only has to give details of the destination and the system will give him/her all the required information through the telephone.

OAG is not the first one in this field. Dun & Broadstreet started DunsVoice and last year received 2 million accesses from its 50,000 users.

Get Me To The Church "Online" — US

Personal computer enthusiasts have found a new way to use their machines to make friends, at any time of the day or night. Subscribers to the CompuServe Information Service can log on to the CB Simulator and converse electronically with others via "live" online messages.

Many people find the CB Simulator an enjoyable and fascinating way to communicate, as well as being a welcome change from the usual forms of social interaction, where so much depends on physical appearance and superficial mannerisms. CB has spawned countless close friendships and even a few marriages.

For those who want to engage in private conversation, CB Simulator offers a special "Talk" mode. Once the discussion is over, they can rejoin the continuing conversations on the same channel they were using previously.

One of the newest CB features is the online photo. CompuServe will now digitize the photographs it receives from CB users who want their likeness available for online display. To see the online pictures, a subscriber must have a computer with high-resolution graphics capability and a software package to translate the data.

Maynelaw, Australia's First Electronic Land Inquiry Service

It is now possible to prepare one inquiry or a full set in minutes, using either office word processing system, personal computers or a computer terminal. Information is keyed in online to the Maynelaw Land Inquiry Service. After checking the information is sent electronically to Maynelaw where the completed forms are printed out. Courier delivery to departments and authorities ensures a fast turnaround.

Duty stamps and cheques are eliminated. Maynelaw pays all fees and charges and these are displayed on-line and itemised in a monthly account.

European Standard for Telebanking

Within 10 years, Europe will have 80 million smartcards and 400,000 ATMs. In order to handle all this financial traffic, the European Commission wants to set guidelines to prevent incompatibility. Also online (videotex) banking services will be included in this European plan. Both national and private networks will be affected by the new guidelines.

US Institutions Launch Telebanking

Seven US financial institutions, that are part of the MAC network automated teller machine system, will introduce "MAC Home and Business Banking". The initial offering will involve a joint marketing deal with Source Telecomputing Corp, making the Source on-line information service available to telebanking customers at preferential rates. Philadelphia National Bank, which is a leading bank in the MAC network, is coordinating the telebanking project. Telebanking software is based on Manufacturers Hanover Trust (MHT) Corporation's "Excel", which has been adapted for the MAC service. MHT has licensed the telebanking software to MAC.

On-line Market Fails

On-line publishers are still suffering from their scientific background and fail to properly market their services. Back in the 70s they were the first to offer on-line information services, at that stage only aimed at scientific users. In the 80s most of these databases broadened their markets notably to the business users. Here, they find themselves in competition with other more commercial database operators, including the videotex marketeers.

World Radio History

READER INFO No. 52

This item contributed by Paul Budde communications, PO Box 372, Roseville 2061

The major obstacles in the on-line publisher are:

- lack of standardised terminals;
- need for computer knowledge at end user lead;
- lack of proper database layout and search structures.

Videotex links for NZ Property

A videotex link will give users of information from the Valuation Department in New Zealand a fast and direct access into 1,200,000 properties held on the department's database. This new videotex coverage will be available for dedicated screen users such as loan companies and real estate agents. It will give these users a complete coverage of the main details of the property under scrutiny, such as the composition of the roof and walls and many other structural details. Details of the land area and classification will also be presented. Significantly, the million-plus properties covered by the database include residential, commercial, rural and industrial.

Home Banking Trends

Small business telebanking is the hottest segment of the industry and is seen as a key step in the development of the telebanking market. However, banks promoting telebanking still believe the big payoff will be in retail/personal accounts.

Institutions offering telebanking are concentrating on recruiting users from among current bank customers who have a PC; another tactic is to advertise in regional PC publications to target PC users who have accounts at the bank.

There is renewed interest in audiotex-type services. Unlike telephone bill payer services of the late 1970s, today's focus is on information-oriented systems (self-service ways to check account balances).

New Bildschirmtext Marketing

The German public videotex service 'Bildschirmtext', similar to Telecom's Viatel service, is changing its marketing strategy. Up until now it promoted Bildschirmtext as an extension of the TV. The strategy now is to market Bildschirmtext as an application on an intelligent terminal. The new campaign is aimed at getting two million Bildschirmtext users by 1990.

Previous market projections made in 1981/82 predicted one million terminals by 1986. There are now 60,000 terminals connected to Bildschirmtext. Recently, Bundespost increased the charges to the service providers. As a result the number of service providers dropped 10% and the number of frames in use by these service providers dropped 25%.

US Bank Looks at Telecommunications

Chase Manhattan Bank is considering possible relationships with telephone companies, with an eye to offering its telebanking as part of the enhanced services packages telephone companies will develop if barriers are lifted. The bank admits it is seeking alternative distribution sources for telebanking, including the possibility that a service could be resold by regional telephone operating companies. Chase, which has also taken advantage of recent relaxation of interstate US banking restrictions, has bought financial institutions in several States in the US and could roll out its Spectrum or Chase Bank by TV through its new subsidiaries.

ABC—UK: Free Tandata Sets

As a result of what is believed to be the first instance of an information provider in the travel industry taking the decision to give away videotex units to subscribers, Tandata Marketing has received an initial order for 150 of its TD1400 videotex terminals from ABC Electronic — publishers of a comprehensive videotex information system on international travel services.

The terminals, which will be specially badged for ABC, will be provided free of charge to new customers taking out a two-year subscription to ABC's Schedules and fares databases.

British Library on Prestel

When Prestel was first launched in the UK it was seen as an ideal medium for publicising the British Library's products and services. Accordingly, the Library became one of Prestel's first information providers, taking part in the Market Test Service which began in 1978 and had a substantial database on the system in time for the public launch in 1979. The database was re-designed and re-launched in 1983 and has proven to be very popular. Many Prestel users who were previously unaware of the existence of the British Library, have become enthusiastic Library users as a result of reading about its services on the Prestel database.

Cellular Radio and Videotex

There has been much speculation about the development of data transmission capabilities via the cellular networks. Reliable, high quality transmission of hard copy data using cellular equipment is now becoming a reality from Air Call in the UK. The company will supply the Vodata cellular modems for data transmission and will also provide the original cellular equipment, computer terminal, printer and installation.

Air Call will provide its own data gateways in the UK to enable mobile customers to access public and private data networks such as videotex, telex and electronic mail.

Recently, Telecom Australia also showed a prototype of its cellular radio-videotex link at an industry meeting in Sydney.

Teleshopping Booming in the US

Not videotex but cable TV has proven to be the key to success in teleshopping. Teleshopping turnover in the US grew from US$20 million in 1985 to US$400 million in 1986. The largest service, Home Shopping Network (HSN), booked US$3 million a day last December.

HSN is available to 10 million viewers in 26 states in the US. Recently, HSN got competition from a new company called Cable Volume Network, in which 18 cable operators and NuMedia joined forces.

World Radio History

WORLD EXPO 88

World Expo 88 has entered its first month. 51 countries and an assortment of corporations will woo an estimated eight million people with the role technology has to play in our lives.

Mary Rennie

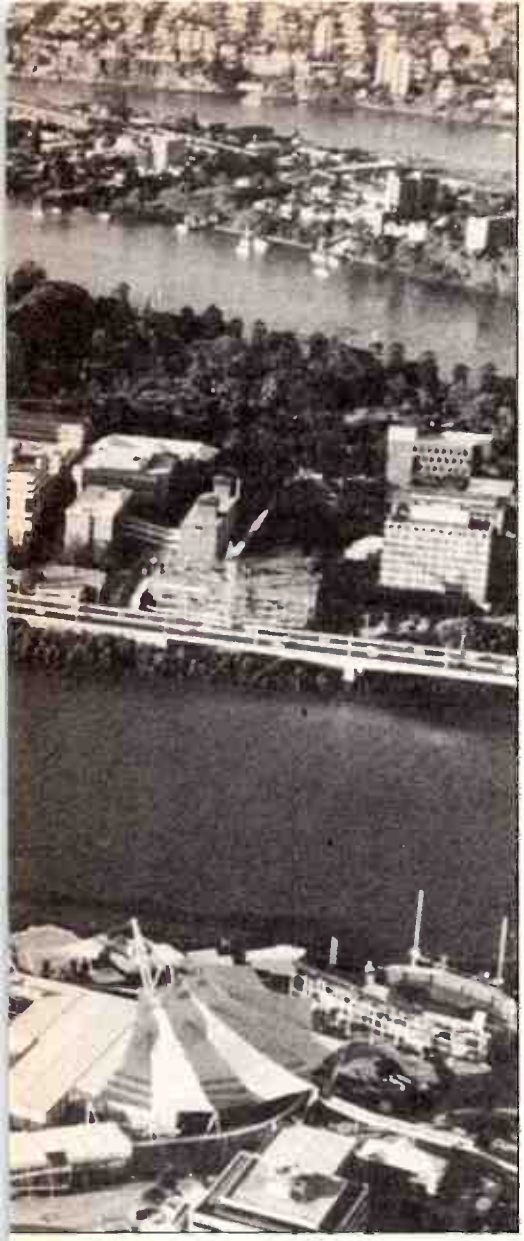
World Expo 88 looks set to be an extravaganza. Opening on April 30 at an estimated cost of $600 million, it will throw together 51 participating countries, each of which has spent between $1 million and $25 million to show some unique side of their country. Want to visit a Nepalese temple? Ski a 40-metre snow-covered Swiss slope? Float above an Kenyan Wildlife Park in a hot air balloon?

Not only that. More than 80 corporations have committed $120 million as exhibitors, sponsors or suppliers to the event. Parades and performers will wander the thoroughfares and a 2.3 km monorail will wend its way around the 40 ha site on the south bank of the Brisbane River, just across the river from the city centre.

A lot of money has been invested in Expo 88, and organisers are more than pleased with ticket sales and general interest in the event. According to the Expo 88 publicity, by the first three months of sale, six times the original target of passes to the Expo had been sold. A recent statement by the Expo General Manager said seven million of the expected 7.8 million visits are already accounted for. Originally, 30 countries were expected to exhibit at Expo 88, but that estimate has been exceeded to 51 countries at the latest count. That, indeed, sounds like an unqualified success, especially gratifying as the Expo is a self-funded event. It is expected to recoup expenses through ticket sales, pavilion rentals, corporate sponsorship and resale of the site after the event.

World expositions have a history that

World Radio History



The World Expo '88 site at Brisbane

date back to 1851 when the first one was held in London at the Crystal Palace. Twenty-five countries participated. Since then they have been held at various intervals throughout the western world, including three times in Australia, in 1879 in Sydney, and in 1880 and 1888 in Melbourne. Expos have always had an attached theme. For the 1851 London Expo the theme was "Telegraphs and Sewing Machines". The 1888 Expo in Melbourne was suitably entitled "Centennial International Exhibition". The 1988 Expo in Brisbane is billed as a Bicentennial event but it has another theme: "Leisure in the Age of Technology.

Meandering Through the Pavilions

This theme has been liberally interpreted by the exhibiting nations. In the pavilions one will find exhibitions illustrating how technology has increased our leisure time (and made it more expensive), how it has enhanced our leisure activities and provided us with new ones, and at a different level, how it has enabled countries to mount exhibitions. In Germany's pavilion, for example, you will see images of technology in everyday German life, very much 20th century stuff. France, however, is sticking to the old but successful European theme of art. In the French pavilion you are presented with a series of immense paintings of the great French impressionists. In the Spanish pavilion art is again the typifying leisure theme. Here you can view Picasso but, as well as that, the pavilion also presents images of contemporary Spain. (One interesting exhibit from the past, however, is a collection of maritime charts of ancient Spanish sailors.) In the USA pavilion the exhibitions depict the development of sport with some emphasis on sports technology.

As you might expect, in the Japanese pavilion technology has a strong foothold. According to its publicity brochures, the pavilion's aim is to present leisure through the ages with Japan 200 years ago as a starting point. A detailed model of Tokyo in 1788 will be displayed accompanied by audio-visuals depicting leisure activities. You can see images of traders passing through the town and people playing chess on a park bench. The display uses a technique called "magic vision" which involves multi projectors and half mirrors set in the model to give a three dimensional effect of real people and moving vehicles. In representing present-day Japanese lifestyles, the display uses a grid of 21 multi screens, three of which are high definition screens, giving Australians a taste of the new high definition TV quality that is currently being phased into Japan. Throughout the pavilion the traditional is mixed with present. Even traditional dances are presented by robots! And, of course, the future is suggested in a simulator in the shape of a dome into which people step to be transformed under water or into space.

The Japanese have spent $25 million on this pavilion, and a further $9.8 million on a pavilion next door known as "Technoplaza Japan". As its title suggests, this is where they really let loose with technology. Here the visitor will encounter an enchanted computerised forest populated by such grotesque creatures as dancing elephants with parrot faces or lions with crocodile tails. Included also will be a display of the intriguing traditional art of "Mizugei" in which Japanese women make water appear from fans, swords and clothing. Television monitors show the culture of the people of the Saitama Prefecture, Queensland's sister state in Japan. Among other amusements like computer games on high resolution monitors and light and sound shows, there will be a room set aside, fitted with a sensor-scanning device, which will automatically advise people of their body temperature, blood pressure and height and weight.

The Technoplaza is chiefly the work of Japanese corporations. But both Japanese and other corporations have their own individual pavilions. The Fujitsu pavilion is one to look out for, as is the IBM pavilion. Centrepiece of the Fujitsu display is a spectacular, if condensed, journey into the five billion year history of the solar system using 3D film and computer graphics and large mainframe computers. The film simulates images of molecular fusion and the evolution of complex cellular structures, such as DNA. You can witness the appearance of fish, dinosaurs, birds and, of course, man.

The Fujitsu pavilion is a prime example of how corporations are using Expo to sell their products by showing them to their best and most remarkable capacities. It places great emphasis on the technology side of the theme "Leisure in the Age of Technology", exploring the possibilities for new leisure and learning afforded by computerisation; in the words of Fujitsu Australia's George Ranucci "We want to take this opportunity to demonstrate to people how their day to day lives and leisure are becoming increasingly dependent on computer and communications technology".

The IBM philosophy is similar. The aim of their $3.8 million pavilion is for visitors "to become more familiar with computers and gain awareness of the possibilities for future technology". It may achieve this understanding but there is something about the spectacle of technology functioning as a display for itself, that denies its utility and sets one marvelling at it, not about it. Visitors will see two spectacular audio visual theatres and an interactive computer park, that is, 30 IBM touchscreens operating in conjunction with IBM Personal System/2 Model 30s and videodiscs to provide the user with information on Australian sport, events and nature. The first theatre, showing how technology is integral to daily living, uses 10 video beams, 20 videodisc players and 10 computers to produce one composite image on a large (10 m × 2.5 m) screen. The screen appears as a large mirror, mixing reflections with projected images of the latest technology. The second theatre presents a journey through time, starting with the arrival of a convict and ending in the present to illustrate how technology has increased our leisure time. This display again uses videodiscs controlled by computer.

At Expo 88 the use of the videodisc is mere commonplace. Audio and visual ef-

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fects using lasers, special projection techniques, computers and multiscreens to evoke scenes and shades of the exhibiting nation are the norm.

The Australian pavilion features two theaters, the Rainbow Serpent Theatre and the Rainbow Sphere Theatre which use these familiar video devices but goes beyond the three dimensional to the what its deviser calls the fourth dimension.

The Rainbow Serpent Theatre has been constructed to tell the Aboriginal legend of the Rainbow Serpent as an old Aboriginal cave-dweller would have, peering out from the cave into the distant world beyond while the eerie Dreamtime world is evoked. This theatre of effects is based on optical dimension expansion, that is, it stretches perspective to the extent that complete infinity in achieved within the confines of the theatre building. Full colour images, similar to holograms, but of far finer resolution and with complete motion continuity, are suspended in an infinity plane. At the same time coloured, yet transparent, "ghost" images are suspended in the middle ground of the cave setting.

A live actor performs a matched routine with the synchronised visual illusions controlled by a cue track played to him on a fold-back speaker system. Eighteen computers lock the systems together (as well as control theatre doors, houselights and crowd control procedures). All effects are cued by the master clock and the entire system is operated by the actor who pushes a button at his start position. The performance lasts eight and a half minutes with a synch-tolerance of 1/30 second.

The Rainbow Sphere Theatre offers another visual feast; a gigantic illuminated ball suspended in black limbo. Behind this display is a complex six-way video-driven kaleidoscope. It uses six video projectors of special high density.

The two theaters and other displays including a personality-endowed robot which greets visitors and divulges information about the pavilion, were devised by Mike Browning of Fourth Dimension Concepts, Melbourne, which was contracted to provide the visual effects. According to Browning the Rainbow Serpent Theatre is a completely new system and an entirely Australian invention.

Outside the main performance, the visitor can pour over various notable Australian inventions including a solar-powered car built by a group of South Australian students and meet Blue the aforementioned robot.

Elsewhere

While Expo 88 functions ultimately to induct nations into each other's cultures and products, and familiarises the individual with ways of life, the organisers are keen to make it also a spectacle and a pleasure. If you don't find the buskers and parades to your taste, the laser light show might be the thing to spark you up. Four locations at the Expo have been set aside, the amphitheatre, the piazza, the Riverstage and the Performing Arts Complex as well as an on-site laser programming studio for these visual (and aural) spectacles. Effects will include swirling, slowing clouds, computer graphics and animated sequences. A laser billboard at the Performing Arts Complex will relay messages including time and temperature and upcoming events. It also presents images as complex as a flower or car or portraits. The technology involves using a computer (Apple Macintosh or IBM-PC) in conjunction with a synthesiser and special scanners. Input animation is digitised and generated as Cartesian co-ordinates using a bit-pad and computer to store for reconstruction by the lasers and scanners. The scanners are motorised mirrors which move along one axis. Producer Laurie Plainer explains the scanners thus: "One scanner is vibrating and when the beam of light hits it, it moves back and forth along the horizontal line. If you then bounce that beam of light across another mirror traveling in the opposite direction, you then have the beam of light moving in the vertical direction. If the scanner is moving fast enough it looks life a vertical line. If you keep the frequencies high, you have both a vertical and horizontal line being described by two scanners. The sum of the two frequencies will create a circle". Changing the fre-

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quencies changes the patterns of light.

Behind the Scenes

Behind the displays, pavilions and administration there is, as you'd expect, a computer system. Expo 88 uses an IBM System/38 computer to link all participants with Expo offices in a local area network. The computer installation is one of the most extensive installations of its kind, with 26 kilometres of underground cabling linking the over 220 IBM PCs, XTs, ATs and Personal System/2s, printers and terminals.

The network will support a population of over 600 people of differing nationalities involved in the Expo, and it provides them with a number of applications from scheduling performances in the 65,000 time slots over the six month period to providing electronic mail facilities for the international and corporate exhibitors. In fact, the system is used in four main areas: for the head office database, public displays, entertainment scheduling, and ticketing.

But the communications system at Expo has not been designed with only participants in mind. There are a number of networks that make the visitor's trip a little smoother. While IBM has supplied equipment for the adminstration and running of Expo, the organisers have tried to keep the public interactive systems independent from the main network, with separate cabling and different equipment. One example, devised by Expo's Technology Unit Director, Ken Pope, for handling lost children is a world first. The system, "Lostots", is based on one pioneered in the US by Datapoint Corp for use in juvenile courts to allow children to give evidence from outside a courtroom. Pope adapted the video, voice and data communications system to provide five intereactive workstations throughout the site through which parents and children can communicate. The system uses Datapoint Minx workstations consisting of a high resolution colour monitor with built-in video camera, full duplex speaker and microphone. Communications between workstations are serviced through a cluster controller. In the video communications mode, which will be used at Expo, the workstation operates on a hands-free basis. The video image is switched by voice activation to show the speaker in a multi-way conference. Although the system can operate via radio and microwave it is networked using coaxial cable.

Another interactive system is Expo Info, developed in partnership with Telecom. This videotex system consists of eight information kiosks located throughout the Expo site, equipped with seven Sony touchscreen displays and audio facilities working in conjunction with videodiscs, and controlling computer to provide information about Expo facilities, pavilions, public transport, local events in Brisbane, etc. They do their bit for tourism too with 20 second video clips advertising any selected exhibiting country, and they cater particularly for the Japanese tourist here. All information is in Japanese and English. According to Expo officials, even before Expo started 100,000 tickets had already been booked by Japanese visitors and 200,000 are expected.

Now that Expo is near opening, interest in it which was initially very poor is creeping up on the nation. As a spectacle it is value for the tourist, a compact world of countries including the US, Soviet Union, Japan, countries from the Middle East, Europe, Asia and The Pacific. As a money spinner it is a bonus for Queensland's tourist industry and a good short-term employment project. For the exhibiting nations perhaps it's too early to tell what Expo 88 will do for their tourism and business. ●

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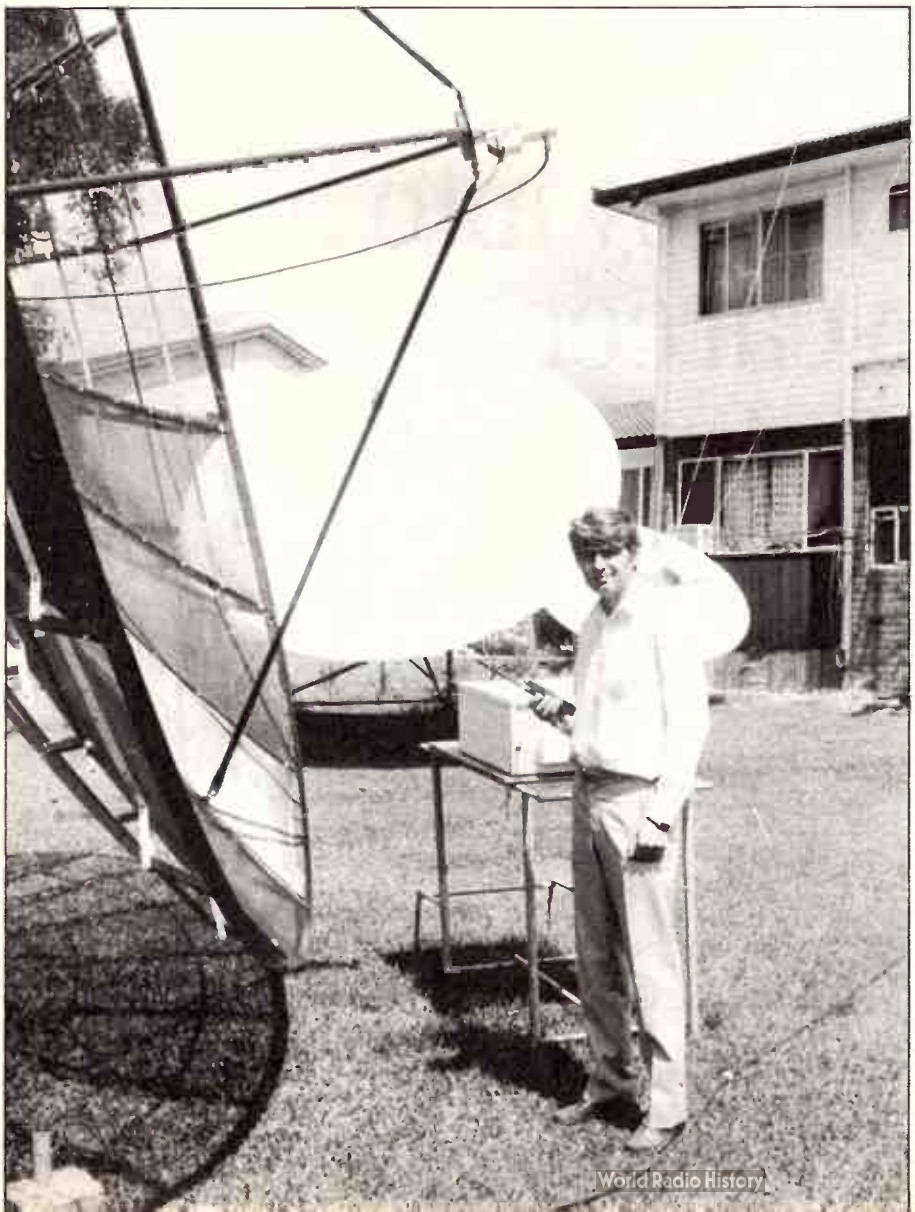
AUSTRALIA'S NUMBER ONE SKY WATCHER

Vic Barker of Gorokan on the Central Coast of New South Wales is a keen sky watcher, although he's only interested in man-made 'stars' . . . ones that relay electronic impulses back to earth. He has been receiving signals from orbiting transponders since before Aussat was a gleam in a designer's eye.

Thomas E. King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Amateur radio helps Vic Barker, VK2BTV, keep in touch with other enthusiasts on the NSW Central Coast while satellite TV allows him to watch the world.

Vic Barker's fascination with satellite TV reception began in 1968 when, accompanied by a home-made colour monitor he arrived in Australia from his native England. The first Pacific Intelsat was switched on, and began relaying information from the USA to Australia. He began a series of attempts to receive the trans-Pacific transmissions. His ongoing attempts were unsuccessful until 1975 when, equipped with a Tunnel Diode Amplifier, and a 10 ft ex Telecom dish, he was able to view NTSC black and white pictures of a golf tournament.

These efforts, 13 years ago, may well have made him the world's first private individual to receive direct satellite broadcasts! In 1978, aided by a Low Noise Amplifier, of Canadian design he tuned into his first NTSC colour signals from Intelsat 4.

Two years later, he was able to watch the colour broadcast feeds to Australia from the Olympic Games in Moscow. By then his homebrew receive station employed an innovative 'threshhold extension technique'. Such a development, states Barker, "comprises an automatic IF tracking system vastly improving the signal to noise ratio. It gave me the equivalent of a 30 ft dish or a receiver with a 1 dB noise figure at 4 GHz."

Gorizont

Using extensive technical and design background to improve his state-of-the-art private earth station, Barker now has much of

Sports action as it's happening half way around the globe is one advantage of a private earth station.

the world at his fingertips. With careful alignment of a large dish and accurate fine tuning of the down converter satellite receiver there's a slowly expanding horizon of satellites to choose from: two Russian satellites, Gorizont 6 at 140°E and Gorizont 8 at 90°E; Palapa B-2 from Indonesia; another Russian, Statsionar 15 at 128°E; Aussats 1, 2 and 3 and the two international globe straddling giants, Intelsat 5 at 180°E and Intelsat 4 AF at 174°E. "Much of the programming on the Indonesian satellite," says Barker, "is of religious nature and not overly interesting for Westerners. Besides that, the signal level is low. A 25 ft dish is really needed in this part of Australia just to get a viewable picture."

Programmes coming from the Russian satellites are entirely different. With the great emphasis that the Sovier Government places on culture, programming is quite varied with considerable music and dance. Lots of lengthy news programs are broadcast, and there is a strong patriotic slant to all Soviet programming. An occasional glimpse of the outside world is seen when either an old western movie, Australian material, or a David Attenborough special is screened. Of course, it's all dubbed into Russian.

"Technical standards are high," he says, "production is excellent even on the commercials which highlight the virtues of locally-made stereos, motorbikes and shampoos. The area which needs improvement is editing."

The Russian satellites provide continual coverage of Programs 1 and 2 from Moscow. An added bonus is that Radio Myak, the national FM service, is available on a TV subcarrier. It's a good source of background music for the experimenter while he's involved in his two other interests: amateur radio and high performance cars.

Intelsats

The widest choice of English language program material naturally comes off the Intelsats satellites which, between them, have footprints covering a third of the globe. Because Intelsat 4 is used for news transfers and specialised programs, it doesn't have the appeal of the 12 transponders of Intelsat 5. This satellite is the one that carries links from the UK and various parts of the USA through the American CBS and NBC networks to the Australian 7 and 9 networks. An additional transponder serves as a TV feed for the Armed Forces Radio and Television System (AFRTS). American sports such as baseball and football and highly popular regulars such as Johnny Carson's, "Tonight Show" are constantly broadcast.

Transponders on Intelsat 5 are also used to electronically link New Zealand, Japan, the USA, Indonesia and Australia for the exchange of broadcast matter. For example, when a Japanese TV team toured Australia, they satellited hours of interviews and features through Intelsat 5 back home for inclusion an evening variety show. In a different direction the Japanese regularly use the same satellite between Tokyo and New York to feed daily Japanese language telecasts in the Big Apple.

For a while New Zealand had a wider choice of electronic media outlets when programming from the ABC was relayed through Intelsat. This stopped with Aussat's birth. There is an Aussat footprint, however, which can be now used for the relay of ABC or commercial services from Australia. This is somewhat of a paradox as New Zealand does not, as yet, have its own satellite link between the north and south islands.

Such a plethora of satellite services allows a 24 hour view of the world, as various links are in place throughout the day or night. One can see events in their entirety as they happen without commercial interruption. For instance, in 1985 Barker watched history in the making as the funeral of Indira Gandhi progressed to its firey conclusion. Because of the distance involved several satellites were used to get the images from India to Australia.

Barker briefly monitors the various available satellites every day. Only if there is an event of significance does he sit and watch the proceedings continuously. Satellite TV is a hobby requiring an immense amount of time, patience and a fair bit of money, even if the system is self-constructed. "It's not simply a matter of pointing the dish at the sky and expecting to see something at the first try," he said. Very careful adjustment is needed if impulses relayed from 35,000 km overhead are to be transformed into watchable pictures.

The first point in the private earth station is the dish, or to be exact, three dishes. He uses a 16 foot dish for the Indonesian and Russian satellites and a 12 foot one from Hills for Russia and the Intelsats. An 8 foot dish is reserved exclusively for reception of Aussat signals.

"A package involving a dish, LNA and a satellite receiver can cost about $2500." This doesn't include the NTSC monitor. If someone starting out has a bit of extra cash they can invest $600 to $1000 in a multistandard monitor which can decode any type of transmission. A video recorder or two doesn't go astray, and for ease of operation the whole satellite receiving station can be computer controlled.

Even though he has employed all of the latest technology he still finds the hobby a challenge. It's a challenge that apparently no one else in Australia has taken up. While many isolated families in the Outback are using Aussat satellite broadcasts as their only access to the world around them this veteran experimenter finds there is no one else in the country to exchange ideas and information with about foreign satellite services. Until others join in this most unusual aspect of DXing he'll remain as Australia's Number One Sky Watcher. ●

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THE ILLAWARRA TECHNOLOGY CENTRE

Approximately six months ago, a $5 million building came on-line to house the Illawarra Technology Centre. It's intended to promote Australian technology in an entrepreneurial way as never before.

Peter Phillips

Situated at the bottom of the infamous Mt Ousley in the grounds of the University of Wollongong is a modern, large, high security building, known as the Illawarra Technology Centre (ITC). Surrounded by trees, the building is all but invisible from the Princes Highway that runs alongside. Opened in November 1987, it augments the smaller premises in Keira Street, Wollongong, used from the time the centre was first established in 1984.

And what, you may ask, is a technology centre and how did it all begin?

To start with, consider the following problem. It demonstrates a typical situation faced by smaller companies with big ideas.

Your company, located in a disused garage, has developed a system of ac motor control. You know the idea is a good one; there's even a prototype to prove it. Now imagine selling the product to a prospect who has driven to the garage, and who is trying to ignore the unlined walls, the leaky roof and the primitive surroundings. "Yes, it's just what we want," says the prospect, he really can't assimilate the benefit of the product in the environment that has spawned it. Present the same product in a more sympathetic situation and things start to look up. It is, it seems, human nature to view the packaging first, then the product.

Enter the Technology Centre, where presentation is paramount.

The need for a Technology Centre in Wollongong that could support and help market technology has its origins with the University of Wollongong. The University, anxious to throw off the public perception of academia first, the rest second, is typi-

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cal of the trend of such institutions, where the need for a closer relationship with industry and commerce is now more a matter of survival than mere trendy rhetoric. And so, in 1984, funded under the Federal Government's 'Steel Regions Assistance Plan', the ITC was set up, pioneered by representatives from groups including the business community and the University of Wollongong.

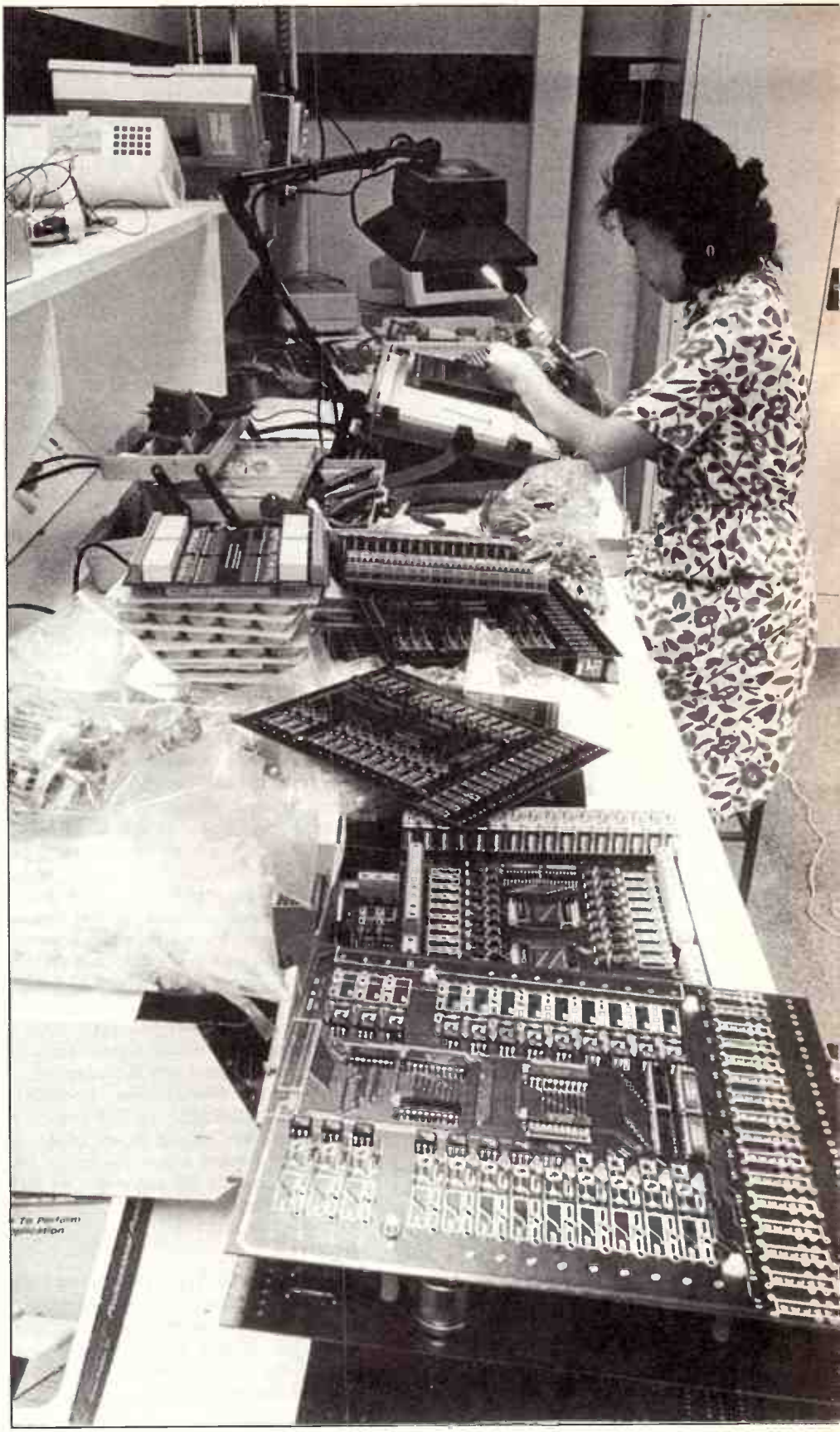
Under the same plan, a similar centre is also located at Newcastle University, and, depending on the eventual success of these, Australia may see more such centres set up to promote local talent that has previously had to either sell out to an overseas venture or try it alone.

The ITC is a non-profit company formed by the University of Wollongong, but with separate State Government funding, making it essentially autonomous. Its aims are, simply, to promote technology, by providing services for companies who need an umbrella to get started. Essentially, a company with technological products in mind can set up its operations within the centre, and use the many facilities and services provided. In return, the centre is guaranteed a 'slice of the action' when that company finally succeeds. The facilities offered include workshops, offices, an area to show the product to visitors, and assistance in the areas of financial management and business planning. As well, services that include a receptionist, PABX system, fax machine, photocopier and all the usual requirements for a commercial enterprise are incorporated; used on a share basis by the various inhabitants of the centre.

The centre targets its entrepreneurial activities towards other Australian companies who normally buy their hi-tech products overseas. The definition of 'hi-tech' is rather loose, but if a computer is a part of the product, then it fits the bill. This means that software companies can avail themselves of the centre, as can others involved in computer.

The Building

The modern, blue building that houses the ITC stands as an imposing monument, not to education, but to the marketing of technology. Here the various companies using the centre display their products in designer surroundings complete with original oils and potted palms all set in a wide area with vaulted ceilings fitted with glass panelling. From this point myriad stairs and corridors lead to offices, a conference room, workshops and development areas. A sophisticated security system prevents casual entry to the development and workshop areas, providing protection for the



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projects under development.

Each enterprise that occupies the centre has its own offices, but shares everything else provided by the centre. There is a workshop, fitted with metal working machinery that includes a lathe, milling machine, bench drills, etc, and a high ceiling area for development of heavy industrial technology. This latter area is connected both visually and electronically to another room intended to house the control electronics of the machinery under development. Currently, a robotics system for welding is being researched, which itself is producing offshoots, including an all-Australian PLC. There are only limited facilities for electronic work, as the centre concentrates on design and the construction of prototypes only. Printed circuit board design is supported by a communal plotter, computers and so on.

A large development area is provided, shared by those companies developing hardware or the related software. Here the visitor is confronted by the typical chaos of any developmental area, complete with drawing boards, workbenches, desks, and lots of computers. Almost every desk has its own Macintosh computer, ranging from the oldest to the newest, some owned by the company, others by the centre. Naturally, this area is not on show; instead, a visitor would be shown to the manager's office, where samples of the product can be viewed or interviews held. In some cases, companies using the centre do so only for the office facilities, and undertake their product development elsewhere. If the company needs to hold a seminar, the conference area, complete with kitchen facilities, is available. Here seating and bench space are provided, allowing product display to augment the seminar. In fact, everything needed to promote a product is available, giving visitors an impression that Australia really does have something to offer in the field of 'hi-tech'.

Various companies/organisations are currently using the centre, and some will move on when (and if), they finally make it. Of the 15 enterprises currently using the centre, some are affiliated directly to the ITC, which also supports activities being undertaken by the University. Staff and students of the University can, and do, become involved in the activities of the centre, but it is evident that the centre is not merely a facade that attracts extra funding for the sole benefit of the University of Wollongong. Things are happening, and the impact of these should start to filter through not only to Wollongong, but to all Australia.

The following roundup of the activities being undertaken at the ITC is not complete, but should give some idea of the likely impact of this centre.

TASC

The Centre of Technology and Social Change (TASC) is a division of the ITC, and was one of the ideas being promoted by University staff before the ITC started. TASC has the objective of showing organisations how to cope with new technology.

The idea of consultants in this field might seem familiar, but, it seems, such is not so. Most management consultants are concerned with personnel, technical consultants with technology, and rarely do the twain meet. TASC offers, among other things, an integrated service that relates technology and its sociological impact on the employees. It also provides expertise in identifying technological opportunities and the assessment of the firm's infrastructure to get the most out of the opportunity.

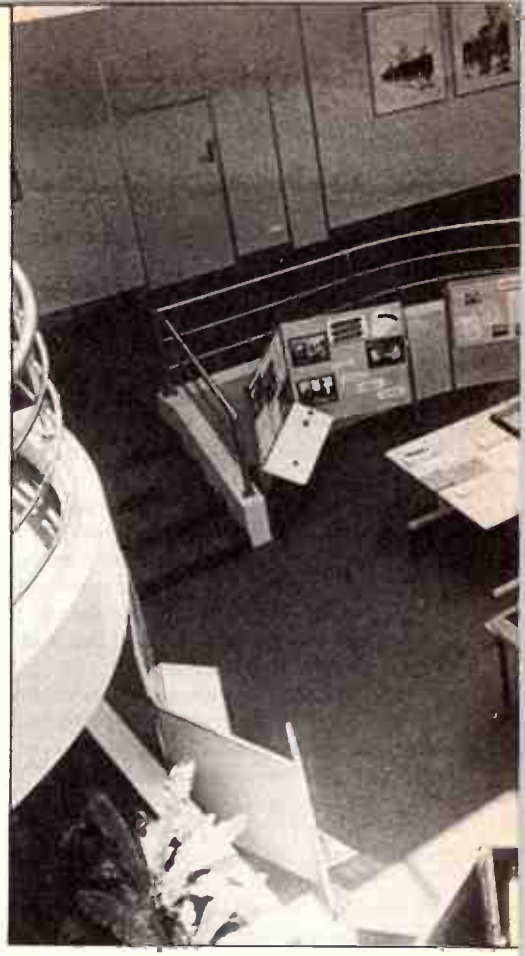
Typically, TASC is called on to identify, not problems with the system itself, but with the manner in which it is being used. It may be that entrenched procedures are preventing the system from operating in the most efficient way, a situation typical of many large government departments or private organisations. TASC would then evaluate the procedures, identify the problems and either solve them or advise the client where to go for help.

As well TASC provides services and advice in the area of worker training in conjunction with other groups, such the Trade Union Training Authority. Like any 'steel industry' city, Wollongong is heavily unionised. The unions have opposed the introduction of new technology on the grounds of creating unemployment. The current view of the union bosses, is that international competitiveness must be achieved, and if technology is the way to do it then it must be supported.

TASC is cited by some as being one of the success stories of the ITC, with its $750,000 annual income, and its contracts with the Commonwealth Government, all mainland State Governments, the CSIRO, BHP, Shell, UNESCO, OECD and so on. Certainly, TASC is not typical of the organisations housed within the centre, but its role in gaining the acceptance of technology is considered by some to be as important as the technology itself.

AAPDA

The Australasian Apple Programmers and Developers Association (AAPDA) is a group currently under sponsorship from Apple Inc. Under the auspices of Alan House, this organisation provides support to programmers of Apple computers. In the early days of the Apple, when the field was wide open, support from Apple was not really important. But with the release of the Apple IIGS, the new MAC, and other advanced products that are too complex to prevent individual effort from producing successful software, Apple Australia decided to set up AAPDA. However, Apple itself didn't want the responsibility of supporting prospective programmers. Rather it decided to sponsor an independent group that could act as a clearing house for technical publications, related software and information. Established in mid 1987, AAPDA has already held its first conference in the Technology Centre, and is now virtually financially independent.



AAPDA is a typical example of how ITC has assisted a group that would otherwise have faced many difficulties getting started. While Apple may possibly be advantaged by increased sales of its computers due to the availability of more software, the main beneficiaries will be those individuals who, through the support of AAPDA, write successful software. And in the IBM world, some incentives are needed it seems. Furthermore, national goals will be satisfied if some members eventually write world-class software. To date, no export orders have been received, but the groundwork is now in place for this to happen. According to Apple's Alan Bell, there is a growing demand, worldwide, for GS software.

AAPDA is already approaching finan-

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cial independence, but may choose to remain at the ITC, by paying, at commercial rates, for the services provided by the centre. There is no obligation for an organisation, when financially independent, to move out, as ITC, like any company, likes some of its tenants to be able to pay their own way.

Controllex Systems

Controllex Systems is a firm dedicated to producing building automation systems. Its founder, Don Peterson, saw a need for an Australian-designed energy management system several years ago, and the resulting device, the CX1, using a 6502 microprocessor, is currently reducing the power bills of many commercial buildings. But like any first product, the CX1 is limited, and Controllex Systems is now developing the CX2 — a much enhanced version of its forerunner. The Technology Centre is ideal for tasks of this type, as the costs of RD for the CX2 are offset by ITC having available some of the equipment that would otherwise have had to be purchased.

Building automation systems, as opposed to energy management systems, offer not only control of lighting and temperature within a large complex, but security, data logging and even evacuation procedures by way of voice synthesis. The CX2, according to Paul Owen, one of its designers, will offer many features that even imported versions lack. For example, it will not be based on a mainframe or minicomputer, but will use its own 68000 processor, housed in its own dedicated enclosure. The user interface will be 'user friendly' and input will be by way of an IBM-AT with a touch screen to enable anyone to operate it. Communication between processor units using on-board modems, linked via fibre optics, will allow units to be interconnected as required. Development of the system is on two fronts; hardware and software, and is well down the track. Already, visitors to the ITC can see the touch screen front end, and observe how the system will operate.

When released, this system will be a serious challenger to the imported products, and will be one of maybe two other all-Australian versions of an increasingly popular device. Controllex Systems is currently the winner of three National Energy Management Awards given by the Federal Department of Resources and Energy, and has as its clients firms such as Westfield, David Jones, Pepsico, the CSIRO and so on. Controllex Systems intends to pursue the export market with the CX2, a unit which appears to be at the forefront of this technology. Perhaps it will become a world leader in the field — another ITC-supported success story.

And There's Lots More

Space restrictions prevent a complete dossier on the activities germinating within the ITC, but two more are deserving of mention in an electronics magazine. One of these is NEIS, (National Engineering Information Services) which is establishing a database that is currently aimed at the Metals Industry. Currently, with the support of BHP, a national 'shopping list' of every supplier of metal parts is being compiled, so that any interested party can access it to find out who makes the very thing needed to complete a particular maintenance task. Using Viatel, the system also allows electronic tendering, even electronic payment. According to the director, Dick Schneller, this system is unique in the world, and is guaranteed to reduce maintenance replacement parts costs by at least 40%. Its electronics counterpart will include every firm in Australia which supplies anything electronic, and the interactive capabilities of the database make it an innovation that will streamline ordering and tendering systems, with subsequent reductions in this type of cost overhead.

And, just when you thought the nation couldn't stand another PLC, the ITC Development Group is about to release one, in June, according to its principal designer Geoff Barton. The features, apart from being all-Australian (according to my sources, the only other one is presently being marketed by AWA) include small packaging with lots of I/O (24 in, 16 out) and the capability of being programmed (in full graphics) by any computer with VT100 terminal emulation mode. And it will include datalogging and PID (analogue — proportional, integral and differential) control. This PLC will be marketed by Elec Tec of Melbourne, and resulted from a need for such a device during the research of the robotics system referred to earlier.

The Future

What started out as the Illawarra Technology Centre is becoming something far larger, according to executive officer Kathleen Iacurto. Proof of this is the current feasibility study being undertaken by Coopers & Lybrand to establish a Technology Park adjacent to the Lucas Heights Research Laboratories. The aim of this 'park' is to provide a means of technology transfer through the entrepreneurial activities of ITC from ANSTO (Australian Nuclear Science and Tecnology Organisation) and others who avail themselves of the facilities.

A lot of great ideas are under development. The task is to sell them to others, both here and overseas. The ITC building at Wollongong is already full, but the recent purchase of the Fairy Meadow Migrant Centre will accommodate more "tenants" who need nurturing to reach full potential. There is a lot happening it seems, and the future looks even brighter for the small groups with high-tech ideas. ●

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Electronics has changed the face of modern astronomy.

THE REVOLUTION IN OPTICAL ASTRONOMY

David Allen

Such has been the modern transformation in optical astronomy that today's students learn none of the old skills, but cut their teeth on the keyboards of big computers and in laboratories bristling with modern electronics. This may seem no more than the steady march of progress we see in all walks of life, but to the professional astronomer it has been much more. In fact it is a revolution in optical astronomy as far-reaching as its predecessor in 1609 when the astronomical telescope was born.

The Electronic Revolution

This revolution can be dated precisely. In 1972 two men independently introduced the first sophisticated electronic detectors to astronomy. Joe Wampler, working at the Lick Observatory in California, devised the Image Dissector Scanner, the IDS. Simultaneously in the UK, Alec Boksenberg, of University College London, gave first light to the Image Photon Counting System, or IPCS. Both types of detectors remain, to this day, the mainstay of many observatories. At the Anglo-Aus-

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tralian Telescope we have used both, and have found the IPCS to be the more versatile, so I will describe it.

Astronomical Spectroscopy

It's instructive to follow the history of astronomical spectroscopy. We are all familiar with the spectral properties of prisms, and it is no surprise to learn that the first approach to spectroscopy merely entailed looking through one or more prisms set up at the eyepiece of a telescope. The earliest major discoveries were made this way, as when the English amateur Sir William Huggins, encountered the emission spectrum of a hot gas cloud and hypothesised that this was a birthplace of stars. Soon, photographic emulsions proved better at recording the spectra of faint objects, and astronomers were able to do quantitative work — real physics and chemistry — on the stars, nebulae and planets. The wartime invention of the image tube gave a further fillip when placed between the spectrograph and the photographic plate. But here progress came to a jarring halt.

The reason was quite simple: the sky is not dark at night. About 100 km about our heads is a faintly luminous layer, and this, combined with the blended radiation of myriads of stars and galaxies, gives light enough to saturate a photograph given a sufficiently long exposure. The use of an image tube merely hastened the effect. Unless the object under study was brighter than the patch of sky that inevitably surrounded it, and which was also recorded by the spectrograph, the plate would be overexposed before any useful information could be derived.

Photon Counting

The IDS and IPCS overcame this problem by doing away with the photographic plate. Instead, an image tube amplified the incident light and fed it to a TV camera. The light was digitized at something like TV frame rates, and the numbers that came out — one per detected photon — were stored in a computer memory. The counts could be accumulated indefinitely without saturation. If the star galaxy being studied proved fainter than the surrounding sky, one simply integrated for longer. One portion of the memory accumulated the object plus superimposed sky; another monitored an equivalent patch of sky alone, so that the difference yielded the object. Moreover, the difference could be continually displayed as the observation proceeded. Compare this situation with the photographic plate where in order to find out what one had detected one had to wait, not only for the end of the exposure, but also the subsequent processing, which might not have been possible until the following morning. Electronics had suddenly taken the astronomer inside the photographic emulsion, allowing immediate judgement on such matters as exposure time and indeed whether the observation was proving useful or not.

In the IPCS there are some extra subtleties. Image tubes are rather dirty detectors — they produce random splashes of light, the so-called ion events, quite frequently. A soldier focusing on a dark forest easily dismisses these brief flashes, whereas the photographic emulsion remembers them all. But the ion events can be distinguished from photons by their size and brightness. Thus they can be rejected by the electronics of the IPCS so that they don't contaminate the data. Clever stuff. Yet more subtle than that is the event centering.

The picture that glows on the phosphor of an image tube is fuzzier than the pattern that lands on its front face. Since astronomers are struggling with very faint objects, several image tubes tend to be stacked one behind another, so that the resulting picture is extremely diffuse. The IPCS electronics include logic circuitry to examine every splash of light received during each frame. For each roughly circular splash the centre is determined, and the computer memory is fed with one count only at the address corresponding to the centre of the splash. In this way the fine detail in the spectrum is retained.

The increase in sensitivity has been staggering. In the 50s and 60s, astronomers who had access to large amounts of telescope time would expose on the same photographic plate for several nights in order to garner the data they sought. The story is often told how Rudolph Minkowski, at the giant Palomar 200-inch telescope, exposed one plate through five consecutive clear nights. At the end of this he was exhausted, but in his enthusiasm to see the result he took the precious plate down to the darkroom — only to develop it in the fixer! Today on the same telescope the same star can be observed better in a few minutes. The data are cleanly stored on magnetic tape, where they are relatively immune to accidental deletion, and can be duplicated at any time as desired without loss of quality. The data are also handily available in digital form for quantitative analysis, again contrasting with the mesolithic era of the photographic plate when enormously complex calibrations were needed to extract all the information.

Charge-Coupled Devices

The IPCS is by no means the end of the story. Charge-coupled devices (CCDs) convert about 80% of incident photons into electrons suitable for measurement, and are therefore a factor of five more sensitive than the image tube at the front of the IPCS. Potentially the CCD can make further gains for astronomy.

When used at a telescope, a CCD is a different animal from the device one runs in a TV camera. Astronomy deals with ultra-low light levels. After exposing for 15 minutes, accumulating photoelectrons all the while, an astronomical image may

Observing at the AAT in the small hours. The astronomer, at left, is at the control desk for the IPCS. At right, the telescope is controlled by the night assistant.

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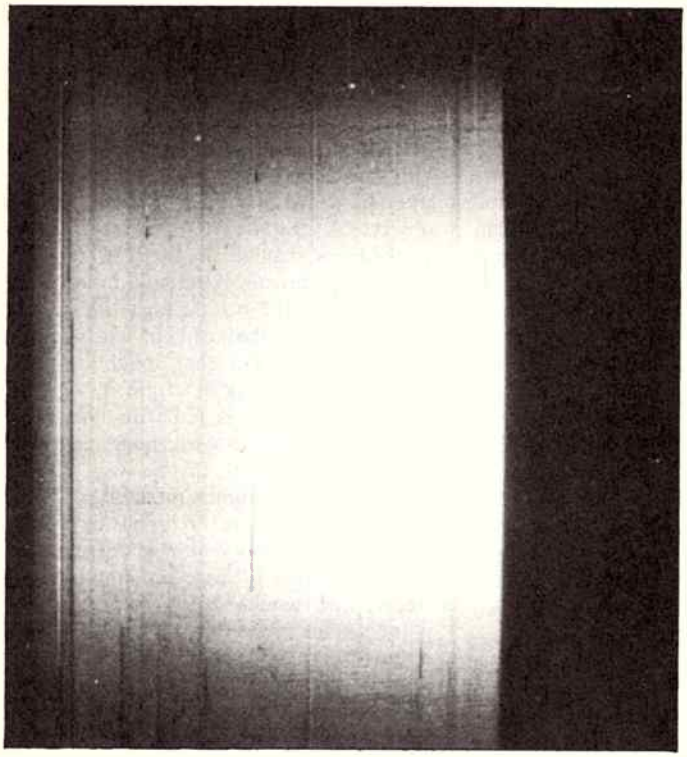
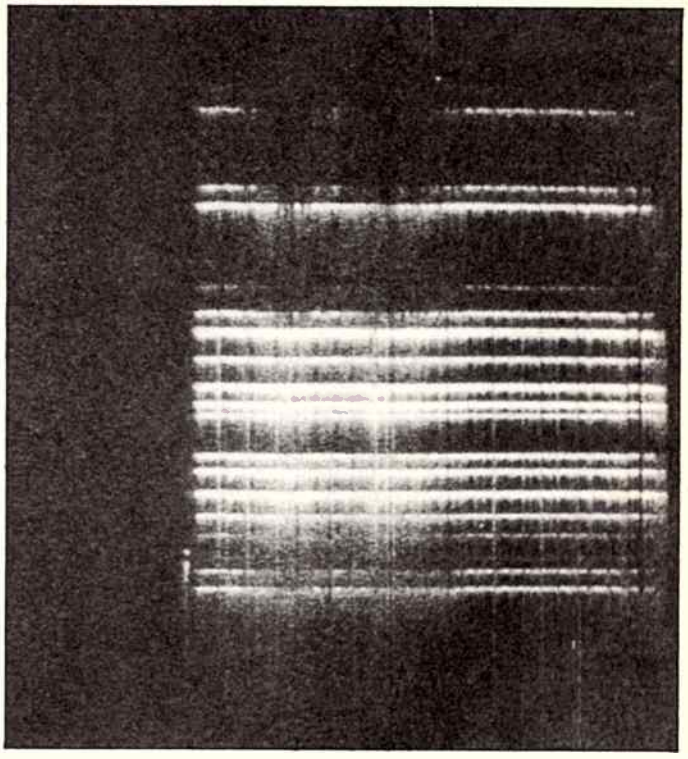


At the low light levels typical in astronomy, dozens of defects show up on this CCD as dark lines and streaks. In a TV camera this chip would appear virtually perfect.



When bands of light are recorded by the same CCD, different defects show up. The astronomer uses those portions of the chip where light is not smeared downwards from one of the bands. In this chip we were restricted to only a few percent of the 385 available columns; it has now been replaced by a much superior specimen.

have only a few tens of electrons in each pixel. In order to measure this minute charge, the CCD must be extraordinarily clean in its operation. Indeed, the IPCS sets high standards, for it is essentially noiseless in its recording of light. To a good approximation every phon detected produces one and only one count in memory, and counts are generated by no other source. The CCD, on the other hand, injects uncertainty as each pixel is read out, in the form of readout noise. In some CCDs the uncertainty may amount to one hundred electrons (and hence photons). Worse, CCDs must shift the precious electrons from pixel to pixel before they are counted; the slightest flaws in that shifting operation contaminate the data.

Exactly how well a CCD performs for astronomy depends on several factors. Slight impurities or defects in the silicon generate small so-called trapping sites; these can be thought of as pits which must be filled up before electrons can be shifted past them. A trapping site may swallow the first one hundred electrons it receives, and a bad one can hold some thousands. In a TV image there will be as many as one million electrons per pixel. The loss of even several thousand electrons from one pixel is then quite trivial. But if the astronomical image has only 20 electrons per pixel, the trapping site will obliterate the signal from several consecutive pixels as the charge is shifted through to be read out. Even in the absence of trapping sites there are slight inefficiencies in the charge transfer process, so that a sharp point of light (such as a star) in one corner of the CCD may have degraded into a fuzzy streak by the time it reaches the opposite, readout corner. The requirement for high cosmetic quality means that only the very best CCDs are suitable, in practice only the top percentage or so.

The performance of the CCD can be improved by suitable adjustments to the many controlling voltages and clocking waveforms. By optimisation of these parameters some of the trapping sites can be weakened, and improvements can be made to the general efficiency of transferring charge, to the noise added at the read-out, and to the unwanted electrons generated within the chip itself (the dark current). For best operation the chip must be cooled to a temperature near 170 K (100 C), which necessitates cryogenic equipment and its associated complexities. When all of this has to be mounted at the back end of a telescope, where it will be tipped at crazy angles and subjected to large changes of ambient temperature and humidity, the technology becomes demanding. Nonetheless, most optical observatories are now equipping their telescopes with CCD detectors.

Armchair Astronomy

I have concentrated on the detectors because therein lies the astronomical revolution. Electronics has also found its way into the instruments that fit between the telescopes and the detectors.

Spectrographs are favourites amongst astronomers: the gentle art of spectroscopy has long been the most potent tool for determining the physical and chemical state of objects too remote to touch and too large to place in a laboratory.

Professional astronomy has been turned into an armchair activity, and this in turn has freed the astronomer for much more sophisticated analyses within moments using the power of a large computer. Not only can he see that the exposure was satisfactory, but he can tell whether some particular subtlety of the data is matching his expectations or not, and whether more data are needed.

Converted Darkrooms

The Ango-Australian Telescope was designed and built in the pre-electronics era. Its eight storeys abound with darkrooms. Some of these are in continuous use, because the photographic plate retains one

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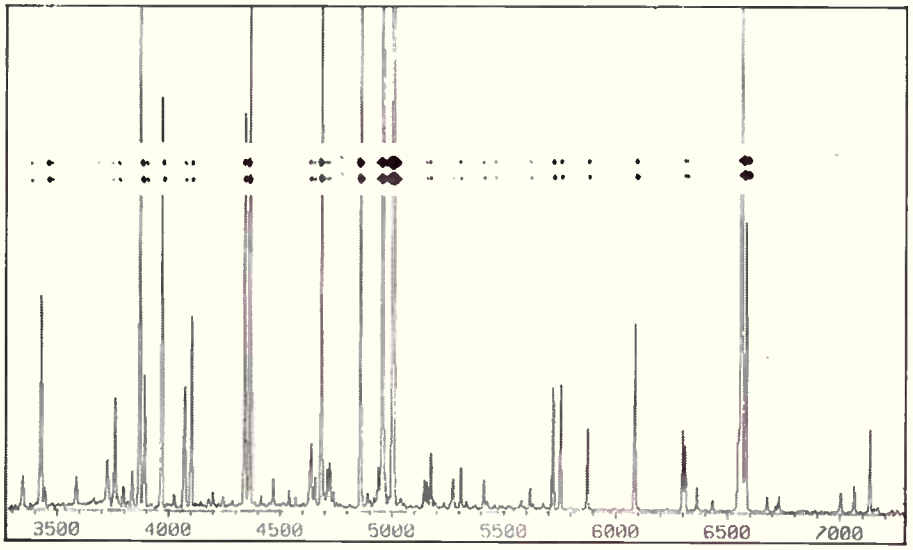
great advantage over the electronic detectors — its size — and for some astronomical problems it remains unsurpassed. But more than half of the darkrooms have been converted into electronics laboratories. Within these labs, technicans beaver away daily to maintain and upgrade the instruments and detectors

The staff are highly skilled and devoted people, and unquestionably represent the Observatory's greatest asset. It is a difficult job to build a new piece of equipment that is truly state-of-the-art. But it is a much more difficult task to maintain it at the forefront when it is used almost nightly by dozens of astronomers who have little understanding of or interest in the subtle inner details. And without those forefront instruments the AAT would lapse into mediocrity, carrying with it much of Australia's international reputation in astronomy.

There is an interesting corollary. It used to be that optical telescopes were sited in places that had superb night-time climates. Such sites are inevitably remote mountain peaks in desert regions, a prime example being the Andean foothills of northern Chille just inland from the Atacama Desert. There are no sites in Australia that match the Chilean climate, yet for the last decade the AAT has been arguably the most productive optical telescope in the world. The reason is that it is sited within half an hour's drive of the pleasant country town of Coonabarabran, a much more acceptable place for a top-notch electronics technician or engineer to live than the Atacama Desert. The men whose chose Siding Spring Mountain for the telescope made a far-sighted decision. ●

David Allen is an astronomer at the Anglo-Australian Observatory.



Photographic spectra, such as the pair across the centre, took hours of telescope time. Modern digital detectors produce the intensity graph of the same object in minutes. This is the spectrum of a gas cloud made to floresce by ultraviolet radiation from a hot star. The heights of the various peaks convey information on the physical and chemical state of the gas.

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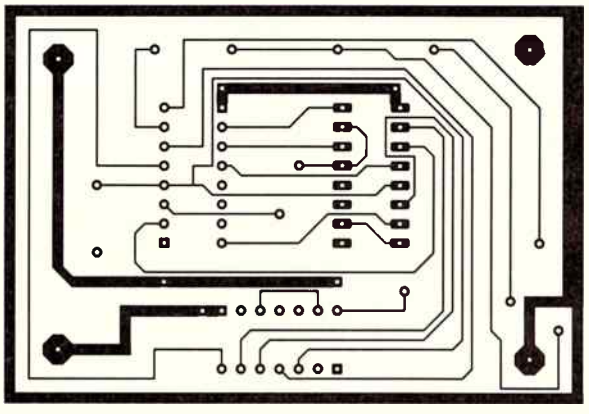

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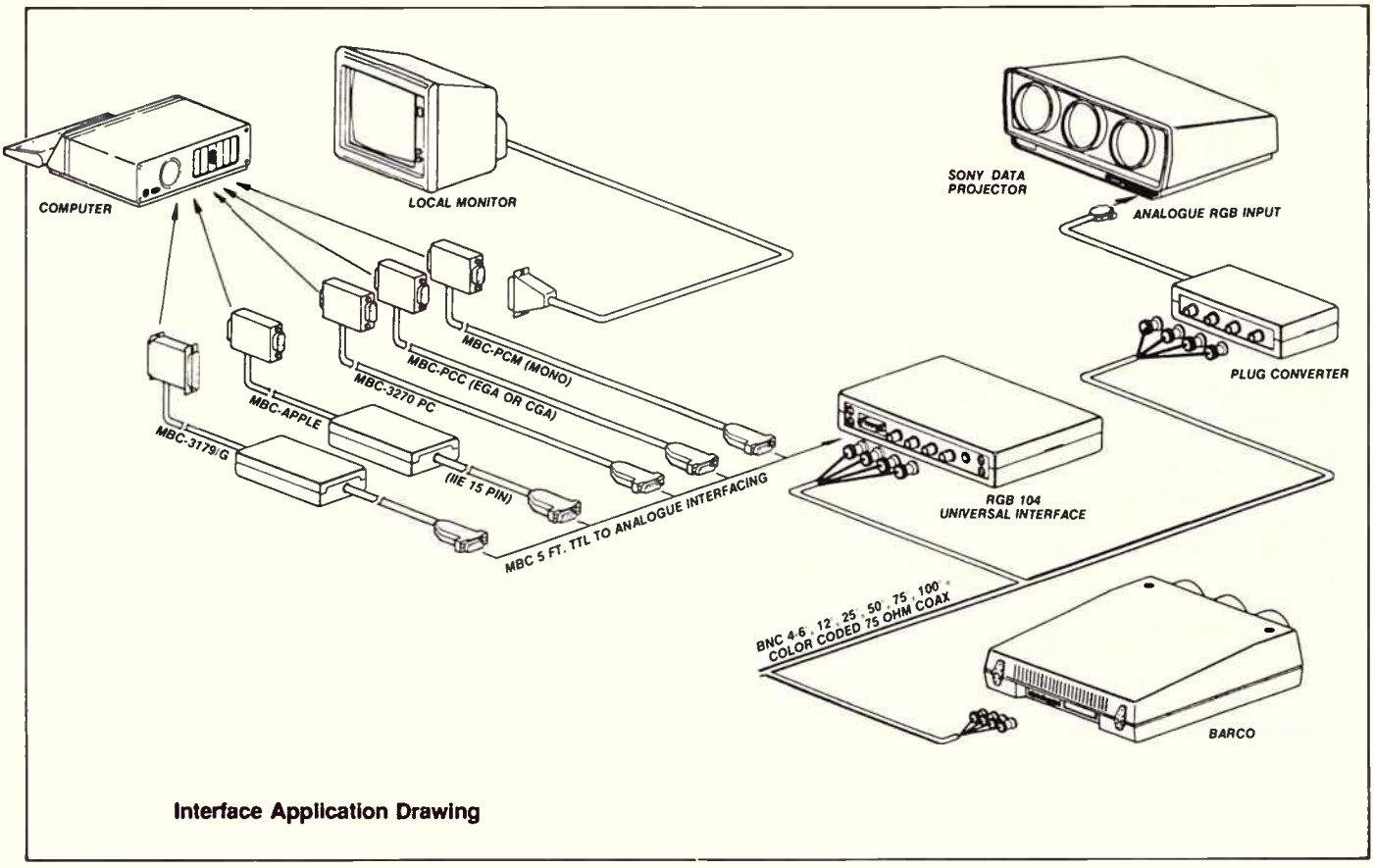

Interface Application Drawing

DATA PROJECTION

Derek J. Powell

Much time and effort goes into designing computers that can communicate with the world at large, Modems allow international data exchange; laser printers simplify publication of information. But real time viewing of computer text and graphics has been limited to the two or three people who can cluster around 30cm monitor.

Projection of a computer's output onto a big screen for group viewing is a technique which is finding increasing application in many fields. Software instruction, for example is much easier to teach when a single large screen is used to focus and direct the attention of a class.

Meetings where spreadsheets are used interactively become much more effective where everyone can see the results of projections as parameters are changed. Large scale simulations and process monitoring also benefit from large screen display, allowing a number of operators in a control room to monitor critical flow diagrams in real time. Hardware and software sales demonstrations are a 'natural' for Data Projection techniques.

The interconnection of computers and video projectors is not as straight forward as it may seem, however, and there are several technical considerations to be addressed. Large screen video projectors have developed from a common heritage as display devices for the relatively undemanding PAL and NTSC video signals.

Computer displays, on the other hand, have evolved along many divergent paths into a variety of very specialised modes. Liquid crystals, monochrome CRT text displays, and super resolution colour displays have all been designed with little regard to standardization and are widely divergent from each other and from television signals.

The rapidly expanding market for computer projection applications has, however, seen the emergence of projectors with extremely flexible circuitry which is able to cope with the demands of data display.

Interfacing computers and projectors requires a two pronged approach. First an interface specific to the particular computer is used to ensure physical and electrical compatibility to the inputs of the projector. Then the video projector itself is chosen to have sufficient scanning speed and sharpness to suit the resolution of the computer's display driver.

Computer Signals

The treatment of computer signals depends on the type of display driver involved, so first we should delve a little into the technologies used in an attempt to categorise them. Table one gives a listing of the most common computer output signals.

The first categorization involves classification as a "composite" or "component" type output. Colour television signals are ultimately evolved from three individual signals, representing the separate propor-

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tions of Red, Green and Blue light present in the original scene. For ease of transmission, these three signals, plus the synchronizing pulses needed to lock the display to the signal source, are usually encoded onto one signal line to produce a composite (PAL or NTSC) video signal.

The encoding process necessarily reduces the bandwidth of the three signals and this limits the resolution obtainable from a composite signal. For this reason, the highly detailed signals from computers are often left in component form with separate video signals for the red, green and blue information and separate synchronizing pulses. This component form is usually referred to as RGB output.

Within the 'component' category there are two major electrical classifications of video signal generated by computer display drivers. These are 'Analogue', and 'TTL' (also called "Digital") video output. Broadly speaking, an analogue video signal is steplessly variable and can produce a continuous tonal range. The levels, polarities and impedance of analogue signals are generally similar to PAL video signals.

Where high resolution graphics are required, the computer manufacturer usually elects to provide analogue video outputs directly from the display driver. These analogue signals are applied to the R, G and B video amplifiers of the monitor which drive the picture tube.

The synchronizing pulses needed to lock the display are often output separately from the video. They are applied to the sync input of the monitor. Here they control the horizontal and vertical oscillators which generates the scanning raster. However analogue video circuits are expensive to build, especially within a computer, where the rest of the signals are digital.

Where the display requirment is only for text and limited graphics a surplus system can be used, here the video and sync signals are output as digital pulses instead of analogue signals.

Data Projection

This "Digital Video" output is called "TTL" and consists of nominal 5 volt pulses on several parallel output lines. The pulses are decoded by special circuits in the computer's monitor and converted to stepped analogue video signals.

TTL systems can only reproduce a limited number of colours or shades typically (in colour) 8, 16 or 64. Also these high impedance, wide bandwidth signals are limited to a cable length of 2 metres or less before they degrade.

Scanning Rates

Whether the computer uses analogue or TTL output, the resolution of the display driver is a critical consideration. The resolution available from a computer display is generally linked to number of scanning lines presented every second by the computer.

Computer video outputs do not always follow the TV standards of 15,625 lines per second. High resolution graphics display drivers produce 18,000 to 64,000 lines per second or more. This requires a display capable of scanning at a horizontal frequency radically different from TV specifications. Vertical frequencies are equally unrestrained, ranging from 50 to 100 fields per second.

Differences in signal levels, impedances, polarities, encoding and so on are usually able to be resolved by external "Black Boxes". Incompatibilities related to the computer's scanning rate cannot easily be corrected for, and a projector must be chosen which has sufficient speed and resolution for the particular computer.

Types of Video Projectors

Video projectors are the most widely used display devices for audiences of 20 or more. There are single tube "green screen" devices, three tube colour projectors and esoteric and expensive types using light valves and other technology.

By far the most common types in use are the three tube video projectors. These use liquid cooled CRT's with different coloured phosphors, one each for red, green and blue. Coupled to the tubes are three lenses which focus the images onto a separate flat screen. Video projectors can be aligned to screens of various sizes. Projected picture width can range from 1.5 to 6 metres. Most commonly a picture size of 2.4 m wide by 1.8 m high is used for data work.

Converging the three coloured pictures onto the screen is a painstaking and exacting process. Even slight errors in the overlaying of each colour can render the text in that area illegible. First, each lens is carefully focused. Then the angle of the red and blue tubes are aligned to exactly overlay the green picture at the centre.

With a crosshatch pattern displayed, the size and geometry controls of each of the three tubes are adjusted so that the pictures converge. Line up can take some time, as there may be 20 or more adjustments on each channel, plus overall controls.

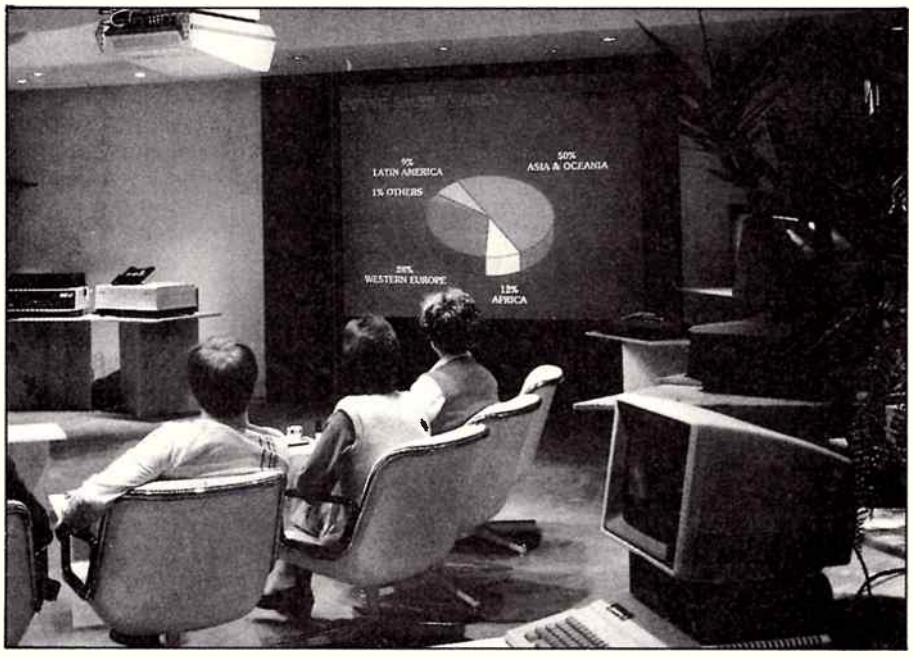
Not all video projectors are capable of providing sharp, clear pictures when linked to computers. Barco, Sony and others make a range of "Data" video projectors tailored to the job. They have special scanning circuits to allow projection of high resolution output and to handle dual resolution boards such as IBM's Enhanced Graphics Adaptor. They have wideband video amplifiers to avoid blurred or unsharp characters.

Data projectors also feature short retrace times. Computers often cram extra pixels onto each line by shortening the "back porch" which is the space usually reserved for colour burst and black level clamping. If the display does not have the ability to retrace quickly enough, characters will be lost at the beginning of each line.

LCD Projection Pads

A new Digital display device, the Liquid Crystal Projection pad, is making great inroads on the data projection market, particularly in education.

Kodak were the first to launch such units in Australia with their "DATASHOW". The Datashow uses a translucent



Data projection systems are ideal in circumstances like this. A large number of people can see the screen at the same time.

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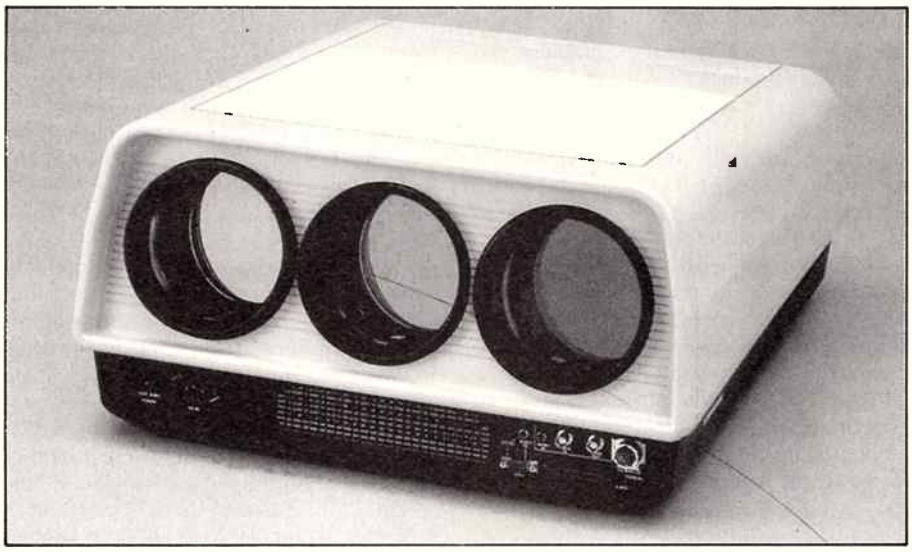


The business end of any data projection system is the projector itself.

liquid crystal plate, which resembles the screen of a "lap-top" portable computer, placed on the platen of an overhead projector.

The computer is connected to the plate via the computers monitor output port. It acts as an electronic transparency of the computer screen and the light transmitted by the overhead projector projects the image, reproducing whatever text or graphics are on the computer monitor.

The 20 x 15 cm display area of the Projection Pad projects large, bright monochrome images ideal for classroom situations or other uses where colour reproduction is not required.

Monitors

Monitors with 50 to 65 cm diagonal screens and RGB analogue inputs are readily available. These produce good results on low to medium resolution output (up to 640 x 200 pixels). They are much superior for group viewing than the 30cm computer monitor. Several monitors may be connected together for larger audiences.

Large screen monitors capable of displaying high resolution graphics are just becoming available. Mitsubishi have a 37" (90cm) high resolution monitor capable of handling a wide range of graphics and text with a horizontal scanning range of up to 35kHz. NEC have shown prototype versions of 20", 26" and 30" multisync monitors with similar capabilities.

Computer/Video Interfaces

The actual connection between the computer and projector is made via an interface device. The interface must first provide a buffered output to drive the projector, together with a split to the computer's own monitor.

Incompatible synchronising pulses are the most common cause of problems when matching computers to projectors. The interface must be capable of accepting the computer's sync signals and regenerating pulses of the correct polarity, amplitude and duration to enable stable projector operation. It is desirable to incorporate circuitry to alter the phase of the sync signals. This enables the picture to be moved horizontally or vertically within the raster to allow proper centering which this reduces problems associated with loss of characters. Moving the picture allows any loss to occur on the right hand margin and at the bottom which is usually more acceptable.

If the computer has a TTL output it is preferable to convert it to analogue format and levels. Analogue signals are more easily distributed and are accepted by a wider range of large screen displays. Where the projector is located some distance from the computer the interface must provide a signal capable of driving a long cable without degradation. It is best to convert the TTL signals to analogue as close as possible to the computer and run 75 ohm coax cable to the projector.

Several operations need to be carried out on the vision portion of the signal. As for sync, the polarity and level of the vision signals may need to be adjusted. In colour this needs to be done for each of the Red, Green and Blue signals. The "Intensity" signals must be decoded and used to modulate the vision levels to produce the required range of colours.

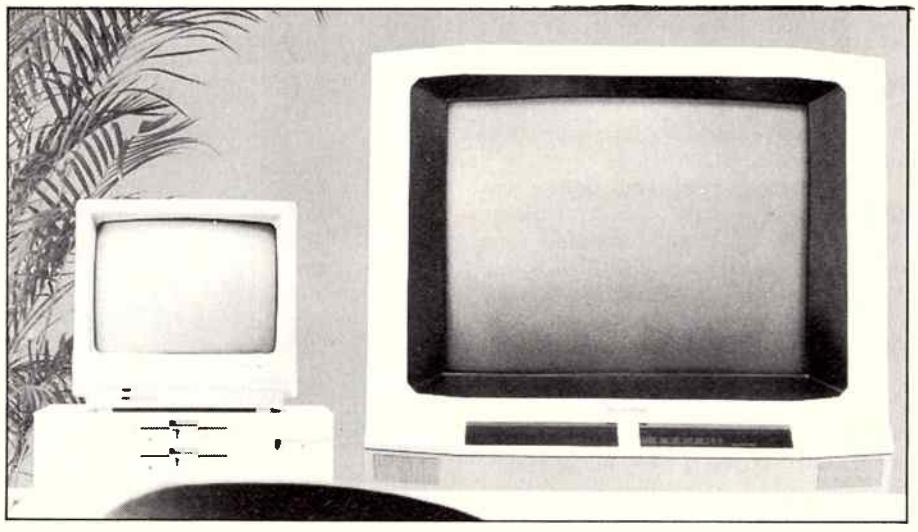
Blue text projects very poorly so interfaces commonly allow for some of the blue signal to be mixed into the green channel. This has the effect of reproducing blue text as cyan, thus improving its legibility. Four signals: Red, Green, Blue and Sync are finally output to drive the projector.

The Future

Large screen display technology is moving very rapidly. Data video projectors with capabilities to match all but the very fastest of CAD terminals are now available.

Projectors using a xenon arc lighthouse and "light valves" (a sort of optical equivalent to the triode valve) produce extremely bright pictures. Other systems using modulated laser light sources now under development for video applications are producing the sharpest pictures yet seen.

The most promising developments are in the field of projectable liquid crystal displays. It seems that colour projection using this technique is two or three years off yet. ●



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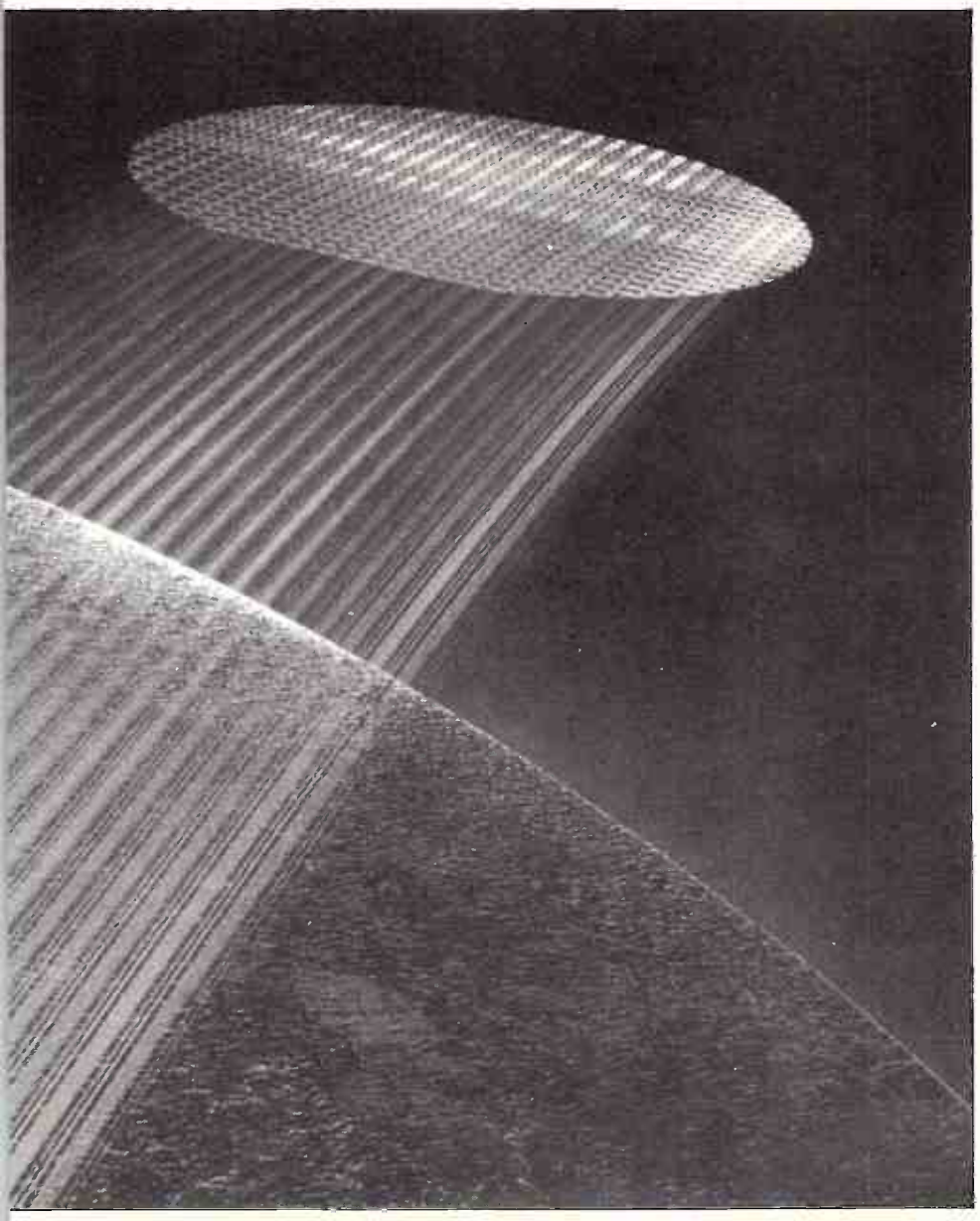
FROM SILICON TO SOFTWARE

A brief survey of firmware which looks at the different ways of storing a program on silicon.

Glen Thurecht



Picture courtesy of Integrated Silicon Design.

The electronics industry has always been enmeshed in a frenzied rush for change. Bigger, smaller, faster, cheaper, anything but last year's model. Nowhere has this change been greater than in the digital world.

The logic systems designer of today is faced with an array of options to consider before transferring the idea from paper to hardware. Each application has its own requirements and hence the design approach depends largely on the following parameters:

1. Development costs
2. Unit costs
3. Assembly costs
4. Testing costs
5. Reduced circuit size
6. System power limitations
7. System performance requirements
8. Design security of the final product
9. Design lead time

On the other hand the designer has the choice of using one or more of the following methods of best satisfying the above requirements:

1. Standard logic families using small/large scale integration
2. Programmable Read Only Memories (PROMs)
3. Programmable logic arrays
4. Single chip microcomputers
5. Mask programmable gate arrays
6. Semi-custom standard cell IC's
7. Fully custom designed TC's

Each technique has its own advantage and disadvantages and the final choice of what is best is a complicated task in which a compromise is found amongst competing system requirements. An example of this trade off is shown in Figure 1 in which unit cost versus production volume is illustrated. Note that the high development costs of semi and full custom design make the unit cost excessively high unless large quanitites are required. On the opposite end of the scale is the standard logic

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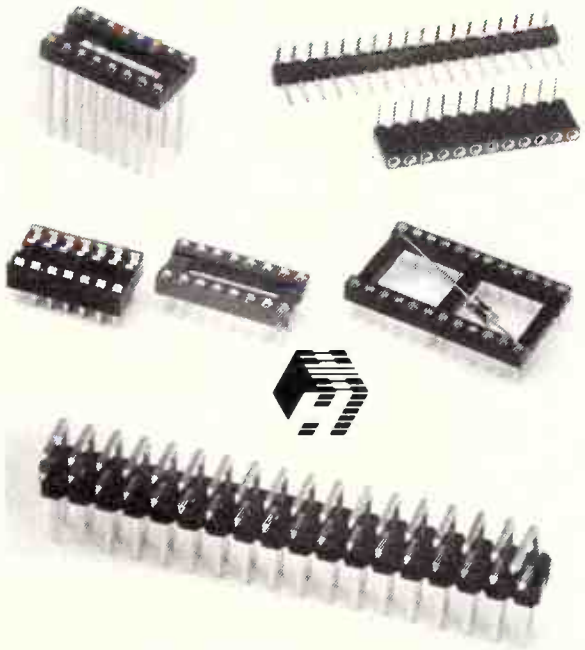

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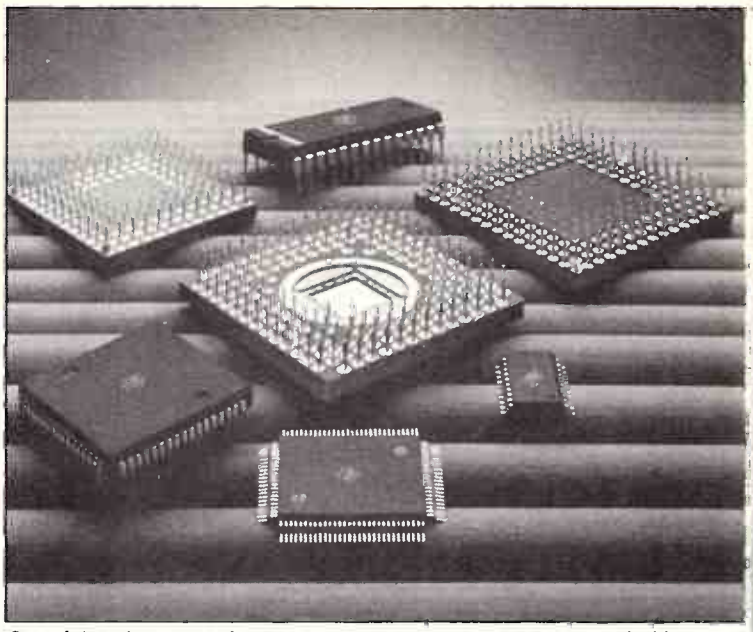
Silicon to Software



One of the advantages of customising your silicon is that you get to decide on the shape of the packaging. This is a sample of what TI can do for you.

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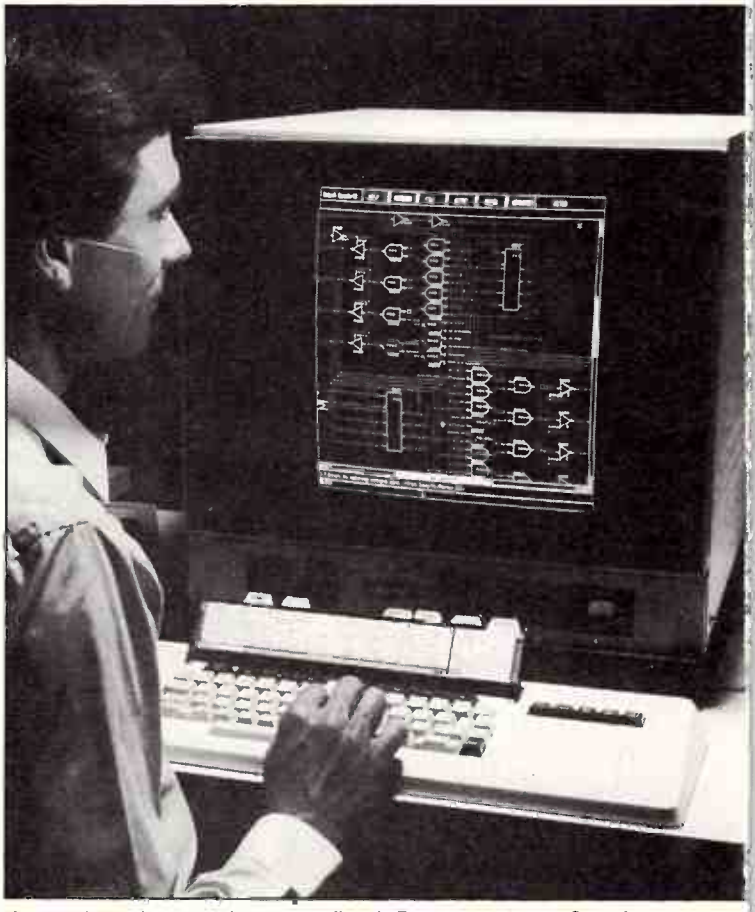

Among the main competitors in the field is Texas Instruments. One of the most user friendly services they, (and other vendors) offer is the use of custom libraries. It is possible, using one's own workstation and sometimes even one's own CAD system to design in silicon using 'standard cells', small pieces of silicon that are presented to the user just like the building blocks of standard logic. For instance, a TI product called Circuit Cell offers 270 cell functions in its library including all the SN54/74HC series logic. Phone (02) 888 3415 for more information about TI products.

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family design approach which gives high unit cost at high production levels.

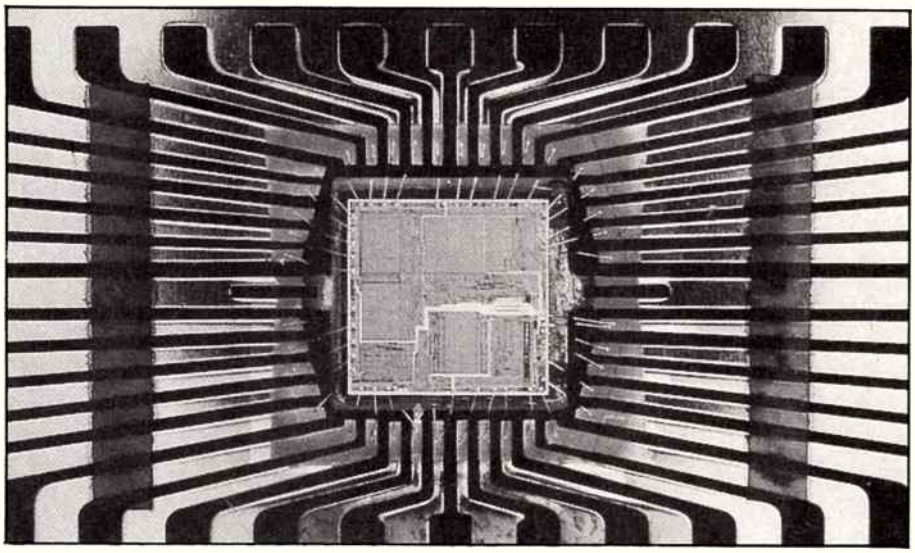
Programmable Read Only Memories

One of the easiest ways to obtain a custom logic device is through the use of a programmable read only memory. This device consists of a number of inputs (the address pins) and a number of outputs (the data pins). All that is needed is to generate a truth table from the logic circuit that you wish to implement and program this into the ROM. This is done by placing every possible combination of highs and lows on the inputs and determining the output. Hence at that input address data will be programmed to provide the correct output.

There are a great deal of advantages to this form of logic implementation. It is usually cost effective, has low development cost, and low printed circuit board area utilisation.

Other advantages of this method can be found when using ultraviolet erasable PROMs (EPROMs) or electrically erasable PROMs (E^2PROMs). These devices allow the system designer to update or change the logic when required. E^2-PROMs can have their contents changed remotely without requiring a person to call upon the equipment in service. This gives the designer great flexibility and promotes a product development life cycle that is responsive to the end users changing requirements.

However, the technique also suffers from a number of drawbacks in contrast to other customising methods. The two major limitations are that the system is only asynchronous and system design security is alow or non existent since a ROM may be read easily and then copied.



The Centre for Industrial Microelectronic Applications (CIMA) is a Melbourne based organisation dedicated to promoting the benefits of using microelectronic technology in products and processes, and in providing assistance to industry in adopting the technology. CIMA engages in technology awareness and trasfer programs, product assessments, and design and information services. They specialise in discovering areas where electronics is not used, but would be advantageous.

Programmable Logic Arrays

Programmable logic arrays are general purpose integrated circuits that internally have logic elements such as gates. Some programmable logic arrays can also be used synchronously and provide flip-flops for use. These are usually referred to as Programmable Logic Sequences.

When the logic array is received from the manufacturer it has all its elements connected together in a matrix of interconnecting wire links. These links are made of nichrome and can be burnt out, or fused when a large current is passed through them. In this way the original matrix is broken up to provide only the connections that the designer wishes to have in order to implement the logic system.

This design approach has the advantages of higher security than PROMs and can allow the implementation of synchronous systems. Drawbacks include the need to buy a separate array programming machine and lower system complexity capability than is available in other customising techniques (other than PROM methods).

Single Chip Micro's

Another powerful way of implementing a logic controller is through the use of a single chip micro. This technique can have greater advantage than found at first glance. Other than the obvious advantages of flexibilty in on-board timers and temporory storage of registers, some micros can

AWA Microelectronics

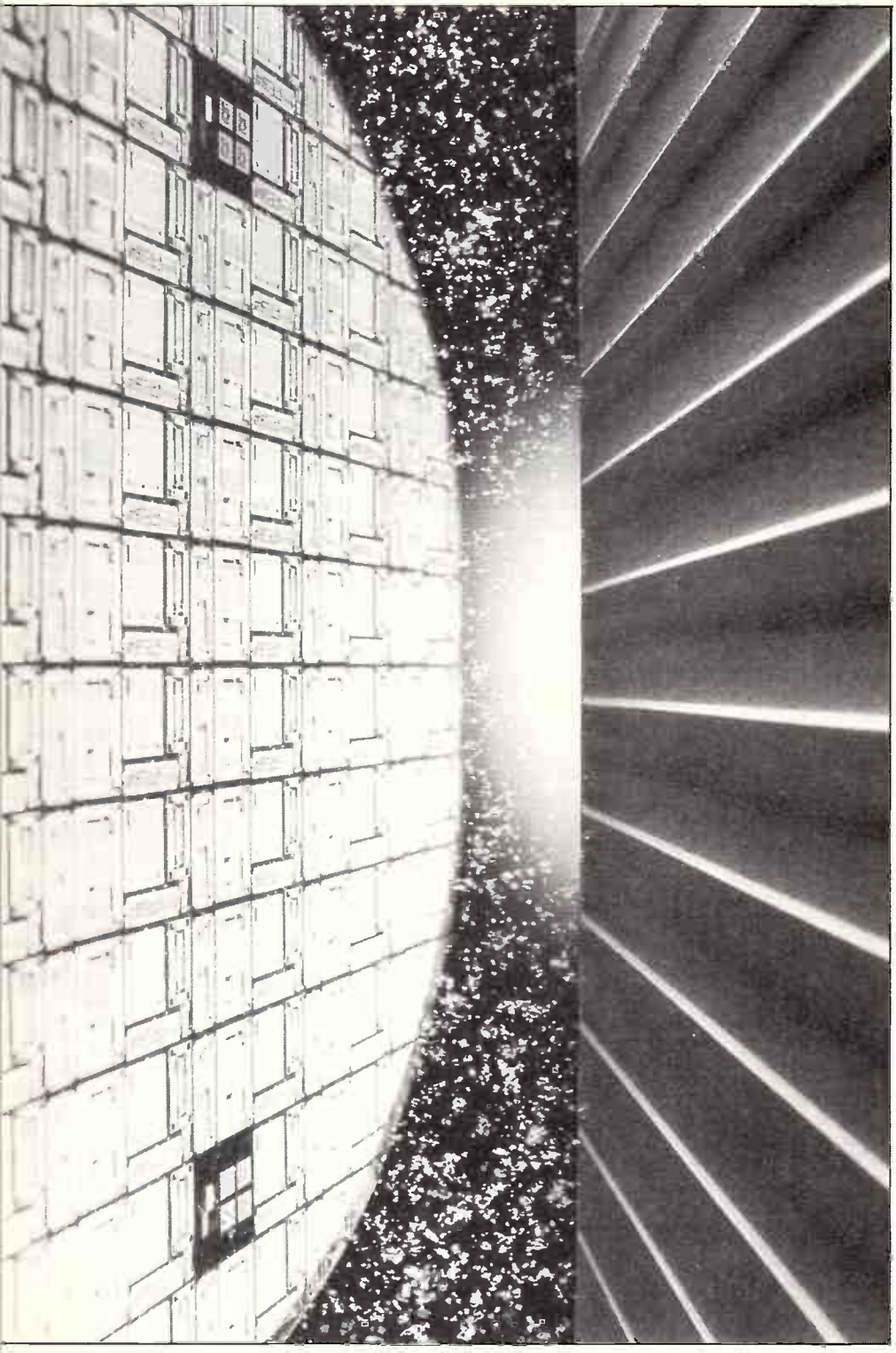
AWA Microelectronics is the leading Australian integrated circuit facility, offering a service which includes the design, mask making, wafer fabrication, assembly and test of Application Specific Integrated Circuits. Wafer fabrication technologies currently in production are Oxide Isolated Silicon Gate CMOS, Metal Gate CMOS, Bipolar, CMOS-Bipolar, and Silicon Gate NMOS.

Since commencing operations over twenty years ago, AWA Microelectronics has executed over 400 designs, over 40 of which are currently at production status. Recent investments by AWA have markedly improved the design capability of AWA Microelectronics, which now offers an automated design service for gate array and standard cell based ASICs, fabricated with oxide isolated silicon gate CMOS. The design service offers schematic capture, logic timing and fault simulation, as well as fully automatic placement and routing. The software allows the extraction of the netlist from the chip layout, so that the performance of the chip, including parasitic capacitance, can be simulated before fabrication.

This service is possible through a technology licence agreement between AWA and GE/RCA, which has recently been increased in scope to include GE/-RCA's well proven suite of ASIC design software. A unique feature of this agreement is that AWA Microelectronics maintains a team of engineers working in co-operation with GE/RCA to develop and enhance this software.

AWA has recently announced plans to build a new wafer fabrication facility in Australia to replace the existing Rydalmere plant. The new facility will be of world standard: the major process will be 2 micron CMOS with two metallisation layers using 6 inch wafers. The process equipment is scheduled to be commissioned by early 1988, with the first commercial silicon being produced in the middle of that year.

World Radio History



Integrated Silicon Design (ISD) is an independent Adelaide microelectronics company that specialises in producing VLSI products at low cost through the use of Application Specific Integrated Circuits. ISD can support products from the initial concept through the design stage right up to fabrication. In addition, they offer a range of courses and seminars associated with the design of integrated circuits in technologies like nMOS, CMOS, and GaAs VLSI design. ISD has a suite of software developed in-house to aid in the design of integrated circuits called the VLSI design suite. This allows not only the physical design of the IC, but also checkes that design and electrical rules have been followed in the design given a particular type of technology. The suite also includes a simulator called Probe. Probe can simulate up to 256 input channels and 256 output channels. ISD also has access to a low cost Gate Array fabrication facility with the capability for up to 2869 gates. The gates can be either CMOS or TTL compatible and have between 2 and 4 nanosecond propogation delays. Phone (08) 223 5802 for more information.

EEPROMS

Electrically Erasable Programmable Read Only Memory is supplied by a number of vendors including Hitachi and Samsung. As with most memory devices, EEPROMs are available in a number of configurations. The KM 2816 from Samsung is a 16 k device, arranged as 2 k by 8 bits. It will write a byte in 10 ms and access it in 250 ns. And requires 110 mA to operate.

An 8 k by 8 bit device is the HN 56C65P from Hitachi which requires a single 5 volt supply, standby power of only 0.5mW and needs about 20 mW per MHz when active. It takes about 10 mS to write a byte, but only 250 nS to access its information. Samsung also do a 64536 bit EEPROM called the 2865. Its arranged as 8 x 8.

Hitachi do a 256 k version of their EEPROM, arranged as 32 k by 8 bits, its called the HN58C256. It's standby power level has been reduced to only 100 microwatts and the access time to 150-200 nS.

offer high design security. For instance Intel have a security system which prevents the internal ROM of the single chip micros from being read or transferred to an external memory. If you wish to verify that code has been stored correctly, a verifications mode is also available. This mode allows ROM code to be read but only after it is passed through a security table which is placed in memory by the logic designer. This table, jumbles the data from the internal ROM in a way which it can only be read by someone who knows the security table itself.

The main limitations of the direct use of single chip micros is the number of input and output ports and the operational speed of processing.

Mask Programmable Gate Arrays

Mask programmable gate arrays are semi-custom integrated circuits that have a complete set of semiconductor layers deposited to generate general logic elements. Only interconnecting metalisation layer need now be added to make the chip functional. As a result all that is needed is for this layer to be designed and a single mask made which drastically reduces development time and hence costs.

Elements such as schmitt triggers, D-type flip-flops, oscillators, and standard logic functional units can be generated from the general purpose building blocks. Some manufacturers even offer the ability to implement both analog and digital circuitry on the same chip.

World Radio History

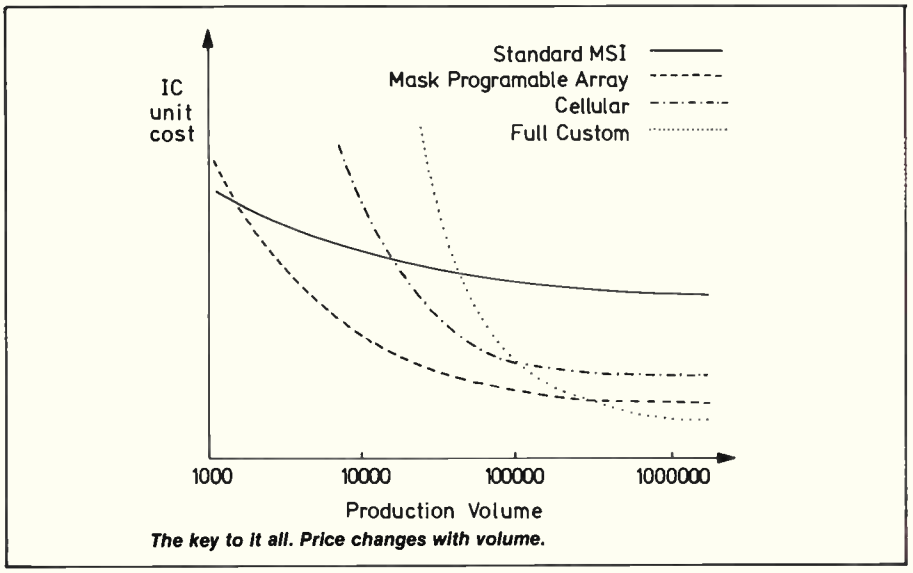
Advantages include high operational speed (80AAHz/MHz or more), good design security, and low developmental cost when compared with other semi or full custom design. Disadvantages include longer design and manufacturers lead times compared to logic arrays, micros or PROM methods and lower chip complexities than other purpose designed semi or full custom integrated circuits.

A typical application of a mask programmable array is shown in Figure 2. This gives an indication of the type of complexity that can be implemented using this method.

Standard Cells

Standard cell methods produce an IC that is fully individualised for each customer. However, in an attempt to reduce the development costs the manufacturer has on hand a set of "standard cells" or tested and proven functional blocks that can be placed and interconnected in a way in which it best suits the application. When the design using the cells is completed, a full set of masks has to be produced and the chip made from scratch.

The benefits from this system are lower development cost compared to full custom design, extremely high design security, high chip complexity capability, and a greater confidence in the prototype chip performing and operating in the way expected at the design stage.



The key to it all. Price changes with volume.

Fully Custom Designed

This is the 'no compromise', fully application specific piece of silicon. The designer has no limitations on the type or form of the functional elements outside normal integrated circuit design rules. This allows him to get the most out of and put the most into the area of silicon he is working

Generic Array Logic

GALs provide designers with a number of logic gates that can be reconfigured in the field using simple programmers. A typical product is National Semiconductor's EECMOS erasable floating gate called the GAL 20V8.

The 24-pin GAL20V8 features 8 programmable output logic macrocells allowing each output to be configured by the user. Additionally, the GAL20V8 is capable of emulating, in a functional/fuse map/parametric compatible device, all common 24-pin PAL device architectures.

Programming is accomplished using readily available hardware and software tools. NSC guarantees a minimum 100 erase/write cycles.

Test circuitry and reprogrammable cells allow complete ac, dc, cell and functionally testing during manufacture. Therefore, NSC guarantees 100% field programmability of the GAL device. In addition, electronic signature is available to provide positive device ID. A security circuit is built-in, providing proprietary designs with copy protection.

For further information contact your local George Brown Group, (03) 329 7500.

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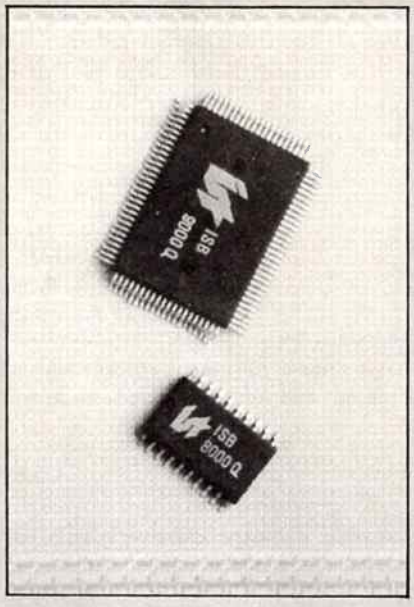
with. It is quite possible to have the equivalent of more than 25,000 two-input gates on a single custom chip.

Of course the cost of doing this sort of development is high and thus strong justification is needed in order to rule out the other approach methodologies. However, as more custom chips are designed and the market gets bigger this approach will become greatly common and costs will fall. The development cycle can vary greatly depending on the complexity and applications at hand. Typically two to twenty months should be allowed to develop the chip and receive the first prototypes for verification.

All in all, logic designers are now in a position in which many different approaches are possible and choosing the best one can be a task in itself. In the end the choice is usually made on experience or familiarity. Nevertheless, sooner or later some of the more exotic techniques will need to be tried to enable products to be competitive on the world market. Indeed the very nature of the modern day marketplace is such that if a product is successful then design security is vital to prevent other manufacturers from 'cloning' the idea. This is one of the greatest attractions of custom logic devices. ●

The Sea of Gates

Innovative Silicon Technology of Agrate, Italy is set to introduce the new Sea of Gates series based on the Channelless core architecture. The high drive ISB 8000 Series already introduced in October 1987, is soon to be followed by the general purpose ISB 9000 Series which will be introduced in February 1988. Both Series are based on SGS 1.5 micron CMOS process and CDI's (California Devices Inc) channelless gate array architecture following an agreement signed last April. The ISDB 8000 Series spans from 3500 to 21000 available 2-input NAND gate equivalents and is aimed primarily at applications requiring output drives heretofore available only from bipolar devices. In addition the Channelless architecture combined with the 1.5 micron process results in the smallest area per usable gate of any currently announced gate array series.



The ISB 9000 Series will use the same internal cell layout and macro library as the ISB 8000 Series but will feature a new denser I/O cell, optimized for the increasingly encountered "pad-limited design". Available gate counts will range from 300 to 21000 gates with typical utilizations ranging from 95% at the low end of 60% for the largest array. Typical delay through a 2-input NAND gate and interconnection is 0.7 ns.

READER INFO No. 160

A New Software Driven Programmer for over 2,000 Devices

The Allpro is a software expandable programming workstation that offers the flexibility and performance you need to keep pace with today's rapidly expanding range of programmable devices.

The Allpro is an IBM PC/compatible based programmer that uses a high speed parallel interface. Each pin at the Allpro's 40 pin ZIF socket is driven by ADCs to produce programming signals specific to each selected device.

Control of each pin is handled by software resident in the PC, with device details contained in a set of easily expandable device library files.

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For more information on this or any of the other models in the Logical Devices range of device programmers, circle the reader info number below or call Emona at **(02) 519 3933,** 86 Parramatta Rd, Camperdown, 2050. Postal address P.O. Box K720, Haymarket N.S.W. 2000. Fax (02) 550 1378.

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S-VHS for Australia

JVC has announced Super-VHS systems for PAL countries, which include Australia and Europe. The first models are expected late this year.

S-VHS, which debuted in NTSC countries (Japan and the US) last year, has been praised for its superior quality which offers more than 400 lines horizontal resolution. The S-VHS system developed by JVC in conjunction with Sharp, Hitachi, Panasonic and Mitsubishi, will accommodate PAL and SECAM signals.

New S-VHS products coming as a result are, a home deck compatible with both full size and compact VHS cassettes and equipped with recording functions for both conventional and S-VHS systems, camcorders and special VHS tape. The price of an S-VHS deck is expected to be around $2500 plus and tape about $20-$30, somewhat higher than high grade conventional VHS tape. One further purchase which might be considered is a new TV monitor matched to the new S-VHS output for around $2000 (see article on S-VHS in this issue). So far, JVC and Panasonic have announced the relese of S-VHS decks for later this year.

READER INFO No. 49

National Changes Name

The Australian subsidiary of Matsushita Electric Industrial, National Panasonic (Aust), has changed its name to simply Panasonic. This brings the consumer electronics side of the company into line with the office automation and industrial products.

The first new products under the new name were released earlier in the year. The new VCRs are all of slim design, compact, lightweight and black. They all come with IR remote control and digital scanner with either three or four heads for HQ picture. These models are the NV-G40a for $879, the NV-H75 Stereo VCR is available for $1539 and the NV-MC5A compact video camera for $3199 and the NV-M7A VHS Home Movie for $3699.

There will be a gradual introduction of colour televisions from the 14 models in the Panasonic range with 29-inch and 33-inch sets already available. The TVs will feature tinted picture tubes, flat square tubes, and include black vertical console models. Other features will be on-screen display of channel and time, 30 and 60 minute off timers and 30-channel tuning with skip function. The larger models feature dual remote control for video and TV.

READER INFO No. 50

World Radio History

Working the System

The new Yamaha System 09 provides a tight blend of components for those who like their hi-fi to work in combination. It consists of the amplifier/equaliser, dual cassette deck, AM/FM stereo digital tuner, semi-automatic turntable, CD player and 3-way bookshelf speaker system.

The A-09 amp provides 80 W/channel at 8 ohms, 110 W/channel at 4 ohms. SNR is 80 dB (phono) and 98 dB (CD), channel separation is 50 dB, and it has a 5-band graphic equaliser. It features loudness control and CD/video input terminals with front panel selection.

The K-09 dual cassette deck allows listening of both decks continuously. The T-09 tuner has a MOSFET front end with quartz-locked PLL digital tuning system and features a High Blend function to reduce noise content in distant broadcasts. The turntable component, the P-09, uses a belt drive with dc servo-controlled motor.

A full-function remote control allows direct access to any disc track on the CD-29 player, along with 24-track programming, 3-way repeat play and music search. Another feature is a tape edit program which automatically selects and programs specific selections on a compact disc to fit within the recording time of a cassette.

The 3-way bookshelf speaker system, the NS-09, combines a 30 cm cone woofer with 12 cm cone midrange and 6.5 cm cone tweeter and is designed to handle up to 100 W. Frequency response is claimed to be 50 Hz to 25 kHz.

READER INFO No. 51

Oz-fi Member Snubbed

Despite a Bicentennial funding grant with all its corresponding focus on 'Australianness' and a current "Manning Made" campaign run by the Manning Valley Tourist Association to promote locally made goods, the Committee supervising the building and equipping of the new Manning Entertainment Centre in Taree NSW has turned its nose up at some locally made quality amplifier products.

The new Entertainment Centre, a complex providing a 500 seat auditorium suitable for national and international entertainers, is scheduled to open in June. Estimated cost of the project is $2,130,750 of which $50,000 was a NSW Bicentennial Council grant for outfitting and another $36,000 came from the Australian Bicentennial Authority Local Government Iniatives Grant.

According to Designer/Director of ME Sound, Peter Stein, the Entertainment Centre Committee has refused to even audition his company's locally made amps even though they are of as high or higher quality than anything the Committee could get from overseas. Stein's company became embroiled in the affair when it sent a letter in August last year to the Committee members, care of the Greater Taree City Council, advising them of its products. When by November they had no reply from the Committee, ME Sound repeated the offer but were informed that the Council intended to use other Japanese equipment "compatible with equipment already owned by the Taree Arts Council".

Stein's complaint is that he was not even allowed to tender for the contract. According to him "the community might have expected that the Centre Committee had a responsibility to choose the best performing equipment, rather than the most commercial." To add a little piquancy to he story, President of the Manning Entertainment Centre Committee, Bob Berrigan, is the local dealer of the Japanese brand equipment chosen.

ME Sound has been manufacturing amplifiers for the last 12 years, with some success particularly in Asia. It is currently negotiating trade in the US. The company is a founding member of the recently formed Oz-fi Guild of Australian hi-fi manufacturers whose aim has been to promote Australian products in Australia and overseas. One of Oz-fi's gripes has been the lack of interest and commitment to Australian products on the part of Australian consumers (notwithstanding the "Buy Australian" campaign), exemplified in this recent snub.

World Radio History

Double Booked

Melbourne has proved a popular location for hi-fi exhibitions this year, unfortunately on the same weekend. Both the International Audio-Video Fair and the Australian hi-fi Show (Melbourne) are scheduled for June 30 to July 3.

Despite having notified the industry back in August last year of his intention to hold a show that weekend and receiving a favourable response, says Peter Barnes organiser of the International Audio-Video Fair, the Australian Hi-fi Show has gone ahead and organised its exhibition for the same dates, which it (Aust Hi-Fi) says were pencilled in with the venue management in July last year following the 1987 show; and in any case they traditionally hold their exhibition then!

However, exhibitors are not amused. Sources contacted by ETI see the situation as a confrontation between the established show organisers and a perceived interloper, and themselves as the victims. Exhibitors must either put in a super effort and appear at both venues, or risk allegiances and reputation and show at only one to an inevitably divided and diminished public. Alternatively they can risk their corporate images and not show at all. In many cases this is a real commercial decision. Investment in a show can run up to a large amount of effort and money. Bose, for example, routinely expects to pay out between $10,000 and $12,000 per show but to correspondingly generate business worth six figure amounts. Too much to put at risk by showing at the wrong event. Dealers are in the individious position of possibly supporting one show while their suppliers support the other.

Both organisers claim to have the bulk of exhibitors committed with them but there is some uncertainty in the industry. Australian Hi-Fi has the advantage of experience and of cosponsors the Melbourne Green Guide and FOX-FM. The success of the Audio-Video Fair must depend on how much publicity Peter Barnes can organise to lure exhibitors.

Hi-fi shows in Australia over the recent years have been disappointing, with only small attendances from the public and on the whole half-hearted participation by the industry. With the prices charged by exhibition organisers, ranging from $400 per eight sq metres space, the exhibiting companies expect a good deal of pre-publicity from any organiser. The public too needs pursuading to fork out an entrance fee to view products it could possibly test more comfortably at any hi-fi dealer's. The public needs to be inspired at the prospect of the new products, the wide range, etc.

Notwithstanding, the aforementioned shows will occur in competition at the following venues, unless one collapses from lack of industry support or The Australian Hi-Fi Show takes the advice of Scan Audio's Mike Henriksen and changes the date of its show. If the date is changed, it will allow exhibitors to gauge the success of both, giving them a better idea of whom to support next time round. The International Audio-Video Fair will take place at Wesley College, St Kilda Road, Melbourne, and the Australian Hi-fi Show at the Dallas Brooks Hall, East Melbourne.

Four New Speaker Kits

Vifa has released four new speaker kits for the hi-fi buff handy with a hammer. Bookshelf size is SA-50 kit with 5-inch woofer/midrange, computer-optimised for use in a 5-litre bass reflex cabinet. Flushmounted in the front baffle, the woofer blends in with the classic 19 mm Vifa dome tweeter with ferrofluid for high power handling and controlled diaphragm movements. An optional sophisticated bandpass bass reflex sub-woofer kit SW-1 is available.

The SA-70, SA-100 and SA-130 kits are updates of various magazine kits. The SA-70 is bookshelf model with 19 mm soft dome tweeters with ferrofluid damped voice coil and 8-inch sandwich-coated woofer with foam surround. Power handling is 70 Wrms per channel. Price for speakers, crossovers and cabinets is $499 per pair.

The SA-100 2-way speaker improves on the original by including an advanced crossover design with asymmetrical crossover slopes and impedance correction circuit. The kit consists of 8-inch polycone woofer with diecast chassis and rubber roll surround, D25 tweeter with ferro-fluid cooled and polymer diaphragms and cabinet materials. Price is $799 per pair.

The SA-130 3-way kit is a large floor-standing model. It uses 10-inch polycone woofer P25WD with diecast magnesium basket, aluminium voice coil former and rubber roll surround, 3-inch dome midrange D75MX and 19 mm ferro-fluid cooled D19TD tweeter. The SA130 has a claimed dispersion pattern linear up to 120 degrees. It's available in kit form either with or without flat-pack cabinets, finished in blackwood grain with silver front baffle for $929 or $1199.

READER INFO No. 54

CD Singles

Philips and Sony have released final specifications of an 8 cm compact disc single. The single, which will play for about 20 minutes, will be 8 cm in diameter, with a recording area of 5 to 7.5 cm. So far only Polygram has announced their release in Australia. The new "singles" will contain the title track plus a couple of others possibly songs not on the album release. They will retail for about $9.99. The singles can be played on a normal CD player by means of an adaptor, a ring-like device which fits around the CD to bring it to the size of the conventional disc.

Japanese Figures Reflect Demands

The Electronics Industries Association of Japan has released production figures for consumer electronics goods in Japan for 1987 and made forecasts for 1988. Production of video cameras, videodisc players, Television receivers and stereo sets is expected to rise, while VCRs, magnetic recording/reproducing systems, stereo set componets and radios are expected to decline in production.

The figures refer to Japanese production only and therefore don't necessarily reflect worldwide trends. japanese production has for a good part, gone offshore on account of the higher yen and the pressure of trade imabalances. Furthermore, Taiwan and Korea are emerging as large suppliers of low-end equipment. However, to the extent that the figures reflect consumer demand they are of interest. It appears the increase in videodisc players corresponds to he remarketing of the technology, engendering consumer demand; large-screen TVs have also proved popular in Japan boosting the sale of TVs. Camcorders are still a relatively new technology and are therefore still popular, while an apparent decrease in stereo sets masks an increase in production of complete systems which has been attributed to the inclusion of digital players and marketing increasingly aimed at teenagers.

READER INFO No. 56

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In Brief

TDK Head Demagnetiser

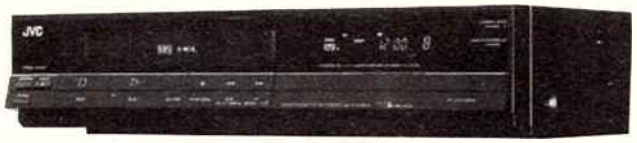
TDK has released a new cassette head demagnetiser, the HD-30, recommended for use in the car. It looks like an ordinary cassette with electronic hardware instead of spools of tape. RRP is $39.50.

READER INFO No. 57

New Cables

A new range of SAEC digital audio interconnect cables include the 1707-PRO designed for connection from source to preamp using "Ohno Continuous Casting" which involves hardening the copper wire from centre to outside, the and the CD-1702 using a coax design, high purity copper with 24 carat gold plated, non-magnetic phono plugs, suitable for most connections. Prices range from $129 to $299.

READER INFO No. 58



Video for Aussie Market

JVC has released the HR-D300EA VCR specially developed, it says, for the Australian market. The particularly Australian identified features are Super Still Slow Motion, and a special index code to mark the beginning of a recording. Other features are double azimuth three-head, five-stage slow motion, 14 day/4 event timer, overlapped programme viewing, on-screen record pause, next function memory, among others. RRP is $849.

READER INFO No. 59

Technics AFP Speaker

Technics has introduced an Audio Flat Panel speaker system only 6.4 cm deep from front to back and with wide flat diaphragm area. The system comes in three models, all 4-way with combined closed/open-back enclosures, with 30 cm x 80 cm flat diaphragm, 13 cm x 32 cm mid-low diaphragm, 8 cm mid-high and 2.7 cm tweeter, 6 ohm impedance level and 35 Hz to 40 kHz frequency response. The SB-FP1000 is a 20 speaker system, 220 x 225 x 100 mm with 1400 W (music) and 600 W (DIN) rated input power. The SB-AFP 100 is a 10-speaker system, 120 x 225 x 100 mm, 700 W (music), 300 W (DIN) input, and the SB-AFP10 is a 5-speaker unit, 100 x 120 x 51 mm with 250 W (music) and 150 W (DIN) rated input.

READER INFO No. 60

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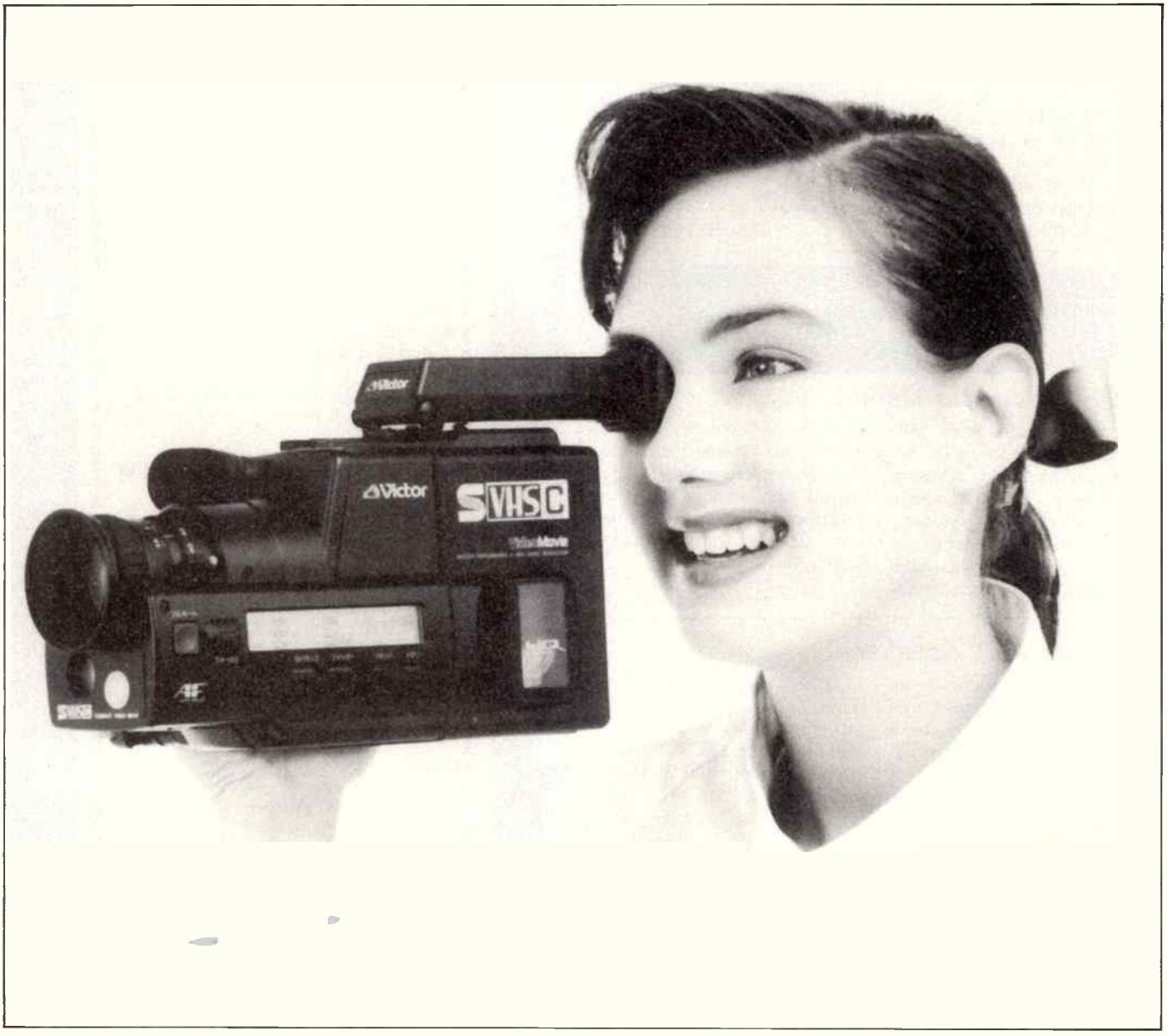
In January 1987, JVC introduced its new video format to Japan, Super-VHS. Rather than an extension of the old familiar VHS, the new format represents a revolutionary change that dramatically improves picture quality but requires new hardware. In January, this year JVC outlined specifications for S-VHS under the PAL broadcasting system, and by the end of the year Australia should see its first S-VHS recorders.

Super Picture With Super-VHS



World Radio History

Mary Rennie

S-VHS Tape

The Super VHS breakthrough was made possible by advances in tape technology. While it may have been attractive to use metal tape which can accommodate signals up to 10 MHz, a cobalt-doped ferric oxide tape was ultimately used in order to maintain compatibility with existing VHS players.

The special feature of the new tape technology is its magnetic coating. The wavelength of the image signal recorded by an S-VHS deck is much smaller (0.8 micron) than that of conventional VHS (1.2 micron). To accommodate this, the size of the ferric oxide particles is 10 to 20% smaller at less than 0.2 micron. Because adjacent differences in the polarity of such fine-grained particles counteract each other and weaken the overall magnetism, coercivity is increased to 800-900 oersted, about 35% higher than the highest grade VHS tape. Maximum residual magnetic flux density which determines the output level throughout the frequency range is also up about 35%, from 1200 Gauss to 1600 Gauss. In terms of magnetic energy this translates into an improvement of almost 80%

Nevertheless, the new tape is a delicte balance of total tape manufacturing technologies, involving binders, lubricants, backcoats, precision machining of cassette shell mechanisms, etc. Super VHS tape is being manufactured by the major tape manufacturers including Fuji, Photo Film, Hitachi, Maxell, Sumitomo, 3M and TDK, as well as by JVC.

Camcorders

While a technology like S-VHS can hardly be put on the backburner, it has some immediate hurdles to overcome. The first is its basic incompatibility with existing VHS equipment if one is to derive the full benefit of the technology. This translates into price, that is, the price of the new deck, monitor and tapes, and while JVC has allowed for gradual upgrading and integration with existing units presumably it will take some time for demand to offset price.

The second hurdle is that while the technology can provide 400 lines horizontal resolution, the deck is limited by the quality of the signal input. The 330-line horizontal resolution with which NTSC television signals are broadcasts, for example, under-utilise the technology as do prerecorded cassettes of the standard VHS format. Where S-VHS may have its biggest impact and be used to maximum advantage is in the camcorder. According to recent Electronics Industries Association figure for the US, close to 50% of households have a VCR while only 2% have a camcorder, providing much scope for growth. Super-VHS camcorders should be attractive to this potential market and used in conjunction with an S-VHS player will reproduce the optimum 400 lines resolution. Although JVC plans to introduce the S-VHS decks before camcorders in Australia, it may be through the camcorder that demand for S-VHS generally is stimulated as people upgrade to match their latest purchase.

SINCE JVC INTRODUCED the video home system (VHS) in 1976, there has been a steady improvement in the product offered to the consumer. In 1979 extended play mode was added; then in 1983 hi-fi audio boosted the sound quality. Two features followed swiftly on one another in 1985 and 1986 when HQ (high quality) circuits were used to reduce noise, enhance detail and raise the white clip, and CTL coding was implemented to provide VHS random access. Still not as good, the videophiles would say, as Beta but then hot on the heels of these innovations, in 1987 came the world's first taste of Super-VHS.

Super-VHS, or S-VHS, is a remarkable improvement in conventional VHS. The new system achieves a superior picture quality comparable to one-inch broadcast recorders, with, JVC promises, more than 400 lines of horizontal resolution, compared to the approximately 230 lines available in a conventional VHS home video recorder.

JVC, in all its publicity on the new system, is quoting its horizontal resolution rather confusingly, in terms of lines instead of the more conventional bandwidth. One can make a rough conversion by assuming that 80 line equals one meg, making SVHS a 5 MHz system.

What's New

The improved quality of S-VHS is apparently due to three technological changes; in signal processing parameters, in processing methods and in the tape. The signal processing parameters JVC has changed are the bandwidth and frequency of the FM luminance carrier. Conventional VCRs record the video or luminance signal with a one megahertz bandwidth, between 3.4 and 4.4 MHz. With S-VHS the luminance carrier is raised to 5.4 MHz, with the white peak of the recording frequency set at 7 MHz. Frequency deviation is widened to 1.6 MHz; this expanded bandwidth contains more video information to provide the 430 lines of resolution. Since the FM luminance signal is raised to higher frequencies, crosstalk with the down-converted chrominance (colour) signal is minimised producing a clearer colour picture. On top of this a non-linear sub-emphasis is adopted in addition to the standard VHS emphasis system.

Signal processing itself in the S-VHS system is different too. In contrast to the conventional VHS system which processes a composite chrominance and luminance signal, the new system processes the signals separately. In the conventional system, the chrominance and luminance signals are not separated until they are inside the television set and even in the best TV monitors there is still a fair amount of interaction or crosstalk, evident as a wavy or rippling effect. With the new system, the signals are recorded as a composite chrominance/luminance signal on tape but separated into Y/C components and processed separately to eliminate crosstalk and dot interference and improve colour quality.

The technique of receiving, processing and sending video signals in the form of

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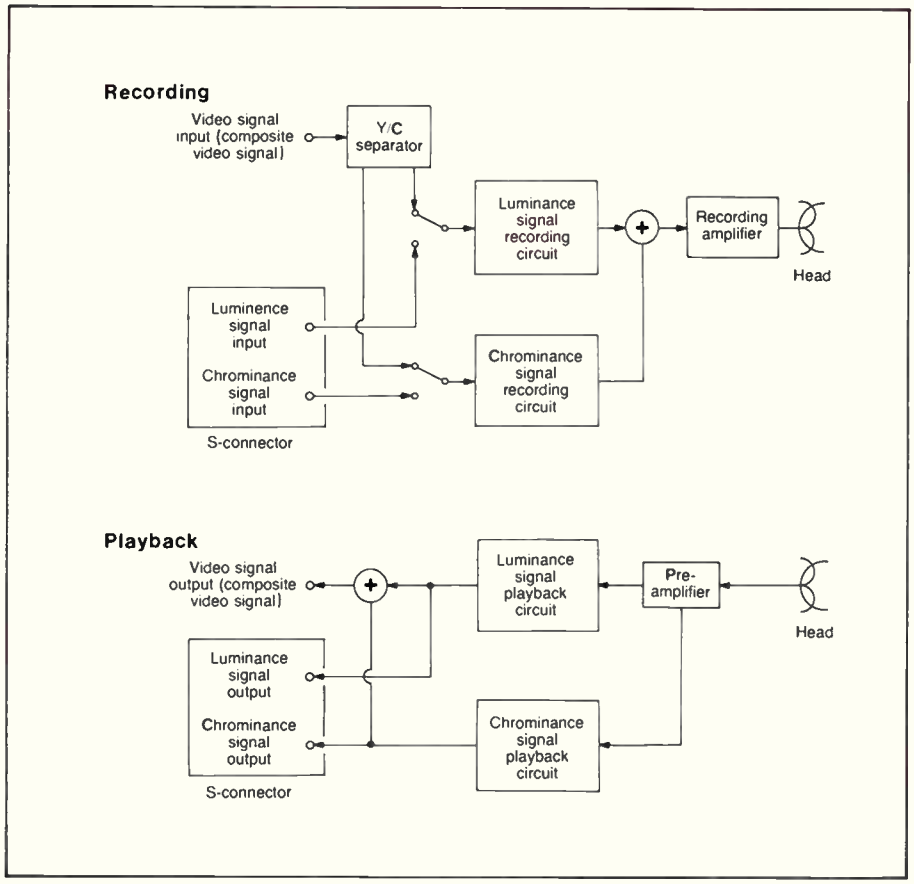


Figure 2. Block diagram of S-VHS separate Y/C signal processing.

Y/C components has been used in the field of professional video recording for several years. Based on this idea, S-VHS takes advantage of the separate Y and C signals by including special Y/C input and output connectors that keep the two signals separate instead of combining them into one composite video signal. The S-VHS deck allows for inputs of either separated or combined signals. The separated Y/C signals input via a special Y/C terminal are processed independently throughout the circuitry until they reach the recording amplifier. A composite video signal, however, is separated into Y/C components before being processed (see Figure 2).

These separate input/output terminals are known as Y/C or S-connectors. The S-VIDEO IN connector is a 4-pin connector that accepts Y/C-separated signal input from another S-VHS deck or camcorder, for example. The S-VIDEO OUT terminal provides the separated Y/C signals for output to another Super VHS deck or to a television equipped with an S-video input terminal.

This anticipates another investment on top of the new S-VHS deck if one is to benefit wholly from the new video system. Although JVC is keen to promote Super-VHS as just another step in VHS technology, compatible with existing devices, the system properly requires a new S-VHS recorder, new tape and a television equipped with the S-connector, which currently they have not got. The new sets should be available to coincide with the introduction of S-VHS decks late in the year.

Super-VHS is, however, compatible with existing monitors to the extent that decks have standard composite video and rf output terminals. According to JVC, when connected to the AV terminal on a standard set, S-VHS will yield more than 400 lines and to the rf terminal will yield more than 300 lines, but not the promised 430. That in itself is welcome though. In countries which use the NTSC format for TV broadcast, that is Japan and the US, the horizontal resolution of TV broadcasts is approximately 330 lines which suffers degradation to 230 lines when recorded and reproduced by conventional VHS. In PAL countries such as Australia the drop in quality is even starker. The PAL system provides a 400-line horizontal resolution quality which is reproduced as 230 lines. Both these broadcast formats are accommodated by the new S-VHS system with its 400-line horizontal resolution and when used in conjunction with a standard television monitor the degradation is obviously much less, only 30 lines or so with the rf connection in the NTSC system and an admittedly still sizable 100 lines in PAL.

Tape

The new system is compatible with existing VHS tape but it won't deliver the best results unless the new Super-VHS tape is used. The new system uses special cobalt iron-oxide tape, chosen in preference to metal tape in order to retain some compatibility with the old system. An S-VHS tape is equipped with an identification hole on the back to distinguish it from a standard VHS cassette. When recording and playing back, an S-VHS VCR automatically searches for this identification hole and switches to the appropriate mode, either standard VHS or S-VHS. Standard VHS cassettes can be used in an S-VHS deck but you will only get standard VHS quality. Super-VHS cassettes that have been recorded on in S-VHS mode, however, cannot be used in a conventional player; all you will get is snow because the video carrier frequency is higher than the 3.4 MHz of a conventional player.

Availability

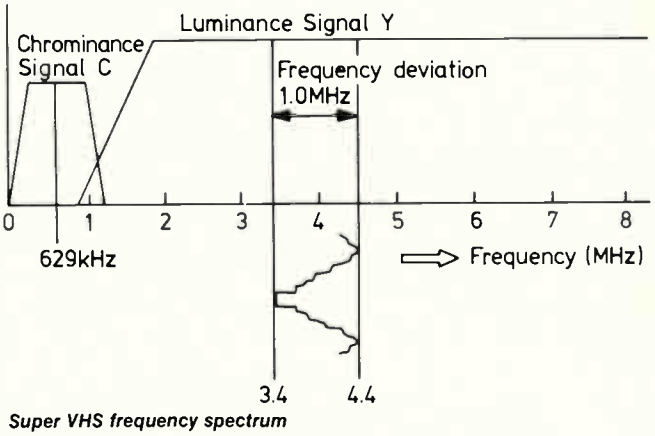
JVC has just released the PAL specifications for S-VHS for Europe as well as Australia, so it to early to gauge consumer response. In Japan and the US the technology has been welcomed, but warily, because of the initially high cost of hardware. In the US, for example, the first S-VHS VCRs cost between $US1000 and $US2500, an S-connector-equipped TV monitor costs around $US800 and S-VHS tape is about $US20 per cassette. As with the compact disc player, prices can be expected to descend. In Australia, the price of the JVC S-VHS deck is expected to be $2500 plus. Television monitors equipped with the S-connector will be available at $2000 plus Super-VHS tape will sell for $20 to $30 per tape; expensive, but not such a large leap if you are already buying high quality tape.

Discussions are currently under way with a number of software suppliers for release of titles on S-VHS. So far no agreements have been reached but JVC already has S-VHS duplicating equipment under production, and the full 430 lines of S-VHS quality is available on prerecorded cassettes. ●

World Radio History

New tape, new unit

VHS frequency spectrum



Super VHS frequency spectrum

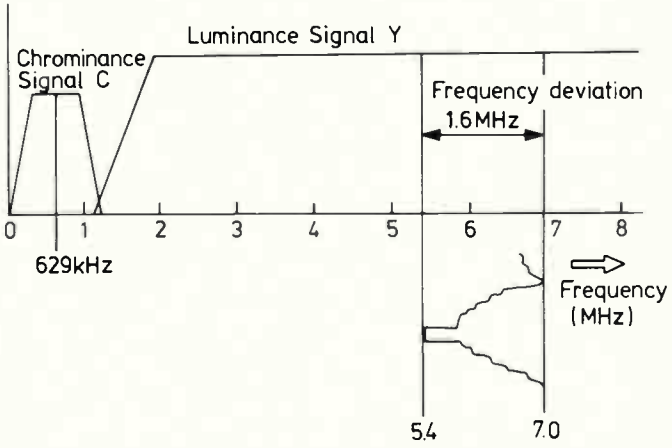


Figure 1. Standard VHS (top) and Super-VHS (bottom) FM luminance carriers. The FM luminance carrier in S-VHS is shifted to 5.4 MHz and widened to 1.6 MHz allowing it to produce 400 lines horizontal resolution.

SPECIFICATIONS

1. SUPER VHS CASSETTE TAPE

High performance tapes:

SE-180, SE-120 etc:	Full-size VHS cassette with an ID (Identification) hole
SE-C30:	Compact VHS cassette with an ID hole

2. RECORDING MODES:

SP mode:	tape speed:	2.34 cm/sec.
	recording time:	3 hours (with an SE-180 cassette)
LP mode:	tape speed:	1.17 cm/sec.
	recording time:	6 hours (with an SE-180 cassette)

3. VIDEO SIGNAL RECORDING SYSTEM

Video input/output signal:	PAL signal, SECAM signal or some other signals (such as MAC signals)
Luminance signal recording:	Frequency modulated (FM) recording
FM carrier frequency:	
White peak:	7.0 MHz
Sync tip:	5.4 MHz
Deviation:	1.6 MHz
Clip level:	
White clip level:	210%
Dark clip level:	70%
Emphasis:	
Main emphasis:	VHS standard emphasis
Sub emphasis:	Non-linear emphasis
Chrominance signal recording:	Colour-under phase-shift recording or quadrature modulated chrominance signal
Carrier frequency:	627 KHz

4. AUDIO SIGNAL RECORDING SYSTEM:

Linear track recording:	conforming to VHS audio recording method

5. PLAYBACK (SIGNAL) PERFORMANCE:

Horizontal resolution:	More than 400 lines

World Radio History

CD players seem to have become the flavour of the age and every electronics company worth its salt, and some which are not, have released units packed with what are claimed to be innovative and unique components. Here we examine some of these devices and see how epoch making they really are.

CDs The State Of The Art

PICK UP a random set of brochures from any audio store these days and it will be a fair bet that at least forty per cent of them will be concerned with CD players. Latest figures of sales from the Electronics Industries Association of Japan strongly reinforce this impression. According to the EIA Japan shipped 2.9 million units to the US last year and this figure is expected to reach 3.6 in 1988. 1987 was also the first year that CDs outsold LPs in the US market.

Demand in Europe is also strong. West Germany's CD market is believed to have reached one million units with portable

The record breaking DP-80 and DC-81 from Accuphase, world famous technology at a world famous price.

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CD players proving exceptionally popular.

As far as can be ascertained Australia seems to be following in the wake of overseas consumers. Last year CD player sales in Australia went beyond 150,000 units. When one considers that sales in 1984 only reached 18,000 that is quite an increase. The players are needed, as sales of actual CDs are in excess of 4.2 million.

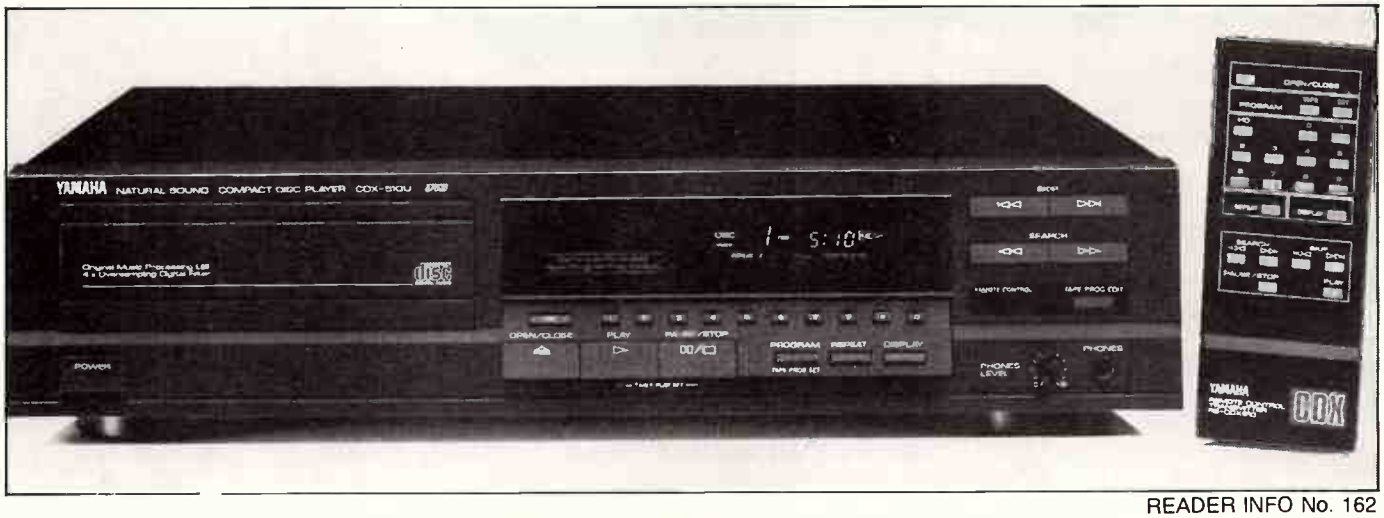
ISS

With sales of this dimension before their eyes competition among electronic companies in Australia is very keen. One way to attract custom is to promise new components with every player. One company which has taken this lesson very much to heart is JVC.

JVC have released four CD players onto the Australian market entitled the XL-E3BK (frequency response 5 Hz-20 kHz, THD 0.004%), the XL-V250BK, the XL-V450BK (frequency response 5 Hz-20 kHzm THD 0.004%) and the XL-M500BK (frequency response 5 Hz-20 kHz, THD 0.004%). They range in price from $599 for the XL-E3BK to $1399 for the XL-M500BK.

JVC claims that its units are well worth their cost since they contain a variety of unique components. One of these is the 'Y servo system'. This unit combines two distinct technologies, a 'High Balance Servo' and a 'High Trackability Servo'. The first of these uses two tracking beams, one which leads and one which follows the main beam. These beams will keep the pickup close to the track even when the actual CD is laden with grime. The 'High Trackability Servo' is said to improve the overall response of the pickup so that the CD player will handle all discs with 'unerring accuracy'. JVC is also extremely proud of its 'Independent Suspension System' (ISS). The ISS is intended to float the laser pick up and disc drive free of the base. The apparent result of this is less tracking error and more accurate sound.

JVC gives the impression that all of these features are unique, however, most companies have some variation on the same theme. For example, JVC have an integrated audio/video entertainment system known as Compu-link of which they



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Above: The Yamaha CDX-510U featuring Yamaha's "Hi-bit digital technology". Left: The JVC XL-E3, which features the 'epoch making' Y Servo and Independent Suspension system. Both companies claim that the new circuitry gives more accurate sound.

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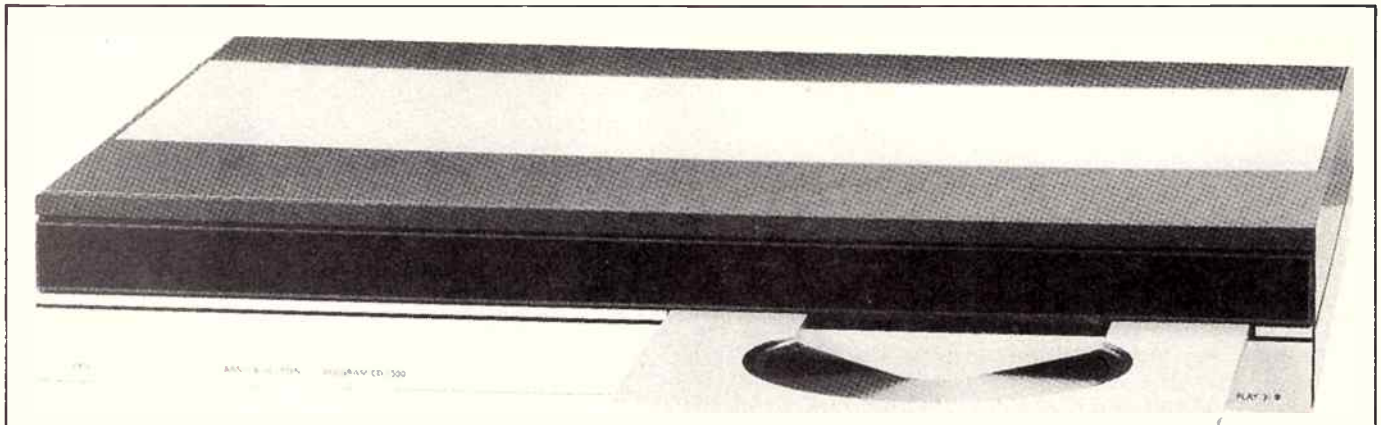

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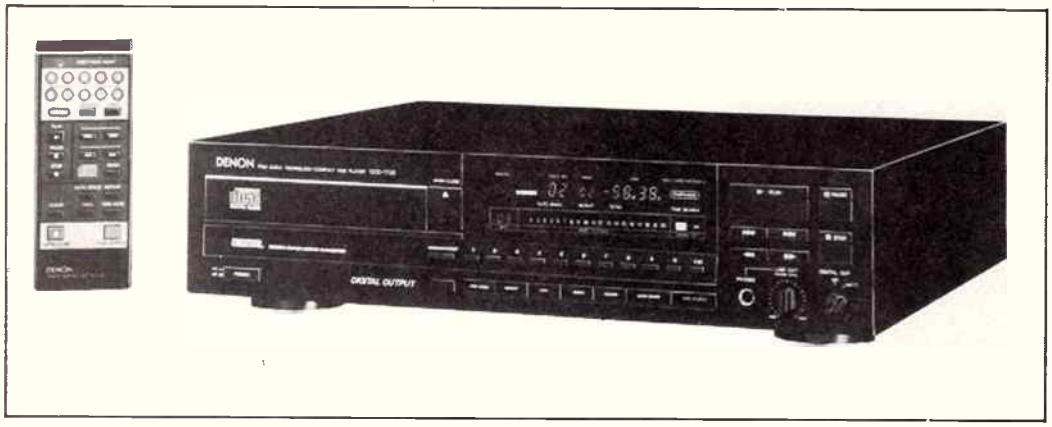

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Above: Bang and Olufsen's Beogram VF 5500. This forms part of B&O's Boelink integrated system described in March Sound Insights. Left: The Denon DCD-1700 which features the Super Linear Converter. Denon claims that this will reduce the distortion caused by the D/A.

are very proud. However Bang and Olufsen, also emphasise the integration of their units with the Beosystem 5500.

Hi-bit Technology

Breathing hard on JVC's heels in the new gadget department is Yamaha, with its "hi-bit" technology.

Yamaha has entered the CD lists in a big way with their CDX range which consists of the CDX-1110/U, CDX-910/U, CDX-810/U, CDX-510/U and lastly the CDX- 410U, all of which have a frequency response better than 5 Hz to 20 kHz and have better THD figures then 0.00%. Yamaha characterises these players as Natural Sound Compact Disc Players. It further claims that the CDX-110/U, the CDX-510/U and the CDX-910/U feature 'Hi-bit digital technology'.

Hi-bit digital technology is designed to combat the effects produced by filtering out unwanted noise above 20 kHz. The CDX-510U for example is equipped with hi-bit quadruple oversampling filter. By quadrupling the sampling rate from 44-.1 kHz to 176.4 kHz, the hi-bit digital filter raises the frequency of the resulting sampling noise so far above the audio signal spectrum that the strain on the low-pass analogue filter is greatly reduced. Yamaha claims that with 18-bit operation, unwanted band rejection stands at 108 dB, compared to he 96 dB of 16 bit digital filters. Passband ripple is claimed to be +/−0.001 dB.

As far as can be ascertained, Yamaha is the leader in Hi-bit technology at the moment, but all the other contenders are going bigger data wards as well, so their lead will not last for long. Indeed, it is now almost impossible to buy a machine with the standard ward length and sampling rate.

Denon's SLC

Another company which claims that its machines have a distinct technological edge is Denon (whose products are distributed by AWA). Denon has recently put out the DCD range which comprises the DCD-3300/1700, DCD-150011/900, DCD-800/600.

Denon's claim to CD fame its Super Linear Converter (SLC). According to Denon's research the Digital/Analogue converter is the device that has had the most impact on the sound of a CD player. The DAc consists of a ladder network of 16 bit resistors. Any tolerance in the value of these resistors will impair the conversion process causing audible distortion. Such problems occur especially where the analogue signal varies between negative and positive values. The SLC is designed to defeat this problem by using an external compensation circuit which produces a negative or positive combination value.

The Story of The Scissors

Technics do not claim to have perfected a Y servo or even a SLC but they go one better with their class AA circuit. According to their publicist, Technics only came up with Class AA after many years of assiduos searching. A group of 'youthful engineers' spent long and hard hours working on an amp design that could handle the wide dynamic range and signal to noise ratio produced by digital recording. As was the case with Buddha, aestheticism and single minded dedication did not prove to be sufficient. The 'youthful engineers' betook themselves to their supervisor. Saying apparently little, the supervisor produced a conventional amp circuit diagram and a pair of scissors. Applying

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one to the other he cut the diagram in half. Instantly all was light. The youthful engineers realised that they had to treat each of the stereo amplifier circuits as two amplifiers — making a total of four amps altogether. This new breakthrough was called the class AA circuit. The voltage control amp is completely free of influence from the load on the current drive amp. The current supply amp is able to provide exactly the current demanded by the load. The Technics staff call this process 'divide and conquer'. They claim that it lets you hear more musical detail. Anyone wishing to savour the effects of this musical wizardry should listen to one of the Technics SL-P range of CDs which all feature class AA circuitry.

JVC, Denon, Yamaha and Technics are the giants of the Japanese electronics industry but they are not without their rivals, one of which is Accuphase which has released the DP-10 CD player.

The DP-10 is a surprising product for several reasons. First off it comes double. In order to combat the well worn problem of digital to analogue conversion the company has divided the actual CD player. and the digital to analogue converter (DC-81) into separate units joined by both coaxial and optical fibre cables. Accuphase claim that they are the first company in the world to do this and that it results in an attenuation of −90 dB at 24.7 kHz and a ripple at ±0.001 dB.

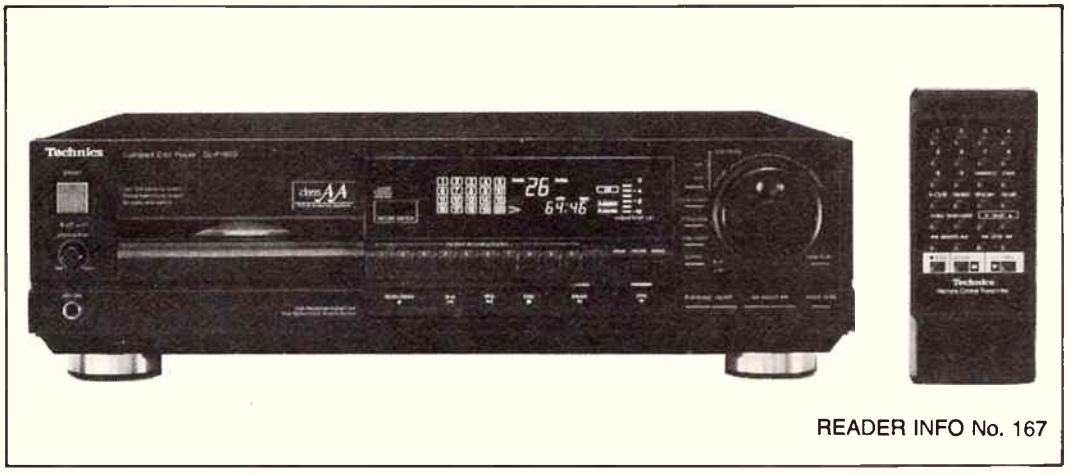
Another surprising, indeed shattering feature of the DP-10 is its price, $9998. Accuphase don't claim that this is a world first, but it certainly breaks some Australian records.

Fire In The West

With Y shaped Servos and SLCs one might have thought that all current innovations in CD technology are being made by the Japanese. Not so, as Phillips has just released the CD960. The interesting features of this unit are the combination of 4X oversampling rate and 16 bit performance. It uses a dual channel chip which copes with the slight time lag caused by the digital to analogue converter switching back and forth between channels. The frequency response of this unit is 2 Hz to 20 kHz =/− 0.2 DB, THD is around 0.0015% at 20 dB. One of the key features of this and other up to the minute CD players is the apparent ability to cope with dirty CDs. This seems to have emerged as a major problem with CDs and consequently Phillips and various other manufacturers have given it top priority.

Conclusion

With all these technological advances, it becomes an interesting question as to whether the CD purchasers of the future will make their choices dependent on sound and price, or whether a particular unit contains a Y shaped servo, SLC or ISS. ●



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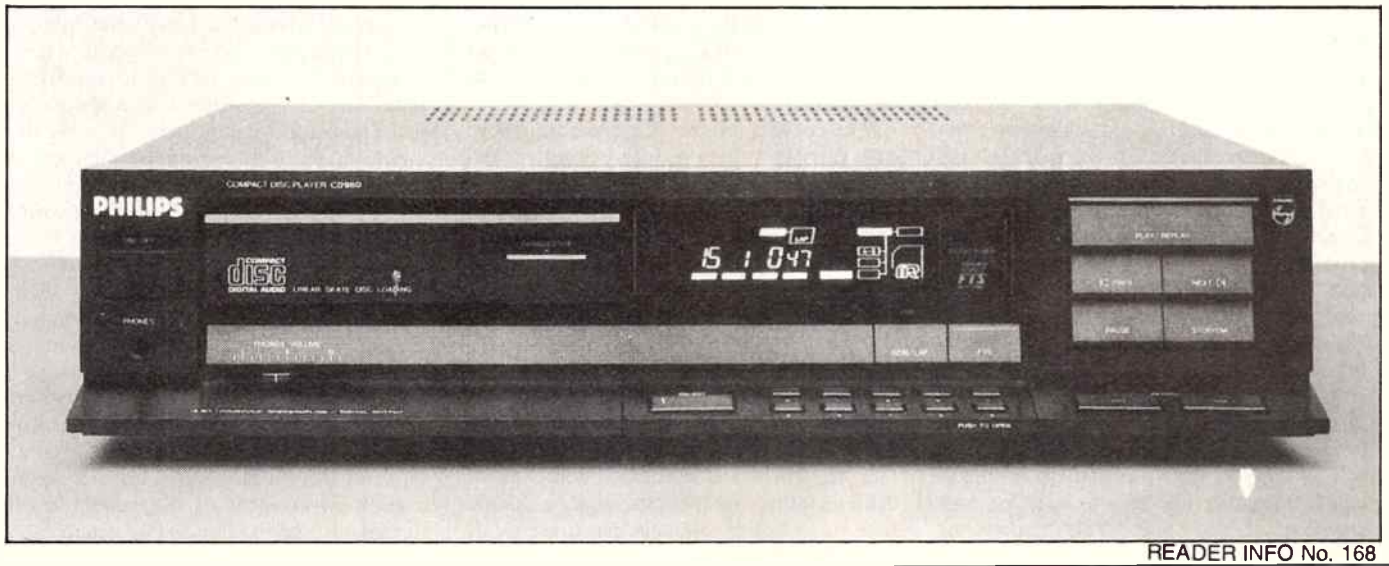

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Left: The Technics SL-P1000, one of the many Technics units to include the long-sought-after class AA circuitry devised by a harassed supervisor with a nippy pair of scissors. Below: The Philips CD 960. Philips laud the virtues of their dual channel chip which they claim copes with the time lag caused by D/A conversion.

World Radio History

Usually, Sound Insights is concerned with the generation of music from discs, records and so on. For a change, this article focuses on the other end of the process. How do we hear music, and what makes a difference?

The Physics Of Sound

THE dictionary defines music as "the science or art of combining tones into a composition having structure and continuity", a definition loose enough to encompass just about anything as music. The Oxford Companion to Music bypasses the problem completely; there is no entry under "music". If you try pinning it down by means of an informal survey, you'll probably find few people agree on a definition. This is a good thing for the ever-changing world of music, though it makes for arguments that are often dull: "Heavy metal? You call that music?"

Basic Physics

All music comes into our perception by means of vibrations of a medium. In the great majority of cases, this means pulsations of the air between the source or sources and the ear. Though some sound may be transmitted through conduction in other materials, we can safely concentrate on sounds that come to us through the air.

The standard high school experiment to demonstrate sound was (and probably still is) to strike a tuning fork and hold it to a microphone connected to an oscilloscope. The resulting pure tone produced a sine wave display that diminished in amplitude with time. All sound is made like this, regardless of its origin. You can thump your fist on the table and the same rules apply to the very different-sounding noise you'll get. The tuning fork just happens to be a special case; it's mechanically designed to produce that pure sound wave.

Breaking this idea down a bit, we can say that all musical sounds originate from one of four mechanical objects: the string, the reed, the tube and the diaphragm. The most complex electronic synthesizer in the world is mute until it moves the diaphragm of a speaker or headset. Simple pan pipes and massive pipe organs are resonating tubes in the same way.

Sometimes the instruments use several of these ideas together. The vibrating string, for instance, doesn't like to impart its energy to the surrounding air, so a diaphragm, the soundboard, is used to couple this energy to the surrounding air molecules. It's rather like making oars for your rowboat; if you make the blades one metre across, you'll never be able to move them in the water, and if you make them three centimetres across, they'll just slice through the water and waste your energy. The ideal relationship between the acoustic instrument's strings, soundboard and the air has been worked out by trial and error over the centuries (with "ideal" meaning that the instrument suits musicians well enough — no one will ever agree on the perfect instrument). The vibrating reed of the clarinet and the trumpet player's lips share the same problem of sound not being particularly loud, so various types of tubes are used to increase the efficiency.

The Ear

At the other end of the chain, the receptor attached to the human being is the ear.

The mechanical parts of the ear are a miracle in themselves, before we even begin considering the processing capability of the brain. The eardrum, or tympanic membrane, vibrates as a result of the sound's variations in the air pressure. The amplitude of these vibrations is incredibly small; ordinary conversion results in a displacement of only one one-hundred-millionth of a centimetre, about the diameter of a hydrogen molecule. The eardrum the tansmits these variations in air pressure to the three small bones of the middle ear, the hammer, anvil, and stirrup. The mechanical advantage provided by these bones results in a pressure change of 30 to 60 times.

The cochlea of the inner ear is where the variations in pressure stimulate the sensation of hearing. Its name means "snail" in Latin and refers to its coiled shape. Its inner workings are so complex that whole books can be (and have been) written on its function.

To oversimplify: the cochlea is lined with groups of microscopic hair cells of various sizes, each group responding to a certain band of frequencies. It's quite possible for extremely loud sounds to damage these cells, resulting in hearing loss. In fact, the cochlea does such a good job of discriminating frequencies that a single tone of sufficient loudness can cause deafness at only that frequency, a biological notch filter. In most cases of short-term exposure to loud sounds, the hair cells will repair themselves. In long-term exposures, or with extremely loud sounds, the damage may be permanent.

There is normally a faint background noise which we can hear in quiet enough surroundings. This signal-to-noise effect is usually not a problem, but can develop into a ringing called tinnitus, which may or may not indicate oncoming deafness. It's interesting to note that Beethoven's deafness was said to be severe tinnitus, rather than a drastic decrease in sensitivity. Temporary tinnitus can be induced by short-term exposure to loud sounds; people who say that they come away from rock concerts with their ears ringing are speaking literally.

Decibels

The most popular unit for measuring is the ubiquitous decibel. It's the favourite level measurement of both sound and electronics technicians, and it's used for sound, voltage levels and power. It states the signal strength coming from your cassette deck, the micropower levels in your cable TV feed, and the level of sound produced by loudspeakers. Yet it's poorly understood.

The whole problem with quantifying sound levels is that our ears are capable of a staggering dynamic range; the intensity of the loudest sound we can hear (at the threshold of pain) is about one trillion times that of the softest sound we can detect under ideal conditions. To avoid having to work with enormous numbers all the time, the difference in the intensity levels is expressed as a base-10 logarithm giving us the ratios of the powers. If you increase the power going into your loudspeakers by 10 times, the intensity of the sound is 10 times, and the log is one; 100 times the power gives a log of two and so forth. Note carefully that intensity, a physical quantity, is not the same as loudness, a subjective auditory sensation from this we derive the bel, after Alexander Graham Bell, a pioneer in hearing studies as well as inventor of the telephone. Its formula is simply: logP1/P2, where P1 is

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William Markwick is the editor of ETI Canada.

Bill Markwick

the larger power and P2 is the smaller.

However, the bel is still a bit coarse for small changes, so it's customary to use the decibel, 0.1 bel and abbreviated dB. Now the standard formula for comparing sound powers becomes: 10logP1/P2.

The Phon

A second sound level unit is the Phon.

Not a unit you run across every day, the phon is used to designate loudness levels. It might be said to be to loudness as the decibel is to intensity (audiologists will cry that I've oversimplified things — the proper subjective unit is the sone — but we're close enough).

If a number of different tones all intersect the 50 phon contour at the same point, they all have the same loudness, regardless of the actual intensity or frequency.

As an illustration of how complicated it can all get, and why I won't bother splitting hairs between phons and sones, imagine a huge cathedral organ playing a chord at the same loudness as say, a flute or piccolo. We just know that the organ is louder, and will swear blind that it is, despite all the physical evidence to the contrary. Perhaps it has to do with the harmonic content, or perhaps there are subjective factors that just refuse to hold still for physical measurements.

Thresholds and Sensitivites

We usually read that the minimum sound we can hear has been defined as 0 dB, where zero is defined as a particular intensity, and we tend to think that any sound of 0 dB in quiet enough surroundings produces the sensation of hearing in anyone. In fact, this figure was arrived at by measuring all sorts of subjects using tones of many different frequencies. The figure represents the average response of a number of people to midrange frequencies, about 800 to 2000 Hz.

Outside the midrange, the ear requires a much louder sound before the impression of hearing is reached. The chart shows, for instance, that at 110 Hz (the A string on a guitar), the threshold is about 40 dB higher than at the midrange. The 10 kHz range, corresponding to the upper "brightness" harmonics of a sound, is about 20 dB higher than the mids.

In addition, there's a wide variation between individuals. The figures given are only a starting point, a guide to the ear's variations with frequency.

However, as the ear can be overloaded by exposures to loud sounds. The threshold of hearing can be shifted upwards, sometimes permanently. Often, though, the effect is temporary. The shift can be as much as 40 dB for a very short time if the sound level has been 80 dB or more; it can be as high as 10 dB for long periods. There also may be shifts in pitch (pitch being our subjective perception of frequency).

If you listen to loud music for any length of time, you'll have noticed without doubt that the high frequencies ("treble") appear to be reduced. Everything sounds slightly duller. This effect usually goes away in time, but threshold shifting of this magnitude must surely indicate an abuse of hearing.

Loudness

Loudness is our subjective perception of sound intensity. Because we're largely unconscious of the complex workings of our hearing mechanism, we tend to think of loudness as being rather straightforward: turn up the stereo and it gets louder. Nothing to it.

In fact, our perception of loudness depends on both frequency and the level of intensity itself. The graph of equal-loudness curves demonstrates this. Each curve graphs the frequency and intensity that will produce the sensation of equal loudness to average listeners; the curves are based on a midrange intensity in steps from 0 to 120 phons. For example, at the threshold of audibility, 0 dB is the minimum only between 800 and 1500 kHz. At 100 Hz, the intensity must be raised about 40 dB for perception to occur.

At an intensity of 60 dB, there is only about a 10 dB difference between 100 and 1000 Hz for equal loudness, and at 100 dB there's hardly any difference. Note that there's consistent dip around 3 to 4 kHz in every curve, indicating that the ear is so sensitive in this area that the intensity must actually be reduced.

If one sound has 10 times as much power as another, the difference in their intensity levels is 10 dB. In the midrange frequencies (say, 500 to 2,500 Hz) and at typical listening levels, we perceive this 10 dB increase as a doubling of loudness. It should be noted that this convenient relationship holds true only under certain conditions; with bass sounds, for instance, and at low levels, much more power is needed.

The Loudness Control

The equal-loudness curves illustrate the function of the hi fi loudness control. If you're listening at 100 phons, the curve is fairly flat: an intensity of 100 dB produces equal loudness pretty much across the frequency spectrum. If the neighbours bang on the wall and you drop the level to 60 phons, a glance at the curve would indicate that a bass note of 100 Hz falls on extra 10 dB in loudness, as does a 10 kHz treble frequency. In other words, dropping the volume has a drastic effect on the perceived frequency response; it's like turning down the bass and treble as well.

To compenste for this, the manufacturers of stereo amps added a loudness control. Usually it's a simple switch, though expensive units might have an adjustable potentiometer. In theory, the loudness control is supposed to boost the bass and treble if you turn the volume down, and cut them if you turn it up.

In actual practice, the poor loudness control is used more as an effect to get a thick, boomy sound. Since the great majority of popular music is electronically doctored to an enormous extent, I don't suppose it makes much difference if you add even more exaggeration to already exaggerated sounds. If you listen to acoustic music, however, it can be a bit painful

World Radio History

when guitars sound like double basses. Ah, to each his own.

Volume

What then of volume? The word implies loudness levels, but as we've seen, the volume control on your stereo is really an intensity control. The "volume" is supplied by your ear/brain interpreting physical quantities. It's of interest to note that the word never appears on professional audio equipment; the label is usually "level".

Pitch

The other basic measurement we can make on music is its frequency.

When a tuning fork is struck, it swings back and forth at a rate determined by its mechanical design. As the bars swing toward you, they compress the air, and as they retreat the air is rarified. The resulting sound waves are then alternating compressions and rarefactions; they're called transverse waves and spread out spherically from the fork.

If we look at the oscilloscope's signal produced by a microphone near the fork we see the familiar sine wave that begins at zero, rises in a smooth curve to a positive peak (compression), falls smoothly to zero, and then duplicates this positive half-cycle in the negative direction (rarefaction).

The rate at which this happens is called the frequency of the sound.

Pitch and frequency are often used interchangeably, but as author Tom Robbins said, there are no synonyms. Pitch is our subjective reaction to a frequency, which consists of a certain number of cycles per second. Frequency is a measurement that can be done easily and precisely with lab instruments.

In general, the relationship between pitch and frequency appears linear to us: twice the frequency seems to give twice the pitch and so on, but this is true only fr a narrow range of frequencies. Our ear/brain hearing mechanism begins to stray from this 1:1 ratio at either end of the audible spectrum. If a piano is tuned using exact octaves right across the range, the upper and lower octaves will sound just a bit flat, even though they may look correct to a frequency counter. Piano tuners compensate for this by tweaking the extreme octaves until they sound right. Chances are that no two people have exactly the same variance at the extreme octaves, so tuners probably encounter fussy piano players who insist it still isn't right, even though the tuner is satisfied. Any variation would be extremely small, though, and you'd need highly trained hearing before you could detect what they're arguing about (besides, the upper octave of a piano consists of more impact noise than string tone).

The usual frequency range given for the ear is 20 Hz to 30 kHz, but like the previous measurements, this is just a generalization. Some people can hear to 25 kHz or more, and some cut off at 10 kHz. The ear's high frequency response diminishes with age and can be affected by illness or long exposure to loud sounds (though it's remarkable how the brain compensates — most will swear that nothing has changed).

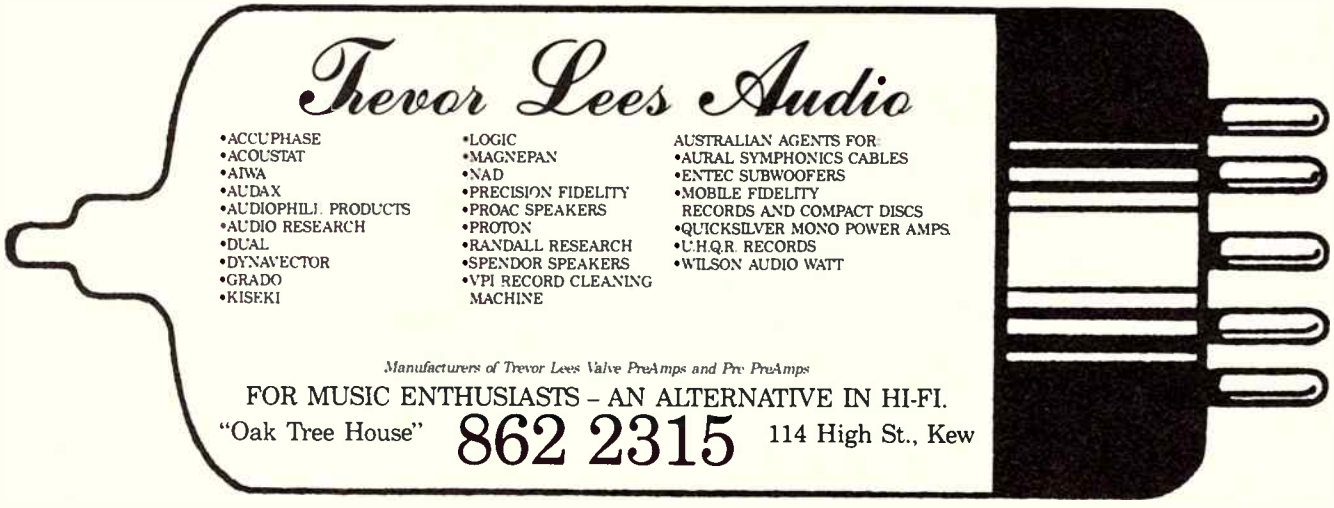
Our sense of pitch is not as ill-behaved as our sense of loudness. By and large, pitch and frequency are locked together and are not affected quite as much by intensity levels. There are graphs available which whow that subjects listening to pure tones report that tones below 500 Hz sound lower in pitch with increasing intensities, and sounds above 300 appear higher. Still, we don't often listen to pure tones for enjoyment.

There is a scale of pitch using a unit called the mel. This unit replaces the Hertz when it comes to subjective measurements. For example, if a listener hears a 1000 Hz tone (given a mel value of 1000) and when asked to choose a tone of one-half the pitch, he may well pick 400 Hz (many people will). The 400 Hz tone is then given a mel value of 500, because it appears to be one-half the pitch, or one octave down.

There is one practical application of this phenomenon when it comes to music. The majority of musical instruments are designed by acoustical rules, and the designers don't worry about pitch versus frequency, largely because most instruments have a limited range of fundamental frequencies. When it comes to pianos and organs, however, the great obtainable range means that the very highest and very lowest notes will not sound true if they are tuned according to theory. Keyboard tuners have to adjust the extreme notes at both ends to compensate for this drifting apart of pitch and frequency. It's probably safe to say that the pitch/frequency problem arises so seldom that we can ignore it for most purposes.

Response to Tones

High school experiments pointed out that two tones identical in frequency and phase



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(i.e., peaks and valleys occurring at exactly the same time) will add together; the amplitude of the resulting wave is the sum of the individual amplitudes. Similarly, the result of two tones identical in frequency but 180 degrees out of phase is a tone with an amplitude equal to the difference of the individual amplitudes. Such exactly conditions of frequency and phase tend to happen only under laboratory conditions. It's unlikely that two musicians could hold their pitches that closely, though it might happen with synthesizers.

A much more likely occurrence is two tones that are similar but not identical. In this case, the result tends to be the formationof beats, a pulsation in amplitude equal to the difference between the two; for example, a 267 Hz tone and a 260 Hz tone would produce a beat note at seven times per second.

Obviously, two tones far enough apart will be heard as separate tones; from listening to an orchestra we know that we can distinguish a vast array of tones and tonal colours (though it often takes training to improve this facility). If the two tones are fairly close together, say 400 and 600 Hz, we can often detect sum and difference frequencies of 200 and 1000 Hz. Of course, this depends greatly on the tones themselves; we might her the phenomenon with two flutes, for instance, but not with a kazoo and a flute.

Electronic technicians may point out the fact that sum and difference tones result when tones are passed through a non-linear system; i.e., the system introduces a distortion which results in the creation of tones in the output not present in the input. The harmonic series generated (which we'll be covering in more depth) results in any extra sounds that we hear. The non-linearity as far as music is concerned may be the ear itself; as we've seen, there is a variation in our perception of intensity and frequency as these parameters themselves change.

It would be an interesting experiment to take two tuning forks 100 or 200 Hz apart and see if the sum and difference tones can be heard. The sum tone is said to be more difficult to hear.

If you have a guitar handy, you can try this Finger an E on the second fret of the fourth string and pluck this note together with the open A or fifth string. Listen carefully for the difference tone; try sounding the notes separately and then together until you can detect it. What you're hearing is the difference note resulting from the interval of a fifth; the E (164.8 Hz) minus the A (110 Hz) gives a resultant of 54.8 Hz. This is a very low note, one that you would associate more with the bass or the organ, so its amplitude is not all that high coming from a guitar body or guitar amplifier. Don't worry if you can't perceive it; it's no reflection on your talent for music or acoustics. It often takes a lot of practice to separate the familiar musical sounds into their constituent parts, or even some of them. ●

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6	31	56	81	106	131	156	181	206	231	256	281	306	331
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15	40	65	90	115	140	165	190	215	240	265	290	315	340
16	41	66	91	116	141	166	191	216	241	266	291	316	341
17	42	67	92	117	142	167	192	217	242	267	292	317	342
18	43	68	93	118	143	168	193	218	243	268	293	318	343
19	44	69	94	119	144	169	194	219	244	269	294	319	344
20	45	70	95	120	145	170	195	220	245	270	295	320	345
21	46	71	96	121	146	171	196	221	246	271	296	321	346
22	47	72	97	122	147	172	197	222	247	272	297	322	347
23	48	73	98	123	148	173	198	223	248	273	298	323	348
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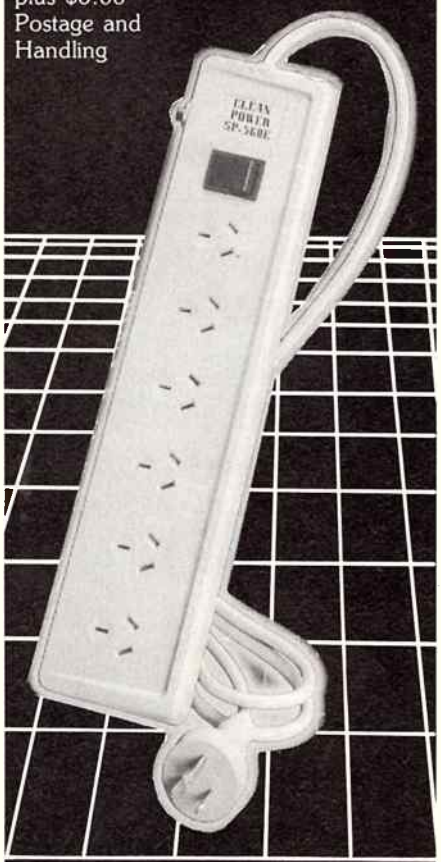

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Reviews

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Artist: Noiseworks
Title: Noiseworks
Producer: Mark Opitz
Label: C.B.S.

The debut offering from this Australian outfit is brash, tough and musically competent.

From the passionate *Love Somebody* and *Welcome to my World* to the energetic *Burning Feeling* and *No Lies*, Noiseworks exude a rare confidence and ability.

They manage to sound surprisingly fresh and vital, in spite of American sounding production values and musical influences from Springsteen and U2.

Especially, vocalist Jon Stevens displays a maturity of style and delivery that belies a debut product.

If this C.D. is any indication, Noiseworks would be a red hot live act and the Australian rock music scene is certainly richer for their existence.

Recommended.

— Mark Lewis

Title — Body & Soul
Artist — Jenny Morris
Producer —
Label— WEA

Jenny Morris is a singer from New Zealand and this is her most popular release in Australia. There are eleven tracks on this disc all in the light rock genre.

Morris has gathered a number of fellow New Zealanders to help her in the production of this album. Prominent among these are Dave Dobbyn and Tim Finn. Morris emerges from this disc as a talented singer, however her songwriting ability leaves much to be desired. The best tracks on this disc *You I Know, Beating On The Same Drum* were written by Neil and Tim Finn respectively. Morris' own contributions such as *Body And Soul*, and *Light Hearted* are ghastly musically and lyrically.

Jenny Morris then is a singer with a future. This album is not going to be remembered as her best but it is a valuable introduction to her style.

Simon O'Brien

Artist: Eurythmics
Title: Savage
Producer: David Stewart
Label: R.C.A.

This release is the seventh from this popular British duo and continues their tradition of finely produced, well crafted pop songs.

Featuring the considerable vocal talents of Annie Lennox and the musical expertise of Dave Stewart, Savage is a fine example of pop music at its most sophisticated.

Song titles vary from the theatrical, *Beethoven (I love to listen to)*, to the irreverent, *I've got a lover (back in Japan)* and *You placed a chill in my Heart* to the raunchy *I need a man.*

A healthy future for British pop is assured while bands of the Eurythmics calibre are still recording.

— Mark Lewis

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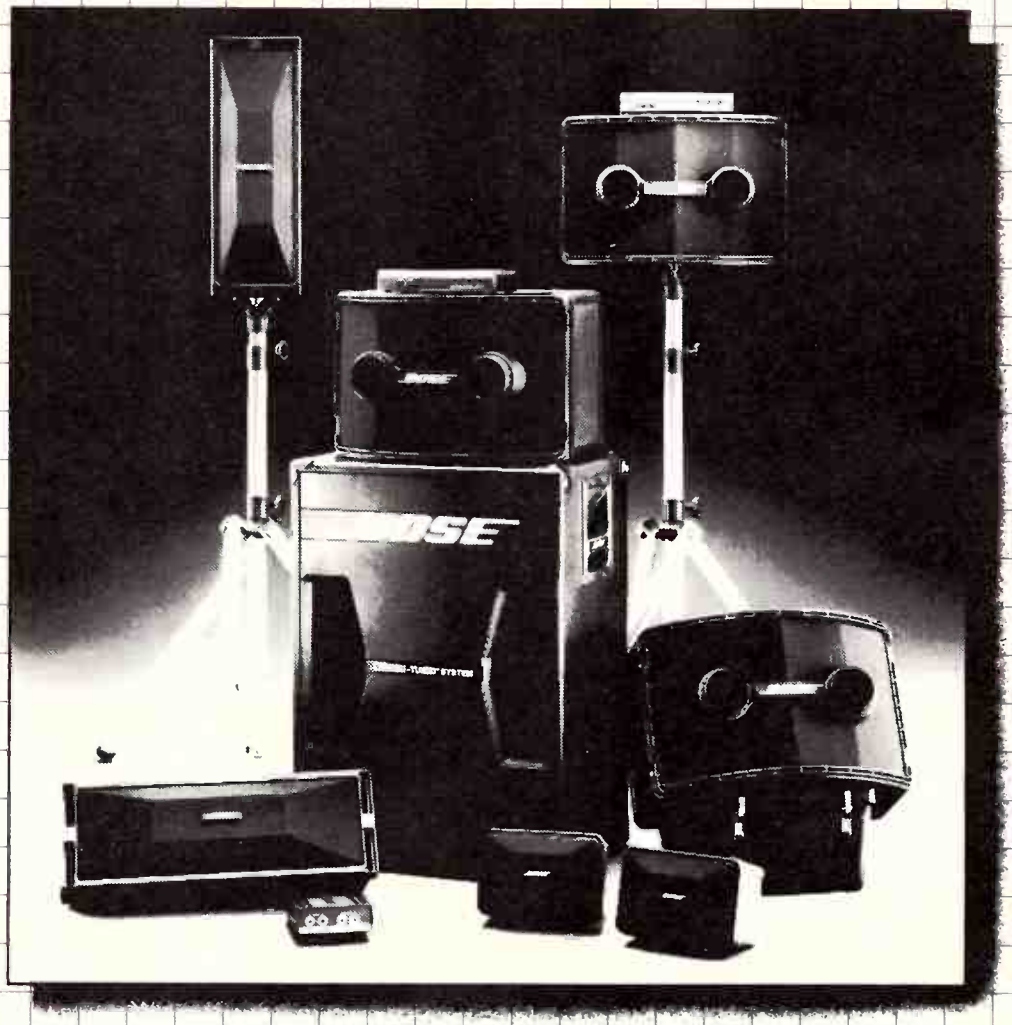

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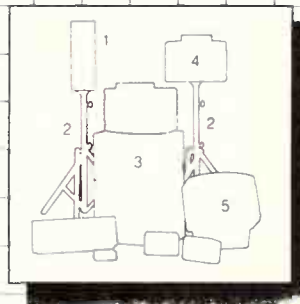

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READER INFO No. 34

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```
10 PRINTCHR$(147)
20 ME$="YOUR MESSAGE"
30 PO$="[HOME] [5-DOWN] [11-RIGHT]"
40 SP=80:REM SCROLL SPEED
50 WI=18:REM WINDOW WIDTH
60 B$=CHR$(29):C$=B$+B$+B$+B$+B$
70 ME$=C$+C$+C$+C$+ME$+"  "
80 FORI=1TOLEN(ME$)
90 PRINTPO$;MID$(ME$,I,WI);CHR$(145)
100 FORN=0TOSP:NEXTN,I
READY.
```

Scroller

This is an extremely simple but very clever idea. Many programmers have probably needed a scrolling message sometime. This program does just that, displays a preset message.

The message can be as long as you like, as long as it fits in a string. The width of the display window is adjustable in line 50. The scroll speed is adjustable in line 40.

The start position of the message is determined in line 30 by means of cursor controls.

This program was mainly designed for use as a subroutine in other programs.

Sean Rodden
Forestville

```
20 REM CREATING PROGRAMMABLE CHARACTERS
31 POKE56334,PEEK(56334)AND254:POKE1,PEEK(1)AND251
35 FORI=0TO63
36 FORJ=0TO7
37 POKE12288+I*8+J,PEEK(53248+I*8+J)
38 NEXTJ:NEXTI
39 POKE1,PEEK(1)OR4:POKE56334,PEEK(56334)OR1
40 POKE53272,(PEEK(53272)AND240)+12
60 FORCHAR=1TO26
80 FORBYTE=0TO7
100 READNUMBER
120 POKE12288+(8*CHAR)+BYTE,NUMBER
140 NEXTBYTE:NEXTCHAR
198 PRINT"(CLR)"
199 PRINT"(DOWN)(DOWN)(DOWN)(DOWN)"
200 PRINT"  ABCDEFGHIJKLMNOPQRSTUVWXYZ
205 PRINT
210 PRINT"  A B C D E F G H I J K L M N
220 PRINT"
230 PRINT"  O P Q R S T U V W X Y Z
9000 REM GHOST ALPHA
9010 DATA0,14,30,102,102,126,102,131
9015 DATA0,254,99,126,99,99,51,206
9020 DATA0,60,102,196,192,195,102,60
9025 DATA0,222,51,99,99,99,102,156
9030 DATA0,222,51,96,60,96,102,252
9035 DATA0,222,51,96,60,96,96,192
9040 DATA0,62,99,192,207,194,103,25
9045 DATA0,227,102,102,62,102,102,200
9050 DATA0,56,24,24,24,24,24,48
9055 DATA0,14,12,12,108,204,204,120
9060 DATA0,227,102,60,60,102,102,195
9065 DATA0,112,48,48,48,96,243,206
9070 DATA0,99,55,127,107,99,99,132
9075 DATA0,227,51,63,103,99,99,195
9080 DATA0,28,103,195,195,195,236,56
9085 DATA0,140,98,98,60,96,96,192
9090 DATA0,62,99,195,195,204,198,51
9095 DATA0,206,99,99,102,60,102,195
9100 DATA0,30,99,24,6,3,195,62
9105 DATA0,63,192,12,12,24,24,24
9110 DATA0,192,99,99,195,198,198,60
9112 DATA0,195,102,102,28,28,24,24
9115 DATA0,195,195,195,59,63,198,0
9120 DATA0,195,102,14,28,60,102,195
9125 DATA0,198,108,24,24,0,48,48
9130 DATA0,63,198,12,24,48,59,226

READY.
```

Ghost Alpha

This program redefines the characters that are used for the alphabet, into ghostly looking chracters.

Shane Carney
Corrimal NSW

```
3000 D1=18:AB=19:PRINT"■"
3010 INPUT"■L■OCK OR ■U■NLOCK  L■■■■":C$
3020 C$=LEFT$(C$,1):AK$=CHR$(34)
3030 IFC$<>"L"ANDC$<>"U"THEN3010
3040 PRINT"■":TAB(16);:OS=0
3050 IFC$="L"THENAC$="LOCK":PRINTAC$:OS=64:GOTO3070
3060 AC$="UNLOCK":PRINTAC$
3070 D1=64-OS
3080 INPUT"■WHICH FILE";F$
3090 IFRIGHT$(F$,1)="*"THENPRINT"■■":GOTO3080
3100 D=0
3110 TY=130
3120 :
3130 OPEN15,8,15:NL$=CHR$(0):N$=F$
3140 OPEN2,8,2,"#":GET#2,A$
3150 PRINT"■SEARCHING FOR "F$
3160 FORS=1TOAB
3170 PRINT#15,"U1:";2;0;D1;S
3180 FORI=0TO7
3190 PRINT#15,"B-P:";2;(2+32*I)
3200 GET#2,FT$
3210 IFFT$=""THENFT$=NL$
3220 FT=ASC(FT$):IFFT<>TY+01THEN3310
3230 H$="                ":F$=LEFT$(F$+H$,16)
3240 PRINT#15,"B-P:";2;(5+32*I)
3250 W$=""
3260 FORQ=1TO16
3270 GET#2,A$:IFA$=""THENA$=NL$
3280 W$=W$+A$
3290 NEXTQ
3300 IFF$=W$THEN3330
3310 NEXTI
3320 NEXTS:PRINT"■■FILE NOT FOUND ERROR.":GOTO3400
3330 IFC$="L"THENPRINT"■LOCKED "N$
3340 IFC$<>"L"THENPRINT"■UNLOCKED "N$
3350 I1=I:S1=S
3360 PRINT#15,"B-R:";2;0;D1;S1
3370 PRINT#15,"B-P:";2;(2+32*I1)
3380 PRINT#2,CHR$(TY+OS);
3390 PRINT#15,"U2:";2;0;D1;S1
3400 CLOSE2:CLOSE15

READY.
```

Lock Unlock

Lock/unlock is a utility for the 1541 and compatible disk drives which allows you to stop files from being scratched.

After running the program you can either press 'L' to lock a file or 'U' to unlock a previously locked file. Then enter the filename (you must enter the full filename) and the program will lock or unlock the chosen file.

John Avis
Frenchs Forest NSW

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7. The first prize is a Nissan Pathfinder with Solartint treated windows, Deluxe bullbar, Thomas Electric Winch, Yokohama Super Digger tyres, and includes all on-road costs, third party insurance and registration.
8. The promoter is The Federal Publishing Company, 180 Bourke Road, Alexandria, NSW 2015. Permit No. TC88 319 issued under the Lotteries and Art Unions Act 1901; Raffles and Bingo Permits Board Permit No. 88 189 issue on 12 2 88; ACT Permit No. TP88 108 issued under the Lotteries Ordinance, 1964.

INNOVATIVE modern body design and ultra-smooth suspension set-up makes the Nissan Pathfinder an instant hit. Since its introduction the Pathfinder has proven itself time and again to be a tough, exciting and rewarding vehicle on or off road.

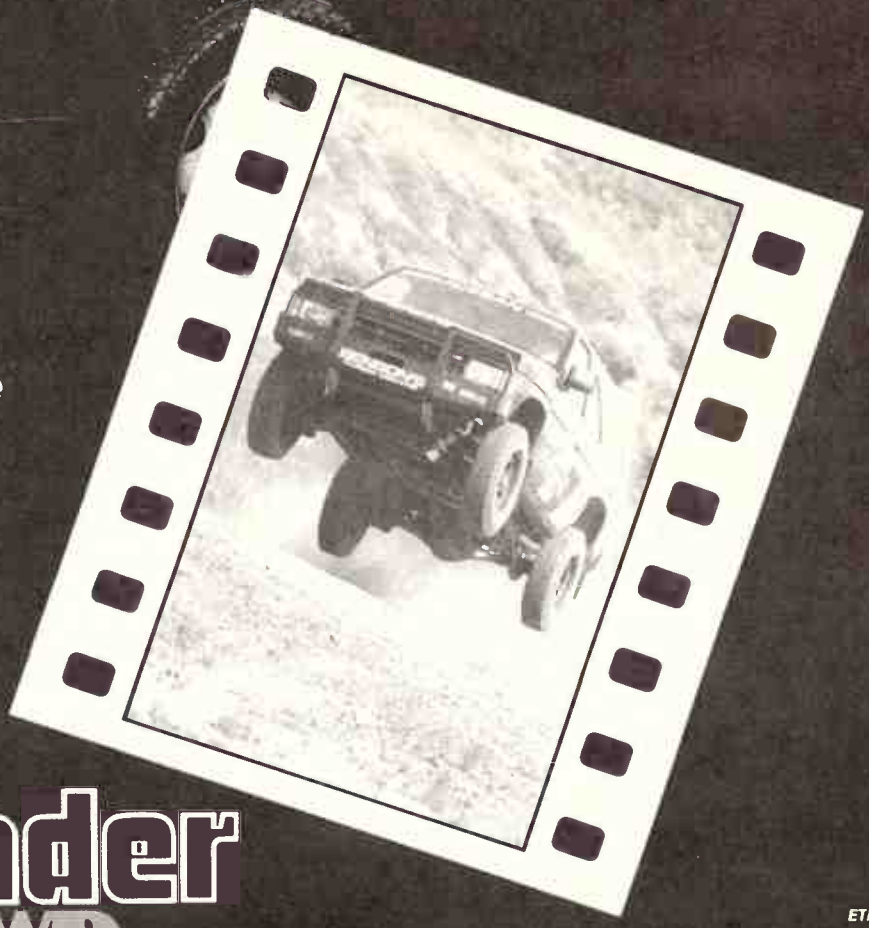
Your vehicle will be customised with TEAM OVERLANDER 4WD accessories including a Deluxe bullbar from Opposite Lock Accessories, Thomas Electric winch, Yokohama Super Digger Tyres fitted to Mullins alloy wheels and to complete the package, windows will be treated by Solartint. Valued at over $30,000.

World Radio History

Pathfinder Could be Yours!!

***a car by subscribing to* Electronics Today**

12 months subscription only $42.00



Team Overlander choose Nissan Pathfinders for everyday transport and competition events.

One of the Team's Nissan Pathfinders in action.

TEAM overlander 4WD

ETINIS4

HURRY — OFFER CLOSES JULY 31, 1988!

World Radio History

Letters to the Editor

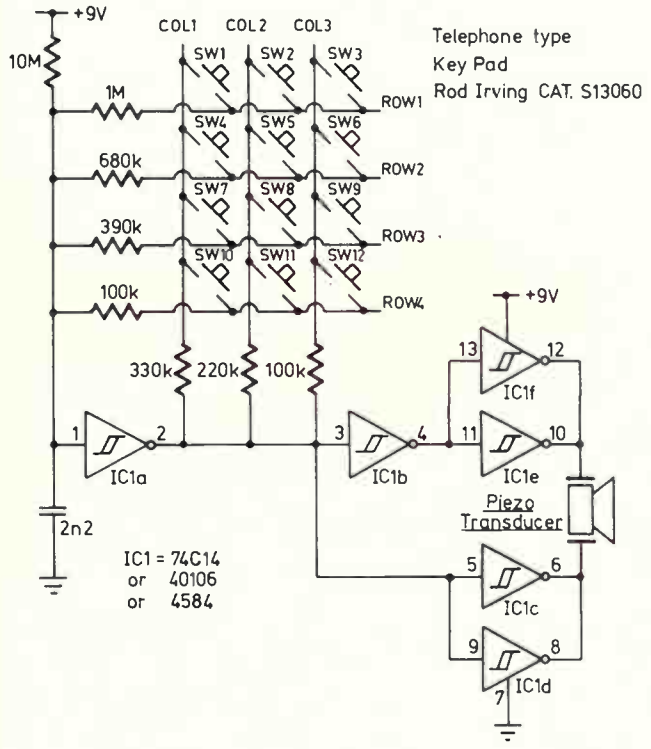
Regarding your recent article on the manufacture of modems in Australia and how the industry is booming when Telecom brings in timed or metered calls. What effect will this have on the private sector of the market? I myself run a 300 Baud moden on the Mac-Board, usually 5 or 6 times a week, for about 20 minutes or so per call. At 20 cents per call that's not really bad, but with metered calls the price will skyrocket. Won't this slow the current selling of modems, since the cost of running them will become prohibitive in the long run.

Kendall Bennet
Kew, Vic

You should have a regular listing of IBM PC compatible games and prices as it is very hard to come by them.

Michael Dweson
Waramanga, NSW

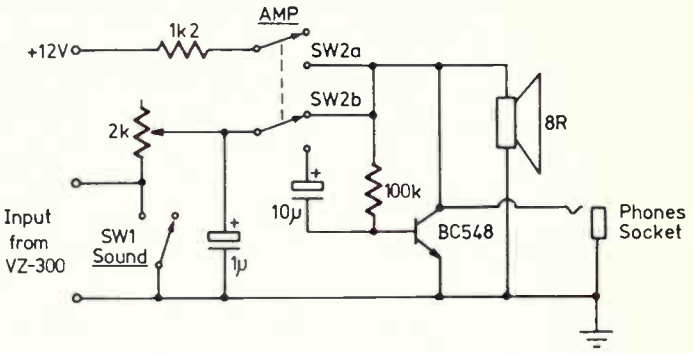
Almost any PC store will be able to assist you — ED.

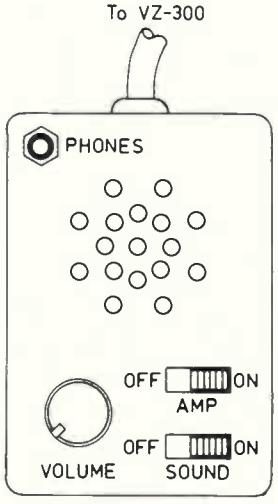


Childs Toy Organ

This circuit will fit into the smallest sized plastic jiffy box. Pressing switches 1 through to 12 causes the resistance between pins 1 and 2 of IC1a to go from 1M33 to 200k in 1200k steps (approx). This causes IC1a to oscillate at 12 different frequencies. The rest of the gates are arranged to drive the transducer in push-Pull. The 10M resistor holds pin 1 high when no switch is pressed. With no switch pressed there is no current flowing through any of the resistors so the circuit does not need an on-off switch. With different brands of ICs the range of sounds may not be suitable so the capacitor can be changed to suit.

Lindsay Kafer,
Laverton Vic





VZ Amp

One of the main downfalls of the VZ300 is its inferior sound, which is brought about by the inefficiency of the piezo-electric speaker included in the unit.

It is for this reason that I have designed a circuit to replace the piezo speaker with a magnetic one and include other features such as an amplifier and volume controls.

The volume and sound on/off controls run directly from the supply used for the piezo but the amplifier needs a 12 V supply which is taken from the input socket for the transformer. I cut the wires from the piezo and removed the monitor socket (because I'm using the TV socket), and installed a 6.5 mm stereo socket in its place. This socket must be stereo because it has to handle the two connections from the piezo and the supply rail. It is essential to check with a multimeter for the polarity of the speaker before cutting it and connecting it to the socket.

I used figure-eight shielded cable to connect the computer to the enhancer mainly because of the three individual connections. The sound can be turned off when you are doing a lot of typing, eg word processing, so you are not annoyed by constant beeping. Headphones can be used when there are other people in the vicinity that do not want to be disturbed.

Switch 1 (sound) is used to turn the sound on/off which it does by either creating a short circuit in parallel to the speaker or opening this short circuit. Switch 2 (amp) is a double pole to switch both the amplifier circuit and to turn on the power to this section.

Steven Merrifield
Newlyn North Vic

World Radio History

Idea of the Month

Vandal Proof Car Aerial

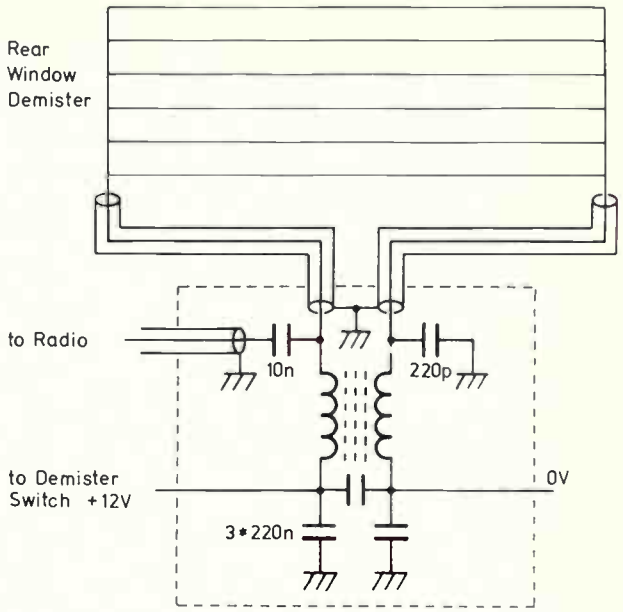
Having experienced the frustration of coming out to my car and finding the so-called "vandal proof" rubberised antenna broken off again, my thoughts turned to a *Wireless World* article I had read (Feb. 85). It described how the rear window demister could double as an antenna. Although it gave no constructional details, it did give some clues as to where I could start.

The main idea is that the inductor is wound bifiliar and connected up series-opposing so that the heavy heater element current, up to 15 A, doesn't saturate the ferrite. This inductor should ideally be a high quality VHF ferrite toroid wound for high L and low C, but mine is 50 mm of loopstick ferrite with as many turns of heavy gauge wire as I could squeeze on.

The heater elements form a simple short wire antenna for medium wave AM and with the 220p capacitor, a folded dipole for VHF FM. The 10n takeoff and 220p capacitor in the folded dipole are a compromise between the separate requirements of AM and VHF frequencies balanced with the need to separate these bands from hash generated by the other sources in the car (ignition, alternator, wipers, etc.). There is probably more room for experiment here. The 0.22µ capacitors form a further hash filter.

The circuitry should be mounted in a metal box for screening; I used a small tobacco tin. The coaxial cable used must have an inner conductor suitable for the high currents that will flow when the heater is on.

In use, I've found that the antenna is quite satisfactory being about as sensitive as the 300 mm monopole it replaced on AM. It is much better on VHF FM, probably because it is correctly polarized to horizontal signals. But best of all, anti-social brats won't be making their brainless "social criticisms" on my car anymore.



A. P. Whichello
Epping NSW

Feed Forward needs your minds. If you have ideas for circuits that you would like to enter in our idea of the month contest, programs for the computing columns or just want a word with the editor, send your thoughts to:

Feed Forward
ETI, Federal Publishing,
PO Box 227,
Waterloo, NSW 2017

Contributors can look forward to $20 for each published idea/program which should be submitted with the declaration coupon below.

Programs MUST be in the form of a listing from a printer. You should indicate which computer the program is for. Letters should be typewritten or from a printer, preferably with lines double spaced. Circuits can be drawn roughly, because we have a draughtsman who redraws them anyway, but make sure they are clear enough for us to understand.

'Idea of the month' contest

Scope Laboratories, which manufactures and distributes soldering irons and accessory tools, is sponsoring this contest with a prize given away every month for the best item submitted for publication in the 'Ideas for Experimenters' column — one of the most consistently popular features in ETI Magazine. Each month, we will be giving away a Scope Soldering Station (model ETC60L) worth approximately $191.

Selections will be made at the sole discretion of the editorial staff of ETI Magazine.

RULES

The winning entry will be judged by the Editor of ETI Magazine, whose decision will be final. No correspondence can be entered into regarding the decision.

The winner will be advised by telegram. The name of the winner, together with the winning idea, will be published in the next possible issue of ETI Magazine.

Contestants must enter their names and addresses where indicated on each coupon. Photostats or clearly written copies will be accepted. You may send as many entries as your wish.

This contest is invalid in states where local laws prohibit entries. Entrants must sign the declaration on the coupon that they have read the above rules and agree to abide by their conditions.

COUPON

Cut and send to: **Scope-ETI 'Idea of the Month' Contest/ Computing Column, ETI Magazine, PO Box 227, Waterloo NSW 2017.**

"I agree to the above terms and grant *Electronics Today International* all rights to publish my idea/program in ETI Magazine or other publications produced by it. I declare that the attached idea/program is my own original material, that it has not previously been published and that its publication does not violate any other copyright."*

* Breach of copyright is now a criminal offence.

Title of idea/program .....

Signature ..... **Date** .....

Name .....

Address .....

..... **Postcode** .....

World Radio History

```
            org $4000

            cmpi.l #$2,$4(a7)          #allow 2 args
             bne.s Usage
            move.l $c(a7),a0
            cmpi.b #$2,1(a0)           #2nd is numeric
             bne.s Usage

            move.l a7,Stack_pointer    #save values in ram
            move.l (a7),Return_address
            move.l $24,Trace_vector

            move.l #Trace_print,$24    #install new vector

            move.w sr,Status
             ori.w #$8000,Status       #set trace flag in ram
            move.l $10(a7),a0
            move.l $4(a0),Address      #trace start address
             bra.s Start

      Usage:
            move.l $8(a7),a0
            move.l (a0),d2
            move.l #Message,d1
            moveq.l #$30,d0
              trap #7                  #print message
               rts

Trace_print:
            move.w (a7)+,Status        #save sr, next address
            move.l (a7)+,Address       #and registers

      Start:
           movem.l d0-d7/a0-a7,Registers

              link a6,#$0
               bsr Cr_lf               #print cr/lf

            move.l Address,a0
             clr.l d2
            move.w Status,d2
            move.l #Text1,d1
            moveq  #$30,d0
              trap #7

            move.l #Text2,d1           #set to print d0-d7
            move.l #Registers,a3
               bsr Print_registers

            move.l #Text3,d1           #then a0-a7
               bsr Print_registers

              unlk a6

            moveq.l #$2,d0             #wait for key/press
              trap #7
             cmpi.b #'x',d0
              beq.s Trace_exit         #end if 'x'

            movem.l Registers,d0-d7/a0-a7   #else restore registers
             move.l Address,-(a7)       #push address
             move.w Status,-(a7)        #and flag
               rte                      #do single step
      Trace_exit:
             move.l Trace_vector,$24    #restore machine
               andi #$7fff,sr
             move.l Stack_pointer,a7
             move.l Return_address,(a7)
               rts                      #and end

Print_registers:
             moveq.l #$30,d0
               trap #7                  #print text

              moveq #$7,d4              #set count

          Loop:
             move.l (a3)+,d2
             move.l #Text4,d1
             moveq.l #$30,d0            #print registers
               trap #7
               dbra d4,Loop

          Cr_lf:
             move.l #Text0,d1
             moveq.l #$30,d0
               trap #7
                rts


 Stack_pointer:  ds.l 1
Return_address:  ds.l 1
  Trace_vector:  ds.l 1
        Status:  ds.w 1
       Address:  ds.l 1
     Registers:  ds.l 16

       Message:  dc.b 'Usage: %s Address'
         Text0:  dc.b 13,10,0
         Text1:  dc.b 'SR: %04x  PC: %08x',13,10,0
         Text2:  dc.b 'D0-D7:',0
         Text3:  dc.b 'A0-A7:',0
         Text4:  dc.b ' %08x',0,0

             end
```

Trace

Trace is intended to be assembled using the ETI 1616 assembler, SSASM. When assembled it can be run as a transient program under 1616/OS and it will allow machine language to be run in a single step fashion. This is the trace mode. The program gives a print-out of the status register and the chip's internal registers at each pause. Any key, except 'x', will cause a single step operation. An 'x' will return control to 1616/OS.

Mike Gregory
Winston Hills NSW

Letters

I am writing on behalf of the Melbourne MSX and Spectravideo Users Group Inc. We are aiming at bringing about a greater awareness of the existence of our user group. We are of the strong belief that there are a great number of MSX (Micro Soft extended BAsic) and SVI (Spectavideo) users out there who have no idea that we exist, or have MSX or SVI Computers hiding in cupboards.

The club meets from 1.00pm to 5.00pm. Usually on the first Saturday of each month except January. Visitors welcome.

Nunawading Civic Centre
C.L. Willis Room
Whitehorse Rd
Nunawading
(03) 546-3035 or (03) 878-6169

I think ETI is going too much for computers, and away from radio and electronics. The old copies were very interesting for the hobbyist, but computers are too far from the hobby scope of today.

R. Trejon
K. R. Electronics
Colum
Qld 4573

How about some articles on building an IBM compatible machine from parts. The boards are already on the market. Discussing how the boards work and how they join up to different parts.

Steven Molnar
Sydney CAE
Carlingford
NSW 2118

We have been looking at ways of getting at the IBM market for a number of years. We have investigated hundreds of project ideas and always come back to the sad truth that a complete unit can usually be bought in from Asia for less than the cost of component parts in this country, which makes them rather unattractive. This applies to complete computers as much as boards. Nevertheless, ideas for hacking into the guts of an IBM clone are always welcome. See for instance, "Clone link" ETI Nov 87, p100-102.

— Ed

More information on R and D in Australia please, especially in the medical and scientific areas.

M Walpole
Wilston
Qld 4501

We are working hard on improving our coverage on local electronics R and D, and I hope the results are starting to become apparent.

— Ed

Your magazine appears to have improved in recent months — the articles are interesting and informative. However, the project and ideas area needs improving. Compared to what you have done in the past, the projects are rather weak, and the circuits in Feed Forward are pathetic. "Sound Insights" is excellent.

M. Boyes
Pennant Hills
NSW 2120

A terrific little Aussie letter this. It's like a Holden, always knocking. If you don't like the projects, stop whinging, Mr Boyes, do something about it. Contribute! Design something. If I don't find your contribution pathetic, I'll run it.

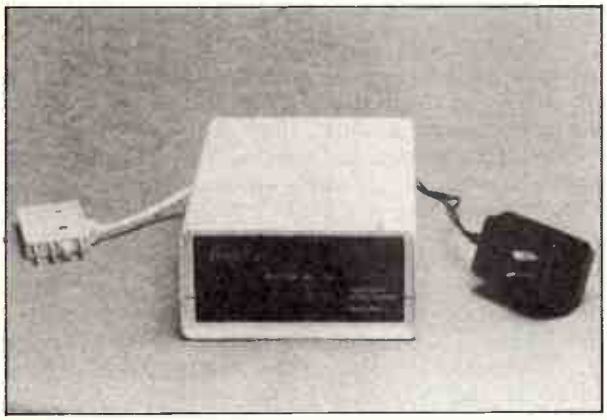
— Ed

World Radio History

DATASAT

and

eti



offer you the chance to win one of 10 DataSat VTEX Intelligent Desk Modems with IBM software, comprehensive manuals, RS-232-C cable, telephone adaptor and plugs. Total value of each prize $548.

Contest to be drawn 15th June, 1988.

Just fill out the coupon below and send to: ETI, P.O. Box 227, Waterloo, N.S.W. 2015.

ETI/DATASAT Contest

Name .....

Address.....

.....

.....

Prize courtesy of DATASAT, 67 Scott St., Liverpool, N.S.W. Phone (02) 821-1622

World Radio History

New Workstations from HP

HP's line of graphics workstations range from the HP 9000 Model 318M monochrome system and its color complement, the Model 319+, to the Model 825SRX superworkstation. In the mid-range, the existing high-performance monochrome (MH) and color (CH) systems are joined by the accelerated systems (CHX) and are configured with the HP 9000 Models 330 and 350 SPUs.

Model 318M, which has an Australian price of around $9930 (duty-levied before tax) features high-resolution monochrome graphics and 2-MIPS computation performance. Model 319C+, at around $18,200 (DLBT), offers graphics performance similar to Model 330MH/CH and Model 350MH/CH in low-priced Models 330MH/CH, 350MH/CH and 319C+ all provide high-performance graphics capabilities, such as hardware support for vector drawing, circle drawing, patterned area fill and pixel replication. These features are most useful for applications such as EE logical design, schematic entry, logic simulation, 2D mechanical drafting, mapping, AEC, AI and computer-aided software engineering (CASE).

READER INFO No. 150

Data Software Acquisition

Elmeasco Instruments is selling the Fluke Helios Toolbox, a software package for creating the data acquisition and control system software of its Helios-I Computer Front End.

Helios-1 makes real-world measurements, and Helios Toolbox is intended for measurement applications requiring custom software. The Helios Toolbox expedites the development of powerful data acquisition software by providing routines that handle all communications with Helios-I. It's written in Microsoft QuickBASIC.

Helios Toolbox is comprised of a variety of routines to assist the programmer in gathering data in real-world parameters such as temperatures, pressures and flows, and processing the data on an IBM-PC/AT/XT or compatible. Data can be scanned and logged using simple one-line statements, focusing programming efforts on the application.

For more information contact your nearest Elmeasco office in Sydney, Melbourne, Brisbane, Perth and Adelaide.

READER INFO No. 151

Extending CAE

Digital Equipment Corporation has announced that it has extended its Systems Cooperative Marketing Program (SCMP) agreement with the CAE Systems Division of Tektronix, to include Tektronix' PCB, Gate Array and Full Custom WorkSystems.

Extending the SCMP agreement to include the PCB, Gate Array and Full Custom WorkSystems represents a closer alliance between Tektronix and Digital in the ECAD (electronic computer-aided design) market. Tektronix product philosophy complements Digital's hardware strategy, and together we provide a proven, high-performance design solution to bring products to market quickly.

Tektronix' PCB WorkSystem includes tools for schematic capture, simulation and verification, and physical layout of complex printed circuit boards for complete PCB development. It accommodates layout and manufacturing constraints of boards with fine-line or surface mount technologies, and mixed design boards.

The Gate Array WorkSystem is an integrated set of tools for the design, simulation and automatic physical layout of gate arrays. It includes the TurnChip ASIC Layout Modules which enable the gate array designer to control the chip design through the physical layout stage for optimal performance and faster time to market.

The Full Custom WorkSystem provides the tools needed for hand-crafted design and layout of high performance analogue, microwave and high-speed digital integrated circuits. Featuring a flexible user interface with customized configuration menus. All three WorkSystems are supported under Digital's VMS operating system.

As Digital's first SCMP participant in the ECAD market segment, Tektronix has marketed its Designer's Database Schematic Capture (DDSC) software with Digital's VAX-based computer family since March 1986.

READER INFO No. 152

IDT CMOS Static Ram 16K

The IDT6167 is a 16,384-bit high-speed static RAM organised as 16K x 1-bit. It is fabricated using IDT's high-performance CEMOS.

Access times as fast at 15ns are available with maximum power consumption of only 550mW. The circuit also offers a reduced power standby mode. When CS goes high, the circuit will automatically go to a standby mode as long as CS remains high. In the standby mode, the device consumes less than 10mW typically. This capability provides significant system-level power and cooling savings. The low-power version also offers a battery backup data retention capability where the circuit typically consumes only 1W operating off a 2V battery.

All inputs and the output of the IDT6167 are TTL-compatible and operate from a single 5V supply, thus simplifying system designs. Fully static asynchronous circuitry is used, which requires no clocks or refreshing for operation, and provdes equal access and cycle times for ease of use. The IDT6167 is packaged in either a space-saving 20-pin, 300 mil DIP or 20-pin leadless chip carrier, providing high board-level packing densities.

The IDT6167 Military RAM is 100% processed in compliance to the test methods of MIL-STD-883, Method 5004, making it ideally suited to military temperature applications demanding the highest level of performance and reliability.

READER INFO No. 153

World Radio History

Interlink IQ-1234 Modem

Melbourne-based Interlink has released details of its IQ-1234.

It will do 2400 bps full duplex, 1200 bps full duplex, 1200/75 bps and 75/1200 bps for the videotex standard plus 300 bps full duplex.

It also has dial-back security with password access, a battery-backed telephone directory and setup memory. On the front-panel there is a dual 7-segment LED status and mode display.

The IQ1234 will auto dial/answer/disconnect and auto baud. It conforms to both CCITT and BELL standards.

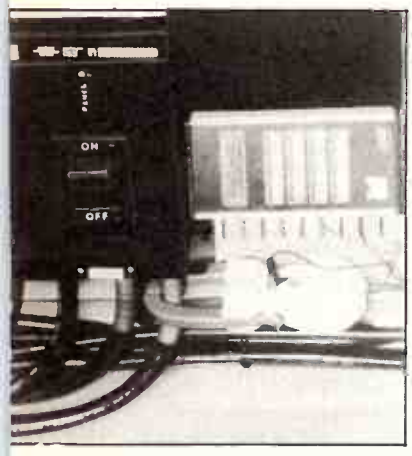
Interlink says the IQ1234 is aimed at bulletin board providers and users requiring high speed yet affordable communications. The battery-backed setup and telephone directory when used with manual operation mode mean that a terminal is not required in order to operate the mode. This means the modem may be used with point of sale terminals, cash registers and other remote devices.

For more information contact Interlink on (03) 525-3388.

READER INFO No. 154

New 160 Amp Welder End

A new 160 amp welder end designed for operation from either gasolene or diesel engine has been released by Pacific Power Generation. Called the Weld King G1W the new unit has a strike voltage of 50 volts and a welding voltage of 25-30 volts.



Pacific's new alternator end is a heavy duty duty construction and features 2 KVA single phase generator functions and 5 KVA three phase generator functions.

The unit is suitable for use with 2.5mm electrodes for continuous duty of 3.5mm diameter electrodes for intermittent operation. A 12 volt or 24 volt battery charger with automatic charging regulation is included as part of the unit's standard configuration.

Pacific claim the new Weld King can be run from any gasoline or diesel engine developing 12 hp at 29 rpm. The unit is designed for 2 pole operation.

READER INFO No. 155

Software for Machine Fault Detection

Brüel & Kjaer Type 7616 organizes the collection of vibration data and process parameters, such as temperature, speed and load, and automatically reports changes in the vibration spectrum. Special attention is paid to machine process parameters in order to make relevant comparisons, since vibration spectra vary with these parameters. The Type 7616 distinguishes between 30 different process parameters per machine.

By using a three-dimensional plot (showing the vibration increase of several spectra simultaneously) and performing a trend analysis of vibration increase, the maintenance engineer can schedule maintenance in advance of a predicted breakdown. It is also possible to make trends in any combination of process parameters.

The Type 7616 runs on the IBM XT or AT Personal Computers. Access to the different functions of the Type 7616 can be limited to suit the responsibilities of individual members of the maintenance team. The routines for the day-to-day collection of data are designed to be used by any member of the team.

For day-to-day data collection, the operator connects the analyzer to the computer and selects a pre-defined route from the Type 7616. The Type 7616 loads the analyzer with the reference spectra for the route and issues a route map on the printer. The operator follows the route map and makes a new measurement at each measurement point. The analyzer automatically repeats the reference measurement setup and performs an on-site comparison. At the same time the operator fills in the process parameters in the route map.

When the route is complete, the operator reconnects the analyzer to the computer, starts the unload and types in the process parameters. The Type 7616 makes a spectrum comparison of each new measurement and any severe spectrum increases are listed in a report which is issued on the printer. All data is stored on disc for further spectrum comparison, trend analysis or 3D plot.

READER INFO No. 156

Current Monitoring System

Australian Metrosonics has released their model fk-7011C current monitoring system contains a compact real-time configurable data logger, clamp-on ac current probe, and portable terminal printer.

AC load current values up to 600 amps can be recorded at 250 millisecond intervals and averaged over one second to four hour periods. It has memory storage for 3500 values. The fk-7011C produces formatted tabular/graphic real-time output reports on the system printer or an IBM compatible computer. For more information contact Australian Metrosonics, PO Box 120, Mt Waverley 3149. Telephone (03) 233 5889.

READER INFO No. 157

World Radio History

Flying Combiners

RFS, a subsidiary of the Hills Group has just released an antenna combiner designed for the RAAF.

These 8-channel combiners will allow common antenna working by up to eight transmitters, or receivers, on different frequencies. Four additional channels may be added to give a total of 12 channels.

Each channel is continuously tunable over the range 225-400 MHz. Frequency separations as close as 1% will give greater than 40 dB isolation. An additional filter per channel will permit separations as close as 0.5%

A channel comprises an assembly of bandpass filters and one reject filter, interposed between individual equipment antenna terminals and the common antenna feeder.

For further information contact Radio Frequency Systems on (03) 728-1777.

READER INFO No. 169

Arbitrary Function Generator

The newly-released Rohde & Schwarz function generator AFGU generates a comprehensive range of signals needed in the field of electronics, electroacoustics, vibration measurements, materials testing and control engineering. Within the frequency range 1 μHz to 20 MHz, AFGU is able to generate sine, triangle and square symmetrical waveforms. For asymmetrical waveforms the range is 1 μHz to 2 MHz. The frequency resolution is 4½ digits with a minimum of 1 μHz. An option extends the frequency range to 40 MHz for square waves with TTL/HCMOS levels.

AFGU allows the generation of any user-specific waveform. A memory is available for the definition of these waveforms providing a resolution of 4096 points in the horizontal and 1024 in the vertical direction.

The signal generated from the readout of the waveform memory and the D/A converter is completely defined by specifying the start and stop addresses, the voltage and the sample clock. Start and stop addresses can be set anywhere in the X address range, thus enabling the generation of curve segments as well as of separate curves stored in different subranges. The sample clock for the generation of the individual points of curves can be set between 100 ns and 327 s with crystal accuracy. With a minium step width of 100 ns at a rise time per step of below 70 ns, AFGU belongs to the fastest class of generators of free-selectable waveforms on the market.

For more information contact Rohde and Schwartz on (02) 267-2622.

READER INFO No. 170

High speed ADC

Force Computers has released a new series of high speed analogue-to-digital I/O boards called the SYS68K/AD-10/11 series.

the AD-10 board features 32 single ended or 16 differential analogue input channels with 12- to 16-bit resolution. To provide analogue output control functions, the AD-11 board features two additional analogue output channels. An expansion bus expands the number of input channels to 256.

The basic card may be expanded to provide:

- ★ measurement of high speed transients or spikes during a specified time;
- ★ high level voltage inputs and 4 to 20 mA current loops;

For further information on the AD-10/11 family, contact the Dindima Group on (03) 873-4455.

READER INFO No. 171

PC4502 Laptop Computer

The Sharp Corporation has announced the release of their new PC4502 laptop computer, claimed to be the first laptop computer in Australia with a backlit screen and 88-key keyboard.

The PC4502 is an IBM compatible computer that will run all popular programs and offers full battery operated portability, without sacrificing anything in convenience or ease of use.

The screen is a backlit, super-twist liquid crystal display that provides excellent readability with enhanced graphic display in a wide variety of conditions. The super-twist crystals give a very high degree of contrast, whilst the backlight provides a uniform light source for easy viewing under a range of different lighting conditions.

Most laptop computers do not have a full size desktop computer style keyboard with seperate numeric and cursor keys. By contrast, the keyboard of the PC4502 has a total of 88 keys with a seperate numeric keypad and seperate curso keys. Data entry is therefore much easier, particularly in number-intensive applications.

A rechargable battery provides independence from power points, for up to seven hours. The computer can also be used with the 240 volt adaptor supplied, even when the battery is recharging. Two 3.5 inch disk drives are provided as standard with 720K bytes capacity per disk. If required, an optional external 5.25 inch disk drive can also be connected to the computer.

Equipped with 384K bytes of RAM, the PC4502 can be expanded up to 640K bytes of main memory And additional 1M byte of memory conforming to the Lotus/Intel/Microsoft EMS standard can also be added, for use with selected wiht software.

Standard interfaces provided are a parallel printer port (Centronics standard), and RS232 port for communications, and an interface for the 5.25 inch disk drive. An optional RGB port for connection of an exernal colour or monochrome monitor is also available. This allows the PC 4502 to be used with a monitor at home or in the office.

Another option is an EPROM card that allows the use of up to 768K bytes of read only memory storage. Software can be put on EPROM chips (subject to copywright provisions) and installed in the machine. The software is then always ready to run — no need to use disks. This makes it ideal for specialised applications.

The PC4502 is a lightweight (4.8kg), fully functional computer with go-anywhere convenience and compatability with popular sofware. With its outstanding range of features, it is the ideal choice for portable computing needs.

For further information conatct Sharp Corporation of Australia, 1 Huntingwood Drive, Huntingwood, Blackwood NSW 2148. Phone (02) 831-9111.

READER INFO No. 172

World Radio History

Julie, listening and talking

DSP Chips Talk And Drive Fast

Recent applications of Texas Instruments TMS320 Digital Signal Processors (DSPs) highlight the flexibility of this new breed of very high speed chip.

Companies involved in areas such as automotive, consumer, and telecommunications — just to name a few — are applying DSPs to a variety of realtime control applications.

This DSP capability was realised by Cranfield Institute of Technology in Bedfordshire, England, and the TMS320 was designed into an active suspension system used in the team Lotus T92 Formula One racecar.

The TMS320 tells the car's hydraulic shock absorbers to adjust and react to current road conditions based on information from a series of sensors located throughout the vehicle.

Many factors are considered, including wheel velocity, car velocity, hub displacement, body attitude, and lateral acceleration. The DSP then controls each wheel independently to allow for these factors.

Due to the high speed of the TI DSP chip, the TMS320-based active suspension system adapts to the varying road conditions every 10-milliseconds.

Another recent example of creative applications of the TMS320 is Julie, the first doll to feature word and voice recognition capabilities. Developed by Worlds of Wonder, Julie is a blond-haired, blue-eyed collector doll featuring synchronised eye and mouth movements and able to make more than 100 discrete, sound-activated, intelligent responses.

Through a simple conversation training process, Julie becomes a child's special friend and will respond only to that child's voice. Julie's temperature sensors will prompt a comment on the weather if there is a sharp change, her motion sensors might elicit an enquiry as to a destination.

"Julie is another exciting example of how state-of-the-art technology can make imagination a reality," said Texas Instruments' Marketing Engineer, David Cartwright.

"More than 100 designs are already underway in Australia using TMS320 chips."

READER INFO No. 173

Ultra-Miniature Relay

Claimed, by National, to be the smallest polarized relay in the world the TQ series measures only 14 mm long 9mm wide and 5mm high. This is certainly much smaller than the popular DIP reed relay and offers the additional advantage of 2 changeover contact sets, a feature rarely available economically in a reed relay.

The TQ relay fits into a 10 pin DIP socket and is available with single side stable or 2 coil latching functions. Operation time is approximately 0.5mSec while contact bounce is less than 0.1mSec due to the provision of bifurcated (twin contacts).

Contacts, although, rated at 30 Vdc at 1 Amp and are suitable for dry circuit applications such as audio or thermocouple switching.

The TQ relay is completely sealed and is available in coil voltages from 3 to 24 Vdc. For further details contact Stuart Wright, Marketing Manager RVB Products. (03) 543 1611.

READER INFO No. 174

Voltage Regulator

New Era Electronics have released a new series of high current voltage regulators.

The 78R05 positive 3 terminal fixed linear voltage regulator is capable of delivering a continuous load current in excess of 20 amperes at a nominal regulated output voltage factory of 5 volts. The 78R05 has built-in protection features such as output short circuit current limiting, thermal overload and safe operating area protection. If external conditions exceed the 78R05's capabilities, the device temporarily shuts down protecting itself and the load circuit until the fault is removed. This feature eliminates costly additional protection circuitry as well as overly conservative heat sinks typical of discrete high current voltage regulator designs. The 2 lead hermetic TO-204MA package (formerly called TO-3) provides up to 90 watts of internal power dissipation. A wide range of high current fixed and variable voltage regulators have also been released. For further information contact Fairmont Marketing on (03) 877-5444.

READER INFO No. 175

Pocket-Size Switch

A pocket-size optical switch developed by a research team at the Caswell laboratories of the Plessey Company, has the capacity to handle all the telephone conversations in progress in the world at any moment.

The device, claimed by Plessey to be the most advanced of its kind ever produced, is being formally unveiled at Telecom 87 in Geneva shortly.

Optical switches differ from the electronics ones used in modern telephone exchanges in that they handle signals in the form of light energy, rather than electrical energy, so conversations are converted into pulses of light rather than electrical signals. Transmission systems using light have the potential to carry almost limitless information.

There is no requirement for a single global telephone exchange tht could use the switch, but the technology will be needed in the very high capacity fibre optic communications network of the future. Plessey believes a more immediate application will be providing emergency re-routing facilities in parts of existing telephone networks where there is already a high concentration of optical fibre links.

READER INFO No. 176

World Radio History

The Psion Organiser

Jon Fairall

The Psion (say it sigh-on) Organiser 2 is one of the most remarkable computing devices to come on the market in the last few years. It is no bigger than a pocket calculator, but contains up to 288 K of memory which can be controlled by an on board programming language called OPL. There is also a database on board, a diary planner with an audible alarm, a calculator with all the necessary scientific functions, an alarm clock you can park by the bed, as well as an RS232 port to connect into more conventional computers or printers. The Organiser is more than just an executive toy.

I started out by calling the Organiser a computing device, because it's difficult to know exactly how to characterise it. It is not a conventional computer, and with its small calculator-like keyboard, would be an extremely inefficient way to enter large amounts of text. On the other hand, it is scarcely a calculator. It has an on board programming language that's much like Forth, although without the language's powerful I/O facilities, and calculators don't usually have databases and diaries as part of their facilities.

In fact the Organiser is a new type of device. It will be used differently, I predict, to any existing computing devices. It is the closest we have yet seen to the electronic notebook. It is, as I found out over the last few weeks, quite possible to carry it around in a brief case, use it to store phone numbers and appointments, in fact, generally to organise one's life.

Inevitably, however, one's first instict is to use it as a calculator, in which role it's perfectly adequate, although it has few of the more exotic functions. If you want to use it in

place of a scientific calculator, the math pack that Psion supply as an extra is really indispensible.

I draw the line at using it to tell the time, but the alarm facility is extremely useful.

I used the database function as a method of storing phone numbers. The Organiser will allow storage of up to 256 characters in up to 16 lines in each entry of the database. A find function can then be used to access any part of any string used in any of the entries. So Joe Bloggs, 02 693 9988 could be called with Joe, Blo or even 88 if that is all one can remember. In the event that two entries contain the same string, both will be called.

OPL

The most interesting part of the Organiser is undoubtedly the Organiser Programming Language (OPL). This is a language based on 'Procedures' which can be defined by a single word. These procedures can then be called as part of other procedures, directly from the opening menu or from within the calculator function. This facility allows one to customise the Organiser to the nth degree.

For instance we might define the procedure "add" to consist of the lines:

```
add:
a=1
b=2
c=3
d=a+b+c
```

so that calling add returns d=4. Now, another program called sub might consist of:

```
e=4
add:
print e-d
```

which makes e=4, calls the program add (d=6) and thus returns a value of −2. As makers of other similar languages have discovered, this is an immensely powerful way of building a program of great complexity.

OPL has all the commands one would expect of a serious programming language, plus peek and poke instructions to allow manipulation of machine code. Frustratingly, the manual tells one that it's possible to programme in machine code, that it's really fast, but also it's dangerous to do because you "take full control of the chip at the heart of the machine", and then provides no information on how to do it. A hacker's joy ground this.

For really serious computing, its possible to get an emulation package for about $200, which will completely emulate the Organiser on a PC, allowing one the freedom to develop a program using a proper keyboard and screen. There are debug, assemble and compile facilities in the package as well.

The processor is an HX6303X, with 16 K of RAM and 32 K of ROM to support it. There is also up to 128 K of EPROM in datapaks. The Organiser has two datapaks that clip into the shell around the back. These can be plugged in and out at will, so expanding the memory capacity indefinitely. They are treated within the Organiser just like disc drives. One can copy from the on board disc space (A) to either of the datapaks (B) or (C), and vice versa.

One consequence of using EPROMs in this way is that the contents of the datapaks can't be erased easily. Thus, if you save to EPROM, then de-

World Radio History

cide to change a program, the datapak will retain both versions of the program, although only one appears in the directory. Psion advises you to test programs in RAM before committing to the datapak. It is possible to change the contents of the datapak if required, but to do so requires that all the information be erased, in a process analogous to reformating a floppy disc. According to the manual, the EPROM can be reliably refomatted 100 times.

Erasure can either be done in the normal way, by exposing to UV light, or alternatively by returning the device to a dealer. Price will be under $5.

Using EPROMs also has significant consequences for the battery. Its obviously difficult to get precise figures, but it appears that in the normal mode of operation the Organiser's nine volt battery will last for a considerable period of time. Certainly during the month of this test it showed no signs of wear. However, writing to the EPROM is a different story. If you intend to store a lot of data this way, a battery pack is a necessity.

Even so, this is not really a negative feature of the Organiser. It shouldn't be necessary to download to the datapaks except at odd intervals, and the expense is more than compensated for by the safety of the data stored on the EPROM. Once in, it won't come out again without a great deal of fuss.

It's not entirely a surprise to find that Psion have built a couple of EPROMS with programs already available on them. Current applications include the Concise Oxford Spell Checker, an electronic version of the Oxford English Dictionary, a finance pack, a maths pack and all the soft and hardware to support a bar code reader.

Less Attractive Features

There were a couple of features of the Organiser that I found less attractive. The device invites text usage, but the keyboard is too difficult to use in its current format. The type of layout used by Casio and HP in their pocket computers is much more preferable. This allows a proper QWERTY keyboard, and while not really allowing proper typing, at least makes possible two finger operation of a sort. The Organiser is strictly a single finger affair. This being so, its difficult to know why they insist on some two finger operations. To access the second function of the keys, for instance, requires that one holds down the Shift and one other key at the same time. This gets to be infuriating after a while.

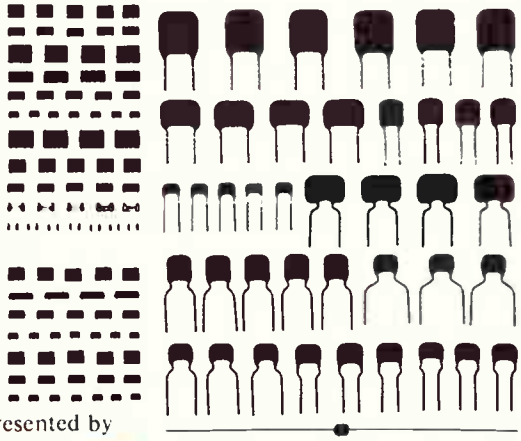
On the other hand, the Psion is physically a very attractive package. It comes in a grey case with a sliding holster that protects the keyboard as it bounces around in bags and cases. It feels nice and robust. The board inside uses surface mounting technology, which goes a long way towards explaining its small size.

It will be interesting to see how the Organiser goes in the Australian market place. It has been promoted extensively in the UK, where Psion are located, and has apparently done quite well. It will sell here for about $500, with the EPROM costing up to $400 for the 128 K datapak. The local distributor, Melbourne based Eastern Micro Electronics, is planning a big marketing push over the next few months, so look out for it.

READER INFO No. 48

ROHM

Multi layer Ceramic chip Capacitors and multi layer Ceramic Capacitors.



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READER INFO No. 19

Rustrak "Ranger" marshalls wanted data

With this intelligent data logger on your hip you'll be able to draw faster conclusions and round up outlaw data for analysis both indoors and outdoors. This rugged, battery operated, compact device can store data unattended in hostile environments, from 5 minutes to 100 days, and it interfaces with IBM PC's and compatibles via the RS-232C communications port. Other features include:

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READER INFO No. 20

World Radio History

Hitachi V-1065 Oscilloscope

Jon Fairall

Hitachi have just released the V-1065 in this country. It's an interesting machine for a number of reasons, not least because of its pricing. At $4739 it's dirt cheap by comparison with the competition.

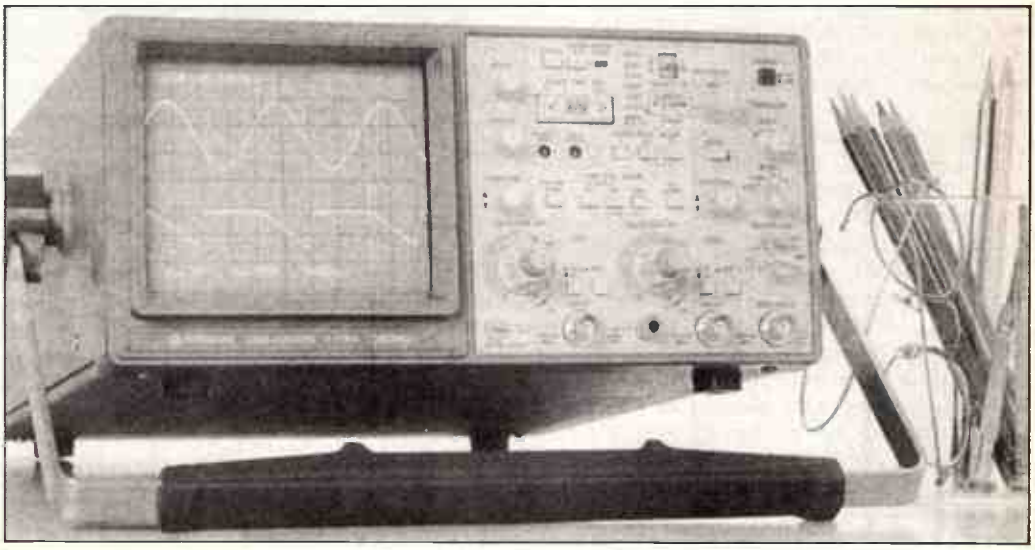
It's also illustrative of the type of design features we can expect to see creeping down the price scale over the next few years. It preserves an analogue signal path, because there is no way to provide a digital one cheaply at this time, but a microprocessor is used extensively everywhere else. It controls the signal path, provides some of the measurement functions, reads the keyboard and provides on screen cursors to delight the operator.

In practice, this level of digitization is extraordinarily useful. On the one hand, it makes the CRO easier to operate, as well as easier to read. On the other, it doesn't make it expensive or slow or a combination of both, which tends to be the case with fully digital models.

It's also, even if it sounds trite to say it, surprisingly small. In spite of the amount of digital circuitry involved, there is actually very little integration on the circuit boards. The processor is a 64 pin 78C10G, but apart from that, most of the rest of the board is taken up with standard logic and discrete components. The small size comes mainly from dense board design and internal layout.

The Front Panel

The vertical section of the 1065 is laid out totally conventionally. There are two channels side by side, each controlled by a rotary knob, with the cal. switch in the middle. The usual range of coupling options is available, as well as a 20 MHz bandwidth switch. This reduces the bandwidth of the CRO for looking at low frequency signals, so improving the SNR of the vertical amps.



READER INFO No. 33

Above this is the horizontal section. Central is the time/div switch, in this case a rocker arm which will move the timebase up or down in steps much like a conventional rotary switch. Pushing the rocker in puts the CRO in auto mode, in which case the processor locks onto the incoming signal and tries to display approximately two periods of the waveform. I tried it on a number of different signals, including sine and square waveshaps as well as TV waveforms and it seems to work quite well.

Above the rocker are two switches to select either the A or B trace, the B trace being a delayed version of the A trace. Above that again is a selector for a ten times magnification of the A trace. Vertical cursors on the A trace indicate the portion of the waveform displayed on the B.

Immediately to the right, a selector switch selects various on-screen modes. I didn't find the operation of this function very intuitive and had to consult the manual a few times, but once you get used to it, its actually a very neat system. A lever switch moves one through ten different fucntions, while a knob at right allows the functions to be adjusted.

So toggling the switch takes one through single sweep operation, a set up position for the A and B sweeps, trigger delay, hold off, time, horizontal position and a measuring setting where one can toggle through the various cursors.

The cursors consists of two pairs of lines. A vertical set, which provide either time or an inverse time reading, and a horizontal function which provides a voltage read out. The inverse time function reads frequency, if the cursors are set to one period of the waveform, of course. As one who is always reaching for a calculator to turn period into frequency when reading a CRO, this is a valuable function.

To get all these functions onto one switch and a knob is quite an achievement, and valuable in terms of front panel real estate to boot. I just wish it was a touch more instinctive.

All the trigger controls save one are to the right of the front panel. These are perfectly straightforward, providing the usual coupling and source choices. A trigger reset for single sweep operation is also included, although why it should be located in the horizontal section instead of the trigger section is anyone's guess.

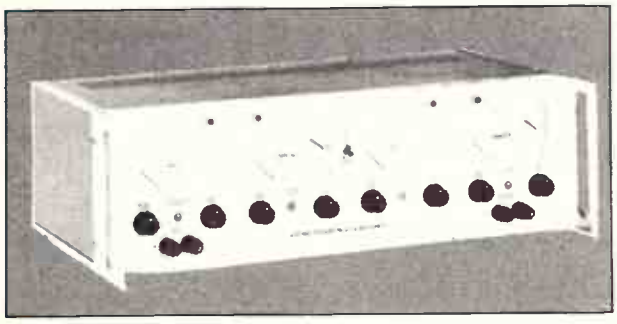
All in all, the V-1065, and its associated models, the 665, 1060 and 660 should do well for Hitachi, providing yet another challenge to H-P, Tektronics and Kikisui.

World Radio History

LABORATORY POWER SUPPLIES

APLAB offer a complete range of regulated DC bench rack power supplies combining high precision and regulation capabilities with continuously adjustable outputs.

Designed with single, dual and multiple outputs, these power supplies can be used in either constant voltage or constant current mode of operation.



Standard models include:

SINGLE OUTPUT
OUTPUT: Output VOLTAGE: Current
0-30V 0-1A to 30A
0-70V 0-2A to 10A

DUAL OUTPUT
0-30V 0-1A to 2A

MULTIPLE OUTPUT
0-30V 0-2A to 5A

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EX STOCK

READER INFO No. 22

POCKET SIZE SOLDERING IRON

CORDLESS PYROPEN JUNIOR

Demand has forced the George Brown Group to purchase Weller's entire allocation, for Australia, on the "Pyropen Junior" out to June, 1988. Now you can perform remote soldering and brazing with advanced versatility. Refilled in seconds, this easy-to-handle butane gas operated soldering pen requires no power cord or batteries and is electrically, completely neutral (no peaks), "Longlife" soldering tips deliver quick heat-up time.

- Temperature Control: Soldering iron 200°C – 450°C approx. Hotblow feature 430°C maximum approx. Torch feature 1300°C maximum approx.
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READER INFO No. 21

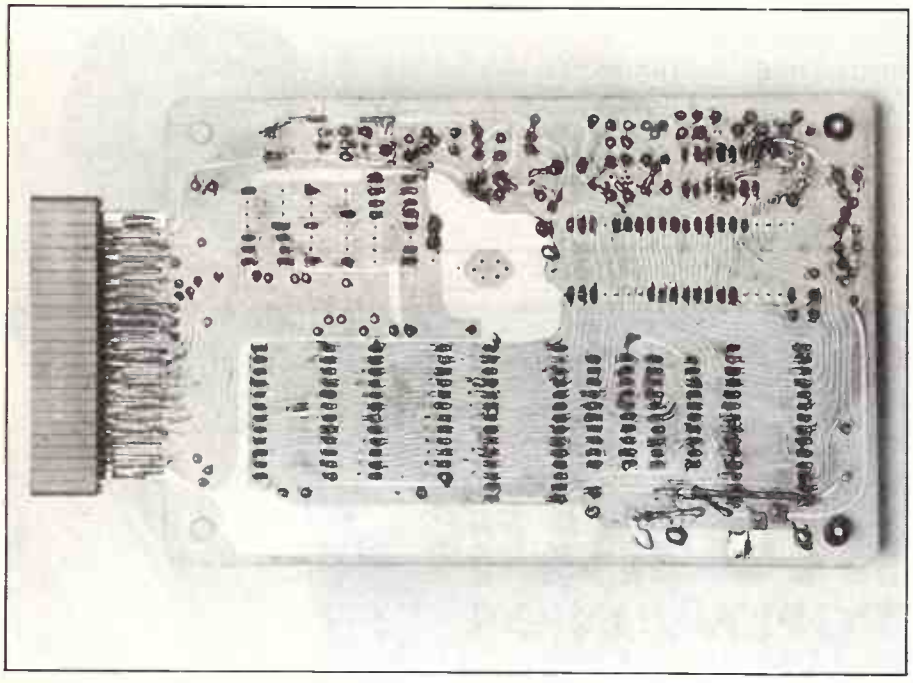
World Radio History

ETI-1611: VZ300 EPROM programmer

Part 1

Customise your computer with this EPROM programmer. This month the hardware, next month, the software.

Herman Nacinovich



FOR ANYONE SERIOUSLY involved with microprocessors or computers, this EPROM programmer will prove to be an invaluable tool. It has lots of features, some of which may only be found in commercial programmers costing much more. Yet it uses relatively few parts, including cheap, readily available IC's and discrete components. Everything is on a single board which plugs directly, or via a ribbon cable plus socket, into the memory expansion slot of a VZ300 computer. Power for the programmer is derived from the internal power supply of the VZ300, thereby saving the cost of having a separate power supply. Also, there is no need for a housing and this represents a further saving in cost.

I designed this EPROM programmer for use with a VZ300 computer for the simple reason that I happen to have a VZ300. Apart from that, however, the choice of a VZ300 for this application has the advantage that it is available at a very attractive price, yet it is more than adequate for the job. In fact, the total cost of this EPROM programmer plus a VZ300 may be less than the cost of a commercial programmer with similar features but without the computer. Thus, if you need an EPROM programmer but don't have a VZ300, it might be worth considering whether the low cost of this computer would justify its purchase for this application. After all, a second computer can always come in handy, can't it?

Among the features built into the EPROM programmer is versatility. This is because most of its operation is under software control. This includes selection of programming voltages appropriate to EPROMs from different manufacturers, modes of data transfer and editing capabilities. There are no switches as these are made unnecessary by virtue of the software programmability.

A ZIF (zero insertion force) socket is provided on the board for a 28-pin EPROM to be programmed. There is provision on the board for an optional, second ZIF socket for a second EPROM which has already been programmed. This allows direct copying from one EPROM to another. In addition, there is provision for an optional 4K of RAM which can be used to extend the internal RAM capacity of the VZ300. This can be useful for editing or for temporarily storing large chunks of machine code before burning them into an EPROM. Also, with 4K of RAM, the board can be used to extend the memory capacity of the VZ300 when it is not used to program EPROMs.

With suitable software, this EPROM programmer can be programmed to do such useful things as verify whether an EPROM has been fully erased before programming, copy from one EPROM to another (as mentioned), transfer data from EPROM to RAM and vice versa, manually enter data temporarily into RAM and editing before transferring to EPROM. One of the good features of this EPROM programmer is that the software can be modified to extend its capabilities without any changes to the board.

The programmer is designed primarily for programming 28-pin EPROMs of the 2764, 27128 and 27256 types (and their CMOS equivalents). There are, of course, other types around, but to try to cater for

World Radio History

all available types would require a horrendously complex switching arrangement and an overall cost which could not be justified. Besides, many of the earlier types (such as the 2708) would seem to be obsolete, hard to get and, on top of that, ridiculously expensive. On the other hand, the 2764, 27128 and 27256 EPROM types would seem to be the most popular and useful currently available. Furthermore, they are substantially pin compatible with each other which simplifies the design of a programmer considerably. With these points in mind, it seems reasonable to limit the design of a programmer for use with these three EPROM types as a compromise between versatility and circuit complexity.

EPROM Characteristics

For those not fully familiar with EPROM characteristics, a general description of these devices may be useful.

All EPROMs of the types with which we are concerned have a set of Address pins, a set of DATA pins and a set of CONTROL pins. The number of address pins reflects the bit capacity of an EPROM. Thus, the 2764 (64K bits) has 13 address pins, the 27128 (128K bits) has 14 address pins and the 27256 (256K bits) has 15 address pins. All EPROMs of this series have eight data pins. That is, data bits are programmed into, and read out of, these devices as 8-bit groups, or bytes.

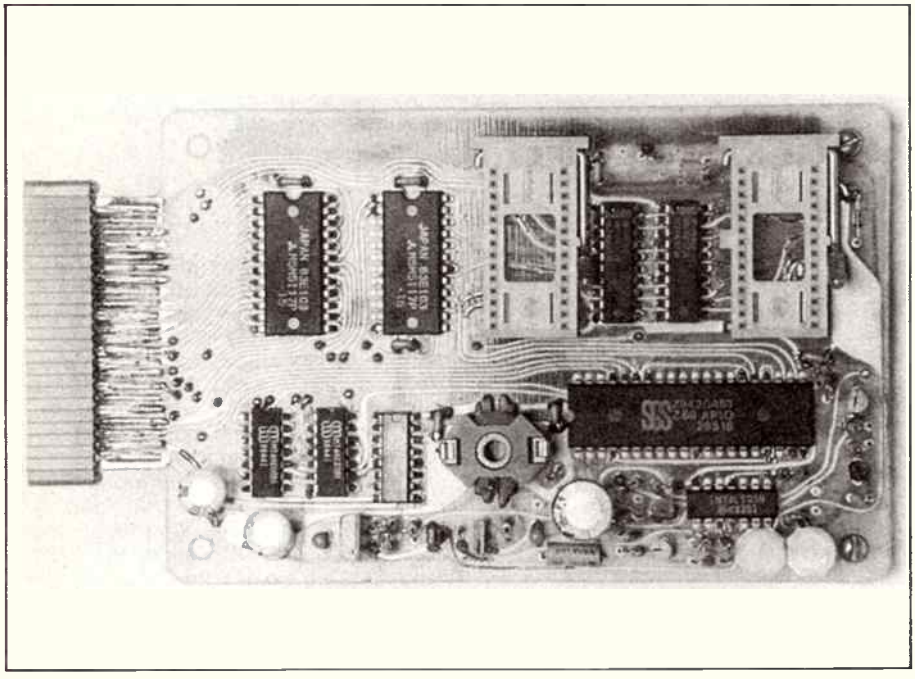
The control pin functions are labelled CE (chip enable), OE (output enable) and PGM (program). The bars over these letters mean that these functions are activated by a logic LOW signal and, conversely, de-activated by a logic HIGH signal, at the respective pins. In the 27256, the CE and PGM functions are combined and accessed at a single pin, while in the other two EPROM types these are associated with separate pins. Incidently, all address and control signals are specified to be at TTL levels.

In addition to ADDRESS and DATA pins, these EPROMs have a GROUND (0V supply), Vcc (+5V supply) and Vpp (programming voltage supply). Vpp is specified to be +5V for READ operations and either +12.5V or +21V (typically), depending upon the manufacturer, for PROGRAMMING operations.

In a READ operation, an address is sent to the address pins and OE and CE are brought LOW. The byte stored at that address in the EPROM appears at the DATA pins and is read. During all read operations, Vpp must be kept at +5V.

A PROGRAM operation is more complicated. Vpp is raised to a high voltage level as specified by the manufacturer. An address is sent to the address pins while a byte to be programmed into that address location is sent to the data pins. CE and PGM are brought momentarily LOW. The usual practice is then to verify that the eight data bits have been correctly programmed before proceeding to program data into the next address location. In the verify operation, the address and Vpp are maintained in their previous states, while OE is brought LOW. The programmed data bits appear at the data pins and are read. If the bits are verified as being correctly programmed then programming proceeds to the next address.

During programming, only 0's can be programmed into selected bit locations. It is not possible to reverse the process by electrically changing a 0 bit to a 1 bit. Thus, initially, all bits in an unprogrammed EPROM must be at a logic 1 and that is generally the case with all EPROMs as they come from the manufacturer. If, for any reason, some of the bits are at logic 0 before programming, then the entire EPROM will have to be erased by exposure to UV radiation. An EPROM programmer, therefore, should be capable of verifying, before programming, that an EPROM has been fully erased. As implied, erasure is the process of converting



ETI-1611 — PARTS LIST

Resistors — all resistors ¼W5% tolerance unless stated otherwise.

R1	68R
R2, 3, 9, 10, 11, 13	5K6
R3, 9	560R
R4, 5	3K3
R6, 7	820R
R8	560R
R12	470
R14	2K2
R15	15K
R16	47R
R17	150R
R18	5K6
R19	5K6
R20	1K
RV1, RV2	1K

Semiconductors

IC1, IC2	74HC373
IC3	74 LS 151
IC4	Z80A PIO
IC5	74L500
IC6	74L532
IC7	74LS05
IC8	7805
RAM1, 2	6116, optional
Q1	BD139
Q2, 3, 4, 5	BC557
Q6	BC547
D1, 2, 4	1N4148

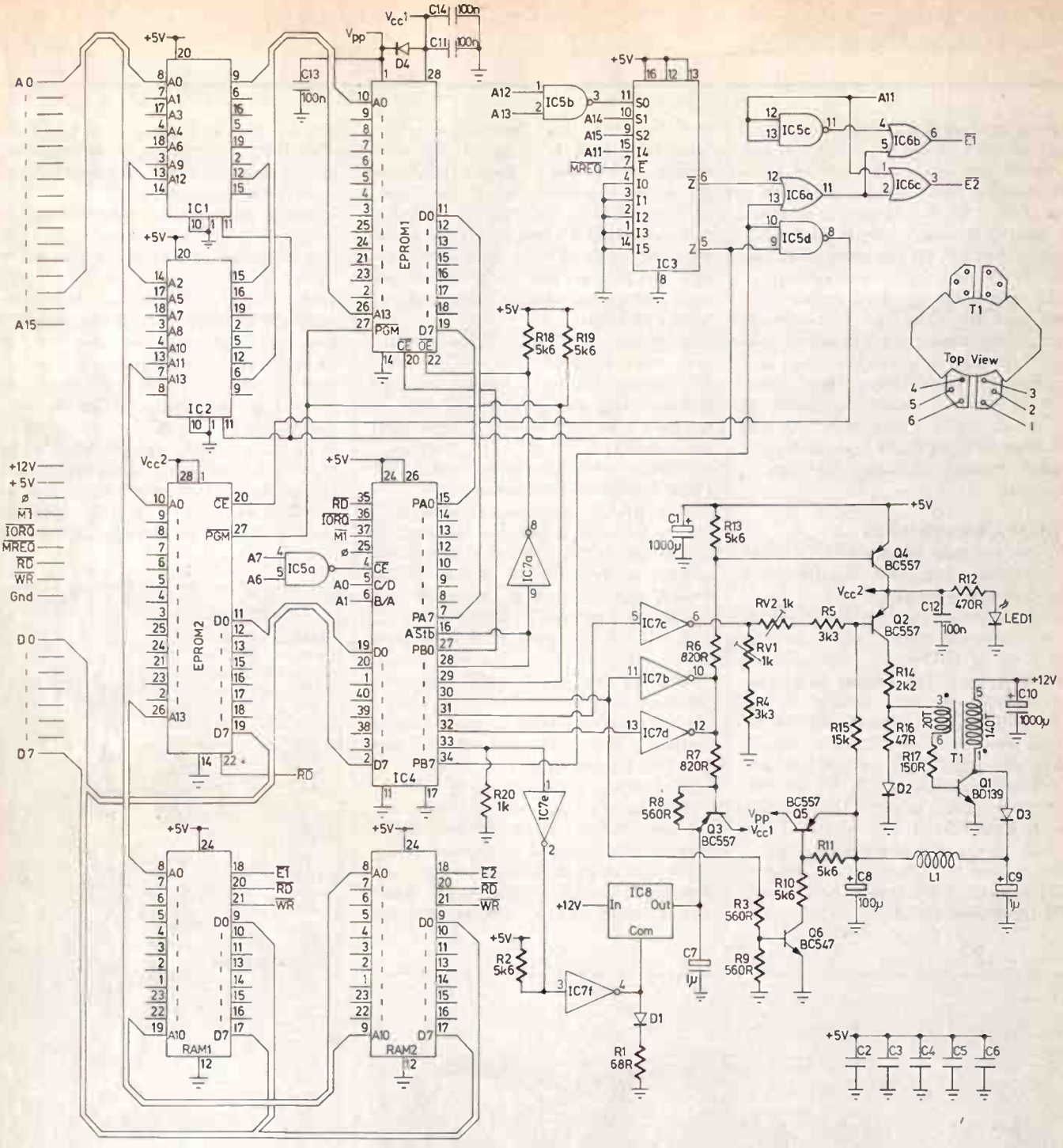
Capacitors

C1, C10	100µ/16V electrolytic
C2-C6, 11, 12	100n monolithic ceramic
C7, 9	1µ tag tantalum
C8	100µ/25V electrolytic (330µ/50v used in prototype)
C13, 14	100n monolithic ceramic

Miscellaneous

PC board, double sided; ZIF socket — Part No P 0655 (Altronics); ZIF socket, optional; inductor, 56µH; ferrite pot core, Neoside, Part No 29-813-25; former to suit, Neosid, Part No 60-793-64; clips to suit, Neosid, Part No 76-022-95; Edge connector, approx. 6m of 0.25mm diam. enamelled copper wire, pair rubber feet, 10mm long, 1 pair of screws, 3mm x 6mm, with nuts.

World Radio History



ETI-1611 — HOW IT WORKS

As it happens, the VZ300 has unused memory address space in the range B800H to FFFFH, which is available for external memory expansion, etc. Address decoder IC3 generates enable signals for the address latch, on-board RAM and EPROM 2 whenever the VZ300 executes a memory read or write instruction for an address in this range. When IC1 and IC2 have been enabled, the address is latched in their outputs and sent to the address inputs of EPROM 1.

IC4 provides the interface between the VZ300's microprocessor and EPROM 1 and the associated control circuitry. In use, PORT A is programmed by instructions from the VZ300 for bidirectional data transfer between the VZS300 and EPROM 1. PORT B is programmed as an output port, also by instructions from the VZ300, and generates all the necessary control signals for EPROM read and program operations in response to an appropriately coded instruction from the VZ300. During an EPROM read operation, data is read by an IN instruction addressed to PORT A. During an EPROM program instruction, data is sent to PORT A by an OUT instruction addressed to that port.

RAM 1 and RAM 2 share a common address range with EPROM 2. To avoid conflict, the decode circuitry allows only one of these to be enabled at any one time. Whether the EPROM or one of the RAMs is selected depends on a control bit sent to port B.

The total address space available for external memory in the case of the VZ300 is only a little over 16K. To program a 27256, which has 32K bytes capacity, it is necessary to generate the most significant address bit by some means other than via the VZ300's address bus. The problem is solved by using one of the port B lines for this purpose. As it happens, the PGM CONTROL Pin on the 2764 and 27128 becomes the most significant address pin on the 27256, so the same port B line is used to control both functions. The only complication is that slightly different software is needed for the 27256.

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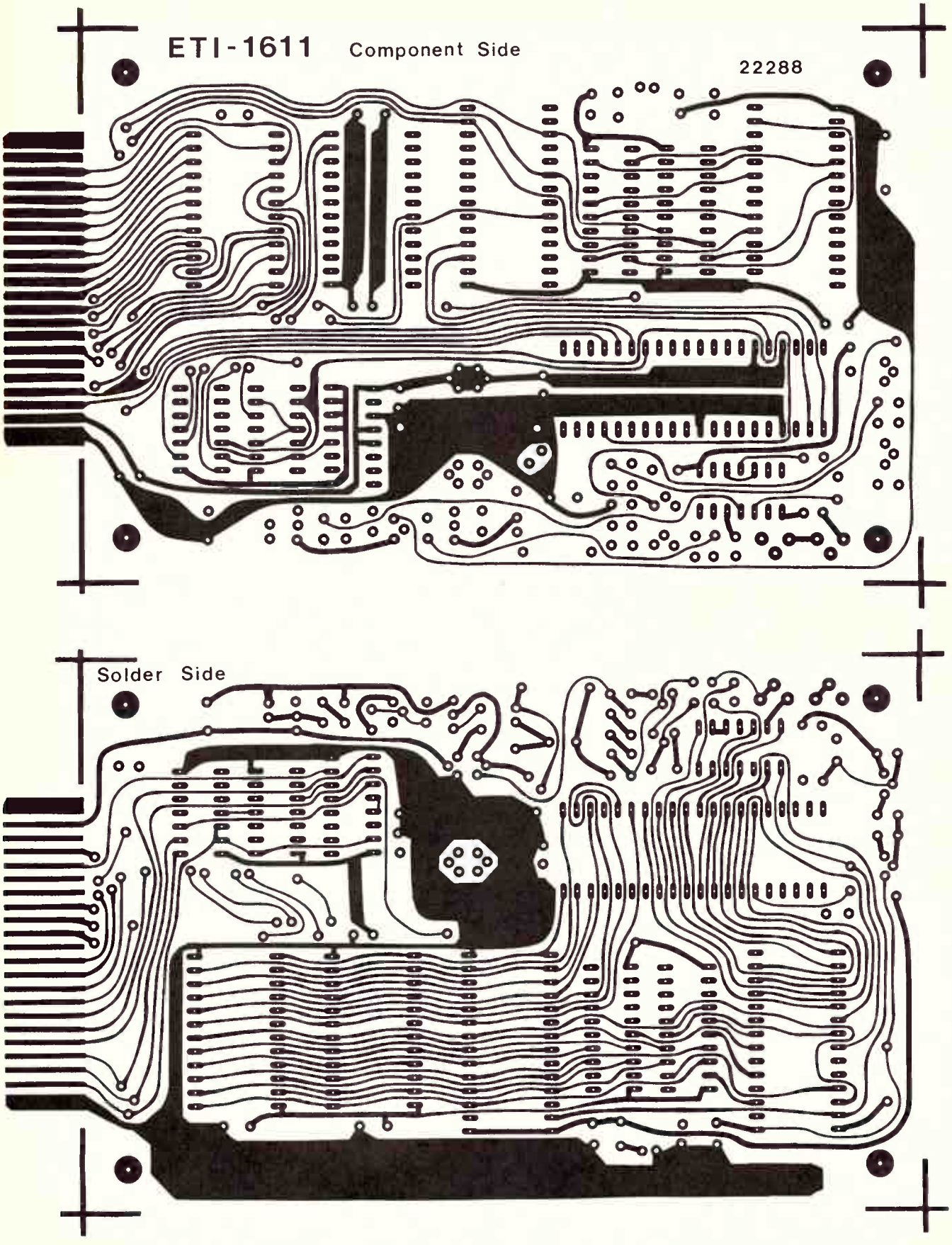


World Radio History

all the bits in the EPROM to a logic 1 by exposure of the EPROM chip to UV radiation. For this purpose, EPROMs are provided with a transparent quartz window above the chip. This window should be covered by an opaque label to prevent accidental erasure in the case of a programmed EPROM. Not all EPROMs, however, are erasable (despite the name). The exception is known as a 'one-time-programmable EPROM', which is an ordinary EPROM but without the quartz window. This device is fully erased when leaving the factory and can only be programmed once. It is intended for use in production equipment and has the advantage of being cheaper to make than an erasable EPROM because a quartz window is not required.

It appears that most problems encountered by EPROM users arise due to faulty or incomplete programming. A marginally programmed bit, for example, may verify OK immediately after programming but may subsequently revert to the opposite logic level while the EPROM is in service. To guard against this possibility, National Semiconductor recommend, for their CMOS range of EPROMs, that programming and verification be carried out with Vcc raised to 6V and that Vcc be lowered to the normal 5V level for ordinary read operations. It seems that, with Vcc raised to 6V, a marginally programmed bit will verify as being unprogrammed, whereas the same bit may not do so with Vcc at 5V. Raising Vcc to 6V during programming and verification guarantees that all bits verified as being correctly programmed will read correctly during service. It will be noted, however, that 6V exceeds the 5.5V maximum operating level generally specified for EPROMs and manufacturers' specification should always be consulted if in doubt. In any case, the present EPROM programmer can be programmed to apply either 5V or 6V to Vcc during programming according to the user's selection.

An important consideration, also, when programming EPROMs, is the width of the PGM pulse which is applied during programming. Older EPROM types such as the 2708 were specified to be programmed with a single 50mS pulse per address location. With many later types, typified by the 27064 to 270256 series, a maximum pulse width as short as 10mS may be specified. Some manufacturers recommend an interactive programming algorithm to minimise the overall programming time. In an example of such an algorithm, a programming pulse of 0.5mS is applied and the programmed byte is verified. If it verifies as correctly programmed then programming proceeds to the next address. If not, then another 0.5mS pulse is applied with the current address and the process repeated until the byte verifies OK. If, after 20 pulses, a given address still does not verify OK then the EPROM is rejected as unprogrammable. With the present programmer it is a simple matter to adapt the software to any programming algorithm that may be recommended by an EPROM manufacturer.

Circuit Description

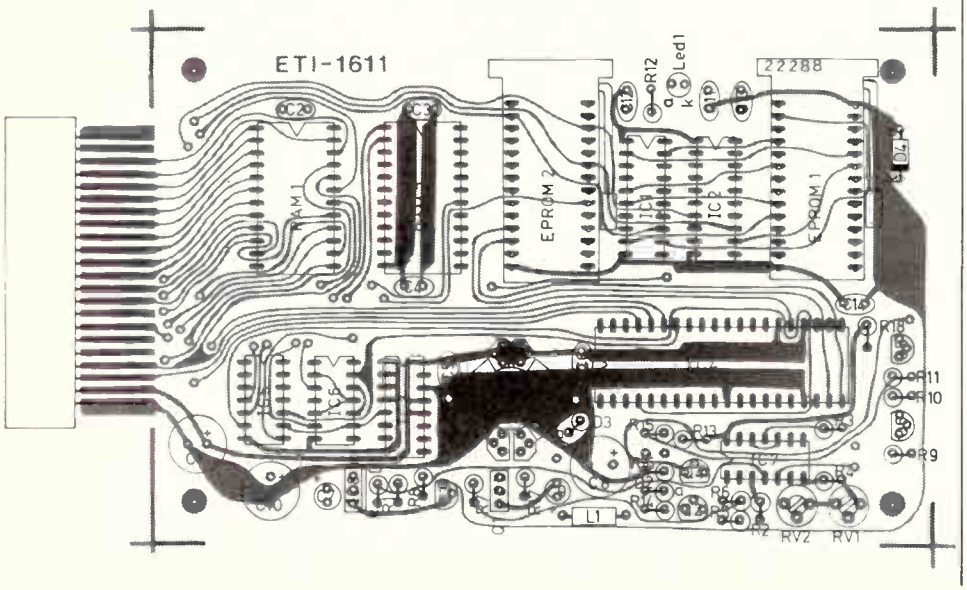
When plugged into the memory expansion slot of a VZ300 computer, this EPROM programmer has direct access to the address, data and control lines of the VZ300's internal Z80 microprocessor. Additionally, the memory expansion bus provides a 5V regulated supply voltage and a 12V unregulated supply voltage. There are 16 address lines and 8 data lines. The main control lines are MREQ (memory request), IORQ (input/output request), RD (read), WR (write) and O (clock).

The circuit comprises two 8-bit registers (IC1 and IC2) wired as a 14-bit address latch. IC3 and IC5b form an address decoder and IC4 provides a programmable interface between the VZ300's microprocessor and EPROM 1 which is the EPROM to be prrogrammed. A 28-ZIF socket is provided on the board to enable the EPROM to be easily inserted and removed. Although more expensive than an ordinary IC socket, this type saves a lot of frustration and effort and is well worth the cost. There is space on the board for an optional, second, ZIF socket for EPROM 2. This is provided in case there is a need to copy from one EPROM to another as quickly as possible. Data can be programmed into, or read from EPROM 1 but can only be read from EPROM 2.

There is also space on the board for an optional pair of 2K static RAMs (RAM 1 and RAM 2). This allows for up to 4K of extra RAM if desired. As previously noted, this can be useful for temporarily storing large chunks of machine code and also allows the board to be used as a handy 4K expansion board for a VZ300 when it is not used for programming EPROMs.

The high Vpp voltage required for programming is generated on the board by a fly-back type DC-DC inverter. This comprises a ferrite core transformer T1 and transistor Q1 in a conventional self-oscillating configuration. The Vpp voltage is regulated by Q2, with one of two voltage levels (21V and 12.5V) selected under software control. Transistors Q3, Q4 and Q5 are used to switch off the Vcc and Vpp supply voltages at the respective pins of EPROM 1 and EPROM 2 before an EPROM is inserted into or removed from its socket. Power ON to the EPROMs is indicated by LED 1 lighting up.

The Vcc supply voltage (Vcc1) for EPROM 1 is obtained from a 5V voltage regulator IC (IC8) on the board. Although the nominal output voltage of this IC is 5V, a resistor R1 and diode D1 connected in series from the 'COM' terminal or IC8 boost the output voltage to around 6V (plus or minus 0.25V). This higher than normal voltage for Vcc is available when programming an EPROM (subject to recommendations of the EPROM manufacturer) and is reduced under software control to 5V in the EPROM read mode. Vcc supply voltage (Vcc2) for EPROM 2 is derived from the VZ300's 5V supply. ●



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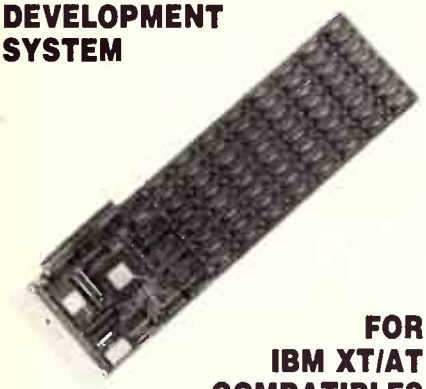

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3T 5AN6030	+20 to +60V	−4.5 to −30V	5A

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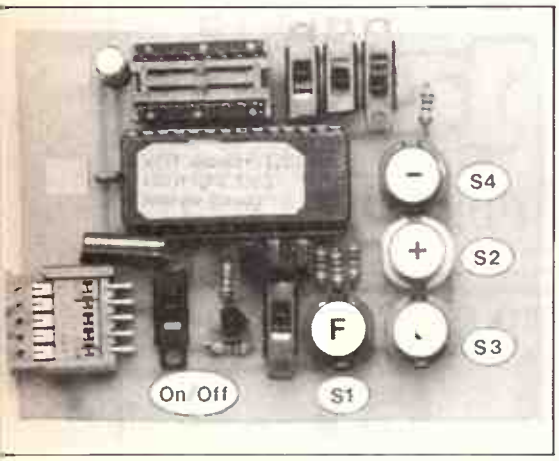
ETI-747 Baudot to Centronics converter

This device takes the output from a radio teletype and converts it directly into a format a simple printer can read.

Andrew Conway



THERE HAVE BEEN many projects for radioteletype (RTTY) demodulators in the popular electronics magazines over the past few years, but they are useless by themselves. The problem is, their output is serial baudot at some weird baud rate, totally incompatible with most modern printers. A few give parallel baudot output, but that isn't much more useful.

The usual method of overcoming this problem is to connect the demodulator to a computer, which is then connected to a printer. Indeed, most of these projects include software to interface to one particular computer. However, this isn't much use to someone who doesn't have the right computer.

Many people are deterred by this software obstacle, while others take the expensive route of buying themselves a new computer, just for RTTY reception. This involves acquiring not only a new computer, but also a new monitor and a data storage device. Furthermore, if the computer is to be used as a "glass radioteletype", it needs to have an 80 character wide display, as RTTY looks silly on anything else, as the lines are split up which really wrecks RTTY pictures.

However, many people possess a parallel printer. There are two types of modern printers, interface-wise: serial or parallel. If you have a serial printer only (usually an RS232 interface), then this project is not for you.

If, however, you have a parallel (usually using a CENTRONICS interface) printer, or one with both a serial and parallel interface, this project will almost certainly work for you.

What this project does is to convert a baudot serial stream from a demodulator (such as the ETI 733, published in April 1983), into parallel ASCII data, which can be fed straight into a printer, without the need of a computer. This not only saves money, but also space, power, and even time, as no program has to be loaded.

Design approach

The obvious approach is to build a small computer, dedicated to RTTY reception. However, this would be expensive and bulky. Another solution would be a large array of discrete logic gates. This would be both large and unversatile. Luckily, there are integrated circuits which can avoid the need for this. They are called single chip microcomputers, and effectively contain a whole computer inside a single chip, for a reasonably low price.

Now, before you run out and buy one, they do have a few disadvantages. You can't fit a huge powerful computer onto one chip, so their specifications are meagre even compare to old computers. However, they are more than adequate for this application. An overview of their technology is given in ETI September 1986.

The chip I chose to use is the MC68705P3S (68705P3 for short!), a Motorola chip containing 20 I/O bits, a timer (which I didn't use), 1804 bytes of EPROM and 112 bytes of RAM. They are bytes, not kilobytes. It runs at one megahertz internally, but uses a four megahertz crystal, as they are cheaper than one megahertz crystals.

I programmed this chip to do everything necessary, bearing in mind the constraints of only having 20 I/O pins. As a result, no other integrated circuits are needed.

Having a software core, I tried to make it as versatile as possible. For this reason there are 3 slide switches and 4 pushbutton switches connected directly to the 68705P3 itself. These allow special actions to occur. Another slide switch (S8) is used in conjunction with an inverter to optionally invert the input signal.

Following is a description of what each switch does:

S1 — When pushed, the decoder is forced into figures mode. Baudot code is only 5 bit, so there are not enough codes for each desired character. Thus two modes are used, figures and letters, which are switched by certain codes. In bad reception conditions, a change-over code could easily be missed, causing gibberish to appear. Thus, if letters are coming out, but you think that it should be in figures mode, press S1.

S2 — Pushing this switch changes the baud rate to the next rate, according to the following table. The current baud rate is displayed in binary format on LEDs d1, d2 and d3, with d1 being the least significant bit.

Selection	d1	d2	d3	Baud rate
0	off	off	off	45.45
1	on	off	off	50
2	off	on	off	75
3	on	on	off	100
4	off	off	on	110

World Radio History

5	on	off	on	150
6	off	on	on	175
7	on	on	on	300

S3 — This switch is the opposite of S2: pressing it takes the baud rate back one stop on the above chart.
S4 — This switch is the opposite of S1: pressing it forces the converter into letters mode.
S5 — When this slide switch is high (i.e. moved so that +5V is connected to the middle terminal of the switch), the output is parallel baudot code, not ASCII. When it is low, ASCII output is available. This switch is usually low.
S6 — When this slide switch is high, linefeed characters are suppressed, as some printers do not need them. When it is low, linefeed characters are passed through. This switch is usually low.
S7 — This switch is reversed for expansion. I plan to use it for applications such as high speed ASCII, when it becomes popular. I considered fax, but decided against it because there is not enough RAM on the 6870P3 to allow a full line to be buffered, and the graphics are very different on different computers. For the while, leave it low.
S8 — This switch determines the polarity of the incoming data. In the normal position (connected to the data input), the date is not inverted. When it is connected to the collector of T1, it is inverted. For use with the ETI 733, I usually use the inverted mode.
S9 — On-off switch.

Connectors

There are two connectors on this board. The 16 pin IC socket goes to the printer: the 5 pin connector goes to the power supply and demodulator. The pinout of the 16 pin socket is as follows, including pin number for a Centronics plug:

IC socket pin	Description	Centronics pin number
1	d7	9
2	d6	8
3	d5	7
4	d4	6
5	d3	5
6	d2	4
7	d1	3
8	d0	2
9	strobe	1
10-16	ground	16

Pins 11 to 16 may be ignored if desired.
Note: from this table it is seen that the converter has no way of telling whether the printer has actually received the data or not. This was done for a few reasons. Firstly, I did not have a spare I/O port on the 68705P3. Secondly, even if I did, I would not be able to make much use of the information as the RAM is so limited. Lastly, ignoring acknowledgements means that I can just turn the printer off line to stop it receiving characters.

You may run into a problem if your printer is very, very, very slow, as it will be unable to keep up with the decoder. However, modern printers are about 10 times faster than the old teletypes, so that is very unlikely to be a problem. For instance, 45.45 baud is only about 6 characters per second, and even 300 baud is only about 40 characters per seconds. Some daisy wheel printers may have trouble keeping up with 300 baud though.

The other socket contains 5 pins in the following order, starting from the edge of the board:
Data (from demodulator)
Ground (to demodulator)
+5V (to demodulator)
+5V (from power supply)
Ground (from power supply)
As seen, a five volt power supply is needed. This must be within plus or minus 10% for the 6870P3 to operate reliably. The decoder draws about 150 mA, and the demodulator will draw some more.

PARTS LIST — ETI-747

Capacitors
C1 ..... 1 µF electrolytic
C2 ..... 15 pF disk ceramic
C3 ..... 0.1 µF disk ceramic (as small as possible)

Resistors
R1-5 ..... 1.0k 5% ¼ Watt
R6 ..... 10k 5% ¼ Watt

Semiconductors
D1-3 ..... Rectangular LEDs
Q1 ..... BC547
IC1 ..... Programmed MC68705P3S (see article)

Switches
S1-4 ..... PCB mounting pushbutton SPST
S5-9 ..... miniature DPST

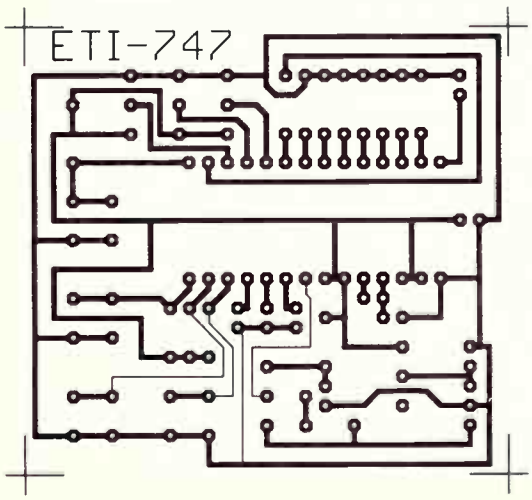
Miscellaneous
4MHz crystal
16 & 28 pin socket
5 pin connector
printed circuit board
printer cable with 16 pin header on one end
Cost estimate: $65, excluding case and demodulator, but including cables.

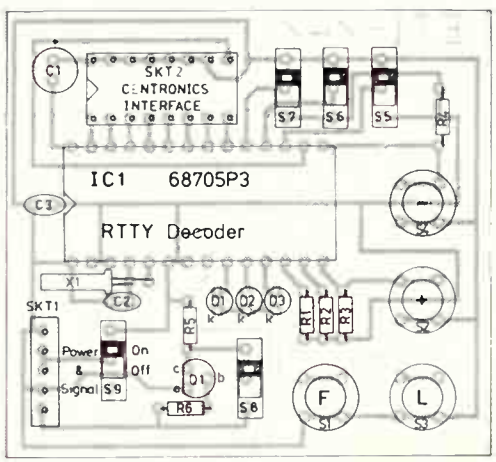
Construction

Firstly, decide whether you are going to put it into a box or not. If not, all the switches may be mounted on the printed circuit board. My prototype was done on the circuit board with some light card stuck to the bottom.

If you are mounting everything on the printed circuit board, make sure that the holes for the switches and connector are big enough. It is much easier to drill the holes larger at this stage then after some components are on it.

Firstly mount the two sockets: the 16 pin one for the printer connection, and the 28 pin one for the 68705P3. I very strongly recommend that you use a socket for the 68705P3, as it is an expensive chip,





World Radio History

and difficult to remove.

Next mount the switches and power connector. Note that if you mount them on the printed circuit board, and if the slide switches have mounting flanges, these must be removed, as they get in the way of other components.

Now mount the LEDs. I have recommended rectangular ones, as full size round ones would not fit very well. After these come the capacitors and then the transistor. Note that when mounting C2, you must leave room for the crystal. This can then be soldered in on its side, lying between the 28 pin socket and 5 pin plug.

Lastly insert the 68705P3 into its socket. Be careful to get all the pins in, and use normal integrated circuit handling precautions.

Now all that is left is making the cables. For the printer cable follow the wiring specifications mentioned previously.

The power/demodulator cable is best implemented by having two pieces of ribbon cable; one (consisting of two wires) to go to the demodulator.

Testing

Now for the big moment! Connect all the cables to their correct positions, check that the slide switches are in their correct positions, and switch on.

All the LEDs should now be out. Press S2 and they should all go on. If none go on, check that power is getting to the 68705P3 and that the ground is OK on the LEDs. If one isn't on, test the connections to it. Now press S2, and they should all go out again. If pressing one switch does something, but the other doesn't, test the connection to the offending switch.

If that worked successfully, then you have verified that the program is running, and that at least part of the circuitry is working. You can now try feeding some real RTTY of known baud rate into the demodulator. Set the decoder to the correct baud rate using switches S2 and S3.

If nothing is being printed, check that the printer is on line, and that the strobe connection is OK. If there is stil no output, check that the demodulator is giving out a good signal. Give it a minute or so, as most printers print a line at a time, so the printer will wait until a carriage return or line feed is received before printing.

If you are getting total gibberish printed, try changing the polarity switch, S8.

If roughly half of your characters are correct, but the other half are incorrect, it is probably one of your data lines in the printer cable that isn't working.

If you are still getting nothing or gibberish, check the printed circuit board for solder bridges and hariline cracks. You could also try some other baud rates or other combinations of the switches.

If you get an extra line spacing between each line printed, try suppressing the line feeds with S6.

There is no calibration to do: all timing is derived from the 4 MHz crystal, and this will be far more accurate than necessary, so don't worry about it. ●

Obtaining 68705P3

As programming the 68705P3 requires sophisticated (and expensive) equipment, it is impractical for a once off user to buy or make a programmer. Also, it is an unusual chip which is not carried by most retailers. Thus I am willing to supply a programmed and verified MC68705P3 for $30, including air mail postage (within Australia only) and secure packing. As the pricing of the MC68705P3 is beyond my control, I reserve the right to alter that charge, so if you are making this project some time after publication, contact me first. Send a cheque or money order to:

Andrew Conway
10 Gilmore Road
Doncaster
Victoria 3108

This software is copyright 1988 by Andrew Conway.

ETI-747: How it works

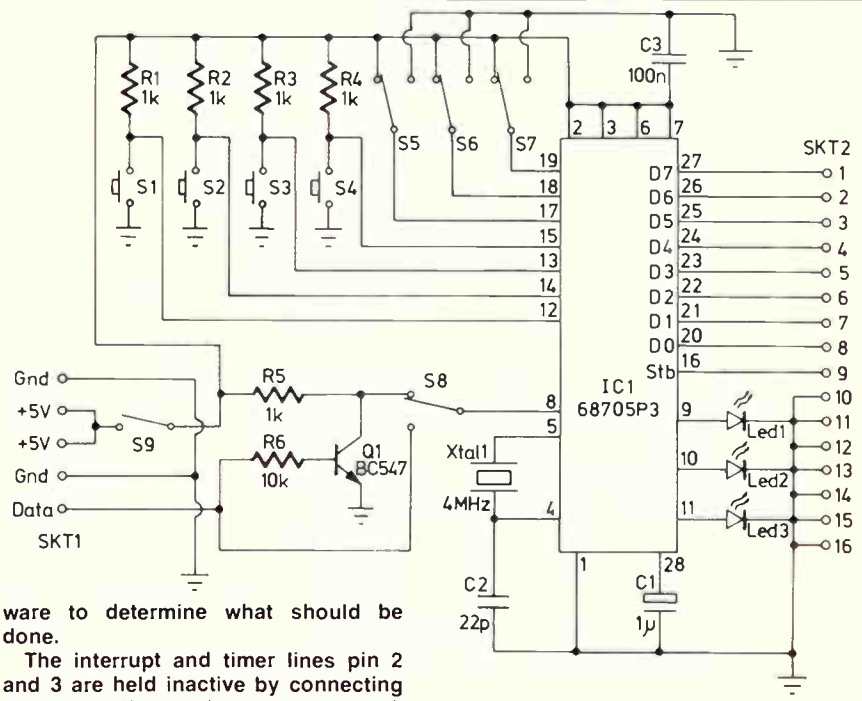
Most of the work in this circuit is done inside the microprocessor, IC1. It contains an on-chip oscillator which means that the only external component needed to make it run is the crystal itself, connected across pins 4 and 5, and a capacitor to ground hanging off pin 4.

Serial Baudot code comes from the RTTY via the data input on skt 1. Q1 and its associated components will act as an inverter if S8 is toggled appropriately. This pulse train is then input onto pin 8 of the IC.

The MC68705 has three ports, and pin 8 is part of these. The state of the line is polled by the software, which takes the baudot standard text and converts it to Ascii, as well as changing the speed and converting it to parallel format. This data is then output via port B to Skt 2.

All the other components on board are either switches which are ready at required intervals or indicators.

Switches S1 to S4 each pull a pin on the 68705P3 low when they are pressed; when they are released, a pull up resistor forces them high. Switches S5 to S7 just pull a pin high or low depending upon their state. These pins are then polled by software to determine what should be done.



The interrupt and timer lines pin 2 and 3 are held inactive by connecting them to +5V, as they are not used. The reset pin 28 contains a resistor internally, so only a single capacitor, C1, is needed for reseting on power up.

S9, the power switch works by cutting off power to the board. C3 is a decoupling capacitor to absorb high frequency AC on the power lines.

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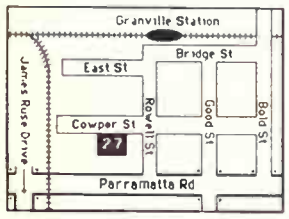

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- ☐ 1N5404 rectifiers 400 PIV 3 Amp.....10 for....$2.00
- ☐ 600PIV 3 AMP avalanche rectifiers 4 for.....$2.00
- ☐ BD237 tab power transistor.....5 for.....$2.00
- ☐ BC328 30V 500mA TO92 transistor 10 for...$1.00
- ☐ NPN 40V unmarked TO5 silicon trans 20/ $1.00
- ☐ 5mm yellow LEDs were 45¢, 20¢ ea, 10 for..$1.75
- ☐ BZY93 24V 20 watt zener diode, stud mtg...$1.00
- ☐ VHF trans MRF-603 (sim 2N5590) 2 for.....$11.95
- ☐ SCR 100V 1A TO5 TS1202 from STC 4 for....$1.00
- ☐ SCR 200V 10A TO66 TS121B (STC) 4 for.....$2.00
- ☐ Mica washer + insulators for TO3, 20 for.....$1.00
- ☐ Mica washer + insul TO220 tab, 20 for $1.00
- ☐ 25 metres insul hook-up wire, 5 colours.....$1.95
- ☐ 8000uF 75vw insul can electro, was $17.....$8.00
- ☐ 2200uF 50vw pigtail electros were $2.50....$1.00
- ☐ 1000uF 18vw pigtail electros .....10 for.....$2.00
- ☐ NE-2 neon lamp 25¢ ea, 10/$2.00, ...100/ $15.00
- ☐ 12V 120mA pigtail lamps 25¢ ea, 10 for.....$2.00
- ☐ 5K log 45mm mono slider potentiometer.....$2.50
- ☐ Bourns 1K 10-turn cermet trimpot.....$1.95
- ☐ 12 way plastic electrical terminal block.....$1.45
- ☐ Mini 12V DC DIL relay 1KΩ coil sgle pole.....$2.00
- ☐ 24V DC relay DPDT 140Ω coil 25A contacts $4.00
- ☐ 220V AC DPDT miniature cradle relay.....$2.95
- ☐ 6V or 9V DC motors medium size 2400RPM $3.00
- ☐ 3 position 10 amp rotary switch + knob.....$1.00
- ☐ DPDT slide switch, was 60¢, now 4 for.....$1.00
- ☐ 6 pole colour coded DIL switch, pcb mount...$1.50
- ☐ Mini PVC tuning gang for trans radios.....$1.00
- ☐ Ferrite rod aerials 150mm x 10mm diam.....$1.95
- ☐ 3.5mm earphone sockets, were 30¢ 20 for....$2.00
- ☐ 5KΩ trans radio volume controls, 4 for.....$2.00
- ☐ Elapsed time XXXX XXHRS meter 36-80Vdc $14.95
- ☐ 3PDT rocker action switch, buy 4 for.....$1.00
- ☐ Assorted new 0.5W resistors, pack of 100...$1.50
- ☐ Hi-stab resistors 1% and 2% assorted ..30/ $1.00
- ☐ Plastic/metal knobs assorted pack, 40 for..$1.50
- ☐ Brown or cream plastic knobs for 6mm shaft 0.25
- ☐ Assorted poly caps up to 630V, pack 30 for $2.00
- ☐ PC8 mount fuse-clip for 3AG fuse, 12 for....$1.00
- ☐ Electrolube spray can (similar WD40) $3.50

For this month only! LOOK

- ☐ Electronic siren 12V dc 98dB, was $18.....$12.00
- ☐ 240Vac 3" or 5" cooling fans, were $20.....$15.00
- ☐ 2KΩ/V pocket multimeter, was $19.50.....$13.50
- ☐ 36 pin Centronics printer leads, asst. from $7.00
- ☐ 36 pin Centronics parallel printer plugs.....$3.95
- ☐ DB25 female socket, gold-plated pins.....$1.50
- ☐ DB25 male plug on wall plate, was $13.25....$3.50
- ☐ 3AG panel mounting fuseholders, were 98¢... 0.50
- ☐ Honeywell microswitches 250V AC 5A.....$1.95
- ☐ Ariste mini desoldering pumps, were $16...$8.00
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- ☐ Car antenna signal booster AM/FM 12V dc...$6.75
- ☐ Telephone pickup coil for recording calls....$5.65
- ☐ FM wireless mike 88-108MHz hi-quality....$17.50
- ☐ Stereo speaker vol cont 8ohm 100W L-pad $15.50
- ☐ 6.5mm stereo panel mount sockets 2 for.....$1.00
- ☐ 3 speakers ON-OFF stereo switch box.....$9.50
- ☐ 95mm piezo tweeter 80W, no crossover req $7.50
- ☐ 58mm (2.25") 8 or 25 ohm mini speakers.....$1.80
- ☐ 75mm (3") 8 ohm mini speakers.....$2.50
- ☐ 5"x3" 4 ohm Magnavox speaker.....ea....$2.50
- ☐ Magnetic lo-impedance earphone.....$1.00
- ☐ Crystal hi-impedance earphone.....$1.95
- ☐ Hi-Fi moving coil magnetic cartridge.....$19.95
- ☐ Compression power mike for CB/2way.....$15.00
- ☐ 240V AC to 12V DC 100mA plug-pack.....$7.50
- ☐ 240V AC to 9V DC 200mA Ferg plug-pack.....$7.50
- ☐ 240V AC to 3/4.5/6V 250mA regulated.....$12.00
- ☐ TV/Aerial/Computer switch-box TV-9.....$4.95
- ☐ TV aerial VHF/UHF mixer/diplexer.....$4.95
- ☐ Video head cleaner VHS or Beta, were $11ea$5.50
- ☐ Replacement head cleaner fluid, was $1.95...$1.00
- ☐ Battery test meter, all 1.5V + 9V batteries $4.50
- ☐ 2 pin mains power lead and socket.....$1.95
- ☐ 3 pin mains plug with 2 core flex 1.8m ea....$1.50
- ☐ Burglar alarm vibration sensor N.O. $4.90
- ☐ Aluminium foil tape for windows 30 metre $5.00
- ☐ Mini Philips screwdrivers set of 4.....$3.20
- ☐ Mini hex nut-driver set of 5 pcs 3 to 5 mm $4.50
- ☐ TV headphones with vol control, were $19...$5.00
- ☐ Compact disc cleaning kit, was $19.95.....$9.95
- ☐ 8" disk drive cleaning kit was $19.95 crazy $5.00
- ☐ Panel mounting BNC sockets, were $2.95.....$1.95

RESISTORS

All wanted values 1 ohm to 10 Meg $2
Packs of 100 same value
0.5W or 0.25W Carbon film

9 Pin DB to 25 Pin DB ADAPTERS

$10.50 Each

2 TYPES-
9P plug to 25P skt... Cat 16-3445
9P skt to 25P plug...Cat 16-3447

FANS

5" 220V AC All working but noisy!
Cat No 06-1101 $7 ea
EX-COMPUTER

NEW DB9 TYPE CONNECTORS

As used on new IBM type computers etc Have 15 pins in 9 pin size connector.

15 PIN Male Cat 16-3406
15 PIN Female Cat 16-3407 Each $7.95

AM/FM Stereo Radio Headphones

by Toshiba/EMI

New and undamaged but plastic headband needs strengthening! 100's sold but no guarentees at this price! Original price $69.95
$15 pr

SOUND FEEDER for CD players

$59 Cat 01-1522
Supplies 3/6/9V dc from lighter skt for CD player or Walkman cassette & inbuilt FM converter transmits sound into car radio for high quality output.

4/6/8" Honeycomb Cone WOOFERS

Reduce cone breakup, excellent bass sound, RMS power ratings All 8 ohms impedance

4" 25W	80Hz-7KHz	19-6080	$29
6" 30W	60Hz-7KHz	19-6082	$45
8" 75W	50Hz-7KHz	19-6084	$69

Car Interior Light DELAY SWITCH

Insert between door switch and light, 15 second delay, 12V dc pos or neg gnd. Cat 01-1522 $14

Nicad Rechargeable NiCad batteries

High quality Japanese nickel cadmium "AA" penlight batteries. each
450mAH Were $3.50 Cat 02-1050 10 for $25 $2.95

STEREO HEADPHONES FOR DIGITAL COMPACT DISC

The difference in bass, treble and sound dynamics is amazing! Clean and crisp with outstanding clarity yet lightweight L/R volume controls, 20-20KHz resp. 100dB at 1KHz sensitivity, normally RRP $44.95, below cost at $20 pr

CD Adapter for Car stereo

Plugs into the headphone socket of portable CD player or TV and uses car stereo cassette system for high quality sound.
$29 Cat 01-1520

5" Honeycomb Cone Mid-range

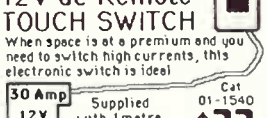
25W 325Hz-15KHz Sealed back, matches all honeycomb cone woofers. Cat 19-6086 $22.50 Each

1" Dome Tweeter

35W 1.2KHz-20KHz Suit honeycomb speakers. Cat 19-6088 $14.50 Each

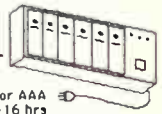
12V dc Remote TOUCH SWITCH

When space is at a premium and you need to switch high currents, this electronic switch is ideal



30 Amp 12V
Supplied with 1 metre long cable
Cat 01-1540 EA $33

Nicad Battery Charger



Mains powered, charges 6 x AA or AAA batteries in 14-16 hrs, with LED indicators.
Cat 02-2012 $19.80

12-15V DC Regulated 3A POWER SUPPLY KIT

Ideal for CB car stereo alarms & battery charger Has LM723 regulator, all parts + instructions
$29 Cat 11-1540

CASSETTE SALVAGE and REPAIR KIT

Complete set of cassette parts with splicing bar and tape and blades
Cat 01-0430
$2.95 Each

8" Polypropolene Cone WOOFERS

Water resistant hi-fi speakers, 75W RMS power, 50Hz-5KHz 8Ω
$44.85 ea
Cat 19-6095 Indoor/outdoor use

Day/Night SENSOR SWITCH

Photocell with 240V AC relay switching for homes, security, neon signs etc
$16.50 Cat 04-0110 Waterproof for outdoors.

7.2V Nicad Chargers

Fast charge in 15 mins or trickle charge from car battery.
Standard Quick Charger.....$39
Deluxe Quick Charger.....$95
Dual meters, electronic timer control.

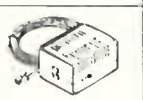
EX-BANK HOLD-UP CAMERAS

Using photographic film but ideal as dummy camera for shop/showroom - just add a flashing LED for extra effect. Includes control unit.
$49 Freight extra

FOOT SWITCH

2.5m lead, phone plug
Momentary type Cat 01-0455
Push ON-Push OFF Cat 01-0457 each $13.95

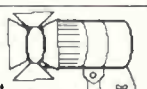
TELEPHONE EXTENSION BELL



10 Metre lead for remote locations with US type plug Aust plug adapter only $5.52 ea
$22.50 Cat 24-3001

HALOGEN VIDEO LIGHT

12V 100 Watt
For all video camera lighting with power pack and charger
$249.00



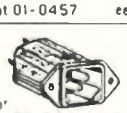
7.2V Nicad Battery Pack for radio control Tamiya cars etc.

$65 Cat 02-1090
Plug-in replacement is 1300mAH and at this price, you could afford 2 as spares. Recommended charging 130mA 15hrs.

RECHARGEABLE ELECTRIC SCREWDRIVER

Was $99 then $55, now $39 Cat 20-2308
Heavy duty professional tool, ni-cad batteries, forward and reverse, 4 tips + charger incl

I.E.C. Mains 240V NOISE FILTER 3 Amps



Low Profile Japan made Was $22.50 now only $15.50
I.E.C Mains lead, just add a 3 pin plug Cat 01-2401 $4.50

PUSH-BUTTON DIGITAL TELEPHONE DIALLERS

with last number memory re-dial feature. $10 WAS $15
Cat 24-3070 Easily installed, not Telecom approved.

PRE-PAK electronics (02)637-1221

Mail Orders: 27 Cowper St, GRANVILLE NSW 2142
also at 1a West St, LEWISHAM (02) 569-9797
Mon-Fri 9:00-5:30 Sat 9:00-1:00 Fax (02)682-3515
Pack/Post: $3 plus 5% of order value; extra for heavy items.
BANKCARD VISA MASTERCARD AMEX
WANTED: Electronic parts, computers, test equipment, CASH paid.

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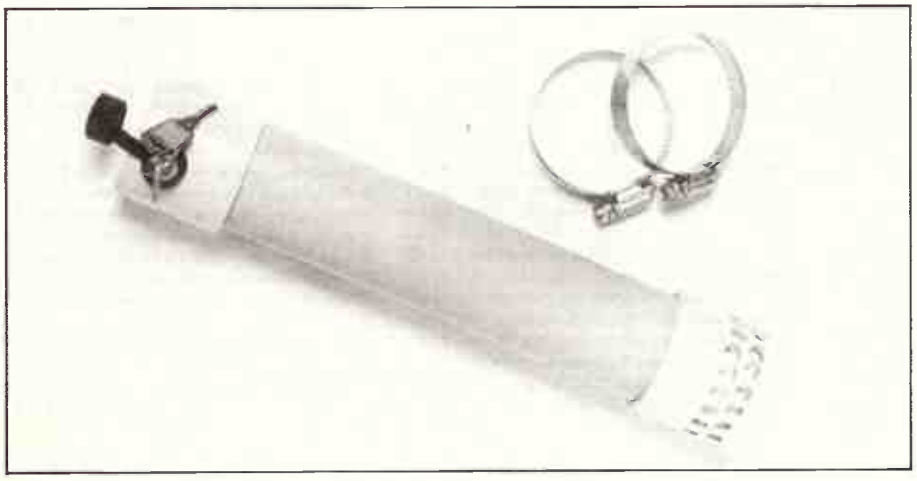
ETI-344: "THE UNTOUCHABLE" BIKE ALARM



This little alarm can protect your motorbike, bicycle, boat trailer and many other items. Since the slightest knock will trigger it, the item it is attached to will virtually become untouchable. It is totally self-contained and with normal use it's internal battery will last for years! It's also inexpensive, easy to construct and very easy to install. The unit also doubles up as a simple vibration detector which can be added into any existing alarm system.

BRANCO JUSTIC

THE ALARM DESCRIBED here should prove the answer for protecting many of your most vulnerable items. It is firmly attached to the item that you wish to protect. There is only one control on the unit; the "OFF-ON" barrel key switch. When the Barrel key switch is first turned into the "ON" position, a short time delay is activated prior to the alarm actually being "armed". The delay is about ten seconds so that you can remove the key without actually triggering the alarm. Normally this period would be termed the "exit delay", except that a bicycle is pretty hard to exit; perhaps "activation delay" would be a more appropriate term to use.

Once the delay time has expired, the unit is "Armed" and any further movement will just about instantly trigger the alarm; actually there is a delay of about two seconds before it sounds off. The reason for this delay is simply to give you time to insert and turn the key without the alarm sounding off.

Once again there is a terminology problem. Normally this two second period would be called the "Entry delay" but it's pretty hard to enter a bicycle; perhaps "Deactivation delay" would be a more appropriate term to use. The alarm time is fixed at about one minute and the alarm will "Rearm" itself in 10 seconds (entry delay/activation delay) after this time has expired.

It's interesting to note that the whole alarm industry is so geared to protecting enclosed areas such as houses and cars that they don't even have the correct terms to describe our alarm. If they did we could have simply said that this alarm has an "activation delay" of ten seconds, an alarm period of 1 minute, a "deactivation delay" of 2 seconds and will "rearm" itself 10 seconds after the alarm time has expired; a case for more universal terms perhaps?

We have called this unit a "Bike alarm", mainly because we expect this will be its main application, but we also expect that readers will find many other applications. As an example, the unit could be simply used as a very sensitive "vibration detector" as provision is made to drive an external relay. A "vibration detector" would be a useful addition to many existing alarm systems, both at home and in cars.

Gentle Knocks

This alarm responds to high frequency vibration. In fact, it is actually triggered by gently knocking the item to which it is connected. This feature avoids false triggering due to low frequency vibrations which could result from wind etc. The unit does not suffer from sensitivity problems; it is very sensitive!

Low Current Consumption

One of the main design features of this unit is it's very low current consumption. The alarm consumes a maximum current of 3μA when it is switched "ON" and "Armed". When the unit is switched "OFF" the alarm draws approximately

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5μA. If the alarm is actually triggered it draws approximately 30mA (with piezo speaker and buzzer -as per prototype), however that's only for one minute. Of course the battery life is mainly determined by how many times it's actually triggered, but with normal usage the battery should last you for years.

It is interesting to note that, if the alarm were permanently left in the armed state, the battery should theoretically last for nearly 15 years (with Alkaline battery), however we suspect the self discharge of the battery (shelf life) would render it useless long before this time. Alkaline batteries are strongly recommended for powering this alarm because of their greater capacity and longer shelf life.

Provision is also made for powering a speaker, buzzer, Piezo siren and relay. The circuitry includes a low power siren driver which is intended to drive a small piezoelectric speaker.

Construction, Testing and Installation

A complete kit of parts for this project is available from Oatley Electronics. Begin construction by assembling all the parts on the pc board provided. Watch the orientation of all the polarised components and insert the IC's into their sockets after all the other components have been assembled. The piezoelectric disc and nut assembly is soldered at the board's edge as shown in the diagram.

Double check all the component locations and follow the connection diagram when connecting up the barrel key switch, battery connector and your chosen loads.

Your alarm should now be operational. Set the sensitivity control to its mechanical

PARTS LIST — ETI-344

1 x PCV; 1 x Piezoelectric transducer disc; 1 x Piezospeaker; 2 x 14 Pin IC sockets; 1 x Barrel key switch; 1 x 9V battery connector; 1 x solid state buzzer;l 2 x 100K ohm Trimpots; Screw, nuts and hook up wire.

Resistors

¼W 5%: 1 x 470 ohm, 2 x 2.2K ohm, 2 x 4.7K ohm, 3 x 33K ohm, 2 x 120K ohm, 3 x 1M ohm, 1 x 4.7M ohm, 1 x SOT (Note and resistor supplied in kit).

Capacitors:

1 x 680Pf ceramic
1 x 0.01μF greencap; 1 x 0.1μF monolythic; Low leakage electrolytics (RBLL); 1 x 4.7μF, 3 x 10μF, 1 x 100μF.

Semiconductors:

7 x 1N4148 silicon diodes; 1 x 1N4004 silicon diodes; 1 x SOT 'N' channel FET; 1 x BC559 silicon PNP transistor; 1 x BD140 silicon PNP transistor; 1 x BC337 silicon NPN transistor.

The parts for this project are available from:

Oatley Electronics

5 Lansdowne Pde., Oatley West, NSW 2223. Phone: (02) 579 4985.
Post address (mail orders): PO Box 89, Oatley, NSW 2223

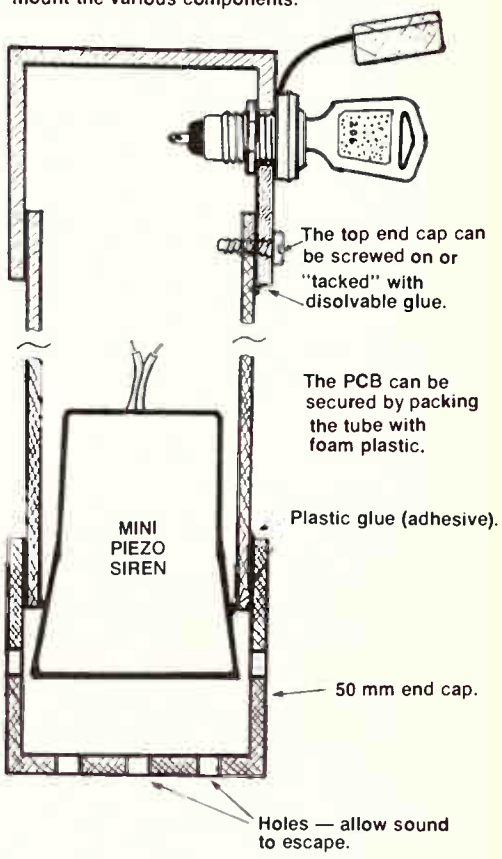
Prices:

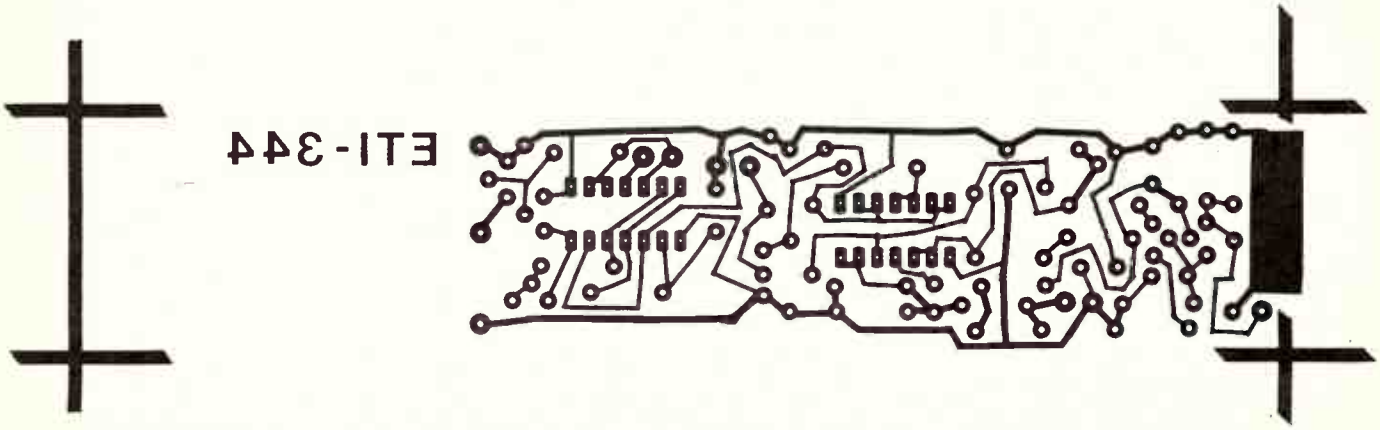
PCB and components kit:
Includes all components, piezoelectric transducer, screw and nuts, IC sockets, battery connector, (battery not included).....$14.95

Accessories:
Piezo speaker.....$ 2.70
Piezo buzzer.....$ 2.70
Mini barrel key switch.....$ 7.50
Piezo siren.....$16.50
12V-3A relay.....$ 2.90
Post and pack.....$ 2.50

NOTE: The printed circuit artwork copywright for this project is owned by OATLEY ELECTRONICS.

Cross-section of the 50 mm tubing showing how to mount the various components.





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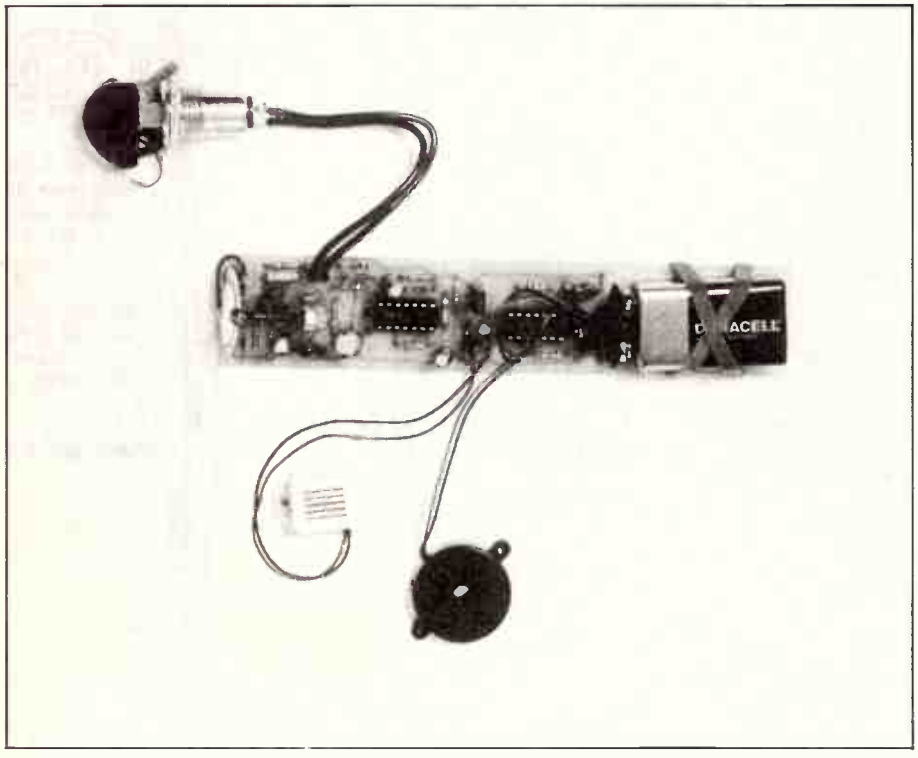
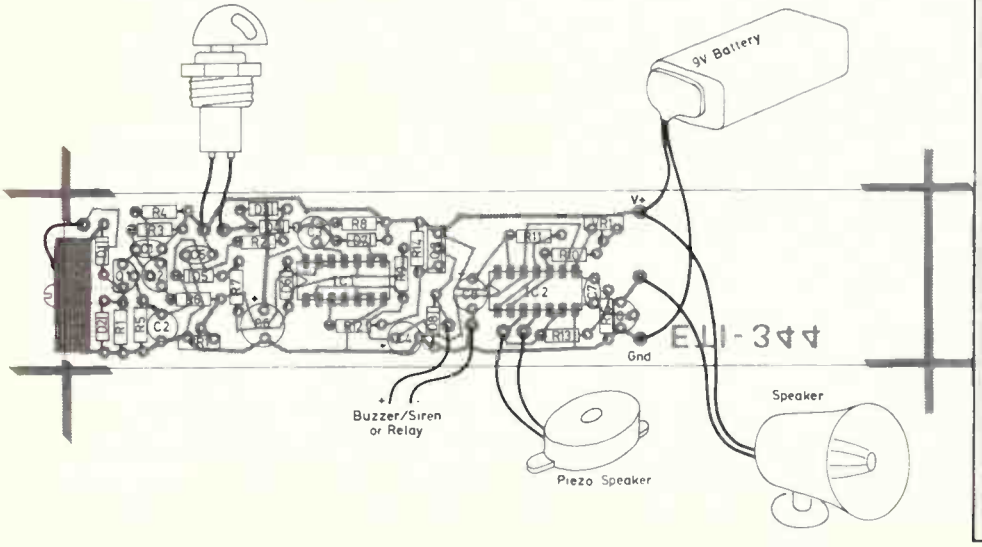
centre position and apply power to the unit (connect the battery) and check for correct operation as previously described. You should be able to trigger the alarm by very gently tapping the board. If you use a piezo speaker the frequency of the oscillator will have to be adjusted in order to obtain the most output; the piezo speaker is a resonant device (about 2.5-3KHz) and for a certain setting of VR2 a noticeably louder output will be obtained. Note that the piezo speaker produces the least output when it is firmly screwed to a surface via the two screwholes provided. Suspending the piezo speaker freely or simply employing only one mounting screw produced significantly higher sound output.

If a piezo buzzer is used, it should be firmly attached (screwed) to the alarm enclosure. This will vibrate the enclosure and the object to which it is attached and produce significant sound output.

The alarm should be encased in your chosen enclosure. The board was designed to fit into a length of plastic pipe. However if the portion of the board to which the battery is attached is cut off, the alarm





HOW IT WORKS — ETI-344

The piezoelectric disc is made to resonate at approximately 70 Hz by the screw and nut assembly provided. The output voltage derived from this resonant piezoelectric assembly is applied to the two back to back diodes (D1 and D2) which limit the voltage applied to the FET amplifier stage to about 0.8v P-P.

The FET amplifier stage (Q1) is biased close to its cut off voltage, due to the high value of source resistance employed (R3-1Mohm). FET's generally have a high spread, and therefore a suitable FET and matching source resistors are selected on test (SOT) and supplied in the kits available from Oatley Electronics.

Transistor Q2 with its associated components forms an amplifier stage which is biased below it's cut-off. The gain of this stage is proportional to the value of collector resistance and therefore depends on the setting of Sensitivity control VR1. Since transistor Q2 is biased below it's cut-off, it's quiescent collector voltage is 0v. However if the piezoelectric assembly is vibrated, the collector voltage of Q1 can rise to near full supply voltage. When the collector voltage of Q2 rises above the threshold voltage of gate IC1a the monostable employing gates IC1a and IC1b will trigger.

Gates IC1a, IC1b, C3 R8 D7 and D6 make up the monostable which determines the alarm time. The monostable time (unstable state) is determined by R8 and C3 and with circuit values shown, is about 1 minute. This time can be easily modified by changing the value of R6. For example with R6 2.2 Mohm the alarm time will be shortened to 30 seconds, however with R6 10 Mohm the alarm time will be lengthened to 2 minutes. Feedback from the output of IC1b via diode D6 to the input of IC1a keeps the monostable in the unstable state after it is triggered. Diode D7 protects against the input voltage to IC1b exceeding the supply voltage when C3 quickly discharges; at the end of the alarm time.

During alarm time the output voltage from the monostable is approximately equal to supply voltage (logic "1"). Resistor R9 and capacitor C4 delay the application of this voltage to gates IC2a, IC2b, IC1c and IC1d when the

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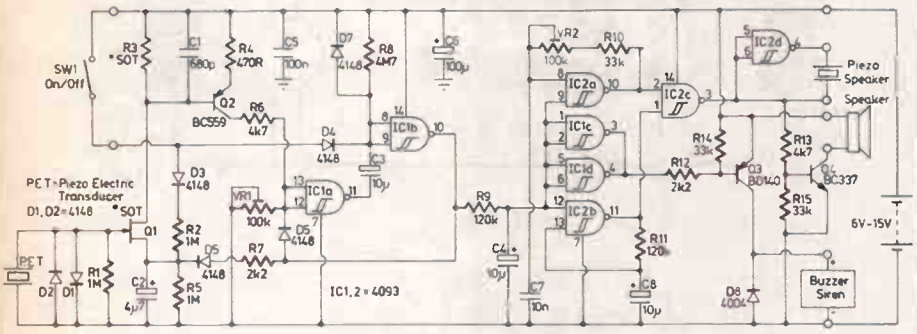
could also be mounted in a small plastic project box. The two illustrated enclosures were made from readily available plastic pipes and their matching "end caps".

The thinner of the two enclosures is actually a length of 40mm high pressure pipe and its matching end caps. This product is normally used for connecting up swimming pool filters and is readily available from large hardware stores (builders suppliers).

The thicker of the two enclosures is actually a length of 50mm electrical conduit and its matching end caps. These are standard electrical products and are readily available from electrical wholesalers. Note that this pipe is thick enough to mount a "Mini piezo siren"; (see diagram). ●



alarm is first triggered. This delay (activation delay) is approximately 2 seconds and it is included to enable the unit to be switched off, without enabling the siren and the buzzer circuitry; the resulting vibration due to the key being inserted triggers the alarm.

When the threshold voltage to IC2a and IC2b is exceeded, the two oscillators begin oscillating. One of the oscillators is made up from IC2a, VR2, R10 and C7. The frequency of this oscillator is adjustable (VR2) around 2.5 kHz. The other oscillator is made up from IC2b, R11 and C8 and it oscillates at approximately 2 Hz. The two oscillator outputs are connected to separate inputs of IC2c. The gating action of IC2c produces bursts of 2.5 kHz square wave signal, pulsed at a rate of 1 Hz. Adding an inverter (IC2d) and connecting the load (piezoelectric transducer) as shown, produces an output voltage which has a p-p output voltage of approximately twice the supply voltage. The threshold voltage of the parallel gates IC1c and IC1d are also exceeded during alarm time. This produces a logic "0" level at the parallel gates' output. This output is used to switch transistor Q3 via R12. Diode D8 is included to protect against possible damage, which is possible if inductive loads such as relays or mechanical buzzers are used in some applications. This output simply provides a dc output voltage, which is approximately equal to the supply voltage during alarm time.

Switching transistor Q43 is used to drive a speaker. This transistor is connected to the internal siren drive circuitry via R13, and can supply peak currents of several hundred mA into the speaker, which is connected into its collector circuit. Note that a higher current darlington pair could be connected in place of Q4 to drive more current into a horn loudspeaker. However in this case higher capacity batteries should be used.

Diode D5 becomes forward biased during alarm time, and produces a high voltage at the FET's source during alarm time. This biases the FET well below it's "pinch off" and renders the amplifier non operational. Also when the alarm time expires it takes a little time before the FET amplifier stage is once again operational; time is determined by R5 and C2 and it is about 10 seconds. This time is sifficient for any mechanical loads (Relays, Buzzers), to stop vibrating thus preventing the alarm from retriggering when the alarm time has expired. In a similar manner closing the barrel key switch SW1, switches the alarm off by putting the FET into "pinch off" and this time constant provides sufficient time to switch the unit on without triggering it from the vibration due to the key being rotated and removed. Diode D4 is included to quickly reset the alarm time monostable if the unit was in the alarm condition prior to the key being operated. When the key is operated (Alarm-OFF) the FET amplifier is non operational due to the voltage which is applied to the FET's source via D3 and R2; the FET is biassed below its pinch-off voltage.

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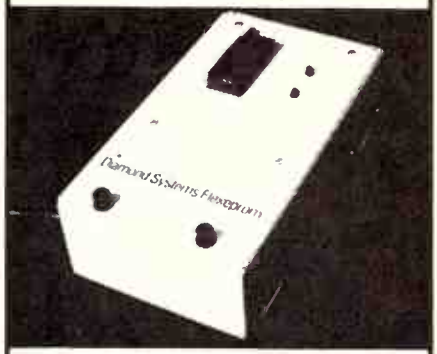

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TEXAS INSTRUMENTS
TECHNOLOGY AWARD UPDATE

Texas Instruments Technology Award

During 1987 Texas Instruments sponsored various final year electrical engineering projects in the fields of Digital Signal Processing, Local Area Networks, and Parallel Processing.

Local Area Networks (LANs) allow communications and the sharing of resources within a building or factory, however, it is becoming increasingly important that Local Area Networks also have the capability to link with Metropolitan and Wide Area Networks such as the Public Switched Telephone Network.

In this update we discuss work carried out on the design of an interface between the IBM Token-Ring LAN (IEEE Standard 802.5) and the Queued Packet and Synchronous Circuit Exchange (QPSX) communications network, an Australian designed network that was recently established as the international standard for Metropolitan Area Networks (IEEE 802.6 Standard).

Student: Evan Petridis

Supervisor: Prof Tony Cantoni — University of Western Australia

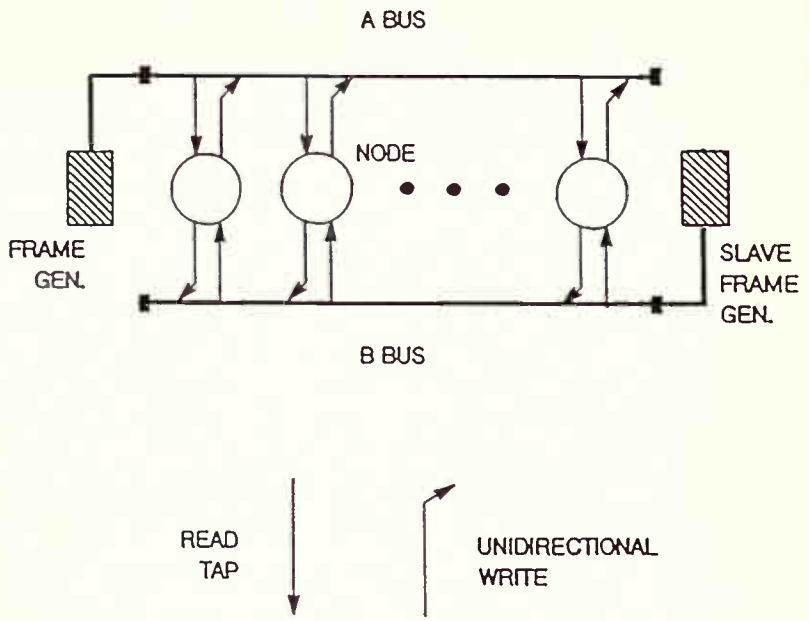
Principle Of Operation

The design allows industry standard personal computer applications software to run over the QPSX network. There are two key aspects to the design. Firstly, the node interface provides a set of services, via QPSX, which is analogout to that provided by a Token-Ring Adaptor board. Secondly, the interface to the PC is designed to exactly emulate that of the Token-Ring Adaptor.

This means that compatability with Token-Ring Network applications is attained without recourse to any modifications of the Token-Ring PC-Resident software drivers, or the applications software.

A further application of the work carried out is that of a network bridge. This is a connection between two QPSX networks, thus allowing data to be routed between them.

Throughout the thesis a top-down design method was used. By partitioning the design problem into small, well defined sub-problems, a system was developed which is both flexible and maintainable.



QPSX Network Overview

The Queued Packet and Synchronous Switch is an integrated switch that offers high capacity sharing of circuit switching capability, as well as very fast packet throughput.

The network uses a dual bus that allows self healing with no loss of capacity and no loss of synchronisation in the event of a break in the cable.

Bus rates of up to 150 Mbit/s are possible for switched voice, synchronous, or asynchronous data.

In conformance with the OSI (Open Systems Interconnection) model, the Logical Link Control (LLC) used for the Metropolitan Area Network IEEE 802.6 standard is that defined by IEEE 802.2 (The LLC is a sub-layer within layer two — the data link layer — of the OSI model. The other sub-layer within layer two is the Medium Access Control (MAC). Layer one — the physical layer — provides the physical data transmission and controls the physical medium such as coax, optical fibre, etc).

Differences between the Token-Ring LAN and the QPSX MAN are found in the Medium Access Control (MAC) sub-layer, and the physical layer.

(Further discussion of IEEE 802 standards, and the OSI model can be found in many recent text books on data communications).

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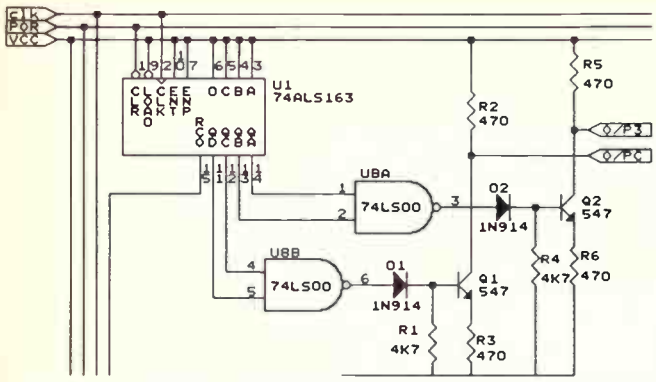

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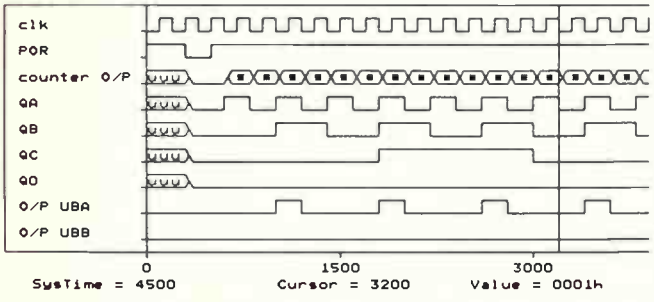

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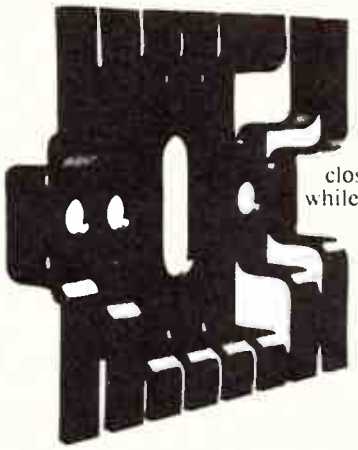

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FRONT LINE ADCs

A look inside the design of a modern analogue to digital converter for use in a voltmeter.

Hal Chenhall

A precision digital multimeter has recently been launched which, because of its advanced technological design, can arguably be claimed to be the most accurate in the world. Of key importance to the performance design objectives was the development of a multi-ramp, multi-slope integrating analogue to digital converter (ADC) which provides selectable resolutions up to a full 8½ digits at significantly faster speeds, and with lower noise and better linearity, than previous designs.

The result is a highly flexible and compact ADC which has the following features:

i) Selectable resolutions and speeds with capabilities ranging from greater than 1000 readings per seconds at 4½ digits resolution a 1 full 8½ digits reading every 7 seconds — significantly faster at high resolution than any other commercial design.
ii) Superb linearity of 0.2 parts per million (ppm) of full scale.
iii) Low noise of less than ppm pk-pk of full scale.
iv) 100% overrange, giving resolutions to 1 part in 200 million.
v) Fast overload recovery.

Dual Slope Integrator

The basic principles behind the design are illustrated by the simple dual slope converter, shown in Figure 1. The process is one of 'charge balance' where the charge flowing onto the integrator capacitor when the unknown signal is applied during a preset period T1, is the same as the charge flowing off the capacitor during a measured period T2 when the reference of opposite polarity to the signal is applied. Providing the value of the reference is known and the duration of both signal and reference periods is measured, then the value of the signal can be deduced.

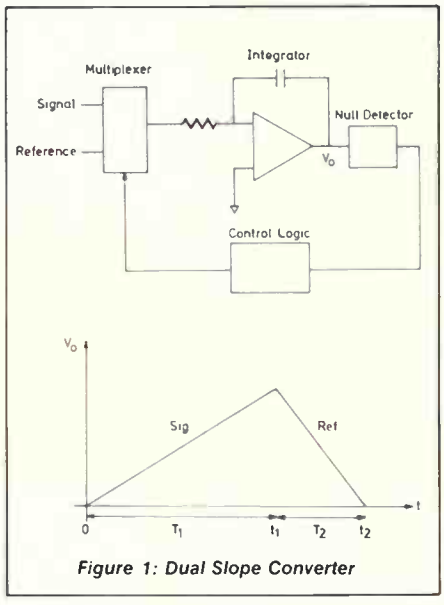


Figure 1: Dual Slope Converter

In theory, the accuracy to which this can be determined is governed by knowledge of the reference accuracy, and the ability to count clock cycles. All that is required of the circuit is that the clock, resistor and capacitor remain stable over the conversion period, as long term variations in these components are irrelevant.

The integration time T1 is chosen according to the requirements for speed and noise for a given resolution. Note that by setting T1 equal to a whole multiple of power line cycles (i.e. line-locking the integration time), excellent line frequency rejection can be achieved.

There are three major problems using this simple design for a high accuracy integrator:

i) T2, the reference time, is determined by how fast we can count accurately — in other words, how good the null detector is at detecting zero. If the integrator was a full scale voltage of 10V (representing 20.000,000 for an integrator with 100% overrange), and a 7½ digit reading is required with a reference time of 1 second, then each digit would be equivalent to 50ns or 500nV at the null detector input. Such speed and sensitivity is, in reality, impractical — even the best current ADCs run at approximately 1µs per digit. This would imply that the reference time for a 7½ digit reading has to be extended to about 20 seconds to remove excessive noise, which is clearly too long.
ii) The integrator capacitor is not perfect, and is best modelled as an ideal capacitor in parallel with an RC absorption network. Dielectric absorption leads to linearity and read rate errors as charge stored in the absorption network during the integration period is not recovered and therefore not counted during the reference time. It therefore precludes true charge balance over short measurement times.
iii) When the signal is close to zero, if the null detector picks up a noise spike and effectively chooses the wrong polarity of reference, then the integrator will potentially start ramping in the wrong direction until the counter overflows, indicating a reading greater than full scale, even though the real signal level is zero!

Quad Slope Integrator

These problems are overcome in a refine-

World Radio History

ment to the basic technique shown in Figure 2 which uses four slopes, instead of two. The bias slope overcomes the problem at zero. At the end of the integration period, a small amount of known signal (feedforward) is applied to ensure that when the reference is switched in, the integrator will work correctly and return to null. As we know the magnitude of the bias signal and the time it is applied for, it can be taken into account.

The use of Ref and Sub-Ref overcomes the problem of null detector speed. Here, the principle is that we count fast until we get close to null, and then simultaneously switch to a lower reference value (Ref/16) and a slower count rate for the final approach to null. This ensures that the slew rate through null is reduced allowing the null detector to have a lower bandwidth and hence achieve lower noise. Where the integrator decides to switch to the Sub-Ref is not important provided it is synchronized to the clock and that the system counts correctly. During the Ref period the system counts in 16's, while during the Sub-Ref period it counts in 1's.

At the Sub-Ref period is small compared to the Ref period, this approach effectively speeds up the conversion by a factor of 16. The Sub-Ref period accounts for approximately 0.1% of full scale, and so to achieve a linearity of less than one part per million of full scale requires that we know Sub-Ref to better than 0.1%, which is easily achieved with resistors.

The linearity and read rate problems caused by dielectric absorption in the integrator capacitor are overcome by applying a feedback network from the first null detector around the integrator. This balances any charge stored in the parasitic capacitors of the absorption network, but has the drawback of needing careful production setup for each individual integrator capacitor.

Such a design is excellent for a 6½ digit instrument, and can be successfully stretched to a 7½ digit design. However, to make an instrument usable at 8½ digits resolution requires further refreshments to the four slope design.

Multi-Ramp, Multi-slope Integrator

A multi-slope, multi-ramp integrator as shown in Figure 3 has been developed to provide the necessary performance for an 8½ digit DMM.

The main elements inherited from the quad-slope technique are the use of bias (feedforward) signals to overcome problems at zero due to noise in the null detector, and the use of Ref and Ref/16 to provide speed and accuracy (i.e. 'course' and 'fine' ramps). The additional features which provide the improvements include:

i) The use of multiple ramps which means that a smaller integrator capacitor can be used, reducing dielectric absorption effects and improving linearity.

ii) Applying signal and reference inputs at the same time rather than separately during multi-ramp conversions, improving speed of conversion.

iii) Using both positive and negative references an equal number of times for every conversion, ensuring that reference switching errors are constant and can be removed by an integral autozero cycle.

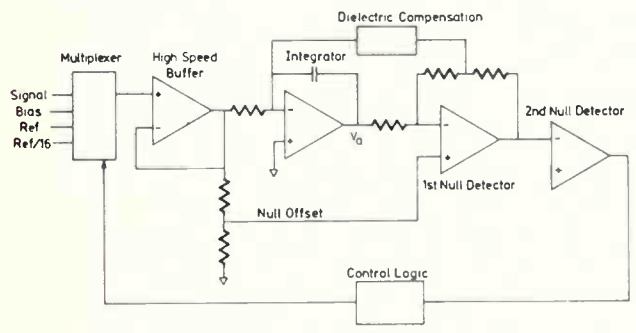
iv) Using an application specific for the ADC integrated circuit (ASIC) control, providing flexibility in programming integration times and resolution.

v) A dynamic autozero system avoids the need for the more common sample and hold type of autozero circuit, which can become saturated at overload and slow down overload recovery.

ADC Operation

When the ADC is not actually converting a signal, it goes into a reset or 'dynamic autozero' mode. This maintains the output of the already low drift integrator near zero by applying small amounts of −Ref/256 and then nulling it with +Ref/256. Because this reset cycle is short (50μs) and occurs at least once before each measurement cycle, it avoids the need or the random interruptions for zero corrections found in less sophisticated conversion techniques.

The output of the integrator during a dynamic autozero cycle is shown in Figure



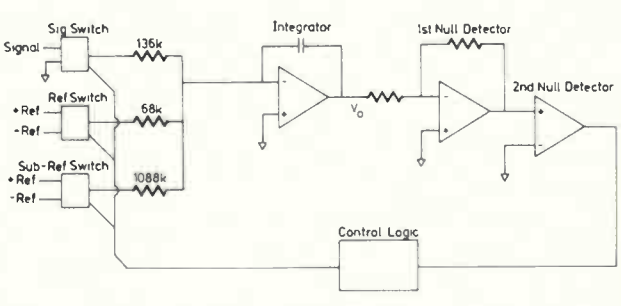


Figure 3: Multi-slope, Multi-ramp Converter

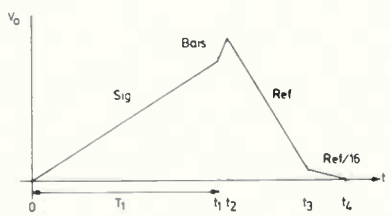


Figure 2: Quad Slope Converter

Figure 4: A-D Dynamic Autozero

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4. Initially, Zero is applied to both signal and reference inputs for a set period. Then, −Ref/256 is applied to the reference input and the output of the integrator 'ramps up' and passes through null. After the null, −Ref/256 is applied for a fixed period so that the integrator overshoots. Zero is again applied for a short period to both signal and reference inputs, to ensure that both references are not accidentally applied to the integrator simultaneously. then, with +Ref/256 switched to the reference input, the integrator 'ramps down' towards and beyond null and for a predetermined period.

The cycle is then repeated, maintaining the integrator output near zero. As can be seen, at the end of each cycle the integrator is in exactly the same place, even though the integrator may drift between resets.

Single-Ramp Conversion

Depending on read rate and resolution requirements, the ADC can make either single-ramp or multi-ramp conversions. Some of the key elements of the conversion technique are well illustrated by considering a single-ramp cycle.

Upon receipt of a reading conversion command, the last reset cycle is completed within a fixed delay of 50μs, and then the signal is applied to the signal input. The integrator 'ramps up' and after a fixed period a feedforward bias of appropriate polarity (+Ref) is fed to the reference input while the signal is still being applied. Next, Zero is applied to both the signal and reference inputs for a fixed delay to ensure that the system does not attempt to switch in both references at the same time, followed by the 'ramp down' period where −Ref is applied to the reference input. Eventually the integrator crosses null, and is allowed to overshoot in order to synchronize to a clock signal. This represents the end of the 'course' conversion period and the integrator then configures itself for the final, more accurate or 'fine', stages of the conversion.

Firstly, Zero is applied to the signal and reference inputs to avoid the effects of any switching transients, followed by applying +Ref/16 to the reference input for a fixed time. The polarity of reference used in the cycle at this point is chosen to ensure that the approach to zero for the final ramp is always made using the +Ref/256 reference, irrespective of Signal polarity. This overcomes any non-symmetry in null detector response times. After another 'dead' period, −Ref/16 applied to the reference input so that the integrator heads back again to null and overshoots. At the end of the final 'dead' period, +Ref/256 is applied to the reference input. This is the last part of the conversion and its final stages are identical to the end of the dynamic autozero cycle. In other words, the integrator output finishes back exactly where it started, so that the charge from the signal has been exactly balanced by the charge from the various references.

At the end of the conversion the ADC goes back into dynamic autozero mode and the reading data may be shifted out of the ADC control circuits. The sequence for a negative polarity signal is subtly different from that for the positive polarity signal described above, but the important fact is that for every conversion each reference is switched in and out once, and that the final 'ramp down' is identical for both Signal polarities. This means that any reference errors due to charge injection are balanced for all conversions, while any small null detector delay time errors and charge injection effects due to the final ramp are automatically removed by the dynamic autozero.

Multiple-Ramp Conversion

A multi-ramp was chosen to give maximum flexibility to the available integration periods without forcing the need for a large integrating capacitor, which could have introduced greater dielectric absorption problems. Instead, a small integrator capacitor is used, and longer integration periods are achieved by ramping up and down several times while specifically avoiding saturation of the capacitor. In addition, the multi-ramp approach provides effective gain in the integrator, reducing the requirements placed on null detector sensitivity, making higher accuracy conversions easier to achieve.

One of the key features of this particular multi-ramp design is that for all but the final ramp, the signal is applied continuously and the various references are applied simultaneously with the signal at the appropriate times (Figure 6). In other words, the integrator effectively 'ramps up' at the same time, which significantly reduces the time to take a reading.

As will have been noted, the timing and counting considerations with this design of ADC are quite complex. Although the ADC always performs the same sequence, great flexibility of control is exercised over its performance through the use of programmable delay timers, a ramp and a counter for the number of ramps performed. All of these timers and counters are integrated into a custom ASIC which has a 32 bit control register programmed by the instrument's microprocessor via a special serial interface. The same serial loop is used to transmit the reading from the ASIC to the processor for calibration and display. ●

Hal Chenhall is with Datron Instruments

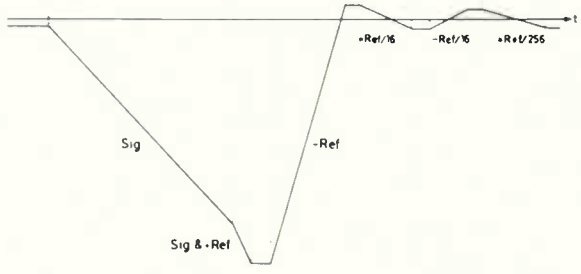

Figure 5: Single Ramp Conversion

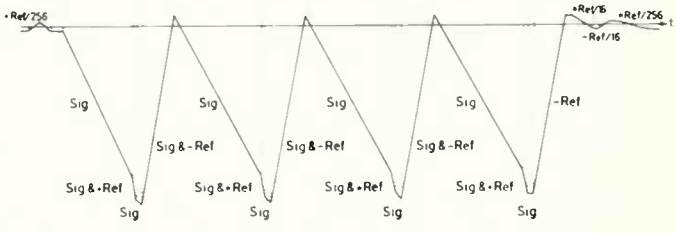

Figure 6: Multi-ramp Conversion

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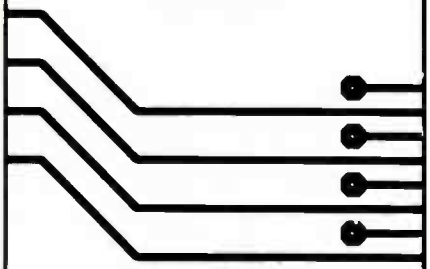

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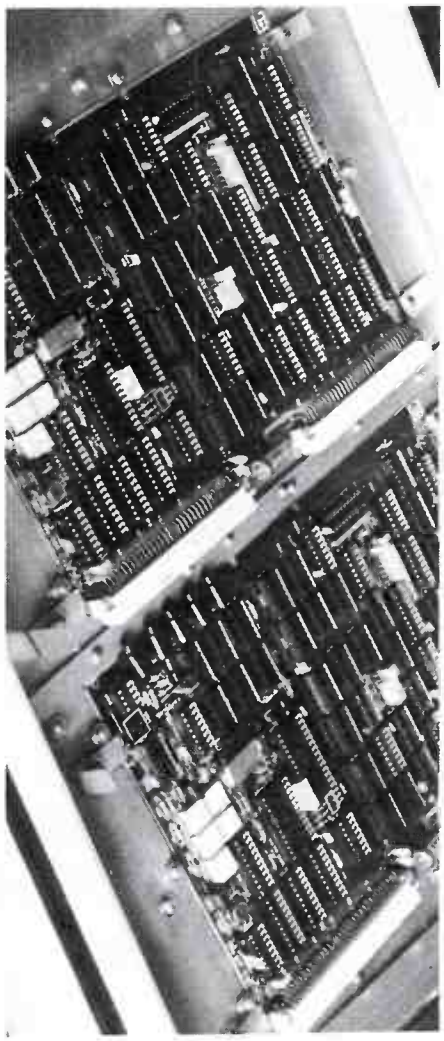

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Deathly Silence

Recently the State Government of NSW legislated to limit the length of car and burgular alarms. Such an attempt to control noise pollution may be desperately needed if the following anecdotes are any sign.

In August 1974 Matsuzo Ohama, a 48-year-old architect, infuriated beyond reason by the constant piano playing from a neighbouring apartment, killed a mother and her two daughters to silence their noise. At his trial Ohama asked for a capital sentence since only through death could he ever achieve the silence he craved. The court accepted his plea and Ohama was duly hanged for his murders.

Living with neighbours is never easy, of course, particularly if those neighbours make a noise. The latest annual report from the Factories Inspectorate records the sad case of a man who, living in a high-rise flat, was obviously driven to distraction by the people upstairs.

Annoyed by his neighbours penchant for loud music, and presumably unhappy with their musical tastes, the man in question decided to act. He made an incendiary device, primed it to go off in a few hours time, then turned on a gas tap and walked out of his flat.

The device duly went off, causing an enormous explosion which alarmed the neighbourhood but which fortunately did not cause major damages or injuries. As the Factories Inspectorate laconically concludes: "the individual concerned was convicted in the Crown Court of intent to cause bodily harm and criminal damage."

The Colour White

South Africa preoccupation with colours seems to extend to its natural history magazines. An article in *African Wildlife* devotes four pages to describing albino animals ranging from giraffes to otters. In *South African Panorama*, the cover feature is about the "Pride of the Golden City" (Johannesburg). The zoo there has just had two new arrivals — a couple of lion cubs, both pure white.

The ETI way of superannuating unwanted staff

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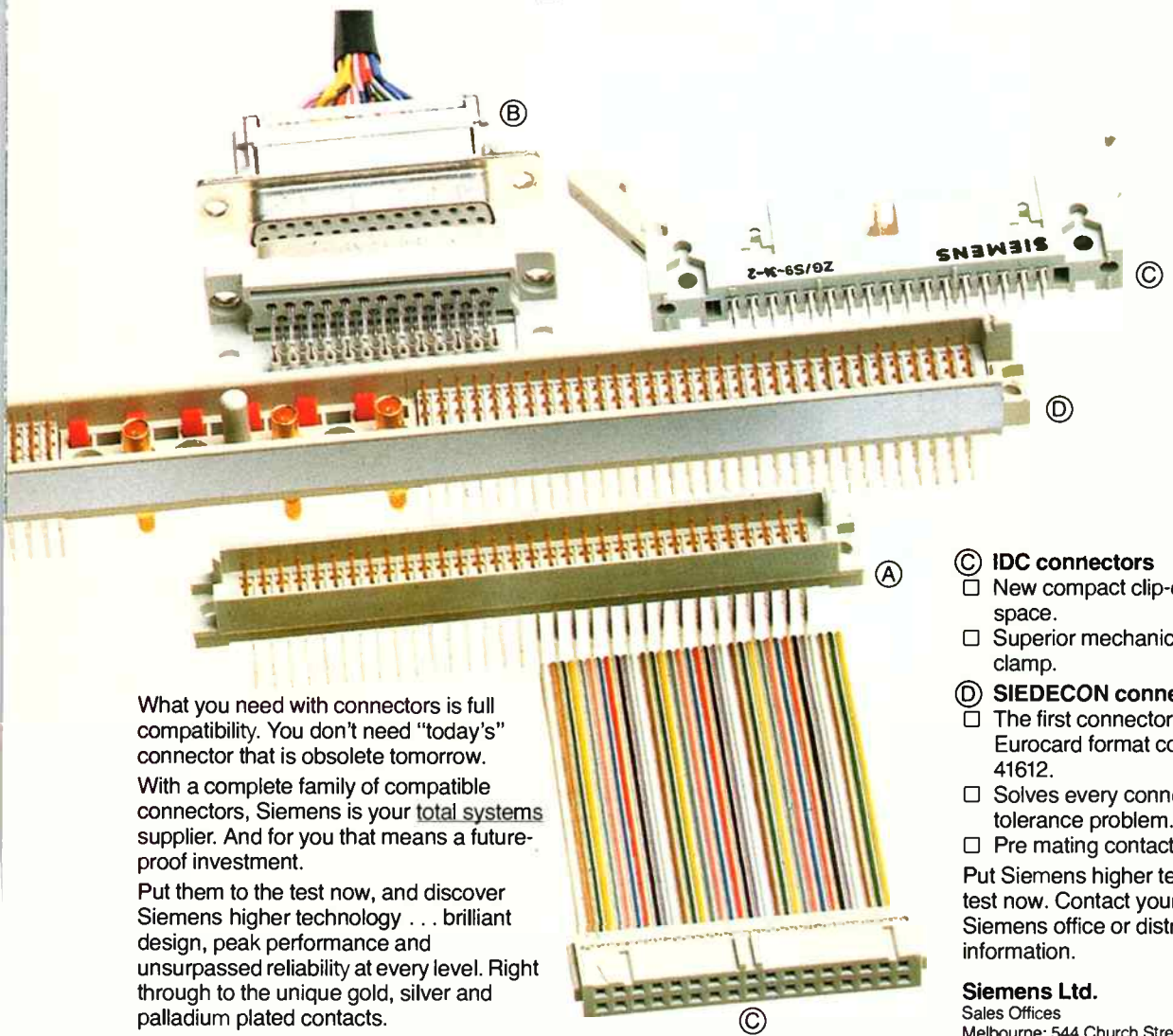

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